REMEDIAL INVESTIGATION/FEASIBILITY STUDY
WORK PLAN

TOP NOTCH CLEANERS SITE
VILLAGE OF HEMPSTEAD, NASSAU COUNTY, NEW YORK
(SITE REGISTRY NO. 1-30-096)

WORK ASSIGNMENT NO. D003600-43

Prepared for:

NEW YORK STATE DEPARTMENT OF
ENVIRONMENTAL CONSERVATION

Prepared by:

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Section 1

1.0 INTRODUCTION

As part of New York State's program to investigate and remediate hazardous waste sites, the New York State Department of Environmental Conservation (NYSDEC) issued a Work Assignment to Dvirka and Bartilucci Consulting Engineers (D&B) of Woodbury, New York, under its Superfund Standby Contract to conduct a Remedial Investigation/Feasibility Study (RI/FS) for the Top Notch Cleaners site located in the Village of Hempstead, Nassau County, New York. The RI/FS for this site is being performed with funds allocated under the New York State Superfund Program. The goals of the RI/FS are to:

- Determine whether the former Top Notch Cleaners site is a potential source of previously identified groundwater contamination downgradient of the site;
- Determine the nature and extent of dry cleaner-related contamination in soil vapor, ambient air, dry well sediment, subsurface soil and groundwater in the site vicinity, and off-site groundwater;
- Determine whether human or environmental exposure pathways exist for identified contamination and, if so, determine the risk which exists due to that contamination; and
- Determine whether remediation of contaminated media is warranted and, if so, evaluate remedial options and recommend a remedial action.

This document has been prepared in accordance with NYSDEC Technical and Administrative Guidance Memoranda and contains site-specific information for conducting the RI/FS at the site. Detailed field investigation, quality assurance and quality control (QA/QC), and health and safety procedures and protocols are provided in the draft document entitled, "Remedial Investigation and Feasibility Study Generic Work Plan, Dry Cleaner Sites," prepared by D&B, dated February 1996, which is included as Appendix A.

This site-specific work plan provides the following information:

- Summary of existing information;
- Scope of the RI/FS field program;

- Project organization;
- Site-specific QA/QC Plan;
- Site-specific Health and Safety Plan; and
- Schedule 2-11 forms.

A site-specific Citizen Participation Plan will be prepared and submitted under separate cover when this work plan has been approved.

Section 2

2.0 SUMMARY OF EXISTING INFORMATION

2.1 Site Location and Description

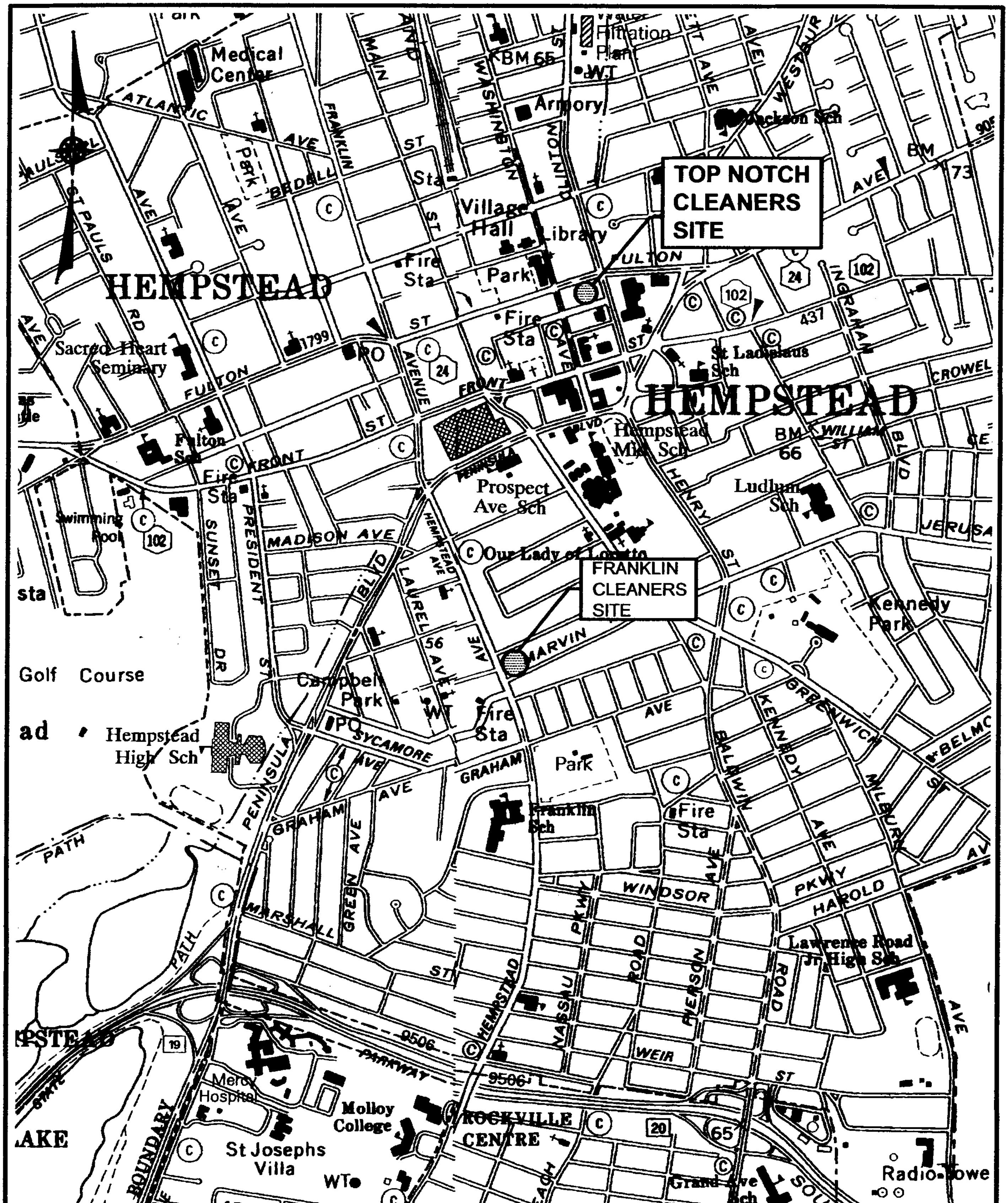
The Top Notch Cleaners site is an inactive dry cleaning facility located at 378 Fulton Avenue, between Washington Street and Clinton Street, in the Village of Hempstead, Nassau County, New York (see Figure 2-1). The site is located on an approximate 0.5-acre parcel of land within a mixed residential and commercial area. The site is part of a strip mall that consists of several small stores and a supermarket (see Figure 2-2). The site is currently comprised of a one-story structure with concrete block walls, and steel columns, beams and joists. A basement with an unused tetrachloroethene (PCE) storage tank, PCE still parts and a 275-gallon fuel oil tank is present at the site. In addition, two open floor drains in the basement were closed in 1997 under the United States Environmental Protection Agency (USEPA) Underground Injection Control (UIC) Program.

The Top Notch Cleaners store is approximately 20 feet in width (east to west) by 70 feet in length (north to south). Fulton Avenue borders the site to the north and a paved parking area exists south of the building and its neighboring stores. Several storm water catch basins/dry wells exist in the parking area behind the shopping center.

According to information provided by the NYSDEC, the site is served by a municipal potable water system (Village of Hempstead Water Department) and the building is connected to the municipal sanitary sewer system. It is unknown whether on-site septic/sanitary systems have ever existed at the site, but the municipal sewer system has reportedly been available in the area since at least 1919, prior to the on-site building, which was constructed in approximately 1968.

2.2 Site History

According to information provided by the NYSDEC, the site is currently owned by Paula and Zeev Jacobs. The site was first utilized as a dry cleaner in 1969 when dry cleaning equipment was first registered at the site. The most recent operator of the site was Hempstead



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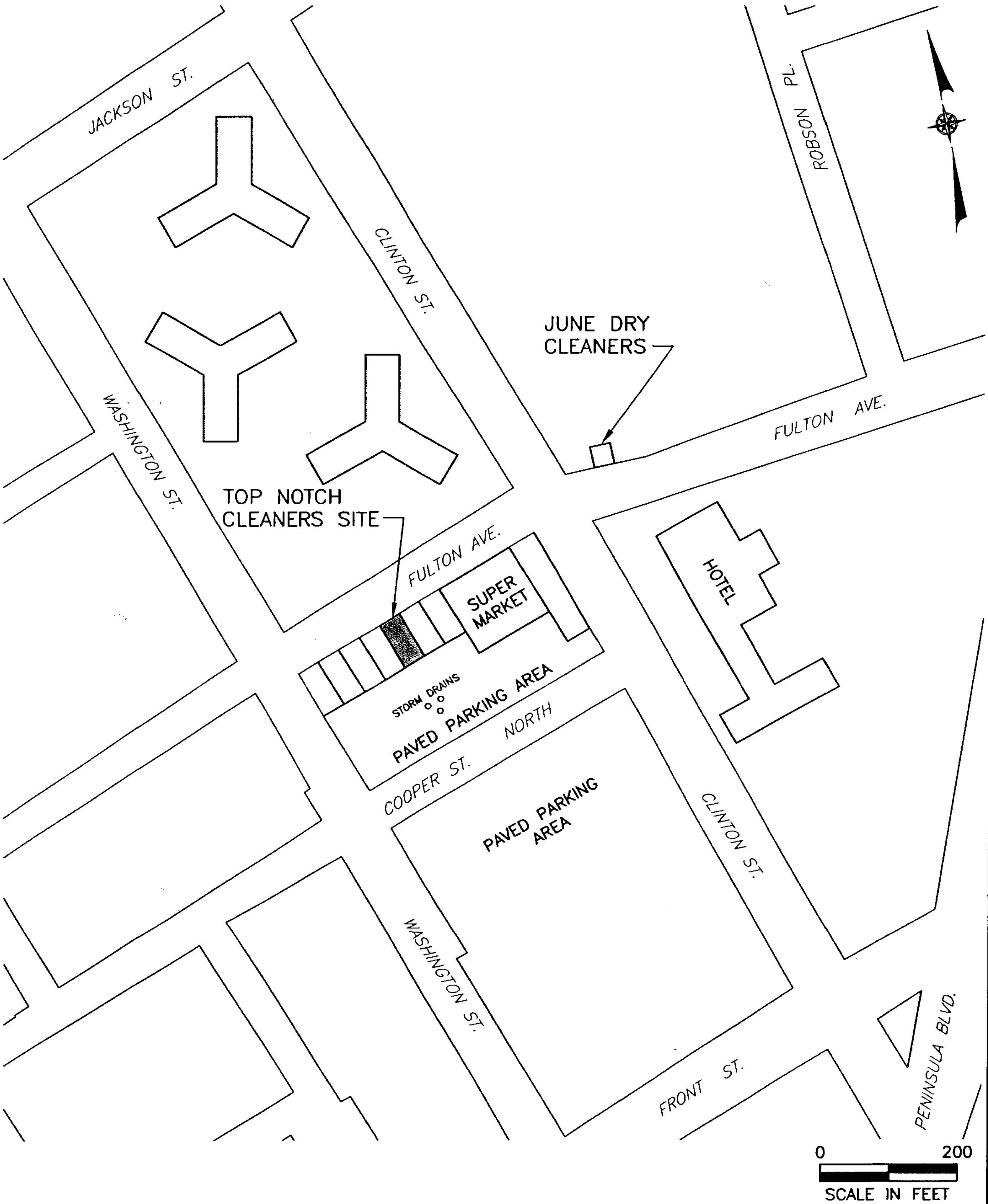
SITE LOCATION MAP

FIGURE 2-1



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SITE VICINITY MAP

FIGURE 2-2

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Top Notch Cleaners, Inc., who operated the facility since approximately 1990. No records of prior dry cleaning facility operators were reported. The facility was listed as a small quantity generator of hazardous waste (I.D. number NYD060345162). NCDH inspection records indicate no evidence of improper waste disposal, although a small PCE spill in the basement was reported by the owner of the dry cleaner on September 9, 1988. According to NYCDH records, the dry cleaner closed between June 2003 and March 2004. According to information provided by the property owner, a furniture store has occupied the former dry cleaner.

A remedial investigation (RI) conducted at the nearby Franklin Cleaners site, located approximately 3,500 feet south (downgradient) of the Top Notch Cleaners site in 1997, detected PCE contamination in groundwater upgradient of the Franklin Cleaner site. Subsequent sampling at upgradient locations suggested that the Top Notch Cleaners site, was a potential source. As a result, the Top Notch Cleaners site was listed as a Potential Hazardous Waste Disposal site ("P" site) by the NYSDEC on April 13, 1999. As a result of the Preliminary Site Assessment (PSA) conducted in 1999 and 2000, the Top Notch Cleaners site was subsequently added to the NYSDEC Registry of Inactive Hazardous Waste Sites as a Class 2 site. The registry number for the Top Notch Cleaners site is 1-30-096. The previous investigations are described in the following section.

2.3 Previous Investigations

In 1997, CA Rich Consultants, Inc. of Sea Cliff, New York, conducted an investigation of the two open basement floor drains at the Top Notch Cleaners site on behalf of the Nassau County Health Department. The investigation was conducted under the USEPA UIC program and showed that low levels of volatile organic compounds (VOCs) (including dry cleaning solvent PCE at 5.1 parts per billion [ppb]) were present in shallow soil samples beneath the floor drains. Concentrations of all detected compounds were below applicable standards/guidelines and, as a result, no remediation was deemed necessary. The floor drains were subsequently sealed and the USEPA acknowledged that the floor drains had been satisfactorily closed. However, this investigation did not include deeper soil or groundwater sampling.

The 1997 RI at the Franklin Cleaners site (Site No. 1-30-050) was conducted by D&B. As described above, groundwater contamination was identified in wells upgradient of the Franklin Cleaners site. The identified contaminants included PCE and its breakdown product tricholorethene (TCE). The distribution of the PCE and TCE indicated that the upgradient contamination may be the result of disposal at one or more of several dry cleaners that were identified north of the Franklin Cleaners site.

Based on this information, as part of the RI field investigation, eight groundwater probes (P-42 through P-49) were advanced upgradient of the Franklin Cleaners site to evaluate the other dry cleaners. Three probe locations (P-45, P-46, P-47) were advanced upgradient of the Top Notch Cleaners and June Dry Cleaners (see Figure 2-2 for site locations). Three intervals were sampled at each probe location, shallow (approximately 25 feet below ground surface [bgs]), intermediate (approximately 35 feet bgs) and deep (approximately 55 feet bgs). VOCs were not detected in the samples from any of these locations.

Three groundwater probes (P-42, P-43 and P-44) were constructed downgradient of the identified dry cleaner sites. Samples from each of these probes contained low levels of VOCs, including PCE and TCE. Total VOC concentrations in the shallow groundwater samples ranged from 3 micrograms per liter (ug/l) to 17 ug/l, total VOC concentrations in the intermediate samples ranged from 2 ug/l to 14 ug/l, and total VOC concentrations in the deep groundwater samples ranged from nondetect to 1 ug/l. Two additional probes (P-48 and P-49) were advanced immediately north of the Franklin Cleaners site. Total VOC concentrations ranged from 10 ug/l to 19 ug/l in the shallow samples, from 94 ug/l to 205 ug/l in the intermediate samples and from 666 ug/l to 949 ug/l in the deep samples.

Based on these results, a Preliminary Site Assessment (PSA) was conducted on behalf of the NYSDEC by Lawler, Matusky and Skelly, LLP (LMS) in October 1999 to identify whether a release of contaminants to the subsurface had occurred in the area upgradient of the Franklin Cleaners site. The major contaminant of concern targeted by the PSA was PCE.

According to the PSA report, the initial phase of the PSA was conducted in October 1999, and consisted of the installation of 18 groundwater probes (HEGP-1 through HEG-15 and HEG-17 through HEG-19) at locations upgradient, side gradient, or downgradient of two active dry cleaners (Top Notch Cleaners and June Dry Cleaners). Samples were not collected at location HEGP-16. Soil samples were colleted at four of the probe locations (HEGP-2, HEGP-7, HEGP-10 and HEGP-13) at various depth intervals above the water table. None of the soil samples contained levels of any VOC that exceeded New York State Recommended Soil Cleanup Objectives.

Three groundwater samples were collected at each probe location, except for HEGP-1, HEGP-9 and HEGP-12. Shallow groundwater samples were collected at depths ranging from approximately 24 to 30 feet bgs (approximate water table); intermediate samples were collected at approximately 35 to 40 feet bgs; and deep samples were collected at depths of approximately 50 to 55 feet bgs. For the three probe locations mentioned above, an additional deeper sample was collected at 75 feet bgs. Three groundwater samples from two probe locations downgradient of Top Notch Cleaners (HEGP-1 [35 feet] and HEGP-3 [40 feet and 55 feet]) contained PCE at concentrations exceeding the NYSDEC Class GA groundwater standard of 5 ug/l. Detected concentrations were 7 ug/l, 20 ug/l and 270 ug/l, respectively. No other groundwater samples collected during the initial phase of the PSA contained PCE (or any other VOC) at a concentration above New York State groundwater standards or guidance values.

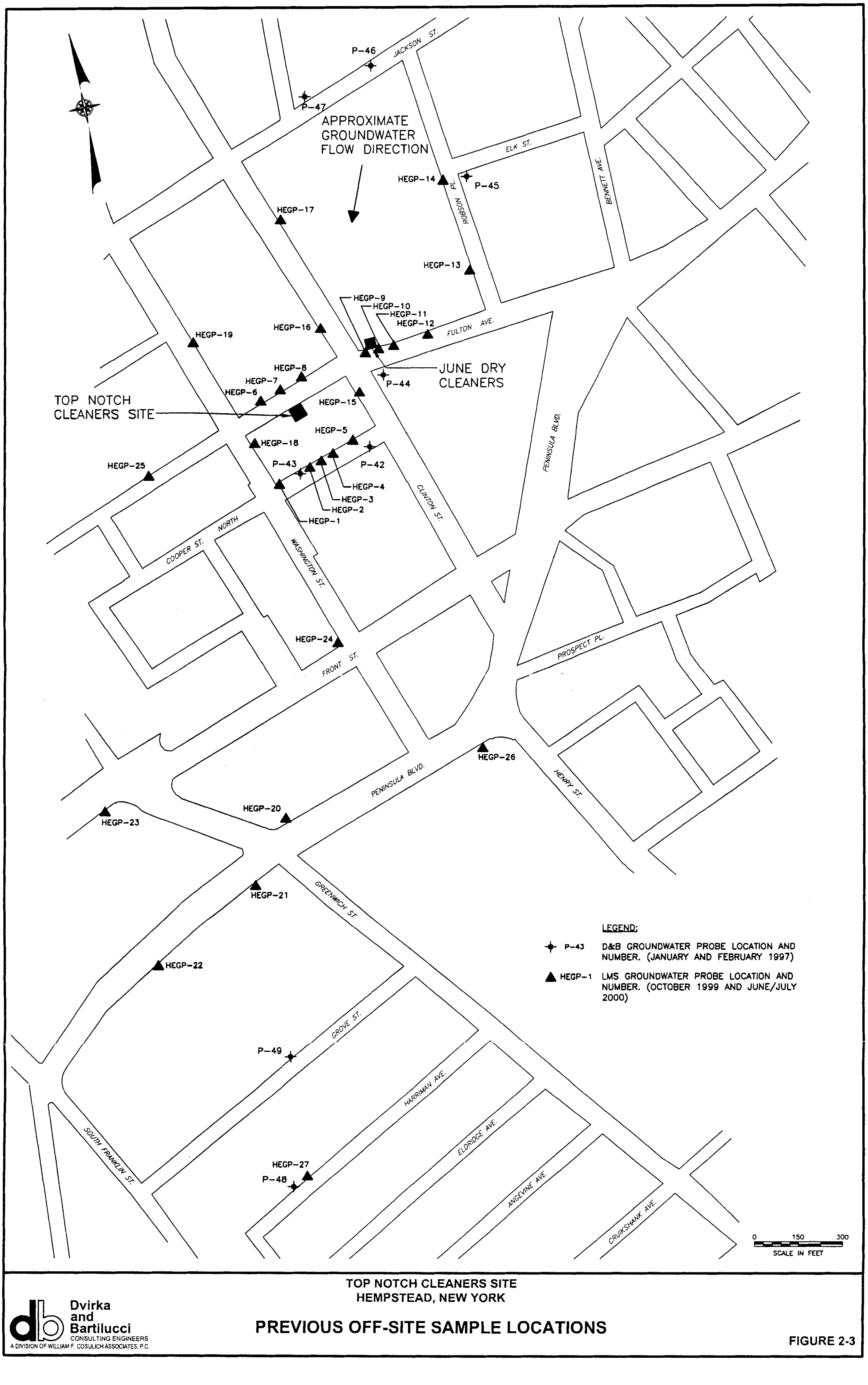
Since PCE contamination was documented south/downgradient of the Top Notch Cleaners site during the first phase of the PSA, it was suspected that a release of PCE that had historically occurred at the Top Notch Cleaners site and was contributing to the groundwater contamination upgradient of the Franklin Cleaners site. As a result, a second phase of PSA work was conducted by LMS in June and July of 2000. According to the PSA report, the second phase of PSA work consisted of installation of eight additional groundwater probes (HEGP-20 through HEGP-27). The supplemental PSA sampling was conducted to further evaluate the horizontal and vertical extent of PCE contamination in the area. Groundwater samples were collected from three depth intervals at each of the eight locations. Fourteen of the 24 groundwater samples contained detectable concentrations of PCE and nine contained PCE at concentrations exceeding the groundwater standard. The maximum PCE concentration detected was 8,100 ug/l in HEGP-20 at a depth of 85 feet bgs. According to the PSA report, vertical profiling of groundwater could not be completed beyond 90 feet bgs, due to limitations of the direct push equipment. In addition, since site access was reportedly not obtained, sampling of individual dry cleaner properties was not conducted during the PSA.

Figure 2-3 shows the historic groundwater sample locations in the vicinity of the Top Notch Cleaners site. Table 2-1 summarizes the groundwater results from previous investigations in the vicinity of Top Notch Cleaners for PCE and its breakdown products, TCE and 1,2-dichloroethene (1,2-DCE).

When the PSA data and the Franklin Cleaners upgradient data are combined, it appears that the Top Notch Cleaners site may be one of the upgradient sources for the PCE contamination. According to the PSA report, if a Top Notch Cleaners plume does exist, it appears to be deep, starting at approximately 50 feet to 55 feet below ground surface and continuing to at least 80 feet below ground surface.

According to NCDH records, several monitoring wells were previously constructed in the site vicinity by the Nassau County Department of Public Works. The locations, construction details and historic sample results for these wells will be evaluated and, if appropriate, these wells will be sampled during the field investigation.

Indoor air samples were collected by the NYSDOH on three occasions between February 2003 and December 2003 to evaluate potential PCE concentrations within the shopping center where Top Notch Cleaners operated. The first two rounds of samples were collected from various locations within the shopping center while Top Notch Cleaners was operating. The third round of samples was collected within the shopping center after Top Notch Cleaners went out of business. The NYSDOH compared the concentrations detected in the indoor air samples to the NYSDOH guidance value of 100 micrograms per cubic meter for PCE in indoor air. Several samples collected while the dry cleaner was in operation contained PCE concentrations exceeding the guidance value. Several samples from the third round of samples, collected after



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PREVIOUS OFF-SITE SAMPLE LOCATIONS

FIGURE 2-3

Table 2-1

TOP NOTCH CLEANERS SITE
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
SUMMARY OF GROUNDWATER RESULTS FOR
SELECTED VOCs FROM PREVIOUS INVESTIGATIONS

Sample Location	Date	Sample Depth (feet bgs)	VOCs		
			PCE	TCE	1,2-DCE
P-42	January/February 1997	24	4	0.7	U
		37	9	5	U
		54	U	U	U
		70	1	U	U
P-43	January/February 1997	24	15	2	U
		37	3	1	U
		54	0.9	U	U
P-44	January/February 1997	24	3	U	U
		37	2	U	U
		53	U	U	U
P-45	January/February 1997	24	U	U	U
		38	U	U	U
		56	U	U	U
P-46	January/February 1997	24	U	U	U
		38	U	U	U
		56	U	U	U
P-47	January/February 1997	24	U	U	U
		44	U	U	U
		64	U	U	U
P-48	January/February 1997	24	9	U	U
		48	89	U	U
		70	610	U	U
P-49	January/February 1997	24	15	3	U
		45	150	23	U
		66	790	120	U
HEGP-1	October 1999	28	1	U	U
		35	7	1	1
		55	U	U	U
		75	U	U	U
HEGP-2	October 1999	30	U	U	U
		40	U	U	U
		55	U	U	U

Table 2-1 (continued)

TOP NOTCH CLEANERS SITE
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
SUMMARY OF GROUNDWATER RESULTS FOR SELECTED VOCs FROM PREVIOUS INVESTIGATIONS

Sample Location	Date	Sample Depth (feet bgs)	VOCs		
			PCE	TCE	1,2-DCE
HEGP-3	October 1999	30	2	U	U
		40	20	U	U
		55	270	2	U
HEGP-4	October 1999	30	2	U	U
		40	U	U	U
		55	U	U	U
HEGP-5	October 1999	30	2	U	U
		40	U	U	U
		55	U	U	U
HEGP-6	October 1999	30	1	U	U
		40	U	U	U
		55	U	U	U
HEGP-7	October 1999	30	1	U	U
		40	1	U	U
		55	4	U	U
HEGP-8	October 1999	30	U	U	U
		40	U	U	U
		55	U	U	U
HEGP-9	October 1999	30	U	U	U
		40	U	U	U
		55	U	U	U
		75	U	U	U
HEGP-10	October 1999	30	U	U	U
		40	U	U	U
		55	U	U	U
HEGP-11	October 1999	30	U	U	U
		40	U	U	U
		55	U	U	U
HEGP-12	October 1999	28	2	U	U
		36	1	U	U
		55	U	U	U
		75	U	U	U

Table 2-1 (continued)

TOP NOTCH CLEANERS SITE
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
SUMMARY OF GROUNDWATER RESULTS FOR
SELECTED VOCs FROM PREVIOUS INVESTIGATIONS

Sample Location	Date	Sample Depth (feet bgs)	VOCs		
			PCE	TCE	1,2-DCE
HEGP-13	October 1999	30	U	U	U
		40	U	U	U
		55	U	U	U
HEGP-14	October 1999	24	U	U	U
		36	U	U	U
		51	U	U	U
HEGP-15	October 1999	30	2	U	U
		40	U	U	U
		55	U	U	U
HEGP-16	October 1999	No samples collected	--	--	--
HEGP-17	October 1999	30	U	U	U
		40	U	U	U
		55	U	U	U
HEGP-18	October 1999	30	2	U	U
		40	1	U	U
		55	2	U	U
HEGP-19	October 1999	30	U	U	U
		40	U	U	U
		55	4	U	U
HEGP-20	June/July 2000	40	23	8	3
		65	46	16	U
		85	8,100	100	340
HEGP-21	June/July 2000	40	U	U	U
		65	15	U	U
		85	81	2	2
HEGP-22	June/July 2000	40	1	U	U
		65	2	U	U
		85	U	U	U
HEGP-23	June/July 2000	30	U	U	U
		45	U	U	U
		65	U	U	U

Table 2-1 (continued)

TOP NOTCH CLEANERS SITE
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
SUMMARY OF GROUNDWATER RESULTS FOR
SELECTED VOCs FROM PREVIOUS INVESTIGATIONS

Sample Location	Date	Sample Depth (feet bgs)	VOCs		
			PCE	TCE	1,2-DCE
HEGP-24	June/July 2000	40	2	U	U
		65	13	U	U
		85	58	U	U
HEGP-25	June/July 2000	40	U	U	U
		65	U	U	U
		85	2	U	U
HEGP-26	June/July 2000	40	U	U	U
		65	U	U	U
		85	U	U	U
HEGP-27	June/July 2000	40	2	U	U
		75	27	2	U
		90	140	3	3

VOCs: Volatile organic compounds
PCE: Tetrachloroethene
TCE: Trichloroethene
1,2-DCE: 1,2-Dichloroethene
U: Undetected

Notes:

1. Locations P-42 through P-49 sampled as part of the 1997 RI/FS for the Franklin Cleaners Site.
2. Locations HEGP-1 through HEGP-27 sampled as part of the 1999-2000 PSA.
3. Results are in micrograms per liter.

the dry cleaner terminated operations, contained PCE concentrations above typical background concentrations for PCE in indoor air.

2.4 Background Information

2.4.1 Regional Geology and Hydrogeology

Long Island is composed of a thick sequence of unconsolidated Pleistocene and Cretaceous-aged sediments overlying a southeasterly sloping Precambrian-aged bedrock surface. In Nassau County the thickness of the unconsolidated deposits ranges from approximately 400 feet on the north shore of Long Island to greater than 1,500 feet on the south shore.

The sediments consist of a series of marine deposits which directly overlie bedrock, followed upwards by a variety of glacially derived deposits. Collectively, the sediments consist of interbedded layers of sand, gravel, silt and clay. From deepest to shallowest, the marine sediments comprise the Raritan Formation (Lloyd aquifer and Raritan confining unit) and the Magothy aquifer. The glacial sediments overlying the Magothy aquifer are collectively known as the Upper Glacial aquifer. The Lloyd, Magothy and Upper Glacial sediments form the major aquifers of Long Island, while the Raritan confining unit separates the Lloyd and Magothy aquifers, and limits flow into and out of the Lloyd aquifer.

The Upper Glacial aquifer (UGA) is approximately 100 to 150 feet thick and consists mostly of Pleistocene-age glacial outwash, which is generally comprised of fine to coarse sand and gravel with local thin clay lenses. The UGA is a porous and permeable unit that transmits water readily and provides a near surface, high yielding water supply source. Reported hydraulic conductivity values within the UGA are relatively high, averaging about 250 feet per day (ft/day). However, this does not imply that groundwater contaminants will travel at this rate.

The upper surface of the UGA is the water table, which is located approximately 25 to 30 feet bgs at the site. According to the Nassau County Department of Health 1997 Water Table

Contour Map, regional groundwater flow at the site is generally to the south to southwest. The RI for the Franklin Cleaners site determined groundwater flow to be to the south-southwest.

The Magothy aquifer, which is under semi-confined conditions, ranges in thickness from 300 to 600 feet. The Magothy aquifer consists mostly of fine to medium sand to clayey sand interbedded with lenses and layers of coarse sand, and sandy to solid clay. Gravel layers are common in the basal zone and discontinuous layers of gray lignitic clay are common in the upper zones. Hydraulic conductivities in the Magothy aquifer are approximately 50 to 60 ft/day and may range as high as 190 ft/day in the basal zone.

2.4.2 <u>Public Water Supply</u>

According to information provided in the PSA report, the nearest public water supply well field is located approximately 0.5 mile to the north (upgradient) of the Top Notch Cleaners site. The well field consists of six wells which are owned by and serve the Village of Hempstead. These wells were installed in the late 1920s to mid 1930s and are identified as N78, N79, N80, N81, N82 and N83. The reported total depths for wells N78, N79, N80, N81 and N83 are 381 feet, 492 feet, 489 feet, 425 feet and 1,003 feet, respectively. Information for well N82 was not reported.

In addition, there are two public water supply wells, N-3668 and N-8264, located approximately 1 mile south (downgradient) of the site. These wells are owned by and serve the Village of Hempstead. They are both screened in the Magothy aquifer at depths of approximately 450 to 500 feet bgs. The wells were installed in 1951 and 1967, respectively. Historic monitoring results for these wells will be obtained and reviewed as part of the field investigation.

Section 3

3.0 SCOPE OF REMEDIAL INVESTIGATION/FEASIBILITY STUDY

The approach to conducting the RI/FS at the Top Notch Cleaners site is to perform a focused field investigation and feasibility study. The remedial investigation will focus on the determination of the nature and extent of contamination associated with the site, and the selection of an interim remediation measure (IRM), if necessary. Based on the results of the remedial investigation, presumptive remedies appropriate for dry cleaners will be evaluated as part of a feasibility study. While the emphasis is on an accelerated investigation and selection of a remedial action, this Work Plan is structured to be in conformance with the Federal Superfund Amendments and Reauthorization Act (SARA), the National Contingency Plan and the New York State Superfund Program.

3.1 Objectives and Approach

The objectives of the RI/FS described in Section 1.0 will be achieved through collection of ambient air, soil vapor, subsurface soil, sediment and groundwater samples for laboratory analysis.

A detailed description of the field investigation is provided below.

3.2 Field Investigation

The field investigation will include the following tasks:

- Geologic characterization utilizing a direct push rig and soil conductivity probe at two locations;
- Ambient air sampling on the first floor and basement of the former dry cleaner and adjacent stores, as well as at one outside background location;
- Subslab soil vapor sampling beneath the foundation of the former dry cleaner;
- Soil vapor sampling at exterior locations adjacent to the former dry cleaner;

- Well survey to identify locations and to obtain information on nearby existing private and public wells;

- Direct push sediment and subsurface soil sampling from the three storm water dry wells nearest the former dry cleaner in the shopping center parking lot;

- Direct push groundwater sampling adjacent to the former dry cleaner and through the three stormwater dry wells nearest the former dry cleaner in the shopping center parking lot;

- Direct push groundwater sampling at one upgradient location and along three transects downgradient of the former dry cleaner;

- Construction and development of permanent monitoring wells;

- Water level measurements and collection of groundwater samples from the permanent monitoring wells; and

- Surveying and mapping.

A summary of the field investigation program is provided in Table 3-1. A summary of the samples to be collected during the field investigation is provided in Table 3-2. Figure 3-1 shows the proposed off-site sample locations. The locations for background, interior ambient air and interior soil vapor samples will be determined in the field.

3.3 Data Validation

In accordance with the Work Assignment, all data for samples analyzed by the laboratory will be validated. Data validation will be conducted by a third-party individual meeting the NYSDEC requirements for a data validator. A Data Usability Summary Report (DUSR) describing the data validation will be prepared.

3.4 Remedial Investigation Report

The results of the remedial investigation will be described in a Remedial Investigation Report. The information and results obtained during the field investigation will be used to characterize the ambient air, soil vapor, soil, sediment and groundwater conditions in the vicinity

Table 3-1

TOP NOTCH CLEANERS SITE
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FIELD INVESTIGATION SUMMARY

PROGRAM ELEMENT	DESCRIPTION
Soil Conductivity Logging	At two locations in the shopping center parking lot or along Cooper Street to the south, soil conductivity logging will be performed to attempt to verify the presence and depth of the low permeability unit that was previously identified in the site vicinity. Based on previous investigations in the area, it is expected that the low permeability unit, if present, would be encountered at approximately 60 feet below ground surface (bgs).
Ambient Air Sampling	One interior ambient air sample will be collected within each of the basement and first floor areas of the former dry cleaner and each adjacent store. In addition, one ambient air sample will be collected at an exterior background location. Specific sample locations will be determined in the field. Each of the seven samples will be collected using a Summa canister and will be analyzed for VOCs using USEPA Method TO-14.
Soil Vapor Sampling	Three subslab soil vapor samples will be collected from the basement of the former dry cleaner, using hand held or direct push equipment and Summa canisters. Soil vapor samples will also be collected from three locations adjacent to the building foundation. These samples will be collected from the depth of the building basement (approximately 10 feet below ground surface) using the direct push method and Summa canisters. All six soil vapor samples will be analyzed for VOCs using USEPA Method TO-14.
Source Evaluation at Dry Wells	The three dry wells nearest the Top Notch Cleaners site in the south parking lot will be investigated to determine the nature of contamination associated with any surface releases. At each dry well, one sediment sample will be collected from inside the bottom of the dry well, and one soil sample will be collected from immediately above the low permeability unit. Sampling will be conducted using the direct push method. Each sample will be analyzed for Target Compound List (TCL) VOCs + 10 using New York State Analytical Services Protocol (ASP) Method OLMO 4.2 (June 2000). As requested by the Nassau County Health Department, a split of each of the three soil samples from the dry wells will be collected and field preserved using methanol preservation. The split samples will be analyzed for TCL VOCs + 10 to evaluate whether comparable results are obtained using the separate sampling methods.

Table 3-1 (continued)

TOP NOTCH CLEANERS SITE
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FIELD INVESTIGATION SUMMARY

PROGRAM ELEMENT	DESCRIPTION
Vertical Profiling of Groundwater at Dry Wells	The three dry wells nearest Top Notch Cleaners site in the south parking lot will be investigated to evaluate groundwater quality in this area. Sampling will be conducted inside each of the three dry wells from the top of the low permeability unit to the water table using the direct push method. It is estimated that four samples will be collected in each groundwater probe location at depths of 60, 50, 40 and 30 feet bgs. Each sample will be analyzed for TCL VOCs + 10 using Method OLMO 4.2.
Vertical Profiling of Groundwater Adjacent to Former Dry Cleaner	Three groundwater probes will be installed adjacent to the former dry cleaner using the direct push method to evaluate whether a contaminant source is present beneath the former dry cleaner. It is estimated that four samples will be collected from each probe at depths of 60, 50, 40 and 30 feet bgs. Each sample will be analyzed for TCL VOCs + 10 using ASP Method OLMO 4.2.
Vertical Profiling of Groundwater at Upgradient Location	One groundwater probe will be advanced at an upgradient off-site location using the direct push method to determine whether contaminated groundwater from an upgradient source is migrating beneath the site. It is estimated that four samples will be collected at depths 60, 50, 40 and 30 feet bgs. Each sample will be analyzed for TCL VOCs + 10 using ASP Method OLMO 4.2.
Vertical Profiling of Groundwater at Downgradient Locations	Up to 15 groundwater probes will be advanced at off-site locations using the direct push method to determine the horizontal and vertical extent of the off-site plume. The probes will be located along three separate transects. The first transect will consist of six locations spaced approximately 100 feet apart on Cooper Street. The second transect will consist of five locations spaced approximately 200 feet apart on Peninsula Boulevard. The third transect will consist of four locations spaced approximately 250 feet apart on Harriman Avenue and South Franklin Street (see Figure 3-1). For the first transect (100-foot spacing), it is estimated that four samples per location will be collected at depths of 60, 50, 40 and 30 feet bgs. For the second transect (200-foot spacing), it is estimated that five samples per location will be collected at depths of 90, 80, 70, 60 and 50 feet bgs. For the third transect (250-foot spacing), it is estimated that five samples per location will be collected at depths of 90, 80, 70, 60 and 50 feet bgs. All of the groundwater samples will be analyzed for TCL VOCs + 10 using ASP Method OLMO 4.2.

Table 3-1 (continued)

TOP NOTCH CLEANERS SITE
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FIELD INVESTIGATION SUMMARY

PROGRAM ELEMENT	DESCRIPTION
Well Survey	A survey/inventory of public water supply and private wells will be completed in the area around the site. The area to be surveyed will be 1/2-mile north/upgradient, 3/4-mile east and west, and 2 miles south of the site.
Monitoring Well Installation	Up to 12 permanent monitoring wells will be constructed at selected locations. It is estimated that one shallow well and one deep well will be installed upgradient of the site and that one shallow and one deep well will be installed on the shopping center property downgradient of the former dry cleaner. It is estimated that two shallow wells and six deep wells will be installed at off-site locations. The final locations of the permanent wells will be based on the groundwater sample results from the vertical profile sampling program. It is assumed that the shallow wells will be approximately 40 feet in depth and that the deep wells will be approximately 85 feet in depth. One split spoon soil sample will be collected from the screen zone of each deep well. One of the split spoon samples will be analyzed for grain size and total organic carbon. The wells will be drilled using the hollow stem auger drilling method. Each well will be constructed using 2-inch diameter PVC screen and casing. Screen lengths will be 15 feet for the shallow wells (screened across the water table) and 10 feet for the deep wells. A portable decontamination pad will be utilized to collect decontamination fluids. Decontamination and purge fluids generated during the field program will be discharged to the Nassau County sanitary sewer system. Drill cuttings will be placed into 55-gallon drums and staged in the vicinity of the site for subsequent off-site disposal. The location for the decontamination pad will be determined at the start of the drilling program.
Well Development	After construction, each monitoring well will be developed to ensure an adequate hydraulic connection to the aquifer. It is assumed that each well will be developed for approximately 2 hours. Approval has been received from the Nassau County Department of Public Works for discharge of water generated during well development to the Nassau County sanitary sewer system.

Table 3-1 (continued)

TOP NOTCH CLEANERS SITE
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FIELD INVESTIGATION SUMMARY

PROGRAM ELEMENT	DESCRIPTION
Groundwater Sampling - New Monitoring Wells	After development, the wells will be allowed to equilibrate for a minimum of 1 week before samples are collected. It is planned to conduct one round of groundwater sampling from the 12 newly installed wells. The groundwater samples will be analyzed for TCL VOCs + 10 using ASP Method OLMO 4.2. In addition, samples from one shallow and one deep well will be analyzed for alkalinity, total organic carbon, iron (total and dissolved), manganese (total and dissolved), nitrate, methane, hydrogen, sulfate, ethane and ethene. Results from these analyses will be used in the evaluation of remedial technologies. Prior to sampling, water levels in all of the 12 newly installed wells will be measured to determine the site-specific groundwater flow direction.
Surveying and Mapping	Each of the new monitoring wells will be horizontally and vertically surveyed in order to develop a groundwater contour map. The ground surface elevation and measuring point elevation for each well will be surveyed by a licensed surveyor.

Table 3-2

TOP NOTCH CLEANERS SITE
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
SAMPLE SUMMARY

Program Element	Environmental Medium	Sample Type/ Depth	Number of Samples and Locations	Equipment	Laboratory Analysis
Ambient Air Sampling	Ambient Air	Grab sample from basement and first floor at former dry cleaner and adjacent stores, plus one background sample.	7 samples 7 locations	Summa Canisters	VOCs using USEPA Method TO-14.
Subslab Sampling	Soil Vapor	Grab sample from beneath basement floor.	3 samples 3 locations	Summa Canisters	VOCs using USEPA Method TO-14.
Direct Push Sampling (adjacent to building)	Soil Vapor	Grab sample from depth of basement floor, adjacent to building.	3 samples 3 locations	Summa Canisters	VOCs using USEPA Method TO-14.
Direct Push Sampling (vertical groundwater profiling adjacent to building)	Groundwater	Grab samples at 10-foot intervals between 30 and 60 feet bgs.	12 samples 3 locations	Direct Push Groundwater Sampler	TCL VOCs + 10 using ASP Method OLMO 4.2.
Direct Push Sampling in Dry Wells (south parking lot)	Sediment and Soil	Grab sample from bottom of each dry well and at top of low permeability unit.	6 samples 3 locations	Direct Push Soil Sampler	TCL VOCs + 10 using ASP Method OLMO 4.2. A split of each of the 3 soil samples will be field-preserved with methanol.
Direct Push Sampling (vertical groundwater profiling in dry wells)	Groundwater	Grab sample at 10-foot intervals between 30 and 60 feet bgs.	12 samples 3 locations	Direct Push Groundwater Sampler	TCL VOCs + 10 using ASP Method OLMO 4.2.
Direct Push Sampling (vertical groundwater profiling at upgradient location)	Groundwater	Grab sample at 10-foot intervals between 30 and 60 feet bgs.	4 samples 1 location	Direct Push Groundwater Sampler	TCL VOCs + 10 using ASP Method OLMO 4.2.
Direct Push Sampling (vertical groundwater profiling at downgradient locations)	Groundwater	Grab sample from direct push sampler at depths ranging between 30 and 90 feet bgs.	69 samples 15 locations	Direct Push Groundwater Sampler	TCL VOCs + 10 using ASP Method OLMO 4.2.

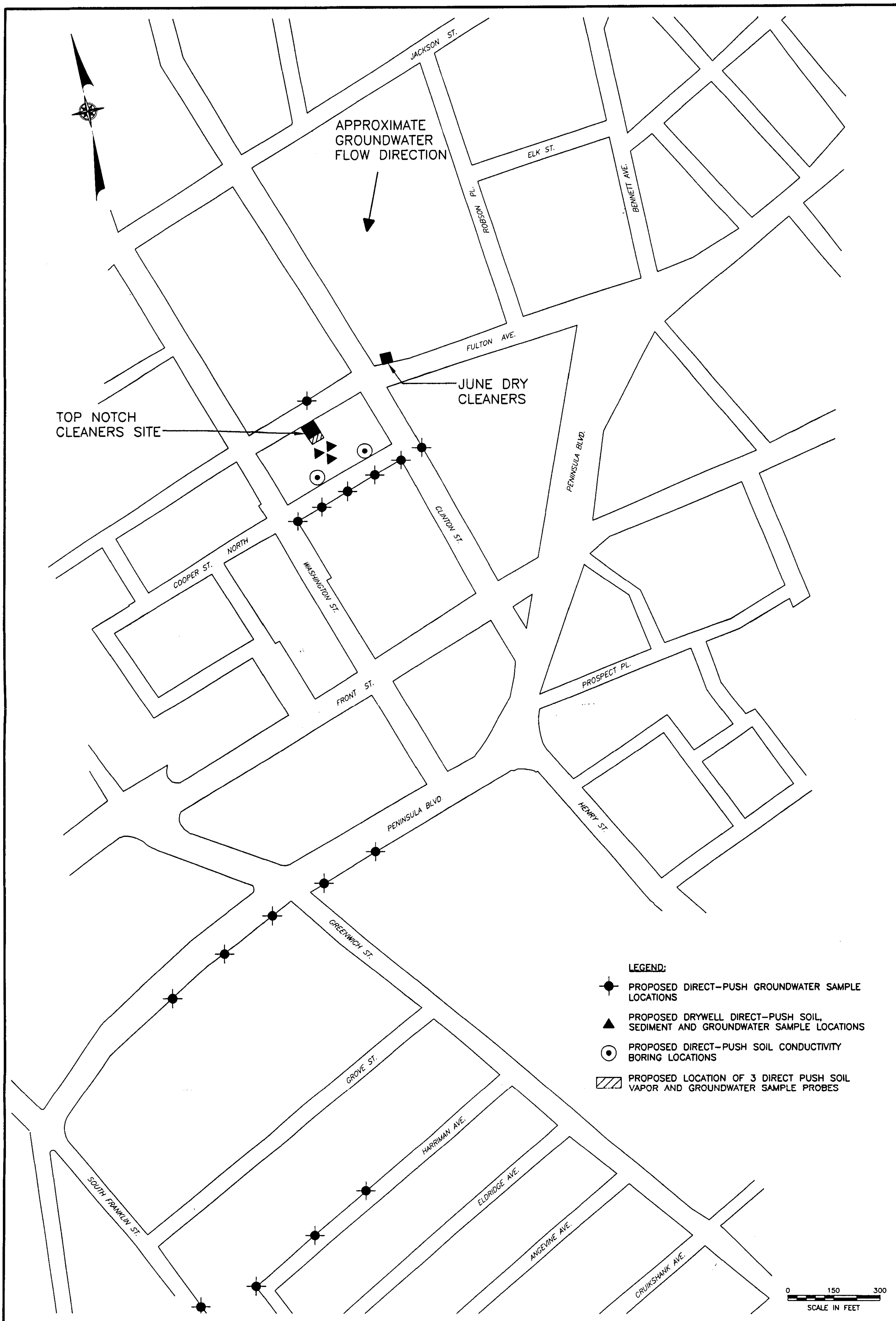
Table 3-2 (continued)

TOP NOTCH CLEANERS SITE
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
SAMPLE SUMMARY

Program Element	Environmental Medium	Sample Type/ Depth	Number of Samples and Locations	Equipment	Laboratory Analysis
Monitoring Well Sampling	Groundwater	At surface of water in well after purging 3 to 5 casing volumes	12 samples 12 locations (one sampling round)	2-inch Submersible Pump and Dedicated Disposable Bailer	TCL VOCs + 10 using ASP Method OLMO 4.2.
	Groundwater	At surface of water in well after purging 3 to 5 casing volumes	2 samples 2 locations	2-inch Submersible Pump and Dedicated Disposable Bailer	Alkalinity, total organic carbon, iron (total and dissolved), manganese (total and dissolved), nitrite, methane, hydrogen, sulfate and ethane/ethene (refer to Table 5-1 for method numbers)
	Soil	In screen zone of deep monitoring well (estimated depth of 75 to 85 feet bgs)	1 sample 1 location	3-inch Split Spoon Sampler	Grain size analysis (ASTM) and total organic carbon using ASP Method 9060.
Trip Blank	Aqueous	Distilled Water	10 samples*	Sample supplied by laboratory	TCL VOCs + 10 using ASP Method OLMO 4.2.
Matrix Spike/Matrix Spike Duplicate	Groundwater	Groundwater (split of sample)	12 samples**	Direct Push Groundwater Sampler or Bailer	TCL VOCs + 10 using ASP Method OLMO 4.2.
	Sediment and Soil	Sediment and Soil (split of sample)	2 samples**	Direct Push Soil Sampler	TCL VOCs + 10 using ASP Method OLMO 4.2.

Notes:

* One trip blank will accompany each shipment of aqueous samples for VOC analyses.
** One matrix spike/matrix spike duplicate set for each medium (soil and groundwater) for every 20 samples collected.



TOP NOTCH CLEANERS SITE
HEMPSTEAD, NEW YORK

Dvirka and Bartilucci
CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

PROPOSED OFF-SITE SAMPLE LOCATIONS

FIGURE 3-1

F:\2275\2275-01.dwg, PROPOSED, 09/10/04 12:19:46 PM, LGlubiak of the site, including groundwater flow characteristics, and the nature and extent of off-site groundwater contamination. The soil and sediment data will be compared to the NYSDEC Recommended Soil Cleanup Objectives. The groundwater data will be compared to NYSDEC Class GA Groundwater Standards and Guidance Values. The report will also include tabulated analytical results by medium, the DUSR, a qualitative human health exposure assessment, an evaluation of the need for implementation of an IRM to address immediate threats to human health resulting from identified contamination, conclusions and recommendations regarding additional investigation and remediation, if warranted. Since the site area is highly developed with little wildlife habitat and the focus of the investigation is off-site groundwater contamination, a wildlife habitat survey will not be conducted.

A draft Remedial Investigation Report will be prepared and submitted to the NYSDEC, NYSDOH and NCDH for review. Comments received on the draft report will be incorporated into the final Remedial Investigation Report.

3.5 Feasibility Study

If it is determined that remediation of soil and/or groundwater contamination is required, a feasibility study (FS) will be conducted to identify and evaluate remediation technologies, and recommend a remedial action. The FS will be prepared after the Remedial Investigation Report has been finalized. As part of the FS, presumptive remedies described in February 1996 draft "Remedial Investigation and Feasibility Study Generic Work Plan, Dry Cleaner Sites" will be evaluated. If applicable, new technologies not identified as presumptive remedies for dry cleaner sites will also be evaluated as part of the FS. The FS will include development, preliminary screening and detailed evaluation of remediation alternatives.

A draft Feasibility Study Report will be prepared and submitted to the NYSDEC for review. Comments received on the draft report will be incorporated into the final Feasibility Study Report.

3.6 Citizen Participation

It is expected that three NYSDEC-run public information meetings will be held to describe the investigation and to provide opportunities for public input. As currently scheduled, the first meeting will be held to present the final Work Plan. The second meeting will be held to present the RI results. The third meeting will be held to present the FS and preferred alternative.

Section 4

4.0 PROJECT MANAGEMENT

4.1 Project Schedule and Key Milestones/Reports

The schedule for the Top Notch Cleaners site RI/FS is provided in Table 4-1. Key milestones are identified to monitor work progress. The following are milestones proposed for this project.

- Milestone 1: Submittal of the Draft RI/FS Work Plan
- Milestone 2: Submittal of the Draft Remedial Investigation Report
- Milestone 3: Submittal of Draft Feasibility Study Report

4.2 Project Management, Organization and Key Technical Personnel

Dvirka and Bartilucci Consulting Engineers (D&B) will be the prime consultant responsible for performance of the RI/FS. Subcontractors proposed to be used for this project include:

- Zebra Environmental Corporation - Direct push sampling;
- Delta Well and Pump Company, Inc. (WBE) - Monitoring well installation;
- Mitkem Corporation (MBE) - Sample analysis;
- Nancy Potak (WBE) - Data validation;
- YEC, Inc. (MBE) - Surveying; and
- Action Trucking - Waste Disposal.

The project organization for the RI/FS, indicating management and project responsibilities for the project team and key personnel, is shown on Table 4-2.

Table 4-1

TOP NOTCH CLEANERS SITE
PROJECT SCHEDULE

Task 1 - Work Plan Preparation:

• Site Visit/Scoping Meeting	August 2004
• Draft RI/FS Work Plan	September 2004
• Final RI/FS Work Plan	February 2005
• Public Meeting	To be determined

Task 2 - Field Investigation

• Field Investigation	
– Ambient Air and Soil Vapor Sampling	March 2005
– Direct Push Sampling	March 2005
– Monitoring Well Installation	June 2005
– Surveying	July 2005
– Monitoring Well Sampling	July 2005
• Laboratory Analysis	March 2005 - July 2005
• Data Validation	July 2005

Task 3 - Remedial Investigation Report

• Draft Remedial Investigation Report	August 2005
• Final Remedial Investigation Report	September 2005
• Remedial Investigation Report Public Meeting	To be determined

Task 4 - Feasibility Study

• Draft Feasibility Study Report	October 2005
• Final Feasibility Study Report	October 2005
• Public Meeting (Proposed Remedial Action Plan)	To be determined

Table 4-2

TOP NOTCH CLEANERS SITE
PROJECT ORGANIZATION

NYSDEC Project Director	Joseph Yavonditte
NYSDEC Project Manager	Larry Lampman
D&B Project Director	Richard Caspe
D&B Project Manager	Kenneth Wenz
Health and Safety Officer	Keith Robins
Quality Assurance/Quality Control Officer	Robbin Petrella
Field Operations Manager	Keith Robins
Remedial Investigation Report	Kenneth Wenz
Feasibility Study Report	Maria Wright
Direct Push Drilling and Sampling	Zebra Environmental Corporation
Drilling and Well Construction	Delta Well and Pump Company, Inc. (WBE)
Sample Analysis	Mitkem Corporation (MBE)
Data Validation	Nancy Potak (WBE)
Surveying Services	YEC, Inc. (MBE)
Waste Disposal	Action Trucking

Section 5

5.0 SITE-SPECIFIC QUALITY ASSURANCE/QUALITY CONTROL PLAN

This section presents the site-specific quality assurance/quality control (QA/QC) plan that will be utilized during this investigation. Except as noted below, sampling procedures, analytical protocols and QA/QC procedures are described in the February 1996 draft "Remedial Investigation and Feasibility Study Generic Work Plan, Dry Cleaner Sites." Table 5-1 lists the sample matrix and analytical protocols to be utilized for this sampling program.

Sample analyses will be conducted by Mitkem Corporation. Mitkem is certified by the New York State Department of Health Environmental Laboratory Accreditation Program (ELAP) for the analyses to be conducted during this investigation. Ambient air and soil vapor samples will be analyzed by USEPA Method TO-14. Soil, sediment and groundwater samples will be analyzed in accordance with the NYSDEC 2000 Analytical Services Protocol (ASP). Category B data deliverable packages will be provided for all soil and groundwater samples.

One trip blank will be sent with each shipment containing aqueous samples to be analyzed for VOCs. Samples will be shipped to the laboratory to ensure that samples will be received at the laboratory within 48 hours after collection.

Matrix spike/matrix spike duplicate (MS/MSD) sample sets will be collected for direct push soil and groundwater samples, and the samples collected from the permanent monitoring wells. MS/MSD sample sets will be collected at a frequency of one set per twenty samples or portion thereof (if less than 20 samples).

For soil vapor sampling inside the basement and outside the building, the direct push tubing will be connected directly to a Summa canister and a sample will be collected by opening the valve on the canister. Ambient air samples will be collected by opening the valve on the Summa canister. The maximum flow rate for soil vapor and ambient air sample collection will be 0.2 liters per minute.

Table 5-1

TOP NOTCH CLEANERS
SUMMARY OF MONITORING PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Container Type/Size/No.	Sample Preservation	Maximum Holding Time**	Analytical Method
Groundwater (Probes and Monitoring Wells)	Grab	Groundwater	Volatile Organics	Glass, clear/ 40 mL/2 ICHEM 300 or equivalent	Cool to 4°C***	7 days for analysis	6/00 NYSDEC ASP Method EPA S0W OLMO4.2
	Grab	Groundwater	Alkalinity	Plastic/500 ml/1 ICHEM 300 or equivalent	Cool to 4°C	12 days	6/00 NYSDEC ASP Method 310.1
	Grab	Groundwater	Nitrate	Plastic/100 ml/1 ICHEM 300 or equivalent	Cool to 4°C	24 hours	6/00 NYSDEC ASP Method 9200
	Grab	Groundwater	Total Organic Carbon	Glass/500 ml/1 ICHEM 300 or equivalent	HCl to pH <2 Cool to 4°C	26 days	6/00 NYSDEC ASP Method 9060
	Grab	Groundwater	Sulfate	Plastic/500 ml/1 ICHEM 300 or equivalent	Cool to 4°C	26 days	6/00 NYSDEC ASP Method 9035
	Grab	Groundwater	Methane/Ethane and Ethene	Glass/40 ml/1 ICHEM 300 or equivalent	Cool to 4°C	7 days	6/00 NYSDEC ASP Method RSK-175
	Grab	Groundwater	Hydrogen	Plastic/500 ml/1 ICHEM 300 or equivalent	Cool to 4°C	24 hours	6/00 NYSDEC ASP Method 420.1
	Grab	Groundwater	Total Iron and Manganese	Plastic/ 1 Liter/1 ICHEM 300 or equivalent	HNO3 to pH <2 Cool to 4°C	26 days for Hg analysis, 6 months for analysis of others	6/00 NYSDEC ASP Method EPA S0W ILMO4.0

Table 5-1 (continued)

TOP NOTCH CLEANERS
SUMMARY OF MONITORING PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Container Type/Size/No.	Sample Preservation	Maximum Holding Time**	Analytical Method
Groundwater (Probes and Monitoring Wells) (cont'd)	Grab	Groundwater	Dissolved Iron and Manganese	Plastic, clear/ 250 mL/1 ICHEM 300 or equivalent	Cool to 4°C*	12 days for analysis	6/00 NYSDEC ASP Method EPA SOW ILMO 4.0
Soil/Sediment (probes in dry wells)	Grab	Soil/Sediment	Volatile Organics	Glass, clear/4 oz/ 2 ICHEM 200 or equivalent	Cool to 4°C Methanol****	10 days for analysis	6/00 NYSDEC ASP Method SOW OLMO 4.2
Soil Borings from Monitoring Wells	Grab	Soil	Total Organic Carbon	Glass/8 oz/1 ICHEM 200 or equivalent	Cool to 4°C	26 days	6/00 NYSDEC ASP Method 9060
	Grab	Soil	Grain Size	Glass 8 oz/1 ICHEM 200 or equivalent	None	6 months	ASTM - Sieve Analysis
Soil Vapor Probe	Grab	Soil Vapor	Volatile Organics	400 ml/Summa canister(1)	None	7 days for analysis	USEPA Method TO-14
Ambient Air Sampling	Grab	Ambient Air	Volatile Organics	400 ml/Summa canister(1)	None	7 days for analysis	USEPA Method TO-14

(1) Suma canister will be equipped with a regulator with a set flow rate of 0.2 l/min.
* Sample will be filtered at the laboratory and then preserved.
** Holding times as listed for each method in Exhibit D of the 6/00 NYSDEC ASP and based upon VTSR (Verified Time of Sample Receipt).
*** Samples are not to be preserved to pH <2.
**** The three soil samples collected within the dry wells will be preserved with methanol.

Section 6

6.0 SITE-SPECIFIC HEALTH AND SAFETY PLAN

This section presents the site-specific health and safety information to supplement the generic Health and Safety Plan (HASP) included in the February 1996 draft "Remedial Investigation and Feasibility Study Generic Work Plan, Dry Cleaner Sites."

Project Name:	Top Notch Cleaners Site Remedial Investigation/Feasibility Study
Address:	378 Fulton Avenue, Village of Hempstead, Nassau County, New York
Telephone:	Not available (facility vacant)
Date of HASP Preparation	February 2005
Dates of Field Investigation:	March 2005 through July 2005
Project Objectives:	Investigate and characterize ambient air, soil vapor, soil and groundwater contamination on-site and off-site (downgradient) of the Top Notch Cleaners site.

Project Organization:

	Name	**Telephone**
Project Director:	Richard Caspe	(516) 364-9890
Project Manager:	Kenneth Wenz	(516) 364-9890
Health and Safety Officer (HSO):	Keith Robins	(516) 364-9890
Field Operations Manager:	Keith Robins	(516) 364-9890
Field Subcontractors:	Zebra Environmental Corporation	(516) 596-6300
	Delta Well and Pump Company, Inc.	(631) 981-2255
	YEC, Inc.	(845) 268-3203
	Action Trucking	(516) 781-3000

Medical Assistance:

Physician:	Plainview Medical Group, P.C.
Address:	100 Manetto Hill Road, Suite 205
	Plainview, NY 11803
Telephone:	(516) 822-2541

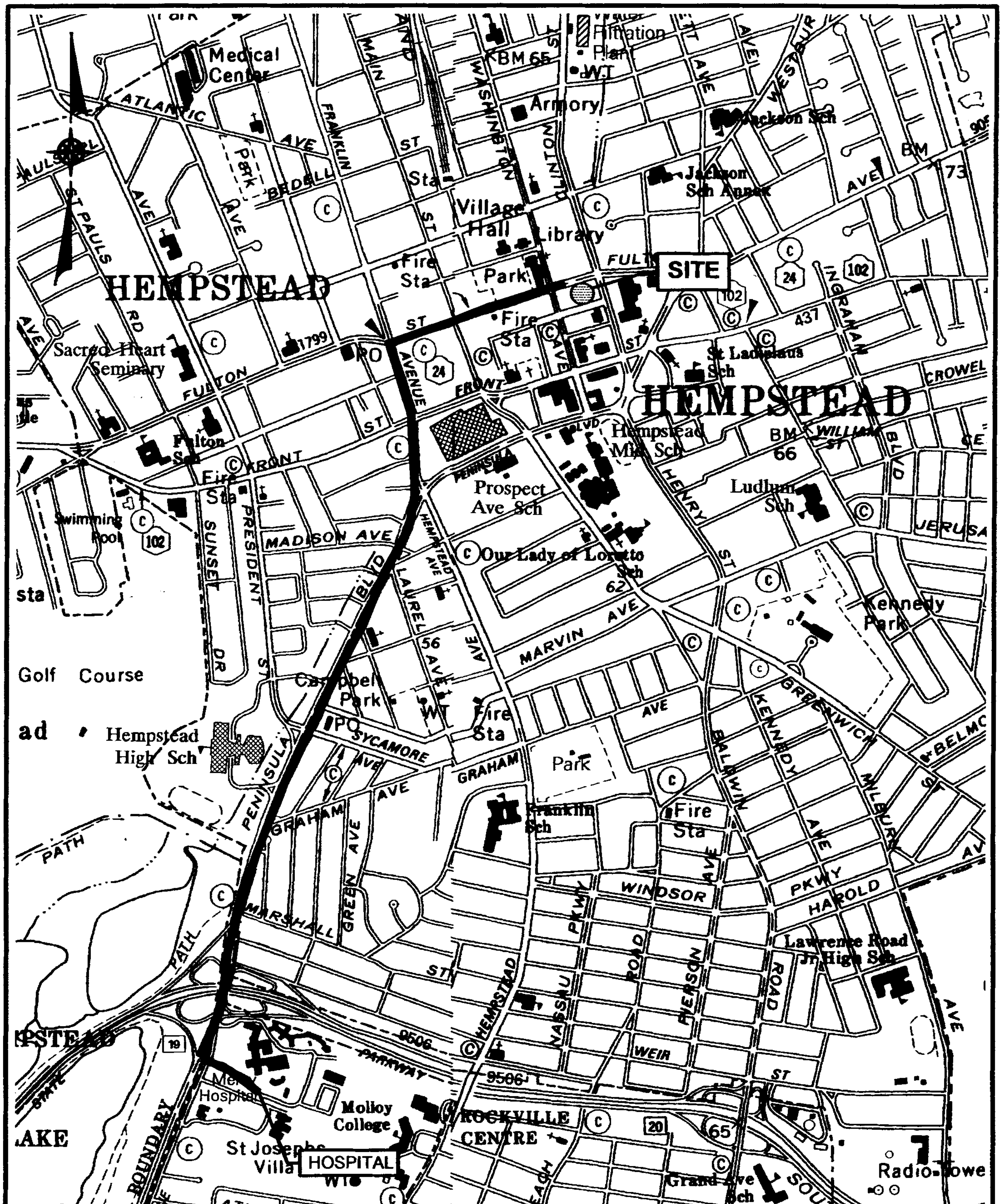
Hospital:	Mercy Medical Center
Telephone:	(516) 705-2525
Directions: (see Figure 6-1)	Proceed west on Fulton Avenue, turn left onto Franklin Avenue, bear right onto Peninsula Boulevard, and follow to North Village Avenue and Mercy Medical Center (just south of Southern State Parkway) on left hand side.

Emergency Contacts:

Agency/Facility	Telephone	Emergency Telephone
EMS - Ambulance		911
Hempstead Police Department	(516) 483-6200	911
Hempstead Fire Department	(516) 486-0012	911
Hospital	(516) 705-2525	
Poison Control Center	(516) 542-2323	

Additional site-related information (including special hazards, site control, waste storage and disposal, personal protective equipment, decontamination area location, special engineering controls, etc.):

Staging area for drums containing drill cuttings to be determined. VOCs and dust will be monitored in the work zone. A Community Air Monitoring Plan will be implemented in accordance with the attached protocol.



TOP NOTCH CLEANERS SITE
HEMPSTEAD, NEW YORK

Dvirka and Bartilucci
CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

ROUTE TO HOSPITAL

FIGURE 6-1

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APPENDIX 1A

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.

Section 7

7.0 PROJECT COST ESTIMATE (SCHEDULE 2.11 FORMS)

This section provides the estimated cost to complete the scope of work described in Section 3.0. The following assumptions have been made as part of the cost estimate.

- All field work can be completed with Level D personal protection;
- Site access for soil vapor and ambient air sampling, and for direct push and drilling locations will be secured by the NYSDEC;
- The NYSDEC will notify homeowners in the vicinity of the drilling locations regarding direct push, monitoring well construction and sampling activities;
- State-owned field equipment will be available for the duration of this project;
- The depth to groundwater in the site vicinity is approximately 25 to 30 feet bgs;
- Direct push equipment will be effective for the source assessment and off-site plume delineation activities;
- Hollow stem auger drilling will be effective for the construction of the 12 planned monitoring wells;
- Drill cuttings from the monitoring wells will be placed into 55-gallon drums and staged at a location to be determined at the beginning of the drilling program;
- Each of the 12 newly installed monitoring wells will be developed for approximately 2 hours each;
- Decontamination, development and purge water will be discharged to the Nassau County sanitary sewer system;
- Standard laboratory turnaround time of 4 weeks will be utilized;
- Characterization sampling will not be required for disposal of decontamination, development and purge water;
- All drill cuttings will be disposed as nonhazardous waste; and
- The three public meetings will be arranged and facilitated by the NYSDEC, and the NYSDEC will prepare and distribute notification information for the meetings.

Schedule 2.11 (a)

Summary of Work Assignment Price
Top Notch Cleaners RI/FS

Work Assignment Number D003600-43

1.	Direct Salary Costs (Schedules 2.10 (a) and 2.11(b))	$41,236
2.	Indirect Costs (Schedule 2.10 (g))	$65,276
3.	Direct Non-Salary Costs (Schedules 2.11 (c)and (d))	$7,217

Subcontract Costs

Cost-Plus-Fixed-Fee Subcontracts (Schedules 2.11(e))

Name of Subcontractor	Services To Be Performed	Subcontract Price
YEC, Inc. (MBE)	Land Surveying	$4,750

4.	Total Cost-Plus-Fixed-Fee Subcontracts	$4,750

Unit Price Subcontracts (Schedules 2.11(f))

Name of Subcontractor	Services To Be Performed	Subcontract Price
Zebra Environmental Corp.	Direct Push Services	$22,476
Delta Well and Pump Co., Inc. (WBE)	Drilling and Well Construction	$53,358
Mitkem Corporation (MBE)	Sample Analysis	$21,410
Nancy Potak (WBE)	Data Validation	$1,534
Action Trucking	Waste Disposal	$12,550

5.	Total Unit Price Subcontracts	$111,328
6.	Subcontract Management Fee	$3,843
7.	Total Subcontract Costs (lines 4 + 5 + 6)	$119,920
8.	Fixed Fee (Schedule 2.10 (h))	$8,947
9.	Total Work Assignment Price (lines 1 + 2 + 3 + 7 +8)	$242,596

SCHEDULE 2.11 (b)
SUMMARY
Top Notch Cleaners RI/FS
WORK ASSIGNMENT NUMBER D003600-43

Average NSPE Wage Rates	IX	VIII	VII	VI	V	IV	III	II	I	TOTAL HOURS
as of July 1, 2002	$63.70	$59.68	$51.87	$41.78	$35.11	$29.65	$26.91	$23.36	$18.63	
Task 1 - Work Plan Development	0	4	0	40	8	76	0	26	0	154
Task 2 - Field Investigation	0	0	0	18	8	92	454	12	0	584
Task 3 - RI Report	0	8	0	60	28	124	32	46	0	298
Task 4 - FS Report	0	8	0	36	112	8	8	28	0	200
Task 5 - Public Participation	0	6	0	38	30	0	0	14	0	88
Total Hours	0	26	0	192	186	300	494	126	0	1,324
Total Direct Labor Cost	$0	$1,552	$0	$8,022	$6,530	$8,895	$13,294	$2,943	$0	$41,236

SCHEDULE 2.11 (b)-1
SUMMARY
Top Notch Cleaners RI/FS
WORK ASSIGNMENT NUMBER D003600-43

Average NSPE Wage Rates	IX	VIII	VII	VI	V	IV	III	II	I	TOTAL HOURS
as of July 1, 2002	$63.70	$59.68	$51.87	$41.78	$35.11	$29.65	$26.91	$23.36	$18.63	
Task 1	0	0.5	0	4	0	0	0	8	0	12.5
Task 2	0	0.5	0	0	0	2	0	12	0	14.5
Task 3	0	0.5	0	0	0	2	0	6	0	8.5
Task 4	0	0.5	0	0	0	2	0	4	0	8.5
Task 5	0	0.5	0	0	0	2	0	6	0	8.5
Total Hours	0	2.5	0	4	0	8	0	36	0	50.5
Total Direct Labor Cost	$0	$149	$0	$167	$0	$237	$0	$841	$0	$1,394

Dvirka & Bartilucci Consulting Engineers
Top Notch Cleaners RI/FS
Work Assignment Number: D003600-43

BREAKDOWN OF ADMINISTRATIVE
LOE HOURS ON SCHEDULE 2.11(b-1)

ADMIN	WORK PLAN DEVELOPMENT														REVIEW WORK ASSIGNMENT (WA) PROGRESS													
ACTIVITY	Conflict of Interest Checks						Prepare 2.11 Schedules								Conduct Progress Reviews						Prepare Monthly Report & Update Schedules							
NSPE	IX	VIII	VII	VI	V	IV	VIII	VII	VI	V	IV	III	II	I	VIII	VII	VI	V	IV	III	VIII	VII	VI	V	IV	III	II	I
TASK 1		0.5							4																			
TASK 2																									2			
TASK 3																									2			
TASK 4																									2			
TASK 5																									2			
TOTAL	0	0.5	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0

ADMIN	REVIEW WORK ASSIGNMENT (WA) PROGRESS														CAP PREPARATION											
ACTIVITY	MBE/WBE Activities								Program Management						Prepare Monthly Cost Control Report & CAP								Oversee CAP			
NSPE	VIII	VII	VI	V	IV	III	II	I	IX	VIII	VII	VI	V	IV	VIII	VII	VI	V	IV	III	II	I	IX	VIII	VII	VI
TASK 1																					8					
TASK 2										0.5											12					
TASK 3										0.5											6					
TASK 4										0.5											4					
TASK 5										0.5											6					
TOTAL	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	36	0	0.0	0	0	0

ADMIN	MISCELLANEOUS																								
ACTIVITY	Update NSPE List								Equipment Use and Inventory				Word Proc. and Report Preparation				Total Adm. LOE (hrs)								
NSPE	VIII	VII	VI	V	IV	III	II	I	IV	III	II	I	IV	III	II	I	IX	VIII	VII	VI	V	IV	III	II	I
TASK 1																		0.5		4		0		8	
TASK 2																		0.5		0		2		12	
TASK 3																		0.5		0		2		6	
TASK 4																		0.5		0		2		4	
TASK 5																		0.5		0		2		6	
TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.5	0	4	0	8	0	36	0

SCHEDULE 2.11 (c)
DIRECT NON-SALARY COSTS
SUMMARY
Top Notch Cleaners RI/FS
Work Assignment No. D003600-43

ITEM	MAXIMUM REIMBURSEMENT RATE	UNIT	ESTIMATED NUMBER OF UNITS	TOTAL ESTIMATED COSTS
IN-HOUSE				
Outside Services*	$200.00	set	0	$0.00
Express Mail	$20.00	package	6	$120.00
Sample Shipping	$50.00	shipment	15	$750.00
Level D Safety Equipment	$14.00	$/person/day	52	$728.00
Level C Safety Equipment	$40.00	$/person/day	0	$0.00
Level B Safety Equipment	$50.00	$/person/day	0	$0.00
TRAVEL				
Transportation (Personal Car)	$0.375	mile	450	$168.75
Van Rental	$325.00	week	8	$2,600.00
Gas	$50.00	week	8	$400.00
TOTAL DIRECT NON-SALARY COSTS				$4,766.75

* Includes photo finishing, slides and any other costs not associated with in-house capabilities.

SCHEDULE 2.11 (d) 1

EQUIPMENT PURCHASED UNDER THE CONTRACT
SUMMARY
Top Notch Cleaners RI/FS
Work Assignment No. D003600-43

ITEM	ESTIMATED PURCHASE PRICE	O&M RATE ($/per month)	TERM OF USAGE (MONTHS)	ESTIMATED USAGE COST (COL. 2 + [3X4])
			TOTAL	$0.00

Schedule 2.11 (d) 2
Summary

Maximum Reimbursement Rates for Consultant/Subconsultant - Owned Equipment
Top Notch Cleaners RI/FS
Work Assignment No. D003600-43

ITEM	PURCHASE PRICE X 85%	USAGE RATE ($/day)	CAPITAL RECOVERY RATE ($/Unit of Time)	O & M RATE ($/Unit of Time)	ESTIMATED USAGE (days)	ESTIMATED USAGE COST (Col. 3x6)
						$0
					TOTAL	$0

Notes:
Usage Rate = Capital Recovery Rate + O&M rate

The maximum usage rate for an item of equipment reverts to the O&M rate when the total usage reimbursement exceed 85% of the purchase price.

SCHEDULE 2.11 (d) 3
EQUIPMENT
VENDOR RENTED
SUMMARY
Top Notch Cleaners RI/FS
Work Assignment No. D003600-43

ITEM	MAXIMUM REIMBURSEMENT RATE	TIME PERIOD	ESTIMATED USAGE (period of time)	ESTIMATED USAGE COST (Col. 2 X 3)
Century OVA 128	$125.00	day	0	$0.00
Photovac Microtip	$125.00	day	0	$0.00
MIE Miniram Digital Dust Indicator	$200.00	week	7	$1,400.00
Horiba U10 Water Quality Meter	$100.00	day	0	$0.00
Solinst Water Level Indicator	$25.00	day	0	$0.00
Generator	$60.00	day	5	$300.00
Peristaltic Pump	$50.00	day	0	$0.00
Grunfos Pump	$125.00	day	0	$0.00
			Total	$1,700.00

SCHEDULE 2.11 (d) 4
SUMMARY
EXPENDABLE SUPPLIES
Top Notch Cleaners RI/FS
Work Assignment No. D003600-43

ITEM	ESTIMATED QUANTITY	UNITS	UNIT COST	TOTAL BUDGETED COST (COL. 2 X 3)
Polyethylene tubing	1000	feet	$0.25	$250.00
Disposable bailers	0.5	case of 24	$200.00	$100.00
			TOTAL	$350.00

SCHEDULE 2.11 (d) 5
CONSUMABLE SUPPLIES
SUMMARY
Top Notch Cleaners RI/FS
Work Assignment No. D003600-43

ITEM	ESTIMATED QUANTITY	UNIT COST	TOTAL BUDGETED COST (COL. 2 X 3)
Miscellaneous Supplies	8	$50.00	$400.00
		TOTAL	$400.00

Schedule 2.11 (e)
Cost Plus Fixed-Fee Subcontracts

Top Notch Cleaners Site

August 19, 2004

NAME OF SUBCONTRACTOR	SERVICES TO BE PERFORMED	SUBCONTRACT PRICE
YEC, INC.	Survey & CAD Mapping	$4,749.93

A. Direct Salary Costs

Professional Responsibilty Level	Labor Classi-fication	Average Reimbursement Rate ($/Hr.)		Maximum Reimbursement Rate ($/Hr.)		Estimated Number of Hours	Total Estimated Direct Salary Cost ($)
Principal	VIII	2004	59.42	2004	64.19	0	0.00
Senior Geologist/Scientist/ Engineer/ Licensed Surveyor	V	2004	39.29	2004	43.22	16	628.64
Staff Geologist/ Scientist/Engineer	IV	2004	34.16	2004	37.57	0	0.00
Staff Geologist/ Scientist/Engineer/CAD Operator	III	2004	29.64	2004	32.89	4	118.56
Senior Technician/Staff Engineer/Scientist/Geologist	II	2004	21.92	2004	24.57	24	526.08
Technician/Draftsperson	I	2004	19.86	2004	22.26	24	476.64
						Total Direct Salary Costs:	1,749.92

B. Indirect Costs - 117% of direct salary cost

Indirect Costs: 2,047.41

C. Maximum Reimbursement Rates for Direct Non-Salary Costs:

Item	Maxium Reimbursement Rate	Estimated No. of Units	
Mileage	0.34 /mile	450 miles	153.00
Tolls	20.00 /trip	2 trips	40.00
CAD Equipment Costs	15.00 /hr	4 hrs	60.00
Survey Equipment Rental	65.00 day	2 day	130.00
		Total Direct Non Salary Costs:	383.00

D. Fixed Fee (15% of Total Direct and Indirect Salary Costs)

Fixed Fee: 569.60

* An approximate boundary survey will be conducted instead a certified boundary survey

SCHEDULE 2.11 (f) 1
UNIT PRICE SUBCONTRACTS
SUMMARY
Top Notch Cleaners RI/FS
Work Assignment No. D003600-43

NAME OF SUBCONTRACTOR	SERVICES TO BE PERFORMED	SUBCONTRACT PRICE	MANAGEMENT FEE
Zebra Environmental Corporation	Direct Push Services	$22,476	$787

	Item	Maximum Reimbursement Rate		Estimated No. of Units		Total Estimated Costs
1a	Mobilization and demobilization, including site set-up, breakdown, clean-up, repair and site restoration.	$1,190	Lump sum	1	Event	$1,190
b	Non-mobile decontamination pad	$95	Lump sum	1	Pad	$95
2	Well set-up	$0	Per location	27	Locations	$0
3	Geoprobe System					
	Truck/Van/ATV-mounted unit	$850	Per 8-hour day	15	Days	$12,750
	Second crew member	$175	Per 8-hour day	15	Days	$2,625
4	Overtime charge for on-site work	$50	Per person hour	30	Person hours	$1,500
5	Probe Sampling					
a	Groundwater sampling	$9	Per sample	97	Samples	$873
c	Macro core sampling	$9	Per 2-foot sample	6	Samples	$54
6	Soil vapor samples	$6	Per sample	6	Samples	$36
7	Portland cement	$16	Per bag	40	Bags	$640
8	Bentonite powder	$35	Per bag	10	Bags	$350
9	Asphalt patch	$7.50	Per bag	5	Bags	$38
10	Standby time	$75	Per hour	5	Hours	$375
11	Soil conductivity probe (not including direct push rig)	$650	Per day	1	Day	$650
12	Street opening permits	$65	Per permit	20	Permits	$1,300
		SUBTOTAL				**$22,476**
		SUBCONTRACT MANAGEMENT FEE				**$787**
		TOTAL				**$23,262**

SCHEDULE 2.11 (f) 2
UNIT PRICE SUBCONTRACTS
SUMMARY
Top Notch Cleaners RI/FS
Work Assignment No. D003600-43

NAME OF SUBCONTRACTOR	SERVICES TO BE PERFORMED	SUBCONTRACT PRICE	MANAGEMENT FEE
Delta Well and Pump Company, Inc. (WBE)	Drilling and Monitoring Well Construction	$53,358	$1,868

Item	Maximum Reimbursement Rate		Estimated No. of Units	Total Estimated Costs
1a Mobilization and demobilization, including site set-up, breakdown, clean-up, repair and site restoration.	$3,000	Lump sum	1 Event	$3,000
b Non-mobile decontamination pad	$800	Lump sum	1 Pad	$800
c Well set-up	$300	Per location	12 Locations	$3,600
2 Hollow stem auger drilling				
4.25" ID, 0 to 50 feet	$18	Per foot	560 Feet	$10,080
4.25" ID, 50 to 100 feet	$17	Per foot	280 Feet	$4,760
3 Split spoon soil sampling				
3-inch diameter split spoon, 50 to 100 feet	$60	Per sample	8 Samples	$480
4 Well screen				
2-inch diameter, Schedule 40 PVC	$6	Per foot	140 Feet	$840
5 Well riser				
2-inch diameter, Schedule 40 PVC	$3	Per foot	700 Feet	$2,100
6 Well screen sand pack	$10	Per bag	80 Bags	$800
7 Bentonite				
a Pellets	$60	Per 5-gallon pail	24 Pails	$1,440
b Powder	$30	Per bag	12 Bags	$360
8 Portland cement	$25	Per bag	176 Bags	$4,400
9 Flush-mounted manhole (6-inch)	$225	Per manhole	12 Manholes	$2,700
10 Keyed-alike locks	$19	Per lock	12 Locks	$228
11 Containerization of drilling material and staging				
a Provide enpty DOT drums	$45	Per drum	70 Drums	$3,150
b Filling, moving and staging of drums (on-site)	$45	Per drum	65 Drums	$2,925
c Move filled drums to secondary locations within 1 mile	$45	Per drum	55 Drums	$2,475
12 Well development (pump and surge)	$140	Per hour	48 Hours	$6,720
13 Standby time	$130	Per hour	10 Hours	$1,300
14 Street opening permits (12)	$100	Per permit	12 Permits	$1,200
	SUBTOTAL			**$53,358**
	SUBCONTRACT MANAGEMENT FEE			**$1,868**
	TOTAL			**$55,226**

SCHEDULE 2.11 (f) 3
UNIT PRICE SUBCONTRACTS
SUMMARY
Top Notch Cleaners RI/FS
Work Assignment No. D003600-43

NAME OF SUBCONTRACTOR	SERVICES TO BE PERFORMED	SUBCONTRACT PRICE	MANAGEMENT FEE
Mitkem Corporation	Sample Analysis	$21,410	$749

Item	Method	Maximum Reimbursement Rate		Estimated Units	Total Estimated Cost
Soil Vapor					
VOCs	EPA TO-14	$325.00	per sample	13	$4,225.00
Groundwater					
VOCs (direct push)	EPA SOW OLM04.2 (6/00 ASP)	$110.00	per sample	97	$10,670.00
VOCs (monitoring wells)	EPA SOW OLM04.2 (6/00 ASP)	$110.00	per sample	12	$1,320.00
Alkalinity	6/00 ASP Method 310.1	$15.00	per sample	2	$30.00
Total Organic Carbon	6/00 ASP Method 9060	$35.00	per sample	2	$70.00
Iron (total and dissolved)	EPA SOW ILM04.0 (6/00 ASP)	$20.00	per sample	4	$80.00
Manganese (total and dissolved)	EPA SOW ILM04.0 (6/00 ASP)	$20.00	per sample	4	$80.00
Nitrate	6/00 ASP Method 9200	$15.00	per sample	2	$30.00
Methane/Ethenes/Ethanes	6/00 ASP Method RSK-175	$80.00	per sample	2	$160.00
Hydrogen	6/00 ASP Method 420.1	$95.00	per sample	2	$190.00
Sulfate	6/00 ASP Method 9035	$15.00	per sample	2	$30.00
Soil/Sediment					
VOCs	EPA SOW OLM04.2 (6/00 ASP)	$110.00	per sample	9	$990.00
Total Organic Carbon	6/00 ASP Method 9060	$35.00	per sample	1	$35.00
Grain Size	—	$90.00	per sample	1	$90.00
QA/QC Samples					
Groundwater					
Matrix Spike/Matrix Spike Duplicate/Matrix Spike Blank					
VOCs	EPA SOW OLM04.2 (6/00 ASP)	$110.00	per sample	18	$1,980.00
Soil/Sediment					
Matrix Spike/Matrix Spike Duplicate/Matrix Spike Blank					
VOCs	EPA SOW OLM04.2 (6/00 ASP)	$110.00	per sample	3	$330.00
Trip Blank					
VOCs	EPA SOW OLM04.2 (6/00 ASP)	$110.00	per sample	10	$1,100.00

SUBTOTAL	**$21,410.00**
SUBCONTRACT MANAGEMENT FEE	**$749.35**
TOTAL	**$22,159.35**

SCHEDULE 2.11 (f) 4
UNIT PRICE SUBCONTRACTS
SUMMARY
Top Notch Cleaners RI/FS
Work Assignment No. D003600-43

NAME OF SUBCONTRACTOR	SERVICES TO BE PERFORMED	SUBCONTRACT PRICE	MANAGEMENT FEE
Nancy Potak (WBE)	**Data Validation**	**$1,534**	**$0**

Item	Maximum Reimbursement Rate		Estimated No. of Units		Total Estimated Costs
VOCs (groundwater)	$13	Per sample	109	Samples	$1,417
VOCs (soil)	$13.00	Per sample	9	Samples	$117

SUBTOTAL	**$1,534**
SUBCONTRACT MANAGEMENT FEE	**$0**
TOTAL	**$1,534**

SCHEDULE 2.11 (f) 5
UNIT PRICE SUBCONTRACTS
SUMMARY
Top Notch Cleaners RI/FS
Work Assignment No. D003600-43

NAME OF SUBCONTRACTOR	SERVICES TO BE PERFORMED	SUBCONTRACT PRICE	MANAGEMENT FEE
Action Trucking	**Waste Disposal**	**$12,550**	**$439**

Item	Maximum Reimbursement Rate	Estimated No. of Units	Total Estimated Costs
Drum pick-up	$100 Per pick-up	8 Pick-ups	$800
Disposal of non-hazardous drill cuttings	$135 Per drum	70 Drums	$9,450
Disposal characterization sampling and analysis	$575 Per sample	4 Samples	$2,300

SUBTOTAL	**$12,550**
SUBCONTRACT MANAGEMENT FEE	**$439**
TOTAL	**$12,989**

Project Name: Top Notch Cleaners RI/FS
Work Assignment No.: D003600-43
Task No./Name: All Tasks
Complete: 0.00%

SCHEDULE 2.11 (g)

SUMMARY

Date Prepared:
Billing Period:
Invoice No.:

MONTHLY COST CONTROL REPORT
SUMMARY OF FISCAL INFORMATION

Expenditure Category	A Costs Claimed This Period	B Paid To Date	C Total Disallowed To Date	D Total Costs Incurred To Date (A+B+B1)	E Estimated Costs To Completion	F Total Work Assignment Price (A+B+E)	G Approved Budget	H Estimated Under/(Over) (G-F)
1. Direct Salary Costs	0.00	0.00	0.00	0.00	0.00	0.00	$41,236	0.00
2. Indirect	0.00	0.00	0.00	0.00	0.00	0.00	$65,276	0.00
3. Subtotal Direct Salary Costs and Indirect Costs	0.00	0.00	0.00	0.00	0.00	0.00	$106,512	0.00
4. Travel	0.00	0.00	0.00	0.00	0.00	0.00	$3,169	0.00
5. Other Non-Salary Costs	0.00	0.00	0.00	0.00	0.00	0.00	$4,048	0.00
6. Subtotal Direct Non-Salary Costs	0.00	0.00	0.00	0.00	0.00	0.00	$7,217	0.00
7. Subcontractors	0.00	0.00	0.00	0.00	0.00	0.00	$119,920	0.00
8. Total Work Assignment Cost	0.00	0.00	0.00	0.00	0.00	0.00	$233,649	0.00
9. Fixed Fee	0.00	0.00	0.00	0.00	0.00	0.00	$8,947	0.00
10. Total Work Assignment Price	0.00	0.00	0.00	0.00	0.00	0.00	$242,596	0.00

Project Manager (Engineer) ____________________ Date ____________________

Project Name: Top Notch Cleaners RI/FS
Work Assignment No.: D003600-43
Task No./Name: 1/Work Plan Development
Complete: 0.00%

SCHEDULE 2.11 (g)

Date Prepared:
Billing Period:
Invoice No.:

MONTHLY COST CONTROL REPORT
SUMMARY OF FISCAL INFORMATION

Expenditure Category	A Costs Claimed This Period	B Paid To Date	C Total Disallowed To Date	D Total Costs Incurred To Date (A+B+B1)	E Estimated Costs To Completion	F Total Work Assignment Price (A+B+E)	G Approved Budget	H Estimated Under/(Over) (G-F)
1. Direct Salary Costs	0.00	0.00	0.00	0.00	0.00	0.00	$5,052	0.00
2. Indirect	0.00	0.00	0.00	0.00	0.00	0.00	$7,997	0.00
3. Subtotal Direct Salary Costs and Indirect Costs	0.00	0.00	0.00	0.00	0.00	0.00	$13,048	0.00
4. Travel	0.00	0.00	0.00	0.00	0.00	0.00	$25	0.00
5. Other Non-Salary Costs	0.00	0.00	0.00	0.00	0.00	0.00	$40	0.00
6. Subtotal Direct Non-Salary Costs	0.00	0.00	0.00	0.00	0.00	0.00	$65	0.00
7. Subcontractors	0.00	0.00	0.00	0.00	0.00	0.00	$0	0.00
8. Total Work Assignment Cost	0.00	0.00	0.00	0.00	0.00	0.00	$13,113	0.00
9. Fixed Fee	0.00	0.00	0.00	0.00	0.00	0.00	$1,096	0.00
10. Total Work Assignment Price	0.00	0.00	0.00	0.00	0.00	0.00	$14,209	0.00

Project Manager (Engineer) ____________________ Date ____________________

Project Name: Top Notch Cleaners RI/FS
Work Assignment No.: D003600-43
Task No./Name: 2/Field Investigation
Complete: 0.00%

SCHEDULE 2.11 (g)

Date Prepared:
Billing Period:
Invoice No.:

MONTHLY COST CONTROL REPORT
SUMMARY OF FISCAL INFORMATION

Expenditure Category	A Costs Claimed This Period	B Paid To Date	C Total Disallowed To Date	D Total Costs Incurred To Date (A+B+B1)	E Estimated Costs To Completion	F Total Work Assignment Price (A+B+E)	G Approved Budget	H Estimated Under/(Over) (G-F)
1. Direct Salary Costs	0.00	0.00	0.00	0.00	0.00	0.00	$16,258	0.00
2. Indirect	0.00	0.00	0.00	0.00	0.00	0.00	$25,737	0.00
3. Subtotal Direct Salary Costs and Indirect Costs	0.00	0.00	0.00	0.00	0.00	0.00	$41,995	0.00
4. Travel	0.00	0.00	0.00	0.00	0.00	0.00	$3,094	0.00
5. Other Non-Salary Costs	0.00	0.00	0.00	0.00	0.00	0.00	$3,928	0.00
6. Subtotal Direct Non-Salary Costs	0.00	0.00	0.00	0.00	0.00	0.00	$7,022	0.00
7. Subcontractors	0.00	0.00	0.00	0.00	0.00	0.00	$119,920	0.00
8. Total Work Assignment Cost	0.00	0.00	0.00	0.00	0.00	0.00	$168,937	0.00
9. Fixed Fee	0.00	0.00	0.00	0.00	0.00	0.00	$3,528	0.00
10. Total Work Assignment Price	0.00	0.00	0.00	0.00	0.00	0.00	$172,464	0.00

Project Manager (Engineer) ______________ Date ______________

Project Name: Top Notch Cleaners RI/FS
Work Assignment No.: D003600-43
Task No./Name: 3/Remedial Investigation Report
Complete: 0.00%

SCHEDULE 2.11 (g)

Date Prepared:
Billing Period:
Invoice No.:

MONTHLY COST CONTROL REPORT
SUMMARY OF FISCAL INFORMATION

Expenditure Category	A Costs Claimed This Period	B Paid To Date	C Total Disallowed To Date	D Total Costs Incurred To Date (A+B+B1)	E Estimated Costs To Completion	F Total Work Assignment Price (A+B+E)	G Approved Budget	H Estimated Under/(Over) (G-F)
1. Direct Salary Costs	0.00	0.00	0.00	0.00	0.00	0.00	$9,580	0.00
2. Indirect	0.00	0.00	0.00	0.00	0.00	0.00	$15,165	0.00
3. Subtotal Direct Salary Costs and Indirect Costs	0.00	0.00	0.00	0.00	0.00	0.00	$24,744	0.00
4. Travel	0.00	0.00	0.00	0.00	0.00	0.00	$0	0.00
5. Other Non-Salary Costs	0.00	0.00	0.00	0.00	0.00	0.00	$40	0.00
6. Subtotal Direct Non-Salary Costs	0.00	0.00	0.00	0.00	0.00	0.00	$40	0.00
7. Subcontractors	0.00	0.00	0.00	0.00	0.00	0.00	$0	0.00
8. Total Work Assignment Cost	0.00	0.00	0.00	0.00	0.00	0.00	$24,784	0.00
9. Fixed Fee	0.00	0.00	0.00	0.00	0.00	0.00	$2,079	0.00
10. Total Work Assignment Price	0.00	0.00	0.00	0.00	0.00	0.00	$26,863	0.00

Project Manager (Engineer) ____________________ Date ____________________

Project Name: Top Notch Cleaners RI/FS
Work Assignment No.: D003600-43
Task No./Name: 4/Feasibility Study
Complete: 0.00%

SCHEDULE 2.11 (g)

Date Prepared:
Billing Period:
Invoice No.:

MONTHLY COST CONTROL REPORT
SUMMARY OF FISCAL INFORMATION

Expenditure Category	A Costs Claimed This Period	B Paid To Date	C Total Disallowed To Date	D Total Costs Incurred To Date (A+B+B1)	E Estimated Costs To Completion	F Total Work Assignment Price (A+B+E)	G Approved Budget	H Estimated Under/(Over) (G-F)
1. Direct Salary Costs	0.00	0.00	0.00	0.00	0.00	0.00	$3,326	0.00
2. Indirect	0.00	0.00	0.00	0.00	0.00	0.00	$5,265	0.00
3. Subtotal Direct Salary Costs and Indirect Costs	0.00	0.00	0.00	0.00	0.00	0.00	$8,591	0.00
4. Travel	0.00	0.00	0.00	0.00	0.00	0.00	$0	0.00
5. Other Non-Salary Costs	0.00	0.00	0.00	0.00	0.00	0.00	$40	0.00
6. Subtotal Direct Non-Salary Costs	0.00	0.00	0.00	0.00	0.00	0.00	$40	0.00
7. Subcontractors	0.00	0.00	0.00	0.00	0.00	0.00	$0	0.00
8. Total Work Assignment Cost	0.00	0.00	0.00	0.00	0.00	0.00	$8,631	0.00
9. Fixed Fee	0.00	0.00	0.00	0.00	0.00	0.00	$722	0.00
10. Total Work Assignment Price	0.00	0.00	0.00	0.00	0.00	0.00	$9,353	0.00

Project Manager (Engineer) ____________________ Date ____________________

Project Name: Top Notch Cleaners RI/FS
Work Assignment No.: D003600-43
Task No./Name: 5/Public Participation
Complete: 0.00%

SCHEDULE 2.11 (g)

Date Prepared:
Billing Period:
Invoice No.:

MONTHLY COST CONTROL REPORT
SUMMARY OF FISCAL INFORMATION

Expenditure Category	A Costs Claimed This Period	B Paid To Date	C Total Disallowed To Date	D Total Costs Incurred To Date (A+B+B1)	E Estimated Costs To Completion	F Total Work Assignment Price (A+B+E)	G Approved Budget	H Estimated Under/(Over) (G-F)
1. Direct Salary Costs	0.00	0.00	0.00	0.00	0.00	0.00	$3,326	0.00
2. Indirect	0.00	0.00	0.00	0.00	0.00	0.00	$5,265	0.00
3. Subtotal Direct Salary Costs and Indirect Costs	0.00	0.00	0.00	0.00	0.00	0.00	$8,591	0.00
4. Travel	0.00	0.00	0.00	0.00	0.00	0.00	$50	0.00
5. Other Non-Salary Costs	0.00	0.00	0.00	0.00	0.00	0.00	$0	0.00
6. Subtotal Direct Non-Salary Costs	0.00	0.00	0.00	0.00	0.00	0.00	$50	0.00
7. Subcontractors	0.00	0.00	0.00	0.00	0.00	0.00	$0	0.00
8. Total Work Assignment Cost	0.00	0.00	0.00	0.00	0.00	0.00	$8,641	0.00
9. Fixed Fee	0.00	0.00	0.00	0.00	0.00	0.00	$722	0.00
10. Total Work Assignment Price	0.00	0.00	0.00	0.00	0.00	0.00	$9,363	0.00

Project Manager (Engineer) ____________________ Date ____________________

Project Name: Top Notch Cleaners RI/FS
Work Assignment No.: D003600-43

SCHEDULE 2.11 (g) SUPPLEMENTAL
MONTHLY COST CONTROL REPORT
SUBCONTRACTS

Date Prepared:
Billing Period:
Invoice No.:

Subcontract Name	Subcontract Costs Claimed This Application Incl. Resubmittals	Subcontract Costs Approved for Payment on Previous Application	Total Subcontract costs to Date (A plus B)	Subcontract Approved Budget	Management Fee Budget	Management Fee Paid	Total Costs To Date
1. Zebra Environmental Corp.	$0.00	$0.00	$0.00	$22,476	$787		
2. Delta Well and Pump Co, Inc.	$0.00	$0.00	$0.00	$53,358	$1,868		
3. Mitkem Corporation	$0.00	$0.00	$0.00	$21,410	$749		
4. Nancy Potak	$0.00	$0.00	$0.00	$1,534	$0		
5. Action Trucking	$0.00	$0.00	$0.00	$12,550	$439		
Total				$111,328	$3,843		

Schedule 2.11 (h)

Project Name: Top Notch Cleaners RI/FS
Work Assignment No.: D003600-43

Date Prepared:
Billing Period
Invoice No.

Monthly Cost Control Report
Summary of Labor Hours
Expended to Date/Estimated To Completion

NSPE Labor Classification	IX EXP/EST	VIII EXP/EST	VII EXP/EST	VI EXP/EST	V EXP/EST	IV EXP/EST	III EXP/EST	I & II EXP/EST	ADMIN/ SUPPORT	TOTAL NUMBER OF DIRECT LABOR HOURS EXP/EST
Task 1	0/ 0	0/ 4	0/ 0	0/ 40	0/ 8	0/ 76	0/ 0	0/ 18	0/ 8	0/ 154
Task 2	0/ 0	0/ 0	0/ 0	0/ 18	0/ 8	0/ 92	0/ 454	0/ 0	0/ 12	0/ 584
Task 3	0/ 0	0/ 8	0/ 0	0/ 60	0/ 28	0/ 124	0/ 32	0/ 40	0/ 6	0/ 298
Task 4	0/ 0	0/ 8	0/ 0	0/ 36	0/ 112	0/ 8	0/ 8	0/ 24	0/ 4	0/ 200
Task 5	0/ 0	0/ 6	0/ 0	0/ 38	0/ 30	0/ 0	0/ 0	0/ 8	0/ 6	0/ 88
Total Hours	0/ 0	0/ 26	0/ 0	0/ 192	0/ 186	0/ 300	0/ 494	0/ 90	0/ 36	0/ 1324
TOTAL HOURS	0/ 0	0/ 26	0/ 0	0/ 192	0/ 186	0/ 300	0/ 494	0/ 90	0/ 36	0/ 1324

MBE/WBE
UTILIZATION PLAN
SUMMARY
Top Notch Cleaners RI/FS
Work Assignment No. D003600-43

Areas to be Subcontracted	Subcontractor Name	MBE/WBE	Total Subcontract Value	% MBE/WBE Utilization
1. Land Surveying	YEC, Inc.	MBE	$4,750	2.0%
2. Sample Analysis	Mitkem Corporation	MBE	$21,410	8.8%
3. Drilling and Well Construction	Delta Well and Pump Co., Inc.	WBE	$53,358	22.0%
4. Data Validation	Nancy Potak	WBE	$1,534	0.6%

Total MBE Utilization	MBE Subcontract Value / Total Contract Value	=	$26,160 / $242,596	10.8%
Total WBE Utilization	WBE Subcontract Value / Total Contract Value	=	$54,892 / $242,596	22.6%
Total MBE/WBE Utilization	MBE/WBE Subcontract Value / Total Contract Value	=	$81,052 / $242,596	33.4%

Appendix A

APPENDIX A

REMEDIAL INVESTIGATION AND FEASIBILITY STUDY GENERIC WORK PLAN, DRY CLEANER SITES

GENERIC
REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN
FOR
DRY CLEANER SITES

FIELD OPERATION AND INVESTIGATION PLAN
QUALITY ASSURANCE/QUALITY CONTROL PLAN
HEALTH AND SAFETY PLAN
CITIZEN PARTICIPATION PLAN
AND
FEASIBILITY STUDY/INTERIM REMEDIAL MEASURE/PRESUMPTIVE REMEDY SELECTION PLAN

PREPARED FOR

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BY

DVIRKA AND BARTILUCCI
CONSULTING ENGINEERS
WOODBURY, NEW YORK

FEBRUARY 1996

GENERIC
REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN
DRY CLEANER SITES

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1.0 INTRODUCTION/GENERIC APPROACH TO INVESTIGATION AND REMEDIATION OF DRY CLEANER SITES

The following provides a brief discussion of the purpose of this document, together with a brief history and description of dry cleaner facilities, the problems and contaminants often associated with dry cleaner sites, and the need to investigate and remediate these sites. In addition, this document discusses the objective and generic approach to conducting a remedial investigation and feasibility study (RI/FS) for dry cleaner sites, and provides an outline for preparation of dry cleaner site related RI/FS work plans and reports.

1.1 Background and Purpose

The purpose of this Generic Work Plan is to serve as a guidance document for the performance of a remedial investigation and feasibility study (RI/FS) at dry cleaner sites where the release of hazardous waste has been documented. This Work Plan has been prepared for use at sites being investigated by the New York State Department of Environmental Conservation (NYSDEC) under the New York State Superfund Program or by Potentially Responsible Parties (PRPs).

Dry cleaning as an industry began during the 19th century when materials, such as camphene and turpentine, were utilized to clean garments. As the process developed, other chemicals were utilized, including benzene, naphtha, gasoline, Stoddard solvent, petroleum distillates, carbon tetrachloride and tetrachloroethene, more commonly known as perchloroethylene (PCE) or "Perc."

Currently , it is estimated that approximately 70 to 85 percent of all dry cleaners use PCE in their dry cleaning process. The remaining 15 to 30 percent utilize petroleum solvents. Petroleum solvents are less expensive than chlorinated solvents, but are flammable and may form explosive mixtures. Small quantities of 1,1,1-trichloroethane and trichlorotrifluoroethane are also used in specialty cleaning/spot removal. Most dry cleaners in the United States use washing machines and dryers similar to those found in laundromats and homes. These washing machines, however, utilize

PCE or other solvents instead of water. The chemicals do not saturate the clothing, but remove dirt from the clothing by chemical degradation.

When the solvent is removed from the washer, it contains dirt and soils removed from the clothing. The solvent is typically passed through a filtration system. Two main types of filters are used - tubular or regenerative filters and cartridge filters. Tubular cartridges utilize diatomaceous earth and activated carbon, and cartridge filters utilize activated carbon and clay. Regenerative filters require the replacement of new diatomaceous earth and activated carbon daily. Cartridge filters are disposable and are therefore used in about 90 percent of all dry cleaning facilities. Solvent losses in the filter cartridges can be reduced by draining the filters in their housing. Regenerative filters generate solid wastes in the form of "muck." Filter muck is the insoluble soils, nonvolatile residue and loose dyes that are removed from the dirty solvent. Therefore, some facilities have a "muck cooker" to allow for further removal of remaining solvent prior to off-site disposal of the muck.

Following filtration, the filtered solvent may either flow back to the solvent base tank or to the distillation unit. Distillation removes soluble oil, fatty acids and greases from the solvent that are not removed by filtration. Solvent distillation is performed on-site in about 80 percent of all dry cleaning facilities. Distillation generates still bottoms that consist of all the remaining solid residue and 50 to 60 percent solvents.

Due to improper handling and disposal practices utilized by dry cleaners over the past century, there are numerous sites located in New York State, as well as elsewhere, that have been contaminated with solvents, such as PCE and its breakdown compounds. Improper disposal of waste material, likely the still bottoms and material drained from the filters, from the dry cleaning process has occurred through discharge to on-site sanitary systems, on-site storm water drainage systems and directly to the ground surface, literally "out the back door."

Although the improper disposal of dry cleaning waste material has contaminated a wide array of media, such as surface soil, subsurface soil and sediment, the primary impact has been the contamination of groundwater and subsequently, water supply wells. These water supply wells include both individual private wells, and community and public supply wells that serve thousands of people and even hundreds of thousands of people.

Perchloroethylene is a toxic chemical known to affect the liver, kidneys, eyes and upper respiratory system. Although PCE is of concern, there is also concern regarding its breakdown products that include trichloroethene (respiratory system, heart, liver and kidneys), dichloroethene (respiratory system, eyes and central nervous system), and chloroethene, which is more commonly known as vinyl chloride and is a known carcinogen.

Due to the nature of the solvents utilized, investigation and remediation of dry cleaner sites can be difficult. Perchloroethylene is a chlorinated hydrocarbon and a dense nonaqueous liquid (DNAPL) that is strongly influenced by structural and stratigraphic features of soil when introduced to the subsurface. DNAPL movement in the subsurface is primarily downward with lateral spreading at the capillary fringe and subsurface heterogeneities. Residual liquid is trapped by surface tension in pore spaces as the DNAPL drains through the soil in both the saturated and unsaturated soil. Due to the relatively narrow and often deep dissolved groundwater contaminant plumes generated by the disposal of PCE, identifying and delineating the plume can be difficult. Remediation techniques are relatively ineffective unless they are able to address the dense nonaqueous phase residual contamination.

The following sections provide the information and procedures necessary to effectively investigate and remediate dry cleaner sites within the context of a remedial investigation and feasibility study. A discussion of the RI/FS objectives and approach, and an overview of the elements that comprise Work Plan preparation, performance of the field investigation and selection of a remedial plan, is provided below.

1.2 RI/FS Objectives and Approach

The approach to conducting a RI/FS at dry cleaner sites is to perform a *focused* field investigation and feasibility study, with an emphasis on source investigation and remediation. The remedial investigation will also focus on the determination of the nature and extent of contamination associated with dry cleaner sites and the selection of an interim remediation measure (IRM), if necessary. Presumptive remedies appropriate for these sites will also be addressed as part of the Phase I Remedial Investigation Report. The objective is to conduct a single phase remedial investigation and select an IRM or presumptive remedy. While the emphasis is on an accelerated investigation and selection of a remedial action, the Generic Work Plan is structured to be in conformance with the Federal Superfund Amendments and Reauthorization Act (SARA) and the National Contingency Plan (NCP), as well as the New York State Superfund Program, including Technical and Administrative Guidance Memorandum (TAGM) 4025 - Guidelines for Remedial Investigation/Feasibility Study, dated March 1989 (see Appendix A), in order to allow for performance of a phased RI/FS, if necessary.

The Work Plan contained in this document is structured to present various field investigation techniques that can be utilized for the collection of field information during the remedial investigation. As stated above, the focus of the field investigation will be on the identification and delineation of the source and extent of contamination, as well as the identification of potential receptors and migration pathways, while obtaining practical information for use in the evaluation of presumptive remedial technologies and selection of a remedial plan. This approach will provide for a cost-effective field program, and allow for accelerated development of a remediation plan for the site.

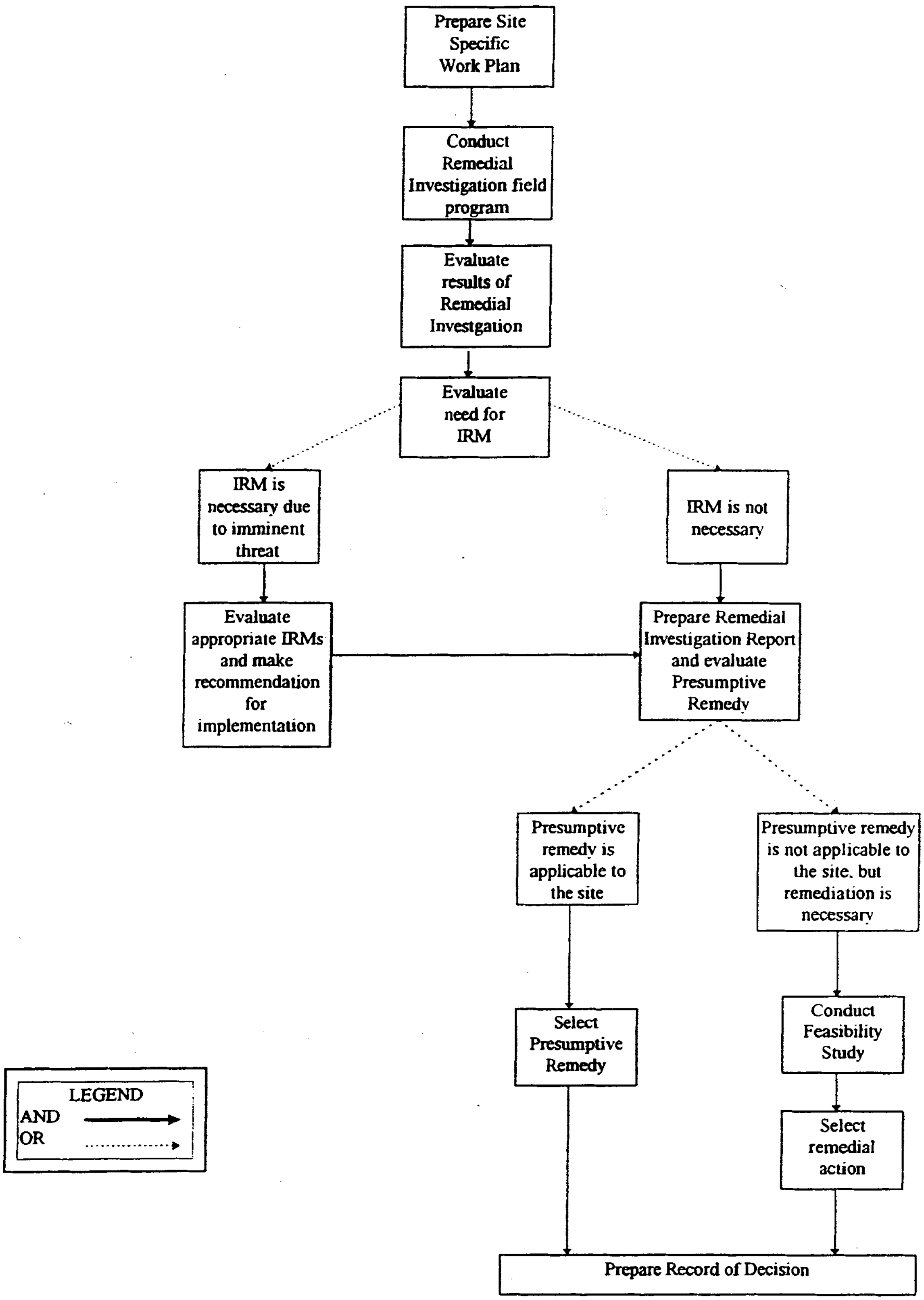
Selection of remediation methods will be dictated by the results of the remedial investigation, human health risk and environmental assessment, and policies and direction provided by the NYSDEC and the New York State Department of Health (NYSDOH). The public will also have the opportunity to review and comment on the recommended remediation plan. As mentioned above, the emphasis of a remedial plan will be on the selection of IRMs and/or presumptive remedies.

To assist in the selection of a remediation method, this Work Plan provides an overview of those technologies/alternatives which have been determined/demonstrated to be suitable for the remediation of dry cleaner sites. This focused approach for both site investigation and remediation will result in substantial project cost and time reductions compared to a standard RI/FS, while still allowing for the development of a cost-effective, environmentally sound and long-term remedial solution.

Succinctly, the objectives of the RI/FS are the following:

- Define the source, nature and extent of contamination;
- Determine current and future potential receptors;
- Determine current and future potential contaminant migration pathways;
- Assess the risks to human health and the environment to determine the need for remedial action; and
- If necessary, predicated upon the results of the risk assessment, select an interim remedial measure if an *immediate* threat to health and the environment has been identified, and/or presumptive remedy or other long-term remedial measure, if required.

In order to appropriately identify the RI/FS process, including the preparation of a Site Specific Work Plan through preparation of the Record of Decision, a flow diagram has been developed. A copy of this flow diagram is provided in Figure 1-1.



GENERIC WORK PLAN FOR DRY CLEANER SITES

Dvirka and Bartilucci
Consulting Engineers
A Division of William F. Cosulich Associates, P.C.

RI/FS FLOW DIAGRAM

FIGURE 1-1

1.3 Phase I Remedial Investigation/Site Characterization

1.3.1 Scoping Plan and Site Background Investigation

The initial element of the remedial investigation is for a site-specific dry cleaner facility "scoping" of the project and collection of existing information pertaining to the specific site. Prior to development of the Site-Specific Work Plan, all background information regarding the site will be collected and reviewed in order to develop a focused field investigation, with particular emphasis on using as much existing data as possible and determining the source of contamination, if unknown. Information about the site will be obtained through accessing all available local and regional governmental records and files. The following is a list of sources of information that will be contacted in order to gather background information with regard to the site and past waste disposal practices.

- Local city, town or county Building Departments to obtain information on the construction of the facility, including the location of floor drains, roof drains, dry wells and on-site sanitary systems. These records may also provide information on previous site owners.

- City and county Health Departments to obtain information on underground storage tanks, spills, previous environmental investigations, existing and abandoned on-site sanitary systems, facility inspections and any complaints filed for the site. The Health Departments may also have information on private and public water supply wells, monitoring wells and pumping/cooling water wells that have been installed on or in the vicinity of the site. In addition, files may be available for other facilities in the vicinity of the site that may have environmental information in the study area.

- Albany and regional offices of the NYSDEC to obtain information on environmental or spill investigations conducted at or in the vicinity of the site.

- NYSDOH to obtain information on private and public water supply wells, or other environmental sampling conducted at or in the vicinity of the site.

- Additional agencies, such as the United States Geological Survey (USGS) and the Soil Conservation Service (SCS) to obtain information with regard to geology and hydrogeology, and soil types in the vicinity of the site.

In addition to review of all available background information, a facility/study area investigation will be performed. As part of this investigation, information on the facility operations will be obtained. This will include interviews with the current and previous owners and operators of the facility. Such information will include, but not be limited to, the following:

- Current and previous waste disposal method(s) (e.g., on-site sanitary system, municipal sewer system, ground surface);
- Location of on-site sanitary system and dry wells;
- Location of interior floor drains, slop sinks and roof drains;
- Location of storm water drainage systems; and
- Location of chemical and waste storage areas.

A Facility Inspection Form (see Exhibit 1-1) will be completed and a facility/site map (sketch) will be prepared as part of the inspection. Information detailed on this sketch will be incorporated onto the base map prepared for the Site-Specific Work Plan (see Section 1.3.2).

If possible, as mentioned above, during the facility/study area inspection, facility personnel, including previous owners/operators, will be interviewed to obtain information with regard to past chemical storage and waste disposal activities. Copies of all pertinent information will be provided in the Site-Specific Work Plan.

Historical aerial photographs may also provide additional information on disposal activities at the site. If it is believed that the contamination detected on-site is a result of surficial spills or improper handling/storage/disposal practices, a review of historical aerial photographs will also be conducted as part of this task. A listing of locations where historical aerial photographs can be obtained is provided in Appendix B.

Historical aerial photographs for the period of time the dry cleaning facility was in operation will be reviewed. Notes on areas observed to exhibit soil staining, stressed vegetation or chemical/waste storage will be made. Once all background information on the site is obtained, it will be summarized for inclusion in the Site-Specific Work Plan.

A base map will be prepared for the site and will include: an outline of site structures and other pertinent physical features, both on- and off-site; location of dry wells, sanitary systems and storm water drainage systems; location of chemical and waste storage areas; and important existing environmental data.

Following summarization of all existing, pertinent information and data, and preparation of the base map, a Scoping Plan will be prepared. This Plan will include preparation of a summary matrix of the recommended field program and preliminary investigation map which will be provided to NYSDEC prior to preparing the detailed Site-Specific Work Plan so that comments on the planned field investigation can be addressed prior to submittal of the formal Work Plan. The map will include the planned location of investigation and sampling points, such as monitoring wells, soil vapor survey points, dry wells, etc.

This matrix and map, combined with a preliminary budget (if applicable), project schedule and staffing plan (with resumes) will be provided to the NYSDEC as the Scoping Plan. Discussion with regard to preparation of the project schedule and staffing plan is provided in Section 1.7.

1.3.2 Development of a Site-Specific Work Plan

Once the background information has been evaluated, and the Scoping Plan and proposed field investigation has been approved by NYSDEC, a Site-Specific Work Plan will be prepared. This Work Plan will include the following:

- A summary of existing background information that will provide the rationale for the field investigation;

- A detailed discussion of the planned field activities, including sample collection and analysis;
- A detailed project schedule showing key milestones and deliverables;
- A detailed project organization chart for key staff together with resumes;
- Site-specific QA/QC information, if different from this Generic Work Plan, due to different proposed sampling and analytical methodologies;
- Site-specific health and safety information, including emergency contacts and route to the nearest hospital; and
- A budget for the project, including Schedule 2.11 (if applicable).

The Site-Specific Work Plan will be submitted to the NYSDEC for review and approval prior to initiation of the field program.

1.3.3 Field Investigation

The remedial investigation field program will include one or more of the following investigation elements depending upon site-specific characteristics and data requirements:

- Aerial Photography and Topographic Mapping
- Grid Network Survey
- Surface Geophysical Survey
- Dye/Smoke Testing
- Closed Circuit Television Inspection
- Soil Vapor Survey
- Shallow Soil/Water Survey
- Surface Soil Sampling
- Dry Well Survey and Sampling

- Storm Water Drainage System Survey and Sampling
- On-Site Sanitary System Survey and Sampling
- Surface Water and Sediment Sampling
- Test Pit Excavation and Sampling
- Direct Push Soil Sampling
- Direct Push Groundwater Sampling
- Monitoring Well and Piezometer Installation
- Groundwater Sampling
- Groundwater Level Measurement
- In-Situ Hydraulic Conductivity Testing
- Pumping Test
- Downhole Geophysical Survey
- Geotechnical Analysis
- Air Screening Survey
- Ambient Air Sampling
- Surveying and Mapping.

Detailed descriptions of sampling, testing, screening and surveying procedures are provided in the Field Operation and Investigation Plan in Section 2.0 of this Work Plan. The identification, frequency and locations of the investigation elements selected for a specific dry cleaner site will be provided in the Site-Specific Work Plan.

1.3.4 <u>Identification of Standards, Criteria and Guidelines</u>

A key consideration in the performance of a RI/FS under the provisions of the Superfund Amendments and Reauthorization Act (SARA) and the New York State Superfund Program, is the establishment of Applicable, Relevant and Appropriate Requirements (ARARs) or Standards, Criteria and Guidelines (SCGs) as referenced under the State Program, early in the RI/FS. These SCGs establish the conditions and numerical values against which the data obtained during the RI/FS will be compared to determine the significance and extent of contamination, and if remedial action is required.

In New York State, the primary regulatory guidance for groundwater and surface water quality is the <u>Technical and Operational Guidance Series (TOGS) - Ambient Water Quality Standards and Guidance Values, dated October 1993</u> (see Appendix C). This document presents standards and guidance values based on water quality classifications for over 200 chemical compounds for groundwater and surface water systems in New York State. The NYSDOH has also promulgated Maximum Concentration Levels (MCLs) for chemical compounds in drinking water. These MCLs are the primary regulatory guidance for private and public water supply well quality. For volatile organic compounds the TOGS have incorporated the MCLs into groundwater standards and therefore will be the primary SCG.

For soils, the <u>NYSDEC TAGM-HWR-94-4046 for the Determination of Soil Cleanup Objectives and Cleanup Levels, dated January 1994</u> (see Appendix D), will be utilized as the SCG. For sediment, the NYSDEC Division of Fish and Wildlife Technical Guidance for Screening Contaminated Sediment, dated November 1993, will be utilized (see Appendix E).

For air, the <u>Draft New York State Air Guide-1, Guidelines for the Control of Toxic Ambient Air Contaminants, dated 1991</u>, including complete HAP Listings, AGCs, SGCs and Air Quality Standards for the Air Guide-1 will be utilized (see Appendix F).

Site-specific SCGs may also be identified based on the results of the remedial investigation and human health risk and environmental assessment. These site-specific SCGs and other guidance for site remediation will be developed for the RI/FS as part of this task in coordination with, and with the approval of, the NYSDEC and NYSDOH.

The SCGs will also be utilized to develop appropriate Data Quality Objectives. These objectives are discussed further in the Quality Assurance/Quality Control Plan, which is contained in Section 4.0 of this Work Plan.

1.3.5 Habitat Based Assessment

A wildlife habitat survey will be conducted in order to prepare an environmental assessment. The survey will be performed in accordance with Step I of the NYSDEC Division of Fish and Wildlife document entitled "Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites," dated June 1991 (see Appendix G). A Step IIa analysis will be completed as part of the environmental assessment discussed in Section 1.3.6 below. A Step IIb analysis will be prepared, if it is determined to be necessary by the NYSDEC. The habitat field survey will identify aquatic and terrestrial species which are directly observed, as well as vegetative cover types, wetlands and surface water bodies, and fish and wildlife which may inhabit the site and surrounding area. The extent of the habitat survey may be as great as 1/2 mile from the site depending upon potential contaminant migration. The Habitat Based Assessment will be included in the Phase I Remedial Investigation. If it is determined that there is not a significant habitat at or in the vicinity of the site, upon approval by NYSDEC, this assessment may not be performed.

1.3.6 Human Health Risk and Environmental Assessment

A baseline human health risk and environmental assessment will be prepared based upon the results of the Phase I Remedial Investigation. A revised assessment will be based upon the results of the Phase II/Post-Screening Investigation, if required.

The goals of the baseline health risk and environmental assessment are to:

- Provide a determination of potential human health risk under current/baseline site conditions, including identification of contaminant migration pathways and potential receptors;

- Identify the potential impacts to flora and fauna posed by existing contamination at the site;

- Provide a basis for determining contaminant levels that can remain on-site and off-site, while providing adequate protection of human health and the environment; and

- Identify areas, on-site and off-site, that require remediation.

The approach to be used to perform the human health risk and environmental assessment is provided in the following United States Environmental Protection Agency (USEPA) documents: Risk Assessment Guidance for Superfund (RAGS), Volume I, Human Health Evaluation Manual Part A, Interim Final dated December 1989; and Risk Assessment Guidance for Superfund (RAGS), Volume II, Environmental Evaluation Manual, Interim Final dated March 1989. The assessment will identify the contaminants and concentrations of concern at the site, define the routes of exposure from these contaminants, define the contaminant migration pathways and identify the potential human receptors based upon the results of the remedial investigation.

The environmental assessment will consist of an evaluation of potential impacts to flora and fauna at the site and off-site caused by the levels and extent of contamination determined as a result of the remedial investigation.

A list of indicator chemicals will be developed for the site from the set of validated remedial investigation data. Indicator chemicals are generally selected to represent the most toxic, mobile and persistent contaminants at the site, as well as those compounds which exceed the SCGs, and those compounds which are detected most frequently and at the highest concentrations. Identification of indicator chemicals will enable the health risk and environmental assessment to focus on the contaminants of greatest potential concern to human health and the environment. As discussed previously, for dry cleaner sites the chemicals of concern are: tetrachloroethene/ perchloroethylene, and its breakdown products comprising trichloroethene, dichloroethene and chloroethene commonly referred to as vinyl chloride (see Figure 1-2). In addition to these chemicals, 1,1,1-trichloroethane and possibly trichlorotrifluoroethane may also be of concern.

Utilizing data from the remedial investigation, site reconnaissance and previous site investigations, the contaminant sources, migration pathways and human exposure points will be identified and evaluated. Potential human exposures from contaminants and contaminated media associated with dry cleaner sites include ingestion, inhalation and dermal contact with waste, contaminated groundwater, surface/drainage water, soil and sediment, and vapors and fugitive dust.

1.3.7 Identification of Interim Remedial Measures

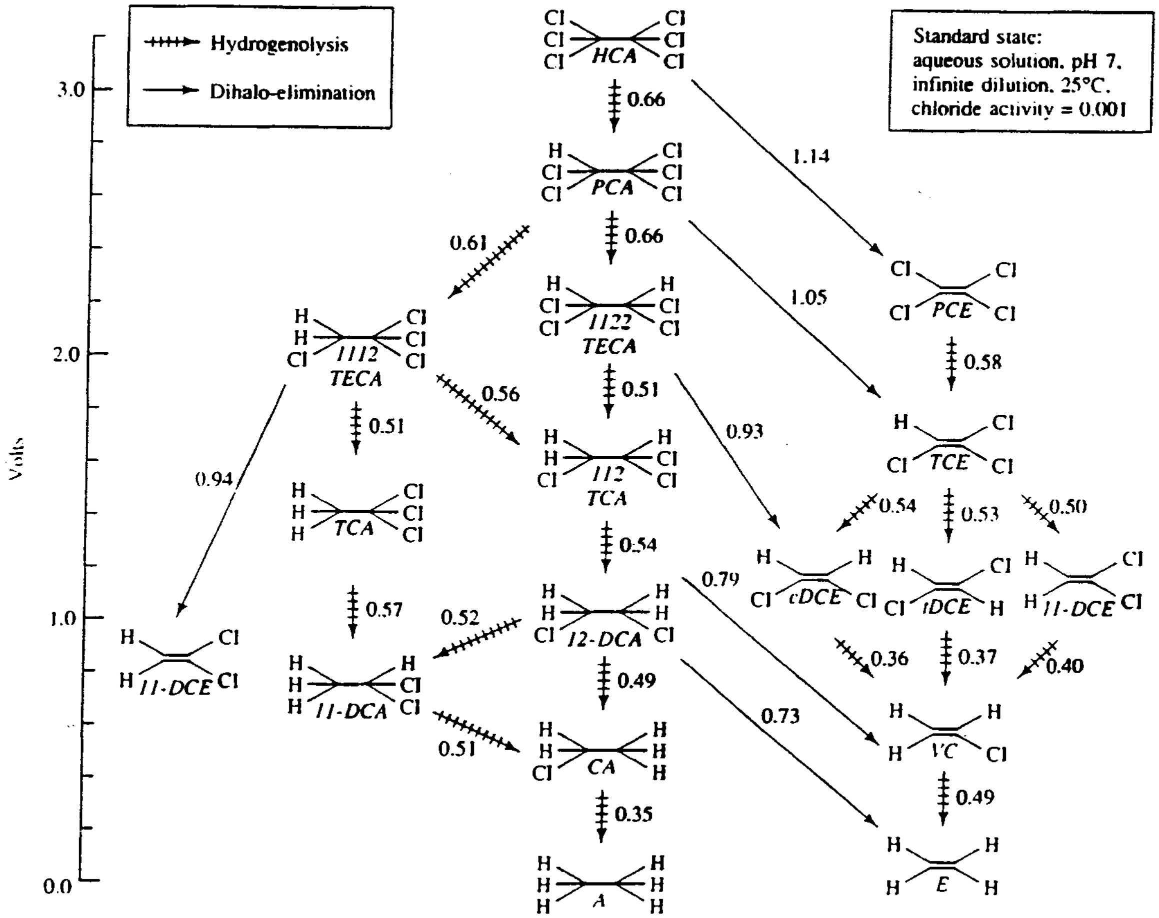
A review of the results of the remedial investigation and human health risk and environmental assessment will be the basis for determining the need for an Interim Remedial Measure (IRM) at the site. If it is determined that there is an imminent threat to human health or the environment, an IRM will be undertaken for the site. The following actions are considered IRMs:

Water Supply

- Individual Well Head Treatment; and
- Bottled Water.

Source Control

- Temporary Soil Cover;
- Fencing and Sign Posting; and
- Termination of Active Discharges.



11-DCE = 1.1-dichloroethene
1112-TECA = 1.1.1.2-tetrachloroethane
TCA = trichloroethane
11-DCA = 1.1-dichloroethane
HCA = hexachloroethane
PCA = pentachloroethane
1122-TECA = 1.1.2.2.-tetrachloroethane
112-TCA = 1.1.2-trichloroethane
12-DCA = 1.2 dichloroethane

CA = chloroethane
A = ethane
PCE = perchloroethene
TCE = trichloroethene
cDCE = *cis*-dichloroethene
tDCE = *trans*-dichloroethene
11-DCE = 1.1-dichloroethene
VC = vinyl chloride
E = ethylene

SOURCE: C.W. FETTER, CONTAMINANT HYDROGEOLOGY, NEW YORK, 1993, p. 324.

GENERIC WORK PLAN
FOR DRY CLEANER SITES

PATHWAYS OF CHLORINATED ALKANE AND ALKENE REDUCTION

Dvirka and Bartilucci
Consulting Engineers

FIGURE 1-2

In addition to these IRMs, several remedial actions identified in Section 1.4 as presumptive remedies can also be considered as an IRM, if implemented prior to the completion of the remedial investigation in order to fast-track site remediation. The evaluation and demonstration of the need for implementation of a presumptive remedy as an IRM will be provided in the Remedial Investigation Report. The above IRMs will be discussed further in Section 3.1.

1.3.8 Phase I Remedial Investigation Report

The information and sample results obtained as part of the Phase I Remedial Investigation field program will be used to characterize the site, including determination of the nature, extent and source of contamination. This information, together with the documentation of all field procedures undertaken, including sampling, testing, and quality assurance/quality control, will be included in the Phase I Remedial Investigation Report.

The report will present figures and maps illustrating the locations of all sampling points, including monitoring wells, soil borings, dry wells, etc., as well as pertinent analytical results. Cross sections will be prepared, if necessary, to describe the geologic and hydrogeologic characteristics of the site, as well as pertinent analytical information. Groundwater contour maps will be prepared for each hydrogeologic unit, in particular for the critical stratigraphic unit identified as a result of the remedial investigation, to indicate groundwater flow direction.

Analytical results will be presented in a spreadsheet format for each matrix by sample number and compared to the appropriate SCGs. Samples exceeding the SCGs, either as a function of individual contaminant or as a group of contaminants, will be highlighted and identified as contaminants of concern pending the results of the human health risk and environmental assessment, which will be prepared as part of the Phase I Remedial Investigation Report.

Results of the contaminants of concern will be discussed and used to delineate the nature, extent and source of site contamination, and to identify the routes of exposure, contaminant migration pathways and potential receptors. An example of a table of contents for a Phase I

Remedial Investigation Report is provided in Table 1-1. Also as part of the Remedial Investigation Report, a description and rationale for the implementation of any IRMs will be provided, and a preliminary identification and evaluation of presumptive remedial technologies will be presented. If additional information as part of a Post Screening/Phase II Remedial Investigation is determined to be necessary prior to selection of a presumptive remedy, for example a treatability study or pumping test, recommendations for the Phase II investigation will be provided in the Phase I Report. It should be noted that if sufficient information exists as a result of the Phase I Remedial Investigation, a recommended presumptive remedy can be set forth in the Phase I Report.

1.4 Phase I/II Feasibility Study/Screening of Remedial Alternatives

1.4.1 Identification and Evaluation of Presumptive Remedial Technologies

Due to the nature of the contamination found at dry cleaner sites (contaminant types and contaminated media), there are several technologies that have demonstrated effectiveness in remediating sites contaminated with the same or similar types of contamination. Each technology has its limitations, and therefore, although a remedial technology may be appropriate for the contaminants of concern, it may not be applicable to a particular site due to site-specific conditions, including physical and hydrogeologic constraints that limit its effectiveness. As part of this Work Plan several remedial technologies have been identified as presumptive remedies. These presumptive remedies can be implemented at sites that match the requirements of the remedy and site conditions. The presumptive remedies identified for dry cleaner sites are provided below as a function of source remediation, contaminated groundwater remediation and water supply remediation:

- Source Control Alternatives
  - Leaching pool/dry well and Leaching Field Cleanout
  - Soil excavation and removal
  - Soil vapor extraction
  - Low temperature thermal desorption
  - No further action

Table 1-1
PHASE I REMEDIAL INVESTIGATION REPORT

TABLE OF CONTENTS

Table 1-1 (Continued)
PHASE I REMEDIAL INVESTIGATION REPORT

TABLE OF CONTENTS (continued)

Table 1-1 (Continued)
PHASE I REMEDIAL INVESTIGATION REPORT

TABLE OF CONTENTS (continued)

- Groundwater Alternatives

  - Extraction and treatment
  - Air sparging
  - No further action
  - Long-term monitoring

- Water Supply Alternatives

  - Extension of existing public water supply
  - Water supply treatment

These presumptive remedies are discussed further in Section 3.2.

1.4.2 Identification and Evaluation of Other Remedial Technologies

If, based upon an evaluation of the presumptive remedies described above, it is determined that none of the presumptive remedies are applicable to the site, or there are other potential remedial technologies that may be more applicable or cost-effective, an evaluation of other remedial technologies must be conducted. This evaluation will be performed in the context of a standard feasibility study.

The first two phases of the feasibility study process are the identification and evaluation/ screening of remedial technologies, and the development and evaluation/screening of potentially applicable remedial alternatives, respectively. These two phases will be prepared in accordance with the following documents:

- Technical and Administrative Guidance Memorandum (TAGM) on Selection of Remedial Actions at Inactive Waste Sites - Revised HWR-90-4030, New York State Department of Environmental Conservation, dated May 1990 (see Appendix H); and

- Guidance on Conducting Remedial Investigations and Feasibility Studies Under CERCLA Interim Final, EPA-540/E 89/004, OSWER Directive 9355.3-01, U.S. Environmental Protection Agency Office of Emergency and Remedial Response, dated October 1988.

A more detailed discussion of the identification, development and screening of technologies and alternatives is presented in Section 3.3. A typical table of contents for a Phase I/II Feasibility Study Report is provided in Table 1-2.

1.5 Phase II Remedial Investigation/Post Screening Field Investigation

Remedial technologies/alternatives being considered for the site, including IRMs and presumptive remedies, but in particular, other alternatives, may require additional investigation to obtain the data necessary for further detailed evaluation. Data gaps identified as a result of the Phase I Remedial Investigation and/or Phase I/II Feasibility Study will determine whether additional field investigation is needed. Additional information required could include data to further refine/confirm the source and extent of contamination, or treatability studies or pumping tests to further evaluate remedial alternatives. The scope of such a Post Screening/Phase II Field Investigation, if required, would be initially outlined similar to the Scoping Plan for the Phase I Remedial Investigation for preliminary approval by the NYSDEC. Subsequent to preliminary approval, a detailed Site-Specific Work Plan Addendum would be prepared for NYSDEC approval prior to performance of the proposed Phase II field program.

1.6 Phase III Feasibility Study/Detailed Analysis of Alternatives

In the context of a standard feasibility study, the detailed analysis of alternatives will include further refinement and/or modification of alternatives selected in the Phase I/II Feasibility Study based on the results of treatability studies (if performed) and the findings of the Phase II Remedial Investigation. In addition, the detailed analysis of alternatives will include evaluation of the following factors, including a comparative analysis for each factor, in accordance with NYSDEC TAGM 4030:

- Overall protection of human health and the environment;
- Compliance with SCGs;

Table 1-2
PHASE I/II FEASIBILITY STUDY REPORT

TABLE OF CONTENTS

- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility and volume;
- Short-term effectiveness;
- Implementability; and
- Cost.

At the conclusion of this analysis, a preferred alternative will be recommended which will specify the remedial action selected for the site to address on-site contamination, as well as off-site contamination, if necessary. A more detailed discussion of the Phase III Feasibility Study is provided in Section 3.4. A typical table of contents for a Phase III Feasibility Study Report is provided in Table 1-3.

1.7 Project Management

1.7.1 Project Schedule and Key Milestones/Deliverables

A site-specific project schedule in the form of a bar chart will be developed for each site-specific RI/FS. The schedule will identify key milestones in order to monitor work progress. These milestones will comprise work plans and reports. Specific deadlines for completion of tasks and subtasks will be identified throughout the project schedule to ensure timely completion of work. A generic project schedule that presents tasks, deliverables and general time frames associated with conducting a RI/FS for a typical dry cleaner site is illustrated in Figure 1-3. The following are typical milestones associated with this type of project:

- Milestone 1 Submittal of the Scoping Plan.
- Milestone 2 Submittal of the Draft Site-Specific RI/FS and Phase I Remedial Investigation Work Plan.
- Milestone 3 Submittal of the Draft Phase I Remedial Investigation Report.

Table 1-3
PHASE III FEASIBILITY STUDY REPORT

TABLE OF CONTENTS

Figure 1-3

- Milestone 4 — Submittal of the Draft Phase I/II Feasibility Study Report (if necessary).
- Milestone 5 — Submittal of the Draft Phase II Remedial Investigation Site-Specific Work Plan Addendum (if necessary).
- Milestone 6 — Submittal of the Draft Phase II Remedial Investigation Report (if necessary).
- Milestone 7 — Submittal of the Draft Phase III Feasibility Study Report (if necessary).

1.7.2 Project Management, Organization and Key Personnel

A project organization chart will also be submitted with each Site-Specific Work Plan. This chart will identify the prime consultant to perform the RI/FS for the site, as well as any subconsultants or subcontractors to be utilized to conduct the work and their areas of responsibility. An example of a project organization chart is provided in Figure 1-4.

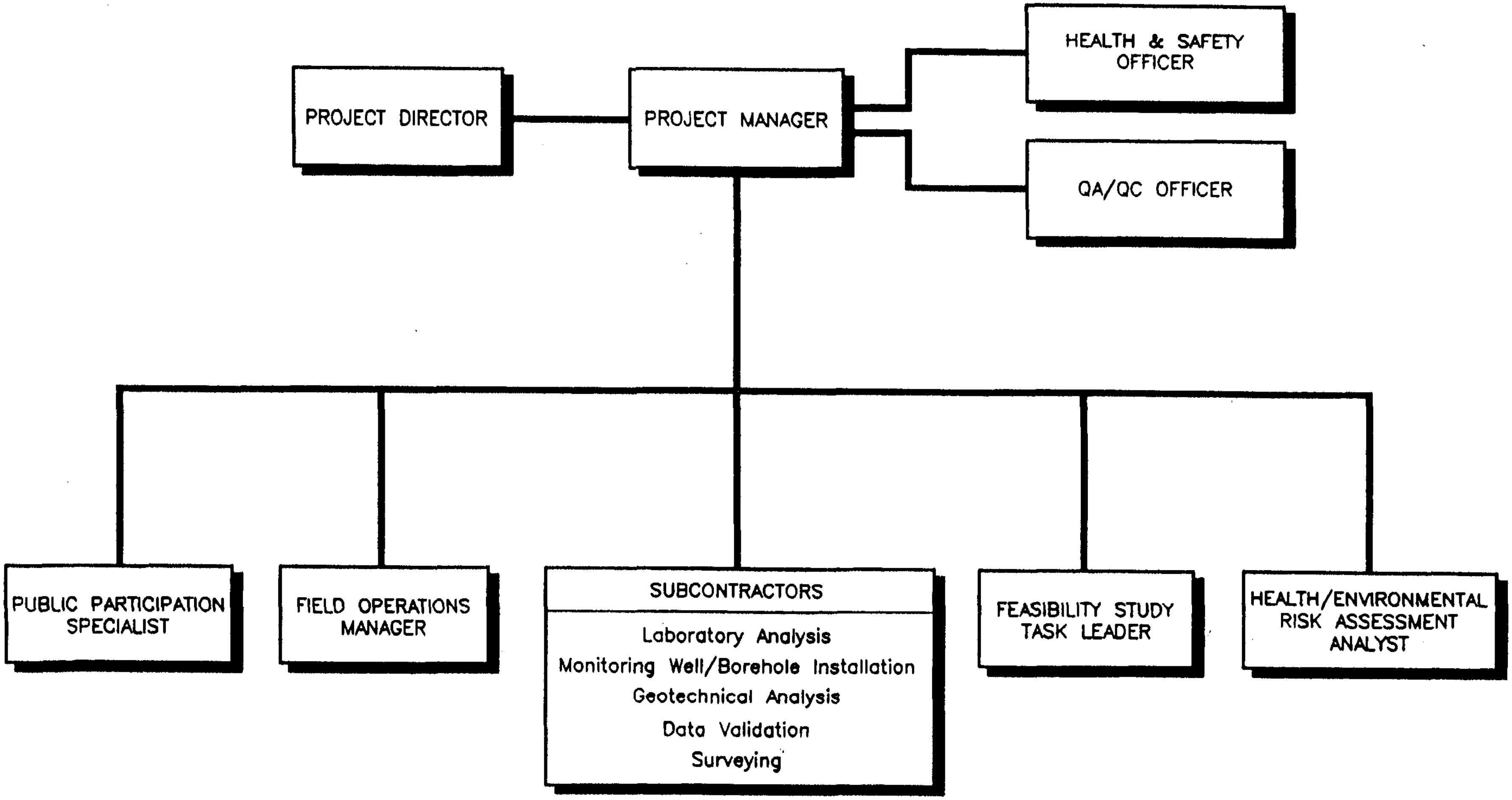
In addition to identifying subconsultants and subcontractors, key management and technical personnel to be involved in the project will also be identified, together with their function/area of responsibility. Resumes of each of the key personnel will be provided in the Site-Specific Work Plan to demonstrate management and technical experience and qualifications for their assigned project roles and responsibilities. Individuals to be involved in the project should have experience in conducting remedial investigations and feasibility studies in New York State, and preferably for dry cleaner or similar sites.

As shown on the example project organization chart, key project personnel include the Project Director, Project Manager, Field Operations Manager, Quality Assurance/Quality Control Officer, Health and Safety Officer, Risk Assessment Analysts, Feasibility Study Task Leader and Public Participation Specialist. It should be noted that the Project Director or Project Manager must be a New York State Licensed Professional Engineer (P.E.), since all engineering related documents, including recommendations for remediation and feasibility study reports will require

FIGURE 1-4

ORGANIZATION CHART

FOR
DRY CLEANER SITE
REMEDIAL INVESTIGATION AND FEASIBILITY STUDIES



DIR: 1396 FILE: 1396-OC RDS-02/29/96

Dvirka and Bartilucci
Consulting Engineers
A Division of William F. Cosulich Associates, P.C.

P.E. certification. The following is a brief description of the responsibilities and appropriate qualifications for these personnel.

Project Director is responsible for overseeing all aspects of the RI/FS, including assignment of staff resumes and management of the project budget and schedule. The Project Director is also responsible for final approval of all deliverables, such as the Work Plan, Remedial Investigation Report and Feasibility Study Report. The Project Director should have considerable knowledge and experience with the New York State Superfund Program and its protocols, as well as dry cleaner and related sites.

Project Manager is responsible for coordination and implementation of all project tasks, including procuring and implementing contracts with subconsultants/subcontractors, and interface with the NYSDEC Project Manager. The Project Manager should be knowledgeable of the New York State Superfund Program and its protocols, and have several years of experience in conducting and managing remedial investigations and feasibility studies at dry cleaner sites, or sites with similar contaminants and contaminated media.

Field Operations Manager is responsible for the daily activities conducted during the field/sampling program, including implementation of the QA/QC Plan and Health and Safety Plan, and day-to-day coordination with the subcontractors. The Field Operations Manager should have several years of experience in managing/conducting field investigations and should be familiar with dry cleaner sites, or sites with similar contaminants and contaminated media.

Quality Assurance Officer is responsible for preparation of the Site-Specific QA/QC Plan and ensuring its implementation. The Quality Assurance Officer is responsible for ensuring that all quality assurance measures are adhered to during sampling, as well as analyses at the laboratory, including performance of field audits, laboratory audits and preparation of data validation/usability reports. The Quality Assurance Officer must have several years of experience in project related quality assurance procedures and be familiar with all NYSDEC and USEPA quality control

documents, including the 1991 Analytical Services Protocols and Contract Laboratory Procedures, respectively.

Health and Safety Officer is responsible for preparing the Health and Safety Plan and ensuring its implementation. The Health and Safety Officer must be a qualified and experienced health and safety professional who has six years or more experience in health and safety, and at least two years in hazardous waste site investigation. In addition, the Health and Safety Officer must have one of the following certifications:

Designation	**Certifying Body**
Certified Safety Professional	American Board of Certified Safety Professional
Associate Safety Professional	American Board of Certified Safety Professional
Certified Safety Executive (CSE)	World Safety Organization, Accreditation and Certification Board
Certified Safety Manager (CSM)	World Safety Organization, Accreditation and Certification Board
Certified Safety Specialist (CSS)	World Safety Organization, Accreditation and Certification Board
Certified Industrial Hygienist (CIH)	American Board of Industrial Hygiene

There are several additional key technical personnel that would be involved in the project including the Risk Assessment Analyst, Feasibility Task Leader and Citizen Participation Specialist. All three personnel should have experience in performing similar tasks at hazardous waste sites under the New York State Superfund Program.

There is one other key technical position involved in remedial investigations and feasibility studies, which is the Data Validator, whose required qualifications are provided in the QA/QC Plan in Section 4.0.

Subcontractors to be utilized for a project will also have to meet specific requirements for conducting a RI/FS at hazardous waste sites.

Monthly Technical Progress Reports and Financial Status Reports, if applicable, will be prepared and submitted to the NYSDEC. Technical Progress Reports will provide detailed information by task, such as accomplishments, problems, compliance with the project schedule and projected changes in project scope, as well as utilization of Minority and Women Business Enterprises, if applicable. Financial Status Reports, if applicable, will be provided as comparison of expenditures against the project budget by task. For Potentially Responsible Party lead projects, only monthly Technical Progress Reports will be required to be submitted to the NYSDEC.

EXHIBIT 1-1
FACILITY INSPECTION FORM

NAME OF INSPECTOR ______________________ DATE ____________

____

ADDRESS OF ______________________________________

____

FACILITY ____

____

CURRENT FACILITY NAME ___________________________

____

CURRENT FACILITY OWNER __________________________

____

CURRENT FACILITY TENANT (IF NOT THE SAME AS OWNER) ____________

____

PERIOD OF TIME LOCATED AT THIS FACILITY - FROM ______ TO ____________

FORMER FACILITY NAME(S)

______________ FROM ______________ TO ______________

______________ FROM ______________ TO ______________

______________ FROM ______________ TO ______________

CURRENT FACILITY USE ____________________________

____

FORMER FACILITY USE _____________________________

____

SIZE OF FACILITY (SQUARE FEET) ____________________

____

NUMBER OF EMPLOYEES ____________________________

ADJACENT PROPERTY USE __________________________

EXHIBIT 1-1 (continued)
FACULTY INSPECTION FORM

CONNECTED TO MUNICIPAL SANITARY SEWER? YES ____ NO ____ IF YES, NAME OF MUNICIPALITY AND WHEN ____
____

IF NO, METHOD OF DISPOSAL (I.E., LEACHING FIELD, LEACHING POOLS, ETC.) _______
____

LOCATION AND NUMBER OF RESTROOMS AND SEWER CONNECTION(S) OR LOCATION OF ON-SITE SANITARY SYSTEM(S) ______________________________
____

NUMBER, SIZE AND LOCATION OF ANY UNDERGROUND OR ABOVEGROUND STORAGE TANKS (PAST OR PRESENT) ______________________________
____

LOCATION AND SIZE OF ANY PETROLEUM OR HAZARDOUS WASTE RELEASES ______
____

NUMBER AND LOCATION OF INTERIOR FLOOR DRAINS (ALSO NOTE ANY PATCHES ON FLOOR OF FACILITY)______________________________
____

NUMBER AND LOCATION OF SLOP SINKS ______________________________
____

NUMBER AND LOCATION OF ROOF DRAINS ______________________________
____

METHOD OF DISPOSAL OF ROOF AND STORM WATER RUNOFF WATER ____________
____

IF DRY WELLS OR STORM DRAINS NOTE THE NUMBER AND LOCATION OF EACH ____
____

TYPES OF CHEMICALS USED (LIST AND OBTAIN COPIES OF MS/DS SHEETS IF AVAILABLE) ______________________________
____

EXHIBIT 1-1 (continued)
FACULTY INSPECTION FORM

LOCATION OF CHEMICAL PRODUCT OR WASTE STORAGE ________________________

____

METHOD OF WASTE DISPOSAL (OBTAIN COPIES OF MANIFESTS, IF AVAILABLE) _____

____

NUMBER AND LOCATION OF ON-SITE WATER SUPPLY WELLS

____

____

NUMBER AND LOCATION OF ON-SITE RECHARGE/DIFFUSION WELLS ______________

____

NUMBER AND LOCATION OF ON-SITE TRANSFORMERS __________________________

____

NOTE ANY STAINING OR DISCOLORATION ON THE CEILING, FLOOR OR WALLS THAT MAY INDICATE THE LOCATION OF CERTAIN TYPES OF EQUIPMENT AND PROCESSES

____

____

NOTE THE LOCATION AND PRESENCE OF ANY UNUSUAL STAINING OF SOIL, STRESSED VEGETATION, ODORS, COLLAPSE OF PAVEMENT, PATCHES OR OBSERVATIONS ____

____

NOTE ANY REMARKS MADE BY ON-SITE EMPLOYEES OR OWNER/TENANT _________

____

PROVIDE A SKETCH OF THE SITE AND LOCATE ANY PERTINENT FEATURES DESCRIBED ABOVE.

2.0 FIELD OPERATION AND INVESTIGATION PLAN

The purpose of this Generic Field Operation and Investigation Plan is to provide general information on elements of the field investigations that will be performed at typical dry cleaner sites. Information relating to site-specific field investigations will be provided in a Site-Specific Work Plan. Any changes or revisions to the investigation techniques and sample analytical methodology provided in this Generic Work Plan, together with the rationale for these changes, will be included in the Site-Specific Work Plan.

Dry cleaner sites share several characteristics related to size, operation and waste disposal. For the purposes of this investigation, certain assumptions have been made with regard to a "typical" dry cleaner site. A typical site is assumed to occupy a relatively small area, such as a portion of a strip mall occupying a few thousand square feet, or a small commercial lot of two acres or less. The size of the land area and orientation of buildings, pavement and utilities will significantly affect the investigation techniques used. The dry cleaner operation is assumed to house a retail store for pick-up, drop-off and storage of garments, and a cleaning facility containing the equipment necessary to clean garments. Water used for cleaning may be provided by a municipal distribution system or obtained from on-site wells. Waste liquids are disposed of through a municipal water system, on-site septic or dry well system, or contained and stored on-site and removed by a waste hauler.

Soil and groundwater contamination at a typical site often results from improper disposal of contaminants into a septic or dry well system that allows the contaminants to directly contact soil or groundwater. Contamination can also occur by accidents or direct disposal into storm drains or onto ground surface. The major contaminant of concern at dry cleaner sites is perchloroethene (PCE) and its breakdown components. PCE is a dense, nonaqueous phase liquid (DNAPL) and all investigations should be conducted using techniques that would minimize the spread of DNAPL contaminants. Investigations should be conducted under the assumption that PCE may be present in various phases, including pure product, contaminants dissolved in groundwater, vapors or contaminated soils.

Specific dry cleaner sites will undoubtedly possess unique characteristics unlike the typical sites described above. The techniques described below may not be applicable at all sites, and other techniques not described in this Work Plan may be desirable under certain circumstances. In any event, a Site-Specific Work Plan will be prepared addressing the specific conditions and investigation requirements for any given dry cleaner site. The Site-Specific Work Plan will describe details and justification for each method to be used, and should alternative methods be required, provide the rationale and procedures for each such method.

The following is a description of the field activities that will be conducted during a remedial investigation at a dry cleaner site. The activities are divided into field screening techniques to determine the source and extent of contamination, and sampling techniques to confirm the source location, nature and extent of contamination. Several steps including review of all available background information (see Section 1.3.1) will be completed prior to initiation or development of the field program. For a detailed description of screening, sampling and analytical procedures, see Section 4.0, Quality Assurance and Quality Control Plan.

2.1 Aerial Photography and Topographic Survey

Aerial photography and topographic mapping are useful techniques to prepare a detailed base map for the site. Aerial photographs will be sufficient to identify major surface features, locate areas of concern, and identify sampling locations. Sites possessing high relief or surrounding surface features that influence shallow groundwater flow direction will require a topographic map to provide information on surface drainage patterns and groundwater discharge. In order to develop a topographic map, stereo-photogrammetric photographs of the site will be required.

Initially, an attempt will be made to obtain recent available aerial photographs of the site area suitable for preparing topographic maps. If a suitable aerial photograph is available, it will eliminate the need to perform a "flyover" of the site as part of the remedial investigation. For sites with little surface relief, a one foot contour interval will be required. For sites where the topography is not flat, two foot contours will be suitable for site investigation reports, remedial design plans, specifications and contract documents. In order to obtain either one or two foot contours, low level mapping must have been completed. This requires a flight scale of at least 500 feet. A listing of sources of recent available aerial photographs for New York State is provided in Appendix B.

If a recent aerial photograph for the area is not available, or if available photography is not suitable, a flyover will be required to prepare the base map and, if necessary, the topographic map. The topographic base map will include all pertinent physical site features, such as buildings, roads, above-ground utility lines, etc., as well as the topographic contours. The base map will be prepared at an appropriate scale depending on the extent of the study area (i.e., 1" = 100' or 1" = 50') to accurately define site features and identify sample locations. Information obtained during the site investigation from surveying the location of monitoring wells and other data points will be incorporated onto the base map for the Phase I Remedial Investigation Report.

2.2 Grid Network Survey

A grid network will be established on-site for use during geophysical surveys, soil vapor surveys, and possibly surface soil sampling. The nodes of the grid will be marked with wooden stakes, nails, rebar, flags or other markings deemed appropriate for site conditions. Grid size and spacing will be determined on a site-specific basis, and be dependent upon the geophysical methods to be used, the size of the site and the area(s) of concern. (Node spacing on-site for dry cleaner sites is typically 10 feet.) The grid will be centered over, and fully include, suspected areas of concern, such as underground structures (e.g., dry wells, leaching fields, etc.). The grid will also be designed to include representative "background" areas, and will be referenced to or measured from permanent structures in order to allow for establishment of the grid in the field without the need for surveying. It will also allow for re-establishment of the sampling points at a later date, such as for further investigation or remediation.

2.3 Surface Geophysical Surveys

Geophysical surveys will be conducted in the areas designated by the grid network. The surveys will be performed to gather information to identify subsurface drilling obstacles, locate on-site septic systems, dry wells, buried tanks, subsurface anomalies, assess stratigraphy and determine depth to bedrock. The surveys will also be used to attempt to define areas of contamination, including contaminant plumes in groundwater.

Several types of surface geophysical surveys are suitable for use at dry cleaner sites and are discussed below. Downhole geophysical techniques are discussed in Section 2.20. Each of the surface geophysical techniques is useful in obtaining various types of information during a remedial investigation. These techniques include ground penetrating radar (GPR), electromagnetic induction (EM), electrical resistivity (ER), seismic refraction, seismic reflection, magnetometry, metal detectors, and very low frequency electromagnetics (VLF). Specific strengths and limitations of each technique are summarized on Table 2-1. The selection of a particular technique will be made on a site-specific basis and will be justified in the Site-Specific Work Plan.

2.3.1 Ground Penetrating Radar

Ground penetrating radar (GPR) can be used to locate buried objects (including plastic conductors), determine depth to water table and define subsurface stratigraphy. GPR is subject to interferences from buried metal, clay layers in the subsurface and concrete that contains certain aggregate types. GPR data is recorded continuously along parallel traverses of a grid. The spacing of traverses is dependent upon the frequency of antennae and depth of interest. Typical traverse spacings anticipated for dry cleaner sites are 5 to 10 feet. Specific equipment

Table 2-1

SUMMARY OF SURFACE GEOPHYSICAL METHODS

Method	Target	Description
Ground Penetrating Radar (GPR)	• Stratigraphy (layering and lateral variations). • Water table in coarse media. • Metallic and nonmetallic buried drums, tanks and pipes. • Bedrock surface. • Fracture zones.	• Provides a continuous visual profile of shallow subsurface objects, structure and lithology in real time. • Graphic output can often be interpreted in the field; thereby facilitating direction of the survey. • Depth of the penetration is site-specific; typically between 6 and 30 ft. • Radar penetration increases in coarse, dry, sandy or massive rock; and decreases with increasing clay content, fluid content and fluid conductivity. • GPR can be used in fresh water and through ice to obtain profiles of sediment depth. • Limited use during wet weather due to exposure of electronic equipment to moisture. • Quantitative interpretation is difficult; data can be affected by various sources of system noise.
Electromagnetic Conductivity (EM)	• Detection and mapping of conductive contaminant plumes. • Stratigraphy (layering and lateral variations). • Metallic and nonmetallic buried drums, tanks and pipes. • Fracture zones.	• Compared to ER, EM has reduced vertical sounding resolution due to the limited number of transmitter-receiver spacings available. • Continuous EM profiling can be obtained from 2.5 to 50 ft. providing increased survey speed, density and resolution. Data can be recorded on a digital datalogger. • Various objects emit noise and interfere with EM surveys including power lines, buried metal objects, radio transmitters, buried pipes and cables, fences, vehicles and buildings. • Limited use in wet weather due to exposure of electronic equipment to moisture. • Frequency-domain EM systems measure in-phase and out-of-phase components of EM conductivity. In-phase component responds to magnetic susceptibility and can be used to detect metals. The out-of-phase component measures electrical conductivity.
Electrical Resistivity (ER)	• Detection and mapping of conductive contaminant plumes. • Stratigraphy (layering and lateral variations). • Fracture zones.	• Survey speed is much slower than with EM methods because of need to drive electrodes into the ground. Only station measurements are made; continuous measurements are not possible. • Profiling or vertical sounding data can be acquired from various depths by using different electrode spacings. Because electrodes can be spaced at any distance (assuming good site accessibility), resistivity is capable of providing better vertical resolution of subsurface conductivity than EM methods which rely on fixed intercoil lengths. • Qualitative interpretation can be made based on observed spatial variability and anomalies. • Quantitative interpretation of stratigraphic layering can be made based on vertical soundings. • Spatial variability and anomalies can be caused by several factors; therefore, interpretations are non-unique. • The influence of subsurface materials on the measured resistivity decreases with depth. • Resistivity is affected less than EM methods by noise associated with power lines, buried metal objects, such as pipes and cables, fences, vehicles and buildings.

Table 2-1 (Continued)

SUMMARY OF SURFACE GEOPHYSICAL METHODS

Method	Target	Description
Seismic Refraction and Reflection	• Bedrock surface. • Depth to water table. • Fractures, faults and buried bedrock channels. • Rock type and degree of weathering. • Stratigraphy (layering and lateral variations).	• Seismic refraction is generally used for shallow investigations (<200 ft. depth). A refraction survey may require a maximum source-to-geophone distance of up to five times the depth of investigation. • Under ideal conditions, as many as three or four layers can be delineated using seismic refractions. A lower velocity layer under a higher velocity layer and thin layers, however, cannot be resolved using the refraction method. • Geophone spacing can be varied from a few to hundreds of feet depending on the desired measurement depth and resolution. • For shallow investigations, 12 or 48 geophones may be positioned at equal spacings as close as 5 to 10 ft. and seismic waves may be initiated separately at each end of the line. • Seismic reflection can be used for deep investigations (to > 1,000 ft.). • Seismic data is collected as station measurements and surveying is slow compared to continuous measurement methods. • Data interpretation can be complicated by heterogeneous subsurface conditions. • Use may be limited during very cold weather due to poor connection of geophones to ground surface. • Seismic methods are subject to interference from vibration noise associated with various natural and cultural sources (i.e., walking, machinery and vehicles).
Magnetics	• Buried ferrous metal objects (drums, tanks, pipes, etc.). • Waste zones containing ferrous metal.	• Magnetometers respond only to ferrous metals (iron or steel). • Magnetometers provide greater depth range than metal detectors; single drums and drum masses can be detected at depths to 20 and 60 ft., respectively. • Magnetometers can be used to provide continuous or station measurements. • Magnetometer response is subject to interference noise from many sources including steel fences, buildings, vehicles, iron debris, utilities, ferrous soil minerals, etc. • Data interpretation may be complicated by heterogeneous subsurface conditions and/or the presence of iron-rich geologic media. • Magnetometry may also be used to study regional geologic conditions, and occasionally to map the bedrock surface.
Metal Detectors	• Shallow buried ferrous metal objects (drums, tanks, pipes, etc.). • Shallow waste zones containing metal.	• Metal detectors are routinely used to locate buried cables and pipes. • Metal objects and drum masses can be detected to depths of 3 and 10 to 25 ft., respectively. • Buried and above-ground metal objects (cars, fences, buildings, etc.) can interfere with measurements.

and grid spacings will be detailed in the Site-Specific Work Plan.

The GPR system will include a data recorder and a real time color video display monitor. The video monitor provides real time images for field interpretation. The recorder provides higher resolution data that can be processed in the office, providing more detailed interpretation as necessary. Different antennas used in GPR provide data on different target areas. A 500 MHz antenna produces better resolution of shallow targets, such as utilities and underground storage tanks (USTs). A 300 MHz antenna provides somewhat deeper signal penetration, but slightly lower resolution of the depth of objects. Both 500 MHz and 300 MHz antennas will be available on-site with the choice of antenna to be determined based upon site conditions.

2.3.2 Electromagnetic Induction

Electromagnetic (EM) induction surveys, also known as terrain conductivity surveys, can be conducted to locate subsurface features with contrasting electrical properties, locate buried utilities, waste disposal areas, fracture zones, and possibly map contaminant plume boundaries. EM surveys can be performed in relatively short time periods and can provide continuous records across a site. Interferences to EM include power lines, radio transmitters, buried metal objects and surface metal objects. EM Data will be collected and recorded on a grid along lines of traverse. Specific grid traverse intervals are determined on a site by site basis, depending on equipment used and depths of interest. Typical surveys use continuous measurements along traverses spaced 10 to 25 feet.

The EM survey will be conducted using a transmitter coil and separate receiver coil. The unit will be an induction type unit and provide measurement of both quadrature-phase and in-phase components of terrain conductivity without ground electrodes or contact. The data for both components will be recorded on a digital data logger. The equipment will be calibrated to read ground conductivity directly in millimhos per meter with a resolution of 2 percent of full scale and an accuracy of 1 mmho/meter. The nominal effective depth for the terrain conductivity meter is typically about 18 feet. Specific equipment and survey grids will be detailed and justified in the Site-Specific Work Plan.

2.3.3 Electrical Resistivity (ER)

Electrical resistivity (ER) can be used to map conductive contaminant plumes, map stratigraphic and structural features, map fresh water and salt water interfaces, estimate depth to groundwater and bedrock, and detect cavities or sink holes. ER measures the resistivity of subsurface materials by injecting an electrical current into the ground using a pair of surface electrodes. The resulting potential field is measured using a second pair of electrodes. Various arrays of electrodes can be used to target specific depths of interest. The depth of investigation using ER is limited by the spacing of the electrodes and the electrical properties of the soil. ER works well with horizontally layered earth and is superior in detecting relatively thin resistive layers. ER is more time consuming than EM, because ground contact is required for electrode placement, and continuous profiling is not possible. ER cannot be used in paved areas, and use is limited in wet conditions. The application of electrical resistivity must be made on a site-specific basis. Details of the use of ER at a specific site will be provided in the Site-Specific Work Plan.

2.3.4 Seismic Refraction

Seismic refraction is generally used for delineation of bedrock surface, determining depth to water table, locating fractures, characterizing bedrock type, determining the degree of bedrock weathering and identifying stratigraphy. Seismic refraction involves the transmission of compressional waves from an artificial seismic source (i.e., hammer, explosives, etc.). Waves radiate from the energy source and are refracted as they pass through media with different densities. Different materials transmit waves at different velocities, therefore, causing the waves to arrive at ground surface at different times. The arrival times of seismic waves emitted from point sources are measured using multiple geophones located in a seismic spread and recorded digitally by a seismograph.

The spacing and orientation of geophones in a seismic refraction survey depends upon site-specific characteristics and data needs. Typical seismic line lengths correspond to the length of geophone spreads and start at 110 feet with 12 channel, 10 foot spacing systems. In general, several seismic lines will be used, with at least one perpendicular intersection of lines. Wherever possible, the lines will include the location of a logged borehole or be located near a planned borehole so that the remotely sensed seismic data can be correlated with data obtained from first-hand observations.

Seismic methods are subject to interference from cultural noise. Noise sources may include vehicles, machinery, pipelines containing flowing fluids, electric lines and wind. Seismic surveys will be conducted so as to minimize the effects of "noise."

2.3.5 Seismic Reflection

Seismic reflection is used to provide high resolution mapping of bedrock-unconsolidated contacts at intermediate depths (i.e., 50 feet to 100 feet). Seismic reflection is generally similar to seismic refraction in the methods of data gathering. Reflection surveys are typically conducted with a shorter spacing, but more geophones compared to a refraction survey for similar depths. Conventional reflection methods are designed for obtaining stratigraphic and structural data from depths as shallow as 20 to 30 feet. Seismic reflection requires more complex data processing than seismic refraction, however, higher resolution is also gained. Seismic reflection is susceptible to the same "noise" interference that affects seismic refraction.

2.3.6 Magnetometry

Magnetometers can be used to identify buried ferrous materials. Magnetometer surveys can be conducted to identify potential drilling hazards at proposed boring and monitoring well locations, as well as to locate underground structures made of iron or reinforced concrete. Magnetometer surveys can also be conducted to identify subsurface anomalies, such as buried metallic containers or drums that may require further investigation, however, these surveys are also susceptible to interference from fences, buildings, power lines and vehicles. Magnetometer surveys are limited to identifying only ferrous materials. Magnetometer surveys can be performed relatively quickly (several hours over a small site) and the equipment can provide continuous recording of magnetic properties providing a high level of detail. In order to effectively identify buried pipes or septic tanks suspected of containing dry cleaner wastes, magnetometer surveys will be conducted using a grid with relatively small spacing (i.e., a minimum of 10 feet).

Magnetometer surveys will be conducted using two portable proton precession magnetometers. One magnetometer will be set up as a base station to automatically record the diurnal variation of the earth's magnetic field at 1-minute intervals. The second magnetometer, equipped to measure both total magnetic field and the vertical magnetic gradient, will be used for the field survey. The advantage of recording both total field and gradient data is the ability to distinguish between anomalies from shallow objects and more deeply buried objects. All magnetic data will be corrected for the diurnal variation prior to interpretation. The total magnetic field data will be used to interpret the locations of buried metal objects and the vertical gradient data can will be used to interpret the relative depth of burial of the objects.

2.3.7 Magnetic Locator Survey

A magnetic locator will be utilized to detect shallow buried ferromagnetic objects. It is useful in detecting pipes, buried manhole covers, monitoring well protective casings, septic tank covers and underground utilities. Locators are typically effective to depths up to approximately 8 feet for large metal objects such as manhole covers. The locator may only be effective at locating metal handles or reinforcing bars on septic tank covers at depths up to 4 feet.

A magnetic locator has various uses during a remedial investigation and will be utilized to screen monitoring well locations, confirm locations of underground sanitary systems and potentially locate underground sanitary systems that cannot be identified through file review or existing maps.

Several types of magnetic locators are available for use. Schonstedt Instrument Company manufactures a wand type magnetic locator that utilizes both an audio and visual indicator to identify both the strength and polarity of the signal. This locator has demonstrated success in identifying buried objects, including pipes, dry wells and underground utilities.

2.3.8 Very Low Frequency Electromagnetic Survey

VLF is a passive geophysical technique that uses distant, very low frequency radio waves transmitted by the military for submarine communications. The tilt of the radio wave transmitted from the distant radio station is measured at various locations over the site. If the subsurface is electrically uniform, the tilt is constant. Conductive zones in the subsurface, such as saturated fractures in bedrock, affect the tilt of the local field and can be measured with a VLF receiver.

The presence of water bearing fractures can be determined using VLF under the following conditions:

1. The survey lines must be oriented approximately perpendicular to the strike of the fractures; and
2. The survey lines must be approximately parallel to the direction of a VLF station emitting a signal strong enough to be detected by the VLF receiver.

In addition, the survey lines must be long enough to cross a fracture zone completely, so that the contrasting properties can be used to identify the "anomaly." The spacing and orientation of survey lines is dependent upon the ability to receive a VLF signal at the site. Typical measurements are made at spacings of 10 feet or more. VLF is strongly affected by cultural surface features such as power lines, fences, buildings, automobiles, and buried objects such as utilities and tanks.

A VLF survey will be performed after fracture trace analysis or other downhole survey technique has provided information regarding the probable orientation of bedrock fracture zones. The survey traverses will be determined based upon the assumed orientation of fractures and the ability to detect a radio signal suitable for the survey. Details for grid spacing and equipment types will be discussed in the Site-Specific Work Plan.

2.4 Dye/Smoke Testing

It may be necessary to conduct a dye or smoke test in order to determine if the facility waste water system is connected to a municipal sewer system or on-site waste water disposal system. To conduct this type of test, fluorescent dye or smoke will be introduced into the sanitary system through the bathrooms, slop sinks, floor drains or roof drains or any other accessible point believed to be at the head of the system.. Observations to determine connection or discharge points will be made primarily through uncovered manholes, leaching pools or septic tanks for municipal systems. Observations will only be made from street level or ground surface. Entering confined spaces, such as manholes, will not be attempted in order to avoid potential safety hazards. The manholes will be monitored with a portable combustible gas/oxygen/hydrogen sulfide detector to determine the lower explosive units, oxygen and hydrogen sulfide levels in the confined space. Prior to initializing any test, the appropriate local municipality will be notified that dye or smoke may be introduced into the system and that access to the system will be made. This type of testing may also be applicable to determine if floor drains and roof drains are connected to a municipal sewer system or on-site disposal system. Specific testing locations will be described in the Site-Specific Work Plan.

2.5 Closed Circuit Television Inspection

Closed circuit television inspection is typically used to determine the integrity of large diameter sewer lines. However, this technique can also be used at dry cleaner sites to inspect the integrity of facility sewer lines that may have separated joints and cracks, which may be a source or release point for waste. This technique is also useful in identifying the location of dry wells and septic systems that may not have been located by other investigative techniques.

This technique utilizes a small scale camera with on-site video equipment to inspect the line. Access to and survey in the lines may be difficult due to sharp bends in the sewer or drainage pipe. Although small, most cameras can only inspect pipes greater than three inches in diameter. Site-specific locations and rationale will be provided in the Site-Specific Work Plan.

2.6 Soil Vapor Survey

On-site soil vapor probe locations will be established on a grid network developed for each site. Sample locations will include areas of documented or suspected contamination, visual staining of soil, and stressed vegetation. Soil vapor surveys can generate an extensive amount of chemical distribution data quickly at a fraction of the cost of conventional invasive methods and offer the benefit of real-time results. All of the contaminants typically found at dry cleaner sites have high vapor pressures and will volatilize in the vadose zone to form a vapor plume around a source area. Volatile organic compounds (VOCs) dissolved in groundwater can also volatilize at the capillary fringe into soil vapor. Subsurface geologic heterogeneities, soil porosity, moisture conditions and sorption equilibra can significantly affect VOC gradients in soil vapor. False negative interpretations may result from the presence of vapor barriers below the gas probe intake.

There are essentially two types of soil vapor sampling including grab sampling and passive sampling. Passive soil vapor sampling measures VOC concentrations over a set period of time. This method eliminates or decreases problems associated with soil vapor interpretation due to variable weather conditions or other factors. Typically, a sorbent material, such as activated carbon, is placed below ground within a hollow probe or sampling chamber for an extended period to trap VOCs that diffuse through soil vapor. Although potentially applicable to delineation of contamination at dry cleaner sites, it will not be generally utilized due to the long sampling times, sometimes over 24 hours. In addition, the volume of the soil vapor sampled is not measured, making determination of soil vapor concentrations impossible, and chemical degradation may affect sampling results due to the length of the sampling period.

Grab sampling is typically a more effective sampling technique for delineation of on-site contamination. Grab sampling can be completed utilizing screening techniques with a PID or FID. However, these instruments are only effective for concentrations greater than 1 ppm and would only be effective as a screening tool. The following provides a discussion of the recommended sampling methodology.

At each soil vapor sampling location, a stainless steel probe with a removable inner rod will be driven into the ground to a depth of at least 3 feet using a slide hammer or other hydraulically or pneumatically driven hammers. The inner rod prevents soil from entering the probe during the installation process. Samples will be taken from a depth of 3 feet to reduce the effects of surface contamination, changes in barometric pressure, temperature and precipitation. If depth to groundwater is shallow (less than 3 to 4 feet), consideration will be given to conducting a shallow soil/water survey discussed below in Section 2.7. Upon reaching the completion depth, the inner rod will be removed and a stainless steel cap will be placed immediately on the top of the steel probe.

Prior to collection of the soil vapor sample for analysis, a determination will be made to demonstrate the vapor is at equilibrium. This can be demonstrated utilizing various methods. One method is to connect a Photoionization Detector (PID) or Flame Ionization Detector (FID) to the vapor probe sampling port. Once the PID/FID readings stabilize, the soil vapor is assumed to be in equilibrium, the PID or FID is removed and a sample collected. A second method is if an on-site portable gas chromatograph is utilized, the sampling pump will be set at a low flow rate and a sample collected and analyzed. Samples will then be collected every minute until two consecutive samples yield comparable results. The pumping (purging) time it takes to obtain comparable results will be noted and will be used throughout the remaining portion of the survey as a standard volume to be purged prior to sample collection.

The soil vapor survey will be performed during dry weather conditions to prevent excessive moisture from interfering with the measurements. Continuous or excess pumping should be avoided; since it may dilute the soil vapor with surface air or distort the actual soil vapor concentration patterns. If samples are analyzed on-site using a portable gas chromatograph, the sample will be collected directly from the tubing utilizing a gas tight syringe. If samples are not analyzed on-site, but at an off-site laboratory, samples will be collected utilizing a vacuum pump and sorbent tubes and analyzed for VOCs in accordance with EPA/600/4-89/017 Method TO1/TO2. Probes will be extracted from the ground after sampling and decontaminated utilizing an alconox and water wash before being installed at the next location. See the Quality Assurance/Quality Control (QA/QC) Plan in Section 4.0 for more detailed sampling procedures. The specific soil vapor survey selected for the site will be described in the Site-Specific Work Plan.

2.7 Shallow Soil/Water Survey

In areas where the water table is too close (within 3 to 4 feet) to the ground surface to allow for a soil vapor survey, a shallow soil/water survey will be conducted. The shallow soil/water survey will comprise the collection of shallow soil or shallow water samples for the purpose of delineating source areas. Similar to the soil vapor survey, soil or water samples will be collected based on the grid network established for the site in areas of documented or suspected contamination. Samples will be collected using a disposable polyethylene scoop, or decontaminated stainless steel hand auger if sample depths are below 1 foot, and placed in a sample container. Samples will be analyzed on-site using a portable gas chromatograph or off-site at an analytical laboratory. A more detailed description of the sampling procedures are provided in QA/QC Plan in Section 4.0. Specific sampling locations will be described in the Site-Specific Work Plan.

2.8 Surface Soil Sampling

Surface soil samples will be collected on-site at locations of known or suspected spill or disposal areas and areas of visually stained soil or stressed vegetation to determine the nature and extent of surficial soil contamination on-site. The number of samples to be collected will be based upon the size of the area being investigated and surface observation. However, in general, a minimum 10 foot grid spacing will be established in an area of known or suspected disposal and samples will be collected from each node.

The number and location of surface soil samples to be collected will be provided in the Site-Specific Work Plan. All samples will be analyzed for volatile organic compounds, unless specified differently in the Site-Specific Work Plan. Total organic carbon analysis will be performed on at least one sample so that soil screening criteria for the site can be specifically determined in accordance with TAGM 4030 (see Appendix H). Samples will be collected at a depth of 0 to 3 inches below ground surface using either a disposable polyethylene scoop or sterile wooden tongue depressor. If the area is paved, samples will be collected 0 to 3 inches below the pavement. Detailed sampling procedures are described in Section 4.5 of this Work Plan. Site-specific sampling methods, if different from this Generic Work Plan, will be provided in the Site-Specific Work Plan, together with the rationale for selection.

2.9 Dry Well Survey and Sampling

Dry wells or leaching pools that have been located and are suspected sources of contamination will be sampled. In the dry wells that contain liquid, both the liquid and sediment/sludge (if present) will be collected and analyzed for volatile organic compounds. If accessible, sampling will be performed from above the enclosure to avoid confined space entry. Prior to sample collection, the access point will be monitored with a PID or FID and portable combustible gas/oxygen/hydrogen sulfide detector to determine the level of personal protection required.

Samples will be collected utilizing a decontaminated long handled polyethylene scoop. If the depth to liquid or sediment is greater than 10 feet, then a disposable bailer (for water samples) and decontaminated push sampler or split spoon sampler (for sediment samples) will be utilized. If the dry well has been abandoned and is not directly accessible for sampling, soil borings or soil probes will be installed immediately adjacent to the dry well or leaching pool to collect samples. Further discussion of direct push sampling and soil boring installation is provided in Section 2.14 and 2.17.2, respectively.

If both liquid and sediment are encountered, the liquid samples will be collected first in order to avoid introduction of sediment into the water column. Sediment samples will be obtained immediately below the liquid samples. Both samples will be analyzed for volatile organic compounds. At least one sediment sample will also be analyzed for total organic carbon to develop sediment chemical quality criteria/SCGs. The detailed sampling procedures are provided in the QA/QC Plan in Section 4.0. Site-specific sampling locations will be described in the Site-Specific Work Plan.

2.10 Storm Water/Drainage System Survey and Sampling

In addition to on-site dry wells, on-site storm water drainage systems may also be a potential source entry area. If surficial disposal is believed to have occurred, material could have migrated into on-site and off-site storm water drainage systems such as catch basins or open drainage ditches. In addition, the drainage system could have been used for direct disposal of PCE contaminated waste.

If a storm water drainage system is a suspected source of contamination or is known to contain contaminated water and/or sediment, it will be sampled. If the drainage system is enclosed (i.e., below ground surface), samples will be collected from catch basins utilizing a decontaminated long handled polyethylene scoop. The sampling will be performed from above the access point in order to avoid confined space entry. Prior to sample collection, the access point will be monitored with a PID or FID and portable gas/oxygen/hydrogen sulfide detector to determine the level of personal protection required. If the drainage system is open and above ground, samples will be collected using a disposable polyethylene scoop in areas likely to accumulate contaminants.

If the depth to liquid or sediment is greater than 10 feet, then a bailer will be utilized to collect the liquid sample and a direct push or split spoon sampler will be utilized to collect the sediment sample. If both liquid and sediment are encountered, the liquid sample will be collected first. Sediment samples will be obtained immediately below the liquid samples. Both the liquid and the sediment samples will be analyzed for volatile organic compounds. At least one sediment sample will also be analyzed for total organic carbon in order to develop sediment chemical criteria/SCGs. Detailed sampling procedures are provided in the QA/QC Plan in Section 4.0. Site-specific sampling locations will be described in the Site-Specific Work Plan.

2.11 On-Site Waste Water Disposal/Sanitary System Survey and Sampling

As discussed in Section 1.3.1, primary emphasis in locating the source of contamination will be made to identify the location of on-site waste water disposal and sanitary sewer systems prior to initiation of the field program. These systems were typically used for the disposal of PCE contaminated wastes. This can be done through review of primarily local and regional files of the Building and Health Departments regarding facility construction plans, sanitary system violations and corrective measures. If no information is available, the system can be attempted to be located through the use of geophysical techniques as discussed in the Section 2.3. Once located, an attempt will be made to access the system directly for sampling, or if this is not possible, to conduct subsurface sampling immediately adjacent to the disposal system utilizing the techniques described in Section 2.14 (Direct Push Sampling) and 2.17.2 (Subsurface Soil Sampling). If the system is still in operation, every attempt will be made to access the system without disrupting the integrity of the system.

If the area of waste water disposal is located several feet below ground surface and the media to be sampled (water and sediment/sludge) is no deeper than about 10 feet, samples will be collected utilizing a decontaminated long handled polyethylene scoop. Sampling will be performed from above ground surface to avoid confined space entry. Prior to sample collection, the access point will be monitored with a PID or FID and portable combustible gas/oxygen/sulfide detector to determine the level of personal protection required. If the samples are to be collected greater than 10 feet in depth, then a disposable bailer for water or decontaminated drilling rod and probe will be used. If both liquid and solid material are encountered, the liquid sample will be collected first. Samples will be analyzed for volatile organic compounds and at least one sediment sample will also be analyzed for total organic carbon. Detailed sampling procedures are provided in the QA/QC Plan in Section 4.0. Site-specific sampling locations will be described in the Site-Specific Work Plan.

2.12 Surface Water and Sediment Sampling

Surface water and sediment samples will be collected at locations likely to be off-site to determine if waste disposal and on-site contamination has impacted nearby surface water bodies (creek, stream, lake, pond, etc.). Samples will be collected from these surface water bodies if it is believed to be impacted by either surface runoff, storm water discharge or groundwater discharge. Sediment samples will be collected at the same locations as the surface water samples. Samples will be collected at the point of discharge to the surface water body and/or in down stream depositional areas.

The water samples will be collected 0 to 6 inches below the surface of the water or at the mid-depth location, if possible, and the sediment samples will be collected 0 to 6 inches below the surface of the sediment utilizing a decontaminated long handle polyethylene scoop, if possible. The surface water samples will be collected before the sediment samples and down stream samples will be collected before upstream to prevent the introduction of sediment into the water samples. At least one sediment sample will be analyzed for total organic carbon in order to develop guidance values for screening of sediment and all samples will be analyzed for volatile organic compounds. Sampling locations will be provided in the Site-Specific Work Plan.

2.13 Test Pit Excavation and Sampling

Test pits may be required to expose underground utilities or on-site sanitary systems that are acting as a source of contamination or a conduit for contaminant migration. The test pits will be excavated with a backhoe with an appropriate bucket reach.

The selection of samples from the test pits will be based on visual observation, such as staining, odor and PID/FID measurements. Samples will be obtained from the backhoe bucket immediately after retrieval utilizing a disposable polyethylene scoop or sterile wooden tongue depressor. Personnel will not enter the pit to collect samples. Samples collected from the test pits will be analyzed for volatile organic compounds and at least one sample will be analyzed for total organic carbon.

The protocol for test pit excavation, sampling and backfill will be the following:

- Uncontaminated soil from the surface of the test pit, approximately 2 to 3 feet in depth, will be removed and placed separately.
- Deeper excavated soil which indicates contamination will be placed on plastic liners and covered.
- If the water table or buried drums are encountered during test pit construction, excavation will be terminated.
- A record of excavation and sample collection will be maintained (see Section 4.20 of

the QA/QC Plan).

- The excavation will be filled in the reverse order of soil removal.
- Final cover will use the soil initially removed and placed separately. If this is not sufficient, clean soil from the surrounding area will be placed on top of the pit.

In general, only the backhoe bucket, which will come into contact with contaminated soil, will require decontamination. Test pit locations will be provided in the Site-Specific Work Plan.

2.14 Direct Push Soil Sampling

Direct push sampling techniques can allow for the relatively rapid collection of soil samples with minimal disturbance of the ground surface and generation of soil cuttings. Soil samples can be collected with a probe from various depths in the vicinity of the suspected contaminant source to determine the depth of the source and degree of contamination in the vadose zone. The geology of the site must be evaluated to determine if direct push (soil probe) sampling techniques are feasible. If probe sampling is not feasible at a site due to the subsurface geology, sampling will then be completed utilizing standard drilling techniques such as hollow stem augers with split spoon sampling. Fore more information on borehole construction and split spoon sampling, see Section 2.17.2. The exact locations of the probe points will be provided in the Site-Specific Work Plan. The probes will be installed utilizing a decontaminated screen point and sampler fitted with a disposable acetate liner. The soil samples will be analyzed for volatile organic compounds and at least one sample will be analyzed for total organic carbon. Detailed sampling procedures are provided in the QA/QC Plan in Section 4.0. Probe holes will be abandoned according to procedures described in Section 2.18.

2.15 Direct Push Groundwater Screening and Sampling

Collection of groundwater samples utilizing direct push sampling techniques include utilization of a groundwater probe or Hydropunch sampler. Direct push sampling techniques will be utilized to collect groundwater samples to define the horizontal and vertical extent of groundwater contamination on- and off-site.

The direct push sampling techniques are useful for preliminary contaminant plume delineation based on actual groundwater sampling. Drawbacks to this method include the fact that this is a one time sample only. The geology and hydrogeology of the site must be evaluated to determine if it is amenable to direct push sampling techniques. Probe sampling is typically only applicable in unconsolidated deposits. If probe sampling is not applicable to a site due to the presence of gravel, boulders or bedrock, sampling may need to be conducted using conventional drilling techniques as described in Section 2.17.

2.15.1 Probe Sampling

Groundwater probes will be installed utilizing a decontaminated screened sampler. Decontaminated probe and rods will be driven until the sampler tip has been driven about one foot below the target sampling depth. Once that depth has been reached, the expandable drive point will be disengaged and the rods pulled back a distance of about two feet to expose the screened sampler. Disposable polyethylene tubing, equipped with a bottom check valve, will be used to convey groundwater to the surface for collection. Each sample, upon retrieval, will be analyzed in the field for pH, conductivity, turbidity and temperature. The samples will be shipped to a lab and analyzed for volatile organic compounds. In situations where samples are collected for screening or when faster analyses results are required, a portable gas chromatograph will be used. Section 4.0 describes QA/QC for portable gas chromatograph sampling.

If necessary, samples may be collected for iron and manganese to provide additional information for potential treatment of groundwater. Prior to the collection of metals samples, groundwater turbidity will be measured. If the turbidity is less than 50 NTUs, one sample will be collected for total metals analyses. If turbidity is greater than 50 NTUs, a filtered sample will also be collected and analyses performed for both filtered and total metals. Refer to the QA/QC

Plan (Section 4.0) for more detailed sampling procedures. Site-specific sampling locations will be provided in the Site-Specific Work Plan. Probe holes will be sealed and abandoned according to Section 2.18.

2.15.2 - Hydropunch Sampling

The Hydropunch is a device that is attached to decontaminated drill rods and driven into the soil with a hydraulic hammer. The Hydropunch cannot be used in gravelly, bouldery or bedrock formations, and samples must be taken several feet below the water table surface. Obtaining groundwater samples in fine grained zones, such as clays and silts, may require excessive collection times and cause high turbidity. In heterogeneous formations, bypassing contaminant zones entirely or spreading contaminant zones, is another drawback of this method.

The Hydropunch samples will be collected by first drilling to the top of the desired sample interval. The Hydropunch sampler will then be placed in the borehole and driven approximately four feet into the sample interval. The sampler will be retracted to expose the decontaminated Hydropunch screen and allow groundwater to enter the sampler. After allowing several minutes to pass to allow the groundwater to equilibrate, the sample will be collected with a small diameter disposable polyethylene bailer. Samples will be collected for volatile organic compounds. Each sample will be analyzed in the field for pH, conductivity, turbidity and temperature. If necessary, samples may be collected for iron and manganese information for potential remediation of the groundwater. The turbidity of the sample must be less than 50 NTUs. If the sample exhibits greater than 50 NTUs, the sample will be filtered, and both the filtered and unfiltered samples will be analyzed for metals. Refer to the QA/QC Plan (Section 4.0) for more detailed sampling procedures.

After collection of the groundwater samples, the Hydropunch sampler will be removed and the boring will be continued to the next sampling interval. Prior to collecting the next sample, the Hydropunch sampler and associated equipment will be decontaminated in accordance with Section 4.6 of the QA/QC Plan, and a new screen will be attached to the sampler. When a sample location has been completed, the borehole will be sealed and abandoned as described in Section 2.18. The locations and depths of probe and/or Hydropunch samples will be provided in the Site-Specific Work Plan.

2.16 Private Water Supply Sampling

Based upon a review of available information, the location and number of private water supply wells in the vicinity of the site will be identified. Based upon the proximity to the site, the potential for the well to be impacted by contamination emanating from the site and recent available sample analysis information, a determination will be made as to the need to collect a sample.

The sample(s) will be obtained from each well at a point in the plumbing before filtration/treatment devices, if they exist and access is available. The samples will be analyzed for TCL volatile organics. A more detailed description of the water supply sampling procedures is provided in the QA/QC Plan.

2.17 Monitoring Well Drilling and Groundwater Monitoring

Groundwater monitoring involves periodic sampling and analysis of groundwater from monitoring wells. The effective design of monitoring wells requires careful consideration of the hydrogeology and subsurface geochemistry at the site. Information obtained from site reconnaissance, geophysical investigations or nearby existing wells can be useful in deciding appropriate monitoring well drilling, construction and development methods for the site. The design of a monitoring well should be based upon site-specific conditions and cannot be completed using a "one size fits all" method or material. The goal of monitoring well design is to construct wells that will produce depth and location-specific hydrogeologic and chemical data. Precautions must be made to ensure that well completion and development procedures minimize disturbance to the natural geologic environment and groundwater samples. Additionally, monitoring well installation techniques must minimize the potential for cross-contamination through the subsurface.

2.17.1 Drilling Methods

The selection of drilling and well completion methods for monitoring well construction will be based on site-specific conditions, including geologic materials to be penetrated, anticipated depth of drilling, potential for cross-contamination and accessibility to boring locations on the site. The selection of an appropriate drilling method for the construction of monitoring wells will be based on minimizing both the disturbance of geologic materials penetrated and the introduction of air, fluids and muds. The use of drilling muds and additives will be avoided, where possible, because the introduction of any foreign material has the potential for interfering with the chemical quality of water obtained from the monitoring wells and determination of aquifer characteristics through the use of slug tests. The following evaluations of various drilling techniques are based on these factors and the physical limits of each method.

2.17.1.1 - Hollow Stem Augers

The hollow stem auger method is among the most desirable drilling methods for the construction of monitoring wells. Hollow stem auger drill rigs are generally mobile, relatively fast and inexpensive to operate in unconsolidated materials. No drilling fluids are used and disturbance to the geologic materials penetrated is minimal. Depths of borings constructed using augers vary based upon soil types, however, borings up to 100 feet and greater are possible (maximum depth limit is about 200 feet). Clayey soils restrict the depth to which auger drilling can be accomplished. Augers cannot be typically used in bedrock, unless it is highly weathered, and the use of hollow stem auger drilling in heaving sand environments may also present difficulty.

2.17.1.2 - Cable Tool

The cable tool drilling method is relatively slow, but still offers advantages, such as low cost per foot, ability to create large diameter borings and ability to increase permeability of bedrock, make it a useful choice for monitoring well construction in unconsolidated formations and relatively shallow consolidated formations. The method allows for the collection of formation samples and the detection of permeable zones. The installation of a steel casing as drilling progresses also provides a stable annulus for the construction of a monitoring well.

2.17.1.3 - Air Rotary

Rotary drilling methods operate on the principle of circulating either a fluid or air to remove the drill cuttings and maintain an open hole as drilling progresses. The different types of rotary drilling are named according to the type of fluid and the direction of fluid flow. Air rotary drilling forces air down the drill rods and back up the borehole to remove the drill cuttings. The use of air rotary drilling is best suited for use in hard rock formations. In soft, unconsolidated formations, a casing is driven to keep the formations from caving. In highly fractured formations, it is often difficult to maintain air circulation and casing may be required. The air from the compressor on the rig must be filtered to ensure that the oil from the compressor is not introduced into the geologic system to be monitored. The use of air rotary drilling techniques must be used with care in highly polluted or hazardous environments. Contaminated solids, water and vapors can be blown out of the hole and are difficult to contain. Protection of the drill crew and observers is correspondingly difficult.

2.17.1.4 - Air Rotary with Casing Hammer

Air rotary drilling with casing driving capability increases the utility of this type of drilling method. Typical air rotary problems associated with drilling in soft, unconsolidated and highly fractured formations are minimized. The utility of constructing monitoring wells in the casing prior to its removal also makes this type of drilling technique more appealing. Concerns about oil in the circulating air and containment of contaminant cuttings, water and vapor, must also be considered.

2.17.1.5 - Reverse Circulation Rotary

Reverse circulation rotary drilling has limited application for the construction of monitoring wells. Large quantities of fluid are circulated down the hole and pumped back to the surface through the drill stem. Mud rotary offers better control of contaminated cuttings and water removed from the borings, and does not cause exposure to vapors as in air rotary techniques. The hydrostatic pressure of the water in the borehole is used to maintain an open borehole. If permeable formations are encountered, large quantities of water will infiltrate into these formations, altering in-situ water quality. Similarly, water bearing units with differing hydrostatic heads will have the opportunity for free interchange of waters, altering the quality of water in the unit of lower hydrostatic head. Because of the large quantities of water normally required for this type of drilling, and the high potential for water to enter the formations to be sampled, this type of drilling is not typically utilized.

2.17.1.6 - Mud Rotary

Mud rotary drilling operates in the same fashion as the air rotary drilling technique, except that water and drilling mud are circulated down the drill pipe and back up the borehole to remove drill cuttings. Mud rotary drilling offers better control of contaminated cuttings and water removed from the boring and does not cause exposure to vapors as in air rotary techniques. The borehole is held open by the hydrostatic pressure of the circulating mud and the mud cake that develops on the borehole wall during the drilling process. Viscosity of the drilling mud is controlled to minimize the infiltration of the drilling fluid into porous formations penetrated by the drilling equipment. The use of drilling mud can cause groundwater chemistry or in-situ permeability to be altered by introduction of mud into the borehole. Monitoring wells installed in mud-rotary borings often require extra well development and may detect solutes attributable to the mud that cause an inaccurate assessment of groundwater chemistry. Under certain conditions, mud rotary techniques can be effective by using a continuous supply of potable water without additives. Alternatively, mud can be used to advance a boring to a depth several feet above the zone of interest, at which time mud can be replaced with potable water and the borehole continued to final depth.

Based upon the advantages and disadvantages of the various drilling methods described above, the preferred drilling methods are to utilize hollow stem augers for drilling in the overburden and mud rotary using potable water without additives in the bedrock. However, the final selection of the drilling method will be based on site-specific geologic and hydrostatic conditions. Alternate method of drilling must be specified in the Site-Specific Work Plan together with the rationale for selection.

2.17.2 Subsurface Soil Sampling

Subsurface soil samples will be collected during construction of monitoring wells and soil borings. Soil borings will be constructed to delineate the extent of subsurface soil contamination on-site. During construction of each borehole, split spoon samples will be obtained at a minimum at 5 foot intervals beginning at the ground surface to the completion depth of the boring to provide stratigraphic information on the site, as well as information on soil quality. The depth of the boring will be determined in the Site-Specific Work Plan. In suspected source entry areas, and at least once in the deepest well on site, samples will be obtained continuously from the ground surface to provide detailed stratigraphic and soil quality information.

Soil samples obtained from decontaminated split spoons will be observed and logged for geologic characteristics, odors and staining, and screened with a FID or PID. The data obtained from this screening will be used to select soil samples from each borehole for chemical analysis.

All subsurface soil samples selected for chemical analysis will be collected from within the unsaturated zone unless contamination at the water table interface is evident, in which case, samples of soil in the saturated zone may be collected.

Soil samples, collected for chemical analysis, will be analyzed for volatile organic compounds and at least one sample will be analyzed for total organic carbon. The number and locations of the samples to be collected, and the rationale for sample collection will be provided in the Site-Specific Work Plan.

In addition to collection of samples for chemical analysis, at least one subsurface soil sample from the screened interval will be collected from each overburden well and analyzed for grain size, including sieve and hydrometer analysis. It may be necessary to combine consecutive split spoon samples to obtain sufficient sample mass for testing. Grain size analyses will be performed in accordance with ASTM D422-63. Geotechnical analysis is discussed further in Section 2.21.

2.17.3 Bedrock Sampling

Rock core samples (NX diameter or larger) will be collected in 5 foot runs starting at the top of competent bedrock and extending to depths determined in the Site-Specific Work Plan. Rock Quality Designation (RQD) will be determined for each core by dividing the total length of the core by the total length of recovered segments greater than 4 inches in length, exclusive of any mechanical (drilling induced) fractures. RQD is useful in quantifying the degree of fracturing for a given segment of a rock formation. Rock cores will be collected for logging purposes only and will not undergo chemical analysis. Logging of bedrock coring will include observations regarding drilling rate, drill water recovery, sudden drops in drill tools and lithology of drill cuttings.

2.17.4 <u>Overburden Monitoring Wells and Piezometers</u>

Monitoring well and piezometer boreholes constructed in the overburden will be advanced using decontaminated 4-1/4 inch ID hollow stem augers. If difficulties with "running sands" are encountered which hinder soil sampling, potable water will be added to the hollow stem augers to maintain a positive hydrostatic head. Additionally, if difficulties with elevated levels of explosive or toxic gases, such as methane and hydrogen sulfide are encountered, potable water or mud may be introduced into the hollow stem augers to suppress the gas. If the depth of boring or nature of unconsolidated deposits prevent the efficient use of 4-1/4 inch ID hollow stem augers, then other methods such as those described in Section 2.17.1 may be considered. The use of alternative drilling methods, if any, will be described and justified in the Site-Specific Work Plan.

The final depth of each borehole will be below the water table at a depth that will allow 6 inches of sand pack to be placed between the screen bottom and bottom of the boring, as well as allow the screen to intersect the water table. For mid-depth or deep overburden wells, the borings must be deep enough to allow six inches of sand pack between well screen bottom and boring bottom, and allow the screen to intersect the zone of concern. If the boring is drilled too deep, for any reason, the borehole must be filled to a depth of six inches below the planned screen location with a bentonite slurry or other suitable impermeable material. At a minimum, overburden borings will be constructed for the installation of monitoring wells and piezometers that screen the water table. The actual number and depth of borings will be determined on a site-specific basis and contained in the Site-Specific Work Plan.

Cuttings generated from the construction of the boreholes will be handled in accordance with <u>NYSDEC TAGM No. 4032 "Disposal of Drill Cuttings</u>" dated November 1989 (see Appendix I). In general, this TAGM allows for on-site disposal of cuttings as long as certain criteria as to location and cover of cuttings is met.

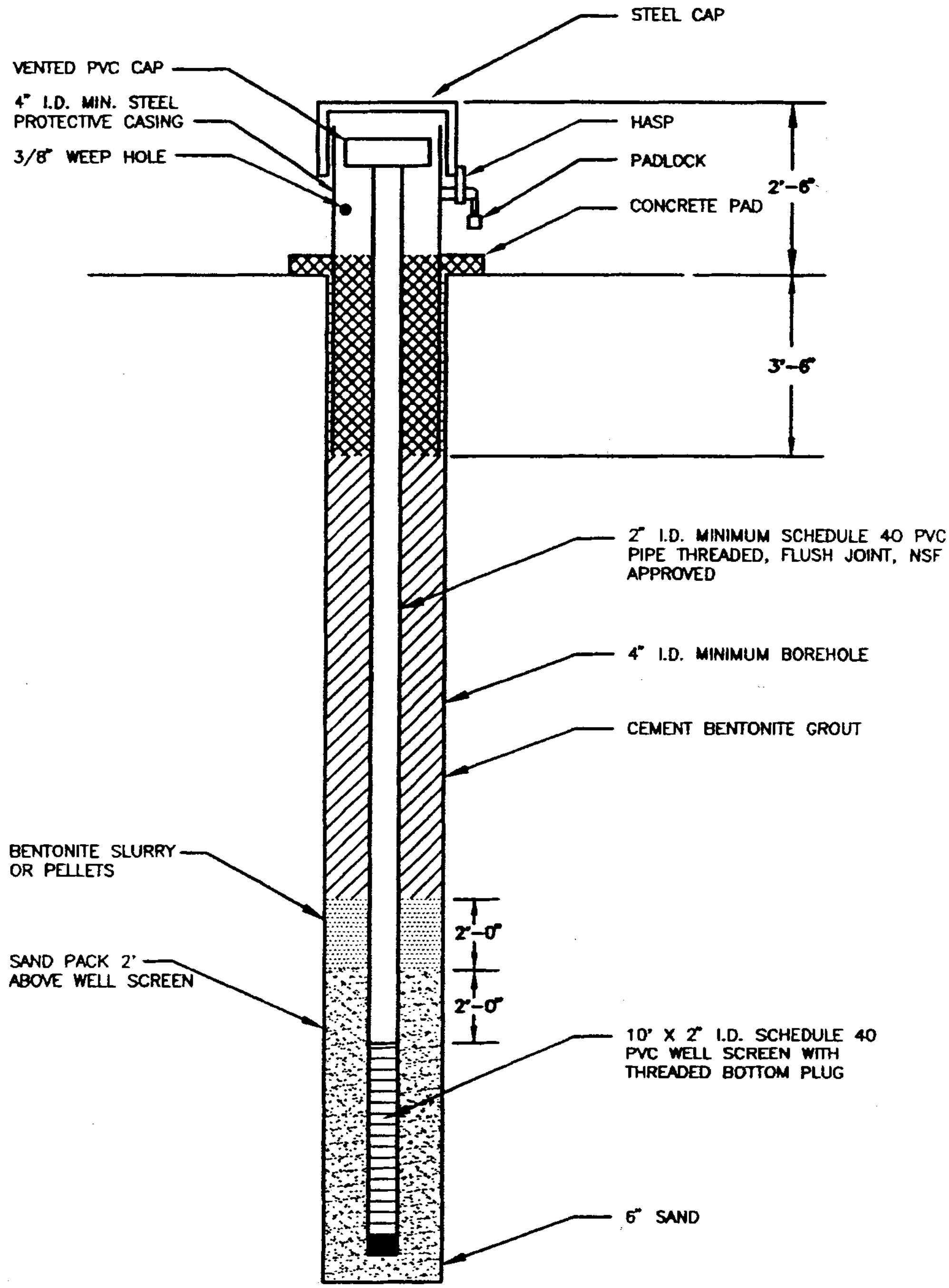
Monitoring wells will be installed for the purpose of groundwater sampling and piezometers will be installed when sampling is not required, but water level data is necessary. The following discussion regarding monitoring wells also pertains to piezometers. The depth of overburden monitoring wells will be determined on the basis of the geology and hydrogeology of the site and the goals of the monitoring program. In the case of overburden wells, the goal in general is to monitor the potential effects of near surface contaminants on groundwater. However, since contaminants associated with dry cleaner sites are typically denser than water, it is also essential to document and monitor the downward migration of contaminants that may be migrating from the site. At a minimum, overburden monitoring wells will screen the water table and be constructed to a depth to adequately determine the vertical extent of groundwater contamination.

In order to properly define the movement of contaminants both vertically and horizontally, it is essential to collect depth-discreet water level data. Monitoring wells completed at the water table will provide a portion of the data needed to determine the vertical direction of groundwater movement. Water levels from several of these wells, if they are completed in the same hydrogeologic unit, will also provide information on the horizontal direction of shallow groundwater flow. If the overburden area of concern is relatively thick, then a series of mid-depth or deep monitoring wells will be required to properly assess groundwater conditions. The need for and depth of mid-depth or deep overburden wells will be provided in the Site-Specific Work Plan.

The diameter of monitoring wells should be the minimum practical size that will be compatible with the strength requirements of the well materials and allow for groundwater sampling. Small diameter monitoring wells will decrease the amount of water to be removed for well development and purging, and minimize the potential need for containment of contaminated water. Additionally, small diameter wells will minimize the potential impact on groundwater chemistry caused by disturbance during well drilling. Overburden monitoring wells will be constructed of decontaminated two inch ID, Schedule 40, 0.010 inch slot PVC well screen and threaded, flush joint PVC casing. No solvents will be utilized to construct the wells. These site-specific cases where non-aqueous phase liquids are present or suspected, the use of stainless steel wire-wrap screens may be considered. In addition, when site-specific conditions dictate, different size screen openings may be utilized. Justification for the use of alternate screen material and size will be provided in the Site-Specific Work Plan.

The well screen in a monitoring well will be long enough to permit entry of water from the vertical zone to be monitored. The length of the screen will be kept to a minimum for water level data to be obtained from the well to represent information that is depth-discreet. (In wells where the length of the screen is long, the resulting water level represents an average water level for the materials opposite the screen, and is sometimes insufficient to determine accurate groundwater flow characteristics.) The overburden water table monitoring well screens will generally be 10 feet long. The screen will be installed with 5 feet below the water table in order to intercept the water table under varying seasonal groundwater elevations. However, at sites where there are large known or suspected variations in seasonal or annual water table elevations, 15 foot screens may be necessary. The selection of screen lengths will be provided in the Site-Specific Work Plan, together with the rationale for selection. A generalized well construction diagram is shown in Figure 2-1.

At the completion of borehole construction and soil sampling, the well screen and riser pipe will be lowered into the hollow stem auger and set at the desired depth. Sand pack of a grain size appropriate for the selected screen opening size and geologic conditions will be placed into the annular space to a minimum height of 2 feet above the top of the well screen using a tremie pipe or other suitable method. Generally, number 2 morie sand will be used. During this time, the auger will be slowly removed. The well pipe will also be pulled up no more than 1/2 foot to allow sand material to fill the borehole beneath the well screen. Upon completing the placement of the sand pack, a minimum 2 foot thick bentonite pellet, chip or slurry seal will be tremied in the annular space. Bentonite pellets or bentonite chips, if used, will be hydrated with potable water and allowed to swell for a minimum of 1/2 hour before introducing the cement



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GENERIC WORK PLAN FOR DRY CLEANER SITES

PLAN FOR CONSTRUCTION OF OVERBURDEN MONITORING WELLS

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FIGURE 2-1

bentonite grout in the remaining annular space. The cement-bentonite grout will be pressure pumped into the annular space by the tremie method.

The monitoring wells will be completed with approximately 2-1/2 feet of riser above ground surface and protected with a locking steel casing with minimum diameter of 4 inches. The protective casing will be at least 5 feet in length and secured into the borehole using concrete sand or gravel mix. The surface seal will be completed with a 3 foot diameter formed concrete pad and will be constructed to drain surface water away from the well. The protective casing will have a locking cap and weep hole, and be marked with the monitoring well identification. In cases where monitoring wells will be installed in roadways, parking lots or through floors, flush mount protective casings will be used. In such cases, a locking water tight PVC well cap will be installed inside of a curb box with bolted, water tight cover. Protective casing types will be specified with justification in the Site-Specific Work Plan.

2.17.5 Bedrock Monitoring Wells and Piezometers

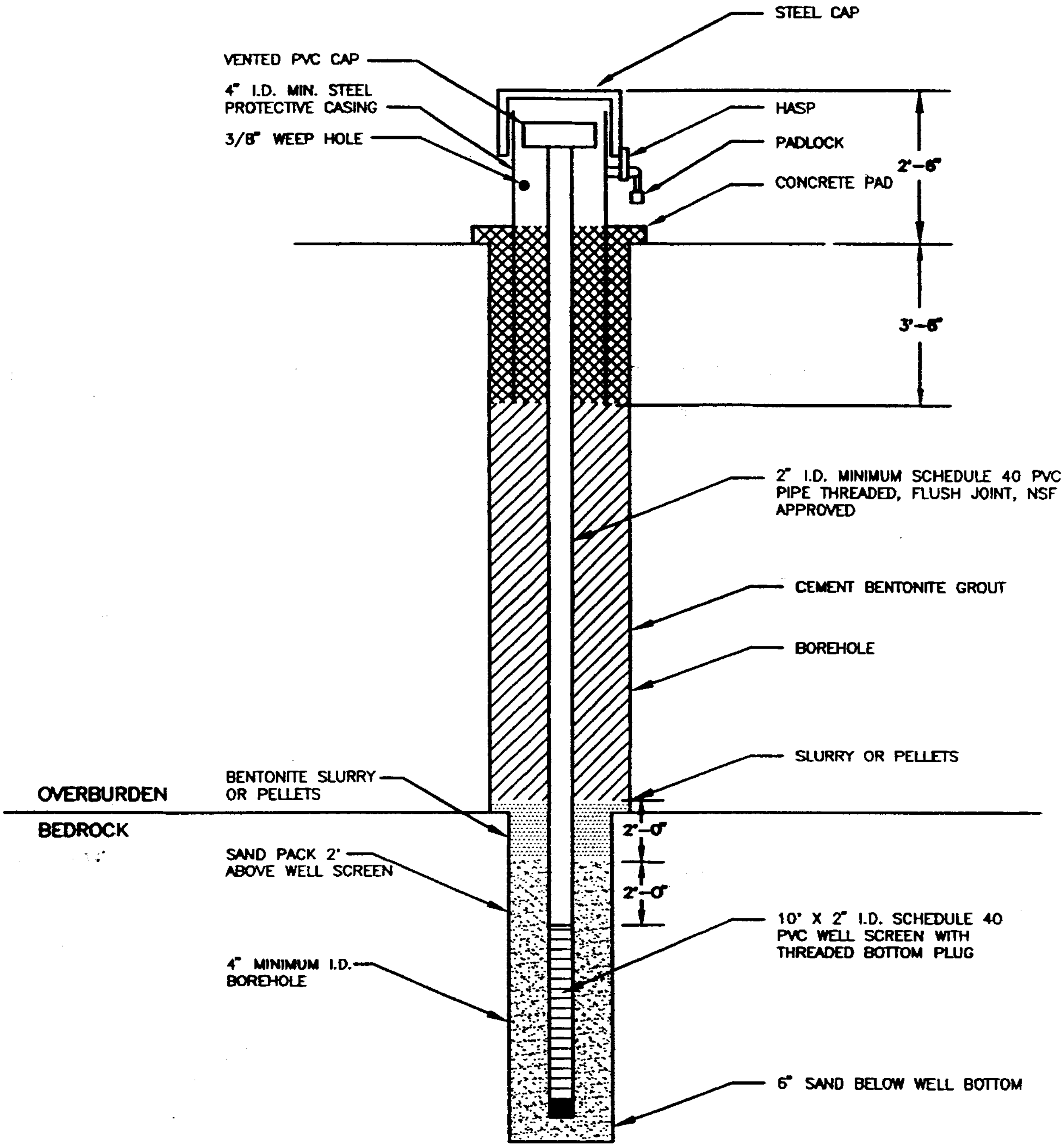
Bedrock monitoring wells and piezometers will be necessary at sites with shallow bedrock
or permeable overburden materials allow vertical migration of contaminants to bedrock. Monitoring wells will be installed for the purpose of groundwater sampling and piezometers will be installed when sampling is not required, but water level data is necessary. The following discussion regarding monitoring wells also pertains to piezometers.

Bedrock wells will be located in clusters with shallow wells, whenever possible. These wells will provide necessary data for determining vertical groundwater quality and flow direction and gradient. These wells will be completed in the shallowest, relatively permeable zone in bedrock. This zone may include weathered bedrock found at the overburden-bedrock interface. Bedrock monitoring wells will be completed with screens, sand packs and bentonite seals in order to maximize discreet groundwater sampling and prevent the possibility of cross-contamination of groundwater between fractures or voids in the bedrock, or overlying overburden materials. Due to the potential for cross-contamination by dense non-aqueous phase liquids such as PCE through fractures, open hole bedrock wells are not preferred. Should open hole wells be necessary, the Site-Specific Work Plan will provide details and justification.

Monitoring well boreholes constructed in bedrock will be advanced using a cutting tool with a minimum inside diameter of 4 inches. In situations where rock is cored at a smaller diameter, the hole must be reamed to 4 inches before monitoring well installation. Only potable water will be allowed in the hole unless other methods are agreed to as provided in the Site-Specific Work Plan. Sampling of drill water for volatile organic compounds will be required if the water source cannot be documented with water quality data to be potable.

As previously described, at a minimum, the boreholes will be advanced to a depth of 1/2 feet beyond the desired screen interval to allow for a sand pack to be placed on the bottom of the boring. Details of well construction specifications are shown in Figure 2-2.

When overburden is penetrated and is contaminated, or suspected to be contaminated, consideration will be given to drilling a double cased boring with the outer casing keyed into and sealed into the bedrock (or overburden confining unit). Double casing will be considered when the potential exists for shallow contaminants to be "dragged" to a deeper, uncontaminated zone by drilling. Drilling through a confining layer that underlies a contaminated zone will require double casing. Details of and rationale for double casing drilling and well construction techniques will be provided in the Site-Specific Work Plan. Bedrock monitoring well completions will be the same as for overburden wells as discussed in Section 2.17.4. Specific details and rationale for the installation of monitoring wells and piezometers will be provided in the Site-Specific Work Plan.



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GENERIC WORK PLAN FOR DRY CLEANER SITES

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PLAN FOR CONSTRUCTION OF BEDROCK MONITORING WELLS

FIGURE 2-2

2.17.6 Borehole and Monitoring Well Logging

All borehole construction and monitoring well installation will be logged and documented by a geologist. Notes will be kept in both bound field books and on Boring Logs and Monitoring Well Construction Logs (see Section 4.20 of QA/QC Plan). The Boring Logs will include the depths of stratigraphic changes, description of all samples, details of drilling techniques, listing of soil samples collected for laboratory analyses, measurements made with PIDs or FIDs. Well construction specifications will be provided in the Monitoring well Construction Logs. The Modified Burmeister Classification System will be used to describe soil samples recovered from the borings. A Daily Field Activity Report (see Section 4.20 of the QA/QC Plan) will be completed whenever there are drilling activities (or any other field activities) undertaken as part of the investigation.

2.17.7 Monitoring Well Development

Monitoring wells will be developed by pumping and surging until the turbidity of the groundwater achieves a reading of 50 NTUs (nephelometric turbidity units) or less, or until NYSDEC approves cessation of development. Well development will be supplemented by measurements of field parameters, including temperature, pH and specific conductance. Development will continue until the field parameters stabilize for a minimum of three consecutive readings of 10 percent variability or less, or as approved by the NYSDEC. When possible, well development water should be recharged on-site. Refer to Section 4.11 of the QA/QC Plan for further discussion on containment and disposal of development water. All equipment used for the development of monitoring wells will be decontaminated prior to use and between wells (see Section 4.6 of the QA/QC Plan).

2.17.8 Groundwater Level Measurement

Groundwater level measurements will be obtained from each of the wells installed as part of the remedial investigation, as well as existing wells. Groundwater level measurements of all wells will be made within an eight hour period of uniform weather conditions. Additionally, water levels will be obtained from surface water bodies that are suspected of influencing groundwater flow on or near the site by installing a fixed measuring point such as a staff gauge or permanent mark, on a fixed surface and measuring the depth to the surface of the water body. The measuring points will be surveyed for location and elevation.

All water level measurements will be made using a fixed reference point at each measurement location. Down hole instruments will be decontaminated between each measurement location (see Section 4.6 of the QA/QC Plan). The static water level will be measured to the nearest 0.01 foot. Groundwater level data will be used to construct groundwater potentiometric surface maps and used to determine local horizontal flow direction, as well as vertical gradients.

2.17.9 Groundwater Sampling

The depth to the water level in the well will be measured in order to calculate the liquid bore volume necessary for purging. Depth to water will be measured with respect to a reference point established at the top of the well casing. Water level measurements will be obtained using a decontaminated electronic water level indicator.

The wells will be purged until a minimum of three to five bore volumes have been removed or until the well is dry, whichever occurs first. The number of bore volumes purged will be a function of the pH, temperature and conductivity, and will continue until stabilization of these parameters is achieved. Purge water will be recharged on-site, if possible. Refer to Section 4.11 of the QA/QC Plan for further discussion on containment and disposal of purge water.

Disposable polyethylene bailers with disposable nylon or polypropylene rope will be used for purging and sampling of the wells. Deep wells or wells that require large volumes of water to be removed may be purged and sampled using decontaminated, downhole pumps and decontaminated or disposable tubing. Once the well has been sufficiently purged, sampling will begin. If groundwater recovery is very slow, it may be necessary to wait several hours, or overnight, for sufficient volume to become available for the necessary sample analyses. The samples collected from the monitoring wells will be analyzed for volatile organic compounds and iron and manganese for potential treatment system design purposes. Locations of the monitoring wells will be provided in the Site-Specific Work Plan together with the rationale for selection. Specific monitoring well sampling procedures are listed in Section 4.5.14 of the QA/QC Plan.

2.18 Probe Hole, Borehole and Well Abandonment

Direct push probe holes and soil borings which are not completed as monitoring wells will be fully sealed in a manner appropriate for the geologic conditions to prevent contaminant migration through the borehole. Sealing of the well or borehole will include the following methods: overboring or removal of the casing to the greatest extent possible followed by perforation of any casing left in place; removal of all casing and other well construction material within the upper 5 feet of the boring or within 5 feet of the proposed excavation level; sealing by pressure injection with cement bentonite grout using a tremie pipe to a depth extending the entire length of the boring to within 5 feet below the ground surface or the proposed excavation level; sealing the remaining 5 feet to ground surface with neat cement grout; and restoration of the sealed site to a safe condition. Well abandonment will follow the methods described in "Groundwater Monitoring Well Decommissioning Procedures," NYSDEC Division of Hazardous Waste Remediation, dated May 1995 (see Appendix J).

2.19 In-Situ Hydraulic Conductivity Testing

In-situ hydraulic conductivity testing provides useful information regarding the groundwater flow characteristics in the geologic units of concern. Hydraulic conductivity testing will be performed on monitoring wells installed as part of the remedial investigation to define groundwater flow rate and the potential for migration of groundwater contaminants. Depending upon site conditions, one or more of the following tests will be performed as part of the site-specific investigation. Details on the selected method will be provided in the Site-Specific Work Plan.

2.19.1 Slug Tests

In-situ hydraulic conductivity testing (slug tests) will be conducted on all monitoring wells as part of the remedial investigation. Slug test data will be collected using falling and rising heads at each well. Hydraulic conductivity calculations will be made using the Bouwer and Rice or other similar method for analyzing slug test data.

Slug testing involves measuring the rate at which water in a monitoring well returns to its initial level after a sudden injection or withdrawal of a known volume of water. Changes in water level over time will be recorded. All down hole equipment will be decontaminated between wells. The data will be recorded using an electronic datalogger and pressure transducer.

2.19.2 Packer Tests

Packer tests may be performed in bedrock borings to determine the relative permeability of fractures encountered during drilling. Packer testing, if necessary, will be performed during bedrock drilling and the results will be used to determine the placement of well screens in bedrock wells. Packers are inflatable devices that are inserted at a selected depth and inflated using water or gas to seal off a portion of the borehole. Either single or double packers may be used, depending on site conditions and the need to isolate specific fractures. The packer test is performed by inflating the packer(s) and injecting potable water into the open hole beneath or between the packer(s). The head or pressure on water injected is monitored over time. The data recorded from the packer test will be interpreted to provide hydraulic conductivity information.

2.19.3 Pumping Test

Pumping tests on monitoring wells are often difficult to perform. The small diameter of monitoring wells necessitate the low flow removal of groundwater from the well. Despite the low flow from the wells, high volumes of water may be required to be removed from the monitoring well in order to obtain useful information regarding aquifer characteristics including hydraulic conductivity. Problems of disposing of the water pumped and obtaining accurate water level readings must also be addressed. Constant rate pumping tests for periods of several hours are normally required. Other monitoring wells within the study area/site must also be monitored for draw down during the test.

Generally, the test well is pumped for several hours at a fixed, known rate. Groundwater elevations in the pumping well and adjacent monitoring wells are recorded at periodic time intervals using an electronic datalogger with pressure transducers or water level measuring device. Data collected during the test is graphed and interpreted using curve matching and mathematical regression techniques. Pumping test data provides aquifer characteristics, including hydraulic conductivity and specific yield, over a relatively large area compared to slug tests. This data is generally necessary for the design of remedial alternatives involving pumping or extraction of groundwater. The Site-Specific Work Plan will provide the rationale and design for pumping tests.

2.20 Downhole Logging

Downhole logging is useful for providing subsurface information in existing wells for which soil samples or logs are not available. Downhole logging can also provide subsurface information not normally available from visual inspection of soil or rock samples. At dry cleaner sites, downhole logging is applicable when detailed information is needed from domestic water wells, or pre-existing monitoring wells.

Downhole surveys produce continuous logs of borehole characteristics that cannot be obtained through visual logging of samples or drilling observations. Methods for geologic and hydrogeologic characterization using downhole logging most commonly use probes that are lowered on a cable. These probes transmit signals to surface instruments that generate logs or charts that relate changes with respect to depth of the parameter being measured. Provided below are descriptions of downhole logging technologies that can be performed during a remedial investigation at dry cleaner sites.

2.20.1 Geophysical Logging

Most borehole geophysical techniques for characterizing bedrock and unconsolidated deposits fall into three categories, comprising electrical or electromagnetic methods; nuclear methods; and acoustic or seismic methods. Additional borehole logging methods include caliper, temperature and fluid flow logging.

The type of borehole (cased or uncased), and whether it is filled with fluid or is dry, are major considerations in the selection of borehole logging techniques. Most electrical methods, for example, require an uncased borehole and either drilling fluid or water in the hole. Several different types of logs can be run in the same borehole and compared to facilitate stratigraphic interpretations. Based upon site-specific conditions and goals of the investigation, different suites of logging techniques may be used. A typical suite of logs in a fluid filled borehole may include spontaneous potential; single point resistance; natural gamma; neutron; caliper; fluid conductivity; temperature and acoustic velocity logging. Measurement of groundwater flow using impeller-flow meter logging equipment in boreholes is an especially useful technique for locating zones of high permeability within a borehole. Temperature logging is also useful in identifying zones of recharge to the well. Specific borehole geophysical methods will be determined on a site-specific basis and described in the Site-Specific Work Plan, together with the rationale for selection.

2.20.2 Borehole Television Camera

Borehole television surveys provide information regarding stratigraphic characterization; fracture frequency size and orientation; and vertical correlation of bedrock cores. A television camera is attached to a flexible multi-lead video cable and lowered down the borehole for visual inspection of the borehole walls. The depth of the probe is measured and displayed on the TV monitor. The camera is mounted with a light and can be positioned remotely to view the borehole at different angles. Proper magnification of the picture can allow the observation of flow direction, velocity and turbidity of groundwater. Downhole cameras are particularly useful for identifying flow into or out of fractures. Borehole cameras could best be used in the investigation of dry cleaner sites to identify fractures and their susceptibility to high permeability flow.

2.21 Geotechnical Analyses

Several geotechnical analyses may be appropriate to characterize soil conditions and groundwater flow, and predict the effectiveness of remedial alternatives at a site. Based upon site-specific conditions and possible remedial alternatives, geotechnical analyses can be performed in a laboratory or in the field. The following sections briefly describe several available geotechnical methods to be utilized in a remedial investigation at dry cleaner sites.

2.21.1 Laboratory Analyses

Included in laboratory analytical techniques are sieve analyses, hydrometer testing, and laboratory permeability testing. Information from these analyses can be used to define aquifer properties such as permeability and storativity, and soil response, such as caking or mobilization, to remediation attempts. Collection of samples for these tests involves retrieving minimum quantities of samples to properly perform the analyses, and using specialized sampling tools, such as a shelby tube or Denison sampler, to collect undisturbed samples. Samples collected for sieve and hydrometer analyses will be performed in accordance with ASTM Method D422-63 and ASTM Method D1140, respectively. Similarly, samples collected for permeability analyses will be analyzed in accordance with ASTM Method D4318. The need for these types of samples and analysis will be determined on a site-specific basis and contained in the Site-Specific Work Plan.

2.21.2 Cone Penetrometer

A cone penetrometer is used for stratigraphic logging in soft soils. A cone penetrometer can measure subsurface hydraulic characteristics, including pressure head, soil permeability and water bearing zones. The cone penetration test involves hydraulically pushing a cone-shaped instrument into the soil and measuring its resistance to penetration. Resistance is measured by sensitive strain gauges that transmit electronic signals to a datalogger. A cone penetrometer can estimate the hydraulic properties of a soil by measuring the poor pressure changes in response to the stresses created by the cone penetrometer. The use of a cone penetrometer is dependent upon the characteristics of unconsolidated materials at the site. The materials must be relatively soft and free of gravel or cobbles. The need for use of a cone penetrometer will be determined on a site-specific basis.

2.22 Air Screening Survey

Ambient air monitoring will be performed throughout field activities during the remedial investigation. Either a flame ionization detector (i.e., Century Foxboro OVA) or a photoionization detector (i.e., Photovac MicroTip) will be utilized to detect total organic vapors. Detailed monitoring procedures are provided in Section 5.9 of the Health and Safety Plan.

The ambient air screening instruments will be used to determine the necessary levels of personal protective equipment (see Section 5.9 of the Health and Safety Plan), as well as to provide data on contaminant concentrations in the background ambient air and during investigative activities.

Ambient air monitoring will also be utilized to screen the site for "hot spots" of volatile organic compounds. This survey will be performed in the initial phases of the investigation and may identify locations where additional investigation will be required. The screening will be performed by monitoring continuously, while walking the site perimeter and across the site. Elevated readings will be recorded utilizing the Air Monitoring Forms provided in Section 5.0.

2.23 Ambient Air Sampling

If elevated levels of organic vapors are detected during the air screening survey or during field investigation activities, due to concern regarding potential elevated levels of volatile organic compounds in the ambient air during investigation activities, in particular vinyl chloride, which is a breakdown product of PCE, provision will be made for the collection of ambient air samples. Air samples will be collected using air pumps and tenax tubes in accordance with EPA Method TO1/TO2. Sampling locations will be positioned within the breathing zone in the prevailing down wind direction. Sampling locations, as well as the rationale for sample collection, will be provided in the Site-Specific Work Plan. Wind speed, direction and temperature will be measured periodically during the collection of the samples.

2.24 Surveying and Mapping

All soil boring, monitoring well and piezometer locations will be surveyed by a New York State licensed surveyor for horizontal and vertical control. Vertical and horizontal control of the monitoring well/piezometer casing will allow for calculation of groundwater elevations for the development of groundwater contour maps. The ground surface, protective casing and measuring point in the inner casing will be surveyed.

Vertical and horizontal control of the soil borings and monitoring wells allow for the preparation of geologic and hydrogeologic cross sections. Additional on- and off-site sampling points, such as surface soil and soil vapor survey locations, will be surveyed, if necessary.

Control points for use in the preparation of a topographic map of the study area will also be surveyed, if necessary. Coordination between the aerial photographer and the surveyor will be required in order to select the necessary control points for preparation of the topographic map.

3.0 FEASIBILITY STUDY AND INTERIM REMEDIAL MEASURE/PRESUMPTIVE REMEDY SELECTION PLAN

This section of the Work Plan provides guidance for the selection of interim remedial measures (IRM) and presumptive remedies for dry cleaner sites, as well as performance of feasibility studies for remedial plan selection, if required. The IRMs and presumptive remedial technologies presented in this section have been identified through proven effectiveness at dry cleaner sites and sites with similar types of contamination and contaminated media. Based on the results of the Phase I Remedial Investigation, the need for implementation of an IRM, the applicability of a presumptive remedy, and the necessity of a feasibility study will be evaluated. The installation of an IRM or a presumptive remedy will allow for an accelerated implementation of remedial action, while at the same time, providing for protection of human health and the environment. This approach will also accelerate site-specific analysis of alternate remedies by preparation of a focused feasibility study.

The presumptive remedial technologies described in this section have been identified by the United States Environmental Protection Agency (USEPA) and the New York State Department of Environmental Conservation (NYSDEC) as appropriate presumptive remedies for sites contaminated with volatile organic compounds (VOCs). These remedies are contained in a directive entitled "Presumptive Remedies: Site Characterization and Technology Selection for CERCLA Sites with Volatile Organic Compounds in Soils", dated September 1993 (see Appendix K). As part of this directive, the USEPA indicated that when utilizing presumptive remedies at VOC contaminated sites, site-specific identification of alternatives is not necessary. The evaluation and documentation of the evaluation is provided in the directive. This directive will be included as part of all Records of Decision prepared for sites that utilize a presumptive remedy. The following sections provide identification of IRMs and presumptive remedies for dry cleaner sites and a description of the applicability of these remedial actions to these sites, as well as determination when a more typical feasibility study will be appropriate.

3.1 Selection of Interim Remedial Measures

An IRM is defined in the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) No. 4042: Interim Remedial Measures (see Appendix L), as a "discrete set of activities to address both emergency and non-emergency site conditions which can be undertaken without extensive investigation and evaluation, to prevent, mitigate, or remedy environmental damage or the consequences of environmental damage attributable to a site listed in the Registry." The purpose of an IRM is to provide an immediate remedial response action, prior to the completion of the a RI/FS, to address contamination that is an immediate threat to human health or the environment.

Although intended to be a temporary or partial response, an IRM can be included as part of, as well as, the final remedy for the site. If the IRM proves to be effective in addressing contamination, the Record of Decision can recommend that no further action be required. For dry cleaning sites, the following sections identify IRMs and presumptive remedies that could be utilized as IRMs if the timing is such, that the response action is implemented prior to the completion of the RI/FS.

3.1.1 Identification and Evaluation of Interim Remedial Measures

Two measures, which are considered for use only as IRMs are:

Water Supply

- Individual well head treatment; and
- Bottled water.

Source Control

- Temporary Surface Cover;
- Fencing and Sign Posting; and
- Elimination of Achieve Discharge

3.1.1.1 - Private Well Head Treatment

Private individual well head treatment for private water supply wells impacted by dry cleaner sites would require the installation and maintenance of treatment systems for individual residential, institutional and commercial/industrial water supply wells. Only those supply wells found to exceed standards for drinking water would be considered for this alternative. Other wells that could be potentially impacted would be monitored periodically to determine if well head treatment is required.

The treatment system would consist of an activated carbon adsorption unit installed at each of the impacted water supply wells. The systems will be installed as a "point of entry" system, whereby the treatment unit is installed on the water "main" from the well and would treat all water that would enter the residences/facility and be used for drinking, cooking, or bathing. Preferably, this would also include irrigation water.

The water treatment systems would need to be monitored and maintained in order to ensure that the systems are operating properly. Several institutional and administrative issues would need to be addressed for this IRM, including determination of responsibility for the installation, monitoring and maintenance of the systems. Although individual well head treatment will reduce impacts to the private water supply users, it is only a temporary measure that will be utilized until an alternative, permanent water supply source can be provided, and/or a groundwater remediation system is installed and the contaminated groundwater remediated to below drinking water standards.

3.1.1.2 - Bottled Water

Provision of bottled water supply is an IRM that involves providing receptors with impacted private (or public) water supply wells with bottled water. While this IRM may be less costly than provision of a well head treatment system, particularly, for a short period of time (less than one year), it would not address concerns regarding use of contaminated water for cooking (for the most part) and bathing, as well as irrigation. Bottled water would only be a truly interim measure until implementation of a permanent remedial measure.

Prior to implementation of this IRM, an evaluation will be required to determine whether supplying bottled water would be protective and cost-effective during the interim, or whether other IRMs, such as individual well head treatment, would be more appropriate.

For further discussion with regard to the selection and procedures for implementation of an IRM, refer to the above referenced TAGM 4042 as mentioned above and NYSDEC TAGM No. 4048, Interim Remedial Measures - Procedures (see Appendix M).

3.1.1.3 - Temporary Surface Cover

In areas where significant surface soil contamination has been found, which could pose a threat to human health and the environment, in order to mitigate potential adverse impacts, soil cover (6 to 12 inches) or a plastic liner will be placed over the area of concern. This cover would mitigate the potential for inhalation, ingestion and dermal contact with the contaminated soil until a permanent remedy is selected and implemented.

3.1.1.4 - Fencing and Sign Posting

Similar to the discussion regarding soil cover above, if significant surface contamination is detected as a result of the remedial investigation which could pose a threat to health and the environment, in particular, as a result of direct contact with waste and contaminated surface soil, installation of a chain-link fence around the area of concern could be implemented as a IRM. In addition, signs could be posted warning the public and those that need to access the site, that hazardous waste is present and the area of concern should not be entered unless appropriate precautions are taken.

3.1.1.5 - Elimination of Active Discharges

If during the facility inspection, or as a result of activities conducted during the remedial investigation, an active discharge of contaminated wastewater is detected, either as a result of current operations or continuing releases from previous operation, the NYSDEC Project Manager and the facility owner/operator will be notified. Notification, through NYSDEC, will be given to the owner/operator to immediately take corrective action to cease and/or contain all discharges and remove any accessible contaminated residuals or media, such as sediment and soil.

3.2 Identification and Evaluation of Presumptive Remedial Technologies

There are several presumptive remedies which have been demonstrated to be effective and are potentially applicable, either as IRMs, or final remedies for dry cleaner sites. The following sections provide descriptions of these remedies. The presumptive remedies have been divided into three primary applications, these being: source control alternatives; groundwater alternatives; and water supply alternatives. Recharge/discharge alternatives are also discussed for the groundwater extraction and treatment technology. These presumptive remedies are the following:

Source Control Alternatives

- Leaching pool/dry well and leaching field cleanout;
- Soil excavation and off-site disposal;
- Soil vapor extraction;
- Low temperature thermal desorption; and
- No further action.

Groundwater Alternatives

- Extraction and treatment;
- Air sparging;
- No further action; and
- Long-Term monitoring.

Water Supply Alternatives

- Extension of existing public water supply; and
- Treatment of public water supply.

A summary of the presumptive remedies, together with a brief description of advantages, disadvantages, site limitation factors and applicability, is provided in Table 3-1.

Table 3-1

GENERIC REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN
DRY CLEANER SITES
SUMMARY OF PRESUMPTIVE REMEDIES

Presumptive Remedy	Advantages	Disadvantages	Site Limiting Factors	Applicability
1. <u>Source Control Alternatives</u> A. Leaching Pool/Dry Well and Leaching Field Cleanout	• Effective for source removal.	• May generate excessive vapor emissions requiring control and treatment. Sediment/sludge with concentrations greater than 6 mg/kg cannot likely be land disposed, but must be incinerated resulting in high cost.	• Access to the system maybe difficult. Abandoned systems may no longer be accessible.	• All liquid,sediment and sludge.
B. Soil Excavation and Off-Site Disposal	• Relatively quick remedy for remediation/removal of contaminated soil.	• May generate excessive vapor emissions during excavation requiring control and treatment. • Soil with concentrations greater than 6 mg/kg cannot likely be land disposed, but must be incinerated, resulting in high cost	• Contamination beneath or immediately adjacent to structures cannot be excavated without potentially impacting the structural integrity of building, resulting in additional costs for shoring. • Contamination may have migrated beneath the excavation limit, thereby reducing the effectiveness of excavation as a remedy.	• All soil types. • Primarily applicable to shallow soil contamination. Potentially cost prohibitive when excavating deep soils, saturated soils, and/or bedrock. Soil beneath water table would require dewatering increasing costs for excavation and treatment of contaminated water.
C. Soil Vapor Extraction	• Can be performed in-situ and does not require excavation and off-site disposal. • Can be conducted relatively easily beneath structures. • Does not require substantial space.	• Low permeability soil limits subsurface air flow rates. • Soil water content greater than 50% severely impedes air flow rate. • Heterogeneous soil conditions may result in preferential pathways and inconsistent removal rates.	• Due to water table upwelling, additional groundwater contamination, where chemicals are located just above the water table, can occur. • Lowering water table to allow volatile chemical recovery by vacuum	• Low molecular weight volatile chemicals, such as PCE and break down compounds. • Henrys Law Constant greater than 0.01. • Homogeneous permeable media. • Intrinsic permeability greater

Table 3-1 (continued)

GENERIC REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN
DRY CLEANER SITES
SUMMARY OF PRESUMPTIVE REMEDIES

Presumptive Remedy	Advantages	Disadvantages	Site Limiting Factors	Applicability
		• Treatment system would be staged on-site, therefore, sufficient space would need to be available for equipment.	extraction may promote DNAPL remobilization and sinking.	than 1 x 10^{-6} cm^2.
D. Low Temperature Thermal Desorption.	• Can effectively treat contaminated soil and allow on-site replacement of treated soil.	• Requires excavation of soil. • May generate excessive vapor emissions requiring control and treatment. • High moisture content increases energy requirements. • Treatment system would be staged on-site, therefore, sufficient space would need to be available for staging of equipment. Thermal desorption systems typically require substantial space.	• Clayey soils may result in incomplete volatilization due to caking and may require additional handling. • Contamination beneath or immediately adjacent to structures cannot be excavated without potentially impacting the structural integrity of building, resulting in additional costs for shoring. • DNAPL may have migrated beneath the excavation limit, thereby reducing the effectiveness of excavation and treatment as a remedy.	• Primarily applicable to shallow soil contamination. Potentially cost prohibitive when excavating deep soils, saturated soil and/or bedrock. Soil beneath water table would require dewatering increasing costs for excavation and treatment of contamination water.
E. No Further Action	• Low cost • No short-term impacts to the environment.	• Not effective in addressing contamination at sites where natural attenuation is not	• None	• Applicable to sites which do not have very significant levels of contamination and

Table 3-1 (continued)

GENERIC REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN
DRY CLEANER SITES
SUMMARY OF PRESUMPTIVE REMEDIES

Presumptive Remedy	Advantages	Disadvantages	Site Limiting Factors	Applicability
		expected to occur or there are potential receptors.		there are no potential receptors. • Sites where there is source control and natural attenuation is expected to occur.
2. Groundwater Alternatives A. Extraction and Treatment	• Controls contaminant plume and mitigates migration to downgradient receptors. • Only technology to effectively address deep groundwater contamination.	• Will only treat dissolved contamination; will not effectively treat residual DNAPL. • Without DNAPL removal, excessively long operating times required for remediation	• Difficult to obtain appropriate extraction rates in low hydraulic conductivity material (i.e., less than 10^{-7} cm/sec). • Highly heterogeneous materials in subsurface may limit effectiveness due to inability to extract contaminated groundwater from lower permeability units.	• Applicable to all sites, however, more applicable to sites where DNAPL contamination has been addressed.
B. Air Sparging	• Shorter remediation times than extraction and treatment. • Will address soil contamination beneath the water table.	• Air must come in contact with all contaminated water and vapors must be controlled/extracted with properly designed and operated soil vapor extraction system. • Applicable to shallow groundwater contamination.	• Low permeability soil may interfere with movement of air and transfer of contaminants from liquid to vapor.	• Applicable to low molecular weight volatile compounds. • Not applicable to sites with hydraulic conductivity values less than 0.001 cm/s.

Table 3-1 (continued)

GENERIC REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORK PLAN
DRY CLEANER SITES
SUMMARY OF PRESUMPTIVE REMEDIES

Presumptive Remedy	Advantages	Disadvantages	Site Limiting Factors	Applicability
C. No Further Action	• Low cost. • No short term impacts to the environment.	• Not effective in addressing contamination at sites where natural attenuation is not expected to occur or where there are potential receptors..	• None.	• Applicable to sites which do not have very significant levels of contamination and there are no potential receptors. • Sites where there is source control and natural attenuation is expected to occur.
D. Long-Term Monitoring	• Monitors the effectiveness of remedial controls and no further action to determine if additional controls are required to protect health and the environment.	• Is not a remedial measure in and of itself.	• Appropriate and effective monitoring system must be in place.	• Applicable to sites where remedial action or no further action is implemented. • Applicable to sites where there is source control and natural attenuation is expected to occur.
3. Water Supply Alternatives A. Extension of Existing Public Water Supply.	• Mitigates potential exposure to contaminated groundwater. • Eliminates monitoring and maintenance of well head treatment systems and provision of bottled water.	• Could be costly where the nearest existing public water supply is a long distance from the impacted private water supply wells.	• Many private water well supply systems are in areas where public water supply systems are not readily available. • Requires cooperation of public water supply owner.	Applicable in areas where public water supply systems exist or are nearby.
B. Treatment of Public Water Supply	• Fairly easy to implement. • Proven technology.	• Requires additional operation and maintenance.	• Requires additional space on well site.	• Applicable to all public water supply wells.

3.2.1 Source Control Alternatives

As part of the above mentioned USEPA presumptive remedy directive, 88 Records of Decisions (ROD) for remediation of Superfund sites, which were identified as exhibiting only volatile organic compounds in soils, or where VOCs were driving the selection of the remedy, were reviewed. This review identified three technologies that were chosen in over 90 percent of the 88 RODs signed, these being: soil vapor extraction; thermal desorption; and off-site incineration. The following sections provide general descriptions of these presumptive remedies as well as additional presumptive remedies for source control groundwater remediation and water supply. Refer to the above referenced USEPA document, as well as the documents listed in Section 7.0 of this Work Plan, for additional references.

3.2.1.1 - Leaching Pool/Dry Well and Leaching Field Cleanout

This remedial action comprises the use of standard cleanout techniques in order to remove contaminated media (liquids, sediments and sludges) from leaching pools, dry wells and leaching/tile fields, followed by off-site disposal of the contaminated media or perhaps on-site treatment, if cost-effective. This remediation method may require using a vacuum pump to remove liquid and solid material from leaching pools, dry wells and septic tanks. It may also require excavation and removal of leaching fields or leaching pools/dry wells to access the contaminated media. This technology, in addition to being an effective remediation measure in and of itself, would also be potentially applicable to sites where removal of the highly contaminated media would aide in the effectiveness of other technologies, such as soil vapor extraction, groundwater extraction and treatment, or air sparging.

The advantage of this alternative is that a majority of the most highly contaminated liquid and solids, constituting a source, would be removed, thereby mitigating continued leaching of the contaminants to subsurface soil and groundwater. However, this alternative is not always effective in eliminating the source area entirely. Residual contamination can remain beyond the removal reach of the alternative. The sediment/sludge removed would probably require incineration due to concentrations of perchloroethylene (PCE) being greater than 6 ppm. This can significantly impact the cost of the alternative. Removal of the contaminated media may also generate elevated vapor emissions requiring control and treatment.

This alternative is applicable to most sites where access to the system(s) is readily available. Abandoned or inaccessible systems may require remediation through other standard techniques, such as excavation of the disposal units and off-site removal.

3.2.1.2 - Soil Excavation and Off-Site Disposal

Excavation and removal of the contaminated soil is potentially applicable to soil in the unsaturated zone and the shallow saturated zone. This alternative is applicable when considering the removal of small volumes of soil due to the high cost of off-site disposal, and when the vertical extent of contamination is not very deep (greater than 90 feet below grade). The cost for excavation and off-site disposal, especially when soils are highly contaminated and incineration is required, is not typically cost-effective in comparison to in-situ treatment technologies, such as soil vapor extraction, once the volume of soil requiring removal becomes significant. Soils exhibiting levels of PCE greater than 6 mg/kg are subject to the Resource Conservation Recovery Act (RCRA) Land Disposal Restrictions. Therefore, all soils exhibiting levels of PCE greater than 6 mg/kg cannot be disposed of in a secure landfill, but, as discussed above, will likely require incineration. Costs for off-site disposal will vary significantly between soils that could be disposed of in a landfill and soils that must be incinerated. However, in certain situations where on-site treatment is not an option due to site limitations and other factors, excavation and off-site disposal may be appropriate.

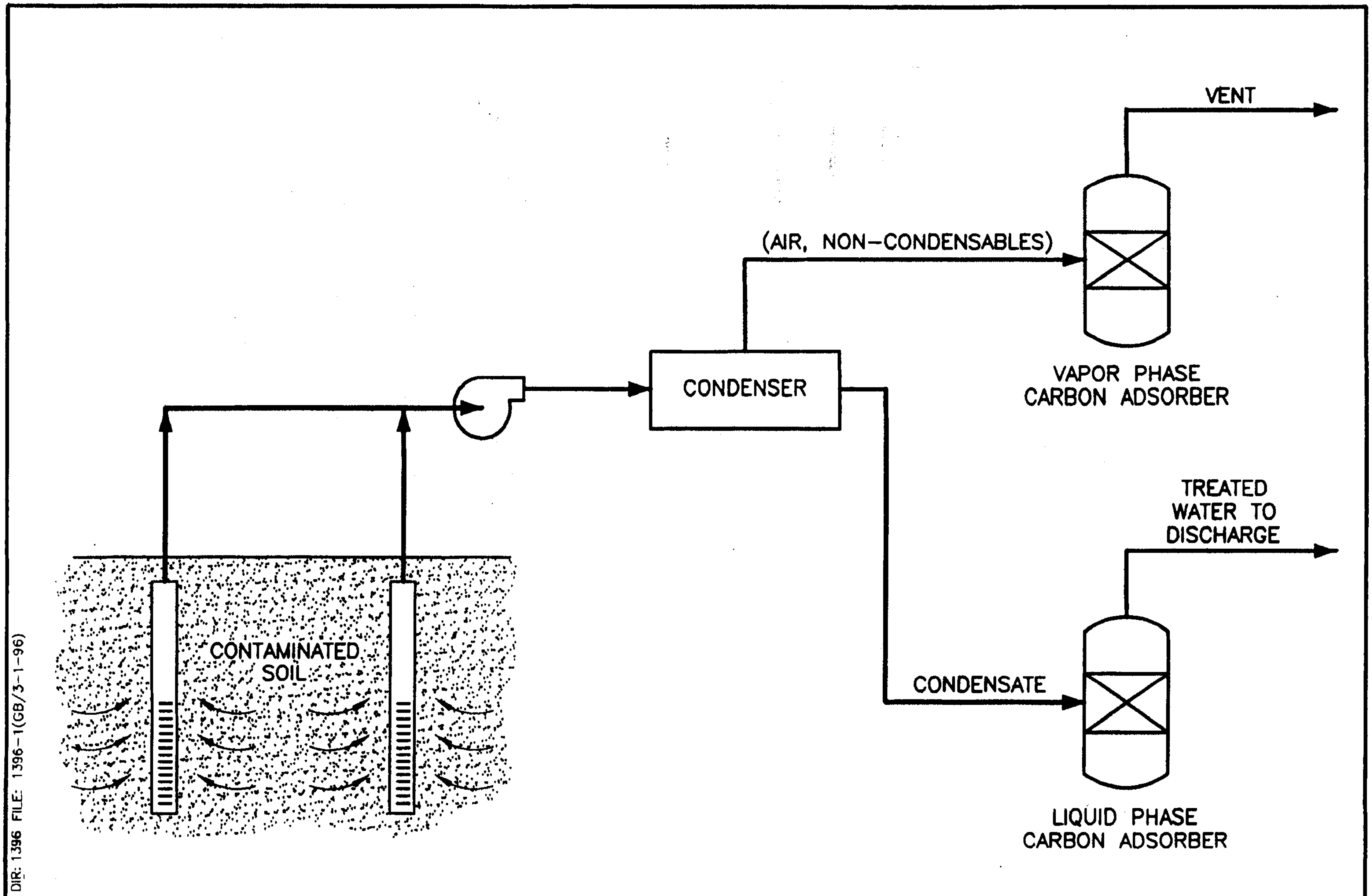
Excavation and handling of highly contaminated soils may generate elevated levels of vapors that may require use of a temporary, enclosed structure to mitigate exposure to on-site and off-site receptors by the release of these vapors. In addition to the potential release of vapors often the source of contamination at dry cleaner sites is a leaching pool/dry well that is located immediately adjacent to the dry cleaning building. Excavation of soil adjacent to and below the leaching system will likely require driving sheet piles to shore up the building foundation and possibly bracing the walls of the structure, which results in significant added cost. Also at some sites, contamination is found beneath the building, which is essentially impossible to excavate without incurring extremely high costs and disruption to the existing use of the building.

3.2.1.3 - Soil Vapor Extraction

Soil vapor extraction (SVE) is an in-situ treatment technology which physically separates and concentrates (VOCs) in contaminated soil (see Figure 3-1). A vacuum is applied through extraction wells and the air is forced through the soil. The air flow generates advective vapor fluxes that change the vapor liquid equilibrium, inducing volatilization of VOCs. The resulting vapors are collected by a system of wells and piping and, typically treated by carbon absorption or thermal destruction. This technology is potentially applicable to soils that are well drained (less than 50 % residual saturation), contain low levels of organic carbon, and present relatively high intrinsic permeability (at least 1×10^{-6} cm^2). It is applicable to compounds that have a vapor pressure of at least 0.5 mm Hg (PCE has a vapor pressure of 14 mm Hg) and a Henry's Constant of greater than 0.01 (PCE has a Henry's Constant of 0.096).

One of the primary advantages of soil vapor extraction is that this alternative can be implemented in-situ, and therefore, eliminates the potential for impacts to surrounding communities through exposure to volatilized contaminants as compared to excavation. In addition, although this alternative requires installation of an on-site vapor collection system (and possibly a treatment system), the size of the SVE system is typically relatively small in size and can be implemented at sites where limited space is available.

Potential disadvantages of the technology include site limiting factors that impede its effectiveness. As presented in Table 3-1, low permeability and heterogeneous soil conditions limit the effectiveness of the SVE system due to low or inconsistent air flow rates. Low and/or



GENERIC WORK PLAN
FOR DRY CLEANER SITES

SCHEMATIC FOR SOIL VAPOR EXTRACTION SYSTEM

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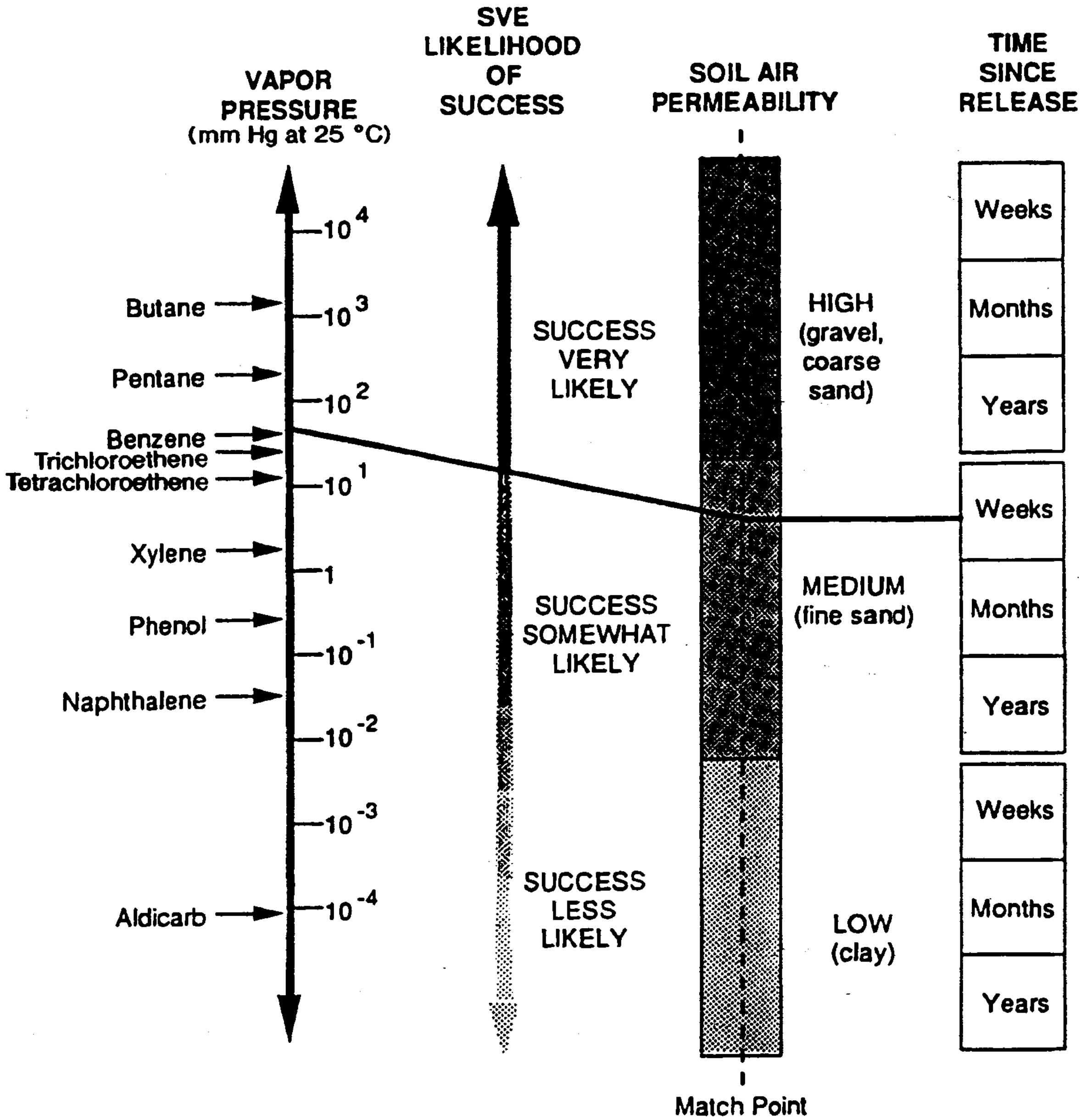
FIGURE 3-1

inconsistent air flow rates and preferential routes of air flow may impact removal rates and efficiency. At certain sites, a rise in the water table may increase groundwater contamination where chemicals are located just above the water table. Lowering the water table in order to address additional soil contamination in the capillary fringe may also increase groundwater contamination by remobilization and sinking of PCE, which is a dense nonaqueous phase liquid (DNAPL). The following discussion provides information to determine the applicability of SVE to a particular site.

As discussed above, low soil permeability limits subsurface air flow rates and reduces process efficiency. Heterogeneous soil conditions may result in preferential pathways and inconsistent removal rates. Air permeability controls the rate at which soil vapor can be extracted from the vadose zone, and thus, the feasibility for use of SVE. Initial screening for SVE effectiveness is frequently made based on an estimate of air permeability. Methods for estimating air permeability, in order of generally decreasing reliability, include: 1) analysis of SVE operation data; 2) analysis of pneumatic tests; 3) calculation based on saturated permeability measurements (i.e., hydraulic conductivity values); 4) laboratory testing of core samples; 5) calculation based on grain-size analysis; and 6) comparison of literature values. Initial screening for SVE effectiveness is frequently made based on an estimate of air permeability, as illustrated in Figure 3-2. Detailed discussion with regard to evaluation of the applicability of SVE systems is provided in USEPA document EPA/540/R-95/513, "Review of Mathematical Modeling for Evaluating Soil Vapor Extraction Systems," dated July 1995.

During most remedial investigations, hydraulic conductivity information is usually obtained. As discussed above, hydraulic conductivity values can be utilized to estimate air permeability in the vadose zone. The equations to be utilized for determining intrinsic permeability (k) from hydraulic conductivity (*k*) are presented as follows:



Source: USEPA Review of Mathematical Modeling for Evaluating SVE Systems

GENERIC WORK PLAN FOR DRY CLEANER SITES

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DECISION NOMOGRAPH FOR EVALUATION OF SVE

FIGURE 3-2

$$k = \frac{k \mu w}{\rho w g}$$

where k = intrinsic permeability [cm^2]

k = hydraulic conductivity [cm/sec]

μ_w = dynamic viscosity of water [gm/cm-sec]

ρ_w = density of water [g/cm^3].

g = gravitational constant [cm/sec^2]

For the purpose of utilizing the above equation, the following values can be assigned:

ρ_{water} = 1.0 g/l

μ_{water} = 0.00775 g/cm-sec.

g = 980.7 cm/sec^2.

The value for intrinsic permeability can be compared to the value of 1 x 10^{-6} cm^2. As discussed above a value greater than 10^{-6} cm^2 is appropriate for SVE. For further discussion, refer to the USEPA document referenced above.

In addition to air permeability, the Henrys Constant of the contaminant(s) is also important in determining the applicability of SVE. Henrys Constant (H) is often expressed as H^1 in m^3 - atm/gmole. In order to convert dimensionless Henrys Constant (H) to H^1, the following equation can be utilized:

H^1 = HRT

where T = temperature (°K)

R = gas constant = 8.21 x 1^{-5} atm - m^3/gmol °K

As stated previously, SVE is applicable to contaminants with a dimensionless Henrys Constant greater than 0.01.

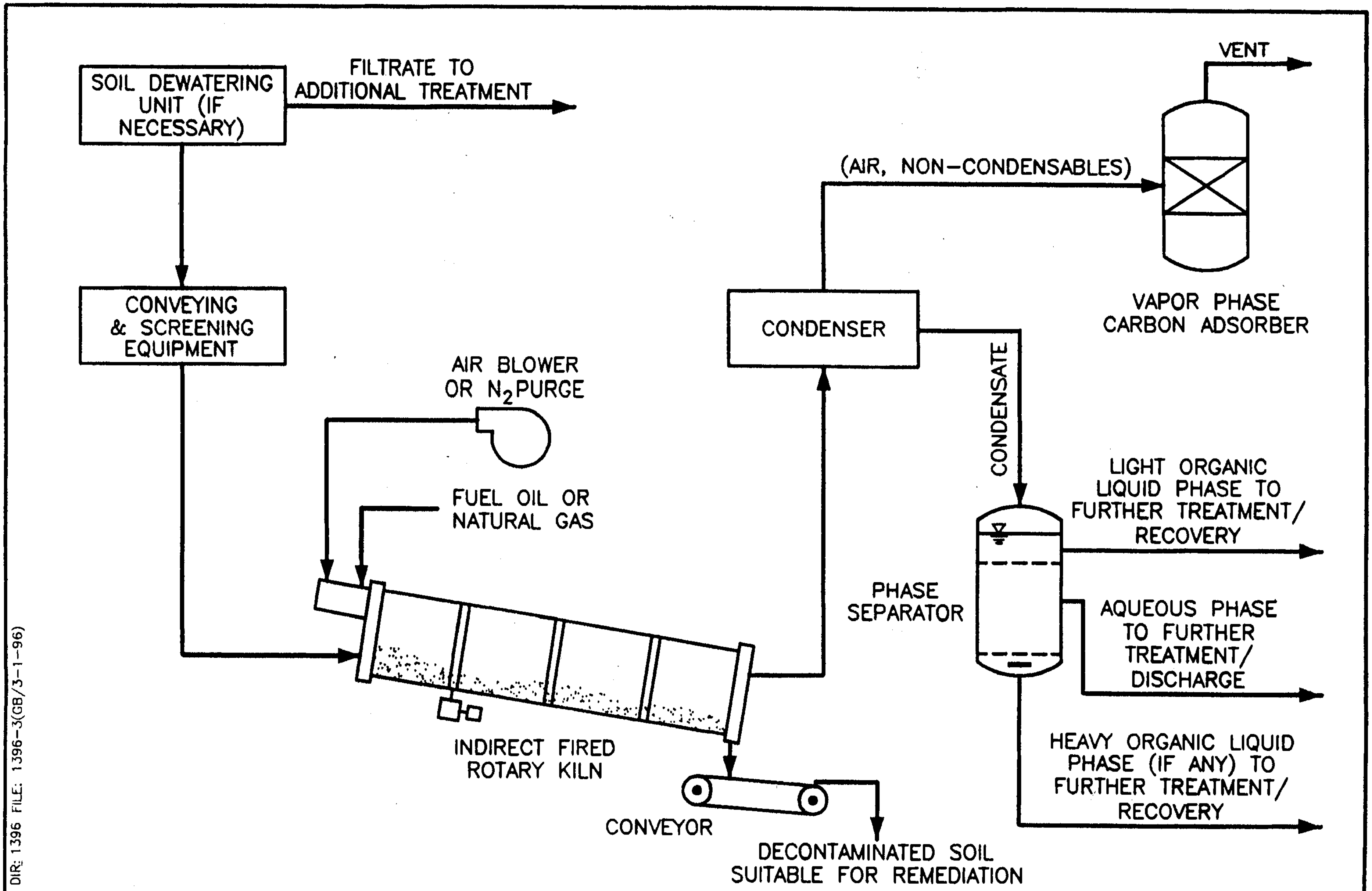
Once it is determined that SVE may be appropriate for the site, a determination of the number of extraction wells will be necessary. The number of wells will be based on the radius of influence of each of the extraction wells and extent of contamination. The radius of influence (ROI) can be estimated by conducting a vapor extraction pilot test, performing empirical calculations and/or performing an air flow model analysis. There are several screening models available to evaluate SVE. An evaluation of these models is provided in the above referenced USEPA document.

Soil vapor extraction generates vapor, liquid residual/condensate and drill cuttings from the installation of the wells. The vapor from the system is usually collected by carbon adsorption and treated by thermal destruction, and the condensate is generally treated on-site by carbon adsorption or disposed of off-site.

3.2.1.4 - Low Temperature Thermal Desorption

Low temperature thermal desorption physically separates volatile, as well as some semi-volatile contaminants with low boiling points, from excavated soil, sediment and sludge. Thermal desorption uses indirect or direct heat exchange to volatilize contaminants and water from soil into a carrier gas stream for further treatment. The carrier gas stream may be either air or an inert gas. Depending on the process selected, this technology heats contaminated media to temperatures between 200° F and 600° F. Off gases may be burned in an afterburner, catalytically oxidized, condensed for disposal or captured by carbon adsorption beds for on-site or off-site treatment (see Figure 3-3).

One of the primary advantages of thermal desorption is that it is an on-site treatment technology that can effectively treat soils contaminated with VOCs and allow for replacement of the soils on-site.



GENERIC WORK PLAN
FOR DRY CLEANER SITES

SCHEMATIC FOR THERMAL DESORPTION

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FIGURE 3-3

However, thermal desorption efficiency may be adversely affected by clayey soils, in that incomplete volatilization may occur due to caking. This handling difficulty can be mitigated to a large extent by pre-processing of the clayey soils, for example, by adding and mixing sand/gravel with the soil. However, this additional handling may increase costs significantly. In addition, high moisture content of the soils increases the energy requirements and there are limitations with regard to the VOC concentrations that this type of system can treat. Also, the space requirements for set up and operation of a thermal desorption system on-site could be substantial which may preclude its use on the typically small dry cleaner property.

Thermal desorption is an ex-situ technology that would require excavation and handling of the contaminated soil. In certain situations this could result in the same difficulties described in Section 3.2.1.2 (Excavation and Removal). This process also creates up to seven residual streams, including treated soil, condensed contaminants, water, particulates, clean off gas and spent carbon. Debris and oversized rejects may be suitable for on-site disposal. Condensed contaminants will require further treatment.

3.2.1.5 - No Further Action

For soil, no further action alternative would be utilized in situations where although there may be residual soil contamination there is no significant threat to human health or the environment. This alternative may be applicable to sites where there is no significant groundwater contamination and natural attenuation would be expected to occur. The no further action alternative would not be applicable to sites where there are potential receptors or where natural attenuation is not expected to occur.

3.2.2 Groundwater Alternatives

3.2.2.1 - Extraction and Treatment

Groundwater extraction and treatment alternatives, also commonly referred to as "pump and treat," can comprise a number of different technologies. This technology can be utilized for remediation of the entire dissolved plume of contaminated groundwater (full containment/aquifer restoration), or a portion of the dissolved plume, which is usually the most highly contaminated zone or "Hot Spots" that poses the greatest threat to human health and the environment (partial containment/aquifer restoration).

There are several different extraction systems that could be utilized in order to remediate the contaminant plumes. Typical extraction methods include either the utilization of extraction wells or a trench-drainline system. Extraction systems are typically placed downgradient of known source areas. Since extraction of the dissolved contamination will not address residual DNAPL contamination, this remedy will not likely be completely effective in remediating a site. This remedy would need to be combined with source control remedies to address residual DNAPL in the soil, particularly in the unsaturated zone. If residual DNAPL is located within the saturated zone, it is likely that this remedy will need be operating for several decades or more. However, this remedy will be effective for containing and treating a dissolved plume.

There are several reasons for selecting either full containment or partial containment. Full containment is usually selected as a full-scale remedial action, where, through the appropriate placement of extraction wells, the intent is to fully contain and treat the plume, that is, all groundwater exceeding standards/guidelines will be remediated. Partial containment usually is selected when a groundwater Interim Remedial Measure (IRM) is installed to address the most highly contaminated groundwater, or when full containment is not achievable or warranted, based on a cost-effective determination and there is no significant threat to human health and the environment.

In low permeability soils and bedrock, pneumatic or hydraulic fracturing has been utilized in order to increase the permeability of the soil and bedrock to accelerate the removal of contaminants. However, this is a developing technology, and therefore, will not be considered as part of the presumptive remedies selected for dry cleaner sites.

The following treatment technologies are currently available for ex-situ treatment of groundwater contaminated with volatile organic compounds:

- Air Stripping
- Granular Activated Carbon
- Chemical/ UV Oxidation

Provided below is a discussion of these technologies.

Air Stripping

Air stripping is a means of removing volatile organic compounds from groundwater by placing it into contact with an air stream, which allows the contaminates to migrate into the air stream. Air stripping is an ideal choice when dealing with compounds with a Henry's Law Constant greater than 0.1. In general, air stripping works best on compounds with high volatility and low solubility, although volatility can be increased by heating the influent air stream. Air stripping operations can be configured as counter-current packed towers, shallow tray systems and diffused aeration systems. Counter-current packed towers offer the best removal of VOCs by providing large surface areas, turbulence and an increased driving force for mass transfer and offer a smaller foot print treatment area.

Air stripping is widely used for groundwater remediation due to its 95 to 99 percent removal efficiency. When treating contaminated drinking water supply, a granular activated carbon system is often added as a polishing step to remove VOCs to below detectable levels. Air stripping is a proven technology and is also relatively higher operating cost than granular activated carbon with many vendors supplying systems.

Air stripping does not work well with low volatility, high solubility compounds. Heating the influent air stream helps to improve this deficiency, but increases the operating costs. Steam stripping, a version of air stripping using steam rather than air, is used for the removal of difficult to remove compounds, but the operating costs are high. Because of the high volatility and low solubility of the chemicals associated with dry cleaners, steam stripping and heating of the influent air stream is not required for remediation of groundwater contaminated by dry cleaner sites.

Granular Activated Carbon

Granular activated carbon systems remove organic compounds from contaminated groundwater by adsorption of the contaminant onto the carbon surface. This treatment technology is effective due to the large surface area of the carbon, which allows for high contact time. These systems can be configured as batch, column or fluidized-bed operations with either fixed or counter-current moving carbon beds. Spent carbon from the system can be thermally regenerated either on or off-site or disposed of off-site.

Granular activated carbon systems are widely used due to their 99 percent removal efficiency. These systems provide a high degree of protection, because they significantly reduce the mobility and volume of contaminants in water. A large number of vendors provide the materials, equipment and manpower necessary for the operation of such a system.

A drawback to this system is that the influent stream must contain less than 100 ppm of suspended solids. Often, granular activated carbon systems are used as a polishing step to prevent suspended solids from entering the system. The cost of a system is moderate to high depending strongly on whether it is used as a primary or polishing step. Also polar, low molecular weight and highly soluble compounds are not effectively removed by carbon systems. However, this system is effective for the removal of dry cleaner related contaminants from groundwater.

Chemical/UV Oxidation

Chemical oxidation is a means of breaking down volatile organic compounds by introducing an oxidizer to the groundwater and allowing the contaminants and oxidizer to react. The two primary oxidizers typically chosen are hydrogen peroxide and ozone. Ultraviolet (UV) lights are often added to provide UV radiation which catalyzes the reaction.

Hydrogen peroxide is very effective at breaking down unsaturated molecules which are present in dry cleaning chemicals. Chemical oxidation using ozone is an emerging technology for treatment of groundwater contaminated with VOCs due to the extremely fast kinetics of the reaction. Trichloroethene, which is a breakdown product of PCE, has been reported to have been reduced by 0 zone from 100 ppb to 0.6 ppb with a residence time under a minute with UV lights.

A drawback to this treatment technology is cost. The cost of hydrogen peroxide limits its use to low flow rates and short term remedial actions. Adding UV lights to chemical oxidation systems also increases costs and O&M expenses to above those of other treatment technologies. Chemical oxidation is best used for breaking down organics in dilute aqueous wastes.

In many instances, elevated levels of metals, such as iron and manganese, are also found in groundwater contaminated with VOCs. Elevated levels of metals, in particular iron and manganese, can significantly impact the effectiveness of the VOC removal due to scaling which causes channeling effects in the treatment media and fouling of the treatment system, as well as the groundwater recharge system to which the treated water is discharged. Therefore, metals removal through pre-treatment utilizing filters (e.g., green sand filters) or precipitation (e.g., pH adjustment, or polymers) will also be necessary in certain situations.

VOC treatment systems such as air strippers and chemical oxidation, will also require removal of VOCs from the off-gases generated by the air prior to discharge to the atmosphere, if the emissions exceed NYSDEC Ambient Air Guidelines as defined in the Air Guide-1 Guidelines for the Control of Toxic Ambient Contaminants. Activated carbon or catalytic/thermal destruction techniques could be used to treat the off-gases.

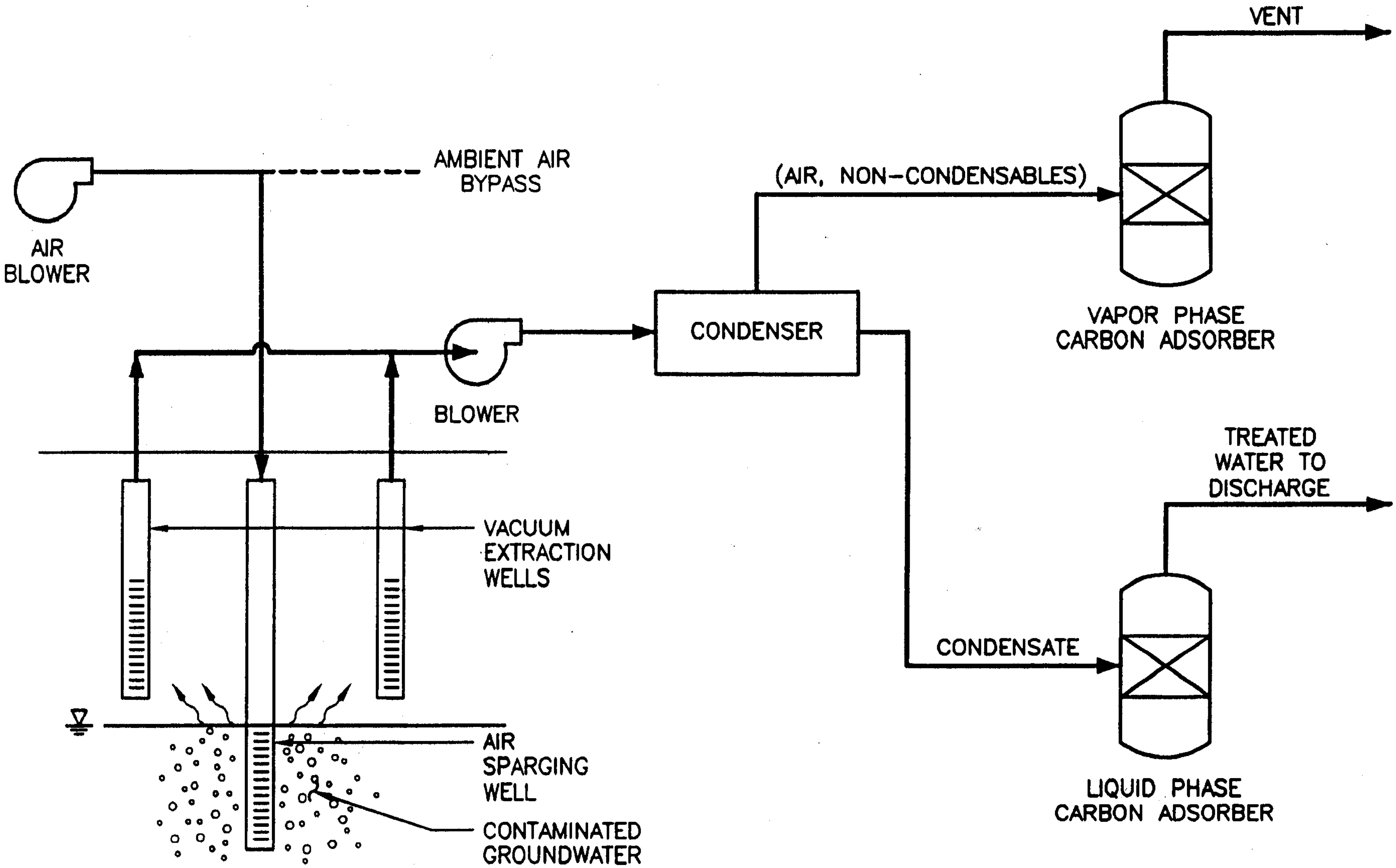
3.2.2.2 - Air Sparging

Air sparging involves the injection of compressed air into the lower portion of the contaminated aquifer. The air percolates up through the contaminated region of the zone of saturation and strips VOCs from the aqueous phase into the vapor phase. By increasing the air flow rate, an increase in the dissolution of the DNAPL residuals trapped in the aquifer can occur. The air sparging system would be used in concert with a soil vapor extraction system. The offgases that leave the saturated zone would be recovered by the SVE system (see Figure 3-4).

Several factors influence the effectiveness of the air sparging system. The aquifer medium must be sufficiently permeable to permit an adequate flow of air and to allow injected air to generate the necessary circulation throughout the zone of contamination. In addition, the soil in the unsaturated zones must be sufficiently homogeneous to allow the vapor released from the groundwater to be adequately controlled and recovered by the SVE system.

Air sparging typically has a shorter remediation period than extraction and treatment due primarily to the influence of residual DNAPL. The increase in dissolution of DNAPL through air sparging decreases the remediation time. However, air sparging is essentially only applicable to shallow groundwater contamination, because the air must come in contact with all of the contaminated groundwater.

Space required for installation of an air sparging system is typically small in size compared to extraction and treatment systems.



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GENERIC WORK PLAN
FOR DRY CLEANER SITES

SCHEMATIC FOR AIR SPARGING SYSTEM

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FIGURE 3-4

3.2.2.3 - No Further Action

For groundwater, the no further action alternative would be utilized in situations where source control activities have been undertaken, and although there may be residual groundwater contamination, the extent may be limited and there is no significant threat to human health or the environment caused by these residuals. This alternative may be applicable where the source area would be remediated, natural attenuation of the contamination would be expected to occur and monitoring would continue, as discussed below. The no further action alternative would not be applicable to sites where there are potential receptors or where natural attenuation is not expected to occur.

3.2.2.4 - Long-Term Monitoring

Long-term monitoring would be applicable to sites where source control/remediation has been conducted, and although groundwater is contaminated, potential downgradient receptors are not currently or anticipated to be impacted by release of contamination from the site. This is particularly relevant to sites when the no further action alternative is selected. In this situation, it may be necessary to monitor the groundwater, and water supply wells, to ensure that the plume does not migrate and impact downgradient receptors. Monitoring would be for the identified contaminants of concern. The typical frequency would be on a quarterly basis for the first 5 years, semiannually for the 6 to 10-year period and annually for the next 20 years. The monitoring locations will be selected on a site-specific basis.

3.2.3 Water Supply Alternative

Provided below is a discussion of water supply alternatives which are considered presumptive remedies for dry cleaner sites.

3.2.3.1 - Extension of Existing Public Water Supply

This alternative would require connecting private residences, commercial and other impacted establishments to the nearest available community or public water supply system. This alternative is a technically implementable technology that would provide for the removal of impacts to potential receptors resulting from contaminated groundwater. It would eliminate the need for the installation, monitoring and maintenance of well head treatment systems for private wells or provision of bottled water in order to protect human health from exposure to contaminated water supply. However, installation of these systems maybe costly depending upon the distance to the existing public water supply and many private well supply systems are not in areas where public water supply systems are available. This alternative would likely include several institutional and administrative issues that would need to be addressed, including the willingness of the water supplier to extend transmission mains.

3.2.3.2 - Public Water Supply Treatment

Similar to provision of treatment systems on private individual wells, treatment systems can be installed on community/public water supply wells to remove volatile organic compounds. For the supply wells, the typical treatment system comprises either air stripping and/or carbon adsorption. Other systems, such as chemical/UV oxidation is not utilized due to lack of operational experience with regard to application on large pumping wells and the high cost associated with these systems. The same benefits and difficulties for air stripper and carbon adsorption system that were discussed in Section 3.2.2.1 for private wells apply to public water supply wells.

3.2.4 Recharge/Discharge Alternatives

Subsequent to treatment of groundwater, the treated water will need to be disposed. Provided below are several alternatives for the disposal of treated groundwater. These alternatives comprise two basis approaches, one being discharge to groundwater and the other being discharged to surface water.

Groundwater discharge would include recharging the extracted treated groundwater into the aquifer upgradient of the contaminant plume. Recharge would take place through injection wells, infiltration galleries or recharge basins. Groundwater would be recharged at the same rate it is extracted.

The use of upgradient aquifer recharge with an extraction and treatment system has several advantages including:

- Enhancement of hydraulic gradient created by the recovery wells;
- Potential reduction in the amount of time required for remediation; and
- Reduction of hydrogeologic influences that the extraction system may have on surrounding wells.

Disadvantages of aquifer recharge include:

- Siting problems with regard to adequate space on site or obtaining access to properties off site for installation of the recharge system; and
- Maintenance associated with the recharge system.

Injection wells, and infiltration galleries and recharge basins are described in more detail below.

Discharge of treated water to surface waters, either directly or via storm water drainage systems has advantages and disadvantages. The disadvantages of discharging to surface waters is that, since there is no groundwater recharge in the vicinity of the extraction wells, surrounding wells may be impacted by the lowering of groundwater levels and the remediation time may be longer due to the elimination of "flushing." Another disadvantage is the loss of the groundwater resource. Although storm water systems are typically readily accessible, at least in more developed/urban areas, it may be difficult to obtain the necessary authorization from the local municipality to discharge to these systems.

For the municipal sanitary system, contaminant discharge requirements are typically less stringent than levels required for discharge to storm water/surface water systems or groundwater, which may result in a less costly groundwater treatment system. In addition, discharge to sanitary system provides for a "backup" treatment system should the system experience treatment difficulties or rapid changes in contaminant concentrations. More detailed discussion of these alternatives is provided below.

3.2.4.1 - Injection Wells

Injection wells consist of a single or series of recharge wells that would allow for discharge of the treated water directly to groundwater. The wells would be constructed in a manner consistent with the extraction wells. The injection wells would be installed to depths similar to the extraction wells in order to ensure recharge of groundwater to the same hydrogeologic unit. However, if appropriate, the wells could be installed to shallower depths to minimize costs. The wells would likely need to be installed on-site unless appropriate access to off-site locations is obtained. Due to the small size of most dry cleaner sites, it may be difficult to locate injection wells on-site and upgradient of the plume of contaminated groundwater. A drawback to use of injection wells is the maintenance required to be sure that the wells maintain the required recharge rate. Injection wells are susceptible to clogging as a result of iron and/or manganese flock or bacteria or air binding. In addition, this discharge method is not typically applicable to areas of high static groundwater table.

3.2.4.2 - Infiltration Gallery

An infiltration gallery consists of a trench filled with crushed stone or gravel, or precast sections which allows for water to infiltrate into the overburden. In general, the gallery would be placed upgradient from the extraction system to assist in the flushing of contaminants from the soil.

As discussed above, this type of recharge system would likely need to be completed on-site unless other arrangements to access off-site properties can be made. Because parcels on which dry cleaners are located are generally small and recharge should take place upgradient of the plume of contaminated groundwater, infiltration galleries may not be suitable as a recharge system. Infiltration galleries may require long term maintenance to provide continued recharge capacity.

3.2.4.3 - Recharge Basin

In addition to infiltration wells and galleries as methods of discharge/recharge to groundwater, recharge basins are also used for discharge of treated water to groundwater. Recharge basins are generally suitable in areas when there are highly permeable soils to promote infiltration to groundwater. Similar to infiltration wells and galleries, to maximize the effectiveness of the overall groundwater treatment system, the recharge basins should be located upgradient of the contaminant plume to increase the hydraulic gradient and promote the flushing of the contaminants. Groundwater treatment systems can either discharge directly to recharge basins or via storm water drainage systems.

Similar to the difficulties in placement of infiltration wells and galleries, and perhaps more so, since recharge basins are open and generally larger, this recharge alternative will likely be difficult to implement due to limited area on the dry cleaner site. Chances for implementation of the discharge to a recharge basin are greater, if the discharge is to an off-site municipal basin. However, as discussed for discharge of treated groundwater to municipal sanitary sewer below, there are a number of technical and administrative issues to be considered, such as the location of the closest drainage system access point and the capacity of the system, as well as the required approval form the municipality to utilize the system. Monitoring and controls may be required to shut down or reduce remediation flow to the basin during rain events.

3.2.4.4 - Municipal Sanitary System

Discharge of treated groundwater to the municipal sanitary system is a reliable and often preferred option, since it provides a measure of redundancy/safety should the groundwater treatment not remove all contaminants to predetermined levels either due to a malfunction or unexpected increase in influent contaminant concentrations. It could also result in less costly groundwater treatment, since discharge requirements are established more as "pre" treatment criteria and require a lesser degree of contaminant removal as compared to treatment to meet groundwater or surface water discharge standards. However, in order to utilize this option, several technical and administrative issues would need to be evaluated including:

- Nearest access point to the existing municipal sanitary system to determine the cost of hook up;
- Capacity of the municipal collection pumping and treatment system to handle the increased flow; and
- Approval from the municipality to discharge to the system.

All of the above listed issues must be addressed prior to selection of this alternative for discharge.

3.2.4.5 - Storm Water System

Extracted, treated groundwater may be discharged to the local storm water drainage system. Storm water systems typically discharge to surface waters, such as rivers and streams, open drainage ditches or recharge basins as discussed above. Since the storm water drainage systems ultimately discharge to surface water or groundwater, discharge to the drainage system would need to meet appropriate surface water and groundwater discharge standards.

All of the technical and administrative issues described for discharge to municipal sanitary systems would also apply to discharge to storm water drainage system. Authorization from the local municipality, evaluation of the capacity of the system and evaluation of the nearest access point must be made prior to selection of this alternative.

3.2.4.6 - Surface Water

If a site is located in the immediate vicinity/adjacent to a surface water body, direct discharge to surface water is a potentially applicable discharge alternative. Similar to discharge to the storm water system, treated water will need to meet the applicable discharge standards for the Classification of the water body to which it is discharged.

3.3 Development and Screening of Alternatives

If it is determined that the above presumptive remedies are not applicable to the specific dry cleaner site, or another remediation technique may be more appropriate and cost-effective, a conventional feasibility study will be performed. As discussed in Section 1.4, the first two phases of the feasibility study are the identification and evaluation of remedial technologies, and development and screening of potentially applicable remedial alternatives.

The Phase I Feasibility Study will identify remedial technologies which could be potentially applicable, taking into account site-specific considerations. As such, this phase includes the following steps:

- Identification and characterization of areas and media requiring remediation based on the results of the Phase I Remedial Investigation;
- Development of remedial action objectives specifying the contaminants and media of concern, exposure pathways and potential receptors, and the cleanup levels necessary to protect human health and the environment;
- Development of general response actions for each exposure pathway;
- Identification of potential remedial technologies, including a description of the technologies and a discussion of applicability to the site. In this step, technologies

which are not technically viable and cannot be implemented at the site will be eliminated from further consideration.

Development of remedial action objectives includes medium-specific or operable unit-specific goals for protecting human health and the environment. The goals will consider the contaminants and contaminant concentrations (as determined by the remedial investigation), the exposure routes and receptors (as determined by the human health risk and environmental assessment), and the acceptable residual/remaining contamination, or risk levels or range of levels. Acceptable contaminant or risk levels include selected SCGs, which will be identified and compared to existing conditions on the site as part of the Phase I Remedial Investigation.

Development of general response actions includes identification of classes of response actions which could be implemented for remediation of waste, soil, sediment and groundwater. Potential general response actions include no action, containment, on-site and in-situ treatment, and removal and off-site treatment and/or land disposal. According to the NYSDEC TAGM 4030 - Selection of Remedial Actions at Inactive Hazardous Waste Sites, the hierarchy of preferred remedial actions, from most desirable to least desirable, are destruction technologies, separation treatment technologies, solidification/chemical fixation technologies, and control and isolation technologies.

Potentially applicable remedial technologies will be identified and prescreened for each general response action. Selection of technologies will be based on the findings of the remedial investigation and the risk/environmental assessment, including the types and concentrations of contaminants, and surface and subsurface site-specific features, including local geology and hydrogeology. Technologies which are obviously not applicable, based on technical effectiveness and implementability, will be eliminated from further consideration in the screening process. Remaining technologies will be carried forward to the development of remedial alternatives in the Phase II Feasibility Study.

Following development of the alternatives, which could comprise a single technology or combination of technologies, such as combining soil excavation and removal with groundwater extraction and treatment, the Phase II Feasibility Study will also include a preliminary evaluation of effectiveness and implementability. Effectiveness evaluation will include consideration of the following:

1. Potential effectiveness of process options in handling the estimated areas or volumes of media, and meeting the remediation goals identified by the remedial action objectives;

2. Potential impacts to human health and the environment during the construction and implementation phase; and

3. Proven operation and reliability of the process with respect to the contaminants and conditions at the site.

Implementability will include both the technical and administrative feasibility of implementing the alternative. Administrative feasibility will consider institutional factors, such as the ability to obtain necessary permits/approvals for on-site and off-site actions; ability to comply with certain institutional aspects of the SCGs, such as the ability to meet the substantive permit requirements; the commercial availability and capacity of treatment, storage and disposal facilities; and the availability of equipment and skilled labor to implement the remedial technology.

The results of the Phase I/II Feasibility Study screening process will include either a list of technologies or alternatives to be carried forward for detailed evaluation as part of the Phase III Feasibility Study. The need for additional field information, such as aquifer testing and geotechnical data, and/or treatability studies to more effectively evaluate technologies, will also be identified and outlined in the Phase I/II Feasibility Study Report, which will be submitted to the NYSDEC for review and approval prior to proceeding with the Phase II Remedial Investigation and/or Phase III Feasibility Study as described below.

3.4 Detailed Analysis of Alternatives

Following approval, the third phase of the feasibility study will include a detailed analyses of alternatives. The detailed analyses will be performed to provide the information necessary to select a remedial action for the site. The remedial alternatives will be evaluated for seven evaluation criteria as contained in NYSDEC TAGM 4030.

- Short-term impacts and effectiveness;
- Long-Term effectiveness and performance;
- Reduction of toxicity, mobility or volume;
- Implementability;
- Compliance with standards, criteria and guidelines;
- Overall protection of human health and the environment; and
- Cost.

In addition to these seven criteria, the feasibility study will provide:

- Technical evaluation, including performance, reliability, implementability and safety considerations;
- Institutional evaluation assessing those issues outside of the technical evaluation, including concerns of the State, local entities and the public;
- Public health and environmental impact evaluation considering the ability to reduce or maintain low risks, the beneficial and adverse effects of the alternative, and whether the alternative is able to adequately protect human health and the environment in accordance with appropriate New York State Standards, criteria and guidelines; and
- Cost evaluation, including capital costs, operating and maintenance costs, and a present worth analysis.

The feasibility study will provide the rationale and justification for selection of the remedial alternative. The level of detail required will depend upon the type and complexity of the site and selected alternative.

A draft Phase III Feasibility Study Report, including the recommended remedial action for the site, will be provided to NYSDEC for review and approval prior to implementation.

4.0 QUALITY ASSURANCE AND QUALITY CONTROL PLAN

The purpose of this Generic Quality Assurance/Quality Control (QA/QC) Plan is to describe the detailed sample collection and analytical procedures that will ensure high quality, valid data for use in the remedial investigation conducted at dry cleaner sites. If any of the collection procedures, sample analysis or sample matrices are modified for a specific site investigation, detailed information regarding the changes and rationale for the change will be provided in the Site-Specific Work Plan.

4.1 Data Usage

The data generated from the sampling program will be used to determine the nature, extent and source(s) of contamination at the site, prepare a human health risk and environmental assessment, and identify, evaluate and recommend a cost-effective, environmentally sound, long-term remedial action plan. The data will also be utilized to monitor for the health and safety of workers at the site and potential receptors off-site.

4.2 Sampling Program Design and Rationale

The following presents a general discussion of the sampling to be conducted during the remedial investigation.

- Soil Vapor - Soil vapor samples will be collected during the soil vapor survey to locate/confirm the source and extent of contamination on-site.
- Shallow Soil/Water - Shallow soil/water samples will be collected during the shallow soil/water survey to locate the source and extent of contamination on-site.
- Surface Soil - Surface soil samples will be collected on-site to determine the extent of on-site surface soil contamination and to determine if waste disposed on-site has impacted off-site surface soil.
- Sediment/Sludge - Sediment and sludge samples will be collected from dry wells, storm drainage systems and/or wastewater disposal/sanitary systems located on-site, and surface water bodies on and off-site to determine if the wells/systems are a source of

contamination, and to determine if surface water sediment has been impacted by on-site contamination.

- Wastewater/Drainage Water - Waste water and drainage water samples will be collected from dry wells and/or wastewater disposal/sanitary systems located on-site to determine if these wells/systems are a source of contamination.

- Storm Water - Storm water samples will be collected from catch basins and storm drains located on and off-site to determine if the storm water system has been contaminated or is a source of contamination.

- Surface Water - Surface water samples will be collected from surface waters on and off-site to determine if the surface water body has been impacted by the disposal of waste material.

- Subsurface Soil - Subsurface soil samples will be collected during construction of monitoring wells and borings, test pits or at probe locations. Subsurface soil samples will be collected to delineate the extent of on-site contamination.

- Groundwater - Groundwater samples will be obtained from monitoring wells and/or probe or hydropunch sampling devices which will be installed as part of the remedial investigation or from monitoring wells which were installed previously at and in the vicinity of the site. Groundwater samples will be collected to determine if disposal of waste material has impacted groundwater on and off-site.

- Water Supply - Water supply samples will be collected from private water supply systems to determine if these systems are impacted by contamination migrating from the site.

- Air - Ambient air samples will be collected on-site, in particular, during different phases of subsurface investigation to determine potential exposure to vapor emissions during field activities.

For a detailed discussion of the sampling program, and selection of sample matrices and locations, see the Field Operation and Investigation Plan (Section 2.0). Site-Specific descriptions of sampling matrices and locations will be provided in the Site-Specific Work Plan.

4.3 Analytical Parameters

Analysis for groundwater, drainage water, storm water, surface water, ambient air and soil vapor samples will consist of the Target Compound List (TCL) +10 volatile organic compounds identified in the 1991 New York State Department of Environmental Conservation (NYSDEC) Analytical Services Protocol (ASP). Groundwater samples may also be analyzed for iron and manganese for evaluating treatment systems. Analysis of surface soil, subsurface soil, sediment and sludge samples will consist of TCL +10 volatile organic compounds and total organic carbon identified in the 1991 NYSDEC ASP.

Both shallow soil and shallow groundwater samples will be analyzed for select volatile organics by headspace utilizing a portable gas chromatograph (GC).

Table 4-1 presents a summary of the parameters/sample fraction to be monitored together with the sample location, type of sample, sample matrix, type of sample container, method of sample preservation, holding time and analytical method.

4.4 Data Quality Requirements and Assessment

Data quality requirements and assessments are provided in the 1991 NYSDEC ASP, which includes the detection limit for each parameter and sample matrix. Note that quantification limits, estimated accuracy, accuracy protocol estimate precision and precision protocol are determined by the laboratory and will be in conformance with the requirements of the 1991 NYSDEC ASP, where applicable. Table 4-2 presents a summary of the data quality requirements.

In addition to meeting the requirements provided in the 1991 NYSDEC ASP, the data must also be useful in evaluating the nature, extent and impact of contamination. Data obtained during the remedial investigation will be compared to specific Standards, Criteria and Guidelines (SCGs) as discussed in Section 1.2.4 of this Work Plan. The SCGs to be utilized include:

Matrix	SCG
Groundwater, Surface Water and Drinking Water	Division of Water Technical and Operational Guidance Series (TOGs) (1.1.1) - Ambient Water Quality Standards and Guidance Values, dated October 1993.
Surface and Subsurface Soil	NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046 for the Determination of Soil Cleanup Objectives and Cleanup Levels, dated January 1994.

Table 4-1

SUMMARY OF ANALYTICAL PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Type/Size/No.	Container Preservation	Sample Holding Time	Maximum Analytical Method
On-site	Grab	Soil Vapor	Volatile Organics	Gas Tight Syringe	Cool to 4°C	24 hours	Portable GC* USEPA Method 601
	Grab	Soil Vapor	Volatile Organics	Sorbent Tube	Cool to 4°C	7 days from VTSR	USEPA/600/4-89/017 Method T01/T02

*GC: Gas Chromatograph.

VTSR - Verified time of sample receipt at the laboratory

Table 4-1 (continued)

SUMMARY OF ANALYTICAL PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Type/Size/No.	Container Preservation	Sample Holding Time	Maximum Analytical Method
On-site	Grab	Surface Soil	Volatile Organics	Glass, clear/ 40 ml/2 ICHEM 200 series or equivalent	Cool to 4°C	7 days after VTSR for analysis	1991 NYSDEC ASP, Method 91-1
	Grab	Surface Soil	Total Organic Carbon	Glass, amber/ 150 ml/1 ICHEM 200 series or equivalent	Cool to 4°C	26 days after VTSR for analysis	1991 NYSDEC ASP, Method 415.1

VTSR - Verified time of sample receipt at the laboratory

Table 4-1 (continued)

SUMMARY OF ANALYTICAL PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Type/Size/No.	Container Preservation	Sample Holding Time	Maximum Analytical Method
On-site Shallow Excavations	Grab	Shallow Soil	Volatile Organics	Glass, clear/ 40 ml/2 ICHEM 200 series or equivalent	Cool to 4°C	7 days after VTSR for analysis	Headspace by portable GC* USEPA Method 601

*GC: Gas Chromatograph

VTSR - Verified time of sample receipt at the laboratory

Table 4-1 (continued)

SUMMARY OF ANALYTICAL PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Container Type/Size/No.	Preservation	Sample Holding Time	Maximum Analytical Method
Dry Wells, Waste Water Disposal/ Sanitary Systems or Storm Drains	Grab	Sediment/Sludge	Volatile Organics	Glass, clear/ 40 ml/2 ICHEM 200 series or equivalent	Cool to 4°C	7 days after VTSR for analysis	1991 NYSDEC ASP, Method 91-1
	Grab	Sediment/Sludge	Total Organic Carbon	Glass, amber/ 150 ml/1 ICHEM 200 series or equivalent	Cool to 4°C	26 days after VTSR for analysis	1991 NYSDEC ASP, Method 415.1

VTSR - Verified time of sample receipt at the laboratory

Table 4-1 (continued)

SUMMARY OF ANALYTICAL PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Type/Size/No.	Container Preservation	Sample Holding Time	Maximum Analytical Method
Surface Water	Grab	Sediment	Volatile Organics	Glass, clear/ 40 ml/2 ICHEM 200 series or equivalent	Cool to 4°C	7 days after VTSR for analysis	1991 NYSDEC ASP, Method 91-1
	Grab	Sediment	Total Organic Carbon	Glass, amber/ 150 ml/1 ICHEM 200 series or	Cool to 4°C	26 Days after VTSR for analysis	1991 NYSDEC ASP, Method 415-1

VTSR - Verified time of sample receipt at the laboratory

Table 4-1 (continued)

SUMMARY OF ANALYTICAL PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Container Type/Size/No.	Preservation	Sample Holding Time	Maximum Analytical Method
Wastewater Disposal/ Sanitary Systems	Grab	Wastewater	Volatile Organics	Glass, clear/ 40 ml/3 ICHEM 300 series or equivalent	Cool to 4°C	7 days after VTSR for analysis	1991 NYSDEC ASP, Method 91-1

VTSR - Verified time of sample receipt at the laboratory

Table 4-1 (continued)

SUMMARY OF ANALYTICAL PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Type/Size/No.	Container Preservation	Sample Holding Time	Maximum Analytical Method
Storm Drains/ Dry Wells	Grab	Storm Drainage Water	Volatile Organics	Glass, clear/	Cool to 4°C 40 ml/3 ICHEM 300 series or equivalent	7 days after VTSR for analysis	1991 NYSDEC ASP, Method 91-1

VTSR - Verified time of sample receipt at the laboratory

Table 4-1 (continued)

SUMMARY OF ANALYTICAL PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Type/Size/No.	Container Preservation	Sample Holding Time	Maximum Analytical Method
Surface Water	Grab	Surface Water	Volatile Organics	Glass, clear/	Cool to 4°C 40 ml/3 ICHEM 300 series or equivalent	7 days after	1991 NYSDEC ASP, VTSR for Method 91-1 analysis

VTSR - Verified time of sample receipt at the laboratory

Table 4-1 (continued)

SUMMARY OF ANALYTICAL PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Type/Size/No.	Container Preservation	Sample Holding Time	Maximum Analytical Method
Monitoring Wells, Soil Borings, Probe Locations or Test Pits	Grab	Subsurface Soil	Volatile Organics	Glass, clear/ 40 ml/2 ICHEM 200 series or equivalent	Cool to 4°C	7 days after VTSR for analysis	1991 NYSDEC ASP, Method 91-1
	Grab	Subsurface Soil	Total Organic Carbon	Glass, amber/ 150 ml/1 ICHEM 200 series or equivalent	Cool to 4°C	26 days after VTSR for analysis	1991 NYSDEC ASP, Method 415.1

VTSR - Verified time of sample receipt at the laboratory

Table 4-1 (continued)

SUMMARY OF ANALYTICAL PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Type/Size/No.	Container Preservation	Sample Holding Time	Maximum Analytical Method
Monitoring Wells and Hydropunch/ Probe Locations	Grab	Groundwater	Volatile Organics	Glass, clear/ 40 ml/3 ICHEM 300 series or equivalent	Cool to 4°C	7 days after VTSR for analysis	1991 NYSDEC ASP, Method 91-1
	Grab	Groundwater	Metals	Plastic/1L/1 ICHEM 300 series or equivalent	HNO_3 to pH <2 Cool to 4°C	6 months after VTSR for analysis of others	1991 NYSDEC ASP, Method 200.7*

*Analysis for iron and manganese only, for treatment purposes.

VTSR - Verified time of sample receipt at the laboratory

Table 4-1 (continued)

SUMMARY OF ANALYTICAL PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Type/Size/No.	Container Preservation	Sample Holding Time	Maximum Analytical Method
Water Supply Wells	Grab	Drinking Water	Volatile Organics	Glass, clear/ 40 ml/3 ICHEM 300 series or equivalent	Cool to 4°C	7 days after VTSR for analysis	1991 NYSDEC ASP, Method 91-4

VTSR - Verified time of sample receipt at the laboratory

Table 4-1 (continued)

SUMMARY OF ANALYTICAL PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Type/Size/No.	Container Preservation	Sample Holding Time	Maximum Analytical Method
Shallow Excavations	Grab	Groundwater	Volatile Organics	Glass, clear/ 40 ml/3 ICHEM 300 series or equivalent	Cool to 4°C	7 days after VTSR for analysis	Headspace by portable GC* Method 601

*GC: Gas Chromatograph

VTSR - Verified time of sample receipt at the laboratory

Table 4-1 (continued)

SUMMARY OF ANALYTICAL PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Type/Size/No.	Container Preservation	Sample Holding Time	Maximum Analytical Method
On-Site	Composite	Ambient Air	Volatile Organics	Sorbent Tube	Cool to 4°C	7 days after VTSR for analysis	EPA/600/4-89/017 Method T01/T02

VTSR - Verified time of sample receipt at the laboratory

Table 4-1 (continued)

SUMMARY OF ANALYTICAL PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Type/Size/No.	Container Preservation	Sample Holding Time	Maximum Analytical Method
Site/Study Area	Trip Blank	Water	Volatile Organics	Glass, clear/ 40 ml/1 ICHEM 300 series or equivalent	Cool to 4°C	7 days after VTSR for analysis	1991 NYSDEC ASP, Method 91-1

VTSR - Verified time of sample receipt at the laboratory

Table 4-1 (continued)

SUMMARY OF ANALYTICAL PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Container Type/Size/No.	Preservation	Sample Holding Time	Maximum Analytical Method
Site/Study Area	Drill Water	Water	Volatile Organics	Glass, clear/ 40 ml/1 ICHEM 300 series or equivalent	Cool to 4°C	7 days after VTSR for analysis	1991 NYSDEC ASP, Method 91-1

VTSR - Verified time of sample receipt at the laboratory

Table 4-1 (continued)

SUMMARY OF ANALYTICAL PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Type/Size/No.	Container Preservation	Sample Holding Time	Maximum Analytical Method
Site/Study Area	Blank	Ambient Air	Volatile Organics	Sorbent Tube	Cool to 4°C	7 days after VTSR for analysis	EPA/600/4-89/017 Method T01/T02

VTSR - Verified time of sample receipt at the laboratory

Table 4-1 (continued)

SUMMARY OF ANALYTICAL PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Type/Size/No.	Container Preservation	Sample Holding Time	Maximum Analytical Method
Site/Study Area	Matrix Spike/ Matrix Spike Duplicate	Groundwater/ Drainage Water/ Wastewater	Volatile Organics	Glass, clear/ 40 ml/1 ICHEM 300 series or equivalent	Cool to 4°C	7 days after VTSR for analysis	1991 NYSDEC ASP Method 91-1
	Matrix Spike/ Matrix Spike Duplicate	Groundwater	Metals	Plastic/IL/1 ICHEM 300 series or equivalent	HCl to pH <2 Cool to 4°C	6 months after VTSR for analysis	1991 NYSDEC ASP Method 200.7*

*Analyses for iron and manganese only, for treatment purposes.

VTSR - Verified time of sample receipt at the laboratory

Table 4-1 (continued)

SUMMARY OF ANALYTICAL PARAMETERS

Sample Location	Sample Type	Sample Matrix	Sample Fraction	Type/Size/No.	Container Preservation	Sample Holding Time	Maximum Analytical Method
Site/Study Area	Matrix Spike/ Matrix Spike Duplicate	Soil	Volatile Organics	Glass, clear/ 4 oz/l ICHEM 200 series or equivalent	Cool to 4°C	7 days after VTSR for analysis	1991 NYSDEC ASP Method 91-1
	Matrix Spike/ Matrix Spike Duplicate	Soil	Total Organic Carbon	Glass, amber/ 150 ml/l ICHEM 200 series or equivalent	Cool to 4°C	26 days after VTSR for analysis	1991 NYSDEC ASP Method 415.1

VTSR - Verified time of sample receipt at the laboratory

Table 4-2

DATA QUALITY REQUIREMENTS

Parameter	Sample Matrix	CRDL* (ug/l)	Estimated Accuracy	Accuracy Protocol	Estimated Precision	Precision Protocol
Volatile Organics	Liquid Solid	10 10	0.87 - 1.18 ug/l	Vol. IV, Part XIX, Method 8240, Table 7	0.11 - 0.84 ug/l	Vol. IV, Part XIX, Method 8240, Table 7
Metals	Liquid	0.2-5000	--	Vol. III, Part XIV, Method 200.7**, Table 4	--	Vol. III, Part XIV, Method 200.7*** Table 4
Total Organic Carbons	Solid	1mg/kg	+0.75	Vol. VI, Part XXIV, Method 415.1, Subpart 9	3.93 - 8.32 mg/kg	Vol. VI, Part XXIV, Method 415.1, Subpart 9

*Contract Required Detection Limits.
**Reference: NYSDEC 12/91 ASP.
***Analysis for iron and manganese only.

Table 4-2 (continued)

DATA QUALITY REQUIREMENTS
OBJECTIVES FOR PRECISION, ACCURACY, AND COMPLETENESS

Matrix/Parameter	Precision (%)[c]	Accuracy (%)
Soil		
VOCs[a]	See Table 4-2a	See Table 4-2a
Total Organic Carbon	± 25 percent	75 - 125 percent
Water		
VOCs[a]	See Table 4-2a	See Table 4-2a
Metals[b]	± 25 percent	75 - 125 percent

NOTES:

(a) Accuracy will be determined as percent recovery of surrogate spike compounds and matrix spike compounds. Surrogate and matrix spike compounds for VOCs are listed in Table 4-2a. Precision will be estimated as the relative standard deviation of the percent recoveries per matrix.

(b) Accuracy will be determined as percent recovery of matrix spikes when appropriate or the percent recovery of a QC sample if spiking is inappropriate. Precision will be determined as relative percent difference of matrix spike duplicate samples, or duplicate samples if spiking is inappropriate.

(c) Precision will be determined as the average percent difference for replicate samples. Accuracy will be determined as the percent recovery of matrix spike samples or laboratory control samples, as appropriate.

Source: 1991 NYSDEC ASP

Table 4-2a

DATA QUALITY REQUIREMENTS
ACCURACY REQUIREMENTS FOR VOCS

	Spike Recovery Limits (%)	
	Water	Low/Medium Soil
Surrogate Compound		
Toluene-d8	88-110	84-138
4-Bromofluorobenzene	86-115	59-113
1,2-Dichloroethane-d4	76-114	70-121
Matrix Spike Compound		
1,1-Dichloroethene	61-145	59-172
Trichloroethane	71-120	62-137
Chlorobenzene	75-130	60-133
Toluene	76-125	59-139
Benzene	76-127	66-142

Source: NYSDEC ASP

Matrix	SCG
Sediment	NYSDEC Division of Fish and Wildlife Technical Guidance for Screening Contaminated Sediment, dated November 1993.
Air	Draft New York State Air Guide - 1, Guidelines for the Control of Toxic Ambient Air Contaminants, dated 1991.*

* Including Complete and HAP Listings, AGCs, SGCs and Air Quality Standards for the Air Guide-1 Software Program.

TCL volatile organic analyses by Method 91-1 will be appropriate for analysis of groundwater, surface water, surface and subsurface soil, and sediment. However, for analysis of drinking water, Method 91-4 will be utilized to obtain the appropriate detection limits to meet local Department of Health standards.

For shallow soil, groundwater and soil vapor samples, select volatile organics will be analyzed for utilizing a portable GC and USEPA Method 601. The water and soil samples will be analyzed via headspace. The standard operating procedures (SOP) for the portable GC and headspace analysis will be provided with the site-specific work plan.

The methods of analysis will be in accordance with the 1991 NYSDEC ASP. Specific analytical procedures and laboratory QA/QC descriptions are not included in this QA/QC Plan, but will be available upon request from the laboratory selected to perform the analyses. The laboratory will be New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) certified for organic and inorganic analyses and also be NYSDOH Contract Laboratory Protocol (CLP) certified.

4.4.1 Data Representativeness

Representative samples will be collected as follows:

- Soil Vapor - Samples will be collected from decontaminated stainless steel or dedicated polyethylene tubing soil probes after the soil vapor has reached equilibrium. Samples will be collected using a personal sampling pump and dedicated gas tight syringe or sorbent tube. See Section 4.5.3, Soil Vapor Collection Procedures.

- Shallow Soil/Water - Soil samples will be collected from a dedicated polystyrene scoop and shallow water samples will be collected directly from the open excavation.

- Surface Soil - Samples will be collected at a depth of 0-3 inches using a dedicated polystyrene scoop or sterile wooden tongue depressor.

- Sediment (Dry Well/Drainage System) - Samples will be collected from the center of the dry well, wastewater disposal/sanitary system, or catch basin and storm drain (if possible) after the drainage/storm water sample is obtained in order not to introduce sediment into the water column. Samples will be collected utilizing a decontaminated polyethylene long handle scoop (if possible) or from a soil probe or split spoon sampler.

- Sediment (Surface Water) - Samples will be collected in the area of the surface water samples 0 to 3 inches below the sediment surface after the surface water sample is obtained in order not to introduce sediment into the water column. Samples will be collected with a decontaminated long handle polyethylene scoop.

- Wastewater/Drainage Water - Samples will be collected from the center of the wastewater disposal/sanitary system (if possible) and at a depth of 6 inches below the surface of standing water (if possible) using a dedicated polyethylene bailer or decontaminated polyethylene long handle scoop.

- Storm Water - Samples will be collected from the center of the drainage system or storm drain (if possible) at a depth of 6 inches below the surface of standing water (if possible) using a dedicated polyethylene bailer or decontaminated polyethylene scoop.

- Surface Water - Samples will be collected from the center of the surface water body cross section (if possible) and at mid-depth or at a minimum of 6 inches below the surface of the water (if possible) in the vicinity of the surface drainage discharge point. Samples will be collected using a dedicated polyethylene bailer or scoop.

- Subsurface Soil (Test Pits) - Samples will be collected from the bucket of the backhoe using a dedicated polyethylene scoop or sterile wooden tongue depressor.

- Subsurface Soil (Monitoring Well/Soil Boring) - Samples will be collected using a decontaminated steel split spoon sampler during monitoring well or soil boring construction.

- Subsurface Soil (Probe) - Samples will be collected using a decontaminated screen point sampler and dedicated acetate tube liner.

- Groundwater (Probe) - Samples will be collected immediately upon installation of the probe using dedicated polyethylene tubing equipped with a bottom check valve.
- Groundwater (Hydropunch) - Samples will be collected immediately upon installation of the hydropunch screen using a dedicated polyethylene small diameter bailer.
- Groundwater (Monitoring Well) - Samples will be collected with a dedicated polyethylene bailer after the monitoring well has been purged of three to five well casing volumes until field measurements for pH, conductivity, temperature and turbidity have stabilized, or until the well is purged dry (whichever comes first) and the well has been allowed to recharge.
- Water Supply - Samples will be collected from the water supply wells, from an accessible point prior to any treatment systems (if possible) and will be collected directly into the sample container.
- Air - Samples will be collected using a dedicated sorbent tube and sampling pump.
- Equipment Calibration - Field equipment used for air monitoring will be calibrated daily before use according to the manufacturer's procedures.
- Equipment Decontamination - Nondedicated sampling equipment will be decontaminated prior to use at each location according to the procedures described in Section 4.6 of this QA/QC Plan.

4.4.2 Data Comparability

All data will be presented in the units designated by the methods specified by a NYSDOH ELAP and CLP certified laboratory, and the 1991 NYSDEC ASP. In addition, sample locations, collection procedures and analytical methods from earlier studies will be evaluated for comparability with current procedures/methods.

4.4.3 Data Completeness

The acceptability of 100% of the data is desired as a goal for this project. The acceptability of less than 100% complete data, meeting all laboratory QA/QC protocols/standards, will be evaluated on a case-by-case basis.

4.5 Detailed Sampling Procedures

Nine types of environmental samples will be collected from different locations as part of the remedial investigation. These include groundwater, wastewater, storm water, surface water, sediment/sludge, subsurface soil, surface soil, soil vapor and ambient air. Sample locations will consist of monitoring wells, water supply wells, dry wells, wastewater disposal/sanitary systems, probe locations, hydropunch locations, storm water drainage systems, surface water bodies, soil borings, surface soils, test pits, soil vapor points and ambient air. Actual locations will be described in the Site-Specific Work Plan.

General sampling approaches and equipment are described in this section. A summary of the remedial investigation sampling program, including sample media, depths, equipment, rationale and analytical parameters is provided in Table 4-3.

When taking soil samples, an attempt will be made to maintain sample integrity by preserving its physical form and chemical composition to as great an extent as possible. An appropriate sampling device (i.e., decontaminated or dedicated equipment) will be utilized to transfer the sample into the sample container. The sample will reflect and contain a good representation of the matrix from which it was collected.

The sample will be transferred into the sample bottle as quickly as possible, with no mixing, to ensure that the volatile fraction is not lost.

The materials involved in groundwater sampling are critical to the collection of high quality monitoring information, particularly where the analyses of volatile, pH sensitive or reduced chemical constituents are of interest. The materials for bailers and pump parts will be PTFE (e.g., Teflon^{R}) stainless steel and/or polyethylene.

Table 4-3

SUMMARY OF SAMPLING PROGRAM

Environmental Media	Sample Location	Sample Point	Sample Depth	Equipment	Rationale	Sample Analysis
Soil Vapor	On-site	Soil vapor survey point	3 feet below soil surface	Decontaminated or disposable soil vapor rods/ tubing , sorbent tube or gas tight syringe and personal sampling pump	To determine soil contamination	TCL volatile parameters EPA 600/4-89/017 or select VOCS by Portable GC (EPA Method 601)
Shallow Soil	On-site	Throughout site	Bottom of shallow excavation	Disposable polyethylene scoop	To determine soil contamination	Select VOCs by portable GC (EPA Method 601)
Surface Soil	On-site	Throughout site	0-3 inches below soil surface	Disposable polyethylene scoop and/or sterile wooden tongue depressor	To determine surface soil contamination	TCL Volatile Organics Total Organic Carbon 1991 NYSDEC ASP
Sediment/Sludge	On-site and off-site	Dry well/catch basin/wastewater/ sanitary system/storm drain and surface water body	0-6 inches below sediment surface	Decontaminated polyethylene scoop or split spoon sampler	To determine sediment contamination	TCL Volatile Organics Total Organic Carbon 1991 NYSDEC ASP
Wastewater	On-site	Wastewater/ Sanitary System	6 inches below water surface	Decontaminated long handle polyethylene scoop or polyethylene bailer	To determine drainage wastewater contamination	TCL Volatile Organics 1991 NYSDEC ASP
Drainage/Storm Water	On-site	Dry well/catch basin/ storm drain	6 inches below water surface	Decontaminated long handle polyethylene scoop or polyethylene bailer	To determine storm water contamination	TCL Volatile Organics 1991 NYSDEC ASP
Surface Water	On-site and off-site	Surface water	6 inches below water surface	Decontaminated long handle polyethylene scoop	To determine surface water contamination	TCL Volatile Organics 1991 NYSDEC ASP
Subsurface Soil	On-site	Test Pits	Dependent on visual charac-teristics and total organic vapor field screening	Decontaminated backhoe bucket, disposable polyethylene scoop and sterile wooden tongue depressor	To determine subsurface soil contamination	TCL Volatile Organics Total Organic Carbon 1991 NYSDEC ASP

Table 4-3 (continued)

SUMMARY OF SAMPLING PROGRAM

Environmental Media	Sample Location	Sample Point	Sample Depth	Equipment	Rationale	Sample Analysis
Subsurface Soil	On-site and off-site	Monitoring well borehole/soil boring	Dependent on visual characteristics and total organic vapor field screening	Auger, decontaminated split spoon and sterile wooden tongue depressor	To determine subsurface soil contamination	TCL Volatile Organics Total Organic Carbon 1991 NYSDEC ASP
Subsurface Soil	On-site and off-site	Probe Location	Dependent on visual characteristics and total organic vapor field screening	Decontaminated probe and polyethylene tube liner	To determine subsurface soil contamination	TCL Volatile Organics Total Organic Carbon 1991 NYSDEC ASP
Groundwater	On-site and off-site	Probe Location	At surface of water in probe	Disposable polyethylene tubing with bottom check valve	To determine groundwater contamination	TCL Volatile Organics TCL Metals (iron and manganese only) 1991 NYSDEC ASP
Groundwater	On-site and off-site	Hydropunch	At surface of water in screen	Disposable polyethylene - small diameter bailer	To determine groundwater contamination	TCL Volatile Organics TCL Metals (iron and manganese only) 1991 NYSDEC ASP
Groundwater	On-site and off-site	Monitoring well	At surface of water in well	Disposable polyethylene bailer (after purge of three well volumes)	To determine groundwater contamination	TCL Volatile Organics TCL Metals (iron and manganese only) 1991 NYSDEC ASP
Shallow Groundwater	On-site	Shallow Excavation	At surface of water in excavation	Disposable polyethylene scoop	To determine groundwater contamination	Select Volatile Organics by portable GC (EPA Method 601)
Water Supply	Private residences and commercial establishments	Prior to treatment system, if possible, or from faucet	NA	Sample container directly after running water for 5 minutes	To determine water supply contamination	TCL Volatile Organics 1991 NYSDEC ASP

Table 4-3 (continued)

SUMMARY OF SAMPLING PROGRAM

Environmental Media	Sample Location	Sample Point	Sample Depth	Equipment	Rationale	Sample Analysis
Air	On-site and off-site	Ambient Air	Breathing Zone	Personal sampling pump and dedicated sorbent tube	To determine air contamination and worker exposure	TCL Volatile Organics EPA 600/4-89/017
Air	On-site and off-site	Drilling and sample locations	In the breathing zone and at point of sample collection	Photoionization and/or flame ionization detector	To screen for air contamination	Total organic vapors

NA - Not applicable.

There will be several steps taken after the transfer of the soil or water sample into the sample container that are necessary to properly complete collection activities. Once the sample is transferred into the appropriate container, the container will be capped and, if necessary, the outside of the container will be wiped with a clean paper towel to remove excess sampling material. The container will not be submerged in water in an effort to clean it. Rather, if necessary, a clean paper towel moistened with distilled/deionized water will be used.

The sample container will then be properly labeled. Information such as sample number, location, collection time and sample description will be recorded in the field log book. Associated paper work (e.g., Chain of Custody forms) will then be completed and will stay with the sample. The samples will be packaged in a manner that will allow the appropriate storage temperature to be maintained during shipment to the laboratory. Samples will be delivered to the laboratory within 48 hours of collection.

4.5.1 Sample Identification

All samples collected will be labeled with a sample identification code. The code will identify the site, sample location, sample matrix and series numbers for sample locations with more than one sample. Samples will be labeled according to the following system:

- Site: - Site name (i.e., Hazardous Waste "HW")
- Sample Location:
  - Soil Boring "SB"
  - Monitoring Well "MW"
  - Water Supply "WS"
  - Dry Well "DW"
  - Surface Soil "SS"
  - Surface Water "SW"
  - Hydropunch "H"
  - Probe "P"
  - Test Pit "TP"
  - Storm Drain "SD"
  - Sanitary System Leaching Pool "LP"
  - Sanitary System Septic Tank "ST"
  - Soil Vapor "SV"
  - Ambient Air "AA"
  - Shallow Excavation "SE"

- Sample Matrix:
  - Soil "S"
  - Sediment "SD"
  - Sludge "SL"
  - Groundwater "GW"
  - Drainage Water/Storm Water "DW"
  - Surface Water "SW"
  - Wastewater "WW"
  - Air "A"
  - Soil Vapor "SV"
  - Tap Water "TW"

- Sample Number:
  - For circumstances where more than one sample of the same type and/or from the same location will be collected, a consecutive sample number will be assigned. When more than one sample is collected from a borehole in a sampling round at different depths, the depth will be indicated on the sample container and in the field log book.

- Quality Assurance/ Quality Control (QA/QC):
  - Matrix Spike "MS"
  - Matrix Spike Duplicate "MSD"
  - Field Blank "FB"
  - Trip Blank "TB"
  - Drill Water "DW"

Based upon the above sample identification procedures, an example of a sample label may be:

Site — Sample Location — QA/QC

HW-SB-S-1-(5) - MS

Sample Matrix — Sample Number — Sample Depth

4.5.2 Sample Handling, Packaging and Shipping

All samples will be placed in the appropriate containers as specified in the 1991 NYSDEC ASP. The holding time criteria identified in the ASP will be followed as specified in Table 4-1.

Prior to packaging any samples for shipment, the sample containers will be checked for proper identification and compared to the field log book for accuracy. The samples will then be wrapped with a cushioning material and placed in a cooler (or laboratory shuttle) with a sufficient amount of bagged ice or "blue ice" packs in order to keep the samples at 4°C until arrival at the laboratory.

All necessary documentation required to accompany the sample during shipment will be placed in a sealed plastic bag and taped to the underside of the cooler lid. The cooler will then be sealed with fiber (duct) or clear packing tape, and custody seals will be placed in such a manner that any opening of the cooler prior to arrival at the laboratory can be detected.

All samples will be shipped to ensure laboratory receipt within 48 hours of sample collection in accordance with NYSDEC requirements. The laboratory will be notified prior to the shipment of the samples.

4.5.3 Soil Vapor

1. Be certain that the sample location is noted on Location Sketch (see Section 4.20).
2. Drive the decontaminated stainless steel probe with removable inner rod into the ground to the desired depth.
3. Remove inner rod and immediately replace with a stainless steel cap equipped with a sampling port.
4. Connect new silicon tubing to the probe and the personal sampling pump. Turn on pump. Allow the pump to run until the soil vapor within the probe has reached equilibrium.*
5. Collect a 10 μl vapor sample using a gas tight syringe and inserting it into the silicon tubing. Transport sample to the portable gas chromatograph (GC) analyst.
6. Shut off pump and disconnect tubing.
7. Extract probe from the ground and decontaminate according to the procedures in Section 4-6.

   *In order to establish how long it takes for the soil vapor to reach equilibrium in the probe, two approaches can be utilized:

a. Once the pump is turned on, collect a sample every one to two minutes and analyze on the portable GC. Continue to collect samples until two consecutive samples yield comparable results. Do this at two or three locations in order to establish a pumping time.

b. Instead of using a personal sampling pump, attach the silicon tubing to the probe and a PID or FID. Once a steady reading is obtained, the system is considered to be in equilibrium. (Not recommended if low levels of volatile organic vapors are present (i.e., <1 ppm)).

4.5.4 Shallow Soil/Water

1. Be certain that the sample location is noted on Location Sketch (see Section 4.20).

2. Be certain that the sampling equipment, including the shovel or stainless steel scoop, is decontaminated utilizing the procedures outlines in Section 4.6.

3. Remove laboratory precleaned sample containers from sample cooler, label container with indelible marker, fill out Sample Information Record.

4. Dig/scoop out soil to desired depth (0.5 to 1.5 feet), set aside.

5. If water is present, collect a water sample using a disposable scoop or filling the bottle directly by lowering into the water. Replace the container cover. If water is not present, sample the soil at the bottom of the excavation using a disposable scoop, place into the open sample containers and replace the container covers.

6. Transfer the sample to the field GC analyst for analysis.

7. Backfill excavation with the removed soils which was set aside as the top layer.

8. If reusable, decontaminate the sampling equipment according to the procedures described in Section 4.6.

9. Place all disposable personal protective equipment and disposable sampling equipment into a 55-gallon drum and store in a secure area (fenced, if possible).

4.5.5 Soil (Surface)

1. Be certain that the sample location is noted on Location Sketch (see Section 4.20).

2. If a dedicated sampling device is not used, be certain that the sampling equipment has been decontaminated utilizing the procedures outlined in Section 4.6.

3. Remove laboratory precleaned sample container from sample cooler, label container with an indelible marker, fill out Sample Information Record and Chain of Custody Form (see Section 4.8).

4. At the sample location, clear surface debris (e.g., vegetation, rocks, twigs, etc.). Collect an adequate amount of soil from a depth of 0 to 3 inches using a decontaminated or disposable scoop and/or sterile wooden tongue depressor. Transfer the sample directly into the sample container.

5. Return the sample container to the cooler.

6. If reusable, decontaminate the sampling equipment according to the procedures described in Section 4.6.

7. Place all disposable personal protective equipment and disposable sampling equipment into a 55 gallon drum and store in a secure area (fenced, if possible).

4.5.6 Sediment (Dry Wells, Catch Basins, Wastewater Disposal/Sanitary System, Storm Drains)

1. Be certain that the nondisposable sampling equipment (e.g., long handle polyethylene scoop) has been decontaminated utilizing the procedures outlined in Section 4.6.

2. Remove laboratory precleaned sample containers from sample cooler, label container with an indelible marker, fill out Sample Information Record and Chain of Custody Form.

3. Insert scoop slowly at 0-6 inches into the sediment and remove sample. Sample sediment only after surface water samples have been taken to avoid introduction of sediment into the water.

4. If depth to sediment is greater than the reach of a long handled scoop, the sample may need to be collected utilizing the soil probe or split spoon sampler (see Sections 4.5.10 and 4.5.11, respectively).

5. With a sterile wooden tongue depressor or disposable polyethylene scoop, transfer the sample into the open sample container taking care not to spill sample on the outside of the container or overfill container and replace cover on the sample container.

6. Return sample container to sample cooler.

7. If necessary, decontaminate the sampling equipment according to the procedures outlined in Section 4.6.

8. Place all disposable personal protective equipment and disposable sampling equipment into a 55 gallon drum and store in a secure area (fenced, if possible).

4.5.7 Surface Water Sediment (Pond, Lake, River, Stream)

1. Be certain that the sample location is noted on Location Sketch (see Section 4.20).

2. Unless using disposable equipment, be certain that the sampling equipment (long handle polyethylene scoop) has been decontaminated utilizing the procedures outlined in Section 4.6.

3. Remove laboratory precleaned sample containers from sample cooler, label container with an indelible marker, fill out Sample Information Record and Chain of Custody Form.

4. Wear disposable gloves and boots if it is necessary to enter the water.

5. Insert scoop slowly at 0-6 inches into the sediment and remove sample (also see other notes above in item 5, Section 4.5.8 - Surface Water).

6. With a disposable polyethylene scoop or sterile wooden tongue depressor, transfer the sample into the open sample container taking care not to spill sample on the outside of the container or overfill container and replace cover on the sample container.

7. Return sample container to cooler.

8. If reasonable, decontaminate the sampling equipment according to the procedures outlined in Section 4.6.

9. Place all disposable personal protective equipment and disposable sampling equipment into a 55 gallon drum and store in a secure area (fenced, if possible).

4.5.8 Drainage Water/Wastewater/Storm Water (Dry Wells, Catch Basins, Storm Drains, Wastewater Disposal/Sanitary Systems)

1. Be certain sample location is noted on Location Sketch (see Section 4.20).

2. Be certain that all nondisposable sampling equipment (e.g., long handled polyethylene scoop) has been decontaminated utilizing the procedures outlined in Section 4.6.

3. Remove laboratory precleaned sample bottles from sample cooler, label container with an indelible marker, fill out Sample Information Record and Chain of Custody Form.

4. Lower the scoop or disposable bailer slowly into the water making sure that the sample is taken just below the surface of the water (or at the water/air interface if there is a sheen present) and raise the sample out of the water. Sample water before sediment to avoid introduction of sediment into the water.

5. Gently pour the sample into the sample container, taking care not to spill the sample on the outside of the container or overfill, and replace cover on the sample container. For volatile organic samples, make sure that there are no air bubbles in the sample vial after it has been capped. This is done by filling the vial such that there is a meniscus on top. Carefully slide the septum, Teflon side down, onto the top of the vial and cap the vial. Check for bubbles by turning the vial upside down and tapping it lightly. If the bubbles appear, reopen the vial, remove septum and add more sample (or resample). Replace septum, recap and check for bubbles. Continue until vial is bubble-free.

6. Return sample container to sample cooler. If sample is obtained directly with a sample container, dry the exterior of the container before placing into cooler.

7. If reusable, decontaminate the sampling equipment according to the procedures outlined in Section 4.6.

8. Place all disposable personal protective equipment and disposable sampling equipment into a 55 gallon drum and store in a secure area (fenced, if possible).

4.5.9 Surface Water (Pond, Lake, River, Stream)

1. Be certain that sample location is noted on Location Sketch (see Section 4.20).

2. Be certain that the sample equipment (long handle polyethylene scoop) has been decontaminated utilizing the procedures outlined in Section 4.6.

3. Remove laboratory precleaned sample containers from sample cooler, label container with an indelible marker, fill out Sample Information Record and Chain of Custody Form.

4. Wear disposable gloves and boots if it is necessary to enter the water.

5. Enter the water downstream of the sample location with minimum disturbance of the sediment and lower the scoop (or glass sample container) slowly into the water making sure that the sample is taken below the surface of the water (or at the water/air interface if there is a sheen present) and raise the sample out of the water. Sample surface water first at the most downstream location and move sequentially upstream. Also sample water before sediment to avoid introduction of sediment into the water column.

6. Gently pour the sample into the sample container, if not sampled directly, taking care not to spill the sample on the outside of the container or overfill container, and replace cover of the sample container. For volatile organic samples, make sure that there are no air bubbles in the sample vial after it has been capped. This is done by filling the vial such that there is a meniscus on top. Carefully slide the septum, Teflon side down, onto the top of the vial and cap the vial. Check for bubbles by turning the vial upside down and tapping it lightly. If the bubbles appear, reopen the vial, remove septum and add more sample (or resample). Replace septum, recap and check for bubbles. Continue until vial is bubble-free.

7. Return sample container to sample cooler. If sample is obtained directly with a sample container, dry the exterior of the bottle before placing into cooler.

8. If reusable, decontaminate the sampling equipment according to the procedures outlined in Section 4.6.

9. Place all disposable personal protective equipment and disposable sampling equipment into a 55 gallon drum and store in a secure area (fenced, if possible).

4.5.10 Soil (Test Pit)

Test pit excavation will be conducted using a backhoe or excavator.

1. Be certain that the sample location is noted on Location Sketch.

2. Be certain that the sampling equipment, including the backhoe/excavator bucket, is decontaminated utilizing the procedures outlined in Section 4.6.

3. Remove laboratory precleaned sample containers from sample cooler, label container with an indelible marker, fill out Sample Information Record and Chain of Custody Form.

4. Set aside top 2 feet of soil.

5. Lower the bucket into the test pit and remove soil/waste material.

6. Immediately upon retrieval of the soil/waste material, obtain an organic vapor measurement with a PID or FID.

7. Depending upon the organic vapor measurement, odors and visual characteristics, obtain a soil sample from the backhoe bucket with a scoop and/or wooden tongue depressor, place into the open sample containers and replace the container covers.

8. Fill out Test Pit Log Form, including a description of soil/waste with location, depth and material sampled.

9. Return the sample container to the cooler.

10. Backfill test pit using the top 2 feet of soil that was set aside as the top layer.

11. If reusable, decontaminate the sampling equipment according to the procedures described in Section 4.6.

12. Place all disposable personal protective equipment and disposable sampling equipment into a 55 gallon drum and store in a secure area (fenced, if possible).

4.5.11 Soil (Probe)

1. Be certain that the sample location is noted on Location Sketch (see Section 4.20).

2. Remove laboratory precleaned sample containers from sample cooler, label container with an indelible marker, fill out Sample Information Record and Chain of Custody Form.

3. Drive the probe to the desired sampling depth.

4. Retrieve the soil probe and immediately after opening it, obtain an organic vapor measurement with a FID or PID.

5. Remove a sample aliquot from the soil probe using a disposable scoop or sterile wooden tongue depressor, place into the open sample container and replace the container cover.

6. Return the sample container to the cooler.

7. If reusable, decontaminate the sampling equipment according to the procedures described in Section 4.6.

8. Place all disposable personal protective equipment and disposable sampling equipment into a 55 gallon drum and store in a secure area (fenced, if possible).

4.5.12 Soil (Borehole, Split Spoon)

1. Be certain that the sample location is noted on Location Sketch (see Section 4.20).

2. Be certain that the sampling equipment (split spoon) has been decontaminated utilizing the procedures outlined in Section 4.6.

3. Remove laboratory precleaned sample containers from sample cooler, label container with an indelible marker, fill out Sample Information Record and Chain of Custody Form (see Section 4.8).

4. Drill into the soil to the desired depth and drive the split spoon sampler.

5. Retrieve the split spoon and immediately after opening the split spoon, obtain an organic vapor measurement with a PID or FID and fill out Boring Log Form (see Section 4.20)

6. Remove a sample aliquot from the split spoon using a disposable scoop or sterile wooden tongue depressor, place into the open sample container and replace the container cover.

7. Return the sample container to the cooler.

8. If reusable, decontaminate the sampling equipment according to the procedures described in Section 4.6.

9. Place all disposable personal protective equipment and disposable sampling equipment into a 55 gallon drum and store in a secure area (fenced, if possible).

4.5.13 Groundwater (Probe)

1. Be certain sample location is noted on Location Sketch (see Section 4.20).

2. Remove the laboratory precleaned sample containers from sample cooler, label container with an indelible marker, fill out Sample Information Record and Chain of Custody Form.

3. Obtain a sample by using a dedicated polyethylene tubing equipped with a bottom check valve.

4. Gently pour the sample into the sample container taking care not to spill on the outside of the container or overfill container and replace cover on the sample container. Samples for volatile organic analyses will have no air space in the sample vial prior to sealing. This is done by filling the vial such that there is a meniscus on top. Carefully slide the septum, Teflon side down, onto the top of the vial and cap the vial. Check for bubbles by turning the vial upside down and tapping it lightly. If bubbles appear, reopen the vial, remove the septum and add more sample (or resample). Replace the septum, recap and check for bubbles. Continue until vial is bubble-free.

5. After sample collection, obtain field measurements including pH, conductivity, temperature and turbidity.

6. If a sample is to be collected for metals analysis, the turbidity must be less than 50 NTUs. If the turbidity cannot be reduced to less than 50 NTUs, the sample will be filtered in the field or by the laboratory. Both the filtered and unfiltered portion of the sample will be analyzed.

7. Return sample containers to sample cooler.

8. Place all disposable personal protective equipment and disposal sampling equipment into a 55 gallon drum and store in a secure area (fenced, if possible).

4.5.14 Groundwater (Hydropunch)

1. Be certain sample location is noted on Location Sketch (see Section 4.20).

2. Using hydropunch equipment drive/punch screen to desired depth.

3. Remove inner sleeve and lower down decontaminated hydropunch bailer.

4. Remove the laboratory precleaned sample container from the sample cooler, label container with an indelible marker, fill out Sample Information Record and Chain of Custody form.

5. Obtain a volatile organic sample by using a hydropunch bailer. Gently pour the sample into the sample container taking care not to spill on the outside of the container or overfill container and replace cover on the sample container. Samples for volatile organic analyses will have no air space in the sample vial prior to sealing. This is done by filling the vial such that there is a meniscus on top. Carefully slide the septum, Teflon side down, onto the top of the vial and cap the vial. Check for bubbles by turning the vial upside down and tapping it lightly. If bubbles appear, reopen the vial, remove the septum and add more sample (or resample). Replace the septum, recap and check for bubbles. Continue until vial is bubble-free.

6. Obtain a sample and analyze for field parameters (pH, conductivity, temperature and turbidity).

7. Turbidity must be less than 50 NTUs prior to collection of a sample for metals analysis. If the turbidity of the sample is greater than 50 NTUs, the sample will be filtered in the field or by the laboratory. Both the filtered and unfiltered portion of the sample will be analyzed.

8. Collect remaining samples. Gently pour the sample into the sample container, taking care not to spill water on the outside of the container or overfill the container. Replace cover on the sample container.

9. Return sample container to sample cooler.

10. Punch down to next depth and repeat items 3 through 9.

11. Decontaminate hydropunch equipment as described in Section 4.6.

12. Place all disposable personal protective equipment and disposable sampling equipment into a 55 gallon drum and store in a secure area (fenced, if possible).

4.5.15 Groundwater (Monitoring Well)

1. Measure the depth of water using a decontaminated water level indicator and compute the volume of standing water in the well.

2. Remove three to five times the volume of standing water from the well until field measurements (pH, conductivity, temperature and turbidity) stabilize, or until the well is dry, whichever occurs first. Turbidity should be less than 50 NTUs prior to collection of a sample for metals analysis.

3. Remove the laboratory precleaned sample containers from sample cooler, label container with an indelible marker, fill out Sample Information Record and Chain of Custody Form.

4. Obtain a sample by using a disposable polyethylene bailer.

5. If the turbidity of the sample is greater than 50 NTUs, the metals; (iron and manganese) portion of the sample will be filtered in the field or by the laboratory. Both the filtered and unfiltered portion of the sample will be analyzed.

6. Gently pour the sample into the sample container taking care not to spill on the outside of the container or overfill container and replace the cover on the sample container. Samples for volatile organic analyses will have no air space in the sample vial prior to sealing. This is done by filling the vial such that there is a meniscus on top. Carefully slide the septum, Teflon side down, onto the top of the vial and cap the vial. Check for bubbles by turning the vial upside down and tapping it lightly. If bubbles appear, reopen the vial, remove the septum and add more sample (or resample). Replace the septum, recap and check for bubbles. Continue until vial is bubble-free.

7. Return sample container to sample cooler.

8. Place all disposable personal protective equipment and disposable sampling equipment into a 55 gallon drum and store in a secure area (fenced, if possible).

4.5.16 Private Water Supply

1. Fill out Water Supply Information Record (see Section 4.20).

2. Remove the laboratory precleaned sample container from the sample cooler, label container with an indelible marker, fill out Sample Information Record and Chain of Custody form.

3. If there is a treatment system, identify a location to sample that is ahead of any in-line water treatment unit, if possible. If samples are to be collected from a faucet, disassemble any screens and/or purification system that may be on the faucet, if possible. Note these conditions on the Information Record Form.

4. Allow the cold water to run for approximately five minutes to adequately flush the line before sampling.

5. Collect the cold water directly in the sample container, taking care not to spill on the outside of the container or overfill container, and replace cover on the sample container. Samples for volatile organic analyses will have no air space in the sample vial prior to sealing. This is done by filling the vial such that there is a meniscus on top. Carefully slide the septum, Teflon side down, onto the top of the vial and cap the vial. Check for bubbles by turning the vial upside down and tapping it lightly. If bubbles appear, reopen the vial, remove the septum and add more sample (or resample). Replace the septum, recap and check for bubbles. Continue until vial is bubble-free.

6. Return sample to sample cooler.

7. Reattach water line that may have been disconnected ahead of treatment devise and reassemble screens and/or treatment systems that may have been removed.

4.5.17 <u>Ambient Air (Sorbent Tube Method TO1 or TO2)</u>

1. Be certain sample location is noted on Location Sketch (see Section 4.20).

2. Set the flow rate* to the desired setting on the air pump.

3. Label sorbent tube and fill out Sample Information Record and Chain of Custody Form.

4. Connect the sorbent tube to pump using polyethylene tubing and set sorbent tube in breathing zone. (This can be accomplished by attaching the pump to a stake).

5. Turn on pump and monitor the pump flow rate at half hour intervals during the duration of sampling.

6. Turn off pump and disconnect the sorbent tube and check the pump flow rate.

7. Place sorbent tubes in containers and place in cooler.

*Flow rate is determined using a calculation contained in Method TO1 or TO2 based on the constituents of concern at the site.

8. Place all disposable personal protective equipment and disposable sampling equipment into a 55 gallon drum and store in a secure area (fenced, if possible).

4.6 Decontamination Procedures

Whenever possible, all field sampling equipment should be sterile/disposable and dedicated to a particular sampling point. In instances where this is not possible, a field cleaning/decontamination procedure will be used in order to mitigate cross contamination between sample locations. A decontamination station/pad will be established for all field activities. This will be an area located away from the source of contamination so as not to adversely impact the decontamination procedure, but close enough to the sampling locations to keep equipment transport handling to a minimum after decontamination.

4.6.1 Field Decontamination Procedures

All nondisposable equipment will be decontaminated at appropriate intervals (e.g., prior to initial use, prior to moving to a new sampling location and prior to leaving the site). Different decontamination procedures are used for various types of equipment that are used to collect samples. When using field decontamination, sampling should commence in the area of the site with the lowest contamination, if known or probable, and proceed through to the areas of highest contamination.

4.6.2 Decontamination Procedure for Drilling/Probing Equipment

All equipment such as drill rigs and other mobile equipment will receive an initial cleaning prior to use at the site. The frequency of subsequent cleanings while on-site will depend on how the equipment is actually used in relation to collecting environmental samples. All wash/rinse solutions will be collected and recharged on-site after testing, if possible. If an appropriate location for on-site recharge is not available, the next preferable option is to discharge to a municipal sewer system.

Until an appropriate discharge alternative is determined, all wash/rinse solutions will be collected and contained on-site in 55 gallon drums.

After the initial decontamination, cleaning may be reduced to those areas that are in close proximity to materials being sampled. Drill rig/probe items such as augers, drill/probe rods and drill bits will be cleaned in between sample locations.

Drilling/probing equipment will be decontaminated in the following manner:

- Wash thoroughly with nonresidual detergent (alconox) and tap water using a brush to remove particulate matter or surface film. This is necessary in order to remove any solids buildup on the back of the rig, auger flights, drill rods, drilling head, etc. Any loose paint chips, paint flakes and rust must also be removed.
- Steam clean (212°F).
- Once decontaminated, remove all items from the decontamination area.

Also, following the general cleaning procedures described above, all downhole/drilling items, such as split spoon samplers, Shelby tubes, rock corers, or any other item of equipment which will come in direct contact with a sample during drilling, will be decontaminated by steam cleaning.

4.6.3 Decontamination Procedure for Sampling Equipment

Teflon, PVC, polyethylene and stainless steel sampling equipment decontamination procedures will be the following:

- Wash thoroughly with nonresidual detergent (alconox) and clean potable tap water using a brush to remove particulate matter or surface film.
- Rinse thoroughly with tap water.
- Rinse thoroughly with distilled water.
- Rinse in a well ventilated area with methanol (pesticide grade) and air dry.

- Rinse thoroughly with distilled water and air dry.
- Wrap completely in clean aluminum foil with dull side against the equipment. For small sampling items, such as scoops, decontamination will take place over a drum specifically used for this purpose.

The first step, a soap and water wash, will be performed to remove all visible particulate matter and residual oils and grease. This step will be followed by a tap water rinse and a distilled/deionized water rinse to remove the detergent. Next, a high purity solvent rinse will be used for trace organics removal. Methanol has been chosen because it is not an analyte of concern on the Target Compound List. The solvent will be allowed to evaporate and then a final distilled/deionized water rinse will be performed. This rinse removes any residual traces of the solvent. The aluminum wrap will protect the equipment and keep it clean until it is used at another sampling location.

4.6.4 Decontamination Procedure for Well Casing and Development Equipment

Field cleaning of well casings will consist of a manual scrubbing to remove foreign material and steam cleaning, inside and out, until all traces of oil and grease are removed. This material will then be stored in such a manner so as to preserve it in this condition. Special attention to threaded joints will be necessary to remove cutting oil or weld burn residues.

Materials and equipment that will be used for the purposes of well development will also be decontaminated by steam cleaning. An additional step will involve flushing the interior of any hose, pump, etc. with a nonphosphate detergent solution and potable water rinse prior to the development of the next well. This liquid waste will be disposed of on-site, if possible after testing.

4.7 Laboratory Sample Custody Procedures

A NYSDOH ELAP and CLP certified laboratory meeting the requirements for sample custody procedures, including cleaning and handling sample containers and analytical equipment, will be used to analyze samples collected during the remedial investigation. The selected laboratory's Standard Operating Procedures will be made available upon request.

4.8 Field Management Documentation

Proper management and documentation of field activities is essential to ensure that all necessary work is conducted in accordance with the sampling plan and QA/QC Plan in an efficient and high quality manner. Field management procedures will include following proper chain of custody procedures to track a sample from collection through analysis, noting when and how samples are split (if required); preparing a Location Sketch; completing Sample Information Records, Chain of Custody Forms, and Boring, Well and Test Pit Construction Logs; maintaining a daily Field Log Book; preparing Daily Field Activity Reports; completing Field Change Forms; and filling out a Daily Air Monitoring Form. Copies of each of these forms, with the exception of the Air Monitoring Forms, are provided in Section 4.20. The Air Monitoring Form is contained in Section 5.0 of the Health and Safety Plan. Proper completion of these forms and the field log book are necessary to support the consequent actions that may result from the sample analysis. This documentation will support that the samples were collected and handled properly.

4.8.1 Location Sketch

For each sampling point, a Location Sketch (found in Section 4.20) will be completed using permanent references and distances to the sampling point noted, if possible.

4.8.2 Sample Information Record

At each sampling location, a Sample Information Record Form (found in Section 4.20) is filled out including, but not limited to, the following information:

- Site name
- Sample crew

- Sample location
- Field sample identification number
- Date
- Time of sample collection
- Weather conditions
- Temperature
- Sample matrix
- Method of sample collection and any factor that may affect its quality adversely
- Well information (groundwater only)
- Field test results
- Analysis to be performed
- Remarks

4.8.3 Chain of Custody

The Chain of Custody Form will be completed and is initiated at the laboratory with container preparation and shipment to the site. The form remains with the sample at all times and bears the name of the person assuming responsibility for the samples. This person is tasked with ensuring secure and appropriate handling of the containers and samples. When the form is complete, it will indicate that there was no lapse in sample accountability.

A sample is considered to be in an individual's custody if any of the following conditions are met:

- It is in the individual's physical possession, or
- It is in the individual's view after being in his or her physical possession, or

- It is secured by the individual so that no one can tamper with it, or
- The individual puts it in a designated and identified secure area.

In general, Chain of Custody Forms are provided by the laboratory selected to perform the analytical services. At a minimum, the following information will be provided on these forms:

- Project name and address
- Project number
- Sample identification number
- Date
- Time
- Sample location
- Sample type
- Analysis requested
- Number of containers and volume taken
- Remarks
- Type of waste
- Sampler(s) name(s) and signature(s)
- Spaces for relinquished by/received by signature and date/time.

For this particular study, forms provided by the laboratory will be utilized.

The Chain of Custody Form will be filled out and signed by the person performing the sampling. The original of the form will travel with the sample and will be signed and dated each time the sample is relinquished to another party, until it reaches the laboratory or analysis is completed. The field sampler will keep one copy and a copy will be retained for the project file. The sample bottle will also be labeled with an indelible marker with a minimum of the following information:

- Sample number
- Analysis to be performed
- Date of collection

A copy of the completed form will be returned by the laboratory with the analytical results.

4.8.4 Split Samples

Whenever samples are being split with another party, a Receipt for Samples Form will be completed and signed. A copy of this form can be found in Section 4.20. A copy of the Chain of Custody Form will accompany this form.

4.8.5 Field Log Book

Field log books will be bound and have consecutively numbered, water resistant pages. All pertinent information regarding the site and sampling procedures will be documented. Notations will be made in log book fashion, noting the time and date of all entries. Information recorded in this notebook will include, but not be limited to, the following:

The first page of the log will contain the following information:

- Project name and address
- Name, address and phone number of field contact
- Waste generator and address, if different from above
- Type of process (if known), generating waste
- Type of waste

- Suspected waste composition, including concentrations

Daily entries will be made for the following information:

- Purpose of sampling
- Location of sampling point
- Number(s) and volume(s) of sample(s) taken
- Description of sampling point and sampling methodology
- Date and time of collection, arrival and departure
- Collector's sample identification number(s)
- Sample distribution and method of storage and transportation
- References, such as sketches of the sampling site or photographs of sample collection
- Field observations, including results of field analyses (e.g., pH, temperature, specific conductance), water levels, drilling logs, and organic vapor and dust readings
- Signature of personnel responsible for completing log entries.

4.8.6 Daily Field Activity Report

At the end of each day of field work, the Field Operations Manager, or designee, will complete this form noting personnel on-site and summarizing the work performed that day, equipment, materials and supplies used, results of field analyses, problems and resolutions. This form will be signed and subject to review. A copy of the Daily Field Activity Report form is contained in Section 4.20.

4.8.7 Field Changes and Corrective Actions

Whenever there is a required or recommended investigation/sampling change or correction, a Field Change Form will be completed by the Field Operations Manager and the NYSDEC on-site supervisor, and approved by the Consultant/PRP and NYSDEC Project Managers.

4.9 Calibration Procedures and Preventive Maintenance

The following information regarding equipment will be maintained at the project site:

1. Equipment calibration and operating procedures which will include provisions for documentation of frequency, conditions, standards and records reflecting the calibration procedures, methods of usage and repair history of the measurement system. Calibration of field equipment will be performed daily at the sampling site so that any background contamination can be taken into consideration and the instrument calibrated accordingly.
2. A schedule of preventive maintenance tasks, consistent with the instrument manufacturer's specific operation manuals, that will be carried out to minimize down time of the equipment.
3. Critical spare parts, necessary tools and manuals will be on hand to facilitate equipment maintenance and repair.

Calibration procedures and preventive maintenance, in accordance with the NYSDEC 1991 ASP, for laboratory equipment, will be contained in the laboratory's standard operating procedures (SOP) which will be available upon request.

4.10 Performance of Field Audits

During field activities, the QA/QC officer will accompany sampling personnel into the field, in particular in the initial phase of the field program, to verify that the site sampling program is being properly conducted, and to detect and define problems so that corrective action can be taken early in the field program. All findings will be documented and provided to the Field Operations Manager. A copy of the Field Audit Form is provided in Exhibit 4-1 of this Work Plan.

4.11 Control and Disposal of Contaminated Material

During construction and sampling of the monitoring wells and soil borings, contaminated waste, soil and water may be generated from drill cuttings, drilling fluids, decontamination water, development water and purge water. All soil cuttings generated during the remedial investigation will be handled in a manner consistent with NYSDEC Technical and Administrative Guidance Memorandum (TAGM) No. 4032, Disposal of Drill Cuttings.

All water generated during the investigation, including decontamination water, drill water and purge water, will be recharged on-site, if possible, following testing. The Site-Specific Work Plan will provide detailed information on the disposal of water generated during the investigation. If it is not possible to recharge water on-site, the next preferred option is discharge of the water to a municipal sewer system. This will be evaluated in preparation of the Site-Specific Work Plan.

Department of Transportation approved 55 gallon drums will be used for the containment of soil cuttings and water, and for disposal of personal protective clothing and disposable sampling equipment (i.e., bailers, scoops, tongue depressors, etc.). The drums will be marked, labeled with a description of the contents and from what location they were collected. All drums will be sealed and stored on-site in a secure area.

4.12 Documentation, Data Reduction and Reporting

A NYSDOH ELAP and CLP certified laboratory meeting the New York State requirements for documentation, data reduction and reporting will be used. All data will be cataloged according to sampling locations and sample identification nomenclature which is described in Section 4.5.1 of this QA/QC Plan.

NYSDEC "Sample Identification and Analytical Requirement Summary" and "Sample Preparation and Analysis Summary" forms (for VOC and inorganic analysis) will be completed and included with each data package. These forms are contained in Exhibit 4-2 of this QA/QC Plan. The sample tracking forms are required and supplied by the 1991 NYSDEC ASP.

4.13 Data Validation

As described in Section 4.12 above, summary documentation regarding data validation will be completed by the laboratory using NYSDEC forms contained in the 1991 NYSDEC ASP and submitted with the data package.

Data validation will be performed in order to define and document analytical data quality in accordance with NYSDEC requirements that investigation data must be of known and acceptable quality. The analytical and validation processes will be conducted in conformance with the NYSDEC ASP dated December, 1991.

Because the NYSDEC Analytical Services Protocol is based on the USEPA CLP, the USEPA Functional Guidelines for Evaluating Organics and Inorganics Analyses for the Contract Laboratory Program (CLP) will assist in formulating standard operating procedures (SOPs) for the data validation process. The data validation process will ensure that all analytical requirements specific to this work plan, including the QA/QC Plan are followed. Procedures will address validation of routine analytical services (RAS) results based on the NYSDEC Target Compound List for standard sample matrices.

The data validation process will provide an informed assessment of the laboratory's performance based upon contractual requirements and applicable analytical criteria. The report generated as a result of the data validation process will provide a base upon which the usefulness of the data can be evaluated by the end user of the analytical results. The overall level of effort and specific data validation procedure to be used will be equivalent to a "100% validation" of all analytical data in any given data package.

During the review process, it will be determined whether the contractually required laboratory submittals for sample results are supported by sufficient back-up data and QA/QC results to enable the reviewer to conclusively determine the quality of data. Each data package will be checked for completeness and technical adequacy of the data. Upon completion of the review, the reviewers will develop a QA/QC data validation report for each analytical data package.

"Qualified" analytical results for any one field sample will be established and presented based on the results of specific QC samples and procedures associated with its sample analysis group or batch. Precision and accuracy criteria (i.e., QC acceptance limits) will be used in determining the need for qualifying data. Where test data have been reduced by the laboratory, the method of reduction will be described in the report. Reduction of laboratory measurements and laboratory reporting of analytical parameters will be verified in accordance with the procedures specified in the NYSDEC program documents for each analytical method (i.e., recreate laboratory calculations and data reporting in accordance with the method specific procedure). The standard operating guideline manuals and any special analytical methodology required will specify documentation needs and technical criteria and will be taken into consideration in the validation process. Copies of the complete data package and the validation report, including the laboratory results data report sheets, with any qualifiers deemed appropriate by the data reviewer, and a supplementary field QC sample result summary statement, will be submitted to the NYSDEC.

The following is a description of the two-phased approach to data validation which will be used in the remedial investigation. The first phase is called checklisting and the second phase is the analytical quality review, with the former being a subset of the latter.

- Checklisting - The data package will be checked for correct submission of the contract required deliverables, correct transcription from the raw data to the required deliverable summary forms and proper calculation of a number of parameters.
- Analytical Quality Review - The data package will be closely examined to recreate the analytical process and verify that proper and acceptable analytical techniques have been performed. Additionally, overall data quality and laboratory performance will be evaluated by applying the appropriate data quality criteria to the data to reflect conformance with the specified, accepted QA/QC standards and contractual requirements.

At the completion of the data validation, a Summary Data Validation/Usability Report will be prepared and submitted to NYSDEC.

4.14 Performance and System Audits

A NYSDOH ELAP and CLP certified laboratory which has satisfactorily completed performance audits and performance evaluation samples will be used to perform sample analyses for the remedial investigation.

4.15 Corrective Action

A NYSDOH ELAP and CLP certified laboratory will meet the requirements for corrective action protocols, including sample "clean up" to attempt to eliminate/mitigate matrix interference.

The 1991 NYSDEC ASP protocol includes both mandatory and optional sample cleanup and extraction methods. Cleanup is required by the 1991 NYSDEC ASP in order to meet contract required detection limits. There are several optional cleanup and extraction methods noted in the 1991 NYSDEC ASP protocol. These include: florisil column cleanup, silica gel column cleanup, acid-base partition, steam distillation and sulfuric acid cleanup for PCB analysis.

High levels of matrix interference may be present in waste, soil and sediment samples. This interference may prevent the achievement of ASP detection limits if no target compounds are found. In order to avoid unnecessary dilutions, the optional cleanup methods noted in the 1991 NYSDEC ASP will be required to be performed by the laboratory as necessary.

It should be noted that if these optional cleanup and extraction methods are utilized, holding time requirements will not be exceeded due to negligence of the laboratory. Subsequent to selection of the analytical laboratory for this project, a meeting or telephone conference call will be undertaken with representatives of the NYSDEC, the Consultant and the laboratory to discuss these issues and establish procedures to ensure effective and timely communications among all parties.

4.16 Trip Blanks (Travel Blanks)

The primary purpose of a trip blank is to detect other sources of contamination that might potentially influence contaminant values reported in actual samples, both quantitatively and qualitatively. The following have been identified as potential sources of contamination:

- Laboratory reagent water;
- Sample containers;
- Cross contamination in shipment;
- Ambient air or contact with analytical instrumentation during preparation and analysis at the laboratory; and
- Laboratory reagents used in analytical procedures.

A trip blank will consist of a set of 40 ml sample vials filled at the laboratory with laboratory demonstrated analyte free water. Trip blanks will be handled, transported and analyzed in the same manner as the samples acquired that day, except that the sample containers themselves are not opened in the field. Rather, these sample containers only travel with the sample cooler. The temperature of the trip blanks will be maintained at 4°C while on-site and during shipment. Trip blanks will return to the laboratory with the same set of bottles they accompanied in the field.

The purpose of a trip blank is to control sample bottle preparation and blank water quality as well as sample handling. Thus, the trip blank will travel to the site with the empty sample bottles and back from the site with the collected samples in an effort to simulate sample handling conditions. Contaminated trip blanks may indicate inadequate bottle cleaning or blank water of questionable quality. Trip blanks will be implemented only when collecting water samples, including field blanks, and analyzed for volatile organic compounds only.

4.17 Drill Water

If water is utilized during the drilling process, a sample of the drill water will be collected and analyzed for TCL VOC +10. The purpose of the drill water sample is to determine if the water may be a potential source of contamination for the environmental samples.

The sample will be collected directly from the valve on the drill rig. The drill water sample will be handled in the same manner as the environmental samples.

4.18 Method Blanks/Holding Blanks

A method blank is an aliquot of laboratory water or soil which is spiked with the same internal and surrogate compounds as the samples. The purpose of the method blank is to define and determine the level of laboratory background contamination. Frequency, procedure and maximum laboratory containment concentration limits are specified in the 1991 NYSDEC ASP. A holding blank is an aliquot of analyte-free water that is stored with the environmental samples in order to demonstrate that the samples have not been contaminated during laboratory storage. This blank will be analyzed using the same analytical procedure as the samples.

4.19 Matrix Spikes/Matrix Spike Duplicates and Spiked Blanks

Matrix spike samples are quality control procedures, consistent with 1991 NYSDEC ASP specifications, used by the laboratory as part of its internal Quality Assurance/Quality Control program. The matrix spikes (MS) and matrix spike duplicates (MSD) will be aliquots of a designated sample (water or soil) which are spiked with known quantities of specified compounds. These QA/QC samples will be used to evaluate the matrix effect of the sample upon the analytical methodology, as well as to determine the precision of the analytical method used. A matrix spike blank will be an aliquot of analyte-free water, prepared in the laboratory, and spiked with the same solution used to spike the MS and MSD. The matrix spike blank (MSB) will be subjected to the same analytical procedure as the MS/MSD and used to indicate the appropriateness of the spiking solution by calculating the spike compound recoveries. The procedure and frequency regarding the MS, MSD and MSB samples are defined in the 1991 NYSDEC ASP.

4.20 Field Management Forms

DVIRKA
AND
BARTILUCCI

DRILLING CONTRACTOR	DRILLING LOG	BORING NUMBER ______
Driller ______	PROJECT NAME ______	Sheet ____ of ____
Inspector ______	______	Boring Location ______
Rig Type ______	PROJECT # ______	______
Drilling Method ______	Location/Address ______	______
Drive Hammer Weight ______	______	

GROUNDWATER OBSERVATIONS			
Water Level			
Time			
Date			
Casing Depth			

Weather ______

Date/Time Start ______

Date/Time Finish ______

Plot Plan

Sample Depth	Sample Number	SPT	PID/FID Reading	FIELD IDENTIFICATION OF MATERIAL	WELL SCHEMATIC	COMMENTS

SPT = STANDARD PENETRATION TEST

Soil Stratigraphy Summary ______

DRILLCON.PM4

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TEST PIT LOCATION SKETCH MAP

N

TEST PIT LOG

TEST PIT NO.	
PROJECT NO./NAME	LOCATION
EXCAVATOR/EQUIPMENT/OPERATOR	
INSPECTOR/OFFICE	START/FINISH DATE
ELEVATION OF: GROUND SURFACE/BOTTOM OF PIT (FT. ABOVE MSL)	CONDITION OF PIT
REMARKS:	

DEPTH	SAMPLE INTERVAL	OVA SCREEN	DESCRIPTION OF MATERIALS	REMARKS
0				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

NJDEPTPL

Dvirka and Bartilucci
CONSULTING ENGINEERS

WELL CONSTRUCTION LOG

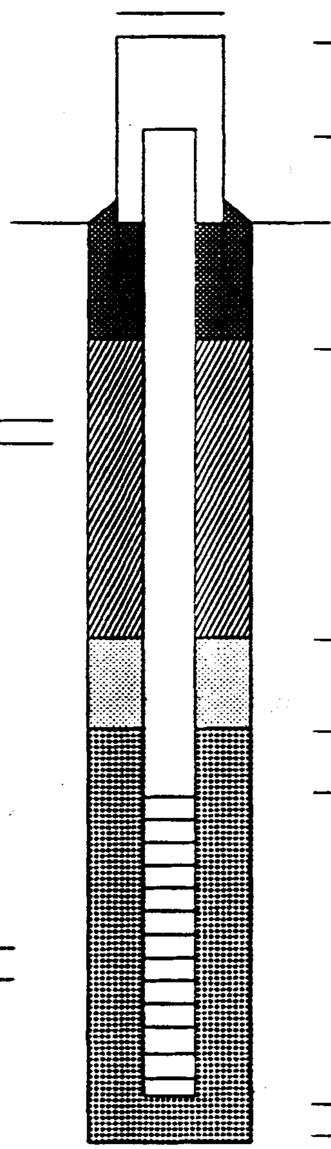
SITE ______________________ JOB NO. ____ WELL NO. ____

TOTAL DEPTH ____ SURFACE ELEV.________ TOP RISER ELEV. ________

WATER LEVELS (DEPTH, DATE, TIME) ________ DATE INSTALLED ______

RISER DIA ___ MATERIAL ________ LENGTH ____
SCREEN DIA ___ MATERIAL ________ LENGTH ____ SLOT SIZE ______
PROT CSG DIA ___ MATERIAL ________ LENGTH ____

SCHEMATIC



___ Prot. Csg Stickup

___ Riser Stickup

Ground Surface

Surface Seal Type ____________

___ Bottom Surface Seal

Grout Type ____________

___ Top Seal

Seal Type ____________

___ Top Sand Pack

___ Top Screen

Sand Pack Type ____________
Size ____________

___ Bottom Screen
___ Total Depth of Boring

Dvirka and Bartilucci
CONSULTING ENGINEERS

WELL CONSTRUCTION LOG

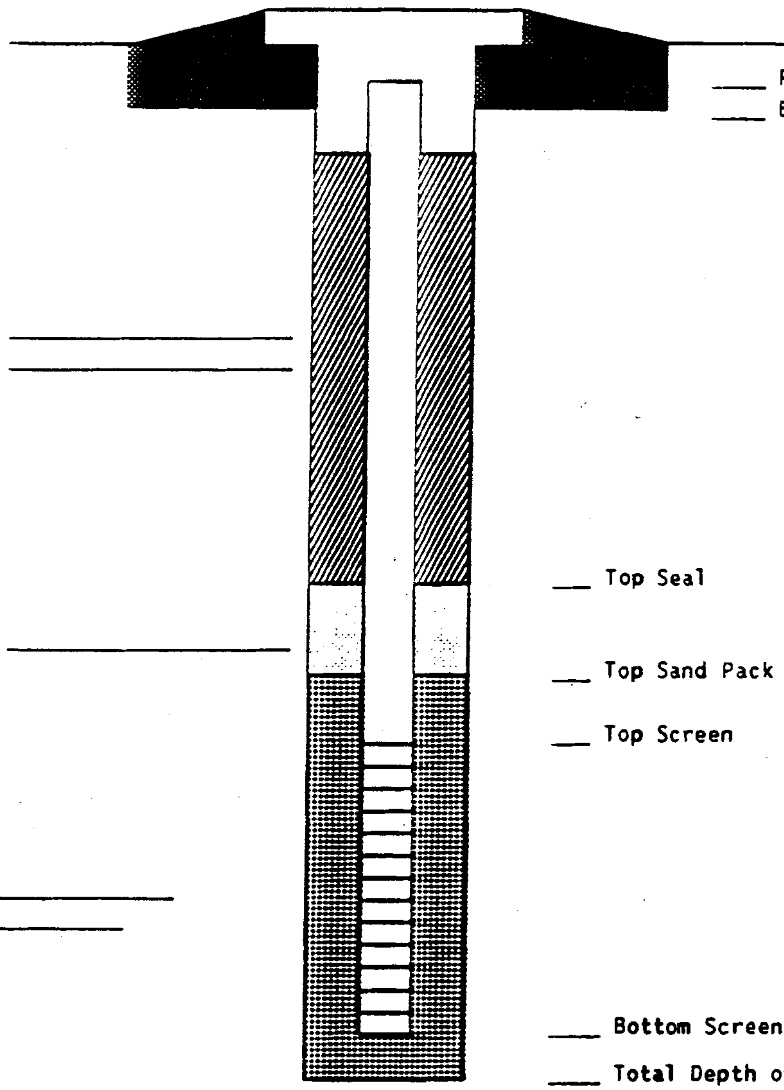
SITE ____________________ JOB NO. ________ WELL NO. __________

TOTAL DEPTH __________ SURFACE ELEV.____________ TOP RISER ELEV. ____________

WATER LEVELS (DEPTH, DATE, TIME) ____________ DATE INSTALLED __________

RISER DIA ___ MATERIAL __________ LENGTH _____
SCREEN DIA ___ MATERIAL __________ LENGTH _____ SLOT SIZE ________

SCHEMATIC



Ground Surface
____ Riser Elevation
____ Bottom Surface Seal

Surface Seal Type
____
____

Grout Type ____________________
____

___ Top Seal

Seal Type ____________________

___ Top Sand Pack

___ Top Screen

Sand Pack Type ________________
Size ____________________

____ Bottom Screen
____ Total Depth of Boring

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LOCATION SKETCH

Project ______________________ Sample Crew ______________________

Sample(s) Location(s) ______________________

Sample(s) and/or Well Number(s) ______________________

____

Location of sample points, wells, borings, etc., with reference to three permanent reference points. Measure all distances, clearly label roads, wells and permanent features.

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Receipt for Samples

Project Name: ______________________________ Field Log Book Reference Number: ______________

Project Address: ______________________________ Sampled By: ______________

Project Number: ______________________________ Split With: ______________

SAMPLE NUMBERS	DATE	TIME	COMP	GRAB	SPLIT SAMPLES	LOG BOOK PAGE NO.	TAG NUMBERS	SAMPLE LOCATION	NO. OF CONTAINERS	REMARKS

Transferred by (Signature)		Received by (Signature)		Telephone
Date	Time	Title	Date	Time

RFS

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SAMPLE INFORMATION RECORD

SITE ______________________ SAMPLE CREW ______________________

SAMPLE LOCATION/WELLNO. ______________________

FIELD SAMPLE I.D. NUMBER ______________________ DATE ______________________

TIME ____________ WEATHER ______________________ TEMPERATURE ____________

SAMPLE TYPE:

GROUNDWATER ______________________ SEDIMENT ______________________

SURFACE WATER ______________________ AIR ______________________

SOIL ______________________ OTHER (Describe. e.g., septage.leachate)

____

WELL INFORMATION (fill out for groundwater samples):

DEPTH TO WATER ______________________ MEASUREMENT METHOD ______________________

DEPTH OF WELL ______________________ MEASUREMENT METHOD ______________________

VOLUME REMOVED ______________________ REMOVAL METHOD ______________________

FIELD TEST RESULTS:

COLOR ______________________ pH ______________________ ODOR ______________________

TEMPERATURE (°F) ______________________ SPECIFIC CONDUCTANCE (umhos/cm) ______________________

TURBIDITY ______________________

PID/FID READING ______________________ VISUAL DESCRIPTION ______________________

____

CONSTITUENTS TO BE ANALYZED:

____________ ____________ ____________ ____________

____________ ____________ ____________ ____________

REMARKS: ______________________

____

____

WELL CASING VOLUMES

GAL/FT	**1-1/4" = 0.077**	**2" = 0.16**	**3" = 0.37**	**4" = 0.65**
	1-1/2" = 0.10	**2-1/2" = 0.24**	**3-1/2" = 0.50**	**6" = 1.46**

SIR-0794.PM4

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DAILY FIELD ACTIVITY REPORT

Report Number: ______________ Project Number: ______________ Date: ______________

Field Log Book Page Number: ______________________________

Project: ______________________________

Address: ______________________________

Weather: (AM) ______________________ Rainfall: (AM) ________ Inches
(PM): ______________________ (PM) ________ Inches

Temperature: (AM) ______ °F Wind Speed: (AM) ______ MPH Wind Direction: (AM) ______
(PM) ______ °F (PM) ______ MPH (PM) ______

Site Condition: ______________________________

Personnel On Site:

Name	Affiliation	Arrival Time	Departure Time

Subcontractor Work Commencement: (AM) ______________ (PM) ______________

Subcontractor Work Completion: (AM) ______________ (PM) ______________

DB-DFAR

DVIRKA AND BARTILUCCI

DATE: ____________________

DAILY FIELD ACTIVITY REPORT

Work performed today by subcontractor(s) (includes equipment and labor breakdown):

DB-DFAR

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AND
BARTILUCCI

DATE: ______________________________

DAILY FIELD ACTIVITY REPORT

General work performed today by D&B: ______________________________

List specific inspection(s) performed and results (include problems and corrective actions):

List type and location of tests performed and results (include equipment used and monitoring results):

Verbal comments received from subcontractor (include construction and testing problems, and recommendations/resulting action):

Prepared by: ______________________ Reviewed by: ______________________

DB-DFAR

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FIELD CHANGE FORM

Project Name: ______________________________

Project Number: ____________________ Field Change Number: __________

Location: ______________________________ Date: __________

Field Activity Description: ______________________________

____

____

____

Reason for Change: ______________________________

____

____

____

Recommended Disposition: ______________________________

____

____

____

______________________________ __________

Field Operations Officer (D&B Consulting Engineers) (Signature) Date

Disposition: ______________________________

____

____

____

______________________________ __________

On-site Supervisor (NYSDEC) (Signature) Date

Distribution: Project Manager (D&B)
Project Manager (NYSDEC)
Field Operations Officer
On-site Supervisor (NYSDEC)

Others as Required: __________
____
____
____

DB-FCF

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DAILY EQUIPMENT CALIBRATION LOG

Project Name: ____

Project Number: ____________________ Calibrated By: ____________________

Date	Instrument Name and Model Number	Calibration Method	Time	Readings and Observations

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WATER SUPPLY SAMPLE INFORMATION RECORD

Name: ______________________________

Address: ______________________________

Telephone: ______________________________

Date and Time Sampled: ______________________________

Sample Location: ______________________________

Sample Number: ______________________________

Well Information: ______________________________

Depth and Type of Well: ______________________________

Date Constructed: ______________________________

Type of Construction and Diameter: ______________________________

Driller: ______________________________

Estimated Usage (gpm): ______________________________

Water Use(s): ______________________________

Type of Treatment Device and Location: ______________________________

Date and Location Last Sampled: ______________________________

Homeowner's Perception of Water Quality: ______________________________

Comments: (Use of bottled water, etc.) ______________________________

Sketch of Lot, Building, and Well and Septic System Location

Sketch of Water Treatment System and Sampling Locations

Photograph of Water Treatment System

EXHIBIT 4-1

FIELD AUDIT FORM

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FIELD AUDIT FORM

Site: ______________________ Date: ______________________

Persons On-site: ______________________ QA/QC Officer Conducting Audit:

______________________ ______________________

______________________ Project:

______________________ ______________________

1. Is safety equipment in use (hardhats, respirators, gloves etc.): YES NO

2. Is a decontamination station, equipment and supplies on site and in working order:

	Methanol	YES	NO
	Alconox	YES	NO
	D.I. Water	YES	NO
	Scrub Brushes	YES	NO
	Steam Cleaner	YES	NO

Comments: ______________________

____

____

3. Is the decontamination pad set up so water is contained: YES NO

Comments: ______________________

____

____

4. Is the site/investigation areas secured (fence, markers, etc.) or otherwise in accordance with project requirements: YES NO

Comments: ______________________

____

____

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FIELD AUDIT FORM
(continued)

5. Is contaminated material properly stored and in a secure area or otherwise in accordance with project requirements: YES NO

   Are the drums of waste (water, soil, ppe) labeled properly: YES NO

   Comments: ______________________________

   ____

   ____

6. Are field forms filled out properly, legibly and timely:

Field Log Book	YES	NO
Chain of Custody	YES	NO
Equipment Calibration Log	YES	NO
Daily Field Activity Report	YES	NO
Location Sketch	YES	NO
Sample Information Record	YES	NO
Equipment Usage Form	YES	NO
Boring Logs	YES	NO

   Comments: ______________________________

   ____

   ____

7. Is the proper sampling and field measurement equipment, including calibration supplies on site: YES NO

   Comments: ______________________________

   ____

   ____

FIELD AUDIT FORM
(continued)

8. Are there adequate sample containers, including deionized water for QA/QC:

	Field Blanks	YES	NO
	Trip Blanks	YES	NO

Comments: ______________________________

____

____

9. Is the equipment decontaminated in accordance with project requirements:

Sampling equipment	YES	NO
Construction equipment	YES	NO

Comments: ______________________________

____

____

10. Is field measurement equipment calibrated:

Daily	YES	NO
Properly	YES	NO

Comments: ______________________________

____

____

11. Are samples collected and labeled properly: YES NO

Comments: ______________________________

____

____

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FIELD AUDIT FORM
(continued)

12. Are samples stored at 4°C: YES NO

Comments: ______________________________

____

____

13. Are coolers properly sealed and packed for shipment including Chain of Custody taped to underside of lid: YES NO

Comments: ______________________________

____

____

14. Is a copy of the Field Investigation Work Plan available on site: YES NO

Comments: ______________________________

____

____

15. Is a copy of each equipment manual on-site: YES NO

Comments: ______________________________

____

____

16. Is a copy of the QA/QC Plan available on site: YES NO

Comments: ______________________________

____

____

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FIELD AUDIT FORM
(continued)

17. Are investigation personnel familiar with the Work Plan and QA/QC Plan: YES NO

Comments: ______________________

____

____

18. Are quality control samples taken:

Trip Blanks	YES	NO
Field Blanks	YES	NO

Comments: ______________________

____

____

19. Are samples shipped in a timely and appropriate manner: YES NO

Comments: ______________________

____

____

20. Has the laboratory been contacted regarding planned shipment of samples: YES NO

Comments: ______________________

____

____

21. Certification - Based upon my audit at the above project, I hereby certify/do not certify compliance with QA/QC requirements for the project:

______________________ ______________________

Dated Signed

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AND
BARTILUCCI

FIELD AUDIT FORM
(continued)

General Comments: ______________________________

____

____

____

EXHIBIT 4-2

NYSDEC SAMPLE IDENTIFICATION, PREPARATION AND ANALYSIS SUMMARY FORMS

To be included with all lab data and with each workplan

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE IDENTIFICATION AND ANALYTICAL REQUIREMENT SUMMARY

Customer Sample Code	Laboratory Sample Code	Analytical Requirements					
		*VOA GC/MS Method #	*BNA GC/MS Method #	*VOA GC Method #	*Pest PCBs Method #	*Metals	*Other

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY
SEMIVOLATILE (BNA)
ANALYSES

Laboratory Sample ID	Matrix	Date Collected	Date Rec'd at Lab	Date Extracted	Date Analyzed

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY
VOLATILE (VOA)
ANALYSES

Laboratory Sample ID	Matrix	Date Collected	Date Rec'd at Lab	Date Extracted	Date Analyzed

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY
PESTICIDE/PCB
ANALYSES

Laboratory Sample ID	Matrix	Date Collected	Date Rec'd at Lab	Date Extracted	Date Analyzed

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY
SEMIVOLATILE (BNA)
ANALYSES

Laboratory Sample ID	Matrix	Analytical Protocol	Extraction Method	Auxiliary Cleanup	Dil/Conc Factor

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SAMPLE PREPARATION AND ANALYSIS SUMMARY
INORGANIC ANALYSES

Laboratory Sample ID	Matrix	Metals Requested	Date Rec'd at Lab	Date Analyzed

5.0 HEALTH AND SAFETY PLAN

5.1 General

This Health and Safety Plan (HASP) is intended to meet the requirements outlined in 29 CFR §1910.120 and §1926, the NIOSH/OSHA/USCG/EPA Guidance Manual for Hazardous Waste Site Activities (NIOSH No. 85-115), USEPA "Standard Operating Safety Guides," and Superfund Amendments and Reauthorization Act (SARA), Title I, Section 126. The HASP addresses activities associated with remedial investigations and feasibility studies (RI/FS) conducted at dry cleaner sites. Compliance with the HASP is required of all on-site personnel entering and/or conducting investigation activities at the site. Personnel conducting activities at the sites will be subject to the requirements of this HASP and be accountable to the authorities having jurisdiction at the site. Site-specific information regarding health and safety will be included in the Site-Specific Work Plan. At a minimum, the information provided in Exhibit 5-1 will be included in the Work Plan.

5.2 Purpose and Scope of the HASP

To ensure health and safety during activities associated with field investigation (including drilling, sampling and excavation) in the restricted zones, this HASP sets forth the requirements for on-site health and safety supervision, air monitoring, medical monitoring, personal protective equipment, controls, safe work practices and proper decontamination by providing this information in the following sections.

5.3 Site Description (General)

The sites covered under this plan are dry cleaner facilities. Specific information pertaining to each site will be provided in the Site-Specific Work Plan.

Since dry cleaning started about 170 years ago, a wide variety of solvents have been used to clean clothes. "Camphene" or turpentine, was used initially, but by the late 1800s, benzene, benzene soap, naphtha and gasoline had begun to be used. Stoddard solvent (mineral spirits or white spirits) was introduced in the 1920s. Carbon tetrachloride, the first chlorinated solvent used in dry cleaning, was introduced shortly afterwards and was used extensively in Europe and the United States until the 1950s, when its toxic and corrosive properties were recognized. Tetrachloroethene, commonly known as perchloroethylene, was introduced in the 1930s and is still used to a limited extent in Europe and in industrial dry cleaning facilities throughout the world. The use of perchloroethylene in dry cleaning began to increase as carbon tetrachloride was phased out, and it is now the solvent used by an estimated 75% of dry cleaners throughout the world, except in certain regions.

In summary, typical contaminants of concern for dry cleaner facilities, including the cleaner chemicals and their breakdown products, are the following:

- Benzene
- Carbon tetrachloride
- Cis-1,2-dichloroethene
- Stoddard solvent
- Tetrachloroethene
- Trans-1,2-dichloroethene
- Trichloroethene
- 1,1,1-Trichloroethane
- Turpentine
- Vinyl chloride

5.4 Personnel Organization and Responsibilities

This project will require the interaction of government agencies, contractors, site facility operators and technical specialists, both on-site and off-site. The project team will comprise representatives of the New York State Department of Environmental Conservation (NYSDEC), the environmental consultant and various subcontractors.

5.4.1 Project Director

The Project Director will have overall responsibility for implementation of the corporate and Site-Specific Health and Safety Plan, and the supervision and monitoring of employees and subcontractors.

5.4.2 Project Manager

The Project Manager will assure that all elements of this HASP are implemented where applicable and that all project staff are protected and working in a safe manner.

5.4.3 Health and Safety Officer (HSO)

The HSO will be responsible for preparation of the Site-Specific HASP and has the final authority to resolve health and safety issues at the site. The HSO has overall responsibility for ensuring that the policies and procedures of this HASP are implemented.

The HSO will provide regular support for all health and safety activities, including recommendations for upgrading or downgrading the level of personal protection, as needed.

The HSO will be on-site as needed during the project. The HSO has the has the authority to stop work at any time unsafe work conditions are present. Any potentially hazardous condition posing a risk beyond the defined role or mission is anticipated to require the HSO to consult with the Field Operations Manager (FOM) and Project Director.

The HSO will be a Certified Hazardous Materials Manager (CHMM), a Certified Industrial Hygienist (CIH) or designee, and will be available off-site on an as-needed basis to provide technical support to the HSO. Any decisions requiring use or selection of personal protection equipment (PPE) or monitoring devices other then those in the HASP will be approved by the HSO or designee.

5.4.4 Field Operations Manager (FOM) and Alternate HSO

The FOM, or designee, will serve as the Alternative HSO and will be responsible for conducting the work and for assuring that the work is conducted in accordance with the requirements of the HASP. The FOM will be on-site as needed during the project and will manage all day-to-day activities of all parties on this project.

The FOM will be responsible for implementing safety precautions and procedures during all investigation phases, and has final authority to resolve health and safety issues at the site when the HSO is not on-site.

5.4.5 Physician

A physician will be responsible for all medical review, diagnosis and certification of all site personnel. An on-call physician will be selected for each site and designated in the Site-Specific Work Plan.

5.4.6 General Health and Safety Requirements for all Employees

The following general health and safety requirements will apply to all persons working at the site:

- All persons working on the investigation team will read, sign and become familiar with the HASP (a copy of the Field Team Review Form is provided in Exhibit 5-2). If any information is unclear, the reader will contact the HSO for clarification prior to any field work. A copy of the plan will be available for review through the Project Manager, FOM or his designee.

- No one will be allowed in active investigation areas without the prior knowledge and approval of the HSO, Project Manager or FOM. All active areas that could pose a potential threat to health and safety will be designated with warning tape or other measures to prevent access by other site personnel or the public.

- Sufficient backup personnel will be available for all site activities. At a minimum, two persons will be present at any location during investigation activities.

- All personnel involved in the investigation at the site will notify the HSO, Project Manager or FOM of any unsafe conditions or activities.

- Standard hygiene practices will be implemented, such as no smoking, eating or drinking during site investigation work activities A thorough washing of hands and face prior to smoking, eating or drinking will be conducted.

- Workers will avoid unnecessary contamination, such as walking through, sitting on, leaning on or kneeling in areas that are known or suspected to be contaminated.

- All site personnel will observe their partners for any signs of adverse effects associated with the work activity, and will inform their partner or supervisor of any unusual signs or symptoms that they are experiencing themselves.

5.5 Hazard Assessment and Risk Analysis

5.5.1 Potential Health Hazards

The general hazard potential at the dry cleaner sites is characterized in Table 5-1. The primary concern at these sites is to protect workers from potential exposure to contaminated soils, vapors, groundwater and other contaminated materials when conducting the remedial investigation. In addition to the chemical hazards, physical, biological and underground hazards also exist. These hazards are identified on Table 5-2 and are discussed below.

Table 5-1

SUMMARY OF CHARACTERISTICS AND HEALTH HAZARDS AT DRY CLEANER SITES

Type of site	Dry cleaner facilities
Apparent hazard	Low-moderate
Potential source	Contaminated surface and subsurface soil, groundwater, waste water, drainage water, surface water, sediment and sanitary waste/sludge
Contamination characteristics	Toxic, corrosive, flammable
Form of hazards	Dusts, liquids, vapors
Routes of exposure	Inhalation, ingestion, skin, eyes

Table 5-2

SUMMARY OF POTENTIAL HAZARDS

CHEMICAL HAZARDS	Tetrachloroethene
	Trichloroethene
	Cis 1,2 dichloroethene
	Trans 1,2 dichloroethene
	Vinyl chloride
	1,1,1 Trichloroethane
	Turpentine
	Benzene
	Stoddard Solvent
	Carbon tetrachloride
PHYSICAL HAZARDS	Noise
	Slips, trips, falls
	Deteriorated overhead surfaces
	Heavy equipment traffic
	Heat or cold stress
	Striking and struck by (heavy equipment)
	Streamline
BIOLOGICAL HAZARDS	Pigeon droppings
	Rabies carrying animals (rats, raccoons, etc.)
	Poisonous snakes (weather dependent)
	Stinging insects (weather dependent)
	Poisonous plants (weather dependent)
ELECTRICAL HAZARDS	Overhead power lines
	Lightning
	Electrical equipment
FIRE/EXPLOSION HAZARDS	Combustible gas
OXYGEN DEFICIENCY	Working in confined spaces
RADIATION HAZARDS	N/A
UNDERGROUND HAZARDS	Electrical lines
	Telecommunication lines
	Gas lines
	Water lines
	Sewer/storm lines

5.5.1.1 - Health Hazard Identification

A list of the chemical contaminants that are commonly found in dry cleaners is found in Table 5-3. These chemical contaminants may be present, along with other compounds, at levels, which upon volatilization, may result in concentrations approaching the OSHA Permissible Exposure Limits (PELs). There may also be chemical or mixtures of chemicals for which no information at the time of preparation of this HASP have been identified. Workers should be observant of any unplanned occurrences (unusual odor, soil colorations, etc.) for chemical hazard groups including:

- sanitary wastes
- solvents
- chemically contaminated dusts
- cement dusts

5.5.1.2 - Health Hazard Evaluation

The primary potential health hazards of concern to workers from contaminants are from the inhalation of vapors and dusts, and skin exposure to corrosive substances or skin absorptive poisons. Potential for these exposures exist when conducting field programs using various investigation techniques.

OSHA PELs and American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV) may be exceeded during investigative activities. Table 5-3 lists the chemicals, PELs, TLVs and primary health hazards. The activities to be performed during remedial investigations are summarized in Table 5-4. These activities will be closely monitored and evaluated to determine the potential for exceeding the standards and the need to implement control measures to protect personnel and the environment.

Table 5-3

PERMISSIBLE EXPOSURE LIMITS (PELS) AND PRIMARY HEALTH HAZARDS FOR POTENTIAL CONTAMINANTS OF CONCERN AT DRY CLEANER SITES

Chemical	ACGIH TLV (ppm)	ACGIH STEL/ Ceiling (ppm)	OSHA PEL (ppm)	OSHA Acceptable Ceiling/ST Concentration (ppm)	Primary Health Hazards
Tetrachloroethene	25	100	100	200	Liver, kidneys, eyes, upper respiratory system, central nervous system
Trichloroethene	50	100	100	200	Respiratory system, heart, liver, kidneys, central nervous system, skin
1,1,1-Trichloroethane	350	450	350	---	Central nervous system, eyes, liver, kidneys, skin, cardiovascular systems
Vinyl Chloride	5	---	1 Action Level = 0.5	5	Liver, skin, respiratory system, central nervous system, lymphatic system, *confirmed human carcinogen*
Cis-1,2-Dichloroethene	200	---	200	---	Respiratory system, eyes, central nervous system
Trans-1,2-Dichloroethene	200	---	200	---	Respiratory system, eyes, central nervous system
Turpentine	100	---	100	---	Eyes, skin, respiratory system, central nervous system, kidneys
Benzene	10	---	Action Level = 0.5	5 (ST)	Eyes, skin, respiratory system, blood, central nervous system, bone marrow, *suspected human carcinogen*
Stoddard solvent	100	---	500	---	Eyes, skin, respiratory system, central nervous system, kidneys
Carbon Tetrachloride	5	10	10	25	Central nervous system, eyes, lungs, liver, kidneys, skin

Table 5-4

ACTIVITIES TO BE PERFORMED DURING REMEDIAL INVESTIGATIONS AT DRY CLEANER SITES

Soil vapor sampling
Dry well, storm water drainage system and on-site sanitary system sampling
Test pit excavation
Surface soil sampling
Borehole construction
Monitoring well installation
Groundwater sampling
Surface water and surface water sediment sampling
Ambient air sampling

5.5.1.3 - Potential Exposures

Potentially contaminated samples include soil, groundwater, waste water, sludge, storm water, surface water and sediment. The expected risk of exposure to these chemicals would be from inhalation, ingestion, skin or eye contact with volatile compounds, contaminated dusts, etc. Potential exposures can be mitigated through appropriate investigation procedures, work practices, air monitoring and personal protective equipment. Duration and frequency of exposure will be short and intermittent over a period of several weeks. All personnel related to the investigation will keep upwind of all soil disturbances and sampling activities at all times, when possible. In addition, splashing of liquids should be minimized by employing careful handling practices.

5.5.1.4 - Physical and Biological Hazards

Potential physical hazards from routine investigative work are low, but still require consideration due to their ability to cause injury. Workers may encounter sharp objects, pinch points or unsecured footing, especially when working inside the dry cleaner facility. Improper or careless use of sampling, drilling and excavation equipment increases the risks of accidents from underground and overhead utilities, and operation of the equipment. When working around machinery inside a dry cleaner, there are also potential electrical hazards. In addition, workers may be exposed to poison ivy, stinging and biting insects, ticks and vermin. Heat/cold stress, sunlight and UV radiation, and biological hazards are also potential hazards.

Open excavations, pits, trenches and other confined spaces also represent hazards and under no circumstances will they be entered unless written procedures are in place and anyone performing confined space operations has received the necessary training. Gases such as methane or hydrogen sulfide may be encountered in drains, sump pits, dry wells or sanitary systems.

5.5.2 Activity Safety and Health Hazard Analysis

Field activities for dry cleaner sites will include collecting analytical data from various sampling locations and environmental media using techniques including:

- Soil vapor sampling
- Dry well, storm water drainage system and on-site sanitary system sampling
- Test pit excavation
- Surface soil sampling
- Borehole construction
- Monitoring well installation
- Groundwater sampling
- Surface water and surface water sediment sampling
- Ambient air sampling

Potential safety risks will vary with the specific activity and equipment used, and with the sampling sites themselves. When any new data is collected, potential health and safety hazards will be evaluated and related to the current and planned activities at the site. All sampling work in which the potential hazards have not been identified may require additional precautions to assure protection against potential hazards. Any modifications of the Generic Work Plan or changes contained in the Site-Specific Work Plan will require evaluation to determine if the existing Health and Safety Plan is adequate in protecting on-site investigators.

With the installation of groundwater monitoring wells and soil borings, soil and groundwater sampling, test pit excavations, and drywell, storm water drainage system and sanitary system sampling during the investigation, some safety risks inherent with these activities may be expected. There is the potential for mechanical and physical struck-by hazards associated with the equipment and sampling activities. There are also potential electrical hazards from underground lines, overhead lines and use of electrical equipment and tools. All underground utilities must be located in areas where subsurface investigation is to be performed. Utility companies will be contacted to provide "mark-outs" on and off site at all investigation locations prior to initiation of subsurface activities. The property owner will also be contacted to determine utility locations on site. When conducting work inside dry cleaners, machinery lockout/tagout must be performed. Workers should be aware of pinch points when working around machines.

The direct handling of contaminated drums, containers or concentrated/pure chemicals is not expected during the investigation. In the event that such materials are encountered during the field program, the operation will cease and uncovered drums which have been damaged will be immediately covered with soil to minimize release of volatile compounds. This condition will be recorded and reported to NYSDEC, and the field team will be instructed to secure the area until health and safety risks are properly assessed and NYSDEC determines further action.

The activities to be conducted at dry cleaner sites represent low to moderate health risk given the potential to encounter contaminated material. The risk associated with safety hazards is also low to moderate. Potential levels of airborne contaminants may dictate use of appropriate personal protective equipment as deemed necessary by the HSO.

Initial work will be conducted in Level D personal protection. Monitoring equipment to be used includes: portable PID/FID, and combustible gas, oxygen, hydrogen sulfide indicator. Other instrumentation and sampling systems may be utilized, if deemed necessary by the HSO or designee. The HSO or designee may modify these requirements as deemed necessary.

Proper wearing of protective equipment and employment of stringent personal hygiene practices should reduce potential health hazards.

Restricting access of on-site personnel to all equipment operations, maintaining safe distances from equipment and wearing proper safety equipment will reduce risk of injuries.

5.6 Training Requirements

5.6.1 General Health and Safety Training

All on-site personnel assigned to or regularly entering areas of the site other than the Support Zone (once established) will be trained in accordance with 29 CFR 1910.120. This training will be required for personnel performing or supervising work; for health, safety, security, or administrative purposes; for maintenance; or for any other site related function.

The training will include a minimum of forty hours of general health and safety training and three days of on-site supervised experience. Documentation of all such training will be made available to the HSO, HSO designee or FOM before any person will be allowed to enter any potentially contaminated area (namely, the Exclusion Zone or the Contaminant Reduction Zone - See Section 5.10 for further discussion of Work Zones).

5.6.2 Site-Specific Training

All site personnel will attend a Site-Specific training meeting and will become familiar with the HASP and site-specific information, and certify their understanding of this plan (see Exhibit 5-2). This meeting will include, at a minimum, discussion in the following areas:

- Site specific hazard analysis (chemical/physical hazards).
- Standard safety operating procedures.
- Personal hygiene.
- Safety equipment to be used.
- Personal protective equipment to be worn, including care, use and proper fitting.
- Decontamination procedures.

- Areas of restricted access and prohibitions in work areas.
- Emergency procedures and plans.
- On-site and off-site communications.
- Hazardous materials handling procedures.
- Air monitoring instrumentation use and calibration.
- Hazardous materials recognition.
- The "Buddy System" to be used at the site.

Visitors entering the Exclusion and Contaminant Reduction Zones will also be briefed on similar information. This briefing will be conducted by the HSO or the FOM/Alternate HSO. Abbreviated awareness briefings for visitors who remain in the Support Zone will also be provided by the HSO, HSO designee or FOM.

Proof of training for all on-site personnel will be included in the Site-Specific HASP or provided to the HSO prior to commitment of field activities. Personnel who have not successfully completed the required training will not be permitted to enter the Exclusion Zone or the Contaminant Reduction Zone.

New employees involved in hazardous activities will be indoctrinated by the HSO prior to entering the site to work. All training requirements will be completed by a new employee prior to indoctrination. Indoctrination will be comprised of the site-specific refresher briefing, the task/operation safety and health risk analysis, and the phased accident prevention plan.

5.7 Personal Protective Equipment

5.7.1 General

All on-site personnel will be issued appropriate personal protective equipment (PPE). All PPE is to be used properly and protective clothing is to be kept clean and well maintained. The HSO or designee will maintain constant communication with the Project Director when conducting air monitoring and consult the Project Director with regard to "action levels" at which the specified minimum levels of protection are either upgraded or downgraded based upon air monitoring results and direct contact potential. The HSO or designee has the authority to require the use of additional equipment, if necessary, for specific operations, or may tailor PPE specifications to best fit the hazard control requirements as appropriate.

5.7.2 General Site Safety Equipment Requirements

The following is the basic work uniform and will be worn primarily outside the Exclusion Zone and the Contaminant Reduction Zone at the site. Equipment includes:

- Coveralls - (optional, may be disposable type).
- Boots/shoes - (OSHA compliant construction footwear)
- Hard hat with splash shield, if needed - ANSI approved.
- Gloves (optional).

5.7.3 Level D Protection

Level D protection will be initially worn in the Exclusion Zone and Contaminant Reduction Zone during intrusive sampling and investigative activities. Equipment includes:

- Coveralls - One or two piece disposable suit, tyvek or equivalent.

- Gloves - Outer (neoprene, nitrile, or equivalent); Inner (latex).
- Boots - Outer (vulcanized rubber or equivalent); Inner (steel toe and shank) or equivalent combination (ANSI approved).
- Safety glasses or goggles (ANSI approved).
- Hard hat with splash shield, if needed (ANSI approved).
- Hearing protection (if work is near heavy or noisy equipment)

5.7.4 Level C Protection

Level C protection will be selected when a modified level of respiratory protection is needed. Selection will be made when air monitoring results for the site or individual work areas exceed the action level criteria (See Section 5.9.2 for action level criteria). Equipment includes:

- Respirators - Full facepiece, air purifying respirator with combination organic vapor and high efficiency particulate air (HEPA) cartridges (OSHA/NIOSH approved).
- Coveralls- Hooded one or two piece chemical resistant suit, PE - Tyvek or equivalent (modification of protective suits may be made upon the approval of the HSO).
- Gloves - Outer (nitrile or equivalent); Inner (latex).
- Boots - Outer (neoprene or equivalent); Inner (steel toe and shank) or equivalent combination (ANSI approved).
- Two-way radio communications (for remote operations).
- Hard hat with splash shield (ANSI approved).
- Hearing protection (if work is near heavy or noisy equipment)

5.7.5 Level B Protection

Level B protection requires full chemical resistant clothing with a full facepiece SCBA or supplied air respirator. Generally, this level of protection is not expected for this project. However, provision will be made to have this equipment available should its use be determined to be required. Investigation activities which may result in this level of protection being required will not be implemented until the equipment has been transported to the site. The HSO will be notified should air monitoring indicate this level of protection is required. Implementation of Level B protection will only be performed when sufficiently trained personnel (minimum of two) are available on-site.

5.7.6 Confined Spaces

Under no circumstances will confined spaces be entered unless discussed with the Project Director and HSO, and this plan is revised or the Site-Specific HASP is prepared to incorporate additional safety requirements, and all personnel are trained appropriately to deal with confined space hazards.

5.7.7 Standing Orders

5.7.7.1 - Eye Protection

Prescription lens inserts will be provided or personal contact lenses may be used for full-face respirators. All eye and face protection will conform to OSHA 1910.133.

5.7.7.2 - Respiratory Protection

Programs for respiratory protection will conform to OSHA 1910.134 and ANSI Z88.2-1980. A respiratory program addressing respirator care and cleaning is described in Exhibit 5-3.

5.7.7.3 - Respirator Fit-testing

Personnel unable to pass a fit-test will not engage in any investigation activities that will require level C or higher protection.

5.7.7.4 - Respirator Maintenance and Repair

Each respirator will be individually assigned and not interchanged between workers without cleaning and sanitizing. Cartridges/canisters and filters will be changed daily or upon breakthrough, whichever occurs first. If breakthrough occurs, a reevaluation by the HSO of the protection level will be made. A procedure for assuring periodic cleaning, maintenance, and change of filters will be followed by each respirator wearer. This procedure is described in Exhibit 5-3 - Respiratory Cleaning and Maintenance Procedure.

5.7.7.5 - Head Protection

A hard hat will be worn by all personnel. All head protection will conform to the requirements in OSHA 1910.135.

5.7.7.6 - Reuse and Retirement of PPE

All non-disposable Level D or C personal protective equipment worn on-site will be decontaminated before being reissued. The FOM, HSO or designee is responsible for ensuring all non-disposable personal protective equipment is decontaminated before being reissued (see Section 5.11). Disposable PPE will be properly disposed of according to NYSDEC requirements and regulations.

5.7.7.7 - Foot Protection

All safety boots will conform to OSHA 1910.136.

5.7.7.8 - Noise Protection

Power equipment may generate excessive noise levels (in excess of 85 decibels). Proper ear protection will be provided and used in accordance with OSHA 1926.52.

5.8 Medical Surveillance

All on-site personnel involved in hazardous waste operations will have satisfactorily completed a comprehensive medical examination prior to the initiation of investigation activities at the site. Medical examinations are required for any and all personnel entering Exclusion or Contamination Reduction Zones.

Medical examinations are not required for people making periodic deliveries provided they do not enter Exclusion or Contamination Reduction Zones.

The date of physical examination of each site worker will be documented. A specific Medical Data Sheet for each individual will be filed with the HSO or designee prior to commencing operations and with the Project Manager.

All personnel who will enter the Exclusion Zone or the Contaminant Reduction Zone will be provided with medical surveillance at the start of their employment (entrance examination) and at the end of the on-site personnel's employment (exit examination). Medical surveillance protocol is the physician's responsibility, but will meet the requirements of OSHA Standard 29 CFR 1910.120 for all personnel. The protocol will be selected by the physician. Additional clinical tests may be included at the discretion of the attending physician performing the medical examination. Non-scheduled medical exams may be conducted as determined necessary by the physician, but will be conducted:

- After acute exposure to any toxic or hazardous material.

- At the discretion of the Project Director and/or the physician, when an employee has been exposed to potentially dangerous levels of toxic or hazardous materials.
- At the discretion of the Project Director and/or the physician, and at the request of an employee with demonstrated symptoms of exposure to toxic or hazardous materials.

In addition to non-scheduled exams, any medical or biological monitoring required by an OSHA standard when OSHA Action Levels are exceeded will be performed.

Companies contracted to perform work on-site in the Exclusion Zone or Contaminant Reduction Zone, will provide equivalent medical surveillance to their on-site personnel and supply documentation to that effect.

5.8.1 Documentation and Recordkeeping

The examining physician will notify the Project Director in writing that the individual has received a medical examination and advise as to any specific limitations upon such individual's ability to work at the project site, which were identified as a result of the examination. Appropriate action will be taken in light of the advice given pursuant to this paragraph.

The ability of on-site personnel to wear respiratory protection during hazardous waste activities will be certified by the physician. Cardiopulmonary system examination and pulmonary function testing are minimum requirements.

The physician will maintain and provide access for employees to his medical surveillance records according to OSHA requirement 29 CFR 1910.20. These records will be maintained for a period of 40 years.

5.9 Environmental and Personal Monitoring Program

5.9.1 General

In order to protect site workers from harmful levels of airborne toxic materials, potentially explosive gases, or excessively cold conditions, regular environmental and personnel monitoring will be accomplished to document exposures and to decide when to increase protective measures.

5.9.2 Air Monitoring

Particular phases of work will require the utilization of specific air monitoring equipment to detect relative levels of contaminants or identify unknown environments.

Air monitoring will be conducted by the HSO or FOM or designee for the express purpose of safe guarding the health and welfare of site workers and the general public residing in the vicinity of the site.

5.9.2.1 - Air Monitoring Instrumentation

On-site air monitoring will be performed using the following direct reading instruments:

- Century OVA-128 (or equivalent) portable flame ionization device (FID) for detection of volatile organic vapors (with and without a methane filter)
- PhotoVac Microtip (or equivalent) portable photo ionization device (PID) for the detection of organic vapors
- Portable combustible gas/oxygen/hydrogen sulfide detector will be available for determining lower explosive limits, oxygen and hydrogen sulfide levels in any identified confined spaces. Under no circumstances will confined spaced be entered unless discussed with the Project Director and the HASP is revised to incorporate additional safety requirements and all personnel are trained appropriately to deal with confined space hazards.

- Draeger gas detector tubes for detecting specific hydrocarbons (e.g., VC, PCE and TCE) should PID/FID readings exceed 1 ppm.

All monitoring and surveillance equipment will be operated, maintained and calibrated each working day in accordance with the manufacturer's instructions and quality assurance procedures. Organic vapor monitoring will be conducted by trained field staff prior to, during and following sampling, and disturbance of soils or sediments at a sampling site. Should contamination levels indicate high hazard potential, the HSO will review monitoring procedures and results.

A daily air monitoring form or entries in a daily log book will be used to record monitoring data. (See Exhibit 5-4).

Instruction and calibration manuals for the proper use of these, as well as other field instrumentation, will be provided as a separate document available for use at the site.

Monitoring and surveillance equipment is impacted by cold weather, communication transmissions and possibly high voltage electrical transmission wires and other interferences. Any unusual meter responses will be noted on the air monitoring form and a diagnosis of potential influencing factors made to determine and eliminate the cause.

5.9.2.2 - Air Monitoring Locations and Action Level Criteria

The primary areas to be monitored during the project are the work zones established around sampling, drilling or excavation locations. Air monitoring protocols for each area will differ, since target populations, contaminant concentrations and atmospheric conditions will vary. Monitoring will be conducted within these work zones and at the site perimeter.

Air monitoring conducted at the sampling locales will focus on workers' breathing zones and may include personal breathing zone samples. Air monitoring just outside of these locations will consist of instruments attempting to quantify the types and degrees of emissions originating from sampling sites.

5.9.2.2.1 - Duration, Frequency and Protocol

Monitoring will be conducted daily or as deemed necessary by the HSO or designee during all activities in the Exclusion Zone, particularly during intrusive activities. The HSO or designee may modify the work zone sampling frequency upon review of previously analyzed work zone samples.

5.9.2.2.2 - Background Air Monitoring

Background monitoring for contaminants will be conducted at the upwind perimeter of the Exclusion Zone prior to allowing workers to enter the Exclusion Zone. Monitoring will occur continuously, or at the discretion of the HSO or designee, downwind and crosswind while work is occurring in the Exclusion Zone. Data will be annotated in the Air Monitoring Form for that day. Indoor air quality monitoring will also be conducted when working inside.

Changes in wind direction will require reassessment of air monitoring locations. Wind directions may be determined with the aid of a wind sock (if appropriate). Levels of contaminants that warrant use of respiratory protection by site workers may require initiation of site perimeter and personal sampling as deemed necessary by the HSO or designee.

5.9.2.2.3 - Exclusion Zone Air Monitoring

Air monitoring conducted in the Exclusion Zone will focus on real time measurement of toxic compounds that pose inhalation hazards, levels of flammable compounds for explosive hazards, and oxygen deficient atmospheres. A summary of the action levels are provided in Table 5-5.

Table 5-5

**ACTION LEVELS FOR
REMEDIAL INVESTIGATIONS
AT DRY CLEANER SITES**

Action Level	Action To Be Taken
OVA/TIP	
Background	**Level D**
Background to 5 units* above background in breathing zone, and no vinyl chloride or benzene present.	Halt work, evacuate area and allow area to ventilate prior to resuming work. Should levels persist, upgrade to **Level C** protection if required upon approval by HSO and FOM.
Greater than 5 units* above background in breathing zone, and no vinyl chloride or benzene present.	Halt work, evacuate work area and allow area to ventilate prior to resuming work. Should levels persist, contact FOM and upgrade to **Level B** protection if required upon approval by HSO and FOM.
DRAEGER COLORIMETRIC TUBE	
Positive color change for vinyl chloride or benzene ≤ 0.5 ppm	Halt work, evacuate area and allow area to ventilate prior to resuming work. Contact FOM. If levels persist, upgrade to **Level C** protection if required upon approval by HSO and FOM.
Vinyl chloride or benzene 0.5 - 1.0 ppm	Halt work, evacuate area and allow area to ventilate prior to resuming work. Contact FOM. If levels persist, upgrade to **Level B** protection if required upon approval by HSO and FOM.
Vinyl chloride or benzene > 1 ppm	Shut down work activities. Monitor site to check for off-site migration.

Table 5-5 (continued)

**ACTION LEVELS FOR
REMEDIAL INVESTIGATIONS
AT DRY CLEANER SITES**

Action Level	**Action To Be Taken**
COMBUSTIBLE GAS METER	
Greater than 10% Lower Explosive Limit (LEL)	Halt work, evacuate area and allow area to ventilate to below 10% LEL prior to resuming work. Notify FOM.
OXYGEN	
Less than 20.5%	Continuous monitoring. Consider engineering controls.
Less than 19.5%	Evacuate work area. Institute ventilation and engineering controls. Maintain site conditions for at least 15 minutes before proceeding. Notify FOM.
Greater than 22%	Continuous monitoring and identify combustion sources.
Greater than 23.5%	Evacuate and institute engineering controls as necessary before proceeding. Explosive condition may be present. Notify FOM.
HYDROGEN SULFIDE	
Less than 10 ppm at breathing zone	**Level D** and continuos monitoring.
Above 10 ppm at breathing zone	Halt work, evacuate area and allow area to ventilate to below 10 ppm. If levels persist, upgrade to **Level B** protection if required upon approval by HSO and FOM.

*Units equal total ionizable organic/inorganic vapors and gases.

**Reading sustained for 1 minute (60 seconds) or longer.

Vapor Emission

If the ambient air concentration of total organic vapors exceeds 5 ppm (or 5 units) above background at the perimeter of the Exclusion Zone, work at that location will be stopped, and the area evacuated until a review of work procedures, air monitoring needs, and use of appropriate respiratory protection and equipment is performed by the HSO or FOM. In addition, downwind monitoring at the site perimeter will be performed to determine whether off-site contaminant migration is occurring. Work will proceed only after review and approval by the HSO or FOM, and the appropriate corrective action is taken or level of protection established. More frequent intervals of monitoring will be conducted as directed by the HSO, including Draeger tube screening for specific contaminants.

If the organic vapor level decreases to below 5 ppm (5 units), and vinyl chloride is not present, activities can resume, but more frequent intervals of monitoring, as directed by the HSO, must be conducted and must include monitoring for vinyl chloride. If the organic vapor levels are greater then 5 ppm, but less than 25 ppm over background at the perimeter of the Exclusion Zone, activities can resume provided Level B protection is worn and the area is monitored for vinyl chloride until levels fall below background.

If the organic vapor level is above 25 ppm at the perimeter of the Exclusion Zone, work activities must be shutdown. When work shutdown occurs, downwind air monitoring as directed by the HSO will be implemented to ensure that vapor emissions do not impact the nearest residential or commercial structure at levels exceeding those specified in the Major Vapor Emission section.

Vinyl Chloride

Should monitoring data for total VOC vapors equal or exceed 1 ppm above background, work will be stopped and the work area evacuated. The area will be evaluated for the presence of vinyl chloride using Draeger detector tubes. If there is positive indication of the presence of vinyl chloride at or below 1 ppm, the HSO or FOM will evaluate the need for use of supplied air respirators. The HSO of FOM will continue to monitor for vinyl chloride. If levels of vinyl chloride equal or exceed 1 ppm, operations will cease and the work area will be evacuated until vinyl chloride is not detected, or go to Level B protection.

5.9.2.2.4 - Community Air Monitoring Plan

Air monitoring for volatile organic compounds will be accomplished at the upwind and downwind perimeter of the Exclusion Zone to document real time levels of contaminants which might be moving off-site. The plan must include the following:

- VOCs will be monitored at the downwind perimeter of the Exclusion Zone daily at 2 hour intervals. If total organic vapor levels exceed 5 ppm above background, activities must be halted and monitoring continued under the provisions of Major Vapor Emission Response Plan (see below). All readings must be recorded and be available for NYSDEC and New York State Department of Health (NYSDOH) personnel to review.

Major Vapor Emission

If organic levels greater than 5 ppm (or 5 units) above background are identified 200 feet downwind from the Exclusion Zone or half the distance to the nearest residential or commercial property, whichever is less, all work activities must be halted.

If, following cessation of the work activities, or as the result of an emergency, organic levels persist above 5 ppm above background 200 feet downwind, or half the distance to the nearest residential or commercial property from the Exclusion Zone, then the air quality must be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (10-foot zone).

If either of the following criteria are exceeded in the 20 foot zone, then the Major Vapor Emission Response Plan will be implemented:

- Organic vapor levels approaching 5 ppm above background for a period of more than 30 minutes; or
- Organic vapor levels greater than 10 ppm above background for any time period.

Major Vapor Emission Response Plan

Upon activation, the following actions will be undertaken:

1. The local police authorities will be immediately contacted by the HSO and advised of the situation.
2. Frequent air monitoring will be conducted at 30 minute intervals within the 20 foot zone. If two successive readings below action levels are measured, air monitoring may be halted or modified by the HSO.
3. All emergency contacts will go into effect as appropriate.

Off-Site Migration Procedures

The same procedures and protocols practiced by on-site workers will aid in preventing any potential adverse conditions with respect to areas adjacent to the site. That is, these procedures are designed to assist in eliminating or minimizing the potential for extensive off-site migration. In the unlikely event that such migration occurs, the following notification procedures and work procedures are listed below:

1. Notification of local police, fire and rescue personnel advising them of the remedial investigation activities and the schedule of events on-site.
2. Immediate notification of NYSDEC, NYSDOH and local officials in the event of a threatening hazardous condition that may effect the health and safety of on-site workers and the surrounding community.
3. Decontamination procedures for equipment to prevent off-site migration of contaminants.

4. Use of a flame or photo ionization detector to monitor volatile organic vapors and potential off-site migration of contaminants.

5. Wetting down the ground surface or using clean cover material or calcium chloride to suppress particulate dust in the event that dust levels in the air of the work area are exceeded.

General visual observation will also be used during all intrusive activities to identify airborne releases (vapors, smoke, etc.) changes in the coloration of excavated materials, changes to the structural integrity of the surface or mechanical integrity of the equipment. Should such conditions be noticed or encountered, work will be halted, and the area evacuated until such time the FOM can be contacted and specific procedures for characterizing and handling the hazard can be developed.

The HSO, or his on-site designee, will observe site conditions daily with special attention to the aforementioned conditions. Depending on site conditions, additional personal protection measures will be implemented during the course of site work.

5.9.2.3 - Heat/Cold Stress Monitoring

Heat/cold stress guidelines are described in detail in Exhibit 5-5

5.9.3 Quality Assurance and Control

All monitoring instruments will be protected from surface contamination during use to allow easy decontamination. All instrumentation will be calibrated before and after use, and operational checks conducted periodically in the field over the duration of the day's field activities.

The following data will be recorded by the HSO or designee on the Air Monitoring Data form:

- Date and time of monitoring;
- Air monitoring location;
- Instrument, model number, serial number;
- Calibration/background levels; and
- Results of monitoring.

Interpretation of the data and any further recommendations will be made by the HSO or designee.

Air monitoring results will be provided verbally to the FOM following each site scan that indicates volatile organic vapor concentrations in excess of the action levels. Results will then be documented in writing and provided to the FOM by the end of that work day.

5.10 Site Control Measures

5.10.1 Work Zones

Those activities discussed previously in Section 5.5 will be subject to the designation of workzones. The Restricted Zone (RZ) will be identified as the area within which all project operations take place. At each sampling site, three work areas will be established: the Exclusion Zone (EZ), Contaminant Reduction Zone (CRZ) and Support Zone (SZ). Only authorized personnel will be allowed in the RZ. Typically, a five foot wide (or distance determined by the HSO or FOM) strip of land bordering the EZ is considered the CRZ. In addition to this strip of land, a specially demarcated area that connects the decontamination area to the CRZ is treated as an extension of the CRZ. All other areas inside the restricted area that are not an active Exclusion or Contaminant Reduction Zone are treated as a Support Zone.

5.10.1.1 - Exclusion Zone

The Exclusion Zone includes the intrusive activities and isolates the area of contaminant generation, and restricts (to the extent possible) the spread of contamination from active areas of the site to support areas and off-site locations. This area will encompass all intrusive work. The Exclusion Zone is demarcated by the Hot Line (i.e., a tape or rope line or physical barrier). Personnel entering the Exclusion Zone must:

- Enter through a controlled access point (the Contaminant Reduction Zone);
- Wear the prescribed level of protection (see Section 5.7); and
- Be authorized to enter the Exclusion Zone (see Section 5.4, 5.6, and 5.8).

Any personnel, equipment or materials exiting the Exclusion Zone will be inspected for contamination. Personnel will be subject to decontamination if deemed necessary by the HSO or FOM. Equipment and materials (e.g., drill rods) will be decontaminated at decontamination facilities.

Specific access for emergency services to areas of specific site operations will be established by the HSO prior to commencing any operation. The delineated area of the Exclusion Zone may vary with task. (See Section 5.5 for specific task descriptions and the levels of protection.)

5.10.1.2 - Contaminant Reduction Zone

It is not anticipated that the prototypical CRZ will be necessary for investigations at dry cleaner sites. The extent and configuration of the CRZ will be at the discretion of the HSO or FOM. Certain safety equipment (e.g., emergency eye wash, fire extinguisher and first aid kit) will be located in the van at the sampling location.

The level of protection to be used for decontamination will normally be Level D. However, the HSO will determine appropriate levels of protection based upon air monitoring readings, and visual inspection of personnel and equipment operations in the Exclusion Zone. Equipment operators (e.g., truck drivers) physically performing tasks outside the EZ may be exempt from this requirement as approved by the HSO or FOM.

5.10.1.3 - Support Zone

A van will be used for storage of equipment and materials, paperwork, MSDS, emergency equipment and communications equipment. A log of all persons entering the site will be maintained by the FOM.

5.10.2 Operations Start-Up

No personnel will be positioned downwind of Exclusion Zone during intrusive activities and sampling, if possible.

5.10.3 Buddy System

All on-site personnel will utilize a buddy system when any task performed at the site requires:

- Personnel to assist in performing an activity.
- Intrusive work performed in the Exclusion Zone.
- Use of protective clothing.
- Communication between the Exclusion Zone and outside the Exclusion Zone.

The FOM, HSO or designee will enforce the buddy system and has the authority to modify the criteria stated above to deal with changing site-specific and environmental conditions.

In order to ensure that help will be provided in an emergency, all on-site personnel will be in line-of-sight contact or in communication with the HSO or FOM when working in the Exclusion Zone.

5.10.4 Site Communications Plan

- Internal communications on-site should be instituted prior to initiating any task in the Exclusion Zone.
- Internal communications will be used by on-site supervisory personnel.
- The FOM, HSO or designee will ensure that all site personnel are trained to use internal communications to:
  - alert personnel on-site of emergencies;
  - pass along safety information (such as for heat stress, cold stress control, or rest period time, etc.);
  - changes in work scope, scheduling or sequencing of operations; and
  - maintain site control (such as notification of vandalism, intruders or violations of HASP protocol).
- Verbal communications and hand signals will be used for all tasks associated with the project. However, for those tasks performed in Level D or Level C, radio communications may be used.
- Any Exclusion Zone work activity being performed out of the line of sight may require use of radio communications.
- Air horns will be positioned at any Exclusion Zone work area to be used for emergency response only. The HSO or designee will designate air horn blast sequences for identification of work location, type of emergency and need for evacuation of all personnel.
- Wind direction indicators will be installed such that a line-of-sight is maintained with all personnel in all work zones. The HSO or designee will designate specific locations for wind direction indicators.
- All moving machinery, bulldozers, cranes, dump trucks, etc. will have working backup alarms.

- External communications (outside the site) will be maintained and used to coordinate emergency response, report to management and maintain contact with essential off-site personnel.

- All on-site personnel will be informed of external communications hardware (such as telephone, etc.) and the necessary telephone numbers to contact in the event of an emergency situation (fire, police, ambulance, etc.).

- All emergency numbers will be available at the site (see Section 5.1.1 for listing of important telephone numbers).

- Appropriate action will be taken should any hazardous environmental condition be observed on site. These conditions and the appropriate action to be taken will be as follows:

Observation	Potential Hazard	Action
Muddy condition	Personnel slip, equipment instability	Monitor work until condition improves
Lightning	Electrocution	Stop work until condition subsides
Horn blasts or other notification by site personnel	Site emergency	Stop work - evacuate to van or trailer - follow emergency notification procedures
Personal injury	Other personnel may be affected	Follow emergency notification procedures
Personal fatigue	Cold stress	Follow cold stress guidelines
Windy condition	Overhead hazards, visual impairment	Stop work until condition subsides

5.10.5 Medical Assistance and General Emergency Procedures

Site-specific information regarding medical assistance and emergency numbers will be listed in the Site-Specific HASP. Emergency medical information for substances potentially present on-site include:

Substance	Exposure Symptoms	First Aid
VOCs (PCE, TCE, VC, DCE, Benzene)	Dermal: irritation Inhalation: dizziness, nausea	Rinse affected area with water. Ventilate, artificial respiration.
H_2S (Hydrogen Sulfide)	Inhalation: irritation	Ventilate, artificial respiration.
Methane	Inhalation: dizziness, nausea	Ventilate, artificial respiration.

5.10.5.1 - General Emergency Procedures

The following standard emergency procedures will be used by on-site personnel. The HSO or designee will be notified of any on-site emergencies and will be responsible for ensuring that the appropriate procedures are followed.

- Personnel Injury: Administer first aid and/or CPR, and arrange for medical attention.
- Fire/Explosion: Alert the fire department. Personnel will move a safe distance from the involved area.

5.10.6 Safe Work Practices

Workers will adhere to established safe work practices for their respective specialties. The need to exercise caution in the performance of specific work tasks is made more acute due to:

- Physical, chemical and toxicological properties of contaminated material present;
- Other types of hazards present, such as heavy equipment, falling objects, loss of balance or tripping;
- Weather restrictions;
- Restricted mobility and reduced peripheral vision caused by the protective gear itself;
- Need to maintain the integrity of the protective gear; and
- Increased difficulty in communicating caused by respirators.

Work at the site will be conducted according to established protocols and guidelines for the safety and health of all involved. Among the most important of these principles are the following:

5.10.6.1 - General

- In any unknown situation, always assume the worst conditions and plan responses accordingly.
- Because no personal protective equipment is 100 percent effective, all personnel must minimize contact with contaminated materials. Plan work areas, decontamination areas and procedures accordingly.
- Smoking, eating, chewing gum or tobacco, or drinking in the Contaminant Reduction Zone and the Exclusion Zone will not be allowed. Oral ingestion of contaminants is the second most likely means of introducing toxic substances into the body (inhalation is the first).
- Work breaks should be planned to prevent stress related accidents or fatigue related to wearing protective gear.
- Medicine and alcohol can potentiate the effects from exposure to toxic chemicals and cold stress. Prescribed drugs should not be taken if working in the Contaminant Reduction Zone or Exclusion Zone, unless approval has been given by the physician. Alcoholic beverage consumption will be prohibited on the site.
- Personnel must be observant of not only one's own immediate surrounding, but also those of others. Everyone will be working under constraints, therefore, a team effort is needed to notice and warn of impending dangerous situations. Extra precautions are necessary when working near heavy equipment and while utilizing personal protective gear because vision, hearing and communication will be restricted.
- Contact lenses are not allowed to be worn on site. If corrosive or lachrymose substances enter the eyes, proper flushing is impeded.
- All facial hair that interferes with the respirator facepiece fit, must be removed prior to donning a respirator for all tasks requiring **Level C** or **Level B** protection.
- Personnel must be aware that chemical contaminants may mimic or enhance symptoms of other illnesses or intoxication. Avoid excess use of alcohol or working while ill during the duration of task assignment.

5.10.6.2 - Site Personnel

- All personnel at the site will be identified to the HSO and FOM.

- All personnel operating in respective work zones will dress according to the protection levels set forth in this HASP (see Section 5.7).

- No red head wooden matches or lighters of any kind will be allowed in the Contaminant Reduction Zone or Exclusion Zone.

- All personnel will notify the HSO or FOM of any unusual occurrences that might effect the overall safe operation of the site.

- Any time a fire extinguisher is used, personnel will notify the HSO or FOM of what took place.

- All injuries and accidents will be immediately reported to the HSO or FOM and the appropriate reports filed (see Exhibit 5-6).

5.10.6.3 - Traffic Safety Rules

- Any vehicles that will not be involved in the site operations will be secured and the motor shut down.

- Only personnel assigned to this remedial investigation will be allowed to enter the site. Any other people, whether from OSHA, USEPA or vendors supplying equipment, etc., will have to be met prior to entering the site.

- At no time will any equipment be allowed to block any access road. If in the moving of equipment, a temporary blockage will exist, that equipment will have an operator available to move that equipment.

- The locations of all fire fighting equipment, valves, hydrants, hose storage places and fire extinguishers will be indicated to all personnel so that they will not be inadvertently blocked at any time.

5.10.6.4 - Equipment Safety Rules

- Proper loading and operation of trucks on-site will be maintained in accordance with DOT requirements covering such items as grounding, placarding, driver qualifications and the use of wheel locks.

- Operation of heavy construction equipment will be in accordance with OSHA regulations 29 CFR 1910 and 1926.

- All equipment that is brought on-site will be available for inspection by the HSO.

- The HSO, or designee, will assign protective equipment to all site personnel and this equipment will be made available for inspection at anytime.

- All equipment will be installed with appropriate equipment guards and engineering controls. These include rollover protective structures.

- Safe distances will be maintained when working around heavy equipment.

- All equipment and tools to be operated in potentially explosive environments will be intrinsically safe and not capable of sparking or be pneumatically or hydraulically driven. Portable electric tools and appliances can be used where there is no potential for flammable or explosive conditions use three-wire grounded extension cords to prevent electric shocks. Ground fault interrupters will be used as well.

- With hydraulic power tools, fire-resistant fluid that is capable of retaining its operating characteristics at the most extreme temperatures will be used.

- Cutting or welding operations will not be carried out without the approval of the HSO and FOM.

- At the start of each work day and on a weekly basis, inspection of brakes, hydraulic lines, light signals, fire extinguishers, fluid levels, steering, and splash protection will be made by the equipment operators (see Exhibit 5-10 for the Daily Unit Inspection Report and the Weekly Safety Inspection List).

- All non-essential people will be kept out of the work area.

- Loose-fitting clothing or loose long hair around moving machinery will be prohibited.

- Cabs will be free of all non-essential items and all loose items will be secured.

- The rated load capacity of a vehicle will not be exceeded.

- Dust control measures will be employed to prevent the movement of dusts from contaminated areas to clean areas. The method employed will be determined and reviewed by the HSO and the FOM.

- Equipment operators will report to their supervisor(s) any abnormalities such as equipment failure, oozing liquids, unusual odors, etc.

- When an equipment operator must negotiate in tight quarters, a second person will be used to ensure adequate clearance.

- A signalman will be used to direct backing as necessary.

- Refueling will be done in safe areas. Engines will not be fueled while vehicle is running. Ignition sources near a fuel area will be prohibited.

- All blades and buckets will be lowered to the ground and parking brakes set before shutting off the vehicles.

- An ongoing maintenance program for all tools and equipment will be implemented by the responsible subcontractor equipment supervisor. All tools and moving equipment will be regularly inspected to ensure that parts are secured and intact with no evidence of cracks or areas of weakness, that the equipment turns smoothly with no evidence of wobble, and that it is operating according to manufacturer's specifications.

- Tools will be stored in clean, secure areas so that they will not be damaged, lost or stolen.

- All heavy equipment that is used in the Exclusion Zone will be kept in that zone until the investigation is complete or the equipment is decontaminated. Equipment will be completely decontaminated before moving it into the Support Zone.

5.10.6.5 - Drilling and Excavation and Equipment Safety Rules

Drill rig and excavator operation, maintenance and safety will be the responsibilities of the drill rig/excavator operator.

5.10.6.6 - Electrical Safety

Electrical hazards can exist at sites because of downed power lines, contact with subsurface utilities or improper use of electrical equipment. The presence of underground electric lines will be checked before any digging or excavating is undertaken. When using cranes or material handlers, care will be taken that the machinery does not come in contact with any energized lines. There should be a 10 foot clearance between a crane and electrical power lines unless the lines have been deenergized or an insulating barrier has been erected.

The following should be used for protecting personnel from electrical shocks:

- Ground equipment

- Double insulating tools
- Over current devices such as fuses and circuit breakers
- Ground fault circuit interrupter
- Tools and flexible cords will be inspected for damage that could lead to shock

5.10.6.7 - Daily Housekeeping

The site and all work zones will be kept in an orderly fashion and the site is to be left safe and secure upon completion of each day's work.

5.10.6.8 - Site Personnel Conduct

- All site personnel will conduct themselves properly and in accordance with generally accepted good work practice.
- At all times, the HSO will monitor all safe operations at the site. Any operation not within the scope of the HASP will be discussed fully before that operation begins.

5.11 Personal Hygiene and Decontamination

5.11.1 General

- All personnel performing or supervising remedial work within a hazardous work area, or exposed or subject to exposure to hazardous chemical vapors, liquids or contaminated solids, will observe and adhere to the personal hygiene-related provisions of this section.
- Any personnel found to be repeatedly disregarding the personal hygiene-related provisions of the HASP will be barred from the site by the HSO.
- All on-site personnel will wear personal protective equipment as required at all times whenever entering the Exclusion Zone or the Decontamination Area.

- Personal hygiene and decontamination facilities, in accordance with OSHA 29 CFR 1910.120 (N), will be provided on-site, when necessary, and include the following:

  - Storage and disposal containers for used disposable outerwear.
  - Hand washing facilities.
  - An uncontaminated lunch area.
  - An uncontaminated rest/break area.
  - Chemical toilet, if no other facilities are located on-site.

- All personnel must enter and leave the work site through the facilities. The portable chemical toilet (if required), if possible, will be located in the Support Zone.

- The personal hygiene and decontamination facilities will be provided so that any personnel leaving the Exclusion Zone may perform decontamination, safely remove all protective outer clothing, and wash face and hands.

- Decontamination will be performed prior to taking breaks, eating lunch or leaving the work site.

- All site personnel will be given orientation training to the use and operation of the personal hygiene and decontamination facilities.

5.11.2 Contamination Prevention

To minimize contact with contaminated substances and lessen the potential for contamination, the following will be adhered to:

- Personnel will make every effort not to walk through any areas of obvious contamination (i.e., liquids, discolored surfaces, smoke/vapor clouds, etc.).

- Personnel will not kneel or site on the ground in the Exclusion Zone and/or the Decontamination Area.

5.11.3 Personal Hygiene Policy

- Smoking and chewing tobacco will be prohibited except in a designated break area.

- Eating and drinking will be prohibited except in the designated lunch or break area.
- All outer protective clothing (e.g., chemically protective suits, gloves, and boots) will be removed and personnel will thoroughly cleanse their hands and other exposed areas before entering the break or lunch area.
- Drinking of replacement fluids will be permitted in a designated area outside the Exclusion Zone. Personnel will, as a minimum, remove outer and inner gloves, respirator and coverall top, and wash hands prior to drinking replacement fluids.
- All personnel should change into fresh clothing after each working period or shift. Showering is mandatory upon return to each individuals' rest place.

5.11.4 Personnel Decontamination Procedures

Decontamination procedures are followed by all personnel leaving the Exclusion Zone. Generalized procedures for decontamination follow. All procedures apply for Level C personal protection, however for Level D only steps 2, 3, and 8 apply. The HSO may modify these procedures based on site conditions.

Step 1 Drop tools, monitors, samples, and trash at designated drop stations (i.e., plastic containers or drop sheets).

Step 2 Scrub outer boots and outer gloves with decon solution or detergent and water. Rinse with water.

Step 3 Remove tape from outer boots (if applicable) and remove boots and discard tape in disposal container. Place boots on boot rack.

Step 4 Remove tape from outer gloves (if applicable) and remove only outer gloves and discard in disposal container.

Step 5 This is the last step in the decontamination procedure if the worker has left the Exclusion Zone to exchange the cartridges on his/her air purifying respirator. The cartridges should be exchanged, new outer gloves and boot covers donned, the joints taped, if necessary, and the worker returns to duty.

Step 6 Remove outer garments and discard in disposal container. New outer garments will be issued at the beginning of each work day or as deemed necessary by the HSO.

Step 7 Remove respirator and place or hang in the designated area.

Step 8 Remove inner gloves and discard in disposal container.

Note: Disposable items (i.e., coveralls, gloves, and boots) will be changed on a daily basis unless there is reason to change more frequently. Dual respirator cartridges will be changed daily, unless more frequent changes are deemed appropriate by site surveillance data or by assessments made by the HSO.

Pressurized sprayers or other designated equipment will be available in the decontamination area for wash down and cleaning of personnel, samples and equipment.

A waterless hand cleaner and paper towels may be used for hands, arms and any other skin surfaces potentially in contact with contaminated material.

Respirators (if used) will be decontaminated daily and taken from the drop area. The masks will be disassembled, the cartridges set aside and all other parts placed in a cleansing solution. After an appropriate time in the solution, the parts will be removed and rinsed with tap water. Old cartridges will be discarded in the contaminated trash container for disposal. In the morning, the masks will be reassembled and new cartridges installed, if appropriate. Personnel will inspect their own masks and readjust the straps for proper fit.

5.11.5 Emergency Decontamination

Decontamination will be delayed if immediate medical treatment is required to save a life. Decontamination will then be performed after the victim is stabilized. When decontamination can be performed without interfering with medical treatment, or a worker has been contaminated with an extremely toxic or corrosive material that could cause additional injury or loss of life, decontamination will be performed immediately.

When decontamination cannot be done, the victim will be wrapped in a chemical protective barrier (clothing or sheeting) to reduce contamination of other personnel. Emergency and off-site medical personnel will be informed of potential contamination and will be instructed about specific decontamination procedures. When the victim is transported off the site, personnel knowledgeable of the incident, the site and decontamination procedure will accompany the victim.

5.11.6 Equipment Decontamination - General

- All vehicles and equipment used in the Exclusion Zone will be decontaminated prior to leaving the site.
- No vehicles will leave the decontamination area until they are properly inspected and approved by the HSO or FOM for general cleanliness of frame and tires.
- No vehicle will leave the site unless it is in a broom-clean condition and free of loose dirt or material on tailgates, axles, wheels, etc.
- The HSO or designee will monitor all vehicles to confirm proper decontamination prior to exiting. Approval will be based on visual inspection of all exposed surfaces.
- Equipment decontamination wash water residues will be collected for disposal.
- Personnel engaged in vehicle decontamination will wear Level C or Level D equipment with respiratory protection consistent with the air monitoring results collected by the HSO, and perform personal decontamination at the completion of equipment decontamination.
- Only clean water will be used for personnel, equipment and vehicle decontamination.

5.11.7 Small Equipment Decontamination Procedures

Small equipment will be protected from contamination as much as possible by draping, masking or otherwise covering the instruments with plastic (to the extent feasible) without hindering operation of the unit. For example, the photoionization detector can be placed in a clear plastic bag to allow reading the scale and operation of the controls.

Step 1 Remove coverings from equipment left in the drop area and place the coverings in appropriate waste containers.

Step 2 Brush or wipe any soil or moisture with a disposal paper wipe. Place soiled wipes in appropriate containers.

Step 3 Place bare units in a clean plastic tub and wiped off with a damp, clean, disposable wipe. Equipment will then be allowed to air dry.

Step 4 Following decontamination, check and recharge equipment, as necessary, for the next day's operations.

Step 5 Prior to entering the Exclusion Zone, recover all small equipment with new, protective coverings, if necessary.

5.11.8 Heavy Equipment Decontamination Procedures

The decontamination area for the drill rig and excavator will be set up as described in 5.11.6. A wash/rinse will be performed on to all surfaces that came in contact with contaminants (e.g., augers). Prior to removing any heavy equipment or vehicles from the Exclusion Zone, they must be thoroughly decontaminated. Specific procedures are as follows:

Step 1 Initially, inspect equipment/vehicles to determine if gross decontamination is required first. Particular attention must be paid to tires, under surfaces, points of contact with the ground, and horizontal surfaces where dusts or aerosols might settle.

Step 2 If visible contamination is present, the equipment/vehicle must be moved to the decontamination pad where gross contamination will be scraped, brushed or swept off.

Step 3 Following gross decontamination, or if visible contamination is no longer present, wash the equipment/vehicle with high pressure washer as deemed necessary by the HSO or designee. Efforts should be made to minimize water usage to reduce wastewater quantities.

Step 4 Prior to releasing any heavy equipment or vehicles from the Contaminant Reduction Zone, decontamination personnel will contact the HSO for final approval.

5.12 Emergency Response and Contingency Plan

5.12.1 General

This plan has been prepared in accordance with 29 CFR 1910.120 (l) and will address the following potential emergencies:

- Emergencies outside the site.
- Emergencies within the site.
- Chemical exposures.
- Site evacuation.

5.12.2 Emergency Equipment

Specially marked and readily accessible emergency equipment will be provided on-site.

5.12.3 Special Requirements

- The Project Director or FOM will be on-call for any after hour emergencies resulting from adverse weather conditions. Incidents resulting from adverse weather will be reported to the HSO who will in turn contact the Project Director.
- First aid kit locations will be specially marked and have adequate water and other supplies necessary to cleanse and decontaminate burns wounds, or lesions. First aid stations will also stock buffer solutions for treating acid and caustic burns.

5.12.4 Emergency/Accident Reporting and Investigation

In the event of an emergency associated with the site work, the HSO or FOM will, without delay take: 1) diligent action to remove or otherwise minimize the cause of the emergency; 2) alert the Project Director; and 3) institute whatever measures are necessary to prevent any repetition of any conditions or actions leading to, or resulting in, the emergency. Notification of the Project Director will occur immediately and initially be verbal with written notification occurring within 24 hours of the incident (i.e., accident, explosion, serious exposure, etc.). The Incident Notification Form, provided in Exhibit 5-6, will be used for written notifications and documentation.

5.12.5 Emergency Medical Care

- Site-specific emergency medical information will be provided in the Site-Specific Work Plan.
- The hospital will be informed by the HSO or FOM of potential medical emergencies that could result from site operations and advised on the types of hazardous materials that are on site. In the event of an incident requiring their assistance, specific details of hazardous materials should be provided to the hospital medical staff, if available.
- A list of emergency information and a map to the nearest medical facility/hospital will be posted at every work site telephone. Copies of this map will also be available to be placed in vehicles used to transport injured personnel to the medical facility.

5.12.6 Emergencies Outside the Site

- All work in the site area will stop when advised by any authorized personnel and will remain so until otherwise instructed.
- The HSO and FOM will be fully advised of any work that may affect the safety of on-site employees or property.
- Actions to be taken by on-site personnel in the event of an outside emergency will include:
  - All operations will cease immediately and all equipment will be shut down and secured.
  - All personnel will leave vehicles in work zone in a safe manner making sure any remaining vehicles will not hamper any emergency traffic in the area or block any fire hydrants or foam supply systems.
  - All personnel will evacuate to a prearranged muster area.
  - All personnel will remain in the muster area to await further instructions.

5.12.7 Emergencies Within the Site

- The HSO will monitor all operations from the roadway and assist any emergency personnel responding to an emergency within this work zone.
- It will be the HSO's responsibility to maintain communications with public works personnel.
- In the event of an emergency within the work zone at the site, the emergency notification procedures will be followed as described in Section 5.12.
- In all emergency situations, it will be the responsibility of the HSO to ensure that all site personnel are accounted for.

5.12.8 Personnel Exposures

The emergency procedures which will be used in the event of acute exposure (eyes, skin contact, inhalation) are described in Exhibit 5-7.

5.12.9 Site Evacuation

The site area will be evacuated, and fire and police departments will be notified in the event of fire, explosion or their potential. Depending on the cause and magnitude of the conditions requiring evacuation, three stages have been designated. See Exhibit 5-7 for details.

5.13 Postings

Postings will be available on-site. These postings will cover four specific areas:

- Use of personal protective equipment
- Personal hygiene
- Provisions for smoking, eating, chewing and drinking
- Emergency information

These postings may be added to based on need to disseminate information or policy. All postings will be coordinated for approval prior to posting. Three specified regulations are shown in Exhibit 5-8. The emergency information for each site will be included on Exhibit 5-1 and will be posted at each site.

EXHIBIT 5-1

SITE-SPECIFIC INFORMATION

The following site-specific information will be filled out by project personnel for each site and will be posted on-site:

Site Name: ____________________
Address: ____________________
____
Telephone: ____________________
Date of HASP Preparation: ____________________
Dates of Field Investigation: ____________________
Entry Objectives: ____________________
____
____
____

Site Organizational Structure:	Name	Phone
Proj. Director:	________	________
Proj. Manager:	________	________
HSO:	________	________
FOM/ Alternate HSO:	________	________
Field team staff:	________	________
	________	________
	________	________
	________	________
Subcontractors:	________	________
	________	________
	________	________

Medical Assistance
Physician: ____________________
Hospital: ____________________
Address: ____________________
____

EXHIBIT 5-1 (continued)

SITE-SPECIFIC INFORMATION

Emergency
Telephone: ____________________

Directions: ____________________

____

____

____

____

Please attach a route to hospital

Emergency Telephones

Agent/Facility	Telephone	Emergency No.
EMS - Ambulance		911
Police Department		911
Fire Department		911
Hospital		
Poison Control Center		

Additional site related information (may include special hazards, site control, waste storage and disposal, PPE, decon area location, special engineering controls, etc.).

____

____

____

EXHIBIT 5-2

FIELD TEAM REVIEW FORM
PROJECT HEALTH AND SAFETY PLAN

INSTRUCTIONS: This form is to be completed by each person working on the subject work-site. Upon completion, this form is to be given to the HSO.

JOB NUMBER: ____________

CLIENT/PROJECT: ______________________

DATE: __________________

I represent that I have read and understand the contents of the above mentioned Plan and agree to perform my work in accordance with it:

____
Signature

____
Name Printed

____
Company/Office

____
Date Signed

EXHIBIT 5-3

CARE AND CLEANING OF RESPIRATORS

General Requirements

Any organization using respirators on a routine basis should have a program for their care and cleaning. The purpose of a program is to assure that all respirators are maintained at their original effectiveness. If they are modified in any way, their Protection Factors may be voided. Usually one person in an organization is trained to inspect, clean, repair, and store respirators.

The program should be based on the number and types of respirators, working conditions, and hazards involved. In general, the program should include:

- Inspection (including a leak check)
- Cleaning and Disinfection
- Repair
- Storage

Inspection

Inspect respirators after each use. Inspect a respirator that is kept ready for emergency use monthly to assure it will perform satisfactorily.

On air-purifying respirators, thoroughly check all connections for gaskets and "O" rings and for proper tightness. Check the condition of the facepiece and all its parts, connecting air tubes, and headbands. Inspect rubber or elastic parts for pliability and signs of deterioration.

Maintain a record for each respirator inspection, including date, inspector, and any unusual conditions for findings.

EXHIBIT 5-3 (continued)

CARE AND CLEANING OF RESPIRATORS

Cleaning and Disinfection

Collect respirators at a central location. Brief employees required to wear respirators on the respirator program and assure them that they will always receive a clean and sanitized respirator. Such assurances will boost morale. Clean and disinfect respirators as follows:

- Remove all cartridges, canisters, and filters, plus gaskets or seals not affixed to their seats.
- Remove elastic headbands.
- Remove exhalation cover.
- Remove speaking diaphragm.
- Remove inhalation valves.
- Wash facepiece and breathing tube in cleaner/sanitizer powder mixed with warm water, preferably at 120 to 140 F. Wash components separately from the facemask, as necessary. Remove heavy soil from surfaces with a hand brush.
- Remove all parts from the wash water and rinse twice in clean, warm water.
- Air dry parts in a designated clean area.
- Wipe facepieces, valves, and seats with a damp lint-free cloth to remove any remaining soap or other foreign material.

NOTE: **Most respirator manufacturers market their own cleaners/sanitizers as dry mixtures of a bactericidal agent and a mild detergent. One-ounce packets for individual use and bulk packages for quantity use are usually available.**

Repairs

Only a trained person with proper tools and replacement parts should work on respirators. No one should ever attempt to replace components or to make adjustments or repairs beyond the manufacturers' recommendations. It may be necessary to send high pressure side components of SCBA's to an authorized facility for repairs.

EXHIBIT 5-3 (continued)

CARE AND CLEANING OF RESPIRATORS

Make repairs as follows:

- Disassemble and hand clean the pressure-demand and exhalation valve assembly (SCBA's only). Exercise care to avoid damage to the rubber diaphragm.
- Replace all faulty or questionable parts or assemblies. Use parts only specifically designed for the particular respirator.
- Reassemble the entire respirator and visually inspect the completed assembly.
- Insert new filters, cartridges, or canisters, as required. Make sure that gaskets or seals are in place and tightly sealed.

Storage

Follow manufacturers' storage instructions, which are always furnished with new respirators or affixed to the lid of the carrying case. In addition, these general instructions may be helpful:

- After respirators have been inspected, cleaned, and repaired, store them so to protect against dust, excessive moisture, damaging chemicals, extreme temperatures, and direct sunlight.
- Do not store respirators in clothes lockers, bench drawers, or tool boxes. Place them in wall compartments at work stations or in a work area designated for emergency equipment. Store them in the original carton or carrying case.
- Draw clean respirators from storage for each use. Each unit can be sealed in a plastic bag, placed in a separate box, and tagged for immediate use.

EXHIBIT 5-3 (continued)

RESPIRATORY CERTIFICATION RECORDS

RESPIRATORY PROTECTION PROGRAM
RECORD OF RESPIRATOR USE

Name ________________________________ Date ____________________

Social Security Number ____________________ Age ____________________

Location ____

Department ____________________ Supervisor ____________________

Area to be used in ____

Type of Respirator ____________________ Fitted By ____________________

Medical Approval Date ____

Medical Facility/Physician ______________________________________

Specific contaminants for which respiratory protection is necessary:

EMPLOYEE STATEMENT

I, an employee of ____________________ have received the above referenced respirator. I have been fitted and properly instructed on its uses and limitations. I, also, understand that it is my responsibility to properly clean, maintain and store my respirator in a clean area unless other arrangements have been made to assure maintenance and care of the respiratory protection.

Signature ______________________________

Date ____________________________________

EXHIBIT 5-4

AIR MONITORING RESULTS REPORT

Date: ______________________________

Duration of Monitoring: ____

Work Location and Task: ____

____

Instrument Reading ________ (Time)	Instrument Reading ________ (Time)	Instrument Reading ________ (Time)
________________	________________	________________
________________	________________	________________
________________	________________	________________

(Note: If instruments have recorders, just attach tape to report. Also note any action levels when exceeded.)

Instrument Calibration: ____

Perimeter Samples Collected: ____

____

Personnel Samples Collected: ____

____

Perimeter and Personnel Sample Results From Previous Day (attach data once received):

____

Comments: ____

____

______________________ Name

______________________ Title (Site Safety Officer)

Signature ______________________________

EXHIBIT 5-5

HEAT/COLD STRESS

1.0 WORKING CONDITIONS AS RELATED TO HEAT STRESS

1.1 Personal Protective Clothing

All of the protective ensemble does not lend itself to the release of body heat generated during work. With this in mind, the following will be taken into consideration during the work schedule so as to minimize the heat stress to all personnel:

- All personnel will be advised to wear lightweight undergarments with short sleeves, under the chemical protective coverall.
- Personnel will be advised that extra clothing be on-site for use as the workday progresses due to the clothing becoming wet from perspiration.
- Dressing-out will be done in a designated trailer and be scheduled so as not to extend time in the protective ensembles.
- The dress-out area will have a table with fresh water and/or other water replenishing liquids along with disposable cups. All personnel will be expected to drink liquids before each work cycle. The SSO will supervise the dressing and water intake.
- As the job progresses and more information becomes available as to the materials that the workers are coming in contact with, consideration as to modifications to the protective ensemble will be examined. Such things as allowing personnel to keep the protective garment's hood down allowing for the release of heat. All decisions regarding the protective ensemble will be the SSO's decision based on available information.
- After completion of each work cycle, personnel will pass through personnel decontamination and remove their protective ensembles in the designated area. All personnel will then be medically monitored, if deemed necessary by the SSO. Liquid replenishment will be mandatory after each work cycle.
- Eating facilities will allow for meal periods to be taken in the designated lunch area. On days of extreme temperatures, the use of air conditioning in the decontamination trailer will be limited so as not to have personnel exposed to temperature extremes.

1.2 Causes of Heat Stress

Wearing the expected levels of protection on-site can put personnel at risk of developing heat stress. This section will discuss heat stress and what steps will be taken to monitor personnel for the signs of it.

The body's chemical activities take place in a limited temperature range. Heat is generated by these processes. Any heat not needed to sustain the activities must be lost from the body to maintain a balance. HYPOTHERMIA is an abnormally high body temperature. The three main avenues for the release of body heat are:

- Respiration is our breathing pattern. Care should be taken that the body is not fooled into believing it is cool based on skin temperature.
- Radiation is how heat is released from the skin. Blood will pool on the surface of the skin as body temperatures increase. The protective ensemble specified for this site will not allow for this type of heat release.
- Evaporative Heat Loss normally allows for a body to cool itself by the evaporation of perspiration. Because the protective ensemble stops any contact with moving air the sweat coming off of the body will not evaporate.

If any of these release mechanisms is out of balance, the following conditions can occur and may be considered emergencies needing care:

- **HEAT RASH** is a common occurrence in areas where body parts rub causing friction. The level of protection will heighten its effects. Proper treatment would be personal washing of the affected areas and administering powder to help healing.
- **HEAT CRAMPS** occur when people are exposed to heat for extended periods of time. Due to the wearing of the required protective ensemble, this will be expected. The person will sweat heavily and drink large quantities of water. The more the person sweats, the more electrolytes are lost. If enough body salts are lost, the individual will begin to experience body cramps and pain in the extremities.

HEAT/COLD STRESS

Proper treatment includes slow replenishment of body fluids augmented by a proper salt solution along with cooling the individual down, taking care not to expose the person to extreme cooling measures. The worker will not be allowed to return to work until the SSO has monitored and approved re-entry.

- **HEAT EXHAUSTION** occurs as the blood pools at the skin surface in an attempt to cool the body. Sweating is profuse, skin is moist and cool, and the patient will experience dizziness, nausea, or fainting. This condition is an indicator of overwork in the environmental conditions. Treatment includes all for heat cramps with an extended rest period before re-entry. Depending on the worker's physical condition, rest periods may be from 30-60 minutes. After experiencing heat exhaustion, the worker should be closely monitored for symptoms reoccurring.

- **HEAT STROKE** can occur if heat exhaustion is not cared for. This occurs when the body loses its ability to regulate its temperature. Sweating stops and, if not treated, can lead to death. Signs and symptoms include dry red skin with no perspiration along with nausea, dizziness and confusion. A strong, rapid pulse should be carefully monitored as this condition can lead to coma. Proper treatment begins by understanding that this is a true medical emergency and requires activating the emergency medical system as covered in other sections. When notifying the Emergency Medical Response organization, emphasis should be placed on the words HEAT STROKE and the need for rapid transportation to the medical facility. (See Appendix A of the SSHP). Emergency medical treatment in the field includes immediate cooling of the body with total body immersion preferable. Water temperature should be cool enough to absorb the high body heat but not cold. Ice packs can be applied to the person's head area and under the arms. Due to the personnel needed to treat the patient while awaiting emergency medical care, all work will stop and all attention will be devoted to the person in stress. The First Aid Technician will evaluate all personnel after the patient is transported to determine if they also are showing signs of heat stroke.

To facilitate treatment of all of the above, the trailer, with its air conditioning, fresh water supply and shower, will be used if necessary. In all cases requiring treatment, emergency decontamination procedures based on the individual's degree of contamination will be done before entry into the trailer. Remember: *You* are your own best indicator of signs of heat stress.

2.0 COLD STRESS

The purpose of this section is to make all workers on-site aware of the problems associated with cold weather operations. As with heat related emergencies, cold weather injuries are progressive. That means that if the worker is aware of the problems beforehand he may prevent further damage and remain working.

Cold related injuries may be divided into two types:

- LOCAL COOLING affects the particular part of the body coming in direct contact with the cold air. This is commonly known as FROSTBITE.
- GENERAL COOLING affects the entire body and is known as HYPOTHERMIA. Hypothermia is a true medical emergency and should be recognized as such and treated immediately by trained medical personnel.

As stated, cold related injuries are progressive. The body loses heat either by CONDUCTION or direct transfer of body heat into the cold environment. An example would be an unprotected head allowing the surface area of the head to come in direct contact with the colder air. The other means by which the body loses heat is by CONVECTION. This occurs when colder air is allowed to pass over the body surface. When that air is also moist or the garments work become wet, a WATER CHILL or more commonly recognized WIND CHILL occurs. An example of wind chill would be a 20 mph wind during a 10 degree day would produce the same effect as -25 degree temperature. Both of these conditions may be easily prevented by proper work attire and safe work practices. Hardhat liners prevent the wind from blowing under the brim but will also affect your hearing ability.

Lose layers of work clothes rather than bulky garments will allow the wearer to adapt to changing conditions. Use of rubber overboots will prevent leather workboots from getting wet and are excellent for stationary work to stop cold penetration.

EXHIBIT 5-5 (continued)

HEAT/COLD STRESS

Signs to Look For:

FROSTNIP, the first stage of frostbite occurs when a body part comes in direct contact to a cold object or cold air. This condition is not serious and can be remedied by warming of the region. The real problem is that a numbing effect can occur and keep the worker from realizing that he is going into the next stage SUPERFICIAL FROSTBITE.

The skin and under layers become effected. If not treated this can become a FREEZING condition in which the deeper structures of the body become effected.

CONDITION	SKIN SURFACE	TISSUE UNDER SKIN	SKIN COLOR
frostnip	soft	soft	red-white
frostbite	hard	soft	white/waxy
freezing	hard	hard	white/gray

HYPOTHERMIA occurs when the body is unable to maintain its proper temperature of 98.6 degrees. It is important for the worker to realize that this can occur in temperatures of 50 degrees and below. Submersion of a body part in cold water will also cause hypothermia very quickly. Some early signs are:

1. Shivering
2. Numbness in extremities
3. Drowsiness
4. Slow breathing and pulse rates
5. Failing eyesight
6. Loss of coordination, inability to do easy tasks
7. Freezing of body parts

Proper treatment begins by activation of emergency medical service procedure. Hypothermia required prompt qualified medical treatment. Initial site action would revolve around getting the affected worker out of the weather and begin the warming process. The most important thing to realize is that Hypothermia is a MEDICAL EMERGENCY.

Workers exposed to cool temperatures for extended period of time can experience lesions in the form of red swollen areas that seem hot and itchy. These chronic lingering lesions are known as CHILBLAINS. Although not an emergency, the Chilblains indicate that the worker in not adequately protecting the affected area.

A common problem in wet work areas is TRENCH FOOT. The worker whose feet remain unprotected by leather footwear in water close to freezing will have swollen limbs that appear waxy and mottled in color. The affected limb will appear cold to the touch. Basic treatment revolves around getting the worker to a warm place and slowly removing the wet footwear. The obvious way to prevent TRENCH FOOT is to wear rubber protective footwear.

Some suggestions to prevent cold weather operation problems:

1. Plan ahead as to the proper work clothes to be worn.
2. Avoid early overheating which dampens clothes and hastens the release of body heat by evaporation.
3. Use of windbreaks in the work zone.
4. Elimination of standing water or avoid prolonged immersion in that water.
5. Provision of heated rest area (i.e., trailer or vehicle).
6. Avoid overheating of the rest area. Extreme temperature differentials between the work area and the rest area will lead to chilling upon return to work.
7. Proper diet and eating habits.

EXHIBIT 5-5 (continued)

HEAT/COLD STRESS

8. Avoid or cut down smoking which constricts the blood vessels.

REMEMBER, YOU ARE THE BEST PROVIDER OF INFORMATION ABOUT HOW YOU FEEL. THE BEST WAY TO PREVENT INJURIES FROM COLD WEATHER OPERATIONS IS TO RECOGNIZE THE EARLY SIGNS AND PREVENT SERIOUS INJURY.

EXHIBIT 5-6

INCIDENT NOTIFICATION FORM

TO: Project Manager

Date:____________

FROM: HSO and/or ____
(someone who has direct knowledge of the incident)

1. Contractor's Name:____

2. Organization:____

3. Telephone Number:____

4. Location:____

5. Reporter Name:____

6. Name of Injured:________________________________ Birth date_______________

7. Company Employing Injured:____

8. Date of Incident:____

9. Company Employing Injured:____

10. Location of Incident:____

11. Brief Summary of Incident (provide pertinent details including type of operation at time of incident):

____

____

____

12. Cause, if known:____

13. Casualties, if any:____

EXHIBIT 5-6 (continued)

INCIDENT NOTIFICATION FORM

14. Details of Any Existing Chemical Hazards or Contamination:

____

____

15. Estimated Property Damage:_______________________________

16. Affect on Contract Schedule:_______________________________

17. Actions Taken by Contractor:_______________________________

18. What Medical Help was Given:_______________________________

____

____

19. Doctor and/or Hospital (if known):_______________________________

____

20. When did Employee Return to Work:_______________________________

21. Other Damages/Injuries Sustained (public or private):

____

____

22. Additional Information:

____

____

____

EXHIBIT 5-7

EMERGENCY INFORMATION

1. Emergencies Within the Site

- Contact the HSO On-Site
- Contact the FOM
- Contact Public Works
- Report the following:
  - Location of emergency in relation to a specific recognizable landmark.
  - Nature of emergency:
    - **FIRE**, if so of what kind and what equipment is involved.
    - **EMERGENCY MEDICAL INCIDENT, ALL INJURIES, ACCIDENTS OR FIRES.**
      Communication will include:
      - Number of injured people.
      - Nature of injuries.
      - If Project Field Team Members can't handle injuries with its resources, what emergency medical services will be needed.
    - If any outside personnel must enter the site, any hazards will be communicated and those people will be supervised by the HSO.
    - In the event that any site personnel wearing protective equipment in the Exclusion Zone becomes injured, the HSO or designated individual will do whatever decontamination is necessary to remove that equipment.
    - Any emergency treatment information dealing with the injury will accompany the injured party so that those treating that person will have any and all information.
    - **REQUEST FOR POLICE.** If any person entering the site who does not belong there becomes a problem, Police will be notified. If that person either endangers the safe operation of Project Field Team members or himself, the HSO will suspend all work until that person can be removed.
  - If site personnel will be evacuating the site due to emergency.

2. Personnel Exposures Within the Site

- Contact the HSO On-Site
- Contact the FOM
- Provide treatment as follows:
  - Eye Exposure - treat by immediate flushing with distilled water (portable eyewash). Transport for examination and treatment. Site-Specific hospital information can be found in Section 5.1.1.
  - Skin Exposure - remove contaminated clothing and treat by washing with soap and water.
  - Inhalation - if a person inhales a large amount of organic vapor, the person will be removed from the work area to fresh air and artificial respiration will be administered if breathing has ceased. The affected person will be transported to the hospital by ambulance or emergency vehicle if overexposure to lungs has occurred.

EMERGENCY INFORMATION

- Personal Injuries - in case of severe injury, the victim will receive emergency first aid at the site, as appropriate, and will be transported by ambulance or emergency vehicle to the hospital. An accident form must be completed for any accident or occupational exposure and forwarded to the Project Manager.

3. Evacuating the Site

- Contact the HSO On-Site
- Contact the FOM
- Follow the directions below:
  - Upwind withdrawal - withdraw to a safe upwind location if:
    - Air quality concentration contain excessive concentrations of volatile organics, combustible gases, or oxygen percentage above or below safe levels for the level of protection being worn. The field team will withdraw to a safe upwind location determined by the HSO.
    - A minor accident occurs. The victim will undergo decontamination procedures and be transported to a safe upwind location. Field operations will resume after first aid and/or decontamination procedures have been administered to the affected individual.
    - Protective clothing and/or respirator malfunctions.
  - Withdrawal from site - evacuate the site if:
    - Explosive levels of combustible gases, toxic gases, or volatile organics are recorded.
    - A major accident or injury occurs.
    - Fire and/or explosion occurs.
    - Shock-sensitive, unstable, or explosive materials are discovered.
    - High levels of radioactive materials are discovered.

- Evacuation of nearby facilities - a continuous release of toxic, flammable, or explosive vapors from the site could affect people off-site. Air quality should be monitored downwind to assess the situation. The FOM, or on-site designee, is responsible for determining if circumstances exist for any level of off-site contamination warranting concern for people off-site. he should always assume worst case conditions until proven otherwise. If conditions are marginal, evacuation should be conducted until acceptable conditions resume. Key personnel identified in the HASP should be contacted when evacuation of nearby facilities becomes necessary.

EXHIBIT 5-7 (continued)

EMERGENCY INFORMATION

TABLE I

EMERGENCY SIGNALS

In most cases, field personnel will carry portable radios for communications. If this is the case, a transmission that indicates an emergency will take priority over all other transmissions. All other site radios will yield the frequency to the emergency transmissions.

Where radio communication is not available, the following air-horn and/or hand signals will be used:

EMERGENCY AIR-HORN SIGNALS

HELP!	Three short blasts	. . .
EVACUATION!	Three long blasts	___ ___ ___
ALL CLEAR!	Alternating long and short blasts	___ . ___ .

EMERGENCY HAND SIGNALS

OUT OF AIR, CAN'T BREATH	Hand gripping throat
LEAVE AREA IMMEDIATELY, NO DEBATE!	Grip partner's wrist or place both hands around waist
NEED ASSISTANCE	Hands on top of head
OKAY! - I'M ALRIGHT! - I UNDERSTAND!	Thumbs up
NO! - NEGATIVE!	Thumbs down

EXHIBIT 5-7 (continued)

EMERGENCY INFORMATION

TABLE II

LOCATION OF EMERGENCY EQUIPMENT

EQUIPMENT	**TYPE**	**LOCATION(S)**
Fire Extinguisher Dry Chemical	20A-80B:C	
First Aid Kit		
Eye Wash	Portable	
Emergency Sprayer	Portable	
Communication	Air Horns Each work area.	

Map (Figure 10-1) Hospital Route

EXHIBIT 5-8

POSTING 1 - USE OF PERSONAL PROTECTIVE EQUIPMENT

WHO This posting applies to all site workers, supervisors, and visitors, *without exception.*

WHEN Prior to entering the Contaminant Reduction Zone (CRZ) or Exclusion Zone (EZ) provisions of this posting will be followed.

WHAT This posting outlines the initial forms of PPE required to be worn while working in the CRZ and EZ. Particular types or forms of PPE may be altered based on the authority of the HSO. Specific guidelines are provided in Section 7.0 of this HASP. Disposable PPE will not be worn more than one work shift of workday. In some instances disposable PPE may have to be replaced more than once during a workday. The HSO will determine the frequency of replacing disposable PPE. Reusable PPE will be properly decontaminated, cleaned, sterilized (if appropriate), and stored. Doubts regarding what to wear will be directed to the HSO for resolution.

WHY The levels of protection specified in the SSHP were chosen to protect individuals from potentially harmful exposures to chemicals or physical hazards. No changes to PPE specifications are authorized without the permission of the HSO.

EXHIBIT 5-8 (continued)

POSTING 2 - PERSONAL HYGIENE

WHO This posting applies to all site workers, supervisors, and visitors, but is intended primarily for site workers.

WHEN Before beginning work, during scheduled breaks, and at the end of a workday.

WHAT This posting summarizes the policy on personal hygiene that applies to all site personnel. Personal hygiene includes those activities such as washing hands, showering, shaving, etc., that are conducive to keeping one's body clean and mind refreshed. For the individual's sake, and his/her coworkers, each worker will be responsible for maintaining a high level of personal hygiene. This is especially critical prior to breaks where food, beverages, or smoking will occur. If proper personal hygiene is not followed, potential ingestion, absorption, or inhalation of toxic materials may occur. Particular attention must be paid to close shaving whenever respirators are worn. Facial hair and long hair will interfere with respirator fit and will allow excessive contaminant penetration.

WHY To avoid accidental ingestion, absorption, or inhalation of hazardous materials. To maintain an elevated state of awareness, thus reducing potential mental errors and accidents.

EXHIBIT 5-8 (continued)

POSTING 3 - PROVISIONS FOR SMOKING, EATING, CHEWING, AND DRINKING

WHO This posting applies to all site workers, supervisors, and visitors, *without exception.*

WHEN At all times personnel are on-site. This regulation will specifically apply during breaks and rest periods.

WHAT Site personnel are forbidden to smoke, eat, chew, or drink in the Exclusion Zone or Contaminant Reduction Zone. Only those areas specified as break areas or common areas in the Support Zone may be used for smoking, eating, chewing, or drinking. The rest/break facility and office trailers in the Support Zone may be used. Individuals found to be repeatedly disregarding these provisions will be released.

The only exception to this posting involves access to electrolytic fluids in the Contaminant Reduction Zone when the HSO has determined heat stress warrants regular replenishing of lost body fluids.

WHY To protect personnel from accidental exposures to hazardous materials, smoking, eating, chewing, and drinking is prohibited everywhere except designated break areas. To avoid potential fires and explosions, smoking is prohibited everywhere except designated break areas and office trailers.

EXHIBIT 5-9

ACRONYMS

ACGIH -	American Conference of Governmental Industrial Hygienists
AIHA -	American Industrial Hygiene Association
AOC-	Area of Concern
ANSI -	American National Standards Institute
AST -	Air Sampling Technician
BG -	Background
Ca -	Carcinogen
CBC -	Complete Blood Count
CFR -	Code of Federal Regulations
CEMT -	Certified Emergency Medical Technician
CHMT -	Certified Hazardous Materials Technician
CIH -	Certified Industrial Hygienist
CRZ -	Contaminant Reduction Zone
DECON -	Decontamination
DOT -	Department of Transportation
EMT -	Emergency Medical Technician
EPA -	Environmental Protection Agency
eV -	Electron Volt
FEV1 -	Forced Expiratory Volume at One Second
FID -	Flame Ionization Detector
FM -	Factory Mutual
FSC -	Field Safety Corporation
FVC -	Forced Vital Capacity
HASP -	Health and Safety Plan
HDPE -	High Density Polyethylene
HEPA -	Common use: "HEPA Filter" High Efficiency Particulate Air Filter
HMT -	Hazardous Materials Technician
HSWA-	Hazardous Solid Waste water Amendment
IDLH -	Immediately Dangerous to Life or Health
IP -	Ionization Potential
mg/m^3 -	Milligrams Per Cubic Meter
MPH -	Miles Per Hour
MSL -	Mean Sea Level
NIOSH -	National Institute for Occupational Safety and Health
NYSDEC-	New York State Department of Environmental Conservation
O&R -	Overhaul and Repair
OSHA -	Occupational Safety and Health Administration
PEL -	Permissible Exposure Limit

EXHIBIT 5-9 (continued)

ACRONYMS

PID -	Photoionization Detector
PPE -	Personal Protective Limit
ppm -	Parts Per Million
RCRA -	Resource Conservation and Recovery Act
RI/FS -	Remedial Investigation/Feasibility Study
SARs -	Supplied Air Respirators
SCBA -	Self Contained Breathing Apparatus
SMAC-25 -	Trade Name for a Blood Analyzer Measuring Twenty-Five Constituents in Blood
SS# -	Social Security Number
SSHP	Site Safety and Health Plan
HSO -	Site Safety Officer
STEL -	Short Term Exposure Limit
SVOC-	Semivolatile Organic Compound
SWMU-	Solid Waste Management Unit
TLVs -	Threshold Limits Values
TSP -	Total Suspended Particulates
TWA -	Time Weighted Average
UL -	Underwriters Laboratories
USEPA-	United States Environmental Protection Agency
UST -	Underground Storage Tank
VOCs -	Volatile Organic Compounds

6.0 CITIZEN PARTICIPATION PLAN

As part of the RI/FS to be performed for dry cleaner sites, a site-specific Citizen Participation Plan will be developed for each site that is to be addressed. The plan will be prepared and implemented in a manner which is consistent with the NYSDEC guidance document entitled "New York State Inactive Hazardous Waste Site Citizen Participation Plan," dated August 1988. A copy of this guidance document is provided in Appendix N.

The following sections identify the information that will be incorporated into the site-specific Citizen Participation Plan.

6.1 Identification of Elected Officials

This section of the Citizen Participation Plan will include the names, addresses and telephone numbers of elected officials who have expressed interest in the project/site, or are directly affected by the site or the proposed RI/FS program. A mailing list with all local and/or affected elected officials will be prepared. The mailing list will be used to inform those officials and involve those that express an interest in the project. A mechanism will also be provided in the plan to allow other interested officials to add their name to this mailing list.

6.2 Identification of Affected and/or Interested Public

This section of the Citizen Participation Plan will include the names, addresses and telephone numbers of organizations and individuals who have expressed interest in the project/site, or are directly affected by the site or the proposed RI/FS program. The names, addresses and telephone numbers of the individuals, groups and organizations identified in the following categories will be provided in the site-specific plan:

- Potential responsible parties.

- Individuals and organizations expressing an interest in receiving newsletters, fact sheets, status reports, etc., with respect to the activities at the site;
- Residents located in close proximity and adjacent to the site; and
- Local media (newspapers, radio and TV stations).

The names and addresses of affected and/or the interested parties will be included on the mailing list. As discussed above, the list will be used to inform and involve the interested public. Interest in the site, issues arising during various stages of investigation and development of the remediation plan, and other factors will determine if additional individuals and organizations are to be added. It should be noted that as the RI/FS proceeds, the list of interested citizens is likely to increase. While in some cases, as necessary, names may be dropped if the individual requests it due to reasons such as moving or lack of interest. Information will also be included in this section to identify the name and address of the contact person accessible to interested parties who would like their name and address included on the mailing list.

6.3 Identification of NYSDEC Contacts

This section of the Citizen Participation Plan will include the names, addresses and telephone numbers of contacts at the NYSDEC, including but not limited to the following positions:

- Project Director;
- Project Manager; and
- Regional Office Contacts.

6.4 Identification of Document Repositories

Documents relating to the RI/FS will be made available for public review at appropriate repositories. Typically, local document repositories are public buildings located near the site, such as a municipal building and/or public library. The location, including addresses, of repositories will be provided in the site-specific plan. Documents to be made available will include, but are not limited to:

- Site-specific RI/FS Work Plan;
- RI/FS Reports; and
- Fact sheets, newsletters, status reports, etc.

6.5 Description of Citizen Participation Activities

This section of the Citizen Participation Plan will describe the specific activities planned to be performed during each task of the RI/FS program to enhance public understanding of the project. The following activities will, at a minimum, be implemented, unless directed otherwise by NYSDEC. Based upon the progress of the RI/FS, local issues and level of interest, these activities may be modified.

- <u>Development of a RI/FS Initial Fact Sheet</u> - A "kick-off" fact sheet will be developed that would include a brief description of the site; planned work to be conducted as part of the RI/FS, including the project schedule; the date of initiation of the field program; and identification of appropriate contact person(s) to obtain additional information with regard to the project.

- <u>Development of the Draft Work Plan, including the Field Operation and Investigation Plan; QA/QC Plan; and Health and Safety Plan</u> - A public meeting or availability session, depending upon public interest, will be held to address any questions or comments on the recommended RI/FS program activities.

- <u>Development of the Draft Remedial Investigation Report and possible Interim Remedial Measure</u> - A fact sheet will be prepared, including a brief description of the site; objectives of the remedial investigation; a summary of the work completed; a summary of the findings; recommendations for an IRM and/or presumptive remedy, if required; location(s) where reports are available; a schedule for remainder of the work; and names and telephone numbers of contact person(s). If there is sufficient interest, a public meeting will be held to present the results of the remedial investigation.

- Development of the Draft Feasibility Study Report and Recommended Remedial Action - If an interim remedial measure is not installed and a presumptive remedy is not selected, a public meeting (or availability session) will be held to discuss the results of the Feasibility Study and the selection of the recommended remedial action for the site.

After submittal of a final RI/FS Report, which incorporates agency and public comments, a Record of Decision (ROD) will be prepared by NYSDEC. The ROD will document the decision process used to determine the remedial actions deemed appropriate for the site, as well as present the selected remedial action plan.

7.0 REFERENCES

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