Volatile Organic Compounds in the Soil Vapors and Groundwater at the Pollution Abatement Services Site, Oswego, New York

Final Report

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EXECUTIVE SUMMARY

Soil vapor and groundwater samples were taken at the Pollution Abatement Services site between October 18 and October 20, 1988, in order to characterize the contamination outside the existing slurry wall. Chemical analyses of the groundwater indicate that the two most highly contaminated wells are SWW4 (total organics = 649.9 ppb) and SWW6 (total organics = 7549.8 ppb). No volatile organic compounds were found in the three wells located upgradient from the site (SWW1, MW11A, and MW11B). Soil vapor transects were set up along the outside perimeter of the slurry wall. The values for total organics were uniformly low along the eastern, southern, and western perimeters. The values were higher and more variable along the northern perimeter. Three conceptual models were developed to explain the observed contaminant distribution. Model A describes the contaminant distribution pattern that would form if the slurry wall did not fully encompass the contaminated source area when it was installed. Model B describes the contaminant distribution pattern that would form if the wall did originally encompass the contaminated source area, but was breached sometime later either by contaminants flowing under the slurry wall or through ruptures in the wall. Model C describes the contaminant distribution pattern for a combination of Models A and B. This model provides the best fit for the observed soil vapor and groundwater geochemistry. Therefore, the most likely explanation for the observed distribution pattern is that the wall did not fully encompass the contaminated source area when it was installed and that the wall was later breached along the northern perimeter.

TABLE OF CONTENTS

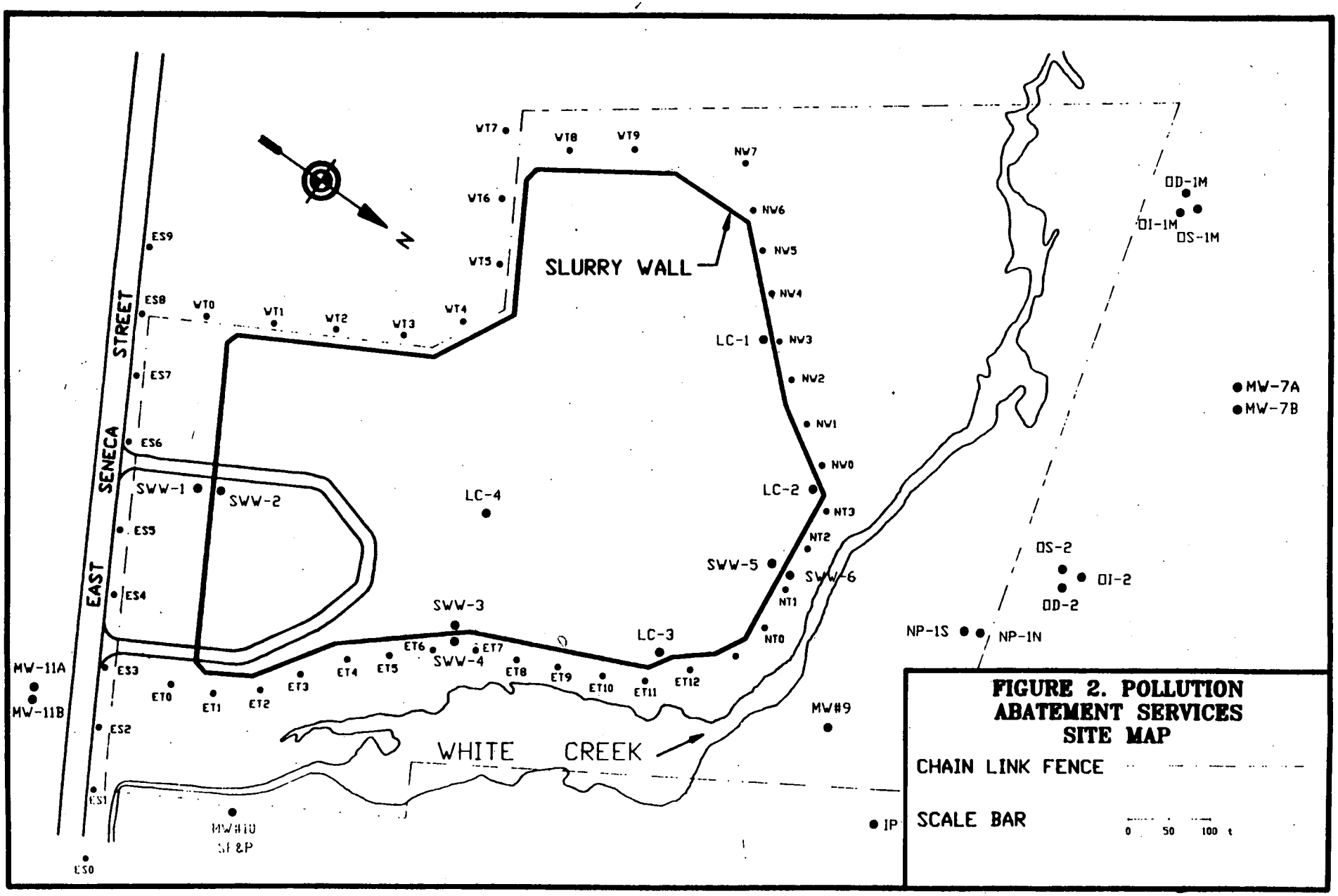
eh:rd/TYSON/PR-1202

LIST OF TABLES

eh:rd/TYSON/PR-1202

LIST OF FIGURES

eh:rd/TYSON/PR-1202


SLURRY WALL
EAST SENECA STREET
WHITE CREEK
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VT7
VT8
VT9
NW7
VT6
NW6
VT5
NW5
NW4
VT0
VT1
VT2
VT3
VT4
LC-1
NW3
NW2
NW1
NW0
LC-2
NT3
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LC-3
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SWW-1
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ET10
ET11
ET12
MW-11A
MW-11B
MW#10
SF&P
MW#9
IP
OD-1M
OI-1M
OS-1M
MW-7A
MW-7B
OS-2
OI-2
OD-2
NP-1S
NP-1N
FIGURE 2. POLLUTION ABATEMENT SERVICES SITE MAP
CHAIN LINK FENCE
SCALE BAR
0 50 100 ft

1.0 INTRODUCTION

1.1 Site Background

The Pollution Abatement Services (PAS) NPL site is located in Oswego County, New York, just east of the town of Oswego (see Figure 1). The most dominant hydrogeologic feature in the area is Lake Ontario, which lies due north of the site. PAS was operated as a disposal and treatment facility from 1970 to 1977. Leakage from drums and storage tanks resulted in the initiation of several removal and remedial activities. The drums and tanks were removed and a perimeter slurry wall was constructed to contain the groundwater contamination (U.S. EPA/OWPE, 1987). A clay cap was laid down over the area within the slurry wall and a groundwater recovery and leachate collection system was installed. Several suites of monitoring wells were completed around the site to test the integrity of the slurry wall and to monitor any off-site contaminant migration.

Prior to the involvement of the Environmental Response Team (ERT), a preliminary investigation was conducted by Versar, Inc. (U.S. EPA/OWPE, 1987). That report contains a description of the monitoring well nomenclature, monitoring well locations, and the surface casing conditions. There are some discrepancies between the monitoring well nomenclature used by U.S. EPA/OWPE (1987) and the nomenclature of the site map provided to the ERT by New York Department of Environmental Conservation (N.Y. DEC). For this report, the nomenclature of the N.Y. DEC map will be used. Figure 2 is a detailed site map, based on the N.Y. DEC map showing the location of the various monitoring wells, the soil vapor sample stations for the current study, and the configuration of the slurry wall. U.S. EPA/OWPE (1987) found significant concentrations of volatile organic compounds (VOCs) and semivolatile compounds in wells SWW4 and SWW6. High concentrations of iron, magnesium, and manganese were found in all the wells. Levels of chromium in excess of the U.S. EPA guidelines were found in wells MW3 (northwest corner of site, not shown on Figure 2), MW9, SWW4, SWW6, and 01-1M. Arsenic was found in MW3, SWW4, and SWW6 and cyanide was found in well IP. Thus, there was apparently some spread of contamination north of the contained area in the vicinity of wells SWW4 and SWW6. However, no information concerning the subsurface condition of the wells and their suitability for sampling was available for that study.

In January of 1988, the Response Engineering and Analytical Contract (REAC) Geotechnical Group, under the authority of the ERT, conducted a detailed subsurface investigation of the site using a borehole camera apparatus (U.S. EPA/REAC, 1988). The investigation yielded the observations shown in Table 1. As shown in the table, the slurry wall monitoring wells (SWW1, 3, 4 and 6) are all in relatively good condition, with the exception of SWW3 which is in need of some flushing. All of these wells are in acceptable condition for sampling. Wells MW11A and MW11B, on the other hand, are both in very poor condition and of dubious reliability as monitoring wells.

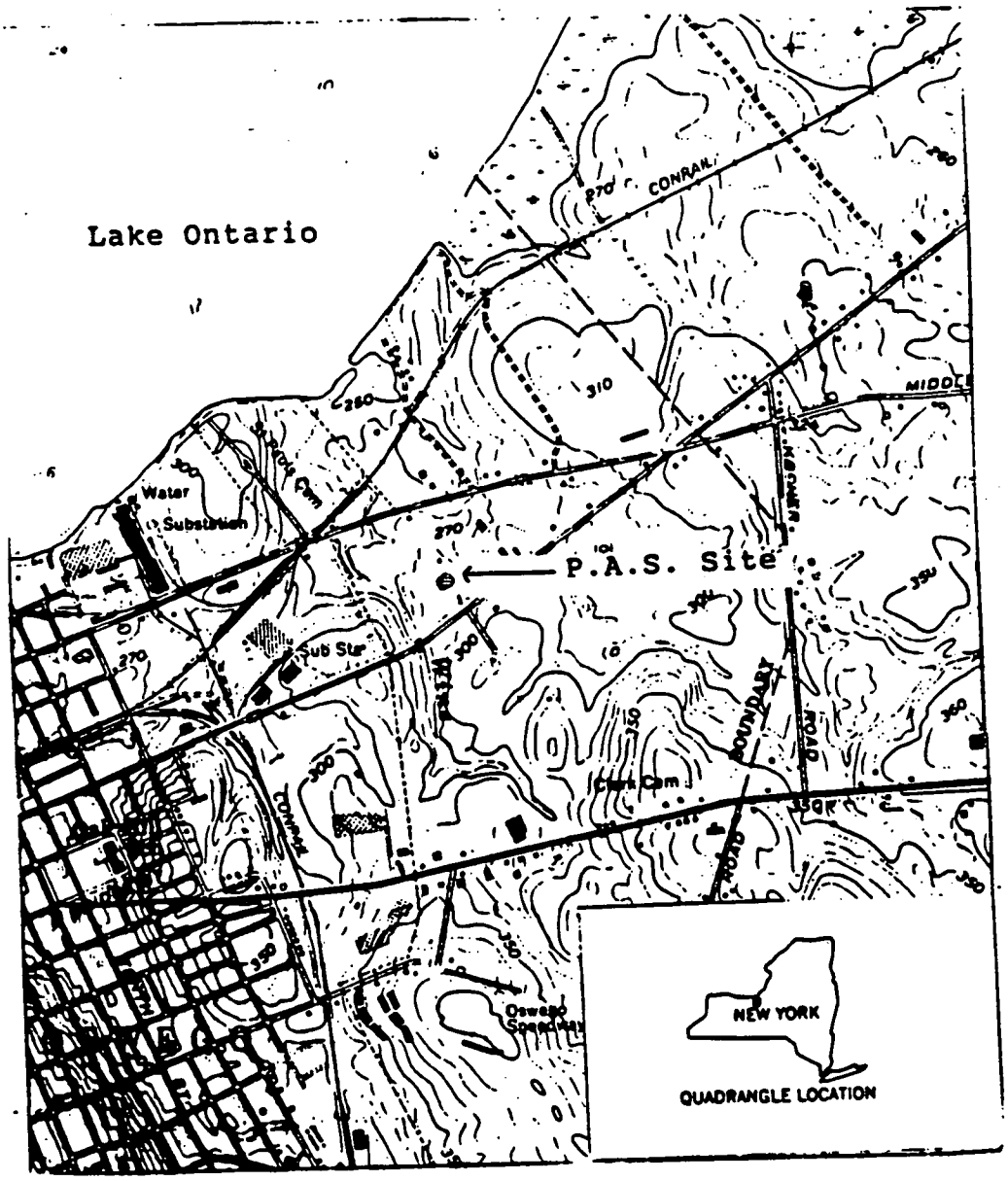

Figure 1. General Location Map
Pollution Abatement Services

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TABLE 1. SUMMARY OF WELL CONDITIONS

Well #	Condition	Diameter (in)	Depth (ft)	Screen (ft)	Chemistry Totals VOC (ug/l)	BNA (ug/l)	Water Level Elevations (ft)	Flow Velocity (ft/day)
SWW1	Clean Well	3	19.7	9.2-19.7	--	--	278.1	0.381
SWW3	Needs Flushing	3	19.6	10.6-19.6	--	--	266.5	--
SWW4	Clean Screen Good Condition	3	25.4	15.4-25.4	391.7	23.8	266.4	*
SWW6	Clean Screen Good Condition	3	17.0	7.3-17.0	2973.9	1310.0	264.0	0.013
MW11A	Corroded - Needs Flushing	3	10.8	6.8-10.8	172.4	0.0	282.3	***
MW11B	Kinked, Rusty Cracked, Scale	3	41.3	Open Hole 31.4-41.3	386.3	0.0	272.5	*

- No Data Collected

* Data impaired due to cold weather

** No close topographic control

*** Bad results due to poor well conditions

The objective of the sampling for U.S. EPA/REAC (1988) was to qualitatively characterize the water in the borehole (not the aquifer) in order to assess the risk of possible damage to the borehole camera and determine levels of protection for the field personnel. Purging the wells prior to sampling was therefore unnecessary. The chemical results listed in Table 1 should only be considered representative of the water within the boundaries of the well, they are not representative of the groundwater in the overburden aquifer. U.S. EPA/REAC (1988) found that the most highly contaminated well was SWW6 (2973.9 ppb total VOCs), followed by SWW4, MW11B, and MW11A. Only the wells located outside the slurry wall were of interest, so no analyses were obtained for wells SWW1 and SWW3.

1.2 Objectives of this Study

There are three main objectives in the current study; (1) characterize the contamination in the overburden aquifer in the area immediately outside the slurry wall, (2) characterize the integrity of the slurry wall, and (3) determine the location of any breaches[1] in the slurry wall. In order to accomplish these objectives, a soil vapor and groundwater sampling plan was devised (see Appendix A). Under these plans, selected wells located immediately outside the slurry wall, and one well located inside the slurry wall, would be sampled. Soil vapor sampling transects would be set up parallel to, and just outside, the wall (see Figure 2). The analyses of the groundwater samples would be used to generally characterize the chemistry of the groundwater outside the slurry wall and the analyses of the soil vapor samples would be used to locate any breaches of the wall.

2.0 METHODOLOGY

2.1 Groundwater Sampling and Analysis

2.1.1 Well Purging

All of the wells were purged according to ERT/REAC SOP 2152 - Monitor Well Sampling. One-inch diameter Teflon bailers were used to purge wells SWW3, SWW4, and MW11A. Three-inch diameter Trico submersible pumps were used to purge wells SWW1, SWW6, and MW11B. All of the effluent

[1] It should be noted that the exact route of contaminant escape is unknown. Two primary routes are suspected; between the bottom of the wall and the top of the bedrock, and through ruptures in the wall itself. Throughout this report any reference to the term "breach" should be considered to represent either one or both of these routes.

was discharged into 55-gallon steel drums and later placed into the onsite leachate collection pit. Three complete well volumes were purged from each well. All purge data is shown in Appendix C. To avoid cross contamination between wells, all purge equipment was dedicated to each well. The equipment was decontaminated at the end of field activities using a sequence of detergent scrub, distilled water rinse, methanol rinse, and air dry. All of the bailers were wrapped in aluminum foil prior to leaving the site.

2.1.2 VOC Groundwater Sampling

All of the wells were sampled according to ERT/REAC SOP 2155 - Sampling for Volatile Organics in Groundwater. One-inch diameter bailers with stop-cocks were used. The bailers were fully cleaned and properly wrapped in aluminum foil prior to shipment to the site. The sample bailers were dedicated to each well to avoid cross contamination. Four 40 ml vials were filled from each well. For QA/QC purposes, one set of duplicate and one set of matrix spike samples was taken. All of the samples were immediately preserved on ice. The VOC samples and the associated trip blanks were shipped back to the REAC laboratory on October 20, 1988.

2.1.3 Analysis

A modified 524.2 method for the analysis of VOC's in water and soil with a gas chromatograph/mass spectrometer (GC/MS) system was used. Details of the analytical procedures and conditions can be found in Appendix E.

2.2 Soil Vapor Sampling and Analysis

2.2.1 Sampling

Soil vapor samples were taken according to ERT/REAC SOP #2149, Soil Gas Survey Procedures. A complete description of the soil vapor sampling activities and results are contained in U.S. EPA/TAT (1988) (see Appendix D). The following is a synopsis of the soil vapor sampling methodology taken directly from that memorandum.

A weight-driven 3/8" steel bar was driven into the ground to a depth of four to five feet to create the soil gas "well." A 5-foot length of 1/4" stainless steel tubing was then inserted into the hole.

Modeling clay was packed around the surface of the hole to prevent intrusion of ambient air and a piece of stiff wire was used to clear the sampling probe of lodged soil particles.

A Gilian pump calibrated to approximately 3 liters/minute was attached to the probe with Tygon tubing and the hole was evacuated for about 15 seconds.

2.2.2 Analysis

The HNU photoionizer was used to measure organic soil vapors at a depth of four to five feet below the surface. The detection of organic vapors utilizing this method does not yield an actual concentration, but does provide a relative measurement of volatile organic compounds when compared to background readings or measurements taken at other sampling locations.

The HNU photoionizer was calibrated using isobutylene as a benzene equivalent, and consequently all readings should be considered total organics as isobutylene.

The HNU detection method is utilized as a quick screening tool. 1-liter Tedlar sampling bags are used to collect actual soil vapor samples, which undergo field gas chromatograph (GC) analysis.

Sampling soil vapor using the Tedlar bags is accomplished in the following manner. The Tedlar bag is placed inside a vacuum dessicator and connected to the sampling probe via a Teflon tubing sampling train. A Gilian pump is used to evacuate the dessicator, thus filling the Tedlar sampling bag with soil vapors drawn from the four to five-foot depth.

The samples contained within the Tedlar bags were analyzed as soon as possible (within 24-48 hours) using Photovac and Sentex field GCs.

The Photovac GC was equipped with a photoionization detector using a 10.6 eV lamp. Standards consisting of common aromatic and chlorinated volatile organic compounds were utilized. The standards used included benzene, toluene, xylenes, TCE, and PCE. Compounds with retention times that matched components of the standard were tentatively identified and quantified against the response area for these components. Unknown compounds were quantified by using the area response of toluene. The method detection limit for the standard compounds is 20 parts per billion.

The Sentex Scentograph GC unit was used to detect two additional compounds of interest in this soil gas survey: 1,1-dichloroethane and bromodichloromethane. The method detection limit for these compounds was 10 ppb.

To further define a broader range of compounds and to confirm those compounds already identified by the field GCs, selected Tedlar bag samples were drawn onto Tenax sorbent tubes to be analyzed by GC/MS. These tubes were desorbed and analyzed for specific ions using the GC/MS at the REAC lab facilities in Edison, New Jersey.

NOTE: Due to an electrical interference originating in the on-site trailer where the field GC analyses were to have been performed by both Photovac and Sentex GCs, the sample bags were transported to the REAC facilities in Edison, NJ, where the GC analysis consequently occurred. As a result of this problem, many of the soil gas samples were analyzed more than 48 hours after sampling took place. The net effect that this is expected to have on the data is a potential lowering of the total organic compound (TOC) concentrations.

2.3 Soil Gas Survey Description

Each sampling transect was named for its location around the periphery: ES, transect parallel to East Seneca Street running NE to SW; WT, west transect along the western periphery; NW, transect running along the north west boundary; NT, north transect outside the portion of the slurry wall due north of the site; and ET, east transect along the eastern boundary of the site. All transects had sample locations spaced at 50-foot intervals, except the ES and WT transects, where sample stations were 75 feet apart.

All samples were obtained at a depth of 4 to 5 feet, except NW1, NW5, NW6, which were sampled at 2 to 2.5 feet due to the shallow water table conditions at these locations, and ET1 DEEP, which was sampled at a depth of approximately seven feet.

Two ambient air samples, ETO AMB and TOC AMB were collected and analyzed, as were three field blanks (Tedlar bags filled with ultra-zero air and carried in the field throughout each sampling day), and two bag check QA/QC samples (Tedlar bags filled with ultra-zero air and analyzed to determine cleanliness of the sample bag lot before sampling occurs).

3.0 RESULTS

3.1 Groundwater Geochemistry

3.1.1 Analytical Results

The results of the VOC analyses are contained in Appendix E. Table 2 is a summary of those results. Duplicate samples were taken on well MW11A. The results were identical in both the sample and the duplicate. A trip blank was also shipped with the samples on the return trip. Minor amounts of toluene, P&M xylene, and O-xylene were found in the blank (see Table 2). The amounts detected in the trip blanks do not seriously affect the validity of any conclusions based on the sample analytical results.

Matrix spike and matrix spike duplicate samples were taken at MW11A. As shown in Appendix E, all spike recoveries and relative percent difference values were within QC limits.

3.1.2 Contaminant Distribution

Wells SWW4 and SWW6 are the most highly contaminated wells at the site (TOC for SWW4 = 649.9 ppb and TOC for SWW6 = 7549.8 ppb). This coincides with the results of U.S. EPA/REAC (1988) and U.S. EPA/OWPE (1987). For comparison, one well located inside the wall, SWW3 (see Figure 2), was sampled. When the results from well SWW3 are compared to those of SWW4, it can be shown that the value for TOC is greater outside the slurry wall. By far the most significant contributor to this difference in concentrations is toluene. The concentration of toluene in SWW3 is 3.2 ppb and that for SWW4 is 91 ppb.

3.1.3 Contaminant Characterization

Table 3 is a listing of the relative percentage of each VOC found in wells SWW4 and SWW6. The most prominent compounds in SWW4 are ethylbenzene (27.7%), P&M xylene (18.3%), and benzene (18.2%). The most prominent compounds found in SWW6 are toluene (42.3%), P&M xylene (22.1%), ethylbenzene (9.1%), and benzene (9.0%).

TABLE 2. CONCENTRATIONS FOR SELECTED VOLATILE ORGANIC COMPOUNDS LISTED IN MICROGRAMS PER LITER (UG/L)

Compound	SMW1	SMW3	SMW4	SMW6	MW11A	MW11A DUPE	MW11B	Trip Blank
Chloroethane	ND	ND	36.0	231.0	ND	ND	ND	ND
Methylene Chloride	ND	1.6	1.8	8.8	ND	ND	ND	ND
Trans-1,2-Dichloroethane	ND	1.2	1.8	44.0	ND	ND	ND	ND
1,1 Dichloroethane	ND	3.1	2.2	98.0	ND	ND	ND	ND
cis 1,2-Dichloroethene	ND	3.7	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1 Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	ND	61.0	118.0	682.0	ND	ND	ND	ND
1,2-Dichloroethane	ND	1.7	2.5	10.0	ND	ND	ND	ND
Trichloroethene	ND	2.2	ND	3.7	ND	ND	ND	ND
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	3.2	91.0	3192.0	ND	ND	0.4(J)	2.3
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	ND	ND	ND	1.0	ND	ND	ND	ND
Chlorobenzene	ND	75.0	22.0	6.7	ND	ND	ND	ND
Ethylbenzene	ND	245.0	180.0	684.0	ND	ND	0.3(J)	0.8(J)
P&M Xylene	ND	87.0	119.0	1666.0	ND	ND	1.0	2.7
O-Xylene	ND	23.0	45.0	648.0	ND	ND	ND	1.1
Isopropylbenzene	ND	3.9	9.5	9.3	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	0.5(J)	0.9(J)	1.7	ND	ND	ND	ND
1,2,3-Trichloropropane	ND	ND	1.0(J)	2.7	ND	ND	ND	ND
n-Propylbenzene	ND	2.0	1.0	7.8	ND	ND	ND	ND
1,3,5 Trimethylbenzene	ND	6.1	4.3	92.0	ND	ND	ND	ND
1,2,4 Trimethylbenzene	ND	17.0	7.8	104.0	ND	ND	0.2(J)	ND
p-Isopropyltoluene	ND	1.6	2.5	3.5	ND	ND	ND	ND
1,4 Dichlorobenzene	ND	6.6	0.3(J)	2.5	ND	ND	ND	ND
1,2 Dichlorobenzene	ND	ND	1.5	72.0	ND	ND	ND	ND
1,2 Trichlorobenzene	ND	0.5(J)	0.7(J)	1.4	ND	ND	ND	ND
Hexachlorobutadiene	ND	1.2	1.4	3.1	ND	ND	ND	ND
Naphthalene	ND	3.1	1.6	22.0	ND	ND	ND	ND
1,2,3 Trichlorobenzene	ND	0.8	1.0	2.2	ND	ND	ND	ND
TOTAL ORGANIC COMPOUNDS	ND	550.0	650.8	7549.8	ND	ND	ND	6.1

Qualifiers

u - The compound was analyzed for but not detected at the given concentration.

[ ] - An approximate value between the detection limit and the quantification limit.

ND - Non-detect

NA - Not analyzed

(J) - Below the method detection limit

TABLE 3. RELATIVE PERCENTAGES OF VOLATILE ORGANIC COMPOUNDS IN WELLS SWW4 AND SWW6

Compounds	SWW4	SWW6
Chloroethane	5.5	3.1
Methylene Chloride	0.3	0.1
Trans 1,2-Dichloroethene	0.3	0.6
1,1 Dichloroethane	0.3	1.2
cis 1,2-Dichloroethene	ND	ND
Chloroform	ND	ND
1,1,1 Trichloroethane	ND	ND
Benzene	18.2	9.0
1,2 Dichloroethane	0.4	0.1
Trichloroethene	ND	0.0
Bromodichloromethane	ND	ND
Toluene	14.0	42.3
1,1,2-Trichloroethane	ND	ND
Dibromochloromethane	ND	0.0
Chlorobenzene	3.4	0.1
Ethylbenzene	27.7	9.1
P&M Xylene	18.3	22.1
O-Xylene	6.9	8.6
Isopropylbenzene	1.5	0.1
1,1,2,2-Tetrachloroethane	0.1	0.0
1,2,3-Trichloropropane	0.2	0.0
n-Propylbenzene	0.2	0.1
1,3,5 Trimethylbenzene	0.7	1.2
1,2,4 Trimethylbenzene	1.2	1.4
p-Isopropyltoluene	0.4	0.1
1,4 Dichlorobenzene	0.0	0.0
1,2 Dichlorobenzene	0.2	1.0
1,2 Trichlorobenzene	0.1	0.0
Hexachlorobutadiene	0.2	0.0
Naphthalene	0.2	0.3
1,2,3 Trichlorobenzene	0.2	0.0
	100.5	100.5

A value of 0.0 indicates that the relative percentage is less than 0.05.

3.2 Soil Vapor Geochemistry

3.2.1 Analytical Results

The results of analyses done on the bag check samples are shown in Appendix D, Table 1. None of the target compounds were detected in these samples. TOC values for the non-target compounds found in BC-1 and BC-2 are 67 and 207 parts per billion (ppb), respectively.

U.S. EPA/TAT (1988) notes that soil gas results can be affected by the site-specific properties of the unsaturated zone. The variability of these site-specific parameters must be recognized in order to correctly interpret soil vapor survey results. Specifically, the soil properties that affect soil gas surveys are soil porosity, texture, water content, organic matter content, shape and size of soil pores, and depth of the unsaturated zone.

Particularly relevant to the PAS site soil gas survey are soil moisture content, soil texture, and proximity of the water table. The surficial material at PAS is comprised of a mixture of clay, silt, sand, and boulders, which is relatively compact and impermeable. Soils such as these, which are found to have a high clay and moisture content, cause decreased rate of diffusion of soil vapors and can hinder the ability to effectively track a plume of organic contaminants.

Soil gas sampling in close proximity to the water table presents another problem. Along the northern site-boundary, NW and NT transects, the water table was reached at depths of less than three feet at certain locations. Shallow groundwater conditions present a difficulty in soil gas sampling because the chemical concentration gradient in soil gas can be very steep, highly variable, and easily disturbed under these conditions (Marrin, 1988).

3.2.2 Contaminant Distribution

A complete correlation between soil vapor and groundwater geochemistry could not be expected due to site specific variables affecting the soil vapor results, particularly the high water table conditions along the northern perimeter and the variations in porosity and permeability associated with the till. The general trends, however, are comparable. Both the TOC values from the groundwater data and the soil vapor data tend to increase to the north, downgradient from the site.

The soil vapor TOC values are generally higher and feature greater variability along the northern perimeter (see Figure 3). The TOC mean and standard deviation values for each transect are listed in Table 4. The standard deviation for the NT and NW transects are 352 and 1011 ppb, respectively, compared to an average standard deviation of 154 ppb for the other three transects combined. Similarly, the TOC mean values for the NT and NW transects are 429 and 1028 ppb, respectively. The average of the TOC mean values for the three other transects combined is 201 ppb.

3.2.3 Contaminant Characterization

Table 5 shows the relative percentage of the main VOC's in each soil vapor transect. O-xylene/styrene and toluene are ubiquitous in the soil vapors throughout the site (the mean relative percentages are 28 and 27%, respectively). Other significant compounds are benzene (22%), TCE (13%), PCE (9%), and m-xylene (2%).

4.0 DISCUSSION OF RESULTS

Both the groundwater data and the soil vapor data indicate that there is significant contamination outside the slurry wall. Both data sets show that the contaminant concentrations are higher along the northern perimeter. This indicates that the contaminants are following the regional groundwater flow vector which is oriented south to north (U.S. EPA/REAC, 1988).

In order to explain the distribution of contaminants discussed in Section 3.0, hypothetical models A, B, and C shown in Figures 4, 5, and 6, respectively, should be considered.

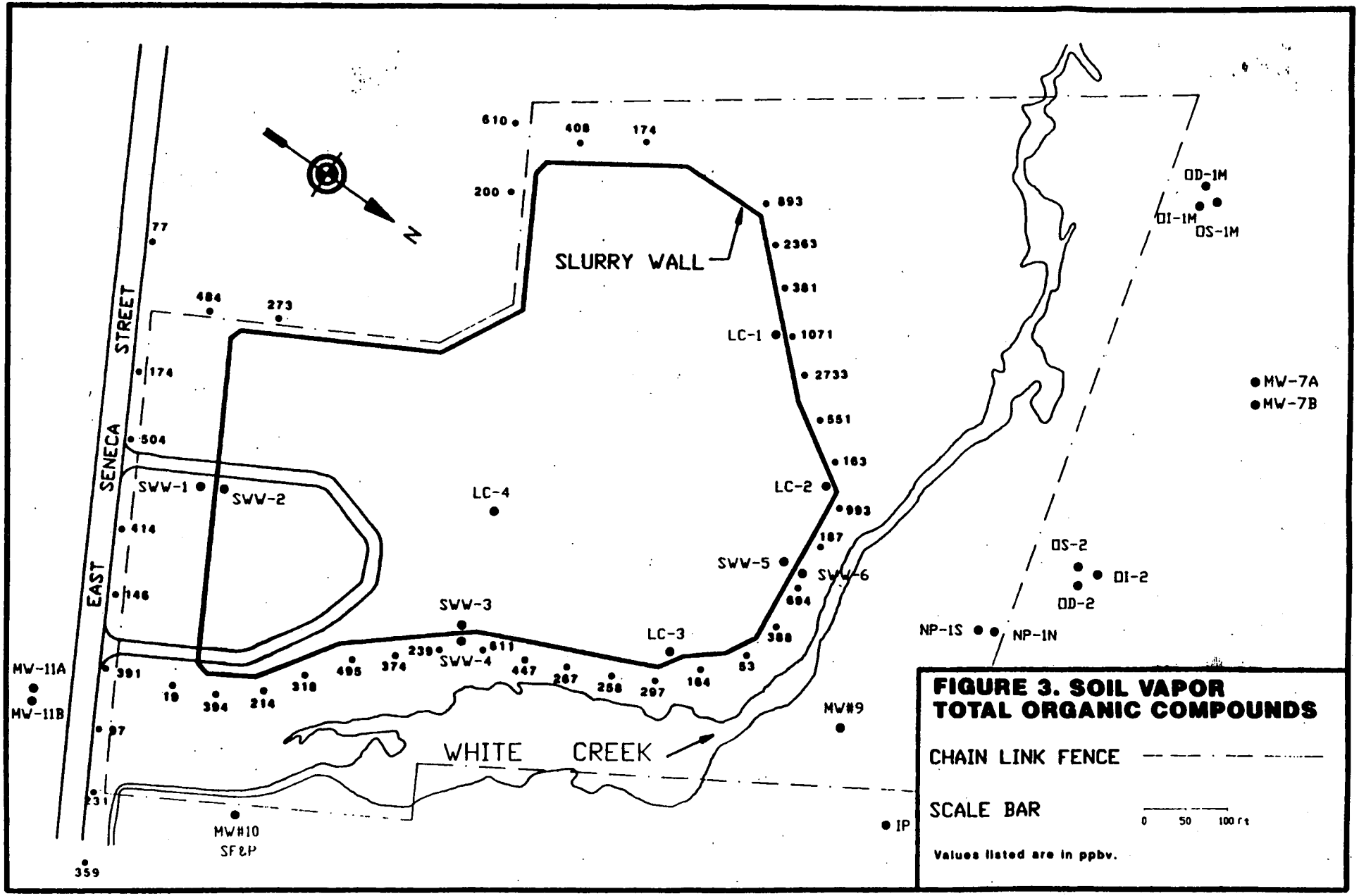
Model A is based on three main assumptions; that the distribution of contaminants within the original plume area was homogeneous, that the slurry wall as originally installed did not fully encompass the plume, and that the slurry wall has remained intact since installation. This would result in a generally uniform distribution of contaminants outside the slurry wall, with a slightly higher concentration developing along the northern perimeter as the regional groundwater flow carried the contaminants downgradient. This model seems to fit the soil vapor and groundwater analytical data at least along the ET, ES, and WT transects.

TABLE 4. TOTAL ORGANIC COMPOUND (TOC) SOIL VAPOR DATA (IN ppb)

Sample No.	Total Organics	Sample No.	Total Organics	Sample No.	Total Organics	Sample No.	Total Organics	Sample No.	Total Organics
ES-00	359	ET-00	19	NT-00	388	NW-00	163	WT-99	484
ES-01	231	ET-01	394	NT-01	694	NW-01	551	WT-01	273
ES-02	97	ET-02	214	NT-02	187	NW-02	2733	WT-06	200
ES-03	391	ET-03	318	NT-03	993	NW-03	1071	WT-07	610
ES-04	146	ET-04	495			NW-04	381	WT-08	408
ES-05	414	ET-05	374			NW-05	2363	WT-09	174
ES-06	504	ET-06	239			NW-06	893		
ES-08	174	ET-07	611						
ES-09	77	ET-08	447						
		ET-09	267						
		ET-10	258						
		ET-11	297						
		ET-12	164						
		ET-13	53						
TOC Mean	266		296		566		1165		358
TOC Standard Deviation	147		143		352		1011		172

TABLE 5. RELATIVE PERCENTAGE OF VOLATILE ORGANIC COMPOUNDS IN EACH SOIL VAPOR TRANSECT

Transect	Benzene	TCE	Toluene	PCE	Ethylbenzene	M-xylene	O-xylene/Styrene	M-Ethyltoluene	Total
ES	15	4	17	ND	ND	ND	64	ND	100
ET	15	27	24	3	ND	ND	30	ND	99
NT	13	14	31	32	ND	ND	11	ND	101
NW	44	8	35	1	ND	7	5	ND	100
Mean relative percentage at site	22	13	27	9	ND	2	28	ND	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694
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LC-4
LC-1
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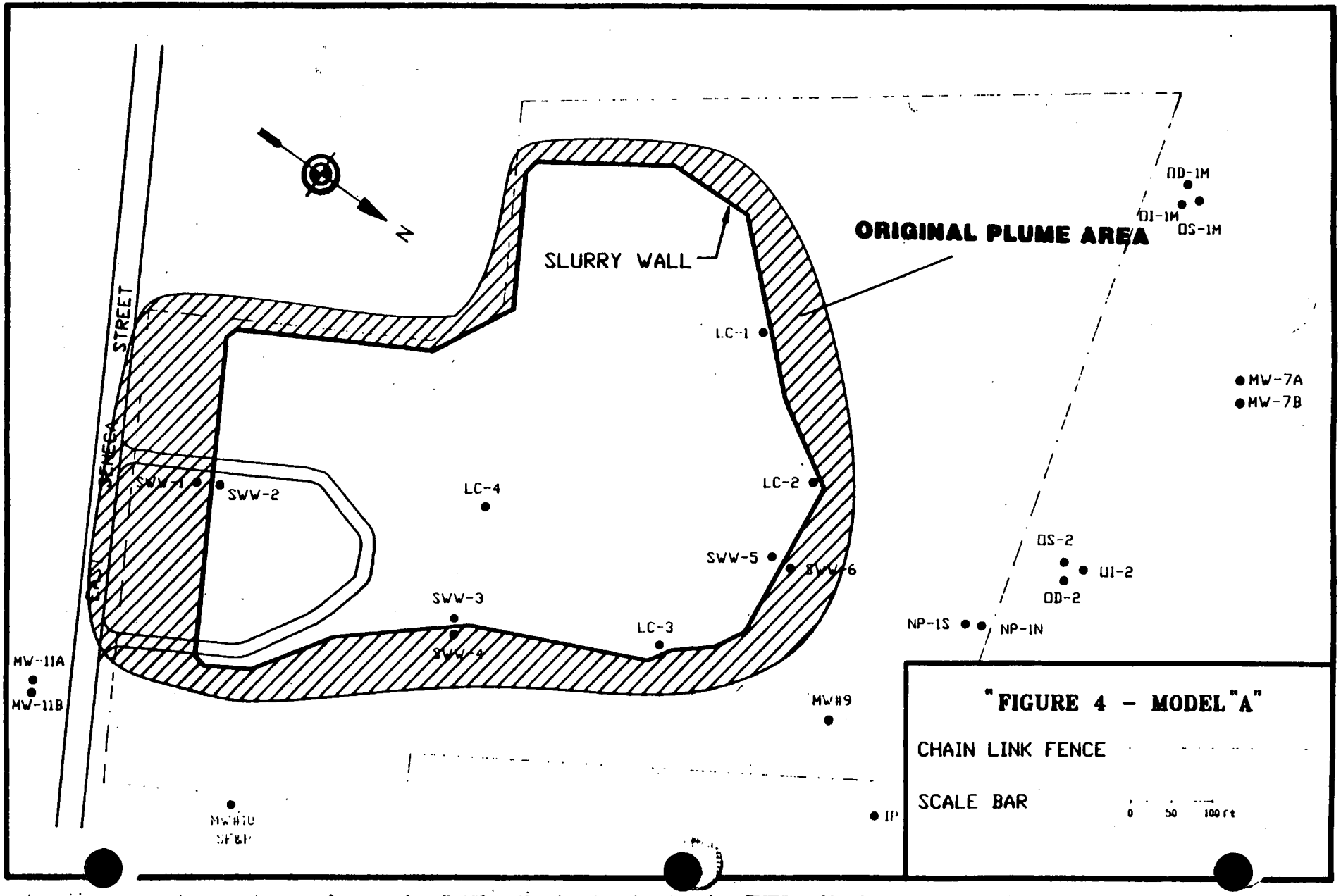
297
164
MW-11A
MW-11B
391
10
394
214
318
97
31
359
MW#10
SF&P
WHITE CREEK
MW#9
IP
OD-1M
OI-1M
OS-1M
MW-7A
MW-7B
OS-2
OI-2
OD-2
NP-1S
NP-1N
FIGURE 3. SOIL VAPOR
TOTAL ORGANIC COMPOUNDS
CHAIN LINK FENCE
SCALE BAR
0 50 100 ft
Values listed are in ppbv.


N
SLURRY WALL
ORIGINAL PLUME AREA
SENECA STREET
OD-1M
OI-1M
OS-1M
MW-7A
MW-7B
LC-1
LC-2
LC-3
LC-4
SWW-1
SWW-2
SWW-3
SWW-4
SWW-5
SWW-6
OS-2
OI-2
OD-2
NP-1S
NP-1N
MW-11A
MW-11B
MW#9
IP
"FIGURE 4 - MODEL "A"
CHAIN LINK FENCE
SCALE BAR
0
50
100 ft

Model B is based on the following assumptions: (1) the original distribution of contaminants within the plume area was homogeneous; (2) as originally installed, the slurry wall did fully enclose the plume; and (3) any contamination observed outside the slurry wall is the result of a breach. The contaminant distribution pattern outside the wall that would result from this situation would feature background level contaminant concentrations punctuated by anomalously high concentrations around the breach. This model seems to fit the distribution pattern observed along the northern perimeter of the site in that the concentrations vary over a wide range in this area. There are anomalously high soil vapor TOC values at sample stations NW-02 and NW-05.

Model C is a combination of Models A and B. The model is based on the following assumptions: (1) the distribution of contaminants within the original plume was homogeneous, (2) the slurry wall as initially installed did not fully encompass the plume, and (3) the slurry wall has subsequently been breached. The resulting distribution pattern would feature relatively uniform TOC values around most of the site with slightly higher values to the north, downgradient from the source area. Superimposed on this distribution pattern would be high TOC anomalies around the breach in the slurry wall. A comparison of the distribution pattern for Model C shown in Figure 6 with the observed pattern shown in Figure 3 shows that it is this model which appears to most completely describe the observed contaminant distribution pattern.

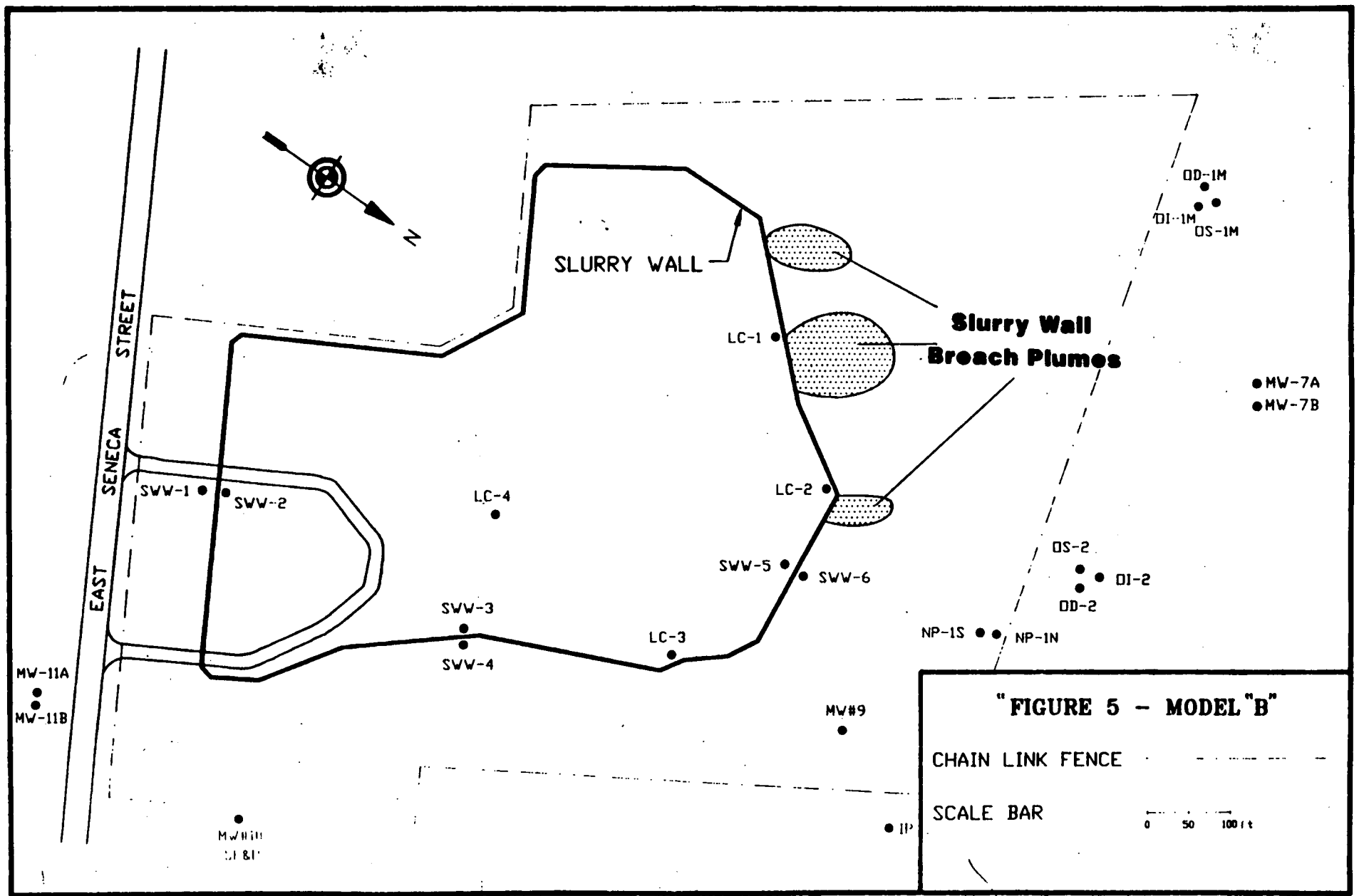
5.0 CONCLUSION

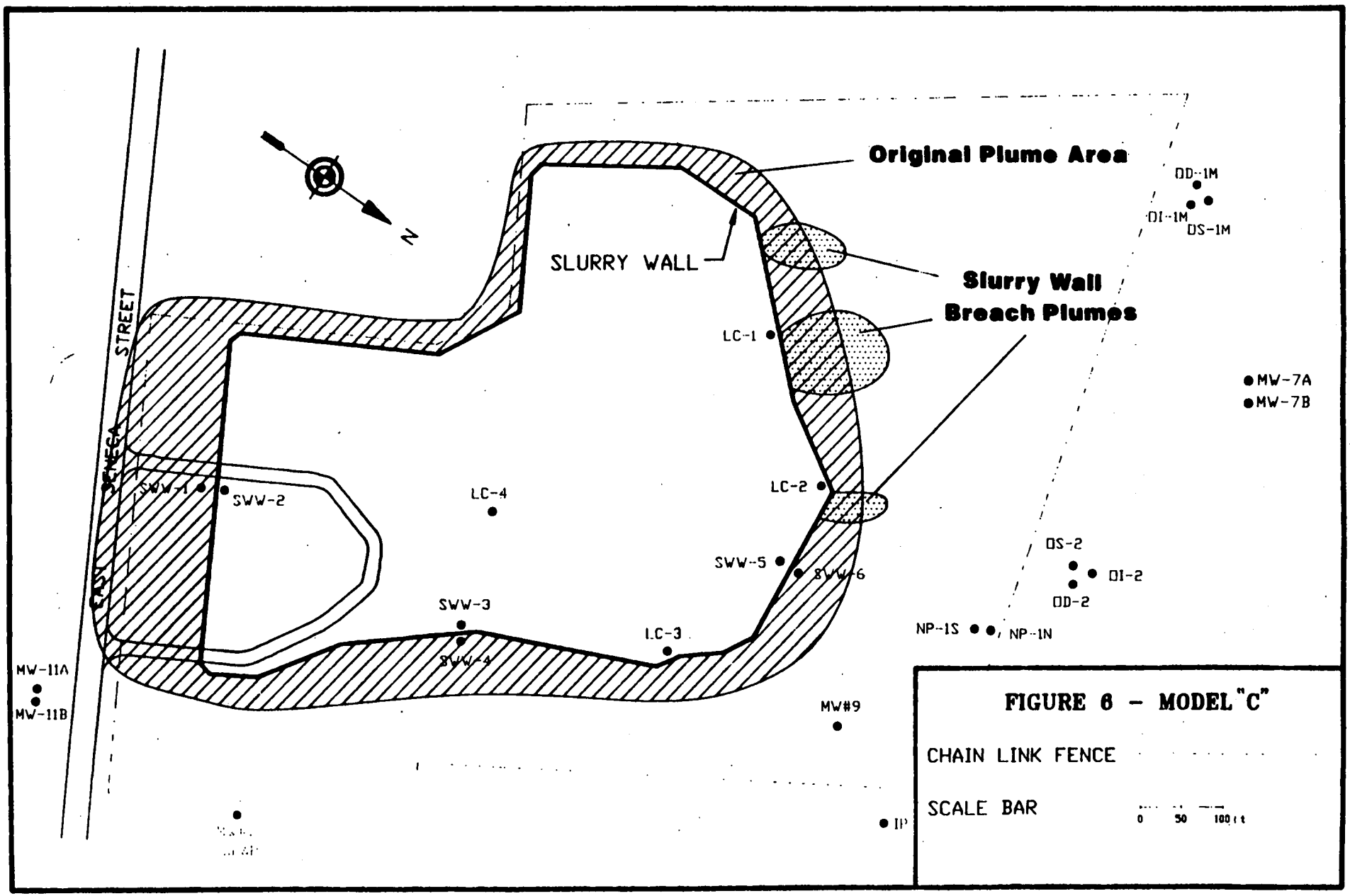
It is apparent that there is significant VOC contamination in the overburden aquifer outside the slurry wall. Of the models considered in this study, Model C, which is based on the assumption that the slurry wall did not encompass the contaminant source area when it was installed and that subsequent to its installation, the wall was breached somewhere in the area of NW2 and NW5, shows the best fit to the data.

6.0 RECOMMENDATIONS

Three main recommendations should be immediately considered. First, in order to fully characterize the contamination at the site, all of the monitoring wells and leachate collection wells should be sampled for full priority pollutants. Second, Model C should be tested by conducting a soil vapor survey along the northern perimeter under low water table conditions. Third, the pump tests recommended in U.S. EPA/REAC (1988) on both the bedrock wells and the overburden wells should be completed.

It has not yet been determined whether the slurry wall breach discussed above is the result of contaminants migrating under the slurry wall or flowing through ruptures in the wall. A seismic refraction survey would yield a detailed bedrock surface topographic map. Channels in the bedrock topography would be delineated using this technique, and the depth to bedrock under the leak area could be determined. This information, when combined with the groundwater and soil vapor geochemical data, could be used to determine the path of contaminant migration along the northern perimeter of the site.


N
SLURRY WALL
Slurry Wall
Breach Plumes
EAST SENECA STREET
LC-1
LC-2
LC-3
LC-4
SWW-1
SWW-2
SWW-3
SWW-4
SWW-5
SWW-6
OD-1M
DI-1M
OS-1M
MW-7A
MW-7B
OS-2
DI-2
OD-2
NP-1S
NP-1N
MW-11A
MW-11B
MW#9
IP
"FIGURE 5 - MODEL "B"
CHAIN LINK FENCE
SCALE BAR
0
50
100 ft


Original Plume Area
SLURRY WALL
Slurry Wall
Breach Plumes
N
SENECA STREET
LC-1
LC-2
LC-3
LC-4
SWW-1
SWW-2
SWW-3
SWW-4
SWW-5
SWW-6
MW-11A
MW-11B
MW#9
DD-1M
DI-1M
DS-1M
MW-7A
MW-7B
DS-2
DI-2
DD-2
NP-1S
NP-1N
FIGURE 6 - MODEL "C"
CHAIN LINK FENCE
SCALE BAR
0
50
100 ft

APPENDIX A

QUALITY ASSURANCE WORK PLAN

Soil Vapor and Groundwater Sampling at Pollution Abatement Services, Oswego, NY

rd/TYSON/PR-1202

QUALITY ASSURANCE

Work Plan

SOIL VAPOR AND GROUNDWATER SAMPLING AT POLLUTION ABATEMENT SERVICES, OSWEGO, NY

Prepared by
Roy F. Weston, Inc.

October 18, 1988

EPA Work Assignment No. 0-202
Weston Work Order No. 3347-01-01-1202
EPA Contract No.: 68-03-3482

APPROVALS

Roy F. Weston, Inc.

Ken Tyson (Date)
Task Leader

W. Scott Butterfield (Date)
Project Manager

EPA

Alan Humphrey (Date)
Work Assignment Manager

Robert Cibulskis (Date)
Project Officer

Walter R. Stutts (Date)
Contracting Officer

eh/WP-190

1.0 OBJECTIVE

1.1 Groundwater sampling for volatile organic compounds

The objective of this sampling event is to determine:
- the extent of contamination, and
- the magnitude of contamination

In the following media:
- groundwater

For the purpose of:
- site characterization and determining the extent of the contamination outside an existing slurry wall

The data will be evaluated against:
- an existing data base

1.2 The objective of the soil vapor sampling portion of this project is to determine:
- the extent of contamination, and
- the magnitude of contamination

In the following media:
- soil/sediment

The data will be evaluated against:
- an existing data base, and
- the data will be compared to that of the water samples

2.0 PROJECT SCOPE

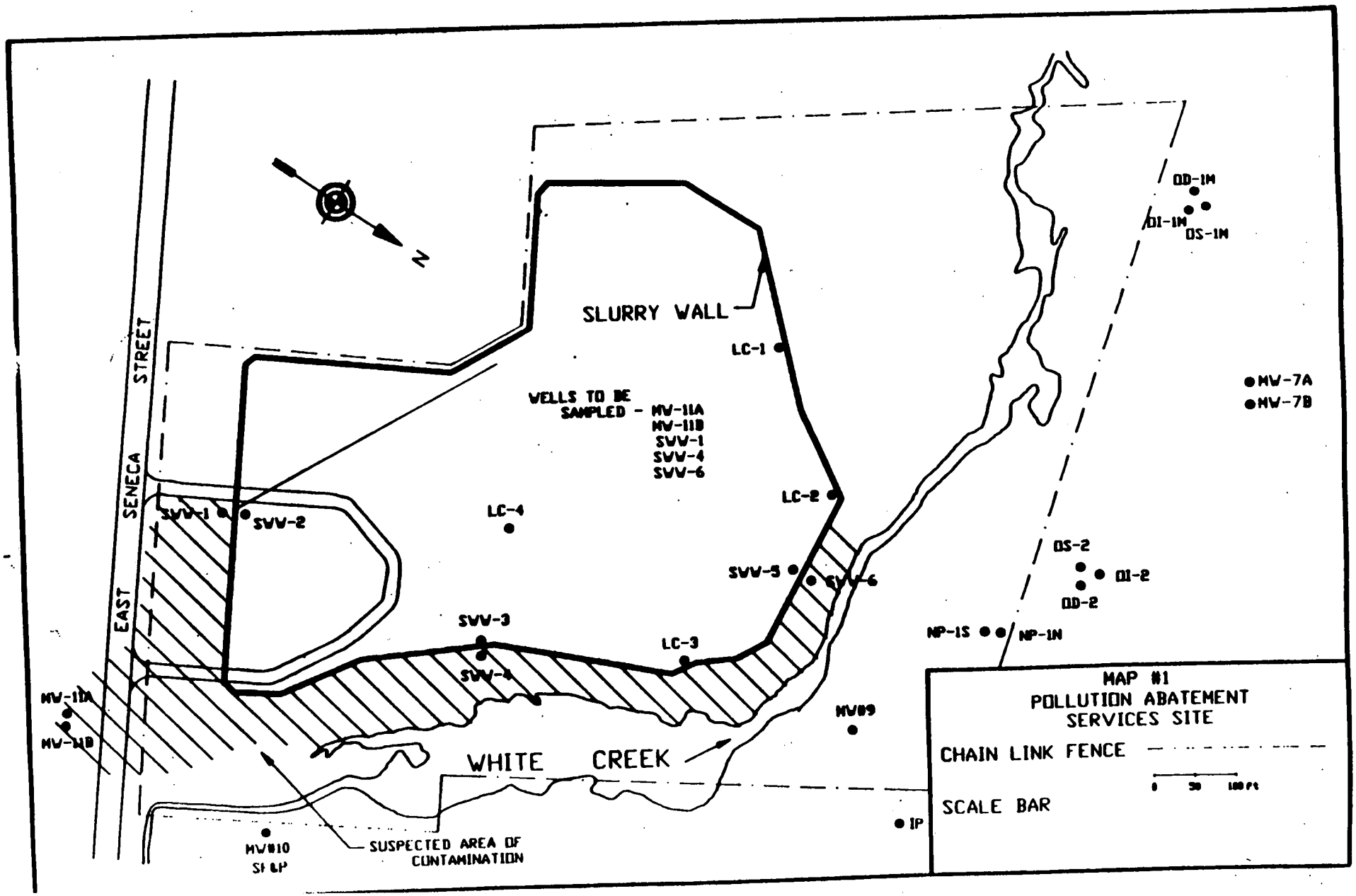
The following information is known about the site:

It is a hazardous waste facility on 4 acres which had been operating for 7 years up until 1977. The types of material(s) handled by this facility were:
- organic solvents, and
- volatile organics

2.1 Groundwater Sampling

The area of suspected contamination is shown on Map 1.

The target contaminants of concern are toluene, benzene, bromodichloromethane, 1,1-dichloroethane, trans-1,2-dichloroethane, and ethyl benzene. The expected concentration range for these contaminants is 236 to 1200 ppb, however, it is also our intent to identify any other target volatile organic compounds found at concentrations exceeding 10 ppb.


N
SLURRY WALL
LC-1
WELLS TO BE SAMPLED - MW-11A
MW-11B
SVW-1
SVW-4
SVW-6
LC-2
LC-4
SVW-1
SVW-2
SVW-5
SVW-6
SVW-3
SVW-4
LC-3
EAST SENECA STREET
MW-11A
MW-11B
MW-10
SHALLOW
WHITE CREEK
SUSPECTED AREA OF CONTAMINATION
MW-9
IP
OD-1M
OI-1M
OS-1M
MW-7A
MW-7B
OS-2
OI-2
OD-2
NP-1S
NP-1M
MAP #1
POLLUTION ABATEMENT SERVICES SITE
CHAIN LINK FENCE
SCALE BAR
0
50
100 Ft

The groundwater sampling portion of this project will involve the collection of samples to be analyzed for volatile organic compounds from the five monitoring wells identified on Map 1. REAC will collect the samples and undertake the analysis. REAC will also arrange for:

- protective gear
- sampling equipment
- sample containers
- sampling personnel
- field analysis
- analysis

2.2 Soil Vapor Sampling

The target contaminants for the soil vapor sampling are identical to those of the groundwater sampling. Since there has been no soil vapor sampling done at this site, the expected concentration range is unknown.

The area of suspected contamination shown in Map 1 is to be sampled for soil vapors. The exact locations of the sample sites will be determined in the field by the ERT Work Assignment Manager.

3.0 TECHNICAL APPROACH

In order to execute the objectives outlined in Section 1.0, this project will involve the collection of 5 groundwater samples and from 30 to 50 soil vapor samples using the procedures outlined in the following REAC SOPs: 2155, Sampling for Volatile Organics in Groundwater; 2149, Soil Gas Survey Procedures; 2007, Groundwater Well Sampling; and 2152, Monitor Well Sampling.

4.0 PROJECT MANAGEMENT AND REPORTING

The Weston/REAC Task Leader, Ken Tyson, will maintain contact with the EPA Work Assignment Manager to keep him informed about the technical and financial progress of this project. This communication will commence with the issuance of the work assignment and project scoping meeting. Activities under this project will be reported in status or trip reports and other deliverables (e.g., analytical reports, final reports) identified in Section 8.0. Activities will also be summarized in appropriate format for inclusion in REAC Monthly and Annual Reports.

5.0 PROJECT SCHEDULE

The work assignment for this project was issued on 10/13/88. The QAWP was initiated at that time. The equipment required to conduct the site activities was assembled and shipped on 10/17/88. Field activities were carried out between 10/18/88 and 10/20/88 and the samples were transferred to the lab on 10/20/88. Preliminary results are expected on 11/14/88. The overall project is expected to close-out with the issuance of a final report on 12/23/88. Refer to the attached project schedule chart and Section 8.0 for an illustration of milestones and deliverable due dates.

6.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The EPA Work Assignment Manager, Alan Humphrey, will provide overall direction to REAC staff concerning project sampling needs, objectives, and schedule.

The REAC Task Leader, Ken Tyson, is the primary REAC point of contact with the EPA Work Assignment Manager. The Task Leader is responsible for the development and completion of the QAWP, project team organization, and supervision of all project tasks, including reporting and deliverables.

The REAC Site QC Coordinator, Ken Tyson, is responsible for ensuring field adherence to the QAWP and recording any deviations from the QAWP. The Site QC Coordinator is also the primary project team contact with the REAC lab. The following REAC field sampling personnel will work on this project.

Personnel	Responsibility
Dave Miller	Groundwater Sampling
Dan deBruijn	Soil Vapor Sampling
Renata Wynnyk	G.C. Soil Vapor Analysis

The REAC QA Officer (John Mateo) is responsible for auditing and guiding the project team, reviewing the final deliverables and proposing corrective action, if necessary, for nonconformity to the QAWP.

7.0 MANPOWER AND COST PROJECTIONS

The estimated costs (including labor, travel, materials and equipment, subcontractor, and analytical) to complete this project are depicted in the attached cost summary sheet.

8.0 DELIVERABLES

The following deliverables will be provided under this project:

ITEM	DATE
o QAWP	11/10/88
o Field Activities	10/21/88
o Trip Report	11/21/88
o Analytical Report	11/21/88
o Draft Final Report	12/23/88

9.0 QUALITY ASSURANCE

As identified in Section 1.0, the objective of the groundwater sampling event does require analyte specificity at or near the level of sensitivity for all samples. The results of these samples (organics) will have confirmed identification and associated confidence limits. Results will

be representative, comparable, and complete. The QA level of control defined by this criteria is QA-3 and for this project it applies to all groundwater samples. The following QA/QC protocols will be addressed: chain of custody documentation, sample holding time documentation, initial and continuing instrument calibration, QC chromatograms and/or mass spectra, matrix spike duplicate and standard calibration curves method blanks, replicates, rinsate blanks, performance evaluation samples, and sample spikes. Table 9.1 and 9.2 are completed to reflect some of the appropriate QA/QC protocols identified above.

As identified in Section 1.0, the objective of the soil vapor sampling event does require analyte specificity for the soil gas samples. On at least 10% of the total screened samples, the organics results will have confirmed identification and associated confidence limits. Results will be representative, comparable, and complete. The QA level of control defined by this criteria is QA-2. The following QA/QC protocols will be addressed: chain of custody documentation, sample holding time documentation, collection and evaluation of blanks and sample replicates, instrument calibration documentation, and sample spike and evaluation (matrix spike and PE samples). Tables 9.1 and 9.2 are completed to reflect some of the appropriate QA/QC protocols identified above.

Specific data review activities for QA-3 and QA-2 should be performed by the following tiered approach:

1. a. For any one data package, review all data elements for 10% of samples.
   b. For the remaining 90% of the samples within the same data package, review holding times, blank contamination, spike (surrogate/matrix) recovery, detection capability, and confirmed identification thoroughly.

2. For every tenth data package, review all data quality elements for all samples.

Numbers of samples to be collected for this project/event are entered onto Tables 9.1 Field Sampling Summary and Table 9.2 QA/QC Analysis and Objectives Summary to facilitate ready identification of analytical parameters desired, type, volume and number of containers needed, preservation requirements, number of samples required and associated number, and type of QA/QC control samples required based on QA level desired.

All project deliverables will receive internal REAC peer QC review prior to release to EPA.

9.1 Field Sampling Summary

Analytical Parameter	Matrix*	Container Type and Volume (# containers rq'd)	Preservative	Subtotal Samples	QC Extra's: Dupes[1]	Rinsate Blanks[2]	Trip Blanks[3] (VOA's)	QC Positives[4]	Matrix Spikes[5]	Total Field Samples
VOA	S	40ml vial (1)	4°C							
VOA	W	40ml vial (3)	4°C**	5	1	0	3	0	1	10
BNA	S	8oz glass (1)	4°C							
BNA	W	32oz amber glass (2)	4°C							
PEST/PCB	S	8oz glass (1)	4°C							
PEST/PCB	W	32oz amber glass (2)	4°C**							
P.P. METALS	S	8oz glass (1)	4°C							
P.P METALS	W	1 liter glass or polyethylene (1)	HNO_3 pH<2 4°C							
CYANIDE	S	8oz glass (1)	4°C							
CYANIDE	W	1 liter polyethylene (1)	NaOH to pH >12 4°C							
PHENOL	S	8oz glass (1)	4°C							
PHENOL	W	1 liter amber glass (1)	H_2SO_4 to pH < 2 4°C							

*Matrix: S-Soil, W-Water, O-Oil, DS-Drum Solid, DL-Drum Liquid, TS-Tank Solid, TL-Tank Liquid, X-Other, A-Air

** If residual chlorine present, preserve with 0.008% $Na_2S_2O_2$.

1. One duplicate sample required for each lot of 20 samples obtained.
2. Only required if dedicated sampling tools are not used. One field blank required per parameter per 10 samples.
3. One trip blank required per cooler used to ship VOA samples. Each trip blank consists of 2 40ml vials filled with distilled/deionized water.
4. Performance check samples for special projects only. Not for every project.
5. One extra samples for each parameter. Applies to Water Samples only.

9.2 QA/QC Analysis and Objectives Summary:

Analytical Parameter	Matrix*	Analytical Method Ref.	Spikes Matrix[1]	Spikes Surrogate[2]	Level of Sensitivity	Lab Dupes[4]	QA/QC Objectives Det. Limits	Prec	Acc	Comp
VOA	S	624/CLP								
VOA	W	624/CLP	1	0	10 ppb	1	10 ppb			
BNA	S	625/CLP								
BNA	W	625/CLP								
PEST/PCB	S	608								
PEST/PCB	W	608								
P.P. METALS	S	SW-846								
P.P. METALS	W	SW-846								
CYANIDE	S	SW-846								
CYANIDE	W	SW-846								
PHENOL	S	625								
PHENOL	W	625								

*Matrix: S-Soil, W-Water, O-Oil, DS-Drum Solid, DL-Drum Liquid, TS-Tank Solid, TL-Tank Liquid, X-Other, A-Air.

1. One matrix spike analysis per "x" % of samples depending on QA level samples. Clean samples will include matrix spike and matrix spike duplicate.
   Surrogate spikes analysis to be run for each sample.
2. A specific concentration that meets the objective.
4. One per lot of 10 samples.

eh/WP-190

APPENDIX B

TRIP REPORT

Pollution Abatement Services Site
Groundwater Sampling and Soil Gas Survey

DATE: November 18, 1988

TO: Alan Humphrey, Work Assignment Manager

FROM: Ken Tyson, Task Leader

THROUGH: Pat Donegan, O&A Section Chief

SUBJECT: TRIP REPORT, POLLUTION ABATEMENT SERVICES SITE GROUNDWATER SAMPLING AND SOIL GAS SURVEY
WORK ASSIGNMENT NO.: 1202

BACKGROUND

As part of an earlier study (Tyson, 1988), REAC recommended additional work including a soil gas survey and additional groundwater sampling for the Pollution Abatement Services (PAS) site. A pre-site meeting was held on 10/13/88 with the REAC O&A Section Chief, Pat Donegan, the REAC Task Leader, Ken Tyson; two members of ERT/TAT, Bob Issacks and Linda Delia; and the ERT Work Assignment Manager, Alan Humphrey in attendance. During that meeting, all major aspects of the planned activities were discussed. A REAC work assignment was issued on 10/17/88 and a workplan was submitted on 11/10/88. The work assignment called for the completion of a soil gas survey to be conducted outside the slurry wall (exact sample locations to be determined in the field) and for groundwater sampling in the following wells; MW11A, MW11B, SWW1, SWW2, SWW4, and SWW6 (see map attached). These wells were all to be sampled for volatile organic analyses. The equipment was transported to the site on 10/17/88.

OBSERVATIONS AND ACTIVITIES

The REAC/ERT/TAT field team arrived at the site at 1000 hrs on 10/18/88. At that point, it was discovered that the key for the lock to the main site entrance was not at the hiding place described by the Region II OSC. After a brief discussion, Alan Humphrey granted permission to have the lock cut by a local welder.

Conditions at the site were found to be very good. There was a group of trailers, a storage shed, and a mobile field office on-site. The weather was cool, with a brisk wind out of the north. A more detailed site description can be found in Tyson, 1980.

eh/TYSON/M-32

The field personnel for this project were divided into three teams; the soil gas sampling team (Alan Humphrey, Dan deBruijn, and Linda Delia), the soil gas analysis team (Bob Issacks and Renata Wynnyk), and the groundwater sampling team (Ken Tyson and Dave Miller).

The soil gas team collected samples according to REAC SOP# 2149 around the exterior of the slurry wall on 10/18/88 and 10/19/88. Due to stabilization difficulties encountered with the G.C.M.S., these samples could not be analyzed in the field. On 10/20/88, the soil gas samples were shipped back to the REAC laboratories in Edison, NJ via the project sample truck for analysis.

The groundwater sampling team successfully purged all of the selected wells using bailers and submersible pumps during the afternoon of 10/18/88 and the morning of 10/19/88. The wells were sampled during the afternoon of 10/19/88 and the samples were shipped back to the REAC laboratories on 10/20/88 via the project sample truck. A copy of the chain of custody for these samples is attached. Severe contamination was observed visually in wells MW11A, MW11A, MW11B, SWW4, and SWW6. Due to brisk winds during the sampling operations, no vapors were detected by the field photoionization detector in the breathing zone. Modified level C protective gear was used for splash protection while purging and sampling these wells.

All members of the field team returned to Edison on the afternoon of 10/20/88.

FUTURE DELIVERABLES, ACTIVITIES, AND RECOMMENDATIONS

Soil gas and volatile organic water analyses are deliverable to the ERT Work Assignment Manager on 11/21/88. These results will be included in a detailed project report which is deliverable on 12/23/88.

Twenty three monitoring wells are currently being installed at the site by the New York Department of Environmental Conservation (NYDEC). Detailed well location maps and well logs will be forwarded to ERT/REAC as soon as they are complete. To date, the packer pump and time-series sampling tests recommended in the previous REAC report (cited above) have not been completed, nor are there any immediate plans to do so. It is strongly recommended that this work be carried out as the next step in the characterization of the site.

REFERENCES

Tyson, K.C., 1988. Subsurface Investigation of the Pollution Abatement Services Site, Oswego, N.Y. Report submitted to the U.S. EPA/ERT under work assignment no. 0-60.

eh/TYSON/M-32

APPENDIX C

Well Sampling Data Forms

WELL SAMPLING DATA FORM
(Page 1 of 2)

Well #: SWW21 Date: 10/19/88 Time: 1200
Boring Diameter: .5 ft Well Casing Diameter: .33 ft
Annular Space Length: 10. ft Stickup: 2.91 ft

WATER LEVEL

Held: _____
Cut: _____
DTW: 9.29 ft from Top of Casing

COLUMN OF WATER IN WELL

Casing Length: 22.5 ft
DTW Top of Casing: 9.29 ft
Column of Water in Well: 13.21 ft

VOLUME TO BE REMOVED

Gallons per foot of A.S. (from Page 2)	=	0.32
Column of Water or Length of A.S. (whichever is less)	X	13.21
Volume of Annular Space	=	4.22
Gallons per foot of casing	=	.3672
Column of Water	X	13.21
Volume of Casing	=	4.85
Total Volume (Volume of A.S.+ Volume of Casing)	=	9.07
Number of Volumes to be Evacuated	X	3
Total Volume to be Evacuated	=	27.21

Method of Purging (pump, bailer, etc.): Bailed

FIELD ANALYSIS	Start	Mid	End
Time			
pH			
Conductivity			
Temperature			

Total Volume Purged: 30 gallons

Sample Time: 1230 Sample # : 3780
Fractions:

Signed/ Sampler: Kenneth C Eyre Date: 10/19/88

Signed/ Reviewer: _____ Date: _____

WELL SAMPLING DATA FORM
(Page 1 of 2)

Well #: SWW3 Date: 10/19/88 Time: 1307
Boring Diameter: 0.50 ft Well Casing Diameter: 0.25 ft
Annular Space Length: 9.0 ft Stickup: 0.66 ft

WATER LEVEL

Held: _____
Cut: _____
DTW: 15.88 Top of Casing

COLUMN OF WATER IN WELL

Casing Length: 19.6 ft
DTW Top of Casing: 15.88 ft
Column of Water in Well: 3.72 ft

VOLUME TO BE REMOVED

Gallons per foot of A.S. (from Page 2)	=	0.32
Column of Water or Length of A.S. (whichever is less)	X	3.72
Volume of Annular Space	=	1.17
Gallons per foot of casing	=	0.367
Column of Water	X	3.72
Volume of Casing	=	1.36
Total Volume (Volume of A.S.+ Volume of Casing)	=	2.53
Number of Volumes to be Evacuated	X	3
Total Volume to be Evacuated	=	7.60

Method of Purging (pump, bailer, etc.): BAILER

FIELD ANALYSIS	Start	Mid	End
Time			
pH			
Conductivity			
Temperature			

Total Volume Purged: 10 gallons

Sample Time: 1325 Sample # : 3782
Fractions:

Signed/ Sampler: Kenneth C. Taylor Date: 10/19/88

Signed/ Reviewer: _____ Date: _____

WELL SAMPLING DATA FORM
(Page 1 of 2)

Well #: SW64 Date: 10/19/88 Time: 1244
Boring Diameter: 0.5 ft Well Casing Diameter: 0.25 ft
Annular Space Length: 10 ft Stickup: 0.58

WATER LEVEL

Held: _____
Cut: _____
DTW: 14.21 ft Top of Casing

COLUMN OF WATER IN WELL

Casing Length: 25.4 ft
DTW Top of Casing: 14.21
Column of Water in Well: 11.19

VOLUME TO BE REMOVED

Gallons per foot of A.S. (from Page 2)	=	0.32
Column of Water or Length of A.S. (whichever is less)	X	10.0
Volume of Annular Space	=	3.15
Gallons per foot of casing	=	0.3672
Column of Water	X	11.19
Volume of Casing	=	3.66
Total Volume (Volume of A.S.+ Volume of Casing)	=	6.81
Number of Volumes to be Evacuated	X	3
Total Volume to be Evacuated	=	20.4

Method of Purging (pump, bailer, etc.): SUBMERSIBLE TRICO PUMP

FIELD ANALYSIS	Start	Mid	End
Time			
pH			
Conductivity			
Temperature			

Total Volume Purged: 25 gallons

Sample Time: 1258 Sample # : 3781
Fractions:

Signed/ Sampler: Kenneth C. Tyson Date: 10/19/88

Signed/ Reviewer: _____ Date: _____

WELL SAMPLING DATA FORM
(Page 1 of 2)

Well #: SWW6 Date: 10/19/88 Time: 1531
Boring Diameter: 0.5 ft Well Casing Diameter: 0.25 ft
Annular Space Length: 9.7 ft Stickup: 1.71

WATER LEVEL

Held: _____
Cut: _____
DTW: 7.71 ft Top of Casing

COLUMN OF WATER IN WELL

Casing Length: 18.71
DTW Top of Casing: 7.71
Column of Water in Well: 11.0

VOLUME TO BE REMOVED

Gallons per foot of A.S. (from Page 2)	=	0.32
Column of Water or Length of A.S. (whichever is less)	X	9.7
Volume of Annular Space	=	3.06
Gallons per foot of casing	=	0.3672
Column of Water	X	11.0
Volume of Casing	=	4.04
Total Volume (Volume of A.S.+ Volume of Casing)	=	7.09
Number of Volumes to be Evacuated	X	3
Total Volume to be Evacuated	=	21.30

Method of Purging (pump, bailer, etc.): SUBMERSIBLE TRICO PUMP

FIELD ANALYSIS	Start	Mid	End
Time			
pH			
Conductivity			
Temperature			

Total Volume Purged: 30 gallons

Sample Time: 1350 Sample # : 3783
Fractions:

Signed/ Sampler: Kenneth C. Taylor Date: 10/19/88

Signed/ Reviewer: _____ Date: _____

WELL SAMPLING DATA FORM
(Page 1 of 2)

Well #: MW11A Date: 10/19/88 Time: 1148
Boring Diameter: 0.50 ft Well Casing Diameter: 0.25 ft
Annular Space Length: 4.0 ft Stickup: 0.17 ft

WATER LEVEL

Held: _____
Cut: _____
DTW: 3.85 ft Top of Casing

COLUMN OF WATER IN WELL

Casing Length: 10.97 ft
DTW Top of Casing: 3.85 ft
Column of Water in Well: 7.12

VOLUME TO BE REMOVED

Gallons per foot of A.S. (from Page 2)	=	0.32
Column of Water or Length of A.S. (whichever is less)	X	4.0
Volume of Annular Space	=	1.26
Gallons per foot of casing	=	0.367
Column of Water	X	7.12
Volume of Casing	=	2.61
Total Volume (Volume of A.S.+ Volume of Casing)	=	3.87
Number of Volumes to be Evacuated	X	3
Total Volume to be Evacuated	=	11.62

Method of Purging (pump, bailer, etc.): BAILER

FIELD ANALYSIS	Start	Mid	End
Time			
pH			
Conductivity			
Temperature			

Total Volume Purged: 18 gallons

Sample Time: 1230 Sample # : 3777
Fractions:

Signed/ Sampler: Kenneth C. Eyre Date: 10/19/88

Signed/ Reviewer: _____ Date: _____

WELL SAMPLING DATA FORM
(Page 1 of 2)

Well #: MW11B Date: 10/19/88 Time: 1130
Boring Diameter: 0.25 Well Casing Diameter: 0.25 ft
Annular Space Length: NA Stickup: 1.77 ft

WATER LEVEL

Held: _____
Cut: _____
DTW: 13.25 ft Top of Casing

COLUMN OF WATER IN WELL

Casing Length: 43.07
DTW Top of Casing: 13.25
Column of Water in Well: 29.82

VOLUME TO BE REMOVED

Gallons per foot of A.S. (from Page 2)	=	NA
Column of Water or Length of A.S. (whichever is less)	X	NA
Volume of Annular Space	=	NA
Gallons per foot of casing	=	0.3672
Column of Water	X	29.82
Volume of Casing	=	10.94
Total Volume (Volume of A.S.+ Volume of Casing)	=	10.94
Number of Volumes to be Evacuated	X	3
Total Volume to be Evacuated	=	32.85

Method of Purging (pump, bailer, etc.): SUBMERSIBLE TEFLO PUMP

FIELD ANALYSIS	Start	Mid	End
Time			
pH			
Conductivity			
Temperature			

Total Volume Purged: 40 gallons

Sample Time: 1130 Sample # : 3799
Fractions:

Signed/ Sampler: Kenneth C. Eyer Date: 10/19/88

Signed/ Reviewer: _____ Date: _____

APPENDIX D

Pollution Abatement Services, Oswego, NY
Preliminary Soil Gas Report

WESTON • SPER Suite 201, 1090 King Georges Post Road,
Edison, NJ 08837 • (201) 225-6266

TECHNICAL ASSISTANCE TEAM FOR EMERGENCY RESPONSE REMOVAL AND PREVENTION
EPA CONTRACT 68-01-7367

MEMORANDUM

TO: Alan Humphrey, EPA/ERT

FROM: Linda D'Elia, ERT/TAT

THRU: Joseph R. Tomaszewicz, ERT/TATL

DATE: December 21, 1988

SUBJECT: POLLUTION ABATEMENT SERVICES, OSWEGO, NY: PRELIMINARY SOIL GAS REPORT.

DCN: TAT-11-G-173
TDD: 11-8810-18
PCS: 2018

Attached is the Pollution Abatement Services soil gas survey preliminary report. This version incorporates all additions/changes as per our discussion on December 20. A final version of this report will follow.

CONTENTS

1.0 INTRODUCTION

1.1 Background

The Pollution Abatement Services (PAS) contamination site is located in Oswego County, New York, east of the town of Oswego. Lake Ontario lies due north of the site.

PAS was in operation as a disposal and treatment facility from 1970 until 1977. Documentation of groundwater contamination indicates the presence of significant concentrations of volatile and semi-volatile organic compounds within on-site monitoring wells.

Remedial activities to date include removal of drums and storage tanks, installation of a slurry wall and a groundwater recovery and leachate collection system, and clay capping of the area contained within the slurry wall. Monitoring wells have been installed on-site, inside and outside of the slurry wall, as well as off-site to monitor possible migration of contaminants.

Sampling efforts have shown a spread of contamination north of the site, and thus a breach in the slurry wall is suspected in that region of the site.

1.2 Objective

The Environmental Response Branch of the United States Environmental Protection Agency (EPA/ERT) was to undertake a soil gas survey of locations outside the slurry wall to determine outward migration of contaminants from within the containment system.

The purpose of this survey was to identify those locations where a breach in the slurry wall might exist, and to determine the direction of contaminant plume migration.

2.0 METHODOLOGY

2.1 Soil Gas Sampling

The equipment and technique used in the soil gas survey were consistent with EPA/ERT standard methods for soil gas sampling (EPA/ERT, 1988).

A weight-driven 3/8" steel bar is driven into the ground to a depth of four to five feet to create the soil gas "well." A 5-foot length of 1/4" stainless steel tubing is then inserted into the hole.

Modeling clay is packed around the surface of the hole to prevent intrusion of ambient air and a piece of stiff wire or wire cable is used to clear the sampling probe of lodged soil particles.

A *Gilian* pump calibrated to approximately 3 liters/minute is attached to the probe with *Tygon* tubing and the hole is evacuated for about 15 seconds.

An *HNu Photoionizer* with 10.2 eV probe is attached to the sampling probe using *Teflon* tubing and the reading was recorded at its peak.

2.2 Detection

The *HNu Photoionizer* was used to measure organic soil vapors at a depth of four to five feet below the surface. The detection of organic vapors utilizing this method does not yield an actual concentration, but does provide a relative measurement of volatile organic compounds when compared to background readings or measurements taken at other sampling locations.

The *HNu Photoionizer* was calibrated using isobutylene as a benzene equivalent, and consequently all readings should be considered total organics as benzene.

The *HNu* detection method is generally utilized as a quick and inexpensive screening tool. 1-liter *Tedlar* sampling bags are used to collect actual soil vapor samples, which undergo field GC analysis.

Sampling soil vapor using the *Tedlar* bags is accomplished in the following manner. The *Tedlar* bag is placed inside a vacuum dessicator and connected to the sampling probe via a *Teflon* tubing sampling train. A *Gilian* pump is used to evacuated the dessicator, thus filling the *Tedlar* sampling bag with soil vapors drawn from the four to five-foot depth.

The samples contained within the *Tedlar* bags were analyzed as soon as possible (within 24 - 48 hours) using *Photovac* and *Sentex* field GCs.

The *Photovac* GC was equipped with a photoionization detector using a 10.6 eV lamp and standards consisting of common aromatic and chlorinated volatile organic compounds were utilized. Standards used include benzene, toluene, xylenes, TCE, and PCE. Compounds with retention times that match components of the standard were tenatively identified and quantitated against the response area for these components. Unknown compounds were quantitated by using the area response of toluene. The method detection limit for the standard compounds is 20 parts per billion.

The *Sentex Sentograph* GC unit was used to detect two additional compounds of interest in this soil gas survey: 1,1-dichloroethane and bromodichloromethane. Method detection limit for these compounds was 10 ppb.

To further define a broader range of compounds and to confirm those compounds already identified by the field GCs, selected *Tedlar* bagged samples were drawn onto *Tenax* sorbent tubes to be analyzed by GC/MS. These tubes were desorbed and analyzed for specific ions using the GC/MS at the REAC lab facilities in Edison, New Jersey.

NOTE: Due to an electrical interference originating in the on-site trailer where field GC analyses were to have been performed by both *Photovac* and *Sentex* GCs, the sample bags were transported to the REAC facilities in Edison, NJ where the GC analysis consequently occurred. As a result of this problem, many of the soil gas samples were analyzed more than 24-48 hours after sampling took place.

2.3 Soil Gas Survey Description

The objective of the EPA/ERT soil gas survey at the PAS site was to determine the migration of contamination through the slurry wall containment system. In order to achieve this, the soil gas sampling locations were chosen surrounding the outside perimeter of the slurry wall (See Figure 1: Soil Vapor Sample Site Map). Each sampling transsect was named for its location around the periphery: ES, transsect parallel to East Seneca Street running NE to SW; WT, west transsect along the western periphery; NW, transsect running along the north western boundary; NT, north transsect outside the portion of the slurry wall due north of the site; and ET, east transsect along the eastern boundary of the site. All transsects had sample locations spaced at 50-foot intervals, except the ES and WT transsects where sample stations were 75-feet apart.

All samples were obtained at a depth of 4 to 5 feet, except NW1, NW5, NW6, which were sampled at 2 to 2.5 feet due to the shallow water table at these locations, and ET1 DEEP, which was sampled at a depth of approximately seven feet.

Two ambient air samples, ET0 AMB and TOC AMB, were taken and analyzed, as were three field blanks (*Tedlar* bags filled with ultra-zero air and carried in the field throughout each sampling day), and two bag check QA/QC samples (*Tedlar* bags filled with ultra-zero air and analyzed to determine cleanliness of the sample bag lot before sampling occurs).

3.0 RESULTS

3.1 *Photovac* GC Analysis Results

The *Photovac* GC analysis results for the PAS site are presented in Table 3. The highest concentrations of total organic compounds found in the soil vapor were detected in samples NW2, NW3, NW5, TOC, and NT3. The NW and NT samples were collected from the northern, downgradient portion of the site (approximately 20-25 feet outside the slurry wall). The TOC sample was collected on the landfill, inside the slurry wall.

Relatively high concentrations of BTXs (77-330 ppb) were detected in samples located generally downgradient, in the north-western portion of the site.

Significant amounts of PCE were found in samples NT3 (124 ppb), and NT1 (50 ppb). TCE was detected in about 20 samples, however many of these contained only trace amounts of that compound.

3.2 *Sentex* GC Results

The *Sentex* GC analysis results (see Table 2) indicated the presence of 1,1-dichloroethane in only one sample, NW2, however the concentration was below instrument detection limit for this compound (10 ppb). No bromodichloromethane was detected.

3.3 GC/MS Analysis Results

Confirmation of GC analyses was performed using *Tenax* sorbent tubes and GC/MS. Nine *Tedlar* bag soil vapor samples were drawn onto *Tenax* tubes to undergo GC/MS analysis along with one field blank (Field Blank #3) and one travel blank. (Refer to Table 3 for GC/MS analysis results).

One hundred mL aliquots of each sample were adsorbed onto *Tenax*/CMS (carbon molecular sieve) tubes for all samples except NW2, where only 20 mL was adsorbed due to the high concentrations of total organics detected in this sample by the *Photovac* GC. Samples were transferred from the *Tedlar* bags to the *Tenax* tubes by attaching the bags directly to the tubes and pulling the sample through the tube using a glass syringe. (Refer to EPA/ERT Soil Gas SOP for outline of standard procedure). Direction of the flow was such that the sample passed through the *Tenax* phase first. The sample tubes were then analyzed by thermal desorption onto a cryogenic trap, followed by GC/MS analysis.

In general, the GC/MS data is in agreement with the *Photovac* GC results. However a substantial amount (282 ppb) of 1,1-dichloroethane was detected by GC/MS in NW2, whereas the *Sentex* showed an amount that was below detection limit in the same sample.

GC/MS also showed the presence of a significant concentration of vinyl chloride in sample NW2 (6420 ppb), thus accounting for the high level of total organics that was detected by *Photovac* GC in that sample. Vinyl chloride was also detected at 294 ppb in NW4.

Non-target compound analysis by GC/MS indicates unusually high concentrations of alkanes in NW2 and NW4.

4.0 DISCUSSION

Soil gas results can be affected by the site-specific properties of the unsaturated zone. The variability of these site-specific parameters must be recognized in order correctly interpret soil vapor studies' results. Specifically the soil properties that affect soil gas surveys are soil porosity, texture, water content, organic matter content, shape and size of soil pores, and depth of the unsaturated zone.

Particularly relevant to the PAS site soil gas survey are soil moisture content, soil texture, and proximity of the water table. At the PAS site, the surficial material is comprised of a mixture of clay, silt, sand, and boulders, which is relatively compact and impermeable. Soils such as these, which are found to have a high clay and moisture content, cause decreased rate of diffusion of soil vapors and can hinder the ability to effectively track a plume of organic contaminants.

Soil gas sampling in close proximity to the water table presents another problem encountered at the PAS site. (Along the northern site-boundary, NW and NT transsects, the water table was reached at depths of of less than three feet at certain locations). Shallow groundwater conditions present a difficulty in soil gas sampling because the chemical concentration gradient in soil gas can be very steep, highly variable, and easily disturbed under these conditions (Marrin, 1988).

5.0 CONCLUSIONS AND RECOMMENDATIONS

Even though factors that inhibit the effectiveness of a soil vapor survey are present at this site, evidence of a plume of contamination at the north-western portion of the slurry wall boundary was discovered and has been substantiated by the analyses of the soil gas samples. Existence of a plume of this nature is consistent with the site hydrogeology (groundwater flow is in the direction of Lake Ontario, or to the north) and the theory that migration of contamination beyond the slurry wall has occurred.

A review of the monitoring well sampling data shows evidence of groundwater contamination in at least two locations outside the slurry wall (See Table 4: VOC Analysis). High concentrations of BTXs in monitoring wells located outside the slurry wall, SWW6 and SWW4, are indicative of the outward migration of contaminants from within the containment/treatment system. This data is somewhat in agreement with the soil gas data that was collected, especially where the contamination was detected at the north and north-western regions outside of the slurry wall, near SWW6. A complete correlation of groundwater and soil gas data could not be expected at PAS due to the site-specific variables affecting soil gas results mentioned earlier.

In order to further delineate the extent and migration of the plume of contamination, it is recommended that a more detailed and extensive soil gas survey should be planned in the future. This soil gas investigation should be carried out during a relatively dry season. Further sampling of both wells and soil gas should be concentrated in the north, north-west, and north-east regions of the site to remain consistent with the northward flow of the groundwater and migration pathway of the contamination plume. Pending results of the second soil gas survey, recommendations may be made for additional groundwater monitoring well installation and sampling.

TABLE 1

PAS, Oswego, NY -- SOIL GAS ANALYSIS
Phocovac QC Analytical Results ... OCT 21-22, 1988

CONCENTRATION (PPBV)

SAMPLE No.	TOTAL ORGANICS*	BENZENE	TCE	TOLUENE	PCE	ETHYLBENZENE	m-XYLENE	o-XYLENE/ STYRENE	p-ETHYL
S C-1	67	ND	ND	ND	ND	ND	ND	ND	
S C-2	207	ND	ND	ND	ND	ND	ND	ND	
ES-00	359	22	ND	13	ND	ND	ND	102	
ES-01	231	6	ND	19	ND	ND	ND	27	
ES-02	97	ND	ND	19	ND	ND	ND	32	
ES-03	391	44 106	ND	19 121	ND	ND	ND	44 69	
ES-04	146	<10	ND	<10	ND	ND	ND	<10	
ES-05	414	23	28	17	ND	ND	ND	67	
ES-06	504	11	11	19	ND	ND	ND	97	
ES-07	174	ND	ND	15	ND	ND	ND	47	
ES-09	77	<10	<10	ND	ND	ND	ND	ND	
ET-00	19	ND	ND	ND	ND	ND	ND	ND	
~~ET-00 MSD~~	~~203~~	20	36	165	ND	ND	ND	6	
ET-01	394	8	ND	19	ND	ND	ND	20	
~~ET-01 MSD~~	~~213~~	ND	ND	ND	ND	ND	ND	ND	
ET-02	313	21	13	13	ND	ND	ND	ND	
ET-03		3	ND	20	ND	ND	ND	ND	
ET-04	495	27	30	31	ND	ND	ND	ND	
ET-05	374	16	ND	ND	ND	ND	ND	45	
ET-06	239	6	ND	ND	ND	ND	ND	40	
ET-07	611	23	21725	197 <10	25	ND	ND	113	
ET-08	447	21	78	53	ND	ND	ND	62	
ET-09	267	ND	ND	11	ND	ND	ND	ND	
ET-10	253	ND	7	ND	7	ND	ND	ND	
ET-11	297	ND	14	ND	18	ND	ND	ND	
ET-12	164	<10	ND	<10	ND	ND	ND	ND	
ET-13	53	ND	ND	<10	ND	ND	ND	ND	
F B-01	135	ND	ND	6	ND	ND	ND	ND	
F B-03	104	ND	ND	ND	ND	ND	ND	ND	
F B-04	90	22	23	17	ND	ND	ND	43	
MT-00	388	ND	ND	<10	ND	ND	ND	ND	
MT-01	694	42 69	29 76	76 166	50 174	ND	ND	ND 58	
MT-02	187	ND	ND	14	ND	ND	ND	ND	
MT-03	~~993~~	27	27	76	124	ND	ND	58	
MW-00	163	ND	ND	ND	ND	ND	ND	ND	
MW-01	551	22	ND	29	ND	ND	ND	ND	
MW-02	2783	330	84 91	99	15	ND	ND	<10	
MW-03	107*	ND	ND	368 <10	ND	ND	ND 77	ND 48	<10
MW-04	331	464 9	<10	17	15 <10	ND	ND	ND	<10
MW-05	2263	78	22	24	ND	ND	ND	ND	
MW-06	893	25	ND	199	ND	ND	ND	43	
TCC	1283	7	55	50	ND	ND	ND	51	
TCC MSD	286	<10	<10	10	ND	ND	ND	ND	
WT-00	434	244	2	16	ND	ND	ND	ND	
WT-01	273	15	11	52	ND	ND	ND	ND	
WT-06	200	27	ND	10	ND	ND	ND	ND	
WT-07	610	ND	ND	ND	ND	ND	ND	ND	
WT-08	408	39	9	<10	ND	ND	ND	31	
WT-09	174	ND	<10	ND	ND	ND	ND	ND	

* : Quantitated as Toluene.
F B : Field Blank
S C : Seq Check
TCE : Trichloroethene
PCE : Tetrachloroethene
ND : Not Detected, <

TABLE 2

RESULTS TABLE FOR TEDLAR BAG ANALYSIS

SAMPLE #	DATE SAMPLED	DATE ANALYZED	1,1-DICHLOROETHANE	BROMODOCHLOROMETHANE
WT 1	10/18/88	10/19/88	ND	ND
ES 6	10/18/88	10/21/88	ND	ND
ES 9	10/18/88	10/19/88	ND	ND
ES 4	10/18/88	10/19/88	ND	ND
ES 3	10/18/88	10/21/88	ND	ND
ES 1	10/18/88	10/21/88	ND	ND
ES 2	10/18/88	10/19/88	ND	ND
ES 0	10/18/88	10/21/88	ND	ND
ES 7	10/18/88	10/19/88	ND	ND
F.BLK.1	10/18/88	10/19/88	ND	ND
WT 0	10/18/88	10/19/88	ND	ND
ES 5	10/18/88	10/19/88	ND	ND
ET 6	10/19/88	10/21/88	ND	ND
F.BLK.2	10/19/88	10/22/88	ND	ND
ET 4	10/19/88	10/21/88	ND	ND
ET 8	10/19/88	10/21/88	ND	ND
ET 0	10/19/88	10/21/88	ND	ND
ET 5	10/19/88	10/22/88	ND	ND
AMB.@ETO	10/19/88	10/22/88	ND	ND
ET 7	10/19/88	10/21/88	ND	ND
ET 9	10/19/88	10/22/88	ND	ND
ET 2	10/19/88	10/21/88	ND	ND
ET 3	10/19/88	10/21/88	ND	ND
WT 7 *	10/19/88	10/21/88	ND	ND
ET 1 DEEP	10/19/88	10/22/88	ND	ND
WT 8 *	10/19/88	10/21/88	ND	ND
WT 6 *	10/19/88	10/21/88	ND	ND
ET 1	10/19/88	10/21/88	ND	ND
F.BLK.4	10/19/88	10/22/88	ND	ND
WT 9	10/19/88	10/21/88	ND	ND
AMB.@TOC	10/19/88	10/22/88	ND	ND
NW 1	10/19/88	10/22/88	ND	ND
NW 3	10/19/88	10/21/88	ND	ND
NW 0	10/19/88	10/21/88	ND	ND
NT 2	10/19/88	10/22/88	ND	ND
ET 11	10/19/88	10/21/88	ND	ND
NW 4	10/19/88	10/22/88	ND	ND
ET 13	10/19/88	10/21/88	ND	ND
ET 10	10/19/88	10/21/88	ND	ND
NT 3	10/19/88	10/21/88	ND	ND
NT 1	10/19/88	10/21/88	ND	ND
NW 2	10/19/88	10/22/88	+	ND
NW 5	10/19/88	10/21/88	ND	ND
NT 0	10/19/88	10/21/88	ND	ND
F.BLK. 3	10/19/88	10/21/88	ND	ND
ET 12	10/19/88	10/21/88	ND	ND
NW 6	10/19/88	10/21/88	ND	ND
TOC	10/19/88	10/22/88	ND	ND

* denotes that chromatogram showed several unidentified peaks, possibly electronic in origin, outside of the compound retention times.

+ denotes tentatively identified compound; concentration is below instrument

TARGET COMPOL

SOIL GAS ANALYSIS BY GC/MS

SITE NAME : POLLUTION ABATEMENT SERVICES (PAS) - OSWEGO, NY

SAMPLE NAME/NUMBER :	FIELD BL.#3	TRAVEL BLANK	MI-0	MW-6	ET-1 DEEP	MI-8	MI-6	MI-6 (DUP)	MW-4	MI-3	MW-2
DATE ANALYZED :	11/2/88	11/2/88	11/2/88	11/2/88	11/2/88	11/2/88	11/2/88	11/2/88	11/2/88	11/2/88	11/2/88
DATE SAMPLED :	10/21/88	10/21/88	10/21/88	10/21/88	10/21/88	10/21/88	10/21/88	10/21/88	10/21/88	10/21/88	10/21/88
FBN :	B0854	B0855	B0856	B0857	B0858	B0859	B0860	B0861	B0862	B0863	B0864
parameter	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb
vinyl chloride	ND	ND	ND	ND	ND	ND	ND	ND	294.0	ND	6420.0
trichlorofluoromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
methylene chloride	BLOQ	ND	BLOQ	ND	BLOQ	BLOQ	ND	ND	ND	ND	39.6
trans-1,2-dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	12.6	ND	282.0
1,1,1-trichloroethane	ND	BLOQ	310.0	13.9	36.0	108.0	ND	BLOQ	32.5	11.1	150.0
carbon tetrachloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
benzene	12.7	11.5	18.7	15.5	14.9	28.2	20.1	19.9	22.2	13.3	142.0
1,2-dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trichloroethylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
toluene	BLOQ	BLOQ	26.3	178.0	14.6	13.0	15.2	13.8	17.2	BLOQ	62.7
tetrachloroethylene	ND	ND	ND	ND	ND	ND	ND	ND	BLOQ	90.8	ND
ethyl benzene	BLOQ	BLOQ	BLOQ	26.0	BLOQ	BLOQ	BLOQ	BLOQ	BLOQ	BLOQ	12.7
m-xylene	BLOQ	BLOQ	14.6	74.0	BLOQ	BLOQ	BLOQ	BLOQ	12.3	BLOQ	26.6
o-xylene	ND	ND	BLOQ	12.8	ND	ND	ND	ND	BLOQ	ND	ND
styrene	BLOQ	BLOQ	BLOQ	BLOQ	ND	BLOQ	BLOQ	BLOQ	BLOQ	ND	29.6
meta-ethyltoluene	ND	ND	BLOQ	ND	ND	ND	ND	ND	ND	ND	ND
bromochloromethane (%)	117.53	121.05	137.93	116.78	94.00	115.69	145.92	96.95	103.13	99.02	113.59
p-bromofluorobenzene (%)	88.19	97.37	108.31	92.21	75.47	84.92	111.77	73.30	78.88	75.67	87.00
Sample volume (mL):	100 *	100 *	100	100	100	100	100	100	100	100	20
Limit of Quantitation(ppb):	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	50.0

ND. Not Detected.

BLOQ. Below Limit of Quantitation.

* - Assumed value for blanks.

NON-TARGET COMPOUNDS

SOIL GAS ANALYSIS BY GC/MS

SITE NAME	:	POLLUTION ABATEMENT SERVICES, OSWEGO, NY			
SAMPLE NAME/NUMBER	:	FIELD BLANK NO. 3			
SAMPLE VOLUME (CC)	:	100		FRN	: 80854
QUANTITATION CONCENTRATION (PPB)	:	5125		DATE SAMPLED	: 10/21/88
QUANTITATION VOLUME (CC)	:	2.00		DATE ANALYZED	: 11/2/88
QUANTITATION SCAN, AREA	:	1137	43024		

chemical name	scan	area	RT	RRT	ppb
acetaldehyde	61	14843	3.43	0.13	35
propane + methanethiol	82	13690	3.72	0.15	33
acetone	231	51320	5.78	0.27	120
2-propanol	260	18851	6.18	0.29	45
siloxane	836	44645	14.15	0.76	110
hexanal	888	21568	14.87	0.80	51
C6 alkene/cycloalkane	1129	10655	18.20	0.99	25
siloxane	1153	79192	18.54	1.01	190
octanal	1279	13355	20.28	1.11	32
siloxane	1420	61072	22.23	1.23	150
nonanal	1450	36421	22.65	1.25	87

NON-TARGET COMPOUNDS

SOIL GAS ANALYSIS BY GC/MS

SITE NAME	:	POLLUTION ABATEMENT SERVICES, OSWEGO, NY		
SAMPLE NAME/NUMBER	:	TRAVEL BLANK		
		SUPELCO LOT NO. 669-37		
SAMPLE VOLUME (CC)	:	100	FRN :	80855
QUANTITATION CONCENTRATION (PPB):		5125	DATE SAMPLED :	10/21/88
QUANTITATION VOLUME (CC)	:	2.00	DATE ANALYZED:	11/2/88
QUANTITATION SCAN, AREA	:	1135 43024		

chemical name	scan	area	RT	RRT	ppb
acetaldehyde	61	26706	3.43	0.13	64
acetone	232	12215	5.79	0.27	29
2-propanol	263	13997	6.22	0.29	33
3-methyl-2-butanone	439	12759	8.66	0.44	30
siloxane	834	372202	14.12	0.76	890
hexanal	886	15376	14.86	0.80	37
heptanal	1090	11600	17.66	0.96	28
C6 alkene/cycloalkane	1127	23209	18.17	0.99	55
siloxane	1150	112176	18.49	1.01	270
siloxane	1194	16396	19.10	1.05	39
octanal	1276	14940	20.23	1.11	36
siloxane	1402	10735	21.98	1.22	26
nonanal	1447	31372	22.60	1.25	75
siloxane	1559	32768	24.15	1.34	78

NON-TARGET COMPOUNDS

SOIL GAS ANALYSIS BY GC/MS

SITE NAME	:	POLLUTION ABATEMENT SERVICES, OSWEGO, NY		
SAMPLE NAME/NUMBER	:	NT-0		
LOCATION	:			
SAMPLE VOLUME (CC)	:	100	FRN	: 80856
QUANTITATION CONCENTRATION (PPB)	:	5125	DATE SAMPLED	: 10/21/88
QUANTITATION VOLUME (CC)	:	2.00	DATE ANALYZED	: 11/2/88
QUANTITATION SCAN, AREA	:	1132 43024		

chemical name	scan	area	RT	RRT	ppb
C4 alkene/cycloalkane	41	11010	3.15	0.11	26
acetaldehyde	62	34591	3.44	0.13	82
2-propanol	230	20286	5.77	0.27	48
acetone	258	12686	6.16	0.29	30
3-methyl-2-butanone	432	11863	8.56	0.43	28
siloxane	832	849288	14.09	0.76	2000
hexanal	884	18726	14.81	0.80	45
heptanal	1087	11264	17.62	0.96	27
siloxane	1148	882497	18.47	1.01	2100
siloxane	1190	26252	19.05	1.05	63
C12 alkene/cycloalkane	1221	20739	19.48	1.07	49
benaldehyde	1249	22861	19.86	1.09	54
octanal	1273	14760	20.20	1.11	35
siloxane	1330	20126	21.26	1.18	48
siloxane	1398	56977	21.93	1.22	140
siloxane	1414	248325	22.15	1.23	590
nonanal	1443	17829	22.55	1.25	42
siloxane	1556	99123	24.11	1.34	240
siloxane	1673	17845	25.73	1.44	43

NON-TARGET COMPOUNDS

SOIL GAS ANALYSIS BY GC/MS

SITE NAME	:	POLLUTION ABATEMENT SERVICES, OSWEGO, NY		
SAMPLE NAME/NUMBER	:	MW-6		
LOCATION	:			
SAMPLE VOLUME (CC)	:	100	FRN :	80857
QUANTITATION CONCENTRATION (PPB)	:	5125	DATE SAMPLED :	10/21/88
QUANTITATION VOLUME (CC)	:	2.00	DATE ANALYZED :	11/2/88
QUANTITATION SCAN, AREA	:	1131 43024		

chemical name	scan	area	RT	RRT	ppb
acetaldehyde	60	30178	3.42	0.13	72
acetone	227	17081	5.73	0.27	41
2-propanol	255	13757	6.11	0.29	33
3-methyl-2-butanone	430	16106	8.53	0.63	38
trimethylsilanol	440	10175	8.67	0.44	24
siloxane	829	428480	14.05	0.75	1000
hexanal	881	15599	14.77	0.80	37
heptanal	1086	10672	17.61	0.96	25
terpene	1105	16325	17.87	0.98	39
alkene/cycloalkane	1123	16141	18.12	0.99	38
siloxane	1148	157353	18.47	1.01	380
C10 terpene	1188	22631	19.02	1.05	53
C10 terpene	1200	16447	19.19	1.06	39
benzaldehyde	1269	34499	19.87	1.10	82
octanal	1274	19663	20.21	1.12	47
alkene/cycloalkane	1326	12868	20.93	1.16	31
siloxane	1400	31092	21.96	1.22	74
siloxane	1415	99511	22.16	1.23	240
acetophenone	1442	15949	22.54	1.25	38
nonanal	1445	16126	22.58	1.25	38
siloxane	1558	15630	24.14	1.35	37
siloxane	1675	20947	25.76	1.44	50

NON-TARGET COMPOUNDS

SOIL GAS ANALYSIS BY GC/MS

SITE NAME	:	POLLUTION ABATEMENT SERVICES, OSWEGO, NY		
SAMPLE NAME/NUMBER	:	ST-1 (DEEP)		
SAMPLE VOLUME (CC)	:	100	FRN :	80858
QUANTITATION CONCENTRATION (PPB):		5125	DATE SAMPLED :	10/21/88
QUANTITATION VOLUME (CC)	:	2.00	DATE ANALYZED:	11/2/88
QUANTITATION SCAN, AREA	:	1133 43024		

chemical name	scan	area	RT	RRT	ppb
acetaldehyde	60	36412	3.40	0.13	87
acetone	229	41675	5.75	0.27	99
3-methyl-2-butanone	431	12767	8.55	0.43	30
siloxane	831	289328	14.08	0.76	690
hexanal	883	13061	14.80	0.80	31
siloxane	1149	116994	18.48	1.01	280
benzaldehyde	1251	22417	19.89	1.10	53
octanal	1274	11927	20.21	1.11	28
alkene/cycloalkane	1327	12301	20.94	1.16	29
siloxane	1400	16089	21.95	1.22	38
siloxane	1416	89169	22.17	1.23	210
nonanal	1446	24244	22.59	1.25	58
siloxane	1677	27803	25.78	1.44	66

NON-TARGET COMPOUNDS

SOIL GAS ANALYSIS BY GC/MS

SITE NAME	:	POLLUTION ABATEMENT SERVICES, OSWEGO, NY			
SAMPLE NAME/NUMBER	:	MT-8			
SAMPLE VOLUME (CC)	:	100		FRN	: 80859
QUANTITATION CONCENTRATION (PPB):		5125		DATE SAMPLED	: 10/21/88
QUANTITATION VOLUME (CC)	:	2.00		DATE ANALYZED	: 11/2/88
QUANTITATION SCAN, AREA	:	1134	43024		

chemical name	scan	area	RT	RRT	ppb
C4 alkene	42	13922	3.17	0.12	33
acetaldehyde	63	29554	3.46	0.13	70
acetone	231	15411	5.78	0.27	37
2-propanol	258	20038	6.15	0.29	48
1-butanol	620	24594	11.16	0.58	59
siloxane	831	86816	14.08	0.75	210
hexanal	883	13196	14.80	0.80	31
C6 alkene/cycloalkane	1126	40255	18.16	0.99	96
siloxane	1150	177306	18.49	1.01	420
alkene/cycloalkane	1226	12350	19.55	1.07	29
benzaldehyde	1252	32263	19.91	1.10	77
octanal	1277	12785	20.25	1.12	30
C10 terpene	1286	11201	20.38	1.12	27
alkene/cycloalkane	1329	21690	20.97	1.16	52
siloxane	1418	149050	22.20	1.23	360
acetophenone	1444	14174	22.56	1.25	34
nonanal	1448	19966	22.62	1.25	48
siloxane	1675	22130	25.76	1.44	53

NON-TARGET COMPOUNDS

SOIL GAS ANALYSIS BY GC/MS

SITE NAME	:	POLLUTION ABATEMENT SERVICES, OSWEGO, NY		
SAMPLE NAME/NUMBER	:	MT-6		
LOCATION	:			
SAMPLE VOLUME (CC)	:	20	FRN	: 80860
QUANTITATION CONCENTRATION (PPB)	:	5125	DATE SAMPLED	: 10/21/88
QUANTITATION VOLUME (CC)	:	2.00	DATE ANALYZED	: 11/2/88
QUANTITATION SCAN, AREA	:	1136 43024		

chemical name	scan	area	RT	RRT	ppb
C4 alkene	40	11024	3.14	0.11	130
acetaldehyde	62	25532	3.44	0.13	300
acetone	232	15712	5.80	0.27	190
2-propanol	261	14063	6.20	0.29	170
siloxane	831	76965	14.08	0.75	920
C8 alkene/cycloalkane	875	20453	14.69	0.79	240
hexanal	884	11615	14.81	0.80	140
C9 terpene	985	19366	16.21	0.88	230
C10 terpene	1091	101772	17.68	0.96	1200
C10 terpene	1110	505333	17.94	0.98	6000
cyclohexanone	1129	38873	18.20	0.99	460
C10 terpene - siloxane	1151	456152	18.51	1.01	5400
C10 terpene	1196	70095	19.18	1.05	830
C10 terpene	1206	274072	19.27	1.06	3300
C10 terpene	1254	265514	19.93	1.10	3200
limonene	1289	154891	20.42	1.12	1800
C10 terpene	1303	23011	20.61	1.14	270
C10 terpene	1336	10152	21.07	1.16	120
siloxane	1421	100541	22.25	1.23	1200
acetophenone	1447	13628	22.61	1.25	160
nonanal	1450	18625	22.65	1.25	220
siloxane	1678	18374	25.80	1.44	220

NON-TARGET COMPOUNDS

SOIL GAS ANALYSIS BY GC/MS

SITE NAME	:	POLLUTION ABATEMENT SERVICES, OSWEGO, NY			
SAMPLE NAME/NUMBER	:	WT-6 (DUP)			
LOCATION	:				
SAMPLE VOLUME (CC)	:	100		FRN	: 80861
QUANTITATION CONCENTRATION (PPB)	:	5125		DATE SAMPLED	: 10/21/88
QUANTITATION VOLUME (CC)	:	2.00		DATE ANALYZED	: 11/2/88
QUANTITATION SCAN, AREA	:	1135	43024		

chemical name	scan	area	RT	RRT	ppb
C4 alkene	40	10806	3.14	0.11	26
acetaldehyde	61	16499	3.43	0.13	39
acetone	228	41783	5.76	0.27	100
siloxane	832	66738	14.09	0.75	160
C8 alkyne/diene/cycloalkene	875	20932	14.69	0.79	50
hexanal	884	10565	14.81	0.80	25
C9 terpene	984	19186	16.20	0.88	46
C8 terpene	1002	11406	16.45	0.89	27
C10 terpene	1089	104999	17.65	0.96	250
C10 terpene	1109	545558	17.93	0.98	1300
cyclohexanone	1127	34049	18.18	0.99	81
C10 terpene + siloxane	1150	435749	18.50	1.01	1000
C10 terpene	1192	81710	19.08	1.05	190
C10 terpene	1204	294034	19.24	1.06	700
C10 terpene	1253	276075	19.92	1.10	660
octanal + C10 terpene	1278	16280	20.27	1.12	39
limonene	1287	168095	20.39	1.12	400
C10 terpene	1302	24308	20.60	1.14	58
carene	1333	10895	21.06	1.16	26
siloxane	1419	123987	22.22	1.23	300
nonanal	1449	32571	22.64	1.25	78
siloxane	1677	20825	25.79	1.44	50

NON-TARGET COMPOUNDS

SOIL GAS ANALYSIS BY GC/MS

SITE NAME	:	POLLUTION ABATEMENT SERVICES, OSWEGO, NY			
SAMPLE NAME/NUMBER	:	NW-4			
SAMPLE VOLUME (CC)	:	100	FRN	:	80862
QUANTITATION CONCENTRATION (PPB):		5125	DATE SAMPLED	:	10/21/88
QUANTITATION VOLUME (CC)	:	2.00	DATE ANALYZED:		11/2/88
QUANTITATION SCAN, AREA	:	1127 43024			

chemical name	scan	area	RT	RRT	ppb
2-methylpropane	18	15488	2.87	0.10	37
acetaldehyde	59	26215	3.44	0.13	62
2-methylbutane	117	24681	4.24	0.18	59
ethanol + 1,2-dichloro-1,1,2-trifluoroethane	191	13282	5.26	0.24	32
acetone	228	22125	5.77	0.27	53
2-propanol	255	16569	6.15	0.29	39
2-methylpentane	282	39228	6.52	0.31	93
3-methylpentane	314	32008	6.96	0.34	76
n-hexane	349	10174	7.45	0.37	24
methylcyclopentane	425	19812	8.30	0.43	47
alkane	619	15613	11.18	0.59	37
siloxane	829	128562	14.09	0.76	310
hexanal	881	13911	14.81	0.80	33
alkane	1066	13381	17.37	0.95	32
C11 alkane	1127	221569	18.21	1.00	530
siloxane	1147	136763	18.49	1.02	330
alkane	1156	36872	18.59	1.02	88
alkane + siloxane	1191	58712	19.10	1.05	140
alkane + alkene/cycloalkane	1221	13098	19.51	1.08	31
alkane	1235	142463	19.71	1.09	340
benzaldehyde	1249	26539	19.90	1.10	63
alkane	1253	57949	19.96	1.10	140
alkane	1272	181034	20.22	1.12	430
alkane	1294	15918	20.52	1.14	38
alkane	1308	247253	20.72	1.15	590
alkane + alkene/cycloalkane	1325	10933	20.95	1.16	26
alkane	1338	54128	21.13	1.17	130
alkane + alkene/cycloalkane	1361	15104	21.45	1.19	36
alkane	1372	11847	21.61	1.20	28
siloxane	1414	137044	22.19	1.23	330
acetophenone	1440	20724	22.55	1.25	49
siloxane	1558	12156	24.18	1.35	29
siloxane	1674	44774	25.70	1.45	110

NON-TARGET COMPOUNDS

SOIL GAS ANALYSIS BY GC/MS

SITE NAME : POLLUTION ABATEMENT SERVICES, OSWEGO, NY
SAMPLE NAME/NUMBER : NT-3

SAMPLE VOLUME (CC)	:	100	FRN	: 80863
QUANTITATION CONCENTRATION (PPB)	:	5125	DATE SAMPLED	: 10/21/88
QUANTITATION VOLUME (CC)	:	2.00	DATE ANALYZED	: 11/2/88
QUANTITATION SCAN, AREA	:	1133 43024		

chemical name	scan	area	RT	RRT	ppb
acetaldehyde	60	21248	3.41	0.13	51
methanethiol	80	15083	3.69	0.15	36
acetone	227	29163	5.72	0.27	69
2-propanol	254	11729	6.10	0.29	28
siloxane	832	127667	14.09	0.76	300
hexanal	884	11993	14.81	0.80	29
siloxane	1150	121484	18.49	1.01	290
alkane - siloxane	1196	13930	19.10	1.05	33
benzaldehyde	1252	23082	19.90	1.10	55
octanal	1276	12721	20.23	1.12	30
siloxane	1417	79505	22.19	1.23	190
acetophenone	1443	10683	22.55	1.25	25
nonanal	1447	15462	22.60	1.25	37
siloxane	1560	12277	24.16	1.35	29
siloxane	1675	15048	25.75	1.44	36

NON-TARGET COMPOUNDS

SOIL GAS ANALYSIS BY GC/MS

SITE NAME	:	POLLUTION ABATEMENT SERVICES, OSWEGO, NY		
SAMPLE NAME/NUMBER	:	MW-2		
LOCATION	:			
SAMPLE VOLUME (CC)	:	20	FRN	: 80864
QUANTITATION CONCENTRATION (PPB)	:	5125	DATE SAMPLED	: 10/21/88
QUANTITATION VOLUME (CC)	:	2.00	DATE ANALYZED	: 11/2/88
QUANTITATION SCAN, AREA	:	1133 43024		

chemical name	scan	area	RT	RRT	ppb
2-methylpropane	15	16702	2.82	0.09	200
acetaldehyde	56	16120	3.39	0.13	190
2-methylbutane	114	94340	4.19	0.17	1100
1,2-dichloro-1,1,2-trifluoroethane	190	36203	5.24	0.24	430
1,1,2-trichloro-1,2,2-trifluoroethane	215	66805	5.59	0.26	800
acetone	226	39265	5.74	0.26	470
2-propanol	254	10834	6.13	0.29	130
2-methylpentane	282	71114	6.52	0.31	850
3-methylpentane	314	35473	6.96	0.34	420
C6 alkene/cycloalkane	427	34575	8.52	0.43	410
1,2-dichloroethene + trimethylsilanol	443	12359	8.74	0.44	150
C6 alkene/cycloalkane	509	72371	9.66	0.49	860
3-methylhexane	526	15162	9.89	0.51	180
alkane	557	23726	10.32	0.53	280
C7 alkene/cycloalkane	568	10290	10.47	0.54	120
C8 alkene/cycloalkane	621	13618	11.21	0.58	160
methylcyclohexane	651	29583	11.62	0.61	350
alkane	718	11513	12.55	0.66	140
siloxane	835	271364	14.17	0.76	3200
hexanal	887	14655	14.89	0.80	170
alkane	1073	24160	17.46	0.95	290
C11 alkane	1133	350312	18.29	1.00	4200
siloxane	1156	339444	18.58	1.02	4000
alkane	1161	76874	18.68	1.02	920
alkane	1197	90043	19.18	1.05	1100
alkane	1233	55786	19.68	1.08	660
C11 alkane	1241	280436	19.79	1.09	3300
alkane	1259	115633	20.04	1.10	1400
alkane	1277	333304	20.29	1.12	4000
alkane	1300	29411	20.61	1.14	350
alkane	1313	437494	20.79	1.15	5200
alkane	1343	76363	21.20	1.17	910
alkane	1366	19291	21.52	1.19	230
siloxane	1377	17263	21.67	1.20	210
nonanal	1419	63137	22.25	1.23	750
	1448	15885	22.66	1.26	190

TABLE 4

VOLATILE ORGANIC COMPOUNDS ANALYSIS

PROJECT # :	#1282 - PAS, Oswego				
SAMPLE # :	3784	3799	3782	3783	
LOCATION :	Fld Blnk	MW11B	SW3	SW6	
FILE # :	^A0752	^A0753	^A0750	^A0751	
DIL. FACT.:	1	1	1	1	0

COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL
Dichlorodifluoromethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
Chloromethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
Vinylchloride	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
Bromomethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
Chloroethane	ND	1.0	ND	1.0	ND	1.0	231	1.0		
Trichlorofluoromethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
1,1-Dichloroethene	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
Methylene Chloride	ND	1.0	ND	1.0	1.6	1.0	8.8	1.0		
trans-1,2-Dichloroethene	ND	1.0	ND	1.0	1.2	1.0	4.4	1.0		
1,1-Dichloroethane	ND	1.0	ND	1.0	3.1	1.0	88	1.0		
2,2-Dichloropropane	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
cis-1,2-Dichloroethene	ND	1.0	ND	1.0	3.7	1.0	ND	1.0		
Chloroform	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
Bromochloromethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
1,1,1-Trichloroethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
Carbon Tetrachloride	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
chloropropene	ND	1.0	ND	1.0	ND	1.0	1.1	1.0		
[illegible]	ND	1.0	ND	1.0	61	1.0	682	1.0		
1,2-Dichloroethane	ND	1.0	ND	1.0	1.7	1.0	18	1.0		
Trichloroethene	ND	1.0	ND	1.0	2.2	1.0	3.7	1.0		
1,2-Dichloropropane	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
Dibromomethane	ND	1.0	ND	1.0	ND	1.0	1.0	1.0		
Bromodichloromethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
trans-1,3-Dichloropropene	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
cis-1,3-Dichloropropene	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
Toluene	2.3	1.0	0.4(J)	1.0	3.2	1.0	3192	1.0		
1,1,2-Trichloroethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
Tetrachloroethene	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
1,3-Dichloropropane	ND	1.0	ND	1.0	ND	1.0	1.1	1.0		
Dibromochloromethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
1,2-Dibromoethane	ND	1.0	ND	1.0	ND	1.0	1.4	1.0		
Chlorobenzene	ND	1.0	ND	1.0	75	1.0	6.7	1.0		
1,1,1,2-Tetrachloroethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
Ethylbenzene	0.8(J)	1.0	0.3(J)	1.0	245	1.0	684	1.0		
p & m-Xylene	2.7	1.0	1.0	1.0	87	1.0	1666	1.0		
o-Xylene	1.1	1.0	ND	1.0	23	1.0	648	1.0		
Styrene	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
Bromoform	ND	1.0	ND	1.0	ND	1.0	1.2	1.0		

Concentrations in Microgram per Liter
Results are Blank Subtracted
(J) Below Method Detection limit
ND Indicates compound Not Detected.

VOLATILE ORGANIC COMPOUNDS ANALYSIS

PROJECT # :	#1202 - PAS, Oswego				
SAMPLE # :	3784	3799	3782	3783	
LOCATION :	Fld Blnk	MW118	SWM3	SWM6	
FILE :	^A0752	^A0753	^A0758	^A0751	
DIL. FACT.:	1	1	1	1	0

COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL
Isopropylbenzene	ND	1.0	ND	1.0	3.9	1.0	9.3	1.0		
Bromobenzene	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
1,1,2,2-Tetrachloroethane	ND	1.0	ND	1.0	0.5(J)	1.0	1.7	1.0		
1,2,3-Trichloropropane	ND	1.0	ND	1.0	ND	1.0	2.7	1.0		
n-Propylbenzene	ND	1.0	ND	1.0	2.8	1.0	7.8	1.0		
2-Chlorotoluene	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
1,3,5-Trimethylbenzene	ND	1.0	ND	1.0	6.1	1.0	92	1.0		
4-Chlorotoluene	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
tert-Butylbenzene	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
1,2,4-Trimethylbenzene	ND	1.0	0.2(J)	1.0	17	1.0	104	1.0		
sec-Butylbenzene	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
p-Isopropyltoluene	ND	1.0	ND	1.0	1.6	1.0	3.5	1.0		
1,3-Dichlorobenzene	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
1,4-Dichlorobenzene	ND	1.0	ND	1.0	ND	1.0	2.5	1.0		
1,2-Dichlorobenzene	ND	1.0	ND	1.0	6.6	1.0	72	1.0		
n-Butylbenzene	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
1,2-Dibromo-3-Chloropropane	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
Trichlorobenzene	ND	1.0	ND	1.0	0.5(J)	1.0	1.4	1.0		
Hexachlorobutadiene	ND	1.0	ND	1.0	1.2	1.0	3.1	1.0		
Naphthalene	ND	1.0	ND	1.0	3.1	1.0	22	1.0		
1,2,3-Trichlorobenzene	ND	1.0	ND	1.0	0.8(J)	1.0	2.2	1.0		

Concentrations in Microgram per Liter
Results are Blank Subtracted
(J) Below Method Detection
ND Indicates compound Not Detected

VOLATILE ORGANIC COMPOUNDS ANALYSIS

PROJECT # :	#1202 - PAS Oswego				
SAMPLE # :	3780	3781	3777	3778	3779
LOCATION :	SW1	SW4	MW11A	MW11Adupe	MW11Adupe
FILE # :	^A0762	^A0749	^A0745	^A0746	^A0747
DIL. FACT.:	1	1	1	1	1

COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL
Dichlorodifluoromethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Chloromethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Vinylchloride	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Bromomethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Chloroethane	ND	1.0	36	1.0	ND	1.0	ND	1.0	ND	1.0
Trichlorofluoromethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
1,1-Dichloroethene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Methylene Chloride	ND	1.0	1.8	1.0	ND	1.0	ND	1.0	ND	1.0
trans-1,2-Dichloroethene	ND	1.0	1.8	1.0	ND	1.0	ND	1.0	ND	1.0
1,1-Dichloroethane	ND	1.0	2.2	1.0	ND	1.0	ND	1.0	ND	1.0
2,2-Dichloropropane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
cis-1,2-Dichloroethene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Chloroform	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Bromochloromethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
1,1,1-Trichloroethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Carbon Tetrachloride	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
[illegible]chloropropene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
[illegible]e	ND	1.0	118	1.0	ND	1.0	ND	1.0	ND	1.0
1,2-Dichloroethane	ND	1.0	2.5	1.0	ND	1.0	ND	1.0	ND	1.0
Trichloroethene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
1,2-Dichloropropane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Dibromomethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Bromodichloromethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
trans-1,3-Dichloropropene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
cis-1,3-Dichloropropene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Toluene	ND	1.0	91	1.0	ND	1.0	ND	1.0	ND	1.0
1,1,2-Trichloroethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Tetrachloroethene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
1,3-Dichloropropane	ND	1.0	0.5(J)	1.0	ND	1.0	ND	1.0	ND	1.0
Dibromochloromethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
1,2-Dibromoethane	ND	1.0	0.6(J)	1.0	ND	1.0	ND	1.0	ND	1.0
Chlorobenzene	ND	1.0	22	1.0	ND	1.0	ND	1.0	ND	1.0
1,1,1,2-Tetrachloroethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Ethylbenzene	ND	1.0	188	1.0	ND	1.0	ND	1.0	ND	1.0
p & m-Xylene	ND	1.0	119	1.0	ND	1.0	ND	1.0	ND	1.0
o-Xylene	ND	1.0	45	1.0	ND	1.0	ND	1.0	ND	1.0
Styrene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Bromoform	ND	1.0	0.5(J)	1.0	ND	1.0	ND	1.0	ND	1.0

Concentrations in Micrograms per Liter
Results are Blank Subtracted
(J) Below Method Detection limit
ND Indicates compound Not Detected.

VOLATILE ORGANIC COMPOUNDS ANALYSIS

PROJECT # :	81282 - PAS Oswego				
SAMPLE # :	3780	3781	3777	3778	3779
LOCATION :	SWM1	SWM4	MW11A	MW11Adupe	MW11Adupe
FILE :	^A0762	^A0749	^A0745	^A0746	^A0747
DIL. FACT.:	1	1	1	1	1

COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL
Isopropylbenzene	ND	1.0	9.5	1.0	ND	1.0	ND	1.0	ND	1.0
Bromobenzene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
1,1,2,2-Tetrachloroethane	ND	1.0	0.9(J)	1.0	ND	1.0	0.6(J)	1.0	ND	1.0
1,2,3-Trichloropropane	ND	1.0	1.0(J)	1.0	ND	1.0	ND	1.0	ND	1.0
n-Propylbenzene	ND	1.0	1.0	1.0	ND	1.0	ND	1.0	ND	1.0
2-Chlorotoluene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
1,3,5-Trimethylbenzene	ND	1.0	4.3	1.0	ND	1.0	ND	1.0	ND	1.0
4-Chlorotoluene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
tert-Butylbenzene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
1,2,4-Trimethylbenzene	ND	1.0	7.8	1.0	ND	1.0	ND	1.0	ND	1.0
sec-Butylbenzene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
p-Isopropyltoluene	ND	1.0	2.5	1.0	ND	1.0	ND	1.0	ND	1.0
1,3-Dichlorobenzene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
1,4-Dichlorobenzene	ND	1.0	0.3(J)	1.0	ND	1.0	ND	1.0	ND	1.0
1,2-Dichlorobenzene	ND	1.0	1.5	1.0	ND	1.0	ND	1.0	ND	1.0
n-Butylbenzene	ND	1.0	0.5(J)	1.0	ND	1.0	ND	1.0	ND	1.0
1,2-Dibromo-3-Chloropropane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Trichlorobenzene	ND	1.0	0.7(J)	1.0	ND	1.0	ND	1.0	ND	1.0
[illegible]lorobutadiene	ND	1.0	1.4	1.0	ND	1.0	ND	1.0	ND	1.0
Naphthalene	ND	1.0	1.6	1.0	ND	1.0	0.7(J)	1.0	ND	1.0
1,2,3-Trichlorobenzene	ND	1.0	1.0	1.0	ND	1.0	0.4(J)	1.0	ND	1.0

Concentrations in Microgram per Liter
Results are Blank Subtracted
(J) Below Method Detection
ND Indicates compound Not Detected

REFERENCES

Environmental Protection Agency, Environmental Response Team. *"Soil Gas Standard Operating Procedure for EPA Environmental Response Team."* 1988.

Marrin, Donn L. *"Soil-Gas Sampling and Misinterpretation,"* Ground Water Monitoring Review. Spring 1988.

APPENDIX E

Analytical Report
VOC Groundwater Samples

ANALYTICAL REPORT

PAS OSWEGO
OSWEGO, N.Y.

November 21, 1988

EPA Work Assignment No.: 1-202
Weston Work Order No.: 3347-01-01-1202
EPA Contract No.: 68-03-3482

Submitted to:
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EPA/ERT

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Date

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Y. Lin

eh/ANA-1202

TABLE OF CONTENTS

INTRODUCTION

On October 20, 1988, nine water samples were received from the Pas Oswego site in Oswego, N.Y. The samples were to be analyzed for volatile organic compounds.

ANALYTICAL PROCEDURES

A modified 524.2 method for the analysis of Volatile Organic Compounds in water and soil was used. Samples were purged, trapped, and desorbed to a GC/MS system. The following conditions and parameters were practiced:

1) Purge and Trap Unit: A Tekmar concentrator (LSC 2000) equipped with an autosampler (ALS2016) was utilized.

   Purge and trap parameters:

   Purge - 11 min. at 25°C
   Desorb - 4 min. at 220°C
   Purge flow rate - 40 ml/min.
   Dry Purge - 9 min. at 25°C
   Bake - 6 min. at 240°C

   Trap - A 2 part trap containing Supelco Carbopack B (200 mg) and Carbosieve S-III (50 mg) was used.

2) GC/MS System: A Hewlett Packard 5995C GC/MS equipped with RTE/6VM data system was used.

   GC/MS Parameters:

   GC Column - 30 meter long x 0.53 mm ID, DB-624 Megabore (J&W Scientific, Inc.) column with 3 um film thickness.

   GC Temperature - 5 min. at 10°C ramped to 160°C at 6°/min., and kept for 4 min.

   GC Flow Rate - Helium at about 10 ml/min.

   GC/MS Interface - Glass lined jet separator with about 15 ml of make up gas at 250°C.

   Mass Spectrometer - Electron Impact Ionization at a nominal electron energy of 70 eV, scanning from 35-300 amu at about one scan per second.

   Computer - Preprogrammed to plot Extracted Ion Current Profile (EICP). Also capable of integrating ions and plotting abundances versus time or scan number. A forward library (NBS-Wiley) search for tentatively identified compounds was performed on samples.

   Depending on levels of detection limits, aliquots of 5 or 25 ml of sample were used. To examine the mass spectral data, 50 ng of p-Bromofluorobenzene was injected to ensure sufficient precision of mass spectra.

eh:rd/ANA-1804

TABLE 1
VOLATILE ORGANIC COMPOUNDS ANALYSIS

PROJECT # :	#1202 - PAS, Oswego				
SAMPLE # :	3784	3799	3792	3783	
LOCATION :	Fld Blnk	MW11B	SWW3	SWW6	
FILE # :	^A0752	^A0753	^A0750	^A0751	
DIL. FACT.:	1	1	1	1	0

COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL
Dichlorodifluoromethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
Chloromethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
Vinylchloride	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
Bromomethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
Chloroethane	ND	1.0	ND	1.0	ND	1.0	231	1.0		
Trichlorofluoromethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
1,1-Dichloroethene	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
Methylene Chloride	ND	1.0	ND	1.0	1.6	1.0	8.8	1.0		
trans-1,2-Dichloroethene	ND	1.0	ND	1.0	1.2	1.0	4.4	1.0		
1,1-Dichloroethane	ND	1.0	ND	1.0	3.1	1.0	38	1.0		
2,2-Dichloropropane	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
cis-1,2-Dichloroethene	ND	1.0	ND	1.0	3.7	1.0	ND	1.0		
Chloroform	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
Bromochloromethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
1,1,1-Trichloroethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
Carbon Tetrachloride	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
1,2-Dichloropropene	ND	1.0	ND	1.0	ND	1.0	1.1	1.0		
Benzene	ND	1.0	ND	1.0	61	1.0	682	1.0		
1,2-Dichloroethane	ND	1.0	ND	1.0	1.7	1.0	10	1.0		
Trichloroethene	ND	1.0	ND	1.0	2.2	1.0	3.7	1.0		
1,2-Dichloropropane	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
Dibromomethane	ND	1.0	ND	1.0	ND	1.0	1.0	1.0		
Bromodichloromethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
trans-1,3-Dichloropropene	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
cis-1,3-Dichloropropene	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
Toluene	2.3	1.0	0.4(J)	1.0	3.2	1.0	3192	1.0		
1,1,2-Trichloroethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
Tetrachloroethene	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
1,3-Dichloropropane	ND	1.0	ND	1.0	ND	1.0	1.1	1.0		
Dibromochloromethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
1,2-Dibromoethane	ND	1.0	ND	1.0	ND	1.0	1.4	1.0		
Chlorobenzene	ND	1.0	ND	1.0	75	1.0	6.7	1.0		
1,1,1,2-Tetrachloroethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
Ethylbenzene	0.8(J)	1.0	0.3(J)	1.0	245	1.0	684	1.0		
p & m-Xylene	2.7	1.0	1.0	1.0	87	1.0	1666	1.0		
o-Xylene	1.1	1.0	ND	1.0	23	1.0	648	1.0		
Styrene	ND	1.0	ND	1.0	ND	1.0	ND	1.0		
Bromoform	ND	1.0	ND	1.0	ND	1.0	ND	1.0		

Concentrations in Microgram per Liter
Results are Blank Subtracted
(J) Below Method Detection limit
ND Indicates compound Not Detected.

TABLE 1

VOLATILE ORGANIC COMPOUNDS ANALYSIS

PROJECT # :	#1202 - PAS, Oswego											
SAMPLE # :	3784		3799		3782		3783					
LOCATION :	Fld Blnk		MW11B		SWM3		SWM6					
FILE :	^A0752		^A0753		^A0750		^A0751					
DIL. FACT.:	1		1		1		1		0			
COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL		
	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l		
Isopropylbenzene	ND	1.0	ND	1.0	3.9	1.0	9.3	1.0			14	
Bromobenzene	ND	1.0	ND	1.0	ND	1.0	ND	1.0				
1,1,2,2-Tetrachloroethane	ND	1.0	ND	1.0	0.5(J)	1.0	1.7	1.0			15	
1,2,3-Trichloropropane	ND	1.0	ND	1.0	ND	1.0	2.7	1.0			16	
n-Propylbenzene	ND	1.0	ND	1.0	2.0	1.0	7.8	1.0			17	
2-Chlorotoluene	ND	1.0	ND	1.0	ND	1.0	ND	1.0				
1,3,5-Trimethylbenzene	ND	1.0	ND	1.0	6.1	1.0	92	1.0			18	
4-Chlorotoluene	ND	1.0	ND	1.0	ND	1.0	ND	1.0				
tert-Butylbenzene	ND	1.0	ND	1.0	ND	1.0	ND	1.0				
1,2,4-Trimethylbenzene	ND	1.0	0.2(J)	1.0	17	1.0	104	1.0			19	
sec-Butylbenzene	ND	1.0	ND	1.0	ND	1.0	ND	1.0				
p-Isopropyltoluene	ND	1.0	ND	1.0	1.6	1.0	3.5	1.0			20	
1,3-Dichlorobenzene	ND	1.0	ND	1.0	ND	1.0	ND	1.0				
1,4-Dichlorobenzene	ND	1.0	ND	1.0	ND	1.0	2.5	1.0			21	
1,2-Dichlorobenzene	ND	1.0	ND	1.0	6.6	1.0	72	1.0			22	
n-Butylbenzene	ND	1.0	ND	1.0	ND	1.0	ND	1.0				
1,2-Dibromo-3-Chloropropane	ND	1.0	ND	1.0	ND	1.0	ND	1.0				
Trichlorobenzene	ND	1.0	ND	1.0	0.5(J)	1.0	1.4	1.0			23	
Hexachlorobutadiene	ND	1.0	ND	1.0	1.2	1.0	3.1	1.0			24	
Naphthalene	ND	1.0	ND	1.0	3.1	1.0	22	1.0			25	
1,2,3-Trichlorobenzene	ND	1.0	ND	1.0	0.8(J)	1.0	2.2	1.0			26	

Concentrations in Microgram per Liter
Results are Blank Subtracted
(J) Below Method Detection
ND Indicates compound Not Detected

TABLE 1
VOLATILE ORGANIC COMPOUNDS ANALYSIS

PROJECT # :	#1202 - PAS Oswego				
SAMPLE # :	3780	3781	3777	3778	3779
LOCATION :	SWW1	SWW4	MW11A	MW11Adupe	MW11Adupe
FILE # :	^A0762	^A0749	^A0745	^A0746	^A0747
DIL. FACT.:	1	1	1	1	1

COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL
Dichlorodifluoromethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Chloromethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Vinylchloride	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Bromomethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Chloroethane	ND	1.0	36	1.0	ND	1.0	ND	1.0	ND	1.0
Trichlorofluoromethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
1,1-Dichloroethene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Methylene Chloride	ND	1.0	1.8	1.0	ND	1.0	ND	1.0	ND	1.0
trans-1,2-Dichloroethene	ND	1.0	1.8	1.0	ND	1.0	ND	1.0	ND	1.0
1,1-Dichloroethane	ND	1.0	2.2	1.0	ND	1.0	ND	1.0	ND	1.0
2,2-Dichloropropane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
cis-1,2-Dichloroethene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Chloroform	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Bromochloromethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
1,1,1-Trichloroethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Carbon Tetrachloride	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
1,1-Dichloropropene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Benzene	ND	1.0	118	1.0	ND	1.0	ND	1.0	ND	1.0
1,2-Dichloroethane	ND	1.0	2.5	1.0	ND	1.0	ND	1.0	ND	1.0
Trichloroethene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
1,2-Dichloropropane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Dibromomethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Bromodichloromethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
trans-1,3-Dichloropropene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
cis-1,3-Dichloropropene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Toluene	ND	1.0	91	1.0	ND	1.0	ND	1.0	ND	1.0
1,1,2-Trichloroethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Tetrachloroethene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
1,3-Dichloropropane	ND	1.0	0.5(J)	1.0	ND	1.0	ND	1.0	ND	1.0
Dibromochloromethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
1,2-Dibromoethane	ND	1.0	8.6(J)	1.0	ND	1.0	ND	1.0	ND	1.0
Chlorobenzene	ND	1.0	22	1.0	ND	1.0	ND	1.0	ND	1.0
1,1,1,2-Tetrachloroethane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Ethylbenzene	ND	1.0	180	1.0	ND	1.0	ND	1.0	ND	1.0
p & m-Xylene	ND	1.0	119	1.0	ND	1.0	ND	1.0	ND	1.0
o-Xylene	ND	1.0	45	1.0	ND	1.0	ND	1.0	ND	1.0
Styrene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
Bromoform	ND	1.0	0.5(J)	1.0	ND	1.0	ND	1.0	ND	1.0
[illegible]	[illegible]	1.0	[illegible]	1.0	ND	1.0	ND	1.0	ND	1.0

Concentrations in Microgram per Liter
Results are Blank Subtracted
(J) Below Method Detection Limit
ND Indicates compound Not Detected.

TABLE 1
VOLATILE ORGANIC COMPOUNDS ANALYSIS

PROJECT # :	#1202 - PAS Oswego									
SAMPLE # :	3780		3781		3777		3778		3779	
LOCATION :	SWM1		SWM4		MW11A		MW11Adupe		MW11Adupe	
FILE :	^A0762		^A0749		^A0745		^A0746		^A0747	
DIL. FACT.:	1		1		1		1		1	
COMPOUND	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL	CONC.	MDL
Isopropylbenzene	ND	1.0	[illegible]	[illegible]	ND	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Bromobenzene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
1,1,2,2-Tetrachloroethane	ND	1.0	0.9(J)	1.0	ND	1.0	0.6(J)	1.0	ND	1.0
1,2,3-Trichloropropane	ND	1.0	1.0(J)	1.0	ND	1.0	ND	1.0	ND	1.0
n-Propylbenzene	ND	1.0	1.0	1.0	ND	1.0	ND	1.0	ND	1.0
2-Chlorotoluene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
1,3,5-Trimethylbenzene	ND	1.0	4.3	1.0	ND	1.0	ND	1.0	ND	1.0
4-Chlorotoluene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
tert-Butylbenzene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
1,2,4-Trimethylbenzene	ND	1.0	7.8	1.0	ND	1.0	ND	1.0	ND	1.0
sec-Butylbenzene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
p-Isopropyltoluene	ND	1.0	2.5	1.0	ND	1.0	ND	1.0	ND	1.0
1,3-Dichlorobenzene	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	[illegible]
1,4-Dichlorobenzene	ND	1.0	0.3(J)	1.0	ND	1.0	ND	1.0	ND	[illegible]
1,2-Dichlorobenzene	ND	1.0	1.5	1.0	ND	1.0	ND	1.0	ND	[illegible]
n-Butylbenzene	ND	1.0	0.5(J)	1.0	ND	1.0	ND	1.0	ND	[illegible]
[illegible]-Dibromo-3-Chloropropane	ND	1.0	ND	1.0	ND	1.0	ND	1.0	ND	[illegible]
Trichlorobenzene	ND	1.0	0.7(J)	1.0	ND	1.0	ND	1.0	ND	[illegible]
[illegible]lorobutadiene	ND	1.0	1.4	1.0	ND	1.0	ND	1.0	ND	[illegible]
Naphthalene	ND	1.0	1.6	1.0	ND	1.0	0.7(J)	1.0	ND	[illegible]
1,2,3-Trichlorobenzene	ND	1.0	1.0	1.0	ND	1.0	0.4(J)	1.0	ND	[illegible]

Concentrations in Microgram per Liter
Results are Blank Subtracted
(J) Below Method Detection
ND Indicates compound Not Detected

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO. 3780

Lab Name: Weston-REAC Contract: 68-03-3482

Lab Code: — Case No.: 1202 SAS No.: — SDG No.: —

Matrix: (soil/water) Water Lab Sample ID: 3780

Sample wt/vol: 5 (g/mL) — l Lab File ID: >A0762

Level: (low/med) low Date Received: 10/20/88

% Moisture: not dec. — Date Analyzed: 10/20/88

Column: (pack/cap) Cap Dilution Factor: 1.0

Number TICs found: 1 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	110827	Cyclohexane	8.92	380	
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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO. 3781

Lab Name: Weston Rear Contract: 3347-01-01

Lab Code: NA Case No.: 1202 SAS No.: NA SDG No.: NA

Matrix: (soil/water) Water Lab Sample ID: 3781

Sample wt/vol: 5 (g/mL) — l Lab File ID: >A 0749

Level: (low/med) low Date Received: 10/20/88

% Moisture: not dec. _____ Date Analyzed: 10/20/88

Column: (pack/cap) Cap Dilution Factor: 1.0

Number TICs found: _____ CONCENTRATION UNITS: (ug/L or ug/Kg) ug/l

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	60297	Ethyl ether	3.50	6.0	
2.	109875	Methane, dimethoxy	4.05	42	
3.	000000 (NJ)	Propanol, methyl	5.87	10	
4.	109999	Tetrahydrofuran	8.93	20	
5.	110827	Cyclohexane	8.89	180	
6.	123911	1,4-Dioxane	11.81	36	
7.		Cycloalkane	22.95	70	
8.		Terpene	24.00	80	
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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO. 3777

Lab Name: Weston REAC Contract: 3347-01-01

Lab Code: NA Case No.: 1202 SAS No.: NA SDG No.: NA

Matrix: (soil/water) Water Lab Sample ID: 3777

Sample wt/vol: 5 (g/mL) ml Lab File ID: >A0745

Level: (low/med) low Date Received: 10/20/88

% Moisture: not dec. na Date Analyzed: 10/20/88

Column: (pack/cap) Cap Dilution Factor: 1.0

Number TICs found: 4 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		Unknown	7.14	12	
2.	110827	Cyclohexane	8.87	770	
3.		1,3-Dioxolane, methyl	9.97	39	
4.		Hexanediol	11.06	6	
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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO. 3778

Lab Name: Weston REAC Contract: 3347-01-01

Lab Code: NA Case No.: 1202 SAS No.: NA SDG No.: NA

Matrix: (soil/water) Water Lab Sample ID: 3778

Sample wt/vol: 5 (g/mL) ml Lab File ID: 7A0746

Level: (low/med) low Date Received: 10/20/88

% Moisture: not dec. na Date Analyzed: 10/20/88

Column: (pack/cap) Cap Dilution Factor: 1.0

Number TICs found: 5 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	109999	Tetrahydrofuran	8.37	1099 5.0	
2.	110827	Cyclohexane	8.87	330	
3.		Unknown	9.74	6.0	
4.		1,3-dioxolane, methyl	9.92	47	
5.		Possible Furan, tetramethyl	11.02	8.0	
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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO. 3779

Lab Name: Weston Reac Contract: 3347-01-01

Lab Code: NA Case No.: 1202 SAS No.: NA SDG No.: NA

Matrix: (soil/water) water Lab Sample ID: 3779

Sample wt/vol: 5 (g/mL) ml Lab File ID: >A0747

Level: (low/med) low Date Received: 10/20/88

% Moisture: not dec. _____ Date Analyzed: 10/20/88

Column: (pack/cap) Cap Dilution Factor: 1.0

Number TICs found: 5 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.		unknown	7.11	14	
2.	109999	Furan, tetrahydro-	8.39	5.0	
3.	110827	Cyclohexane	8.85	2.0	
4.		1,3-dioxolane, methyl	9.94	47	
5.		unknown	11.04	7.0	
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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO. 3784

Lab Name: Weston-REAC Contract: 68-03-3482

Lab Code: — Case No.: 1202 SAS No.: — SDG No.: —

Matrix: (soil/water) Water Lab Sample ID: 3784

Sample wt/vol: 5 (g/mL) ml Lab File ID: >AC752

Level: (low/med) low Date Received: 10/20/88

% Moisture: not dec. — Date Analyzed: 10/20/88

Column: (pack/cap) cap Dilution Factor: 1.0

Number TICs found: 2 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	110827	Cyclohexane	8.93	50	
2.	62533	Aniline	21.67	12	
3.					
4.					
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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO. 3799

Lab Name: Weston-REAC Contract: 68-03-3482

Lab Code: — Case No.: ____ SAS No.: — SDG No.: —

Matrix: (soil/water) Water Lab Sample ID: 3799

Sample wt/vol: 5 (g/mL) ml Lab File ID: >AC753

Level: (low/med) low Date Received: 10/20/88

% Moisture: not dec. — Date Analyzed: 10/20/88

Column: (pack/cap) Cap Dilution Factor: 1.0

Number TICs found: 1 CONCENTRATION UNITS: (ug/L or ug/Kg) ____

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	110827	Cyclohexane	8.87	100	
2.					
3.					
4.					
5.					
6.					
7.					
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VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO. 3782

Lab Name: Weston Reac Contract: 3347-01-01

Lab Code: NA Case No.: 1202 SAS No.: NA SDG No.: NA

Matrix: (soil/water) Water Lab Sample ID: 3782

Sample wt/vol: 5 (g/mL) — Lab File ID: 2A0750

Level: (low/med) low Date Received: 10/10/08

% Moisture: not dec. — Date Analyzed: 10/20/08

Column: (pack/cap) Cap Dilution Factor: 1.0

Number TICs found: ____ CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	109875	Methane, dimethoxy	4.00	12	
2.	109999	Tetrahydrofuran	5.38	6.0	
3.	110827	Cyclohexane	8.89	55	
4.	123911	1,4-Dioxane	11.81	19	
5.		Cyclohexane, methyl	22.95	7.0	
6.	121697	Benzenamine, N,N-dimethyl	23.91	15	
7.		Tetramethylbenzene	28.37	5.0	
8.		Indane, 5-methyl-	25.19	6.0	
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1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO. 3783

Lab Name: Weston-REAC Contract: 68-03-3482

Lab Code: — Case No.: 1202 SAS No.: — SDG No.: —

Matrix: (soil/water) Water Lab Sample ID: 3783

Sample wt/vol: 5 (g/mL) ml Lab File ID: >A0751

Level: (low/med) low Date Received: 10/21/88

% Moisture: not dec. — Date Analyzed: 10/20/88

Column: (pack/cap) Cap Dilution Factor: 1.0

Number TICs found: 17 CONCENTRATION UNITS: (ug/L or ug/Kg) ug/L

	CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.	60297	Ethyl ether	3.49	56	
2.	67641	2-Propanone	3.99	22	
3.	109999	tetrahydrofuran	8.42	65	
4.	110827	Cyclohexane	8.88	200	
5.		possible Ketone C5	10.47	11	
6.		unknown	14.99	49	
7.		NIBK	17.37	5	
8.		Alkyl benzene, C_9H_{12}	19.97	16	
9.	62533	Aniline	21.71	270	
10.		Benzene, trimethyl (1,3,5)	22.99	44	
11.	116029	Cyclohexanol, trimethyl	23.22	12	
12.		Ethanone, methyl	23.86	8	
13.		Indene, dihydrodimethyl	25.14	7	
14.		Phenol, dimethyl	25.46	11	
15.		Phenol, triethyl	27.66	6	
16.		Phenol, tetramethyl	29.62	5	
17.		Phenol, tetramethyl	30.40	6	
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QA/QC PROCEDURES

Table 2A lists the results of the surrogate standard recoveries. All surrogate recoveries were within QC limits.

Table 3A lists the matrix spike and matrix spike duplicate recoveries, as well as the RPD values. All spike recoveries and RPD values were within QC limits.

2A

WATER VOLATILE SURROGATE RECOVERY

Name: WESTON REAC Contract: 68-03-3482

Lab Code: NA Case No.: 1202 SAS No.: NA SDG No.: NA

	EPA SAMPLE NO.	S1 DCE-d4	S2 TOL-d8	S3 DCB-d4	OTHER	TOT OUT
01	3780	98	98	92		
02	3783	78	52	101		
03	3781	92	99	92		
04	3777	98	101	95		
05	3778	95	102	96		
06	3779	95	99	94		
07	3784	99	99	92		
08	3799	100	101	92		
09	3782	93	99	94		
10	3779MS	99	101	99		
11	3779MSD	99	99	98		
12	MBLANK1	96	100	94		
13	MBLANK2	99	100	93		
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QC LIMITS

DCE-d4 = 1,2-Dichloroethane-d4
TOL-d8 = Toluene-d8
DCB-d4 = Dichlorobenzene-d4

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogates diluted out

3A

WATER VOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: WESTON REAC Contract: 68-03-3482

Lab Code: NA Case No.: 1202 SAS No.: NA SDG No.: NA

Matrix Spike - EPA Sample No.: 3779

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC LIMITS REC.
1,1-Dichloroethene	50.00	0.00	52.00	103	61-145
Trichloroethene	50.00	0.00	54.00	108	71-120
Benzene	50.00	0.00	56.00	111	76-127
Toluene	50.00	0.00	55.00	110	76-125
Chlorobenzene	50.00	0.00	51.00	102	75-130

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
1,1-Dichloroethene	50.00	52.00	103	0	14	61-145
Trichloroethene	50.00	56.00	111	2	14	71-120
Benzene	50.00	58.00	115	3	11	76-127
Toluene	50.00	57.00	114	3	13	76-125
Chlorobenzene	50.00	53.00	106	3	13	75-130

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of qc limits

RPD: 0 out of 5 outside limits
Spike Recovery: 0 out of 10 outside limits

COMMENTS: _____

Roy F. [illegible]on, Inc.
REAC, Edison, N.J.
EPA Contract 68-03-3482

CHAIN OF CUSTODY REC[illegible]D/LAB WORK REQUEST

No: 000938

Project Name: RA 5
Project Number: 1202
RFW Contact: TYSON Phone: 632 9740 Due Date: ASAP

SHEET NO. ____ OF ____

SAMPLE IDENTIFICATION

ANALYSES REQUESTED

Sample No.	Sampling Location	Matrix	Date Collected	Container/Preservative	VOA	TIME			
3783A	SEDIMENT	W	10/19/88	40 ml / Ice	✓	1335			
B	↓					↓			
C									
D									
3784A	FIELD BLANK			40 ml / Ice		1342			
B	↓					↓			
C									
D									

Matrix:
S- Soil DS- Drum Solids
W- Water DL- Drum Liquids
O- Oil X- Other

Special Instructions:

Items/Reason	Relinquished By	Received By	Date	Time	Items/Reason	Relinquished By	Received By	Date	
VOA	[signature]	[signature]	10/20	9AM					

Roy F. . .on, Inc.
REAC, Edison, N.J.
EPA Contract 68-03-3482

CHAIN OF CUSTODY REC D/LAB WORK REQUEST

No: 000937

Project Name: PAS
Project Number: 1202
RFW Contact: TESOK Phone: 622-9784 Due Date:

SHEET NO. 1 OF

SAMPLE IDENTIFICATION

ANALYSES REQUESTED

Sample No.	Sampling Location	Matrix	Date Collected	Container/Preservative	VOA	TCLP			
3780 A	SWW1	W	10/18/88	4 Glass Jars		1239			
B									
C									
D									
3781 A	SWW4					1244			
B									
C									
D									
3782 A	SWW3					1307			
B									
C									
D									

Matrix:
S- Soil DS- Drum Solids
W- Water DL- Drum Liquids
O- Oil X- Other

Special Instructions:

Items/Reason	Relinquished By	Received By	Date	Time	Items/Reason	Relinquished By	Received By	Date	
VOA				9AM					

Roy F. [illegible]son, Inc.
REAC, Edison, N.J.
EPA Contract 68-03-3482

CHAIN OF CUSTODY REC[illegible]D/LAB WORK REQUEST

No: 000935

Project Name: PAS
Project Number: 1202
RFW Contact: TYSON Phone: Due Date:

SHEET NO. 1 OF 1

SAMPLE IDENTIFICATION | **ANALYSES REQUESTED**

Sample No.	Sampling Location	Matrix	Date Collected	Container/Preservative	VOA	TIME			
003799A	MW11B	W	10/19/88	40mL/ICE	"	11:30			
B	"	"	"	"	"	"			
C	"	"	"	"	"	"			
D	"	"	"	"	"	"			
003777A	MW11A	"	"	"	"	11:48			
B	"	"	"	"	"	"			
C	"	"	"	"	"	"			
D	"	"	"	"	"	"			
003778A	MW11A MATRIX SP.	"	"	"		11:57	MATRIX	SPIKE	
B	"	"	"	"		"			
C	"	"	"	"		"			
D	"	"	"	"		"			
3779A	MW11A DUPLICATE	"	"	"		12:05	DUPLICATE		
B	"	"							
C	"	"							
D	"	"							

Matrix:
S- Soil DS- Drum Solids
W- Water DL- Drum Liquids
O- Oil X- Other

Special Instructions:

Items/Reason	Relinquished By	Received By	Date	Time	Items/Reason	Relinquished By	Received By	Date	
VOA	[illegible]	[illegible]	10/20/88	9AM					

REFERENCES

Marrin, Donn L. "Soil-Gas Sampling and Misinterpretation," Groundwater Monitoring Review. Spring 1988.

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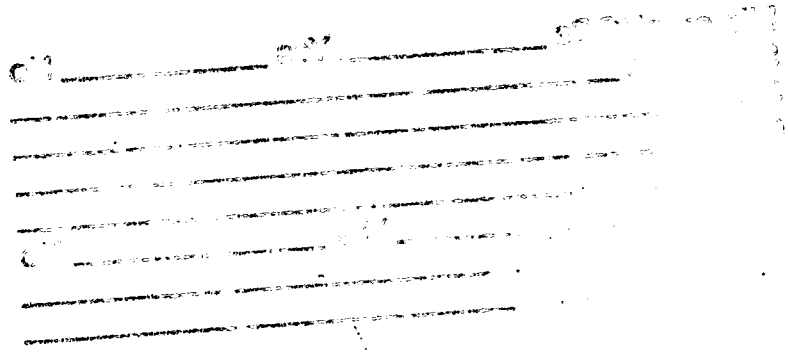

eh:rd/TYSON/PR-1202

File on eDOCs X Yes _____ No
Site Name PAS
Site No. 73801
County Oswego
Town Oswego
Foilable X Yes _____ No
File Name 1989-02-225VE
Scanned & eDOC _____