PRELIMINARY SITE ASSESSMENT SUPPLEMENT REPORT

FORMER MOBIL OIL HANGAR D, BAY 1
WESTCHESTER COUNTY AIRPORT
TOWN OF HARRISON, WESTCHESTER COUNTY

FEBRUARY 1996

PREPARED BY:

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MOBIL OIL CORPORATION
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1.0 INTRODUCTION

1.1 PROJECT OVERVIEW

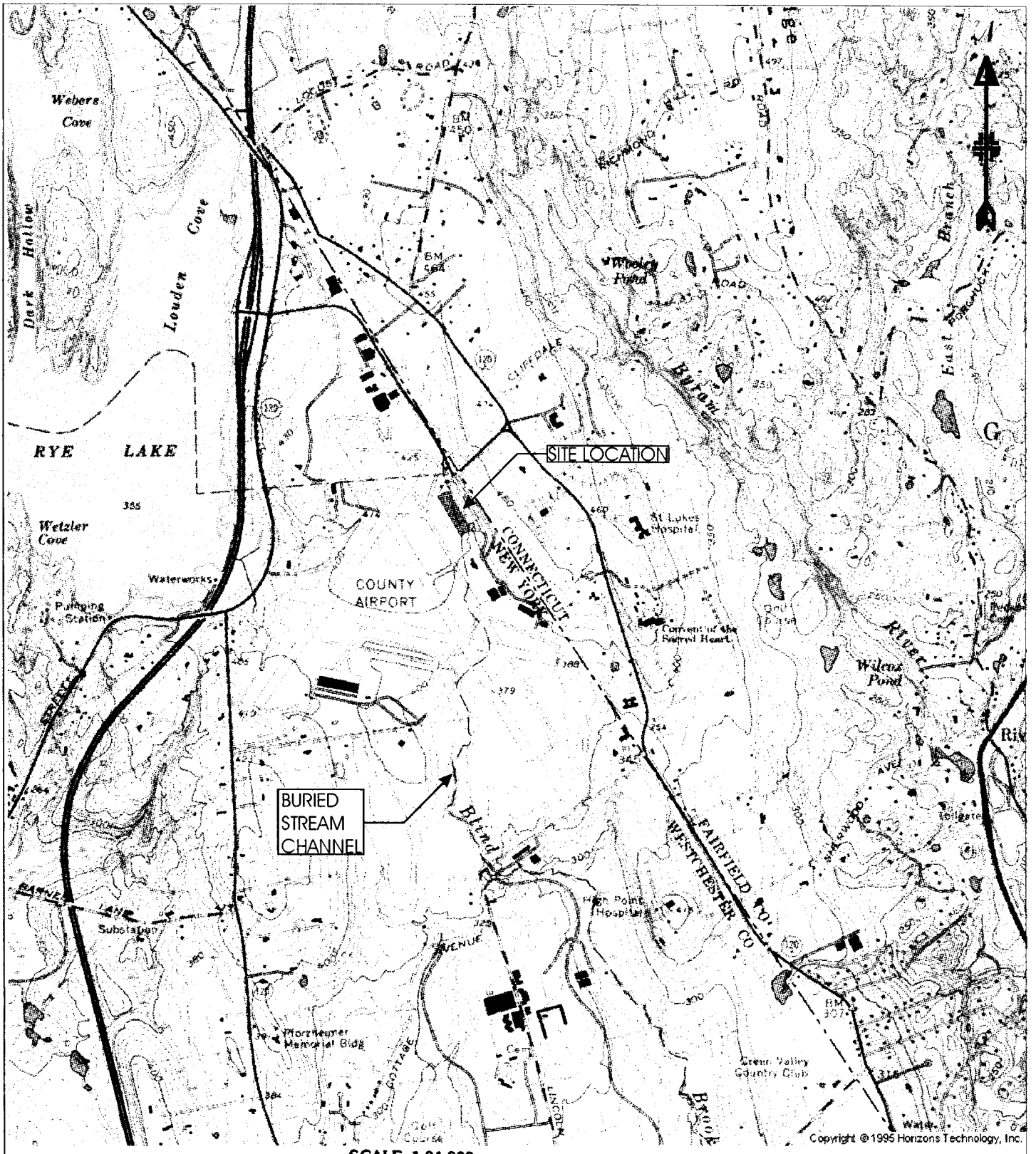
In 1990, Mobil Oil Corporation (Mobil) entered into discussions with Texaco, Inc. relative to a transfer of Mobil's long-term lease of Hangar D, Bay 1 at the Westchester County Airport, Town of Harrison, New York (Figure 1-1). In response to the possible lease transfer, Texaco initiated the performance of a subsurface environmental investigation in and around the hangar. The results of the investigation revealed concentrations of total volatile chlorinated hydrocarbons (CHCs) up to 54 parts per million (ppm) in the soil beneath the concrete hangar floor near the suspected source area. The suspected source area was in the vicinity where drummed solvents were stored. Based on this finding, Mobil agreed to conduct additional investigations, which are summarized in Section 1.3.

1.2 PROJECT DESCRIPTION

This Preliminary Site Assessment Supplement (PSAS) was conducted to delineate the horizontal extent of groundwater contamination detected in the overburden aquifer. Fifteen Geoprobes were advanced in and around the Former Mobil Oil and Union Carbide Hangars. Groundwater samples were collected from nine of the Geoprobes and analyzed, in the field using a portable gas chromatograph (GC), for 1,1-dichloroethane (1,1-DCA), 1,1,1-trichloroethane (TCA), trichloroethylene (TCE) and tetrachloroethylene (PCE). These chemical constituents were selected based upon the findings of previous investigations. Shallow bedrock was encountered at the remaining six Geoprobe locations, and groundwater samples could not be collected.

1.3 PREVIOUS INVESTIGATIONS

Five environmental investigations were conducted prior to the implementation of this PSAS. The results of all five investigations have been previously submitted to the NYSDEC



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SOURCE:
GLENVILLE, CONN.-N.Y.
USGS QUADRANGLE
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FORMER MOBIL HANGAR
WESTCHESTER COUNTY AIRPORT
SITE LOCATION MAP

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FIGURE 1-1

and four of these reports are summarized in the Site Assessment Summary submitted to the NYSDEC on November 12, 1993. These reports include:

- Pilko & Associates, January 1991 - Phase II, III and IV Pre-Leasing Environmental Assessment of Mobil Flight Operations Hangar, Westchester County Airport.

- Target Environmental Services, Inc., January 1991 - Soil Gas Survey, Mobil Hangar, Westchester County Airport.

- Legette, Brashers and Graham, May 1991 - Mobil Oil Corporation, Subsurface Investigation of the Mobil Hangar, Westchester County Airport.

- Legette, Brashers and Graham, August 1991 - Letter report to Greg Hill, Mobil Oil Corporation, from Keith Yocus and Charles Olmsted.

- Malcolm Pirnie, Inc., August 1995 - Preliminary Site Assessment Report, Former Mobil Oil Hangar D, Bay1.

Specific details pertaining to each study can be found in the original reports submitted to the NYSDEC. A brief summary of the analytical results generated from the investigations is provided below:

- Concentrations of CHCs in soil were detected up to 54 ppm near the source area.

- Concentrations of CHCs in the soil decreased with depth, typically not detected or detected at concentrations less than 1 ppm at depths below 24 inches.

- Concentrations of CHCs in the soil decreased with distance from the source area, typically detected at concentrations of 1 ppm or less at a distance of 40 feet from the source area.

- The CHCs detected in the soil were likely attributable to the chlorinated solvent or solvents previously used at the hangar. Solvents used at the hangar include primarily TCA and PCE. Minor concentrations of TCE and 1,1-DCA were detected and are also associated with solvent usage.

- Concentrations of CHCs in soil vapors were present in the immediate vicinity of the source area at concentrations up to 73 ppm. Soil gas concentrations decreased with distance, to approximately 1 ppm at 60 feet from the source area.

- Groundwater samples collected from three PowerPunch probes advanced in the Former Mobil Hangar reported 1,1-DCA concentrations ranging from 59 ppb to 2100 ppb; TCA was detected in one sample at a concentration of 460 ppb; and, cis-1,2-dichloroethene (1,2-DCE) was detected in two samples at concentrations of 240 ppb and 360 ppb.

- Subsurface soil samples collected from the Union Carbide Hangar reported 1,2-DCE concentrations ranging from non detected to 53 ppb; 1,1-DCA was detected in two soil samples at concentrations of 1.1 ppb and 15 ppb.

1.4 GEOLOGIC SETTING

Based upon the review of the USGS topographic map (Glenville Quadrangle) provided as Figure 1-1, it appears that a buried stream channel is located beneath the center and northeast side of the hangar. The stream channel generally trends north-south and terminates at Blind Brook, located immediately south of the airport and appears to have been the former headwaters of Blind Brook prior to airport construction.

Previous and current subsurface investigations appear to confirm the presence of the former stream channel. Soil borings and Geoprobes located between the center of the hangar and the northeast side of the hangar encountered heterogeneous soils that are likely fill materials placed as part of the airport construction. This material consisted primarily of

poorly sorted sand and silt with occasional pockets of cobbles to depths exceeding twenty feet. However, from the center of the hangar to the southwest side of the hangar, bedrock was encountered at depths ranging from one foot to eleven feet below grade. The presence of the fill material is consistent with the location and orientation of the stream channel as indicated on the USGS map.

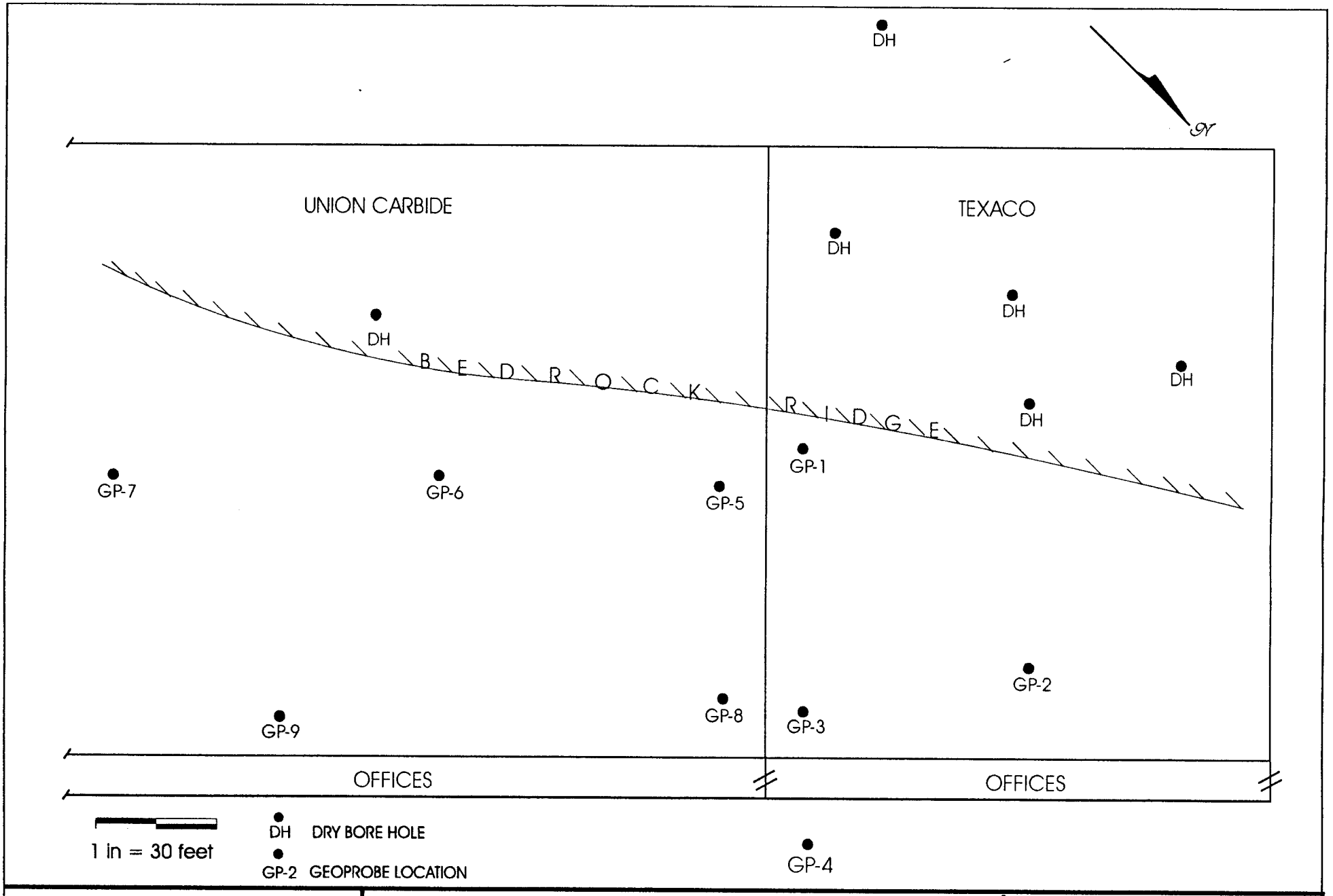
2.0 FIELD PROCEDURES

2.1 GROUNDWATER SAMPLING PROCEDURES

Nine groundwater samples were collected through the use of a Geoprobe (Figure 2-1). The Geoprobe consisted of hollow steel probes coupled with a detachable drive point. The probes were either pushed or driven below the water table to the desired depths except where bedrock was encountered. Bedrock was encountered at six of the Geoprobe locations prior to reaching the water table. At the desired depth, the probes were retracted, allowing water to collect in the probes for subsequent collection. Samples were collected using a stainless steel check valve attached to 1/4 inch diameter polyethylene tubing that was inserted into the probes. The groundwater was retrieved by raising and lowering the check valve apparatus or by connecting the tubing to a peristaltic pump. Groundwater samples were collected in 40 milliliter (ml) vials that were filled to exclude air and capped with Teflon-lined septa caps. All sampling equipment was either dedicated for one time usage or decontaminated using standard, acceptable decontamination procedures prior to sample collection.

2.2 ANALYTICAL PROCEDURES

The groundwater samples were subjected to indirect analysis by first decanting approximately half of the sample. The vials were then shaken vigorously and a sample of the headspace from the vial was injected into the GC. Indirect analysis is the preferred technique when a large number of samples are to be analyzed daily. The method is less time consuming than direct injection of the water sample into the GC because there is less chance of contamination to the system. The GC was calibrated for indirect analysis by decanting 20 ml of a known standard. The standard bottle was resealed and shaken vigorously. An analysis of the headspace in the bottle determined the Response Factor (RF) which was then used to calculate the sample concentrations. The precision and accuracy of both methods are similar.



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FORMER MOBIL OIL HANGER D
WESTCHESTER COUNTY AIRPORT
GEOPROBE LOCATIONS

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FIGURE 2-1

During this investigation, up to 40 ml of groundwater were collected for each sample and immediately analyzed. The samples were injected into a Hewlett Packard 5890 Series II gas chromatograph, equipped with a electron capture detector (ECD) in volumes of 1 to 1,000 microliter, depending on the volatile organic compound (VOC) concentrations in the sample.

The detection limits for target compounds depend on the sensitivity of the ECD to the individual compound as well as the volume of the sample injection. The detection of the target compounds were calculated from the RF, the sample injection size and the calculated peak size observed under the conditions of the analyses. The detection limit for each of the target compounds are presented below.

Compound	Detection Limit (μg/l)
1,1-dichloroethane	0.3
1,1,1-trichloroethane	0.01
trichloroethylene	0.01
tetrachloroethylene	0.01

A more specific discussion of the analytical parameters and the analytical Quality Assurance/Quality Control (QA/QC) is provide as Appendix 1.

3.1 GROUNDWATER RESULTS

The PSAS groundwater investigation consisted of advancing Geoprobes at fifteen locations for the purposes of collecting groundwater samples. Of the fifteen locations, six encountered bedrock prior to the water table. Groundwater samples were collected from the remaining nine locations for field analysis for four target VOCs. The analytical results were compared to the NYSDEC Division of Water Technical and Operational Guidance Series (TOGS 1.1.1) Ambient Water Quality Standards and Guidance Values dated November 1991 to allow a relative evaluation of the concentrations detected. The TOGS standard for 1,1-DCA, 1,1,1-TCA, TCE, and PCE is 5 ppb. Analytical results are summarized on Table 3-1 and are presented on Figure 3-1.

Concentrations of 1,1-DCA ranged from not detected in samples GP-4 and GP-9 to 6800 ppb in sample GP-1. Concentrations of 1,1,1-TCA ranged from 0.2 ppb in sample GP-4 to 5600 ppb in sample GP-3. Trichloroethylene concentrations ranged from not detected in sample GP-9 to 150 ppb in sample GP-3; and PCE concentrations ranged from 0.04 ppb in sample GP-4 to 450 ppb in sample GP-1.

In general, the groundwater samples collected from the Geoprobes located near the suspected source area (i.e., GP-1, GP-3, and GP-5) reported the highest total volatile organic concentrations. The groundwater samples collected from the Geoprobes located inferred to be hydraulically upgradient, sidegradient, and downgradient from the suspected source area reported total volatile organic concentrations that were 2 to 4 orders of magnitude lower than the concentrations detected in the samples collected near the suspected source area.

3.2 GEOLOGIC RESULTS

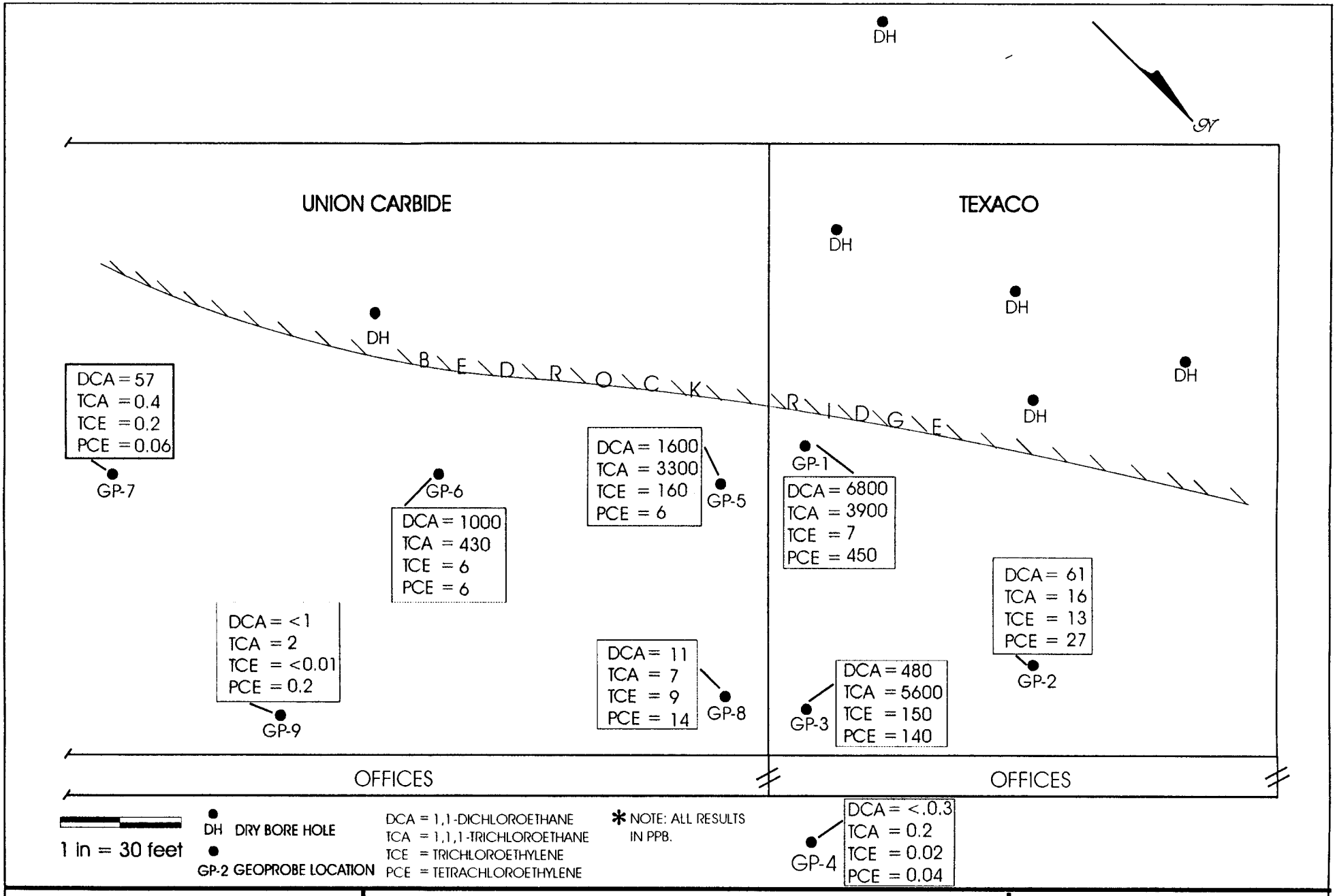
Although the objective of this PSAS was to aid in the determination of the horizontal extent of the shallow groundwater contamination, geologic information regarding the structure of subsurface features was also obtained. Groundwater samples were not collected from six Geoprobe locations because bedrock was encountered. These Geoprobes were located near the southwest side of the hangar. Bedrock was not

TABLE 3-1
GROUNDWATER SAMPLING ANALYTICAL RESULTS

FORMER MOBIL OIL HANGAR D
WESTCHESTER COUNTY AIRPORT
HARRISON, NEW YORK

Sample I.D.	1,1-dichloroethane ug/l	1,1,1-trichloroethane ug/l	trichloroethylene ug/l	tetrachloroethylene ug/l
GP-1	6800	3900	7	450
GP-2	61	16	13	27
GP-3	480	5600	150	140
GP-4	< 0.3	0.2	0.02	0.04
GP-5	1600	3300	160	6
GP-6	1000	430	6	6
GP-7	57	0.4	0.2	0.06
GP-8	11	7	9	14
GP-9	< 1	2	< 0.01	0.2
TOGS	5	5	5	5

TOGS Standards are from the NYSDEC Division of Water Technical and Operational Guidance Series (TOGS 1.1.1) Ambient Water Quality Standards and Guidance Values dated November 1991.



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FORMER MOBIL OIL HANGER D
WESTCHESTER COUNTY AIRPORT
GEOPROBE ANALYTICAL RESULTS

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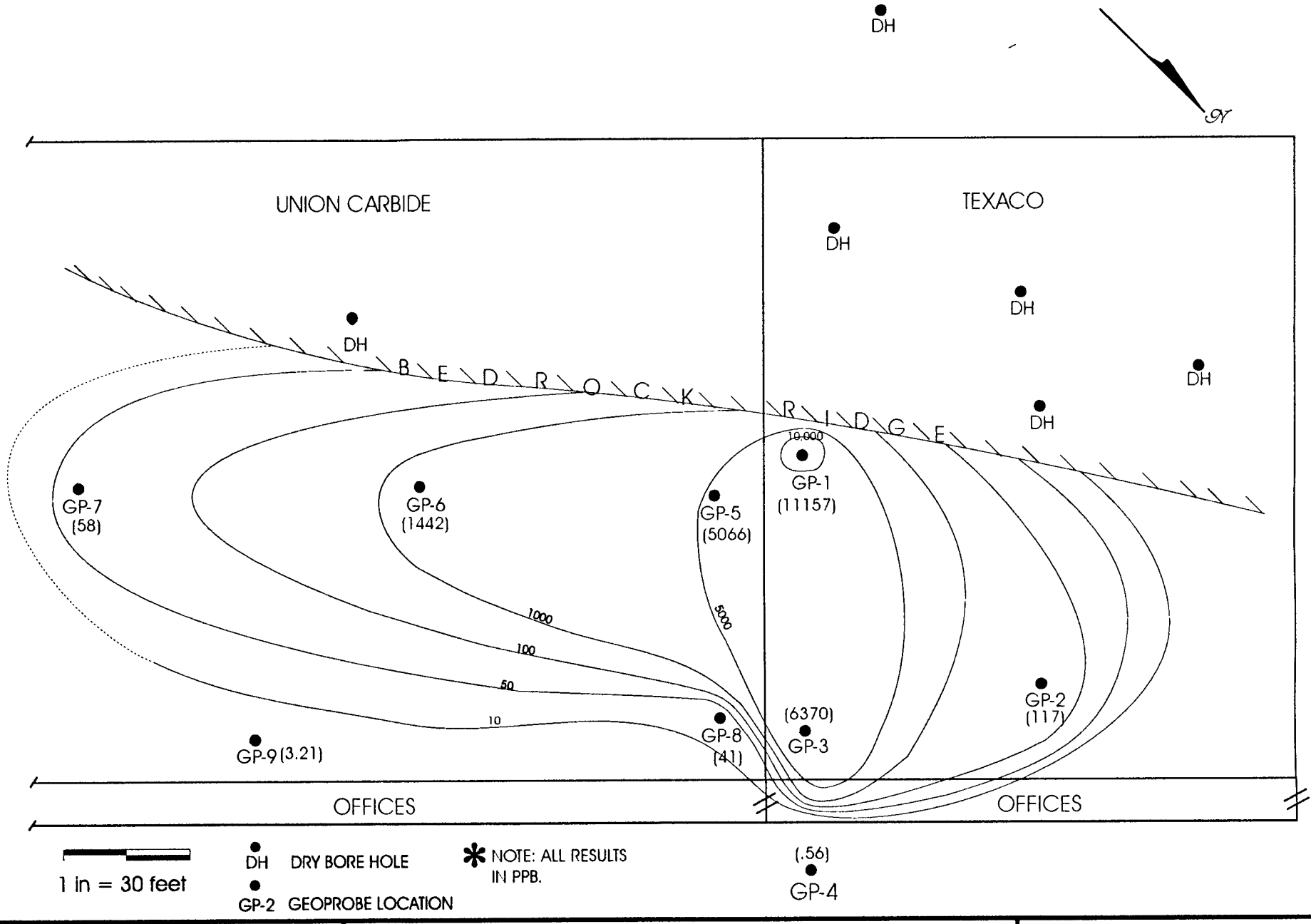
FIGURE 3-1

encountered in the remaining nine Geoprobe locations. It appears that these nine Geoprobes are located within the buried stream channel that was identified on the USGS topographic map. Consequently, the shallow groundwater is bounded to the southwest by the bedrock ridge. The effects of this bedrock ridge on the contaminant transport are shown on the contaminant contour map presented as Figure 3-2.



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FORMER MOBIL OIL HANGER D
WESTCHESTER COUNTY AIRPORT
TOTAL TARGET VOLATILE ORGANIC CONCENTRATIONS

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FIGURE 3-2

4.0 CONCLUSIONS

Based upon the interpretation of the analytical results derived from the implementation of the PSAS at the Former Mobil Oil Hangar D, Bay 1, the following conclusions can be made.

- The horizontal extent of contamination in the shallow groundwater has been adequately determined during the implementation of this PSAS, whereby decreasing trends in contaminant concentrations that approached and were below NYSDEC standards were observed.

- An apparent buried stream channel as shown on the USGS topographic map, was encountered during the advancement of the Geoprobes. Bedrock was not encountered in nine Geoprobes that were located along the center and northeast side of the hangar, in the same orientation as the stream channel. However, bedrock was encountered at depths ranging from 1 foot to 11 feet below grade in six Geoprobes located near the southwest side of the hangar. The position of this bedrock ridge correlates with the position of the southwest bank of the stream channel as shown on the USGS topographic map.

- The data shows a significant reduction in VOC concentrations with distance from the suspected source area. Plumes showing dramatic concentration reduction with distance from the source (such as this one) are typically static or near-static, with migration controlled primarily by biodegradation.

APPENDIX A

TRACER RESEARCH CORP. REPORT

Vapor Trace® Groundwater Investigation
WEST CHESTER COUNTY AIRPORT
November 8 and 9, 1995
Greenwich, New York

Vapor Trace® Groundwater Investigation

WEST CHESTER COUNTY AIRPORT
Greenwich, New York

November 8 and 9, 1995

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1.0 WEST CHESTER COUNTY AIRPORT SITE INVESTIGATION

Tracer Research Corporation (Tracer Research) performed a *Vapor Trace*® groundwater investigation at the West Chester County Airport located in Greenwich, New York. The investigation was conducted November 8 and 9, 1995 for Malcolm Pirnie, Inc. of Mahwah, New Jersey.

1.1 Objective

The purpose of the investigation was to determine the extent of possible soil and/or groundwater contamination by screening groundwater samples for the presence of volatile organic compounds (VOCs). The groundwater samples were collected and analyzed for the following analyte class and compounds:

Analyte Class: Halocarbon
- 1,1 dichloroethane (1,1 DCA)
- 1,1,1 trichloroethane (TCA)
- trichloroethene (TCE)
- tetrachloroethene (PCE)

1.2 Overview of Results

For this investigation, nine (9) groundwater samples were collected from 13 to 21 feet below ground surface (bgs). A summary of the results of the investigation is presented in Table 1.

Table 1. Groundwater Sample Summary

Compound	# of Samples in Which Compound was Detected	Low Concentration (µg/L)	High Concentration (µg/L)	Sample(s) with High Concentration
1,1 DCA	7	11	6800	GP1-13'
TCA	9	0.2	5600	GP3-20'
TCE	8	0.02	160	GP5-16'
PCE	9	0.04	450	GP1-13'

2.0 SITE DESCRIPTION

The investigation took place in the vicinity of the former Mobile Oil Hangar at the West Chester County Airport. Samples were collected through concrete cover. The geologic setting, depth to groundwater and direction of groundwater flow were not reported.

3.0 GROUNDWATER SAMPLING PARAMETERS

Groundwater sampling probes consisted of four foot sections of drill steel coupled together with a Geoprobe slotted and/or screened groundwater sampler attached to the probe. Groundwater samples were collected at depths of 13 to 21 feet bgs.

The hollow probes with detachable drive points were advanced below the water table by hydraulically pushing and/or pounding the probes to the desired depths. If required, an air compressor and rock drill were used to drill through any concrete.

Once at the desired depth, water was allowed to collect in the probe. Samples were collected using a stainless steel check valve attached to 1/4 inch inner diameter (ID) poly-tubing that was inserted into the sample probe. The water was retrieved by raising and lowering the check valve apparatus in the groundwater, forcing a column of water up into the tubing.

Groundwater samples were collected in 40 milliliter VOA vials that were filled to exclude air and capped with Teflon-lined septa caps. For indirect analysis approximately half of the liquid in the bottle was decanted. The vials were then shaken vigorously and a sample of the headspace from the container was injected into the gas chromatograph.

Indirect (headspace) analysis is the preferred technique when a large number of water samples are to be analyzed daily. The method is more time efficient for the measurement of volatile organics than direct injection of the water sample into the GC because there is less chance of semi-volatile and non-volatile contamination of the system. Depending upon the partitioning coefficient of a given compound, the indirect analysis method may be more sensitive than the direct injection method. The precision and accuracy of both methods are similar.

4.0 ANALYTICAL PARAMETERS

During this investigation, up to 40 milliliters (mL) of groundwater were collected for each sample and immediately analyzed in the Tracer Research analytical van. The samples were injected into the gas chromatograph (GC) in volumes of 1 to 1,000 microliters (µL) depending on the VOC concentrations in the sample.

Analytical instruments were calibrated daily using fresh working standards made from National Institute of Sciences and Technology (NIST) traceable standards and reagent blanked solvents.

The GC was calibrated for indirect analysis by decanting 20 mL of the known standard, leaving approximately the same amount of headspace as in the groundwater samples. The standard bottle was resealed and shaken vigorously for 30 seconds. An analysis of the headspace in the bottle determined the Response Factor (RF) which was then used to calculate the sample concentrations.

4.1 Chromatographic System

A Hewlett Packard 5890 Series II gas chromatograph, equipped with a electron capture detector (ECD) and one computing integrator, was used for the groundwater analyses. The compounds were separated in the GC on a 6-foot by 1/8 inch outer diameter (OD) packed analytical column (10% OV101 stationary phase bonded to 80/100 Chromosorb W support) in a temperature controlled oven. Nitrogen was used as the carrier gas.

The instrument calibrations were checked periodically throughout the day to monitor the response factors and retention times. The following paragraphs explain the GC and ECD processes.

GC Process

A groundwater sample is injected into the GC where it is swept through the analytical column by the carrier gas. The detector senses the presence of a component different from the carrier gas and converts that information to an electrical signal. The components of the sample pass through the column at different rates, according to their individual properties, and are detected by the detector. Compounds are identified by the time it takes them to pass through the column (retention time).

ECD Process

The ECD captures low energy thermal electrons that have been ionized by beta particles. The flow of these captured electrons into an electrode produces a small current, which is collected and measured. When the halogen atoms (in the form of halogenated hydrocarbons) are introduced into the detector, electrons that would otherwise be collected at the electrode are captured by the sample, resulting in decreased current. The current causes the computing integrator to record a peak on a chromatogram. The area of the sample peak is compared to the peak generated by a known standard to determine the concentration of the analyte.

4.2 Analyses

The detection limits for target compounds depend on the sensitivity of the detector to the individual compound as well as the volume of the sample injection. The detection limits of the target compounds were calculated from the response factor, the sample injection size and the calculated minimum peak size (area) observed under the conditions of the analyses. If any compound was not detected in an analysis, the detection limit is given as a "less than" value, e.g., <0.01 µg/L. The approximate detection limits for the target compounds are presented in Table 2.

Table 2. Detection Limits for Target Compounds

Compound	Detection Limit in Groundwater (µg/L)
1,1 DCA	0.3
TCA	0.01
TCE	0.01
PCE	0.01

5.0 QUALITY ASSURANCE AND QUALITY CONTROL

Tracer Research's Quality Assurance (QA) and Quality Control (QC) program was followed to maintain data that was reproducible through the investigation. An overview presenting the significant aspects of this program is presented below.

Groundwater Sampling Quality Assurance

To ensure consistent collection of samples, the following procedures are performed:

Sampling Probes

Probes are used only once each day. To eliminate the possibility of cross contamination, they are washed daily or decontaminated before re-use with high pressure soap and hot water spray, or steam-cleaned.

Groundwater Samplers

Each stainless steel check valve is decontaminated after each use with an alconox based detergent and rinsed with distilled water. Associated tubing is discarded after each use to avoid cross contamination.

Each groundwater sampler is decontaminated after use with soap and water. Enough groundwater samplers are carried on each van to limit decontamination slowdown.

Glass Syringes

Glass syringes are used for only one sample a day and are washed and baked out at night. If they must be used twice, they are purged with carrier gas (nitrogen) and baked out between samples.

VOA Vials

VOA vials are used only once and then discarded to avoid cross contamination.

Analytical Quality Assurance Samples

Quality assurance samples are performed at the minimum frequencies listed in Table 3. The actual frequency depends on the number of samples analyzed each day and the length of time of the survey.

Table 3. Quality Assurance Samples

Sample Type	Frequency
Ambient Air Samples	2 per day or 1 per site
Analytical Method Blanks	1 per day
Continuing Calibration Check	1 every 5 samples
Field System Blank	1 per day
Reagent Blank	1 per set of working standards
Replicate Samples	1 per day or 10% of all samples

The ambient air samples are obtained on site by sampling the air immediately outside the mobile analytical van and directly injecting it into the GC. Analytical method blanks are taken to demonstrate that the analytical instrumentation is not contaminated. These are performed by injecting carrier gas (nitrogen) into the GC with the sampling syringe. Subsampling syringes are also checked in this fashion.

Continuing calibration checks are analyzed to verify the detector response for the target VOCs. If the response changes by more than twenty-five percent, the gas chromatograph is recalibrated and new response factors are calculated.

Field system blanks are analyzed to check for contamination of the sampling apparatus, e.g., probe and sampling syringe. A sample is collected using standard soil gas sampling procedures, but without putting the probe into the ground. The results are compared to those obtained from a concurrently analyzed ambient air sample.
If the field system blanks detect compounds of interest at concentrations that indicate equipment contamination or concentrations that exceed normal background levels (ambient air), corrective actions are taken. If the problem cannot be corrected, an out-of-control event is documented and reported. Field system blanks are performed after any probe decontamination process.

A reagent blank is performed to ensure the solvent used to dilute the stock standards is not contaminated. Analytical instruments are calibrated daily using fresh working standards made from National Institute of Sciences and Technology traceable standards and reagent blanked solvents.

Quantitative precision is assured by replicating analysis of 10 percent of the samples. Replicate analyses are performed by subsampling vapors from the VOA vial.

The injector port septa through which samples are injected into the GC are replaced daily to prevent possible gas leaks from the chromatographic column. All sampling and subsampling syringes are decontaminated after use and are not used again until they have been decontaminated by washing in anionic detergent and baking at 190°C.

6.0 RESULTS

The analytical results from this groundwater investigation are condensed in Appendix A. The data are presented by location and by analyte concentration. When the compound was not detected, the detection limit was presented as a "less than" value, e.g., <0.01 µg/L.

Samples are identified by the sample location number and depth. For example, GP1-13' represents a water sample collected from location 1 at a depth of 13 feet bgs.

APPENDIX A Condensed Data

CONDENSED DATA

TRACER RESEARCH CORPORATION
MALCOLM PIRNIE/ WEST CHESTER COUNTY AIRPORT/ GREENSWICH, NEW YORK/ 5250505S
11/08/95

SAMPLE	1,1 DCA ug/L	TCA ug/L	TCE ug/L	PCE ug/L
GP1-13'	6800	3900	7	450
GP2-21'	61	16	13	27
GP3-20'	480	5600	150	140
GP4-19'	<0.3	0.2	0.02	0.04

Analyzed by: D. Wilson
Checked by: M. Stivers

Tracer Research Corporation

CONDENSED DATA

TRACER RESEARCH CORPORATION
MALCOLM PIRNIE/ WEST CHESTER COUNTY AIRPORT/ GREENWICH, NEW YORK/ 5250505S
11/09/95

SAMPLE	1,1 DCA ug/L	TCA ug/L	TCE ug/L	PCE ug/L
GP5-16'	1600	3300	160	16
GP6-20'	1000	430	6	6
GP7-20'	57	0.4	0.2	0.06
GP8-16'	11	7	9	14
GP9-19'	<1	2	<0.01	0.2

Analyzed by: D. Wilson
Checked by: M. Stivers

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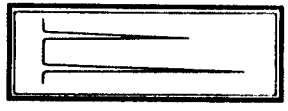

Tracer Research Corporation appreciates the opportunity of being of service to your organization. Because we are constantly striving to improve our service to you, we welcome any comments or suggestions you may have about how we can be more responsive to the needs of your organization. If you have any questions regarding the field work, analytical results or this report, please do not hesitate to contact Marj Stivers or Greg Burchette at 800.303.4523.