GROUNDWATER REMEDIATION WORK PLAN

FOR THE

ARKWIN INDUSTRIES SITE WESTBURY, NEW YORK

NYSDEC SITE NUMBER 1-30-043D

PREPARED FOR

ARKWIN INDUSTRIES, INC.

PREPARED BY

FPM group

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NOVEMBER, 2000

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SECTION 1.0
INTRODUCTION

FPM Group (FPM) was retained by Arkwin Industries, Inc. (Arkwin) for the purpose of installing and operating a remediation system at the Arkwin site (the Site). The Site is comprised of five properties located along Main Street and Brooklyn Avenue in the New Cassel Industrial Area (NCIA). Figure 1.1 shows the Site location and Plate 1 illustrates the Site layout.

Arkwin has occupied the Site since 1955, performing precision machining for the aerospace industry. Operations primarily consist of machining and assembly of small aircraft parts. As part of the manufacturing process chlorinated solvents were used in degreasing operations. Investigations at the Arkwin facilities showed several on-Site drywells that were impacted by chlorinated solvents. As a result, the Site was included on the New York State Department of Environmental Conservation (NYSDEC) Registry of Inactive Hazardous Waste Disposal Sites as a Class 2 Site (Site Number 1-30-043D). A Remedial Investigation (RI) and an Interim Remedial Measure (IRM) were previously conducted by Arkwin to address the on-Site soil contamination.

The NYSDEC contracted a consultant to perform investigations to define the nature and extent of the groundwater contamination. The NYSDEC contractor, Lawlor, Matusky & Skelly Engineers (LMS), prepared a Focused RI Report dated March, 1999. The Focused RI included soil and groundwater sampling and the installation of nine groundwater monitoring wells at the Site.

The soil sampling results showed that there was no detections of volatile organic compounds (VOCs) above the quantitation limits. For the groundwater, the results primarily showed detections of 1,1,1-trichloroethane (1,1,1-TCA), trichloroethylene (TCE), and tetrachloroethylene (also known as perchloroethylene or PCE). The results of the upgradient wells showed that the upgradient groundwater is

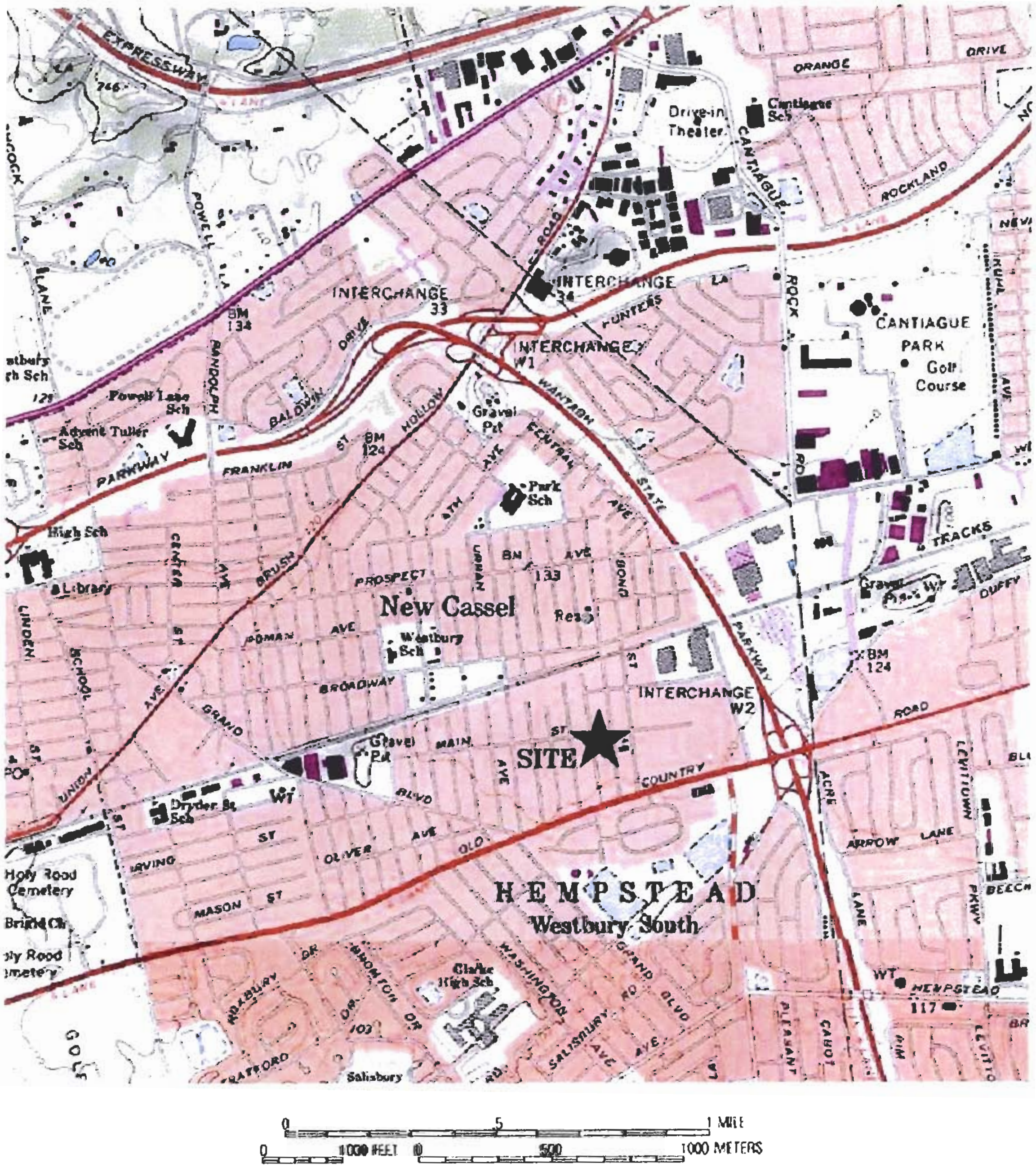

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FIGURE 1.1

SITE LOCATION
ARKWIN INDUSTRIES, INC.

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Draw\arkwin\figure1-1.dwg, 10/12/00 04:19:01 PM impacted by similar VOCs and that groundwater contamination has migrated onto the Site from an upgradient, off-Site source.

Based on these findings, the NYSDEC issued a Record of Decision (ROD). The NYSDEC-selected remedy for the Site includes the installation of an air sparging/soil vapor extraction (AS/SVE) system to address the VOC contamination in the on-Site groundwater. In addition, the NYSDEC requires the semiannual sampling of existing groundwater monitoring wells to monitor the effectiveness of the system.

This work plan describes the tasks necessary to address the groundwater contamination and includes a Health and Safety Plan (Appendix A) to be followed during field activities.

SECTION 2.0
ENVIRONMENTAL SETTING

2.1 Hydrogeologic Setting

The regional geology of the NCIA was derived from U.S. Geological Survey Paper #1825 entitled, "Geology and Hydrology of Northeastern Nassau County, Long Island, New York" (Ibister, 1986). In the vicinity of the Site, the geology consists of a basement layer of Precambrian bedrock which occurs at a depth of approximately 900 feet below mean sea level (MSL).

Overlying the bedrock are a series of Upper Cretaceous deposits. The Lloyd Sand is the lowest Upper Cretaceous deposit and consists of discontinuous layers of sand, gravel, sandy clay, silt, and clay. The upper surface of the Lloyd Sand occurs at approximately 650 below MSL.

Overlying the Lloyd Sand is the Raritan Clay which consists primarily of gray, red, white, and blue clay and silty clay and lenses of sand and gravel. The upper surface of the Raritan Clay occurs at approximately 550 below MSL. Overlying the Raritan Clay is the Upper Cretaceous Magothy Formation which consists primarily of interbedded gray and white fine sand and clayey sand and black, gray, white, and some red clay. Gravelly zones are common at the bottom of the Magothy Formation but are rare in the upper part. The upper surface of the Magothy Formation is estimated to occur at approximately 55 feet below the ground surface.

Overlying the Magothy Formation are the Pleistocene Upper Glacial deposits which, in the NCIA are composed primarily of unconsolidated outwash deposits of well-sorted stratified sand and gravel. The Upper Glacial deposits are the uppermost unit and are estimated to be 60 to 70 feet thick in the Site vicinity.

Based on the U.S. Geological Survey Paper 82-4056 entitled, "Geology of the '20-foot' Clay and Gardiners Clay in Southern Nassau and Southwestern Suffolk Counties, Long Island, New York" (Doriski and Wilde-Katz, 1982), neither the '20-foot' Clay nor the Gardiners Clay exists under the NCIA.

The Site-specific geology was derived from boring log data for the most recently installed wells at the Site (LMS, 1999). Stratigraphic information from previous investigations is not available. Split-spoon samples were collected at five-foot intervals at each of the borings for the most recently installed wells. This information is shown on the stratigraphic cross sections in Figures 2.1.1 and 2.1.2. The locations of the cross sections are shown on Plate 1.

Pleistocene Upper Glacial deposits, consisting of fine to coarse sand with fine gravel, were present in the upper portion (generally 55 feet) of each boring. Between approximately 55 and 65 feet, the stratigraphy became more variable, consisting primarily of fine to medium sand with intermittent white, tan, or beige clay. The clays are generally less than 0.5 feet thick, although several one to two-foot thick clays were noted in well AIMW-8C. These materials appeared to be transitional between the Upper Glacial deposits and underlying Magothy Formation. Below 65 feet, the stratigraphy consisted primarily of fine-grained micaceous sand with thin stringers of silt or clay. The silt and clay layers were noted to be no more than one to two inches thick and the amount of silt and clay appeared to be minor and decrease downward.

The groundwater beneath the NCIA is recharged through infiltrating precipitation. The infiltrating precipitation accumulates above the bedrock and forms aquifers which correspond to the permeable geologic units. The depth to water is approximately 55 feet and the thickness of the Upper Glacial deposits is approximately 60 to 70 feet. Therefore, the Upper Glacial Aquifer is fairly thin in the Site vicinity.

The Site-specific groundwater flow direction was ascertained from the LMS report (May, 1999) and is shown in Appendix B. The groundwater flow direction in the Site area is generally to the southwest and

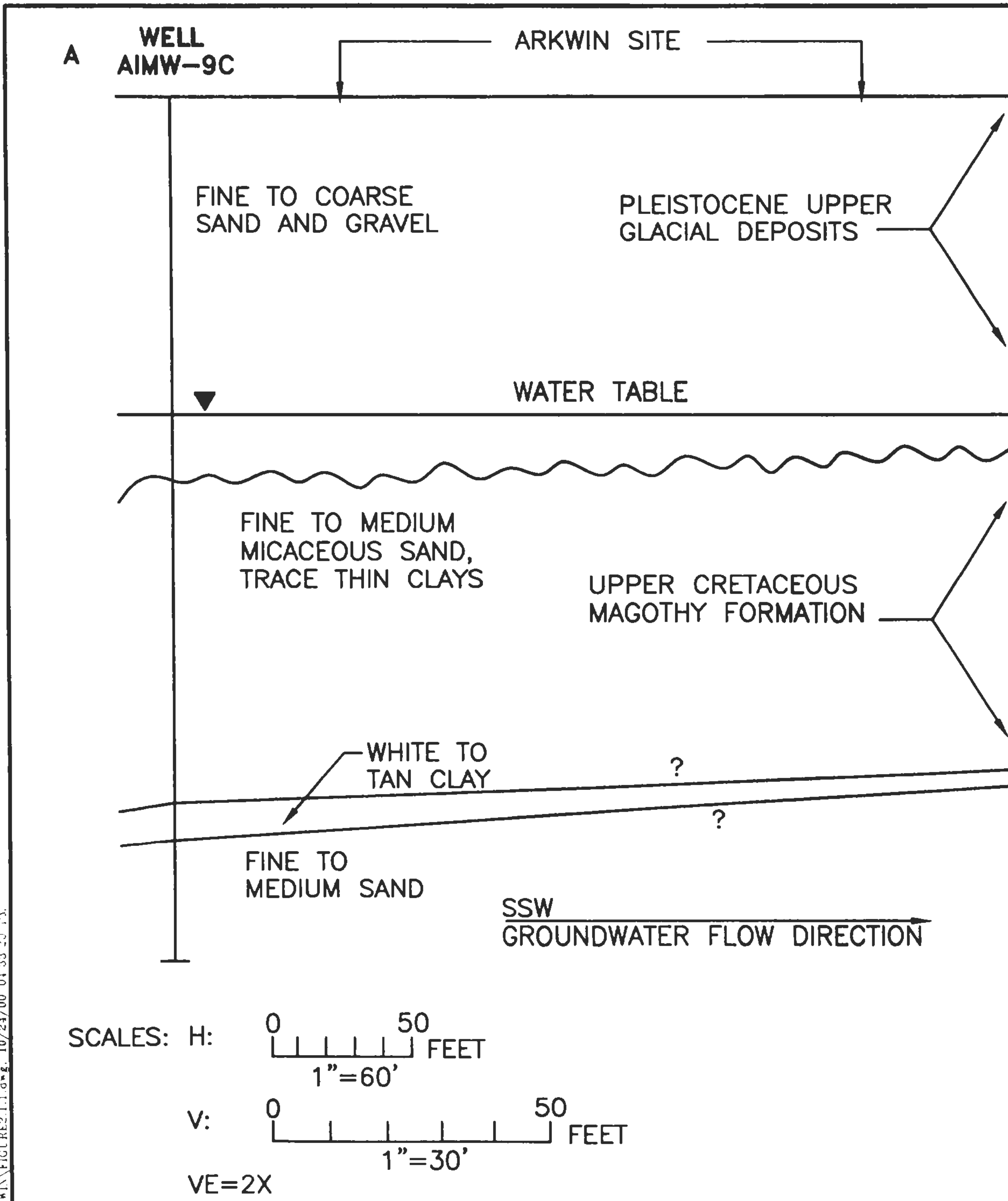

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FIGURE 2.1.1
STRATIGRAPHIC CROSS-SECTION A-A'
ARKWIN INDUSTRIES SITE
WESTBURY, NEW YORK

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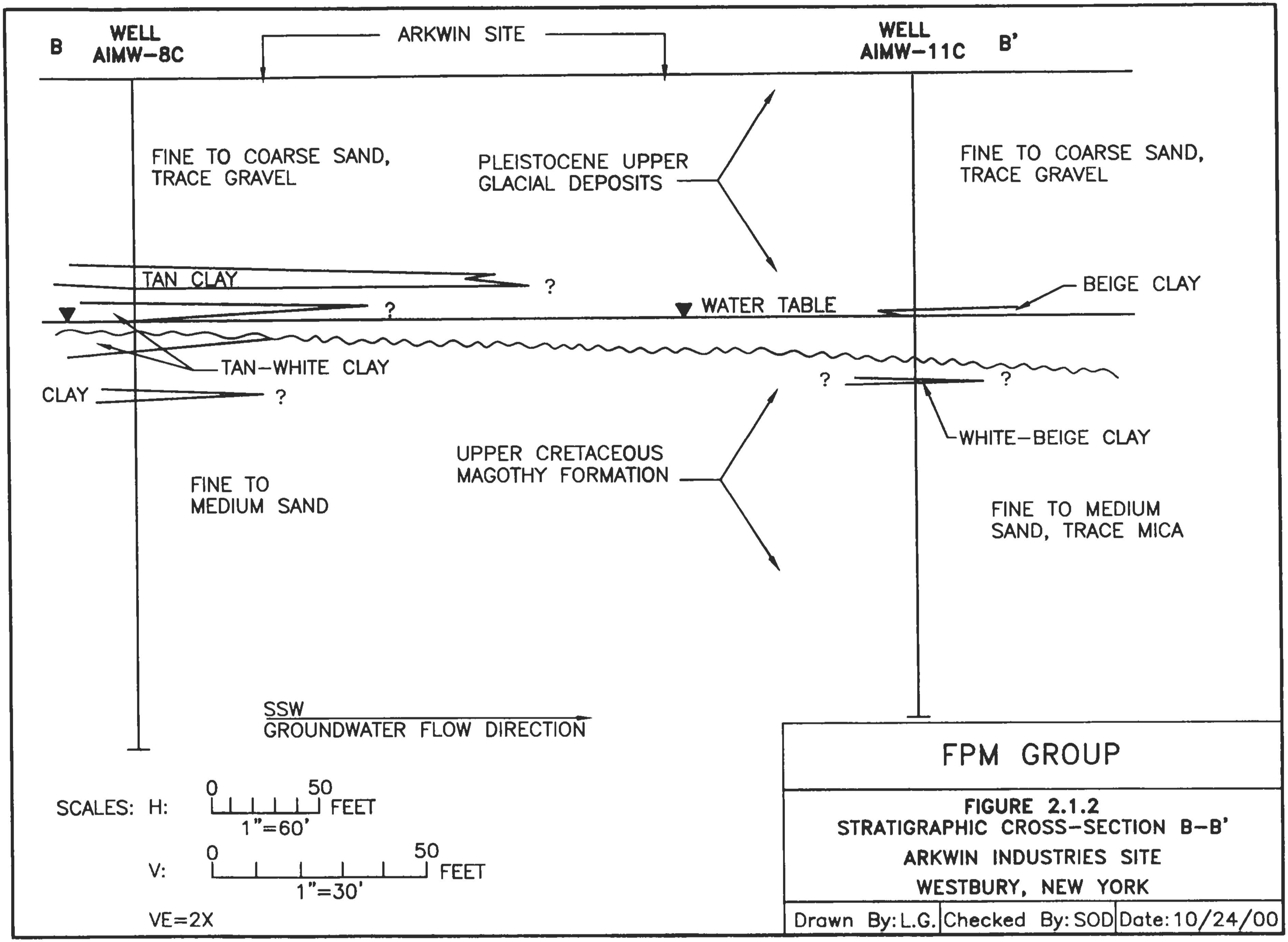

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FIGURE 2.1.2
STRATIGRAPHIC CROSS-SECTION B-B'
ARKWIN INDUSTRIES SITE
WESTBURY, NEW YORK

Drawn By: L.G.	Checked By: SOD	Date: 10/24/00

does not appear to vary between stratigraphic levels. The horizontal groundwater gradient ranges from 0.0012 for the shallow groundwater to 0.0014 for the deep groundwater.

Most of the Site wells are completed within 10 feet of the water table and are, therefore, within the Upper Glacial Aquifer. However, the "B"-designated wells are completed 25 to 35 feet below the water table, or within the uppermost part of the Magothy Formation, and the "C"-designated wells are completed approximately 80 to 90 feet below the water table and are well within the Magothy Formation.

No confining layer was encountered between the Upper Glacial and Magothy Aquifers and a clearly-defined stratigraphic boundary was not noted. The vertical hydraulic gradient between the shallow, intermediate, and deep wells ranges from 0.001 to 0.002 downward.

Hydraulic conductivity was estimated by performing slug tests. The shallow wells (0 to 10 feet below the water table) showed an average hydraulic conductivity of 33 feet per day (ft/day) with a range of 5 to 102 ft/day. This range reflects the variable nature of the transitional materials at the base of the Upper Glacial Aquifer. The average hydraulic conductivity of the intermediate wells 25 to 35 feet below the water table) was 98 ft/day with a range of 48 to 154 ft/day and reflects the somewhat more uniform fine-grained sands generally found at these depths. The average hydraulic conductivity of the deep wells (80 to 90 feet below the water table) was 76 ft/day with a range of 27 to 139 ft/day.

2.2 Surface Water and Drainage

The Site area is located within an industrial park that is serviced by the Nassau County Sewer System. There are no wetlands, lakes, or streams in the Site area.

2.3 Climatology

The Site is affected by the Atlantic Ocean sea breezes. These sea breezes are formed on spring and summer days when the land surface is considerably warmer than the water and large-scale weather systems are weak. The onset of a sea breeze is characterized by a change in the wind direction to southerly, a decrease in air temperature, and an increase in relative humidity. Sea breezes generally cease by very late afternoon, only to form again the following day unless the large-scale weather systems are strong enough to suppress development.

Prevailing winds on Long Island are generally from the north or northwest in the colder months and from the south or southwest in the warmer months. The average annual wind speed at JFK International Airport, the nearest coastal station which records wind observations, is 12.1 miles per hour (National Oceanic and Atmospheric Administration, 1986. Local Climatological Data, Annual Summary with Comparative Data – JFK International Airport).

Based on information in the U.S. Geological Survey Professional Paper 627-A "The Precipitation Regime of Long Island, New York" (Miller & Frederick, 1969), the approximate annual precipitation rate in the area of the Site is 43 inches per year. Water losses due to evapotranspiration are given as 28 inches per year. The recharge rate to the groundwater aquifer is, therefore, 15 inches per year. This recharge occurs predominantly during late fall and early spring.

SECTION 3.0
PREVIOUS INVESTIGATIONS

Information regarding previous investigations were derived from the "Focused Remedial Investigation Report, Arkwin Industries" prepared by the NYSDEC contractor LMS in March 1999 and the "Record of Decision, Arkwin Industries Site" prepared the NYSDEC, December, 1999.

The Site is located in the NCIA, which contains numerous contaminated sites as a result of past disposal practices. In 1986, chlorinated solvent contamination was discovered in the groundwater in several areas in the NCIA. During 1993, Arkwin's consultant, at the direction of the Nassau County Department of Health, collected soil samples to evaluate the potential presence of on-Site contaminants. In June and July 1994, during the NYSDEC Preliminary Site Assessment (PSA), additional soil samples were collected beneath the Site. Both investigations indicated the presence of chlorinated volatile organics and petroleum hydrocarbons. Based on the results of the PSA, which found documented on-Site use of chlorinated solvents and an apparent impact to groundwater below the Site, Arkwin Industries was included on the Registry as a Class 2 Inactive Hazardous Waste Disposal Site.

A consent order (W1-0754-95-06) between NYSDEC and Arkwin for a Focused Remedial Investigation (FRI) was executed on July 26, 1996. Arkwin's consultant started field work on August 19, 1996 and the work was completed in mid-September,1996. The field work included soil sampling inside and adjacent to three drywells/sanitary drains located south of 648 and 656 Main Street. During late August, 1996, soil sampling was also performed inside and adjacent to drywells located south of 670 Main Street. In early September, 1996, groundwater samples were collected from five on-Site monitoring wells and one Nassau County well. The laboratory results of the soil analyses showed that an abandoned sanitary drain designated as DW-8, located in the driveway south of 648 Main Street, contained VOCs in excess of NYSDEC Recommended Soil Cleanup Objectives (Objectives). The analytical results of the groundwater sampling conducted at five on-Site monitoring wells and one Nassau County well indicated the presence of several VOCs in excess of NYSDEC Class GA Ambient Groundwater Quality Standards (Standards).

The contaminated soil was excavated from DW-8 in June, 1997 as part of an IRM and disposed of in an off-Site permitted facility. Since the contaminated soil was removed from the Site, the NYSDEC determined that no further action for the on-Site soil was required. A ROD regarding the soil was signed in February, 1998.

Additional field investigation activities were performed in 1998 for the soil and groundwater and included the collection of direct-push soil and groundwater samples and installation of 12 new monitoring wells at the Site. LMS collected a total of nine soil and nine groundwater samples from three direct-push locations and submitted them for VOC analysis. Groundwater samples were collected from the 12 newly-installed monitoring wells and the existing wells at the Site. Plate 1 shows the groundwater sampling locations and resulting total VOC concentrations.

Analytical results from direct-push soil samples indicated that contaminants were detected from only two intervals of the nine that were sampled. In all cases where detections occurred, the compounds were present well below the NYSDEC Objectives.

Direct-push groundwater samples collected from below the drywell locations showed concentrations of several VOCs at or exceeding NYSDEC Standards in seven of the nine samples analyzed. Overall, the concentrations found were not highly elevated over the NYSDEC Standards. Concentrations in excess of the NYSDEC Standards ranged from 1 microgram per liter (ug/l) of benzene (AIGP-1 at 67-68 feet) to 9 ug/l of 1,1,1-TCA (AIGP-3 at 67-68 feet).

A total of 12 monitoring wells (four well clusters each consisting of a shallow, intermediate, and deep well with screens at depths below the water table of roughly 0 to 10, 25 to 35, and 80 to 90 feet) were installed. Appendix C shows the total depths of all wells (which are reported by LMS to contain 10-foot screens) and the depths to water. Each of these wells and the existing wells were sampled and analyzed for VOCs.

The groundwater analytical results for the monitoring wells showed concentrations of VOCs in excess of the NYSDEC Standards in 14 of the wells sampled (see Plate 1 for a summary of the total VOCs detected and Appendix D for the LMS tables of detected VOCs). The groundwater from each well contained various halogenated VOCs including 1,1,-TCA, TCE, PCE, and the breakdown products of each compound. Table 3.1 depicts the VOCs detected in the upgradient and downgradient wells at each stratigraphic level. In the shallow wells, total VOCs ranged from 6 ug/l to 47 ug/l in the upgradient wells (AIMW-9A and AIMW-8A) to 117 ug/l to 513 ug/l in the downgradient off-Site wells (AIMW-10A and AIMW-11A). As shown in Table 3.1, the shallow groundwater upgradient of the Site is impacted by several VOCs, primarily TCE. However, the shallow groundwater downgradient of the Site shows a greater VOC impact with 1,1,1-TCA, 1,1-DCA, 1,1-DCE, and PCE as the primary components. The VOCs, specifically 1,1,1-TCA, 1,1-DCA, 1,1-DCE, and PCE, in the shallow groundwater are the primary target of the groundwater remediation.

In the upgradient intermediate-depth wells, total VOCs ranged from 6 ug/l to 211 ug/l in wells AIMW-9B and AIMW-8B. Downgradient intermediate-depth well total VOCs concentrations ranged from 3 ug/l to 35 ug/l (AIMW-10B and AIMW-12B). As shown in Table 3.1, the intermediate-depth groundwater upgradient of the Site is impacted by several VOCs, primarily 1,1,1-TCA. The intermediate-depth groundwater downgradient of the Site shows a comparable to lower VOC impact for each of the detected VOCs, including 1,1,1-TCA. Based on this information, it does not appear that the intermediate-depth groundwater at 25 to 35 feet below the water table has been significantly impacted.

TABLE 3.1
GROUNDWATER VOLATILE ORGANIC COMPOUND DATA
ARKWIN INDUSTRIES SITE, WESTBURY, NEW YORK

SHALLOW WELLS (0 to 10 feet below water table)

Well Location	Upgradient Wells					Downgradient Wells				NYSDEC Class GA Ambient Water Quality Standards
Well No.	AIMW-9A	MW-3	MW-2	AIMW-8A	MW-1	AIMW-10A	MW-7	AIMW-11A	MW-4	
Volatile Organic Compounds in ug/l										
1,1-Dichloroethylene	ND	ND	**8J**	ND	2J	**32 DJ**	**54**	**27**	**20**	5
1,1-Dichloroethane	ND	ND	3 J	1 J	ND	**59 D**	**180 D**	**12**	**12**	5
1,2-Dichloroethylene	ND	ND	**9 J**	3 J	ND	5 J	**7 J**	ND	**13**	5
Chloroform	ND	ND	ND	ND	ND	ND	2 J	ND	ND	7
1,2-Dichloroethane	ND	ND	**2 J**	ND	ND	ND	ND	ND	ND	0.6
1,1,1-Trichloroethane	2 J	ND	**6 J**	4 J	**7 J**	ND	**560 D**	**400 D**	**200 D**	5
Trichloroethylene	ND	ND	**120**	**39**	ND	**7 J**	**16**	**17**	**24**	5
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	**2 J**	ND	ND	1
Tetrachlorethylene	ND	ND	ND	ND	ND	**14**	**45**	**57**	**120**	5
Xylene (total)	4 J	ND	ND	ND	ND	ND	ND	ND	ND	5

TABLE 3.1 (CONTINUED)
GROUNDWATER VOLATILE ORGANIC COMPOUND DATA
ARKWIN INDUSTRIES SITE
WESTBURY, NEW YORK

INTERMEDIATE WELLS (25 to 35 feet below water table)

Well Location	Upgradient Wells		Downgradient Wells		NYSDEC Class GA Ambient Water Quality Standards
Well No.	AIMW-9B	AIMW-8B	AIMW-10B	AIMW-11B	
Volatile Organic Compounds in ug/l					
1,1-Dichloroethylene	**20**	ND	3 J	5 J	5
1,1-Dichloroethane	**8 J**	ND	ND	4 J	5
1,1,1-Trichloroethane	**180**	1 J	ND	**17**	5
Trichloroethylene	ND	5 J	ND	**6 J**	5
Tetrachlorethylene	3 J	ND	ND	3 J	5

DEEP WELLS (80 to 90 feet below water table)

Well Location	Upgradient Wells		Downgradient Wells		NYSDEC Class GA Ambient Water Quality Standards
Well No.	AIMW-9C	AIMW-8C	AIMW-10C	AIMW-11C	
Volatile Organic Compounds in ug/l					
1,1-Dichloroethylene	ND	**21**	ND	ND	5
1,1-Dichloroethane	ND	**9 J**	ND	ND	5
1,1,1-Trichloroethane	ND	**21**	**6 J**	5 J	5
Tetrachlorethylene	ND	**29**	ND	ND	5
Benzene	ND	ND	**3 J**	ND	1

Notes: Only analytes detected in one or more samples are included in this table.
All samples collected October, 1998
ND = Not Detected.
B = Analyte is detected in an associated blank.
D = Diluted sample result.
J = An estimated value.
ug/l = micrograms per liter
Bold values exceed the NYSDEC Class GA Ambient Water Quality Standard.

In the deep wells, total VOCs ranged from non-detect to 80 ug/l in the upgradient wells and 5 ug/l to 9 ug/l in the downgradient wells. As shown on Table 3.1, the deep groundwater (80 to 90 feet below the water table) upgradient of the Site is impacted by several VOCs, primarily 1,1-DCE, PCE, and 1,1,1-TCA. The deep groundwater downgradient of the Site shows comparable to lower impacts for each of the detected VOCs, including 1,1,1-TCA. Based on this information, it does not appear that the deep groundwater has been significantly impacted.

In summary, groundwater sampling indicates that there is groundwater contamination in this area of the NCIA, and the analytical results from upgradient wells indicate that groundwater contamination has migrated onto the Arkwin Site from upgradient sources. Based on a comparison of the upgradient and downgradient groundwater impacts at several depths below the water table, it appears that if the Site contributed to the groundwater contamination, only the shallow groundwater (0 to 10 feet below the water table) has been impacted. The intermediate-depth (25 to 35 feet) and deep (80 to 90 feet) groundwater does not appear to be significantly impacted. Therefore, the proposed groundwater remediation is targeted for the shallow groundwater.

Based on the soil samples which were collected, no soils in excess of the Soil Cleanup Objectives were found below the former source areas. LMS stated that no additional remedial actions are warranted for the soils.

Based on the results from these investigations, the NYSDEC issued a ROD in December, 1999. The ROD indicates that no further action is required for the on-Site soil. For the groundwater, the NYSDEC has selected the following remedy:

- An air sparging/soil vapor extraction system (AS/SVE) to address VOCs in the on-Site groundwater; and

- A remedial design, including pilot tests, to verify the components of the conceptual design and provide the details necessary for the construction, operation, and monitoring of the remedial program.

  The remedial design is to include the following elements:

- Installation of injection wells to introduce air into the groundwater to promote volatilization of the VOC contamination;
- Installation of extraction wells to capture contaminants volatilized from the groundwater;
- Installation of GAC filters to treat volatilized contaminants prior to release to the atmosphere;
- The system will be in operation for an estimated period of three years;
- Semiannual sampling of existing groundwater monitoring wells will be conducted to monitor the effectiveness of the system (although the wells to be monitored were not specified). This monitoring data will be reviewed by NYSDEC to determine if the system reached its objectives and can be deactivated; and
- Implementation of institutional controls and the recording of deed restrictions to restrict the future use of groundwater at the Site.

SECTION 4.0
PROPOSED REMEDIATION

4.1 Existing Groundwater Conditions

VOC-impacted groundwater is present in two areas: the area to the east of Brooklyn Avenue downgradient of 670 Main Street and the area to the west of Brooklyn Avenue downgradient of 648 and 658 Main Street. VOC contamination exists in the shallow groundwater downgradient of these areas. Significant concentrations of VOCs are also present in the Site groundwater as a result of contaminated groundwater migrating onto the Site from off-Site, upgradient sources.

4.2 Proposed Groundwater Remediation

An AS/SVE system is proposed for the remediation of the groundwater. Air sparging involves utilizing a compressor (or air pump) connected to wells screened below the water table to inject air into the aquifer. The introduced air migrates upward through the aquifer in the pores between the sand grains and directly contacts the groundwater. The VOCs partition from the groundwater into the air and are carried by the air upward to the vadose zone. The air carrying the VOCs is then removed from the vadose zone by the SVE system. The VOCs of concern in the groundwater include 1,1,1-TCA, 1,1-DCA, 1,1-DCE, and PCE. Other VOCs were also noted, however, none of the detected concentrations in the downgradient wells significantly exceeded the concentrations in the upgradient wells. All of the VOCs of concern are highly volatile and amenable to remediation by AS/SVE, having Henry's Law coefficients greater than 10^{-3} atm m^3/mol and vapor pressures greater than 1 mm Hg.

The AS system also introduces additional dissolved oxygen to the groundwater. However, the increase in dissolved oxygen is not anticipated to result in significant biodegradation of the targeted VOCs since they are not prone to aerobic biodegradation.

Six air sparging wells and seven SVE wells were assumed in the ROD for cost estimating purposes. However, FPM proposes some modifications in the number and locations of wells to better address groundwater contamination at the Site.

Five air sparging wells are proposed at the Site as shown on Plate 2. FPM may recommend modifications in the number and location of the air sparging wells based on the results of the pilot test. Based on the existing data, the wells are located to treat the area of VOC-impacted groundwater in the vicinity and downgradient of the Arkwin facilities. The estimated radius of influence of the air sparging wells is 10 to 20 feet based on FPM's experience with other remediation projects in areas with similar geology.

The air sparging wells will be constructed of one to two-inch diameter Schedule 40 PVC casing and screen with the screened interval extending from approximately 27.5 to 30 feet below the water table (82.5 to 85 feet below grade). The anticipated slot size is 0.02 inches. Each air sparging well annulus will be backfilled with Morie #2 well gravel to approximately one foot above the top of the screen and the balance of the annulus will be backfilled with bentonite grout. The wells will be connected to a compressor or air pump via two-inch diameter PVC casing. Two AS/SVE systems will be utilized: one each on the west and east sides of Brooklyn Avenue. The purpose of this is to eliminate the cost of installing piping across Brooklyn Avenue and to enable one system to be shut down if remediation is accomplished more quickly than the other system. The compressors will be housed in sheltered enclosures with soundproofing to reduce noise.

To optimize the performance of the systems, each individual air sparging well may be operated sequentially such that each well is operated several times daily. This type of operation increases the efficiency of the system since new flow paths are established during each operating cycle and the amount of air flow is larger (for a given compressor) than if several wells are operated at once.

An SVE system is proposed for the capture of VOC vapors associated with the air sparging wells. SVE involves utilizing a blower connected to wells screened in the vadose zone to pull air through the open pores in the vadose zone soil. As the air passes through the soil, the vapors migrating from the groundwater to the vadose zone are removed from the subsurface. The air containing the contaminants is routed from the wells through the blower and directed to a stack for discharge to the atmosphere.

Based on the existing data, three SVE wells are proposed as shown on Plate 2. FPM may recommend modifications in the number and locations of these wells based on the results of the pilot test. These wells are intended to remove vapors generated from sparging of the groundwater as discussed above. The estimated radius of influence of the wells is 50 to 60 feet. The wells will be constructed of two-inch diameter Schedule 40 PVC casing and screen with the screened interval extending from approximately 40 to 50 feet below grade (just above the water table). The anticipated slot size is 0.02 inches. Each SVE well annulus will be gravel-packed to approximately one foot above the top of the screen and the balance of the annulus will be backfilled with bentonite grout. The wells will be connected to the blowers via two-inch diameter CPVC or galvanized casing set in below-grade trenches to reduce interference with surface activities at the Site. The blowers will be housed in sheltered enclosures with soundproofing to reduce noise. A water knockout drum and an air filter will be installed in-line upstream of the blower at each enclosure to remove water and particulates, respectively, from the air. The above-ground piping will be galvanized.

4.3 Pilot Testing

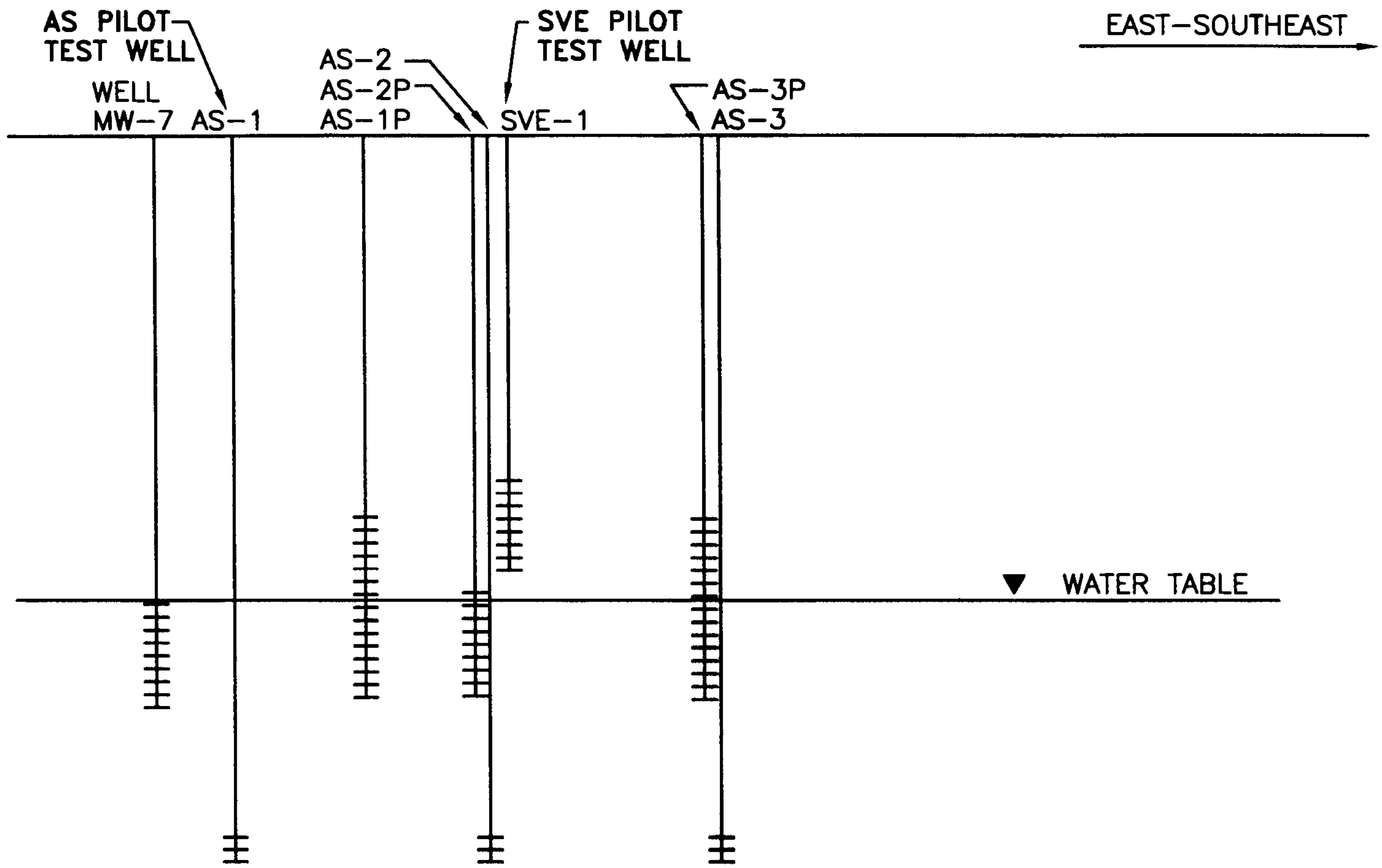
A pilot test will be performed to confirm the radius of influence of the SVE and AS wells and to evaluate the vapor emission concentrations. Stratigraphic information will also be obtained to evaluate the potential presence of low-permeability materials in the area targeted for remediation. The area of AS-1/

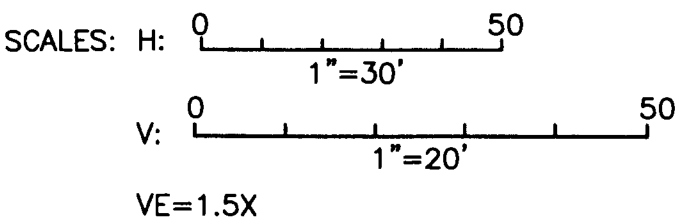
AS-2/SVE-1 (see Plate 2) was targeted for the pilot test since this appears to be the most heavily-impacted area and the greatest number of AS/SVE wells are planned to be installed in this area.

Three AS wells (AS-1 through AS-3) and one SVE well (SVE-1) will be installed for the pilot test. Figure 4.3.1 shows the pilot test layout in cross section. During well installation, the AS-2 well will be installed first and split-spoon soil samples will be obtained from the AS-2 boring at five-foot intervals from 30 feet below grade to the total boring depth. The split-spoon soil samples will be examined and classified using the Unified Soil Classification System and any low-permeability materials (silt or clay) noted will be evaluated with respect to their anticipated impact on AS/SVE performance.

At the borings for wells AS-2 and AS-3, screened piezometers (designated as AS-2P and AS-3P) will be installed in the same borehole as the sparging wells. Piezometer AS-1P will also be installed midway between wells AS-1 and SVE-1. Each piezometer will be screened from 40 to 60 feet below grade (except for piezometer AS-2P, which will be screened only below the water table). The purpose of the piezometers is to assist in evaluation of the radius of influence of the AS and SVE wells during the pilot test.

To perform the SVE pilot test, a series of increasing vacuums will be applied to the SVE-1 well and the observed vacuum will be recorded at wells AS-1P and AS-3P, which are located at distances of approximately 20 and 40 feet, respectively, from SVE-1. Prior to start-up of the pilot test, the ambient pressure will be recorded at each of the wells to confirm background subsurface pressures. During the test, the vapor flow rate will also be recorded using a portable anemometer installed in the PVC piping on the pressure side of the system. The flow rate will be determined by multiplying the recorded flow velocity by the area of the PVC discharge pipe to yield a discharge rate. VOC concentrations will also be monitored during the test from a sampling port located on the pressure side of the blower. VOC concentrations will be determined by obtaining and analyzing air samples in Tedlar bags.





FPM GROUP

FIGURE 4.3.1
PILOT TEST SUBSURFACE LAYOUT
ARKWIN INDUSTRIES SITE
WESTBURY, NEW YORK

Drawn By:L.G.	Checked By:SOD	Date:10/31/00

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The SVE portion of the pilot test will be run as a step test at several different flow rates, including 20, 40, and 80 cubic feet per minute (CFM). Each step test will be run for two hours. For each step, vacuum measurements, airflow rates, and vapor concentrations will be measured before, during, and at the conclusion of each two-hour step. These data will be used to evaluate the radius of influence of the SVE system and the anticipated vapor concentrations.

A pilot test will also be performed on the AS wells to confirm the radius of influence and to evaluate the associated VOC emission concentrations in the SVE system. Sparging well AS-1 will be operated and the nearby wells MW-7, AS-1P, AS-2P, and AS-3P (located at distances of 12, 20, 40, and 80 feet, respectively, from AS-1) will be monitored to evaluate the presence of air bubbles, changes in dissolved oxygen, and water table elevations. These data will be utilized to evaluate the radius of influence. Vapor emissions from the SVE system will also be monitored to evaluate the mass removal rate and the need for vapor treatment prior to discharge of the emissions. The AS portion of the pilot test will also be run as a step test at several different flow rates, including 5, 10, and 20 CFM. Each step test will be run for two hours with the SVE system operating at the best vacuum rate. For each step, the performance of the AS system will be monitored as discussed above to evaluate the radius of influence and the vapor emissions will be monitored before, during, and after each step. The resulting data will be evaluated to confirm the operating parameters of the AS/SVE system.

4.4 Proposed Monitoring and Reporting Program

The proposed monitoring program includes two aspects: monitoring of the operation of the SVE and AS systems and monitoring of VOCs in groundwater. Monitoring of the operation of the SVE system will be performed on a weekly or bi-weekly basis and will include checking to confirm the proper mechanical operation of the system components. Monthly monitoring of the SVE system will also be performed and will consist of sampling the system effluent (and influent if vapor treatment is used) to confirm that emissions are within acceptable limits.

Monitoring of the operation of the AS system will also be performed on a bi-weekly basis and will include checking to confirm the proper mechanical operation of the system components. Additional monitoring will also be performed on a semiannual basis and will consist of evaluating the dissolved oxygen concentration in the groundwater monitoring wells in the vicinity and downgradient of the air sparging system. Groundwater elevation measurements will also be obtained in conjunction with groundwater monitoring.

Groundwater monitoring will consist of sampling the groundwater monitoring wells upgradient and downgradient from the remediation systems. Since the wells to be monitored are not specified in the ROD, the following wells are proposed to be monitored: AIMW-9A, MW-3, MW-2, AIMW-8A, MW-1 (upgradient shallow wells), and MW-7 and MW-4 (downgradient shallow wells). The samples will be analyzed for VOCs by the CLP-equivalent of USEPA Method 8260 using NYSDEC ASP methods and Category B deliverables. FPM may propose a reduction of the number of wells sampled if some of the wells repeatedly show no detections of VOCs.

The procedures for groundwater sampling will be as follows:

1. The depth to the static water level and depth of the well will be measured with an interface probe. Measurements will be recorded to the nearest 0.01 foot.
2. The length of the column of water present in the well casing will be calculated and the volume will be derived .
3. A decontaminated submersible pump with a polyethylene hose or a dedicated PVC bailer will be used to purge a minimum of three casing volumes of water from each well. All non-disposable

equipment that enters the well will be decontaminated with a low-phosphate detergent and potable water wash and then a potable water rinse followed by a distilled water rinse prior to use.

4. Three to five casing volumes will be purged from each well prior to sampling. Following the removal of each casing volume, field parameters, including pH, turbidity, specific conductivity, and temperature will be monitored. Stability will be achieved when all stability parameters vary less than 10 percent between the removal of two successive casing volumes and after at least three casing volumes have been removed.

5. Upon achievement of stability, sampling will commence. All samples will be obtained as soon as possible after purging. Sample water will be obtained using a dedicated disposable bailer. A dedicated polypropylene line will be attached to the bailer.

6. Each sample container will be labeled with the Site location, well number, date and time of sampling, and analysis to be performed. The labeled sample containers will be placed in laboratory-supplied coolers with ice or chemical ice packs to depress the temperature to four degrees Celsius. A chain-of-custody form will be filled out and kept with the samples in the coolers to document the sequence of sample possession. The sample coolers will be delivered by an overnight courier to the laboratory. The groundwater samples will be analyzed by a NYSDOH ELAP-approved laboratory for VOCs.

Monitoring reports will be prepared and submitted to the NYSDEC on a semiannual basis. Each monitoring report will document the operation of the remediation systems for that period and will present the results of monitoring. Estimates of the mass of contaminants removed will be presented together with recommendations for improved system operation.

4.5 Shut-Down Closure Criteria

Although it is stated in the ROD that the AS/SVE system is expected to operate for three years, earlier termination of the AS/SVE system will be proposed if closure is indicated. It is intended to continue operating the AS/SVE system for three years or until one of three shut-down criteria is met. The proposed shut-down criteria are:

- Mass removal rates decline to low and relatively unchanging levels (become asymptotic when plotted versus time) or;
- The total concentration of the targeted VOCs (1,1,1-TCA, 1,1-DCA, 1,1-DCE, and PCE) is reduced in the downgradient monitoring wells (MW-4 and MW-7) by 90 percent relative to the October, 1998 concentrations for two consecutive sampling periods, or;
- A comparison of upgradient shallow groundwater quality (wells AIMW-9A, MW-3, AIMW-8A, MW-2, and MW-1) and downgradient shallow groundwater quality (wells MW-7 and MW-4) shows no significant elevation of concentrations in the downgradient wells for the VOCs of concern (1,1-DCE, 1,1-DCA, 1,1,1-TCA, and PCE). A significantly elevated downgradient concentration shall be identified if the sum of the 1,1,1-TCA, 1,1-DCA, PCE, and 1,1-DCE concentrations in the downgradient wells is more than 100 ug/l above the sum of the concentrations in the upgradient wells for two consecutive sampling periods.

When either the system has operated for three years or one of the three closure criteria is met, it is proposed to shut down the AS/SVE system and increase the groundwater monitoring frequency to quarterly. If, after four quarters of groundwater monitoring, no increase in downgradient shallow groundwater VOC contamination is noted relative to the upgradient shallow groundwater VOC concentrations, then closure of Operable Unit (OU) No. 02 (groundwater) will be requested.

SECTION 5.0
QUALITY ASSURANCE PROJECT PLAN

5.1 Sampling Equipment Decontamination Procedures

All non-disposable downhole equipment used during sampling will be decontaminated prior to use at each location to prevent cross contamination. For groundwater sampling, dedicated, disposable bailers will be used. The decontamination procedures are as follows:

1. Equipment will be scrubbed in a bath of potable water and low-phosphate detergent;
2. Potable water rinse;
3. A methanol rinse followed by a hexane rinse;
4. Distilled water rinse;
5. Air dry.

5.2 Chain-of-Custody Procedures

For each day of sampling, a chain-of-custody sheet will be completed and submitted to the laboratory. A copy of the chain-of-custody sheet will also be retained by FPM. The chain-of-custody sheet will include the project name, the sampler's signature, the sampling locations, and analysis parameters requested.

5.3 QA/QC Samples

QA/QC samples will be obtained during the groundwater sampling. One field blank per day will be prepared by pouring laboratory-supplied water through either the sampling bailer and into a set of sample containers. The field blank will be tested for the same analytes as parent samples. The field blank results will be reviewed to evaluate the potential for field or laboratory contamination and will attest to the quality of the decontamination procedures.

During groundwater sampling, one trip blank will be provided by the laboratory for each set of samples to be submitted to the laboratory for VOC analysis. The trip blanks will be prepared from analyte-free, water by the laboratory and will remain in the coolers in which the samples are stored. Trip blanks will be analyzed for VOCs. The purposes of trip blanks are to ensure that no cross-contamination of VOCs occurs in the sample cooler and to attest to laboratory water quality.

A matrix spike and matrix spike duplicate for groundwater samples will be submitted to the laboratory by obtaining an extra volume of a selected groundwater sample. The frequency of matrix spike and matrix spike duplicates will be one per 20 samples. The purpose of the matrix spike and matrix spike duplicates are to confirm the accuracy and precision of the laboratory.

In addition, blind duplicate samples will be obtained at a frequency of at least five percent of the total number of samples obtained. Each blind duplicate sample will be prepared by collecting a separate aliquot of a parent sample. The blind duplicate sample will be analyzed for the same parameters as the primary sample and the results will be used to attest to the precision of the laboratory.

No QA/QC samples are proposed for SVE vapor sampling.

5.4 Sample Analysis

All groundwater and SVE vapor samples will be submitted to a New York State Department of Health ELAP-certified laboratory. The proposed subcontractor laboratory is York Analytical Laboratories.

All groundwater samples will be analyzed for Target Compound List (TCL) VOCs using the CLP-equivalent of EPA Method 8260. The data will be reported as NYSDEC ASP Revision 12/91 Category B deliverables. SVE system vapor samples will be analyzed for VOCs using the TO1/TO2 method. The data for the SVE samples will be presented in a report-only format. Table 5.4.1 shows the number of samples to be collected, holding time, analytical protocols, and estimated number of QA/QC samples.

TABLE 5.4.1
SAMPLE CONTAINERS, PRESERVATION, HOLDING TIMES, AND ANALYSIS METHODS

Sample Matrix	Number of Samples Per Event	Parameters	Container Type	Preservation	Holding Time	NYSDEC Analysis Method
Groundwater	11	TCL VOCs	Glass Jar with Teflon Liner	4°C (Zero Headspace)	14 days w/HCl	CLP-equivalent of EPA Method 8260
QA/QC	5	TCL VOCs	Glass Jar with Teflon Liner	4°C (Zero Headspace)	14 days w/HCl	CLP-equivalent of EPA Method 8260
SVE Vapor	2	VOCs	Tedlar Bag	Store in cooler	7 days	T01/T02

Notes:

- Field blanks and trip blanks will be obtained at a rate of one per day during groundwater sampling.
- Holding times begin on the date the sample received by the laboratory. Samples must be received by the laboratory within 48 hours of sampling.

5.5 Data Evaluation

The data collected will be assembled, reviewed, and evaluated following each sampling round. The groundwater data collected will be organized and analyzed to identify the nature and extent of contamination in the Site groundwater. The SVE system emissions data will be reviewed to confirm that the emissions remain within acceptable limits.

5.6 Estimated Schedule of the Remedial Activities

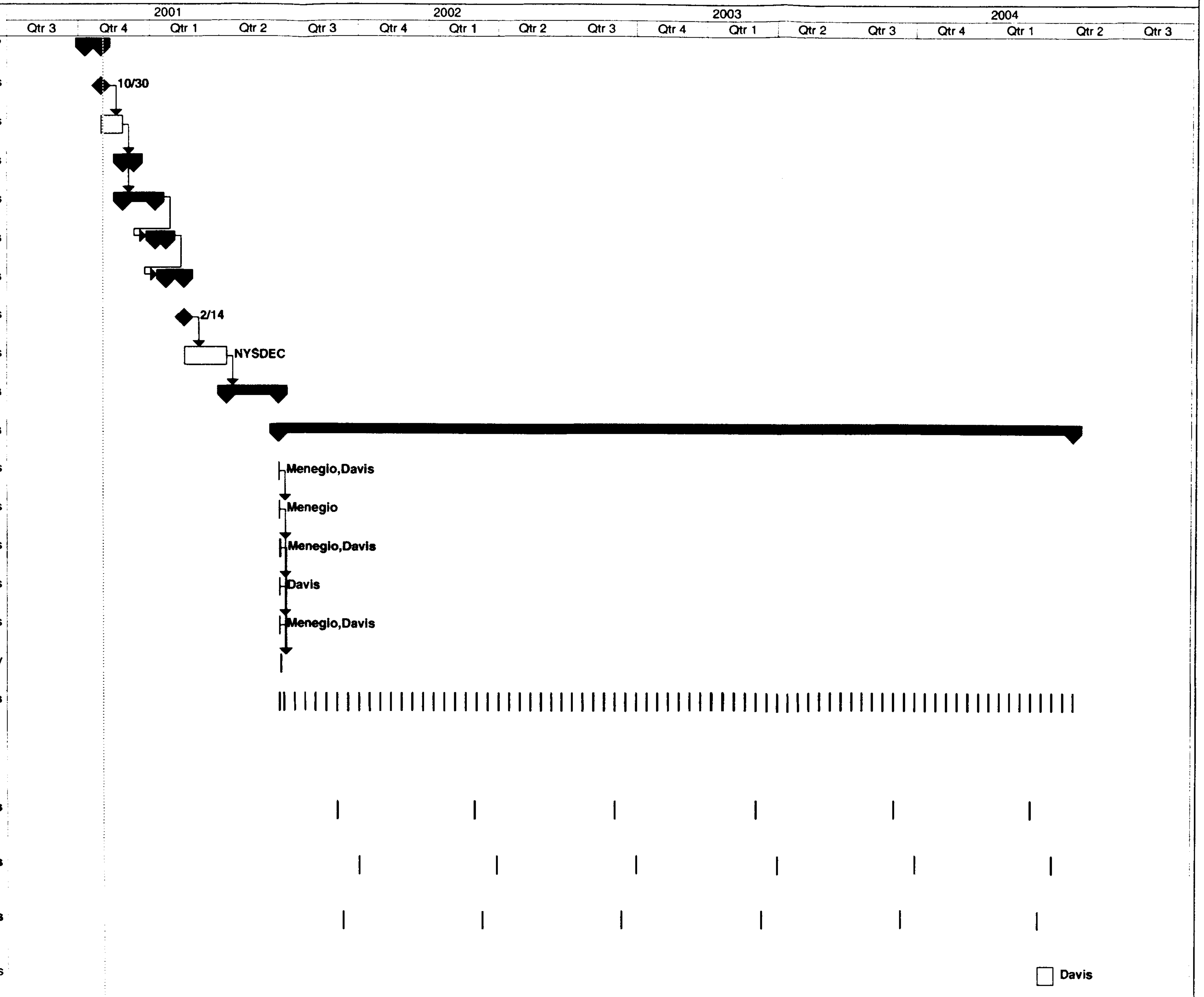
The estimated schedule for the execution of the remediation activities is shown on the following page.

5.7 Miscellaneous

The project manager for this project will be Stephanie Davis, Senior Hydrogeologist. The FPM field supervisor will be Greg Menegio, Environmental Scientist.

Arkwin Project Schedule

ID	Outline	Task Name	Duration
1	1.0	**Prepare Work Plan for Pilot Testing**	**14.25 days?**
51	2.0	**Submit Work Plan Pilot Study to NYSDEC**	0 days
52	3.0	**NYSDEC Review and Approval of Pilot Test Work Plan**	20 days
53	4.0	**Utility markout**	**10.5 days**
57	5.0	**Contractor Selection**	**30 days**
63	6.0	**Installation of Pilot System**	**10 days**
70	7.0	**Perform and Evaluate Pilot Test**	**17.5 days**
76	8.0	**Submit Pilot Test Results to DEC**	0 days
77	9.0	**NYSDEC Review and Approval**	40 days
78	10.0	**Installation of Full Scale system**	**48.25 days**
91	11.0	**Operation and Maintenance**	**745 days**
92	11.1	Meet with Arkwin to review O&M	0.5 days
93	11.2	Prepare O&M manual for Arkwin	0.5 days
94	11.3	Detail Arkwin tasks/frequency, prepare charts for them to keep	1.5 days
95	11.4	Detail FPM tasks/frequency, prepare charts for FPM to keep	0.5 days
96	11.5	Detail emergency proceedures	0.5 days
97		Start Remediation system	1 day
98		**Operation and maintance of the system (one day every two Weeks) check system, effluent monitoring, change out of carbon drums. Every Two weeks for three years**	**745 days**
183		**Sample groundwater monitoring wells ,every six months for three years**	**651 days**
190		**Prepare ground water quality and progress report to NYSDEC two time per year for three years**	**651 days**
197		**Check if Done (after every groundwater sampling event)**	**653 days**
204		Final Remediation Report	15 days



Project: Arkwin for KP Date: Wed 11/1/00	Task		Progress		Summary		External Tasks	
	Split		Milestone		Project Summary		External Milestone	
	Deadline							

APPENDIX A

HEALTH AND SAFETY PLAN

FPM

HEALTH AND SAFETY PLAN

FOR THE

GROUNDWATER REMEDIATION AT THE ARKWIN INDUSTRIES SITE NEW CASSEL INDUSTRIAL AREA WESTBURY, NEW YORK

PREPARED BY

FPM group

909 MARCONI AVENUE
RONKONKOMA, NEW YORK 11779

NOVEMBER, 2000

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TABLE OF CONTENTS (CONTINUED)

TABLES

SITE WORKER
HEALTH AND SAFETY STATEMENT

I have read this Health and Safety Plan (HASP) for the groundwater remediation at the Arkwin Industries Site (the Site), Westbury, New York and I have reviewed and understand the potential hazards and the precautions/contingencies of each potential hazard.

I agree to abide by the stipulations of this HASP and further agree to hold FPM Group harmless from, and indemnify against, any accidents which may occur as a result of activities at the Site regardless of whether or not they were covered in the HASP.

Name: ______________________ Representing: ______________________

______________________ Date: ______________________
Sign

Name: ______________________ Representing: ______________________

______________________ Date: ______________________
Sign

Name: ______________________ Representing: ______________________

______________________ Date: ______________________
Sign

Name: ______________________ Representing: ______________________

______________________ Date: ______________________
Sign

SECTION 1.0
INTRODUCTION

This Health and Safety Plan (HASP) has been written for compliance with "OSHA Hazardous Waste Operations Standards (29 CFR 1910.120)", the guidance documents, "Standard Operating Safety Guidelines (Office of Solid Waste and Emergency Response, 1988)" and the "Occupational Safety and Health Guidance Manual for Hazardous Waste Activities" (U.S. Department of Health and Human Services, 1985).

1.1 Scope and Applicability of the HASP

This HASP is designed to be applicable to locations where soil vapor extraction (SVE) and air sparging (AS) system installations are performed at the Arkwin site (the Site). This HASP may also be modified or amended to meet specific needs of the work proposed. This HASP will detail the Site safety procedures, Site background, and safety monitoring. Contractors will be required to adopt this HASP in full.

The Health and Safety Officer (HSO) will be present at the Site to inspect the implementation of the HASP, however, it is the sole responsibility of the contractor(s) to comply with the HASP.

The HASP has been formulated as a guide to complement professional judgment and experience. The appropriateness of the information presented should always be evaluated with respect to unforeseen Site conditions which may arise.

1.2 Site Work Zone and Visitors

The Site work zone (a.k.a. exclusion zone) during SVE or AS system installation will be a 30-foot radius about the work location. This work zone may be extended if, in the judgment of the health and safety officer (HSO), Site conditions warrant a larger work zone.

No visitors will be permitted within the work zone without the consent of the HSO. All visitors will be required to be familiar with, and comply with, the HASP. The HSO will deny access to those whose presence within the work zone is unnecessary or those who are deemed by the HSO to be in non-compliance with the HASP.

All Site workers including the contractors will be required to have 40-hour hazardous material training (eight-hour refresher courses annually), respirator fit test certification, and medical surveillance as stated in 29 CFR 1910.120.

The HSO will also give an on-Site health and safety discussion to all Site personnel, including the contractors, prior to initiating the Site work. Workers not in attendance during the health and safety talk will be required to have the discussion with the HSO prior to entering the work zone.

Emergency telephone numbers and directions to the nearest hospital are found in Table 1.2.1.

TABLE 1.2.1
EMERGENCY TELEPHONE NUMBERS

Police	911
Ambulance	911
Poison Control Center	516-542-2323
N.Y.S. Department of Environmental Conservation	631-444-0320
Nassau County Medical Center	516-542-3311

FPM Contact Personnel (631-737-6200)

Dr. Kevin J. Phillips, P.E.
Stephanie Davis, Project Manager
Greg Menegio or John Bukoski, Health & Safety Officer

Directions to Nassau County Medical Center (516-542-3311)

Head north on Brooklyn Avenue to end, make a right on to Summa Avenue and go to end. Make a right turn on to Frost Street. Cross over Old Country Road (Frost Street becomes Carman Avenue). Follow Carman Avenue for approximately two miles and Nassau County Medical Center is located on the left side of the road at the corner of Carman Avenue and Hempstead Turnpike in East Meadow.

SECTION 2.0
KEY PERSONNEL AND RESPONSIBILITIES

The project manager for this project will be Stephanie Davis. The project field staff may include Stephanie Davis, Greg Menegio, and John Bukoski. Contractor personnel may also be on Site. The senior FPM staff member on Site will act as HSO and will report to the project manager. Contractor personnel will be provided with health and safety information by the HSO.

SECTION 3.0
SITE BACKGROUND

3.1 Site History and Known Chemical Constituents at the Site

The Site is comprised of five buildings located at 648, 656, 662, and 670 Main Street and 66 Brooklyn Avenue in Westbury, New York. The Site is approximately 1.7 acres in size. Groundwater at the Site may be impacted with chemicals related to the previous industrial use at the Site and to off-Site sources. The primary chemicals known to be present at the Site are presented in Table 3.1.1.

TABLE 3.1.1
PRIMARY CHEMICALS WITH THRESHOLD LIMIT VALUES

CONTAMINANT	SHORT TERM EXPOSURE LIMIT (STEL) 15 MINUTES	TIME-WEIGHTED AVERAGE 8 HOUR EXPOSURE LIMIT
Perchloroethylene (PCE)	200 ppm 1,357 mg/m^3	50 ppm 339 mg/m^3
Trichloroethylene (TCE)	200 ppm 1,070 mg/m^3	50 ppm 269 mg/m^3
Trichloroethane (TCA)	450 ppm 2,460 mg/m^3	350 ppm 1,910 mg/m^3
cis-1,2-dichloroethene	-	200 ppm 793 mg/m^3

SECTION 4.0
TASK/OPERATION HEALTH AND SAFETY ANALYSIS

This section will present health and safety analyses for the SVE/AS system installation.

4.1 Safety Analysis

A hollow-stem auger drilling rig will be utilized to install the SVE/AS wells. A photoionization detector (PID) will be used to monitor VOCs in the worker's breathing zone during drilling and installation of piping.

Steady-state PID readings greater than five ppm in the worker's breathing zone will require upgrading to Level C personal protective equipment. Steady-state readings, for this purpose, will be defined as readings exceeding five ppm above background for a minimum of ten seconds. Readings will be obtained at points approximately one foot above and then around the borehole. These points will define the worker's breathing zone.

Upon encountering PID levels greater than five ppm above background in the worker's breathing zone, all personnel will be evacuated from the work zone in the upwind direction (if applicable). Specific evacuation routes will be discussed prior to commencement of work at each location based on work location and wind direction. In addition, an evacuation meeting place will be determined. Level C personal protection will be implemented including full-face air-purifying respirators with dust and organic vapor cartridges (personal protective equipment will be described in greater detail in Section 7.0). All FPM personnel and contractors must be properly trained and fit tested prior to donning respirators. If, at any time, PID readings exceed steady-state levels greater than 50 ppm above background, or any conditions exist which the HSO determines will require Level B personal protective equipment, all work at the Site will cease immediately and all personnel will evacuate the work zone. Evacuation will occur in the upwind direction if discernable. Level B conditions are not anticipated to be encountered; however, if level B conditions arise, no Site work will be performed by FPM or contractors and a complete evaluation of the operation will be performed and this HASP will be modified.

All personnel who may directly contact soil will be required to wear chemical-resistant gloves (such as butyl or nitrile) when the potential for dermal contact with the soil is possible. Dermal contact with excavated soils will be avoided.

Hard hats and steel-toe, steel-shank safety boots will be required when work is performed in the vicinity of heavy equipment (drill rigs, backhoes, etc.).

4.2 Other Safety Considerations

4.2.1 Noise

During AS/SVE system installation, operation of generators, or any other operation which may generate potentially harmful levels of noise, the HSO will monitor noise levels with a Realistic™ hand-held sound level meter. Noise levels will be monitored in decibels (dBs) in the A-weighted, slow-response mode. Noise level readings that exceed the 29 CFR 1910.95 permissible noise exposure limits will require hearing protection (see Table 4.2.1.1 for permissible noise exposures).

Hearing protection will be available to all Site workers. The hearing protection will consist of foam, expansion-fit earplugs (or other approvable hearing protection) with an Environmental Protection Agency noise reduction rating of at least 29 dB. Hearing protection must alleviate worker exposure to noise to an eight-hour time-weighted average of 85 dB or below. In the event that the hearing protection is inadequate, work will cease until a higher level of hearing protection can be incorporated.

4.2.2 Slip/Trip/Fall Preventative Measures

To reduce the potential for slipping, tripping, or falling, the work zone will be kept clear of unnecessary equipment. All Site workers will be required to wear work boots with adequate tread to reduce the potential for slipping (work boots must be leather or chemical-resistant and contain steel toes and steel shanks).

TABLE 4.2.1.1
PERMISSIBLE NOISE EXPOSURES*

Duration Per Day Hours	Sound Level dBA Slow Response
8	90
6	92
4	95
3	97
2	100
1½	102
1	105
½	110
115	

Notes:

When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions: $C_1/T_1+C_2/T_2$ C_n/T_n exceeds unity, then, the mixed exposure should be considered to exceed the limit value. Cn indicates the total time of exposure at a specified noise level, and Tn indicates the total time of exposure permitted at that level.

Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.

* Standards derived from 29 CFR 1910.95

4.2.3 Insects and Ticks

Insect and tick problems are expected to be minimal. Potential insect problems include, but are not limited to, bees, wasps, and hornets. Prior to commencement of work, each work area will be surveyed for nests and hives to reduce the possibility of disturbing these insects. In addition, each Site worker will be asked to disclose any allergies related to insect stings or bites. The worker will be requested to keep his or her anti-allergy medicine on Site.

Tick species native to Long Island consist of the pinhead-sized deer tick and the much-larger dog tick. All Site workers will be advised to avoid walking through tall grassy areas where possible and will be advised to check for ticks on clothing periodically.

4.2.4 Heat/Cold Stress

Heat stress may become a concern especially if protective clothing is donned which will decrease natural ventilation. To assist in reducing heat stress the following measures will be taken:

- An adequate supply of water or other liquids will be brought on Site. To prevent dehydration, personnel will be encouraged to drink generous amounts of water even if not thirsty.
- A shady rest area will be designated (such as beneath the trees in the northeast corner of the property) to provide shelter during sunny days.
- In hot weather, workers wearing protective clothing may be rotated.

When the temperature is over 70 degrees Fahrenheit and personnel are wearing protective clothing, heat stress monitoring may be implemented as follows:

- Heart rate may be measured by counting the radial pulse for 30 seconds at the beginning of the rest period. The heart rate should not exceed 110 beats per minute. If the rate is higher, the next work period will be shortened by ten minutes (or 33%). If the pulse rate is 100 beats per minute at the beginning of the next rest period, the following work cycle will be shortened by 33%. The HSO will decide on the length of work periods and rest periods based on Site conditions.

- Body temperature may be measured, if deemed necessary, at the beginning of the rest period. Oral temperature should not exceed 99 degrees Fahrenheit. If it does, the next work period will be shortened by ten minutes (or 33%). However, if the oral temperature exceeds 99.7 degrees Fahrenheit at the beginning of the next period, the following work cycle will be further shortened by 33%. Work will not re-commence until by temperature has dropped below 99 degrees Fahrenheit.

Indications of heat stress range from mild (fatigue, irritability, anxiety, decreased concentration, dexterity or movement) to fatal. Medical help will be obtained for serious conditions. Heat-related problems are:

- <u>Heat rash</u>: caused by continuous exposure to heat and humid air and aggravated by chafing clothes. Decreases ability to tolerate heat as well as being a nuisance.
- <u>Heat cramps</u>: caused by profuse perspiration with inadequate fluid intake and chemical replacement (especially salts). Signs: muscle spasm and pain in the extremities and abdomen.
- <u>Heat exhaustion</u>: caused by increased stress on various organs to meet increased demands to cool the body. Signs: shallow breathing; pale, cool, moist skin; profuse sweating; dizziness and lassitude.
- <u>Heat stroke</u>: the most severe form of heat stress. Can be fatal. Medical help must be obtained immediately. Body must be cooled immediately to prevent severe injury and/or death. Signs: red, hot, dry skin; no perspiration; nausea; dizziness and confusion; strong, rapid pulse; coma.

Cold exposure is a concern if work is conducted during cold weather or marginally cold weather during precipitation periods or moderate to high wind velocity periods. To assist in reducing cold exposure the following measures will be taken:

- All personnel will be required to wear adequate and appropriate clothing. This will include head gear to prevent the high percentage loss of heat that occurs in this area (thermal liners for hard hats if hard hats are required).
- Provide a readily available warm shelter near each work zone.

- Carefully schedule work and rest periods to account for the current temperature and wind velocity conditions.
- Monitor work patterns and physical condition of workers and rotate personnel, as necessary.

Indications of cold exposure range from shivering, dizziness, numbness, confusion, weakness, impaired judgement, impaired vision to drowsiness. Medical help will be obtained for serious conditions if they occur. Cold exposure-related problems are:

- Frost bite: Ice crystal formation in body tissues. The restricted blood flow to the injured part results in local tissue destruction.
- Hypothermia: Severe exposure to cold temperature resulting in the body losing heat at a rate faster than the body can generate heat. The stages of hypothermia are shivering, apathy, loss of consciousness, decreasing pulse rate and breathing rate and death.

4.2.5 Potential Electrical Hazards

Potential electric hazards consist primarily of underground and overhead power lines. Potential underground electrical hazards will be minimized by having a utility markout performed for the Site. In addition, available as-built Site blueprints will be used to avoid contact with subsurface utility lines or structures. Overhead electrical hazards will be evaluated by visually observing the work location prior to raising the drill rig mast or performing other operations which have the potential to contact overhead utilities. No work shall be performed in close proximity to overhead utilities.

There is also the potnetial for electrical hazard associated with the AS/SVE system installation. To avoid these potential electrical hazards, all AS/SVE system electrical work will be performed by a licensed electrician. The electrician shall utilize standard industry procedures and practices for avoiding electrical hazards.

4.2.6 The Buddy System

All activities in contaminated or potentially contaminated areas will be conducted by pairing off the Site workers in groups of two (or three if necessary). Each person (buddy) will be able to:

- Provide his or her partner with assistance.
- Observe his or her partner for signs of chemical or heat exposure.
- Periodically check the integrity of his or her partner's protective clothing.
- Notify the HSO or others if emergency help is needed.

The buddy system will be instituted at the beginning of each workday. If new workers arrive on Site, a buddy will be chosen prior to the new worker entering the work zone.

4.2.7 Site Communications

Two sets of communication systems will be established at the Site: internal communication among personnel on-Site, and external communication between on-Site and off-Site personnel.

Internal communication will be used to:

- Alert team members to emergencies.
- Pass along safety information such as heat stress check, protective clothing check, etc.
- Communicate changes in the work to be accomplished.
- Maintain Site control.

Due to ambient noise, verbal communications may be difficult at times. The HSO will carry a whistle (and compressed air horn if respirators are donned) to signal Site workers. A single whistle blast will be the signal to immediately evacuate the work zone through the access control point. This signal will be discussed with all Site workers prior to commencement of work.

An external communication system between on-Site and off-Site personnel will be established to:

- Coordinate emergency response
- Report to the Project Manager

- Maintain contact with essential off-Site personnel

A field telephone will be available at all times in the HSO's vehicle. In addition, the nearest stationary phone will be identified prior to the commencement of Site operations and this location will be relayed to all Site workers.

4.2.8 General Safe Work Practices

Standing orders applicable during Site operations are as follows:

- No smoking, eating, drinking, or application of cosmetics in the work zone.
- No matches or lighters in the work zone.
- All Site workers will enter/exit work zone through the Site access point.
- Any signs of contamination, radioactivity, explosivity, or unusual condition such as dead animals will require evacuating the Site immediately and reporting the information to the HSO.
- Loose fitting clothing or loose long hair will be prohibited in the work zone during drilling operations.
- A signal person will direct the backing of work vehicles.
- Equipment operators will be instructed to check equipment for abnormalities such as oozing liquids, frayed cables, unusual odors, etc.

SECTION 5.0
PERSONNEL TRAINING REQUIREMENTS

All FPM personnel and contractor personnel will receive adequate training prior to entering the Site. FPM and contractor's personnel will, at a minimum, have completed OSHA-approved, 40-hour hazardous materials Site safety training and OSHA-approved, eight-hour safety refresher course within one year prior to commencing field work. The HSO will have received the OSHA-approved, eight-hour course on managing hazardous waste operations. In addition, each worker must have a minimum of three days field experience under the direct supervision of a trained, experienced supervisor.

Prior to Site fieldwork, the HSO will conduct an in-house review of the project with respect to health and safety with all FPM personnel who will be involved with fieldwork at the Site. The review will include discussions of signs and symptoms of chemical exposure and heat stress that indicate potential medical emergencies presented in Table 5.1. In addition, review of personal protective equipment will be conducted to include the proper use of air-purifying respirators.

TABLE 5.1
SIGNS AND SYMPTOMS OF EXPOSURE TO CHEMICALS

Type of Hazard	Signs and Symptoms
Chemical Hazard	Behavioral changes Breathing difficulties Changes in complexion of skin color Confusion Coordination difficulties Coughing Depression Dermatitis Dilated Pupils Dizziness Euphoria Fatigue and/or weakness Flushed face and/or neck Insomnia Irregular heartbeat Irritability Irritation of eyes, nose, respiratory tract, skin or throat Headache Lacrimation Light-Headedness Muscle Fatigue Nausea Nervousness Numbness in limbs Paresthesia Sleepiness Tingling Tremors Vertigo Visual disturbance Vomiting

TABLE 5.1 - CONTINUED
SIGNS AND SYMPTOMS OF EXPOSURE TO CHEMICALS

Type of Hazard	Signs and Symptoms
Heat Exhaustion	Clammy skin Confusion Dizziness Fainting Fatigue Heat rash Light-headedness Nausea Profuse sweating Slurred speech Weak pulse
Heat Stroke (may be fatal)	Confusion Convulsions Hot skin, high temperature (yet may feel chilled) Incoherent speech Staggering gait Sweating stops (yet residual sweat may be present) Unconsciousness

SECTION 6.0
MEDICAL SURVEILLANCE PROGRAM

All workers at the Site must participate in a medical surveillance program in accordance with 29 CFR 1910.120. A medical examination and consultation must have been performed within the last twelve months to be eligible for fieldwork.

The content of the examination and consultation will include a medical and work history with special emphasis on symptoms related to the handling of hazardous substances, health hazards, and fitness for duty including the ability to wear required personal protective equipment under conditions (i.e., temperature extremes) that may be expected at the work Site. All medical examinations and procedures shall be performed by, or under the supervision of, a licensed physician.

The physician shall furnish a written opinion containing:

- The results of the medical examination and tests.
- The physician's opinion as to whether the employee has any detected medical conditions that would place the worker at increased risk of material impairment of the employee's health from work in hazardous waste operations.
- The physician's recommended limitations upon the worker assigned to the work.
- A statement that the worker has been informed by the physician of the results of the medical examination and any further examination or treatment.

An accurate record of the medical surveillance will be retained. The record will consist of at least the following information:

- The name and social security number of the employee.
- Physician's written opinions, recommended limitations, and results of examinations and tests.

Any worker medical complaints related to exposure to hazardous substances.

SECTION 7.0
PERSONAL PROTECTIVE EQUIPMENT

7.1 General Considerations

The two basic objectives of the personal protective equipment (PPE) are to protect the wearer from safety and health hazards, and to prevent the wearer from incorrect use and/or malfunction of the PPE.

Potential Site hazards were discussed previously in Section 4.0. The duration of Site activities is estimated to be several months. All work is expected to be performed during daylight hours and workdays, in general, are expected to be eight to ten hours in duration. Any work performed beyond daylight hours will require the permission of the HSO. This decision will be based on the adequacy of artificial illumination and the type and necessity of the task being performed.

Personal protection levels for the Site activities, based on past investigations, are anticipated to be Level D with the possibility of upgrading to Level C. The equipment included for each level of protection is provided as follows:

<u>Level C Protection</u>

Personnel protective equipment:

- Air-purifying respirator, full-face
- Chemical-resistant clothing includes: Tyvek^{tm} (spunbonded olefin fibers) for particulate and limited splash protection or Saranex^{tm} (plastic film-laminated Tyvek) for permeation resistance to solvents.
- Coveralls*, or
- Long cotton underwear*
- Gloves (outer), chemical-resistant
- Gloves (inner), chemical-resistant
- Boots (outer), leather or chemical-resistant, steel toe and shank.

- Boot covers (outer), chemical-resistant (disposable)*
- Hard hat (face shield)*
- Escape mask*
- 2-way radio communications (inherently safe)*

(*) optional

Criteria for Selection of Level C Protection

Meeting all of these criteria permits use of Level C Protection:

- Oxygen concentrations are not less than 19.5% by volume.
- Measured air concentrations of identified substances will be reduced by the respirator below the substance's threshold limit value (TLV).
- Atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect any body area left unprotected by chemical-resistant clothing.
- Job functions do not require self-contained breathing apparatus.
- Direct readings are below 50 ppm on the PID.

Level D Protection

Personnel protective equipment:

- Coveralls
- Gloves*
- Boots/shoes, leather or chemical-resistant, steel toe and shank.
- Safety glasses or chemical splash goggles*
- Hard hat (face shield*)
- Escape mask*

(*) optional

Criteria for Selection of Level D Protection

Meeting any of these criteria allows use of Level D Protection:

- No contaminant levels above 5 ppm organic vapors or dusty conditions are present.
- Work functions preclude splashes, immersion, or the reasonable potential for unexpected inhalation of any chemicals above the TLV.

Additional Considerations for Selecting Levels of Protection

Other factors which will be considered in selecting the appropriate level of protection are heat and physical stress. The use of protective clothing and respirators increases physical stress, in particular, heat stress on the wearer. Chemical protective clothing greatly reduces natural ventilation and diminishes the body's ability to regulate its temperature. Even in moderate ambient temperatures, the diminished capacity of the body to dissipate heat can result in one or more heat-related problems.

All chemical protective garments can be a contributing factor to heat stress. Greater susceptibility to heat stress occurs when protective clothing requires the use of a tightly fitted hood against the respirator face piece, or when gloves or boots are taped to the suit. As more body area is covered, less cooling takes place, increasing the probability of heat stress.

Wearing protective equipment also increases the risk of accidents. It is heavy, cumbersome, decreases dexterity, agility, interferes with vision, and is fatiguing to wear. These factors all increase physical stress and the potential for accidents. In particular, the necessity of selecting a level of protection will be balanced against the increased probability of heat stress and accidents.

7.2 Donning and Doffing Ensembles

Donning an Ensemble

A routine will be established and practiced periodically for donning a Level C ensemble. Assistance may be provided for donning and doffing since these operations are difficult to perform alone.

Table 7.2.1 lists sample procedures for donning a Level C ensemble. These procedures should be modified depending on the particular type of suit and/or when extra gloves and/or boots are used.

Doffing an Ensemble

Exact procedures for removing Level C ensembles must be established and followed to prevent contaminant migration from the work area and transfer of contaminants to the wearer's body, the doffing assistant, and others.

Doffing procedures are provided in Table 7.2.2. These procedures should be performed only after decontamination of the suited worker. They require a suitably attired assistant. Throughout the procedures, both worker and assistant should avoid any direct contact with the outside surface of the suit.

7.3 Respirator Fit Testing

The fit or integrity of the facepiece-to-face seal of a respirator affects its performance. Most facepieces fit only a certain percentage of the population; thus each facepiece must be tested on the potential wearer in order to ensure a tight seal. Facial features such as scars, hollow temples, very prominent cheekbones, deep skin creases, dentures or missing teeth, and the chewing of gum and tobacco may interfere with the respirator-to-face seal. A respirator shall not be worn when such conditions prevent a good seal. The worker's diligence in observing these factors shall be evaluated by periodic checks. Fit testing will comply with 29 CFR 1910.1025 regulations.

7.4 Inspection

The PPE inspection program will entail five different inspections:

- Inspection and operational testing of equipment received from the factory or distributor.
- Inspection of equipment as it is issued to workers.
- Inspection after use.
- Periodic inspection of stored equipment.

TABLE 7.2.1
SAMPLE DONNING PROCEDURES

---

1. Inspect the clothing and respiratory equipment before donning (see Inspection in subsection 7.4).

2. Adjust hard hat or headpiece if worn, to fit user's head.

3. Standing or sitting, step into the legs of the suit; ensure proper placement of the feet within the suit; then gather the suit around the waist.

4. Put on chemical-resistant safety boots over the feet of the suit. Tape the leg cuff over the tops of the boots.

5. Don the respirator and adjust it to be secure, but comfortable.

6. Perform negative and positive respirator facepiece seal test procedures.

   - To conduct a negative-pressure test, close the inlet part with the palm of the hand or squeeze the breathing tube so it does not pass air, and gently inhale for about 10 seconds. Any inward rushing of air indicates a poor fit. Note that a leaking facepiece may be drawn tightly to the face to form a good seal, giving a false indication of adequate fit.

   - To conduct a positive-pressure test, gently exhale while covering the exhalation valve to ensure that a positive pressure can be built up. Failure to build a positive pressure indicates a poor fit.

7. Depending on type of suit:

   - Put on inner gloves (surgical gloves).

   - Additional overgloves, worn over attached suit gloves, may be donned later.

8. Put on hard hat

9. Have assistant observe the wearer for a period of time to ensure that the wearer is comfortable, psychologically stable, and that the equipment is functioning properly.

TABLE 7.2.2
DOFFING PROCEDURES

---

1. Remove any extraneous or disposable clothing, boot covers, outer gloves, and tape.

2. Remove respirator by loosening straps and pulling straps over the top of the head and move mask away from head. Do not pull mask over the top of the head.

3. Remove arms, one at a time, from suit, avoiding any contact between the outside surface of the suit and wearer's body and lay the suit out flat behind the wearer. Leave internal gloves on, if any.

4. Sitting, if possible, remove both legs from the suit.

5. After suit is removed, remove internal gloves by rolling them off the hand, inside out.

- Periodic inspection when a question arises concerning the appropriateness of the selected equipment, or when problems with similar equipment arise.

The inspection checklist is provided in Table 7.4.1. Records will be kept of all inspection procedures. Individual identification numbers will be assigned to all reusable pieces of equipment and records should be maintained by that number. At a minimum, each inspection should record the ID number, date, inspector, and any unusual conditions or findings. Periodic review of these records may indicate an item or type of item with excessive maintenance costs or a particularly high level of down-time.

7.5 Storage

Clothing and respirators will be stored properly to prevent damage or malfunction due to exposure to dust, moisture, sunlight, damaging chemicals, extreme temperatures, and impact. Storage procedures are as follows:

Clothing:

- Potentially contaminated clothing will be stored in an area separate from street clothing.
- Potentially contaminated clothing will be stored in a well-ventilated area, with good air flow around each item, if possible.
- Different types and material of clothing and gloves will be stored separately to prevent issuing the wrong material by mistake.
- Protective clothing will be folded or hung in accordance with manufacturer's recommendations.

Respirators:

- Air-purifying respirators should be dismantled, washed, and placed in sealed plastic bags.

TABLE 7.4.1
PPE INSPECTION CHECKLIST

CLOTHING

Before use:

- Determine that the clothing material is correct for the specified task at hand.
- Visually inspect for:
  - imperfect seams
  - non-uniform coatings
  - tears
  - malfunctioning closures
- Hold up to light and check for pinholes.
- Flex product:
  - Observe for cracks
  - Observe for other signs of shelf deterioration
- If the product has been used previously, inspect inside and out for signs of chemical attack:
  - discoloration
  - swelling
  - stiffness

During the work task, periodically inspect for:

- Evidence of chemical attack such as discoloration, swelling, stiffening, and softening. Keep in mind, however, that chemical permeation can occur without any visible effects.
- Closure failure
- Tears
- Punctures
- Seam discontinuities

TABLE 7.4.1 - CONTINUED
PPE INSPECTION CHECKLIST

GLOVES

Before use:

- Pressurize glove to check for pinholes. Either blow into glove, then roll gauntlet toward fingers or inflate glove and hold under water. In either case, no air should escape.

AIR-PURIFYING RESPIRATORS

- Inspect air-purifying respirators:
  - before each use to be sure they have been adequately cleaned
- Check material conditions for:
  - signs of pliability
  - signs of deterioration
  - signs of distortion
- Examine cartridges to ensure that:
  - they are the proper type for the intended use
  - the expiration date has not been passed
  - they have not been opened or used previously
- Check faceshields and lenses for:
  - cracks
  - crazing
  - fogginess
- Air purifying respirators will be stored individually in resealable plastic bags.

7.6 Maintenance

Specialized maintenance will be performed only by the factory or an authorized repair person. Routine maintenance, such as cleaning, will be performed by the personnel to whom the equipment is assigned. Respirators will be cleaned at the end of each day with alcohol pads or, preferably, by washing with warm soapy water.

7.7 Decontamination Methods

All personnel, clothing, equipment, and samples leaving the contaminated (work zone) area of the Site must be decontaminated to remove any harmful chemicals or infectious organisms that may have adhered to them. Decontamination methods either (1) physically remove contaminants (2) inactivate contaminants by chemical detoxification or disinfection/sterilization, or (3) remove contaminants by a combination of both physical and chemical means. In many cases, gross contamination can be removed by physical means involving dislodging/displacement, rinsing, wiping off, and evaporation. Contaminants that can be removed by physical means include dust, vapors, and volatile liquids. All reusable equipment will be decontaminated by rinsing in a bath of detergent and water (respirators, gloves to be reused). Monitoring equipment will be decontaminated by wiping with paper towels and water.

The effectiveness of the decontamination will be evaluated near the beginning of Site activities and will be modified if determined to be ineffective. Visual observation will be used for this purpose. The HSO will inspect decontaminated materials for discoloration, stains, corrosive effects, visible dirt, or other signs of possible residual contamination.

All disposable PPE will be discarded following use. All used PPE to be discarded will be placed in an appropriate receptacle for disposal.

SECTION 8.0
DECONTAMINATION PROCEDURES FOR SAMPLING AND EXCAVATION EQUIPMENT

All non-dedicated sampling equipment shall be decontaminated prior to, and following, use at each sampling location. Decontamination procedures shall consist of the following:

1. Scrub equipment in a bath of low-phosphate detergent and potable water.
2. Potable water rinse.
3. Methanol followed by hexane rinse.
4. Distilled water rinse, air dry.
5. Aluminum foil wrap, shiny side out, for transport.

Personal protective equipment decontamination has been discussed in Subsection 7.7.

All excavation equipment and other equipment which has contacted Site soil or groundwater will be decontaminated prior to leaving the Site. Decontamination of this equipment will consist of physically removing adhering soil using hand tools followed by rinsing the equipment with potable water. Decontamination will be performed in the immediate vicinity of the soil excavation area so that the removed soil and rinseate will be discharged in the area undergoing remediation.

SECTION 9.0
CALIBRATION PROCEDURES, FREQUENCIES, AND MAINTENANCE

This section will present the calibration procedures, frequencies, and maintenance for the health and safety field monitoring instruments. The use of the monitoring equipment is presented as follows (the manufacturer's owner's manuals for all equipment used will be present at the Site):

1. Photovac MicroTIP - this instrument is a photoionization detector (PID) that measures the concentration of airborne ionizable gases and vapors. The MicroTIP does not distinguish between individual compounds and will not read methane. The calibration will be performed using ambient air to "zero" the instrument and a 95 ppm cylinder of isobutylene to calibrate the span. The calibration will be performed as follows:

1. Connect the supplied regulator to the Span Gas cylinder. Hand-tighten the fittings.
2. Open the valve on the gas bag by turning the valve stem fully counter clockwise.
3. Attach the gas bag adapter nut to the regulator. Hand-tighten the fittings.
4. Turn the regulator knob counter clockwise about half turn to start the flow of gas.
5. Fill the gas bag about half full and then close the regulator fully clockwise to turn off the flow of gas.
6. Disconnect the bag from the adapter and empty it. Flush the bag a few times with the Span Gas and then fill it.
7. Close the gas bag by turning the valve clockwise.
8. Press SETUP and select the desired Cal Memory with arrow keys and press ENTER. Press EXIT to leave Setup.
9. Press CAL and expose MicroTIP to ambient air. Press ENTER and MicroTIP sets its zero point.

10. MicroTIP then asks for the Span Gas concentration. Enter the Known Span Gas concentration and then connect the Span Gas bag adapter to the inlet.

11. Press ENTER and MicroTIP sets its sensitivity.

12. When MicroTIP's display reverts to normal, MicroTIP is calibrated and ready for use. Remove the Span Gas bag from the inlet.

The instrument will be calibrated prior to the commencement of each day's work. The instrument will be charged overnight prior to each day's work.

SECTION 10.0
EMERGENCY RESPONSE PLAN

This section will present the Emergency Response Plan (ERP) for the Site. Pre-emergency planning will consist of reviewing the ERP with all workers at the Site prior to initiation of work.

Personnel Roles

It is anticipated that during system installation activities at the Site, in general, several persons will be on the Site: the HSO and contractors. Should an emergency situation arise at the Site, the HSO will assume control and decision-making. The HSO will also resolve all disputes concerning health and safety requirements and precautions. The HSO will also:

- Be authorized to seek and purchase supplies as necessary.
- Have control over activities of everyone entering the Site.

The HSO will communicate, by field telephone or other, with off-Site personnel to include the Project Manager to evaluate data and assist in the decision-making process. Phone numbers for the fire department, police, ambulance, poison control center, Nassau County Department of Health Services, NYS Department of Environmental Conservation Spill Response Department, are listed in Table 1.2.1 of this document. The hospital which will be utilized during an emergency will be Nassau County Medical Center. The directions to the hospital, along with the hospital's emergency room phone number are presented in Table 1.2.1. Copies of Table 1.2.1 will be available at the Site and will be placed in all vehicles of personnel involved in activities at the Site.

Internal communications will consist of a single whistle (or compressed air horn if Level C is donned) blast. This blast will signal all workers to evacuate the work zone by the nearest exit.

Response Follow-Up

Following an emergency, or incident, a detailed report will be generated by the HSO. All equipment will be restored to pre-emergency conditions. The HASP will be reviewed following an emergency to determine if it provides adequate information to assist in dealing with the emergency. The HASP may be revised to incorporate additional information as needed.

Emergency Recognition and Prevention

Before daily work assignments begin, each day a brief on-Site meeting will be held by the HSO which will address health and safety issues related to the day's work. Prior to initiation of work, a detailed on-Site health and safety meeting will be held to review all potential hazards, contingencies, and safety measures.

Safe Distances and Places of Refuge

The main potential cause of work zone evacuation is a significant vapor release. Vapor release evacuation will be discussed prior to subsurface activities at the Site and in general will be in the upwind direction. Wind direction will be monitored at each work location and all workers will be notified of the direction of evacuation prior to commencement of work. Safe distances will be discussed at each location and determined by the HSO. The PID will be used to determine if workers have evacuated a sufficient distance.

At all times, vehicles which may be utilized in an emergency for transport to the hospital (or other destination) will have clear access to leave the Site. The HSO will assure that an emergency vehicle does not become blocked-in by other vehicles.

Site Security and Control

The HSO will control entry of personnel into the work zone. No unnecessary persons shall be permitted in the work zone.

Decontamination Procedures During Emergencies

In the event of a medical emergency, decontamination will be performed if it does not interfere with essential treatment. Decontamination will be performed by washing, rinsing, and/or cutting off protective clothing and equipment.

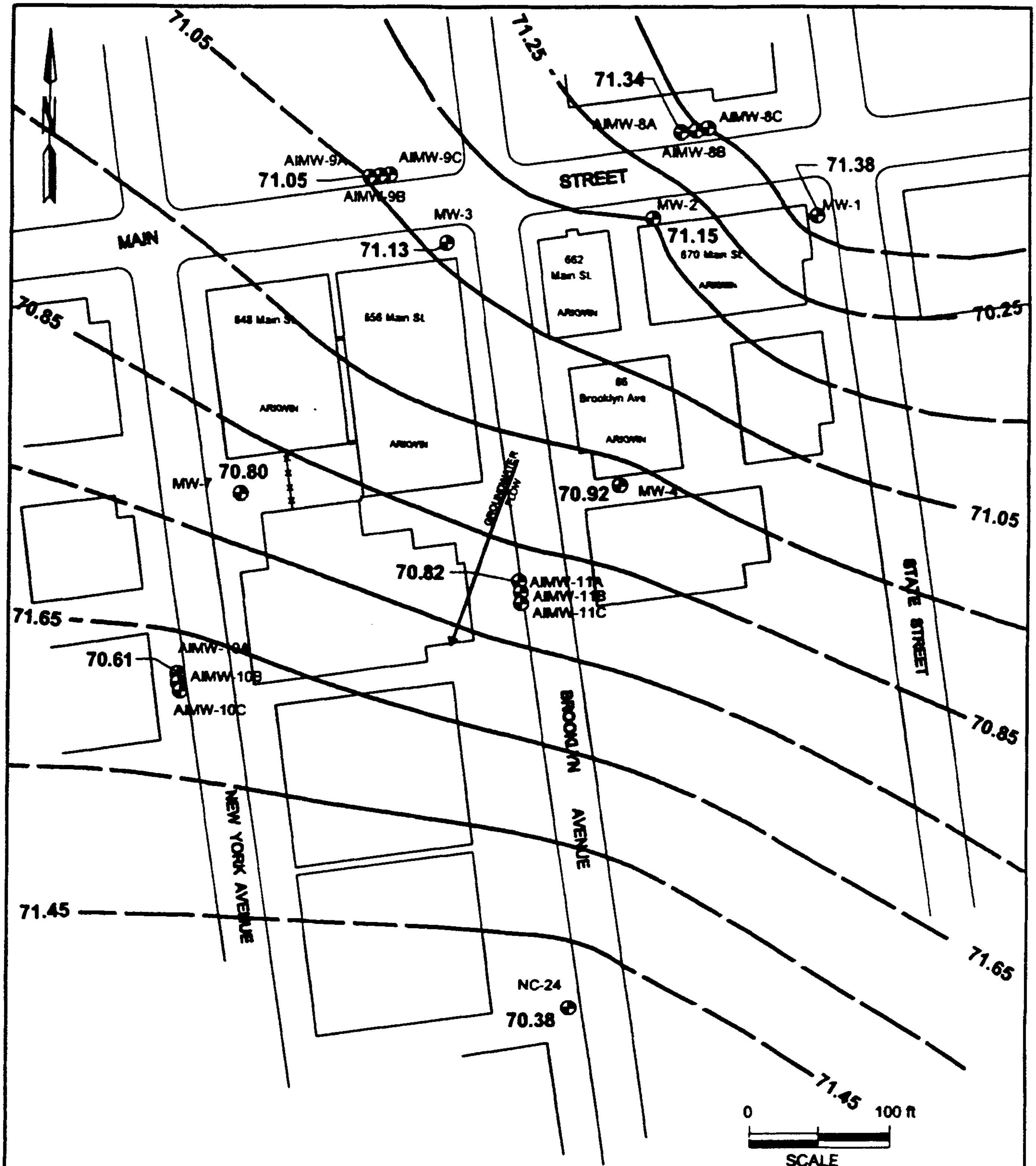
If decontamination cannot be performed, the victim will be wrapped in plastic to reduce contamination to other personnel. Emergency and off-Site medical personnel will be alerted to the potential contamination.

Emergency Medical Treatment and First Aid

Medical emergencies will be treated, in general, by medical experts by transporting the victim to the nearby hospital. A first aid kit will be present on Site for minor medical treatment.

APPENDIX B

SITE-SPECIFIC GROUNDWATER FLOW DIRECTION



Legend

⊕ Monitoring well location

Groundwater contour interval = 0.10 ft

Dashed contour lines are inferred

\Arkwin GW contours.dsf

Figure 4-2

Shallow Groundwater Contours

ARKWIN INDUSTRIES RI/FS
NEW CASSEL INDUSTRIAL AREA
NYSDEC I.D. No. 130043D

LAWLER, MATUSKY & SKELLY ENGINEERS LLP
Pearl River, New York

APPENDIX C

WELL INFORMATION

LMS Water Level Data

WELL ID	Total Depth (ft)	Water Level (ft) 10/19	Water Level (ft) 10/22
AIMW-08a	69.4	52.99	52.74
AIMW-08b	90.1	52.77	52.92
AIMW-08c	146.6	52.98	53.09
AIMW-09a	62.7	52.85	52.99
AIMW-09b	89.61	52.98	53.09
AIMW-09c	149.5	53.05	53.07
AIMW-10a	62.2	-	51.16
AIMW-10b	90	50.95	50.95
AIMW-10c	143	50.82	50.95
AIMW-11a	63	52.05	52.08
AIMW-11b	89	51.78	51.75
AIMW-11c	142.5	51.63	51.83
MW-1	60.95	-	52.59
MW-2	62.3	53.42	53.51
MW-3	61.3	53.10	53.16
MW-4	62.5	52.82	52.86
MW-7	61.5	52.47	52.51
NC-24	63.3	-	49.49

APPENDIX D

OCTOBER 1998 GROUNDWATER DATA

FPM

TABLE 5-3

GROUNDWATER PROBE DATA SUMMARY (OCTOBER 1998)

Arkwin

PARAMETER	AIGPW-1 (57-58 ft)	AIGPW-1 (67-68 ft)	AIGPW-1 (76-77 ft)	AIGPW-2 (57-58 ft)	AIGPW-2 (67-68 ft)	AIGPW-2 (79-80 ft)	AIGPW-3 (57-58 ft)	AIGPW-3 (67-68 ft)	AIGPW-3 (79-80 ft)	NYSDEC CLASS GA STANDARDS (@)
VOLATILE ORGANICS (µg/l)										
Acetone	ND	ND	ND	ND	240 d b	ND	ND	ND	ND	50
1,1-Dichloroethylene	ND	ND	ND	ND	ND	3 j	2 j	4 j	ND	5
1,1-Dichloroethane	ND	ND	ND	ND	ND	3 j	3 j	4 j	5 j	5
2-Butanone	96	11	12	51	63	57	7 j	ND	5 j	50
1,1,1-Trichloroethane	2 j	4 j	5 j	ND	2 j	8 j	5 j	9 j	3 j	5
Benzene	3 j	1 j	ND	ND	2 j	2 j	ND	ND	ND	0.7
2-Hexanone	12	ND	ND	6 j	9 j	9 j	ND	ND	ND	50
Tetrachloroethylene	ND	ND	ND	ND	ND	ND	5 j	3 j	ND	5
Toluene	2 j	ND	ND	ND	ND	ND	ND	ND	ND	5

@ - NYSDEC Division Technical and Operational Guidance Series (1.1.1), Ambient Work Quality Standards and Guidance Values, June 1998.

b - Found in associated blanks.

j - Estimated concentration; compound present below quantitation limit.

ND - Not detected at analytical detection limit.

TABLE 5-4 (1 of 3)

MONITORING WELL DATA

Arkwin

PARAMETER	AIMW-8A	AIMW-8B	AIMW-8C	AIMW-9A	AIMW-9B	AIMW-9C	NYSDEC CLASS GA STANDARDS(a)
VOLATILE ORGANICS (µg/l)							
Chloroethane	ND	ND	ND	ND	ND	ND	5
1,1-Dichloroethylene	ND	ND	21	ND	20	ND	5
1,1-Dichloroethane	1 j	ND	9 j	ND	8 j	ND	5
1,2-Dichloroethylene (total)	3 j	ND	ND	ND	ND	ND	N/A
Chloroform	ND	ND	ND	ND	ND	ND	7
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	0.6
1,1,1-Trichloroethane	4 j	1 j	21	2 j	[redacted]	ND	5
Trichloroethylene	39	5 j	ND	ND	ND	ND	5
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	5
Tetrachloroethylene	ND	ND	29	ND	3 j	ND	5
Benzene	ND	ND	ND	ND	ND	ND	0.7
Xylene (total)	ND	ND	ND	4 j	ND	ND	5

(a) - NYSDEC Division of Water Technical and Operational Guidance Series (1.1.1) June 1998.
b - Found in associated blanks.
d - Concentration recovered from diluted sample.
g - Estimated based on validator review; see Appendix
j - Estimated concentration; compound present below quantitation limit.
ND - Not detected at analytical detection limit.

TABLE 5-4 (2 of 3)

MONITORING WELL DATA
Arkwin

PARAMETER	AIMW-10A	AIMW-10B	AIMW-10C	AIMW-11A	AIMW-11B	AIMW-11C	NYSDEC CLASS GA STANDARDS(a)
VOLATILE ORGANICS (µg/l)							
Chloroethane	ND	ND	ND	ND	ND	ND	5
1,1-Dichloroethylene	32 d j	3 j	ND	27	5 j	ND	5
1,1-Dichloroethane	59 d	ND	ND	12	4 j	ND	5
1,2-Dichloroethylene (total)	5 j	ND	ND	ND	ND	ND	N/A
Chloroform	ND	ND	ND	ND	ND	ND	7
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	0.6
1,1,1-Trichloroethane	ND g	ND	6 j	[redacted]	17	5 j	5
Trichloroethylene	7 j	ND	ND	17	6 j	ND	5
Tetrachloroethylene	14	ND	ND	57	3 j	ND	5
Benzene	ND	ND	3 j	ND	ND	ND	0.7
Xylene (total)	ND	ND	ND	ND	ND	ND	5

(a) - NYSDEC Division of Water Technical and Operational Guidance Series (1.1.1) June 1998.
b - Found in associated blanks.
d - Concentration recovered from diluted sample.
j - Estimated concentration; compound present below quantitation limit.
ND - Not detected at analytical detection limit.

TABLE 5-4 (3 of 3)

MONITORING WELL DATA
Arkwin

PARAMETER	MW-1	MW-2	MW-3	MW-4	MW-7	MW-8 MW-4 blind duplicate	NC-24	NYSDEC CLASS GA STANDARDS(a)
VOLATILE ORGANICS (µg/l)								
Chloroethane	ND	ND	ND	ND	ND	ND	60	5
1,1-Dichloroethylene	2 j	8 j	ND	20	54 g	47	940 d	5
1,1-Dichloroethane	ND	3 j	ND	12	180 d	180 d	1800 d	5
1,2-Dichloroethylene (total)	ND	9 j	ND	13	7 j	7 j	5 j	N/A
Chloroform	ND	ND	ND	ND	2 j	2 j b	3 j b	7
1,2-Dichloroethane	ND	2 j	ND	ND	ND	ND	15	0.6
1,1,1-Trichloroethane	7 j	6 j	ND	200 d	560 d	580 d	22000 d	5
Trichloroethylene	ND	120	ND	24	16	15	4 j	5
Tetrachloroethylene	ND	ND	ND	120	45	40	11	5
1,1,2-Trichloroethane	ND	ND	ND	ND	2 j	3 j	ND	5
Benzene	ND	ND	ND	ND	ND	ND	ND	0.7
Xylene (total)	ND	ND	ND	ND	ND	ND	ND	5

(a) - NYSDEC Division of Water Technical and Operational Guidance Series (1.1.1) June 1998.
b - Found in associated blanks.
d - Concentration recovered from diluted sample.
g - Value estimated based on validator review; see Appendix
j - Estimated concentration; compound present below quantitation limit.
ND - Not detected at analytical detection limit.