

529SERBSF10,631

529SERBSF10,631

Site Name (Subject):	THOMASVILLE FURNITURE INDS/LENOIR
Site ID (Document ID):	NCD054290770
Document Name (DocType):	Contractor Report (CONTR)
Report Segment:	
Description:	Phase II Assessment Report
Date of Document:	5/6/1992
Date Received:	
Box: <i>Enter SF and # with no spaces</i>	SF10,631
Access Level:	PUBLIC
Division:	WASTE MANAGEMENT
Section:	SUPERFUND
Program (Document Group):	SERB (SERB)
Document Category:	FACILITY

Print Report for
Record

Go to New
Blank Record

Go to New Record -
(default to last
record values)

Delete Record

RECEIVED

JUN 2 1992

SUPERFUND SECTION

TFI Lenoir, North Carolina
Phase II Assessment Report

Prepared for
Thomasville Furniture Industries, Incorporated

May 6, 1992

ENSCI Corporation
1108 Old Thomasville Road
High Point, North Carolina 27260
(919) 883-7505

Executive Summary

Background

On December 27, 1990, Thomasville Furniture Industries, Incorporated (TFI) discovered a drum believed to contain a solvent material in an excavation located in the parking lot of the Lenoir, North Carolina facility. ENSCI Corporation was contracted by Thomasville Furniture Industries to perform an initial assessment of the area where the drum was located. The assessment was completed and ENSCI's June 24, 1991 Phase I Assessment Report was generated.

Subsequent to the Phase I investigation, TFI conducted a Phase II investigation at the Lenoir facility. The Phase II work was divided into two tasks.

A brief description of the two tasks follows.

Task I

Task I included composing a detailed definition of any plume by soil gas analysis, and the location of any potential buried caches of drums. ENSCI conducted a three-step process to complete Task I:

- delineate possible trench locations and possible buried drum caches using ground-penetrating radar
- define soil gas anomalies using Petrex sampling tubes (initial horizontal extent)
- determine contaminant identity and estimated concentration by referencing the soil gas analysis to groundwater data generated in the Phase I Site Assessment and Task II of this investigation.

Task II

Task II included the re-sampling of (1) existing monitoring wells, (2) stream sediment, and (3) stream water. A library search test for a variety of contaminants indicated that some of the monitoring wells possessed up to 20 semi-volatile organic compounds. Based on the data it provided, ENSCI developed the following testing criteria for all samples acquired during Phase II:

- EPA Method 8080-Polychlorinated Biphenyls (PCBs)
- EPA Method 9020-Total Organic Halogen

- Polar and Non-Polar Hydrocarbons by IR
- Total Petroleum Hydrocarbons by IR
- EPA Method 9070-Oil and Grease
- Flash Point
- Isopropanol and n-Butyl Alcohol by GC/FID Methodology

In addition, wells #1, #5, #6, and #7 were analyzed for organics using EPA Methods 624 and 625.

Discussion

Three independent investigations, Sub-Surface Interface Radar Survey (SIRS), Petrex Soil Gas Analysis, and sampling of monitoring wells and Blair Fork Creek have provided data necessary to establish that two apparently independent areas have been impacted at the TFI facility.

The two impacted areas are along the northern and central/south-central portions of the western property boundary of the TFI facility. The central/south-central impacted area may be potentially associated with the past practice of drum burial. The northern impacted area is apparently associated with an upgradient source unrelated to TFI. The upgradient area has been primarily delineated through soil gas analysis, though supportive analytical results were also generated.

The northern area contaminant was identified as toluene based on soil gas survey results. No groundwater data is presently available for the area due to a lack of monitoring wells. However, a large source of toluene and a variety of other contaminants has been identified immediately upgradient of the TFI facility.

Identification of Potential Sources

To identify potential sources of contamination (one goal of the Phase II Assessment), ENSCI has taken into consideration the possibility that some or all of the detected contaminants originated upgradient or upstream of TFI property. Based on information gathered from the State Superfund Section, it appears that the Reliance facility is the primary suspected source of upgradient contamination.

Much of this information came from a State investigation which followed complaints by construction workers who noticed strong odors in soils. The workers were excavating soils during rebuilding of the bridge across Blair Fork Creek. Samples collected by the North Carolina Solid Waste Management Section in connection with the investigation tested positive for total xylene, ethylbenzene, and toluene. The investigation concluded that "...investigative

work during 1987 and 1988 has shown that soil still contains levels as high as 211,597 mg/kg total xylene, 58,688 mg/kg ethylbenzene, and 5,146 mg/kg toluene. Groundwater and surface water contamination has also been shown to still exist at the site."

Chemicals reportedly present at the Reliance facility include styrene, methanol, ethanol, isopropanol, methyl ethyl ketone, butanol, methyl isobutyl ketone, and glycol ether. Due to the juxtaposition of TFI and Reliance, and the hydraulically downgradient position of TFI, it was determined that the TFI facility may have been impacted by a Reliance/Whittaker plume(s) migrating with the shallow groundwater.

Conclusions

Based on the results of the SIRS investigation, Petrex survey, and analytical work, the following conclusions can be drawn:

- SIRS data indicates several linear alignments of hyperbolic reflections, but a very random pattern also exists in the northern area of high target density.
- SIRS detected targets are on the order of 200+ individual hyperbolic reflections with 50% coverage of the suspect area. Due to SIRS limitations, this value only represents the uppermost or first target encountered.
- The detected materials are a combination of petroleum hydrocarbons and widespread, low-level halogenated compounds.
- Soil gas anomalies indicate a plume composed almost exclusively of toluene is present well north of SIRS clusters, possibly indicating a source near/at the Reliance facility.
- Soil gas plume definition, groundwater plume definition and impacted soil delineation has not been completed to the south/southwest along Blair Fork Creek.
- The North Carolina State Superfund Section reports indicate the Reliance facility is fraught with plumes of widely disparate chemicals that impact Blair Fork Creek, groundwater, and soil to an undetermined extent.

Phase II Assessment

Facility Name: Thomasville Furniture Industries,
Incorporated

Facility Location: 315 Elizabeth Street
Lenoir, North Carolina 28645

Client Contact: Mr. Howard Grubbs
Attorney at Law
Womble, Carlyle, Sandridge & Rice
Post Office Drawer 84
Winston-Salem, North Carolina 27102

Mrs. Sherry Stookey
Supervisor, Environmental Compliance
Thomasville Furniture Industries, Inc.
Post Office Box 339
Thomasville, North Carolina 27361

Report Date: May 6, 1992

Report Prepared By: ENSCI CORPORATION
Bruce K. Braswell, P.G.

Bruce K. Braswell

Table of Contents

1. Background	1
2. Scope of Work	3
2.1 Task 1 Summary	3
2.2 Task 2 Summary	4
3. Identification of Potential Sources	4
4. Sub-surface Interface Radar Survey	6
4.1 SIRS Methodology	6
4.2 SIRS Results	7
5. Sampling and Analysis	8
5.1 Monitoring Well Sampling and Analysis	9
5.1.1 Volatiles/Semi-volatiles	9
5.1.2 Total Hydrocarbons	11
5.1.3 Flash Point Testing	12
5.2 Blair Fork Creek Analytical Results	13
5.2.1 Aqueous Volatile/Semi-volatile Organics	13
5.2.2 Aqueous Total Hydrocarbons/Organic Halogens	14
5.2.3 Sedimentary Total Hydrocarbons/Organic Halogens	15
6. Soil Gas Survey	16
6.1 Methodology	17
6.2 Results	19
3	
7. Conclusions	19

1. Background

On December 27, 1990, Thomasville Furniture Industries, Incorporated (TFI) discovered a drum believed to contain a solvent material in an excavation located in the parking lot of the Lenoir, North Carolina facility (see Figure 1). Subsequent to the discovery of the buried drum, Mrs. Sherry Stookey, TFI's Environmental Compliance and Inspection Supervisor, immediately contacted Keith Masters in the Mooresville Regional Office of the North Carolina Department of Environment, Health and Natural Resources, Division of Environmental Management. On January 2, 1991, TFI's legal representative, Mr. Howard Grubbs, gave notice to the State Superfund Section, Division of Environmental Management, and the Site Assessment Division at the U.S. EPA, Region IV.

In mid-February, 1989 (prior to this incident), TFI had submitted notification to the State of an Inactive Hazardous Substance or Waste Disposal Site. The TFI site is listed in

- US EPA, Region Four
Wastelan (January 23, 1991)
PRGM02: Pre Remedial/Federal Facility Report (Report 20)
Reference # 02808
- NCDEHNR
Superfund Section (February, 1991)
Inactive Hazardous Waste Site Priority List
- NCDEHNR
Division of Solid Waste Management
Superfund Section (February, 1991)
North Carolina Inactive Hazardous Sites Inventory
Site Priority List

ENSCI Corporation was contracted by Thomasville Furniture to perform an initial assessment of the area where the drum was located. To initiate the Phase I investigation, ENSCI Corporation implemented a drilling program designed to assess the area where the buried drum was discovered. This investigation consisted of the installation of eight (8) monitoring wells in the proximity of the area potentially impacted. The installation of the monitoring wells revealed that the suspected area lies within alluvium deposited by Blair Fork Creek. This alluvium mantles weathered saprolite lying stratigraphically below (see Idealized Geology Figure). The saprolite is derived from the weathering of geologic materials, identified in the Preliminary Explanatory Text for the 1985 Geologic Map of North Carolina, as medium to coarse-grained, thickly layered gneissic biotite granite to quartz diorite with biotite gneiss and schist, hornblend gneiss, amphibolite, and meta-gabbro. Field observations indicated the presence of biotite schist and possibly amphibolite in split spoon samples recovered during monitoring well installation.

U S HIGHWAY 321

ELIZABETH ST N.W.

U S HIGHWAY 321-A

PLANT ENTRANCE

CHAIN LINK FENCE & EDGE OF PAVEMENT

"OLD COTTON MILL"
ONE-STORY BRICK

PAVED
LOADING
AREA

PAVED PARKING

TWO STORY BRICK & CONCRETE
MANUFACTURING BUILDING

WELL 1
GW ELE:
1119.51

WELL 6
GW ELE:
1117.93

WELL 2
GW ELE:
1115.81

WELL 7
GW ELE:
1101.69

WELL 3
GW ELE:
1118.87

WELL 4
GW ELE:
1116.88

WELL 5
GW ELE:
1116.88

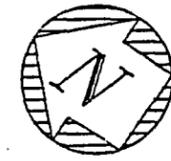
WELL 8
GW ELE:
1116.97

APPROXIMATE LOCATION
OF EXCAVATED DRUM

CROSS SECTION
LOCATION

EDGE OF PAVEMENT

PAVED DRIVE



FOR: TFI INCORPORATED		
TITLE: APPROXIMATE LOCATION OF EXCAVATED DRUM		
SCALE: 1"=100'	DWN BY: DJ	FIGURE: 1
DATE: 12/81	CK BY: HB	JOB #: E21017A

THOMASVILLE FURNITURE INDUSTRIES

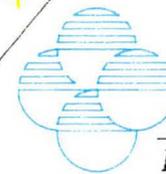
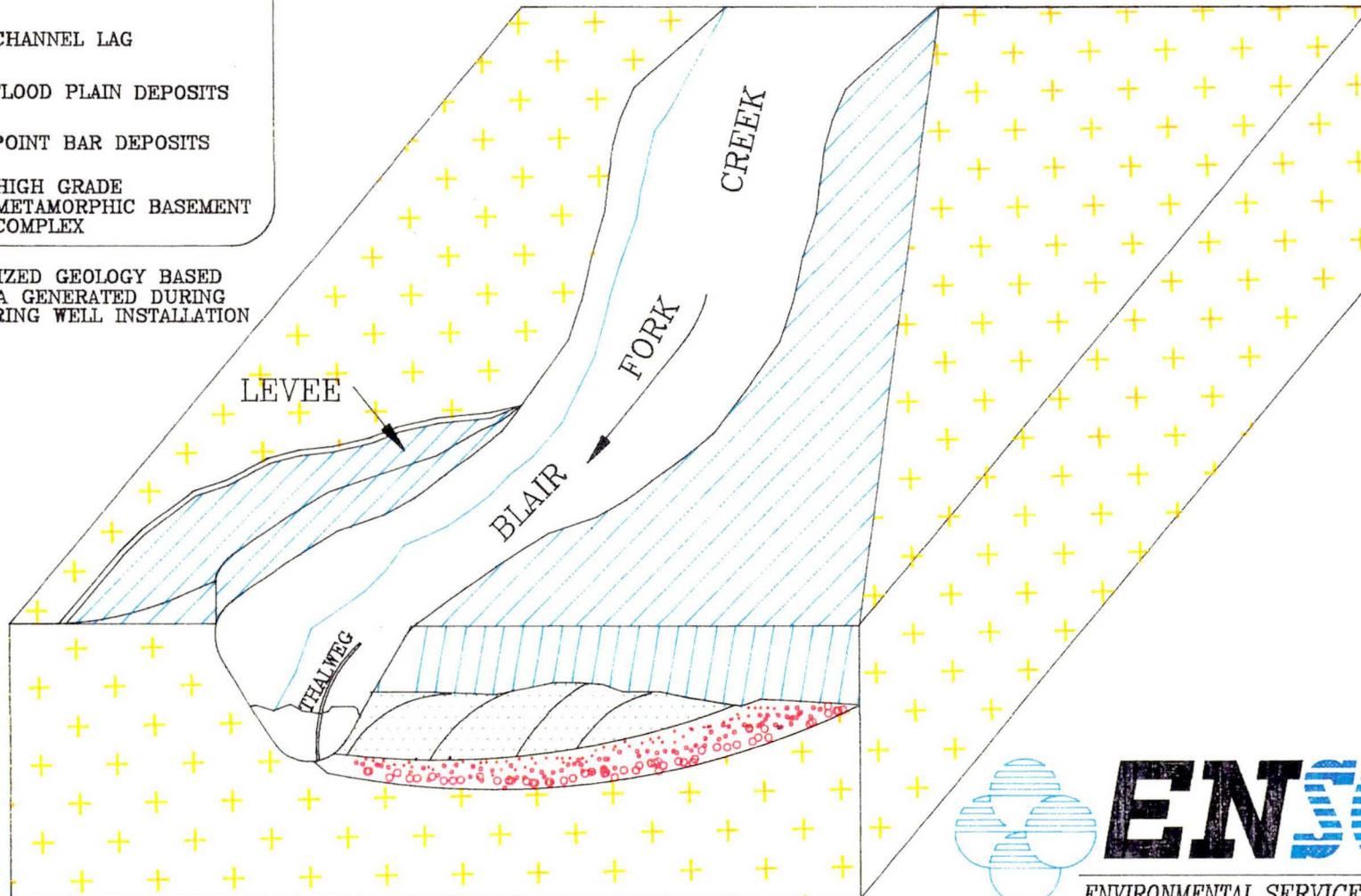
*IDEALIZED GEOLOGY FIGURE

LEGEND

-  CHANNEL LAG
-  FLOOD PLAIN DEPOSITS
-  POINT BAR DEPOSITS
-  HIGH GRADE METAMORPHIC BASEMENT COMPLEX

* IDEALIZED GEOLOGY BASED
ON DATA GENERATED DURING
MONITORING WELL INSTALLATION

US 321-A



ENSCI

ENVIRONMENTAL SERVICES GROUP
HIGH POINT, NORTH CAROLINA

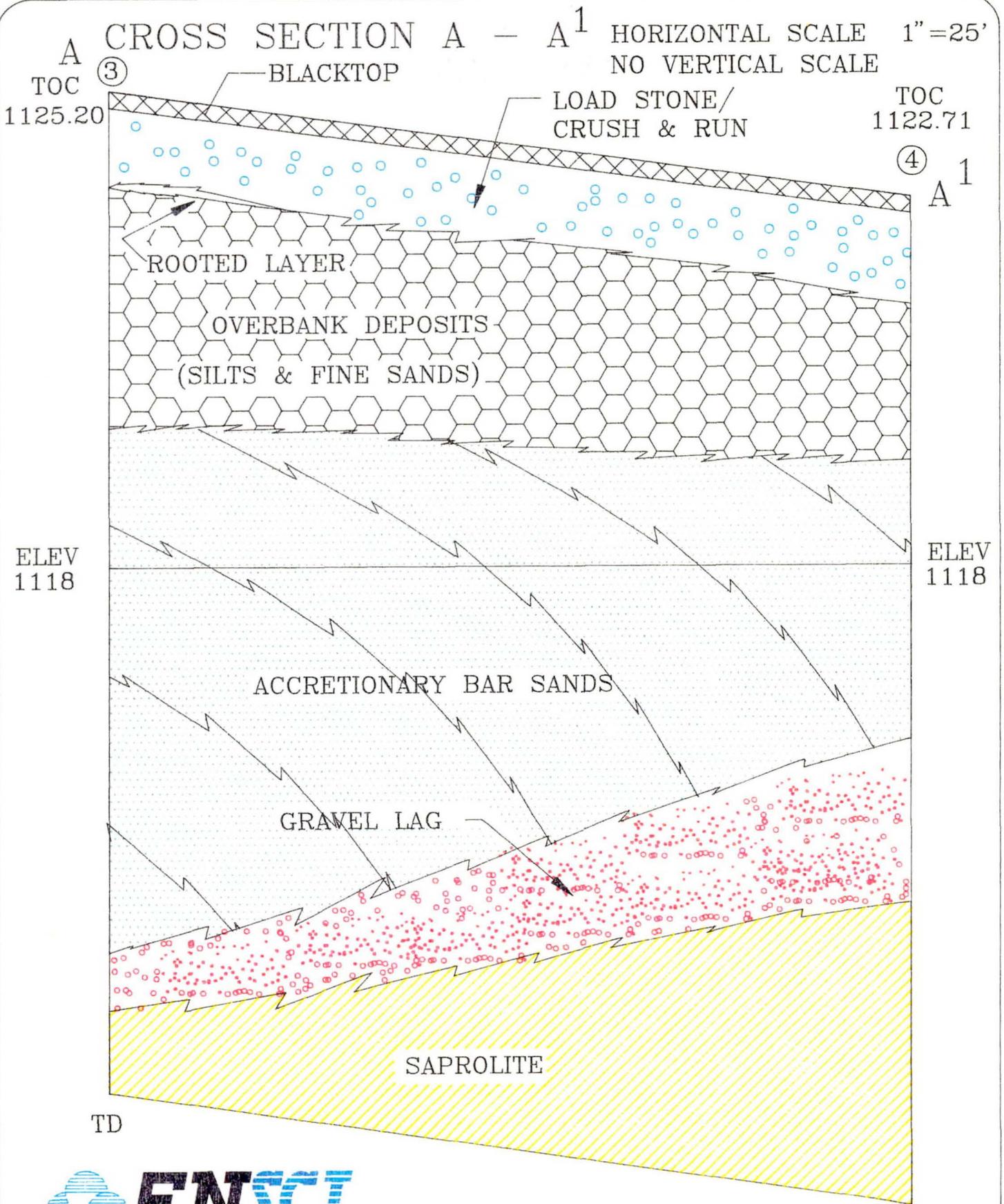
Four monitoring wells were installed along the sides of the suspected area in positions that were estimated to extend well beyond the perimeter of the area where drums were potentially buried. These wells were generally installed to a depth below the interface boundary of the Blair Fork Creek sediment package and saprolite material lying stratigraphically below. Two deep monitoring wells were installed in a Type III configuration hydraulically upgradient and downgradient of the suspected area; adjacent to monitoring wells #2 and #5, respectively (see Figure 12). The deep wells were installed to assess the vertical distribution of any potential contaminants sourced from the suspect area.

Two monitoring wells were installed to establish upgradient background groundwater (water) quality at the facility. Monitoring well #1 was installed in the most upgradient position with respect to the suspected area, but the position did not encounter sediments deposited by Blair Fork Creek. As a result, it was decided to install an additional upgradient background monitoring well (MW #6) in a position that would encounter the sediment package deposited by the creek (see Figure 1). The second upgradient background water quality well did intersect the Blair Fork Creek sediment package.

The monitoring wells were installed and developed, stabilized for 48 hours, purged, and sampled for volatile organic compounds, semi-volatile organic compounds, and metals by ICP using EPA Methods 624, 625, and 200.7; respectively. In the process of sample acquisition, a visible sheen was noted on groundwater samples recovered from monitoring wells #2 and #4. Monitoring wells #3, #5, #6, and #8 all possessed faint to strong odors of organic chemical contamination.

As seen in Table 3, analytical results for volatile and semi-volatile organic chemical compounds, tested using the Target Compound List, indicate the presence of a variety of constituents at levels in excess of NCAC Subchapter 2L standards. The Table also indicates the presence of organic chemicals for which there is no listed standard. By NCAC Subchapter 2L, when there is no listed standard in Subchapter 2L, the standard is set at the detection limit of the respective test method or .1 ppm for acetone and .005 ppm for naphthalene, 2 methylnaphthalene, and Bis (2-ethylhexyl) Phthalate.

Based on the potentiometric surface, it is apparent that Blair Fork Creek has a very strong influence on the localized shallow aquifer (see Cross Section A-A'). The creek is a manifestation of the shallow groundwater table at the surface and stream fluctuations due to high rainfall or periods of low rainfall will strongly influence the local observed hydraulic head (see Idealized Geology Figure).



SEE FIGURE 1 FOR CROSS SECTION LOCATION

This Phase II Assessment Report is intended to supplement data generated in the Phase I investigation.

2. Scope of Work

Subsequent to the Phase I investigation, TFI undertook a Phase II investigation at the Lenoir facility. The Phase II Site Assessment targeted the following goals:

- Perform additional groundwater sampling with respect to library search results generated by AnalytiKEM, Incorporated for ENSCI Corporation.
- Acquire samples of sediment and water from Blair Fork Creek, upgradient and downgradient of the TFI facility. Test samples using parameters defined by the Phase I library search results.
- Make initial determination of the horizontal extent of the area impacted by a potential drum burial site, including potential drum cache locations and related contaminant levels.

To accomplish the above goals, the work was divided into two tasks. Task I included the detailed definition of any plume by soil gas analysis and the location of potential buried caches of drums. Task II included the re-sampling of existing monitoring wells, stream sediment, and stream water.

ENSCI Corporation personnel mobilized to the Lenoir facility in September, 1990 to implement the work. A brief description of the work follows:

2.1 Task I Summary

The goals of Task I include initial definition of the horizontal extent of the area impacted by any potential drum burial site, location of any potential drum burial caches, and estimation of contaminant identity and concentrations in soil. To accomplish these goals, ENSCI conducted a three-step process

- define soil gas anomalies using Petrex sampling tubes (initial horizontal extent)
- delineate possible trench locations and possible buried drum caches using ground-penetrating radar, and
- determine contaminant identity and estimated concentration by referencing the soil gas analysis to groundwater data generated in the Phase I Site Assessment and Task II of this scope of work.

2.2 Task II Summary

The library search in ENSCI's Phase I Assessment tested for a wide variety of potential volatile and semi-volatile contaminants. One of the purposes of the search was to better define testing criteria for future sampling. Defining target compounds allows greater economy and accuracy of future sample testing.

The library search indicated that some of the monitoring wells possessed up to 20 semi-volatile organic compounds. Based on the data it provided, ENSCI developed the following testing criteria for all monitoring wells:

- EPA Method 8080-Polychlorinated Biphenyls (PCBs)
- EPA Method 9020-Total Organic Halogen
- Polar and Non-Polar Hydrocarbons by IR
- Total Petroleum Hydrocarbons by IR
- EPA Method 9070-Oil and Grease
- Flash Point
- Isopropanol and n-Butyl Alcohol by GC/FID Methodology

In addition, wells #1, #5, #6, and #7 were analyzed for organics using EPA Methods 624 and 625.

Samples of creek water and creek sediment were obtained from Blair Fork Creek at the TFI facility. These samples were obtained hydraulically upgradient, parallel, and downgradient from the suspected drum burial site. The samples were analyzed using the above-mentioned analyses.

3. Identification of Potential Sources

During the Phase I investigation, ENSCI personnel performed a survey of several industrial properties surrounding the TFI facility. These surveys included a walk-through (along the railroad tracks), and visual inspection of the Reliance facility. It is located at 1713 Main Street, NW, in Lenoir (NCDO53009510). The inspection revealed the presence of an interceptor trench sub-parallel to Blair Fork Creek. This trench, and the Reliance property, lie immediately upgradient of TFI. Conversations with TFI employees and management indicated significant environmental problems were known to have existed at the Reliance site in the past. As a result, TFI reviewed available records at the State Superfund Branch in Raleigh, North Carolina.

The records search yielded significant information about the Reliance facility. This information included a December, 1988 Site Investigation Report, generated by the Superfund Branch, Solid Waste Management Section, North Carolina Division of Health Services. The Superfund Branch report was generated out of a Solid Waste Management response to complaints received during the rebuilding of the Main Street Bridge during 1987. The Main Street Bridge lies hydraulically downgradient of the Reliance facility, crosses Blair Fork Creek, and separates TFI/Reliance property.

The complaints received by the North Carolina Division of Solid Waste Management were made by construction workers who noticed strong odors in soils they were excavating. In response, Mr. Larry Fox, with the NC Solid Waste Management Section, collected soil samples along Blair Fork Creek that tested positive for total xylene, ethylbenzene, and toluene. The ensuing State investigation concluded that "...investigative work during 1987 and 1988 has shown that soil still contains levels as high as 211,597 mg/kg total xylene, 58,688 mg/kg ethylbenzene, and 5,146 mg/kg toluene. Groundwater and surface water contamination has also been shown to still exist at the site."

The 1988 Site Investigation Report indicated a historical use of the Reliance facility property, by various chemical manufacturers, that dated to at least 1967. The various chemical manufacturers include: from oldest to youngest, American Petrochemical Company (? to 1967), Whittaker Coatings and Chemicals (1967-1980), and Reliance Universal of Kentucky, Incorporated (1980-Present). The report also includes a summary of historical releases at the facility. Among the known releases discussed in the report, there is a summary of activity that dates to the mid-1970s. Apparently, in 1975, five municipalities drawing water from the Catawba River, up to 20 miles downstream of the Reliance facility, began to register complaints about the "obnoxious taste and odor of their drinking water". Systematic sampling by the EPA and State identified the contaminant as 2-ethyl, 4-methyl, 1,3-dioxolane. The contaminant source was traced to the present Reliance facility (at that time Whittaker Chemicals and Coatings) following the determination that the source of the dioxolane was Lenoir's Lower Creek wastewater treatment plant. A subsequent investigation, performed at the Reliance/Whittaker facility indicated on-site dioxolane, toluene, acetone, and "...other compounds as well.". The report states "At several locations along Blair (sic) Fork Creek, shallow auger holes revealed levels of pure xylene.". Other organic chemical compounds reportedly detected at the Reliance/Whittaker facility include: trichloroethylene, tetrachloroethylene, and benzene compounds. Chemicals reported to be potentially present at the Reliance facility include: styrene, methanol, ethanol, isopropanol, methyl ethyl ketone, butanol, methyl isobutyl ketone, and glycol ether.

The 1988 report indicates that a remedial effort occurred from 1977-1980 at the Whittaker facility; prior to the acquisition of the property by Reliance. From information generated during the 1987-1988 investigation, it is apparent that remedial measures taken by Whittaker which ceased in 1980 have failed to mitigate organic chemical contamination.

To identify potential sources of contamination, one goal of a Phase II Assessment, ENSCI has taken into consideration the possibility that some or all of the contaminants detected originated upgradient or upstream of TFI property. Based on information gathered from the Superfund Section and this investigation, ENSCI has identified the Reliance facility as the primary suspected source of contamination upgradient of the TFI facility.

4. Sub-surface Interface Radar Survey

In an effort to delineate any potential drum cache and possible trench locations, ENSCI subcontracted Geophysical Survey Systems, Incorporated, in North Salem, New Hampshire, to perform a Sub-Surface Interface Radar Survey (SIRS) at the TFI site. The SIRS was performed on September 27, 1991 and September 28, 1991. It was conducted over the grid area established for the soil gas survey (see Figure 2).

4.1 SIRS Methodology

The SIRS is performed by towing the instrument transducer along the grid lines established by a professional surveyor (see Appendix A). The area, as seen in Figure 3, was approximately 150 feet by 500 feet. The SIRS profiles were performed on a grid with 10-foot spacings throughout the primary investigation area, and 50-foot spacings elsewhere (see Figure 2). The Geophysical Survey Systems, Inc. representatives brought two instrument antennas to the TFI facility. The antennas included a Model 3102 (500 megahertz) and a Model 3105AP (300 megahertz) transducer. Both of these transducers were tested on the first day of surveying at the TFI Facility. The Model 3105AP (300 megahertz) transducer achieved the greatest penetration without losing significant resolution. A time scale of 100 nanoseconds was utilized for the entire survey, with a maximum potential penetration depth of 10-15 feet. In the areas investigated, the penetration depth with the SIRS was approximately 7 feet.

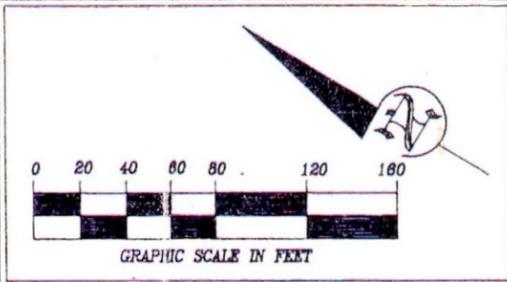
The SIRS profiles generated by Geophysical Survey Systems, Inc. were electronically encoded on data sheets scaled to the 50-foot grid points, or other landmarks. The grid marks were annotated on the recorded profiles to get a data horizontal scale. The speed of data acquisition in the field was approximately two miles per hour and 32 scans per second, or approximately one scan every 1.1



	BLAIR FORK CREEK
	LOCATION OF HYPERBOLIC ANOMALY
	POSSIBLE TRENCH OR SOIL INTERFACE BOUNDARY
	10' X 10' GRID SYSTEM

GRID SYSTEM SURVEY COMPLETED BY MARK TERRY & ASSOCIATES.

COMPOUND:



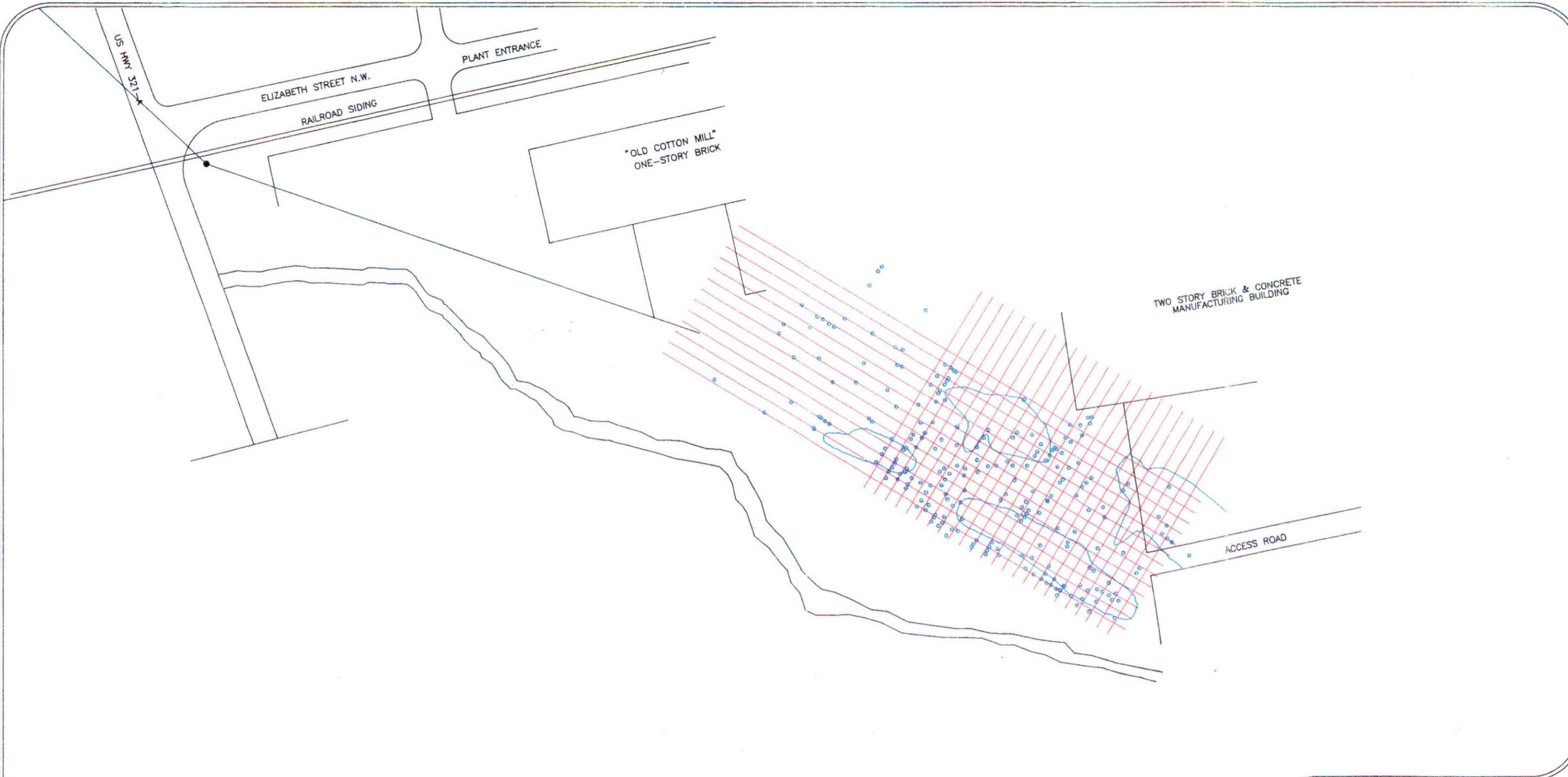
NOTE:
 CREEK LOCATION IS APPROXIMATE. NO CREEK LOCATION SURVEY WAS COMPLETED. LOCATION OF CREEK DETERMINED USING DRAWING DATED 1-4-72. DRAWN BY HUTH ENGINEERS INC., OF LANCASTER PA., REFERENCE NO., TFI-LN-RE-2.

ENSCI
 ENVIRONMENTAL SERVICES GROUP
 HIGH POINT, NORTH CAROLINA

FOR: TFI INCORPORATED

TITLE: SUBSURFACE INTERFACE RADAR ANOMALIES (WITH 25'X50' AND 10'X10' GRID SYSTEM)

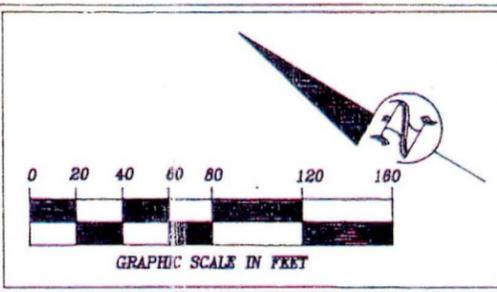
SCALE: 1" = 80'	DWN BY: DJ	FIGURE: 2
DATE: 12/91	CK BY: BB	JOB #: H91017A



	BLAIR FORK CREEK
	LOCATION OF HYPERBOLIC ANOMALY
	POSSIBLE TRENCH OR SOIL INTERFACE BOUNDARY
	10' X 10' GRID SYSTEM

GRID SYSTEM SURVEY COMPLETED BY MARK TERRY & ASSOCIATES.

COMPOUND:



NOTE:
CREEK LOCATION IS APPROXIMATE. NO CREEK LOCATION SURVEY WAS COMPLETED. LOCATION OF CREEK DETERMINED USING DRAWING DATED 1-4-72. DRAWN BY HUTH ENGINEERS INC., OF LANCASTER PA., REFERENCE NO., TFI-LN-RE-2.

ENSCI
ENVIRONMENTAL SERVICES GROUP
HIGH POINT, NORTH CAROLINA

FOR: TFI INCORPORATED

TITLE: SUBSURFACE INTERFACE RADAR SURVEY ANOMALIES (WITH 10'X10' GRID SYSTEM)

SCALE: 1" = 80'	DWN BY: DJ	FIGURE: 3
DATE: 12/91	CK BY: BB	JOB #: HS1017A

inches. The data set of paper profiles generated by GSSI were supplied to ENSCI for further analysis and interpretation. Several sample profiles are shown as Figures 4 and 5. The profiles were also recorded on a color video display unit using a stereo tape recorder. The recorded profiles contain a higher resolution output which is reviewed on screen to enhance the interpretation of the hard copied data.

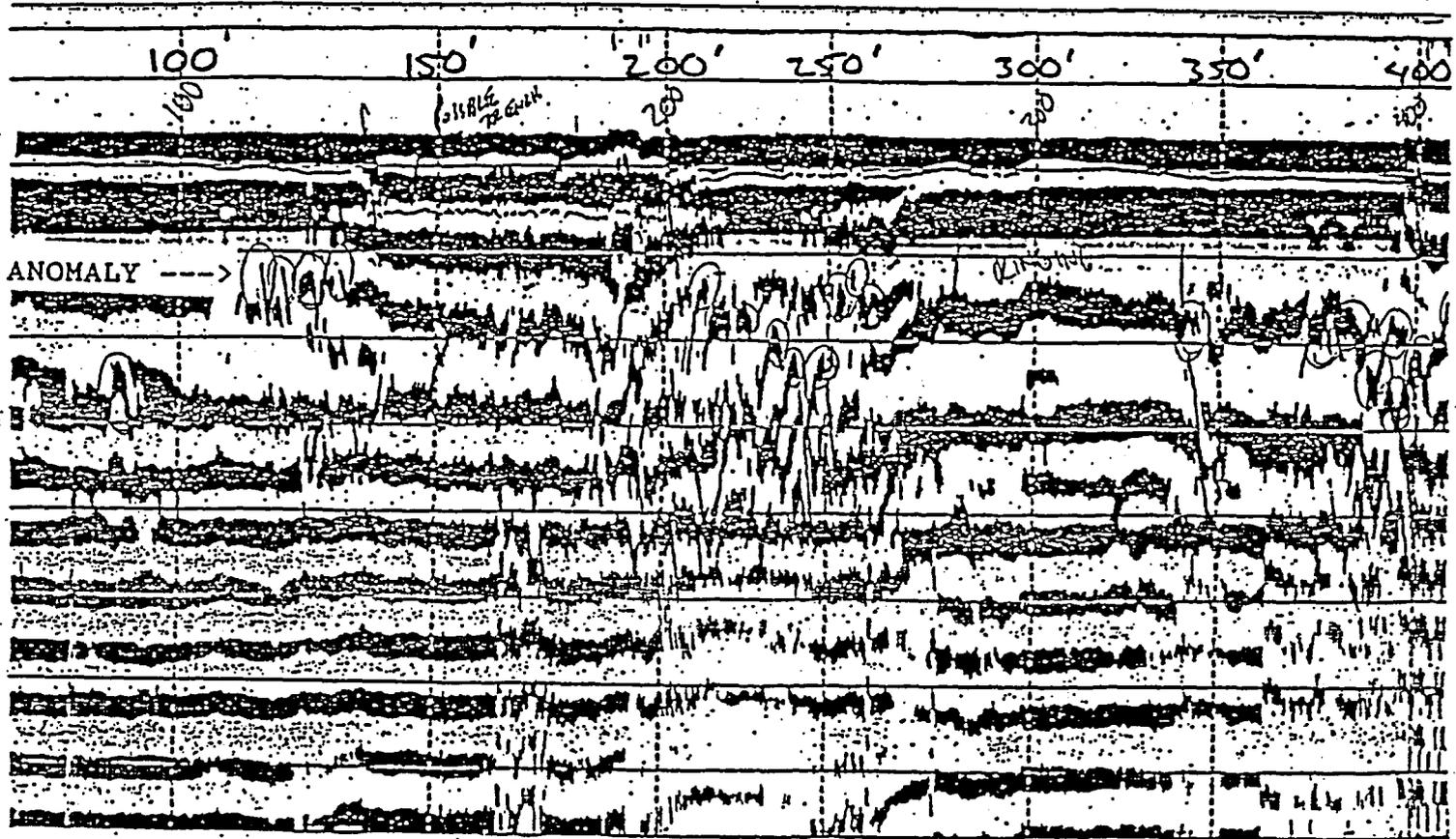
4.2 SIRS Results ,

The purpose of conducting the SIRS investigation was to detect the presence of possible buried drum caches and possible former trench locations. Figures 4 and 5 demonstrate examples of anomalous features at the facility that were detected using SIRS. These two figures demonstrate anomalies that may reflect both a trench position and drum locations. Figure 4 is an example of a profile in the north-south direction along a line 10-feet east of the D-line of the survey grid. There are three areas along this profile where concentrations of hyperbolic targets were interpreted. These hyperbolic targets are present from 100 feet to 150 feet, 200 feet to 260 feet, and 370 feet to 400 feet along the profile. As seen in the figure, there are multiple targets that have been circled. These reflections are thought to represent round top metallic targets that may be drums. This profile also shows an area where there is considerable attenuation of the radar signal from approximately 270 feet to 340 feet. This attenuation is interpreted as soils and/or sub-surface materials that differ from the surrounding areas, based on comparisons to other data profiles. These results are consistent with those which would exist at a trench location.

Figure 5 shows an SIRS profile acquired at the TFI Facility along the 260 line of the survey in an east-west direction. The anomaly indicated in the Figure is a steeply dipping reflector between the B & C marks of the profile. This area is possibly a reflection off a trench boundary, or a steeply dipping lateral change in the soil stratigraphy. Also present between the B & C marks is a signal ringing, or multiples, that are interpreted as near surface anomalies that are conductive. These reflections may represent crushed drums or other metallic debris. Figure 2 shows the TFI site plan and grid system with anomalies discovered by the SIRS. As seen in the Figure, approximately 225 hyperbolic anomalies were found. These types of anomalies are typical of round top targets that may be metallic.

SIRS anomalies mapped in Figure 2 indicate a concentration of parabolic targets, in a north-south orientation, sub-parallel to the fence along the western parking lot boundary (near the D grid line). Another linear concentration of parabolic targets is oriented east-west and immediately north of the 2+00 grid line. Another vague linear alignment of parabolic reflections lies to the

SURFACE --->



ANOMALY --->



FOR
TFI INCORPORATED

TITLE
PROFILE 10 NORTH-SOUTH
300 MHz, 100 ms

SCALE
N/A

DWN BY:
DJ

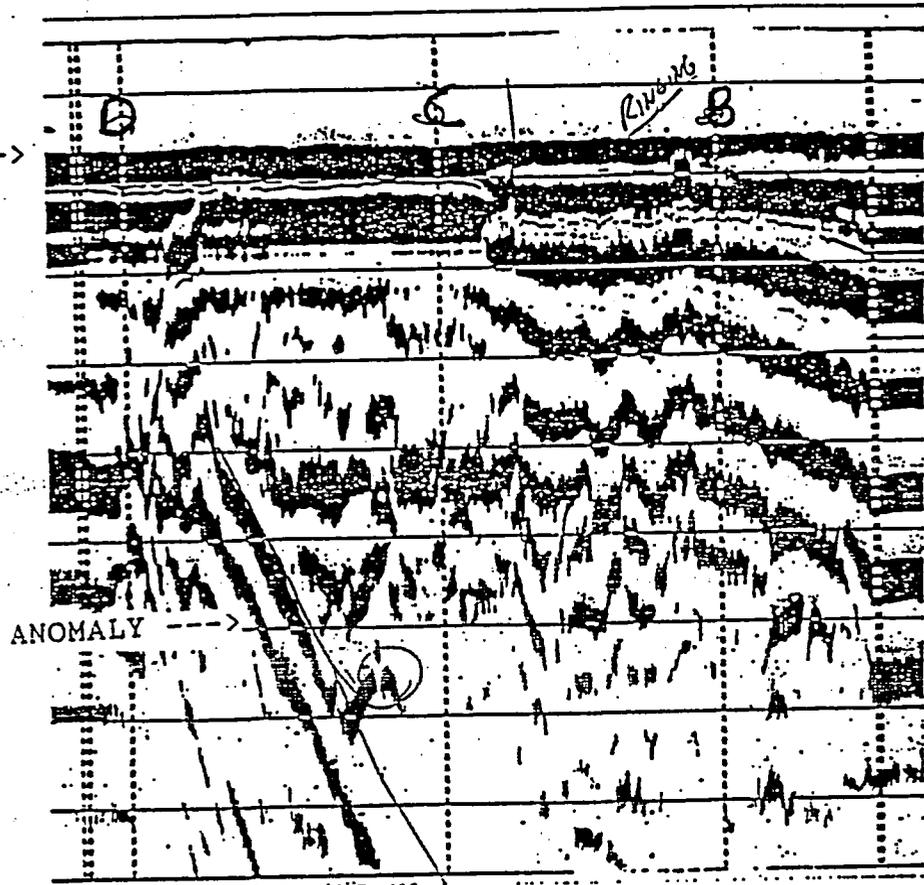
FIGURE
4

DATE
12/91

CK BY:
BB

JOB #
E91017A

SURFACE --->



ANOMALY --->



FOR: TFI INCORPORATED

TITLE: PROFILE 260 WEST-EAST
300 MHz, 100ms

SCALE: N/A	DWN BY: DJ	FIGURE: 5
DATE: 12/91	CK BY: BB	JOB #: H91017A

west of grid line C, between 1+75 and 4+00. Many anomalous reflections are present at the TFI facility, as seen in the Figure. However, there are also many parabolic reflections present that do not appear to have any discernable orientation. These reflections may represent false signals, targets other than buried drums, or they may indicate a random burial practice.

The total number of hyperbolic reflections detected during this SIRS is on the order of 225 individual anomalies. The bulk of these targets were detected between 1+75 and 4+00 to the west of grid line B (see Figure 2). This area was surveyed on a 10 foot grid spacing by SIRS. In general, when a transducer is towed across a survey grid, the width of the surveyed area is, by convention, considered to be a line centered directly below the SIRS transducer. In reality, the SIRS generated signal is approximately 3 feet in width (equal to the transducer). Allowing for a surveyed area 3 feet in width below each grid line, it becomes very obvious that the area actually surveyed is approximately 50% of the total area present within a 10 foot grid spacing. Assuming that 50% of the area of interest has been surveyed, it is plausible to conclude that more hyperbolic targets may be present within the surveyed area.

In addition to 50% coverage of the survey area using 10-foot grid spacings, one must consider that the detected hyperbolic anomalies represent the first contacted target. Any potential signal generated by targets that occur at depths below those shown in Figure 2 will be occluded by the uppermost hyperbolic signal. The net effect of this phenomenon is a potential for multiple anomalies being present where only one has been indicated.

ENSCI believes data yielded by this type of geophysical investigation is invaluable when conducting a site assessment. We do, however, also advocate the use of "ground truth" to confirm that detected anomalies are real. Accordingly, the data cannot be taken literally to conclude that buried drums are located at each of the hyperbolic reflections mapped in Figure 2.

5. Sampling and Analysis

Task II included detailed sampling and analysis of groundwater recovered from TFI monitoring wells (see Appendix B). In addition, ENSCI proposed to sample Blair Fork Creek water and sediment. During September, 1991, all existing monitoring wells were purged a minimum of three well volumes and sampled using the following analytical methodologies:

- EPA Method 608/8080 for Polychlorinated Biphenyls (PCBs)
- EPA Method 9020 for Total Organic Halogen
- Polar & Non-Polar Hydrocarbons by IR

- Total Petroleum Hydrocarbons by IR
- EPA Method 9070 for Oil and Grease
- EPA Method 1010, Flash Point Pensky-Martens Closed Cup Method
- Isopropanol and n-Butyl Alcohol by GC/FID Methodology

In addition to the above-mentioned analysis, monitoring wells #1, #5, #6, and #7 were sampled and tested using EPA Methods 624 and 625, with the volatile analysis being referenced to a dioxolane standard.

As seen in the Phase I Assessment Report, acetone was discovered in monitoring wells #1 and #7. Based on the upgradient positions of these wells, it is probable that these findings are the result of a plume migrating from the Reliance Universal of Kentucky, Inc. (Reliance) facility onto TFI property. Available data indicates a significant problem with a variety of organic chemical compounds at the Reliance facility.

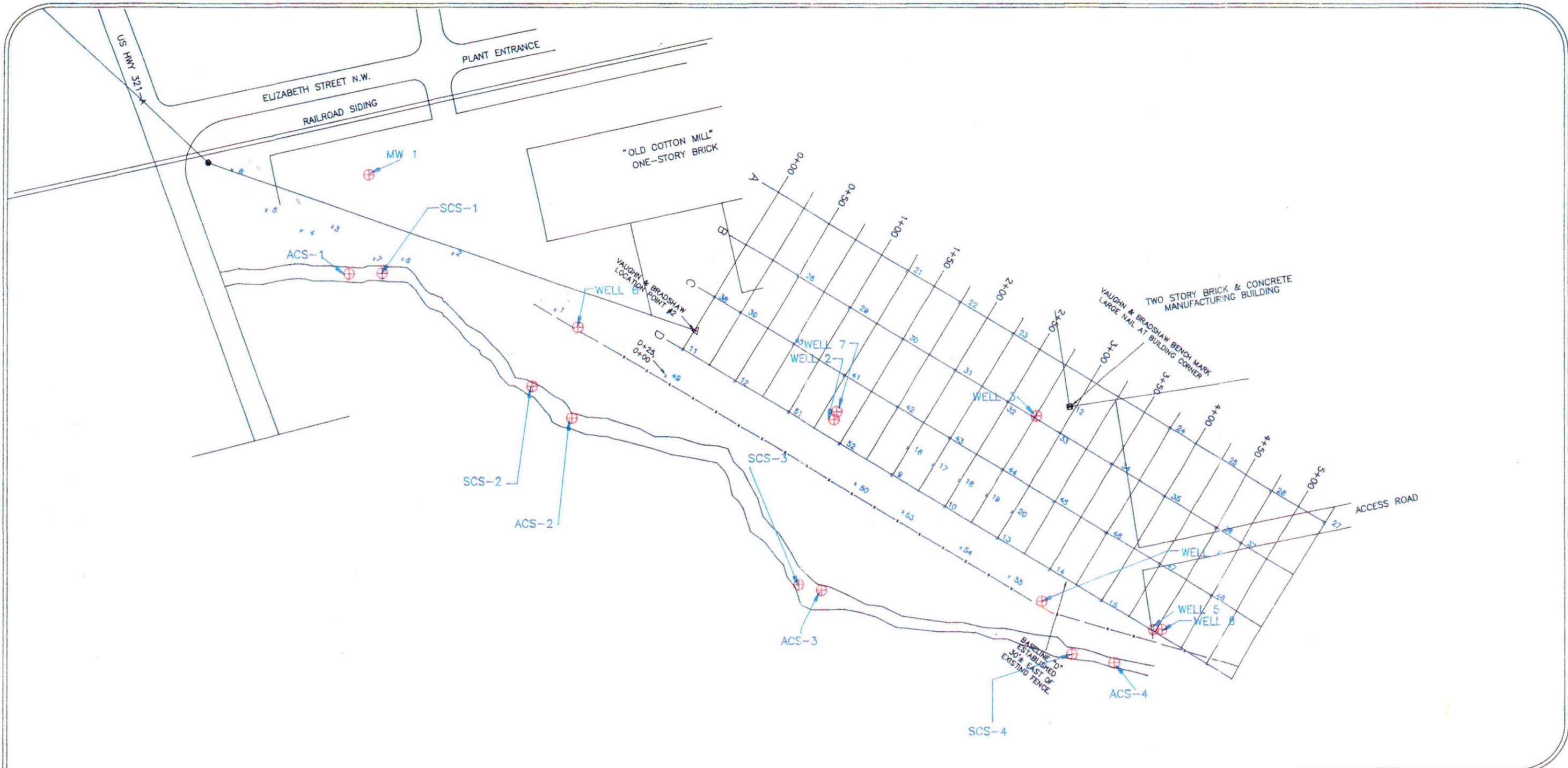
Due to the juxtaposition of TFI and Reliance, and the hydraulically downgradient position of TFI, it was determined that the TFI facility may have been impacted by a Reliance/Whittaker plume(s) migrating with the shallow groundwater. Based on information gathered from the State, (see Section 3), all volatile organic chemical analyses performed during the Phase II investigation were referenced to a 1,3-dioxolane standard.

To investigate any potential impact on Blair Fork Creek by the TFI Facility, and the potential impact on TFI by the upgradient Reliance Universal Facility, four stream sediment and water samples were acquired during the Phase II investigation (see Figure 6). These samples were analyzed using the above-listed methodologies, as well as EPA Methods 624, 625, and Total Metals by ICP. The 624 analysis was performed using the Target Compound List and includes library searches to detect any volatile and semi-volatile compounds not specifically targeted by the list. The volatile organic analysis was referenced to a dioxolane standard in the same way monitoring wells #1, #5, #6, and #7 were.

5.1 Monitoring Well Sampling and Analysis

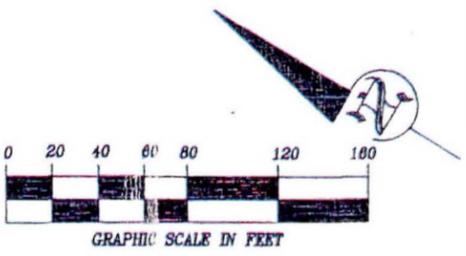
5.1.1 Volatile and Semi-volatile Compounds

Positive analytical results shown in Tables 1 and 2 indicate that a total of 8 VOC/SVOC compounds were detected in monitoring wells at the TFI facility (see Appendix C). Table 1 indicates positive analytical results for volatile/semi-volatile organic analysis performed on samples recovered from monitoring wells #1, #5, #6, and #7. The Table also includes positive analytical results for Total Organic Halogen testing of all monitoring wells. Table 1



WELL 2	MONITORING WELL LOCATION AND IDENTIFICATION NUMBER
+72	TOTAL IONIZATION SAMPLE LOCATION AND IDENTIFICATION NUMBER
ACS-2	AQUEOUS CREEK SAMPLE LOCATION
SCS-2	SEDIMENTARY CREEK SAMPLE LOCATION

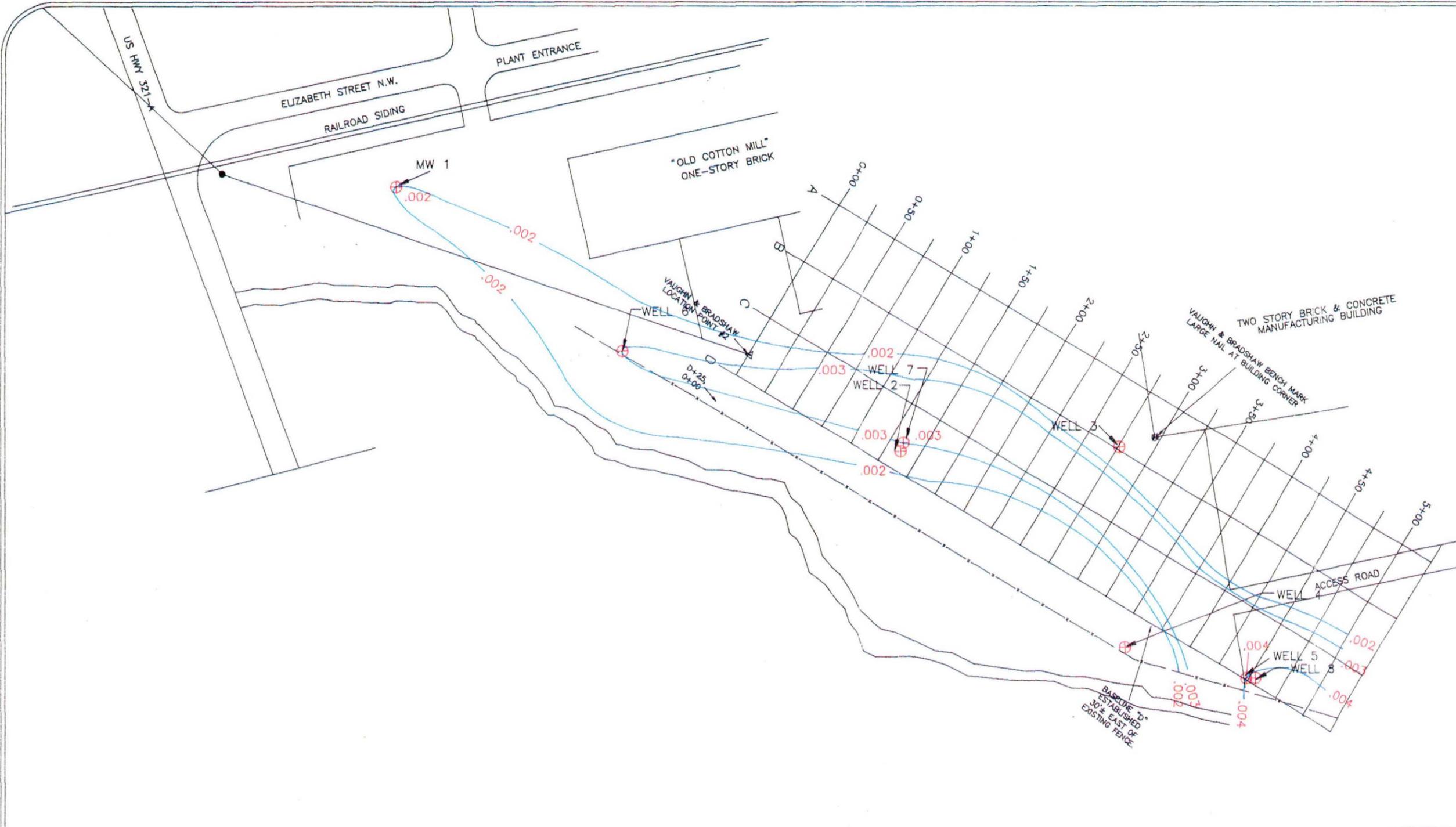
SURVEY OF MONITORING WELLS COMPLETED BY JAMES M. BRADSHAW ON 8 MAY 91.
 SURVEY GRID COMPLETED BY MARK TERRY AND ASSOCIATES.



NOTE:
 CREEK LOCATION IS APPROXIMATE, AS NO SURVEY WAS ACCOMPLISHED. CREEK LOCATION DETERMINED WITH FOLLOWING REFERENCE DRAWING., DATED 1-4-72. DRAWN BY HUTH ENGINEERS INC., OF LANCASTER, PA. REFERENCE NO., TFI-LN-RE-2.



FOR: TFI INCORPORATED		
TITLE: MONITORING WELL AND SAMPLE LOCATIONS		
SCALE: 1" = 80'	DWN BY: DJ	FIGURE: 6
DATE: 12/91	CK BY: BB	JOB #: H91017A



ANALYTICAL RESULTS AT SAMPLE/WELL LOCATIONS	
WELL #	ppm
1	.002
2	0
3	0
4	0
5	.004
6	.003
7	.003
8	0

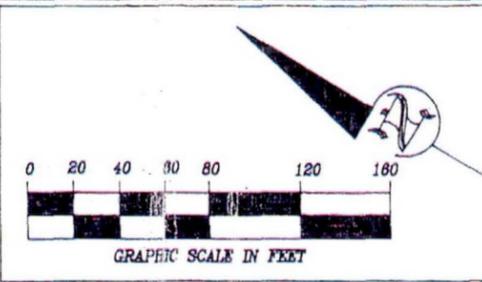
8.4

ISOCONCENTRATION CONTOUR
CONTOUR INTERVAL = 1 ppm

NOTE
DATA SET INCLUDES MONITORING
WELL INFORMATION ONLY.

ANALYTICAL RESULTS
OBTAINED FROM:
ANALYTIKEM INC., TEST REPORT
NO., A81565, DATED 10/25/91

COMPOUND:
CARBON DISULFIDE



NOTE:
CREEK LOCATION IS APPROXIMATE. NO
CREEK LOCATION SURVEY WAS COMPLETED.
LOCATION OF CREEK DETERMINED USING
DRAWING DATED 1/4/72. DRAWN BY HUTH
ENGINEERS, INC., OF LANCASTER, PA.,
REFERENCE NO., TFI-LN-RE-2.

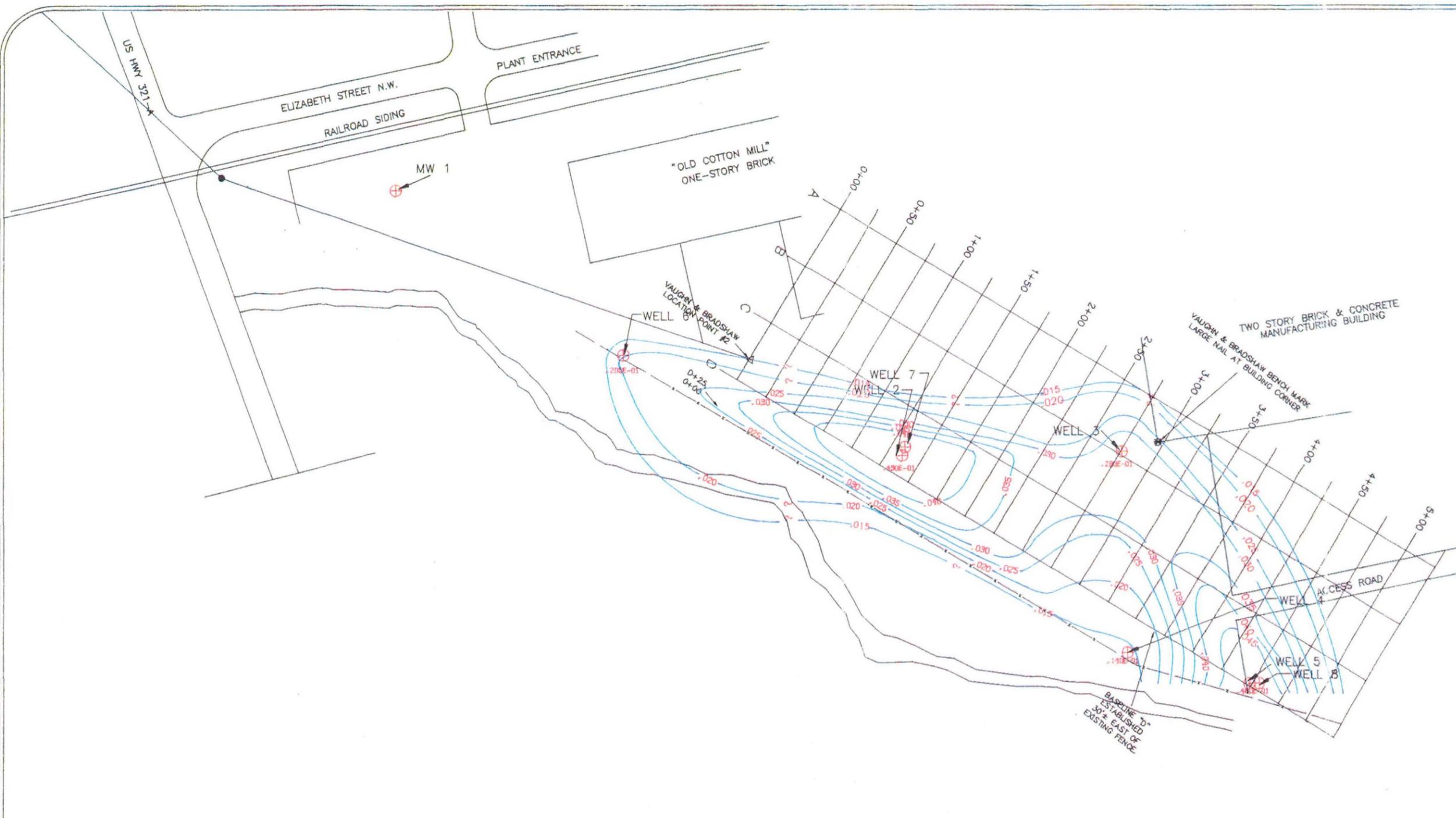
ENSCI
ENVIRONMENTAL SERVICES GROUP
HIGH POINT, NORTH CAROLINA

FOR: TFI INCORPORATED

TITLE: CARBON DISULFIDE ISOCONCENTRATION MAP

SCALE: 1" = 80' DWN BY: DJ FIGURE: 7

DATE: 12/12 CK BY: BB JOB #H91017A



ANALYTICAL RESULTS AT SAMPLE/WELL LOCATIONS	
WELL #	ppm
1	.015
2	.043
3	.029
4	.014
5	.022
6	.020
7	.013
8	.048

8.4

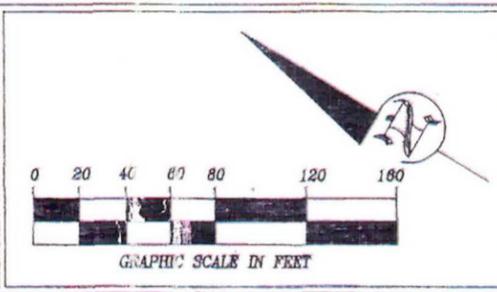
NOTE

ISOCONCENTRATION CONTOUR
CONTOUR INTERVAL = .005 ppm

DATA SET INCLUDES MONITORING
WELL INFORMATION ONLY.

ANALYTICAL RESULTS
OBTAINED FROM:
ANALYTIKEM INC., TEST REPORT
NO., A81565, DATED 10/25/91

COMPOUND:
TOTAL ORGANIC HALOGEN



NOTE:
CREEK LOCATION IS APPROXIMATE. NO
CREEK LOCATION SURVEY WAS COMPLETED.
LOCATION OF CREEK DETERMINED USING
DRAWING DATED 1/4/72. DRAWN BY HUH
ENGINEERS, INC., OF LANCASTER, PA.,
REFERENCE NO., TFI-LN-RE-2.

NOTE:
ANALYTICAL DATA FOR WELL NOS., 1, 4,
AND 7 EXCLUDED TO FACILITATE ISOCON-
CENTRATION CONTOUR GENERATION.

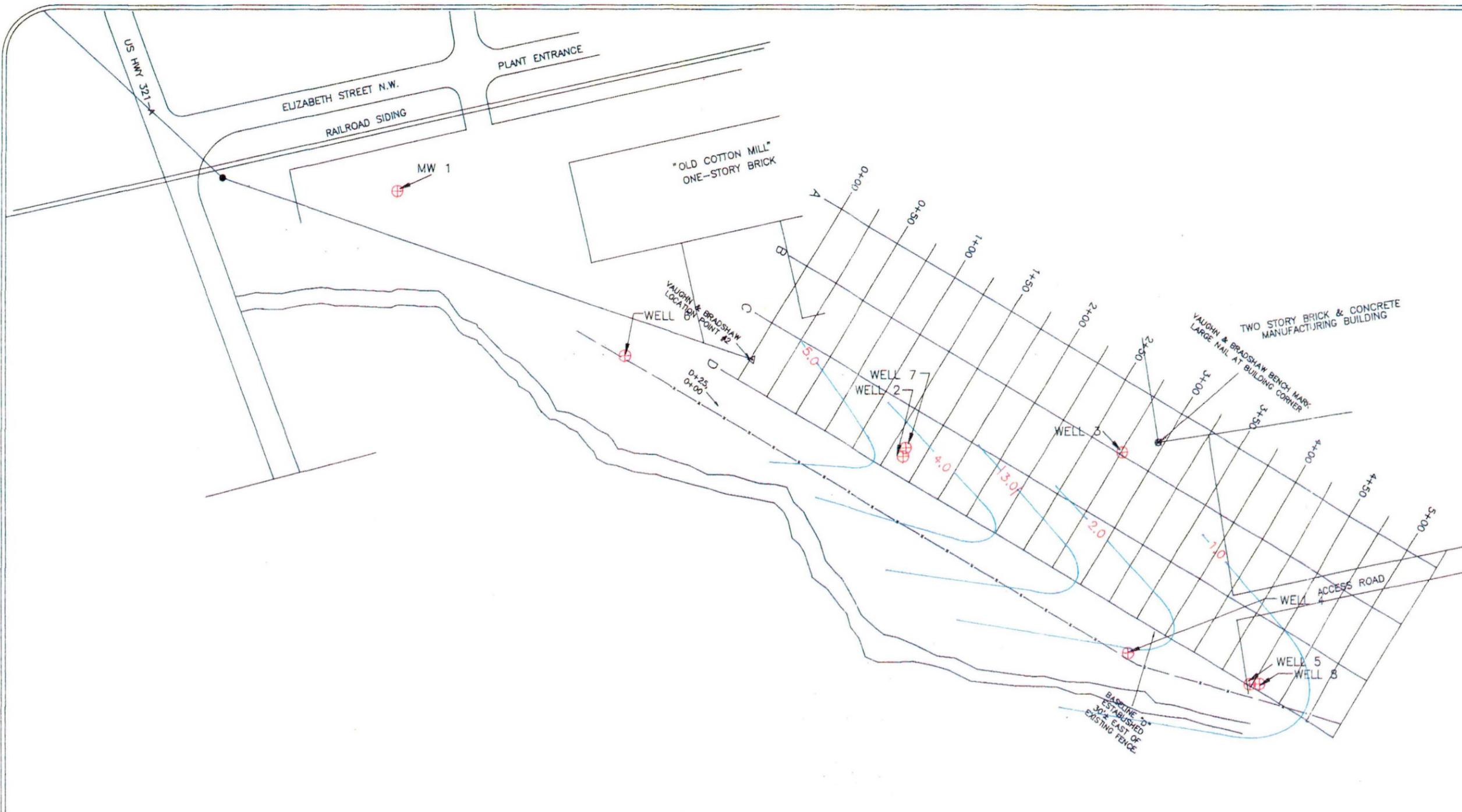
ENSCI
ENVIRONMENTAL SERVICES GROUP
HIGH POINT, NORTH CAROLINA

FOR: **TFI INCORPORATED**

TITLE: TOTAL ORGANIC HALOGEN
ISOCONCENTRATION MAP

SCALE: 1" = 80' DWN BY: DJ FIGURE: 8

DATE: 12/12 CK BY: BB JOB #H91017A



ANALYTICAL RESULTS AT SAMPLE/WELL LOCATIONS	
WELL #	ppm
1	0
2	4.7
3	0
4	2.2
5	1.4
6	0
7	0
8	0

8.4

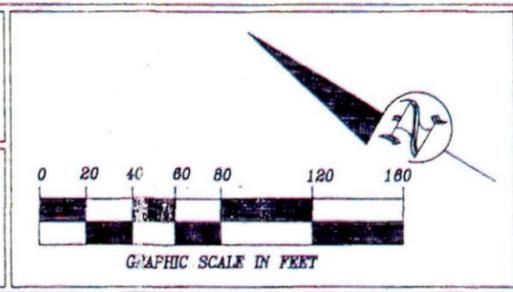
NOTE

ISOCONCENTRATION CONTOUR
CONTOUR INTERVAL = 1 ppm

DATA SET INCLUDES MONITORING
WELL INFORMATION ONLY.

ANALYTICAL RESULTS
OBTAINED FROM:
ANALTIKEM INC., TEST REPORT
NO., A81565, DATED 10/25/91

COMPOUND:
POLAR
PETROLEUM
HYDROCARBONS



NOTE:
CREEK LOCATION IS APPROXIMATE. NO
CREEK LOCATION SURVEY WAS COMPLETED.
LOCATION OF CREEK DETERMINED USING
DRAWING DATED 1/4/72. DRAWN BY HUTH
ENGINEERS, INC., OF LANCASTER, PA.,
REFERENCE NO., TFI-LN-RE-2.

ENSCI
ENVIRONMENTAL SERVICES GROUP
HIGH POINT, NORTH CAROLINA

FOR: TFI INCORPORATED

TITLE: POLAR PETROLEUM HYDROCARBONS
ISOCONCENTRATION MAP

SCALE: 1" = 80' DWN BY: DJ FIGURE: 9

DATE: 12/12 CK BY: BB JOB #H91017A

specific Polar compounds is therefore unlikely using Petrex type soil gas analysis. General conclusions can, however, be drawn from analogy between Polar TPH, Non-Polar TPH, soil gas TPH, and SIRS analysis performed at the subject facility.

Looking at both Figures indicates that higher concentrations of hydrocarbons exist to the north of SIRS data clusters. In particular, the soil gas data indicates a strong concentration of Non-Polar TPH well north of the suspect area. As discussed below, the soil gas TPH map was divided into benzene, toluene, and ethylbenzene/xylene constituents (see Figures 15 - 18). Soil gas Figure 18 shows that the bulk of the upgradient soil gas concentration is composed of toluene. Note: see additional discussion below.

ENSCI tested all monitoring wells at the TFI facility for Total Non-Polar Petroleum Hydrocarbons, by IR. Typical Non-Polar Petroleum Hydrocarbons include most fuel fraction hydrocarbons. Data shown in Table 2 indicates their presence in three of the monitoring wells (see Appendix C). Isoconcentration data mapped in Figure 10 indicates these compounds are present in the suspect area at rather uniform concentrations.

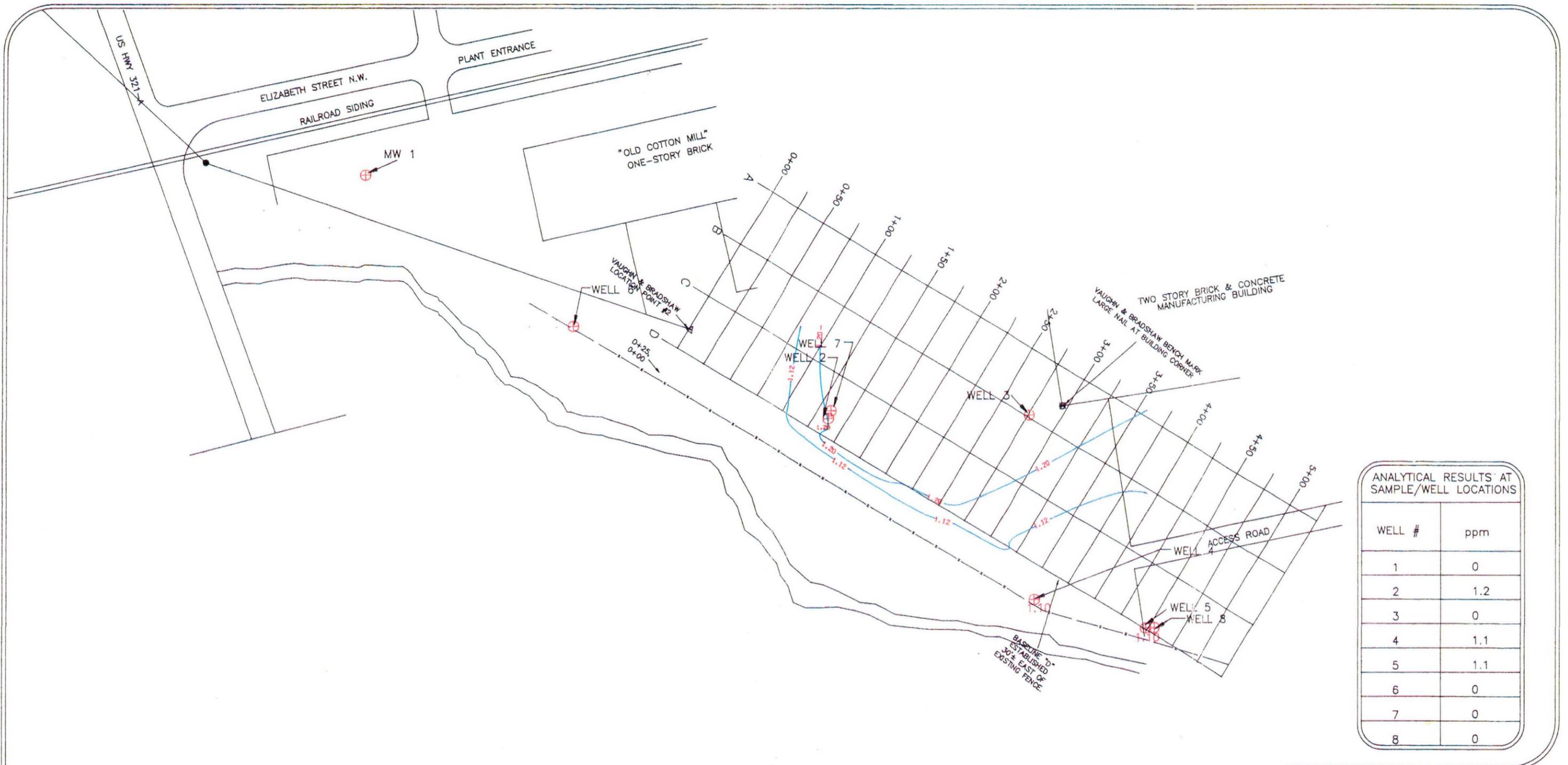
Table 2 summarizes concentrations of heavy hydrocarbons detected using EPA Method 9071 at the TFI facility. As seen in the Table, two wells tested positive using the methodology. These wells, #7 and #4, represent both aquifer systems represented at the facility (see Phase I Report). ENSCI is of the opinion that the results for MW #7 may be spurious. If the analytical results were correct, one would reasonably expect a correlative value for TPH to be detected by IR methodology (see Appendix C). As no correlative values of hydrocarbon concentrations were detected by the other TPH tests, ENSCI believes that MW #7 data should be ignored unless future sampling indicates otherwise. Due to questionable analytical results, no isoconcentration map was generated for the test method.

5.1.3 Flash Point Testing

ENSCI performed a Pensky-Martens Closed-Cup Method for Determining Ignitability on aqueous samples recovered from all the monitoring wells. As seen in Table 2, monitoring wells #5 and #6 both have a flash point less than 180°F (see Appendix C). This lower flash point indicates the presence of volatile/semi-volatile organic compounds in relatively high concentrations.

5.2 Blair Fork Creek Analytical Results

Figure 6 shows the approximate locations of stream sediment and stream water samples that were acquired from Blair Fork Creek. The position for the creek shown in all of the enclosed figures is



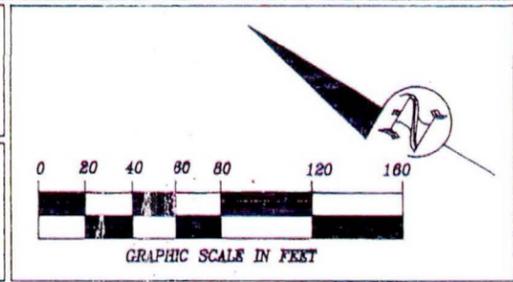
ANALYTICAL RESULTS AT SAMPLE/WELL LOCATIONS	
WELL #	ppm
1	0
2	1.2
3	0
4	1.1
5	1.1
6	0
7	0
8	0

8.4 ISOCONCENTRATION CONTOUR
CONTOUR INTERVAL = .08 ppm

NOTE DATA SET INCLUDES MONITORING WELL INFORMATION ONLY.

ANALYTICAL RESULTS OBTAINED FROM:
ANALTIKEM INC., TEST REPORT NO., A81565, DATED 10/25/91

COMPOUND:
NON POLAR PETROLEUM HYDROCARBONS



NOTE: CREEK LOCATION IS APPROXIMATE. NO CREEK LOCATION SURVEY WAS COMPLETED. LOCATION OF CREEK DETERMINED USING DRAWING DATED 1/4/72. DRAWN BY HUTH ENGINEERS, INC., OF LANCASTER, PA., REFERENCE NO., TFI-LN-RE-2.

NOTE: ANALYTICAL DATA FOR WELL NOS., 1,3,7, AND 8 IGNORED TO FACILITATE ISOCONCENTRATION CONTOUR GENERATION

ENSCI
ENVIRONMENTAL SERVICES GROUP
HIGH POINT, NORTH CAROLINA

FOR: TFI INCORPORATED

TITLE: NON-POLAR HYDROCARBON ISOCONCENTRATION MAP

SCALE: 1"=80' DWN BY: DJ FIGURE: 10

DATE: 12/12 CK BY: BB JOB #H91017A

approximate. When the parking lot area was surveyed for ENSCI, Blair Fork Creek was not included. The position of the creek shown in all of the figures is a composite of TFI drawing TFI-LN-RE-2 drawn by HUTH Engineers in 1972 and ENSCI field observations. All other positions shown in the TFI site maps have been tied to the North Carolina Geodetic Grid System.

5.2.1 Blair Fork Creek Aqueous Volatile/Semi-volatile Organics

As seen in Figure 6, four samples of creek water were obtained for analysis using the parameters defined above. Table 4 is a summary of positive analytical results for volatile and semi-volatile organic compounds (see Appendix C). As seen in the Table, a total of eight VOA/SVOA compounds have been detected in Blair Fork Creek water. Volatile Organic Compounds include 2-Propanone, 2-Butanone (MEK), 4 Methyl-2 -Pentanone (MIBK), Toluene, Ethylbenzene, m-Xylene, and o,p-Xylene. All of these constituents occur at levels below 15 NCAC with the exception of 2-Propanone and 4 Methyl-2-Pentanone, neither having an established standard and therefore have standards of .02 ppm and .01 ppm, respectively per 15 NCAC. The singular SVOC detected, 2-Methylphenol, has a detection limit, and 15 NCAC Standard, of .005 ppm.

Figure 11 is an isoconcentration map of 2-Propanone (acetone) generated from Blair Fork Creek aqueous samples. The Figure indicates that concentrations of the constituent increase in a downgradient direction. It is unlikely that the TFI facility is releasing the materials to the stream via the shallow aquifer system, given the fact that no acetone has been detected to date in monitoring wells installed in the southern portions of the property adjacent to the stream (MW #4, MW #5, MW #8, see Appendix C). During Phase I work (see Table 3) acetone was discovered in monitoring wells #1 and #7. These wells represent the upgradient shallow and deep monitoring wells, with MW #7 installed into the SIRS suspect area in a Type III installation (see Figure 12). It should be noted that no acetone was discovered in MW #1 or MW #7 by identical sampling performed in Phase II.

A plausible explanation for the increasing acetone concentration downgradient in Blair Fork Creek is that a plume of the material may be coming from the Reliance facility and intersecting Blair Fork Creek on TFI property. If Blair Fork Creek is a gaining stream, meaning that the stream gains water from its channel as it flows downgradient, and a plume of acetone generated from Reliance is intersecting the stream; one would expect to see an increase in concentration such as this. Additional supporting evidence stems from investigative work previously performed at the Reliance site (see above discussion). Apparently, the Reliance site has been known for releases of acetone, in addition to a variety of other materials.

TABLE 4

BLAIR FORK CREEK AQUEOUS SAMPLES
 TARGET COMPOUND LIST
 POSITIVE ANALYTICAL RESULTS
 REPORTED IN ppm

Samples Collected 9/27/91

VOLATILE ORGANIC COMPOUNDS

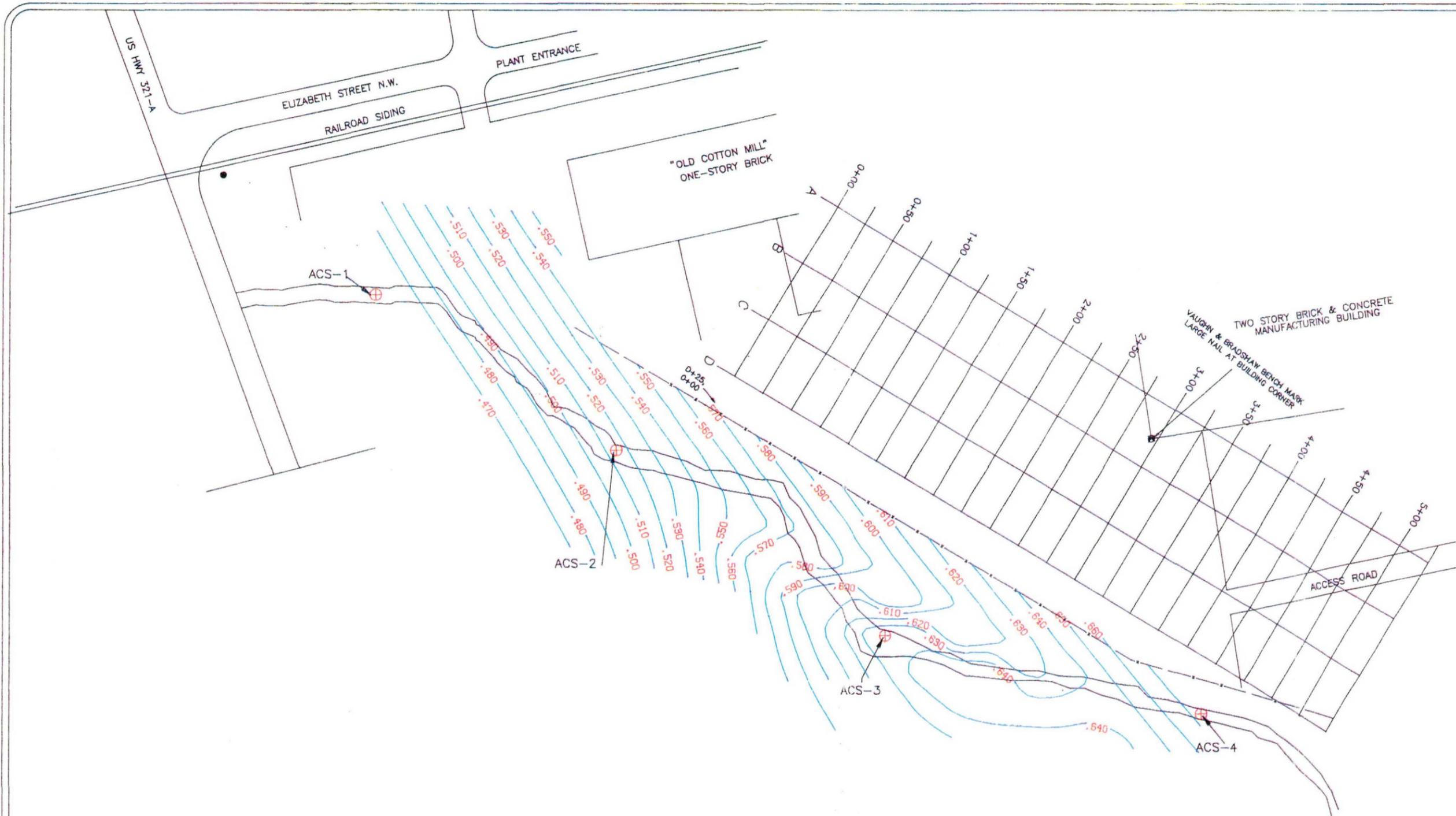
	ACS #1	ACS #2	ACS #3	ACS #4	NC GROUNDWATER STANDARDS 15 NCAC SUBCHAPTER 2L SECTION .0200
2 - Propanone	.470	.510	.630	.660	NO STANDARD
2 - Butanone	.024	.020	.007	ND	.170
4 Methyl - 2 - Pentanone	ND	ND	ND	.023	NO STANDARD
Toluene	.008	.004	ND	.003	1.0
Ethylbenzene	.011	.005	ND	.005	.029
m - Xylene	.025	.017	.010	.013	* .40
o,p - Xylene	.018	.012	.008	.011	* .40

SEMIVOLATILE ORGANIC COMPOUNDS

	ACS #1	ACS #2	ACS #3	ACS #4	NC GROUNDWATER STANDARDS 15 NCAC SUBCHAPTER 2L SECTION .0200
2 - Methylphenol	ND	ND	ND	.011	NO STANDARD

ND = Not Detected

* = Total Xylenes (m, o, and p)



ANALYTICAL RESULTS AT WELL/SAMPLE LOCATIONS	
AQUEOUS CREEK SAMPLE#	ppm
ACS-1	.470
ACS-2	.510
ACS-3	.630
ACS-4	.660

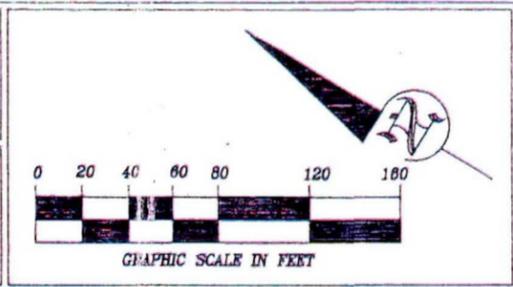
8.4

ISOCONCENTRATION CONTOUR
CONTOUR INTERVAL = .01ppm

NOTE: DATA SET INCLUDES AQUEOUS SAMPLE LOCATION INFORMATION ONLY.

ANALYTICAL RESULTS OBTAINED FROM:
ANALTIKEM INC., TEST REPORT NO., A81565, DATED 10/25/91

COMPOUND:
2-PROPANONE (ACETONE)



NOTE:
CREEK LOCATION IS APPROXIMATE. NO CREEK LOCATION SURVEY WAS COMPLETED. LOCATION OF CREEK DETERMINED USING DRAWING DATED 1-4-72. DRAWN BY HUTH ENGINEERS INC., OF LANCASTER, PA., REFERENCE NO., TFI-LN-RE-2.

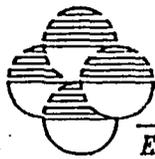
ENSCI
ENVIRONMENTAL SERVICES GROUP
HIGH POINT, NORTH CAROLINA

FOR: TFI INCORPORATED

TITLE: 2 - PROPANONE (ACETONE) ISOCONCENTRATION MAP

SCALE: 1" = 80' DWN BY: DJ FIGURE: 11

DATE: 12/6/91 CK BY: BB JOB # H91017A



ESGI

ENVIRONMENTAL SERVICES GROUP
HIGH POINT, NORTH CAROLINA

TYPE III MONITORING WELL

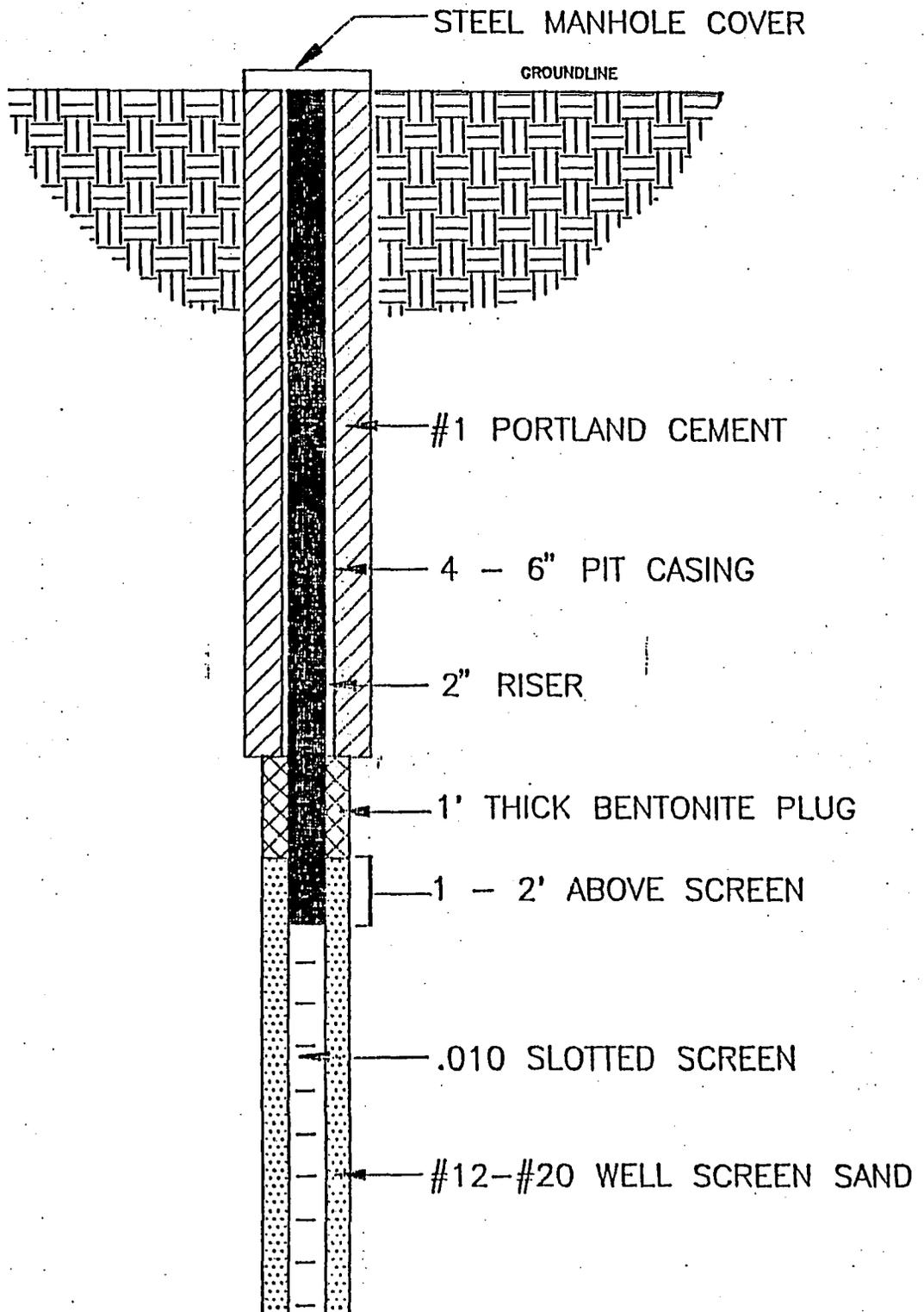


FIGURE 12

Only one sample of creek water tested positive for 4 Methyl-2-Pentanone (MIBK). This sample was taken in the most downgradient location along the creek. Due to the single occurrence, no isoconcentration map was generated. MIBK has never been detected in any monitoring wells at the TFI facility. Given the Reliance facility history, and reported on site potential for this chemical, it is possible that Reliance may have sourced this material.

The only semi-volatile compound detected in aqueous creek samples, 2-Methylphenol, was detected downstream similar to MIBK. No isoconcentration map was generated because there was only one occurrence of 2-Methylphenol.

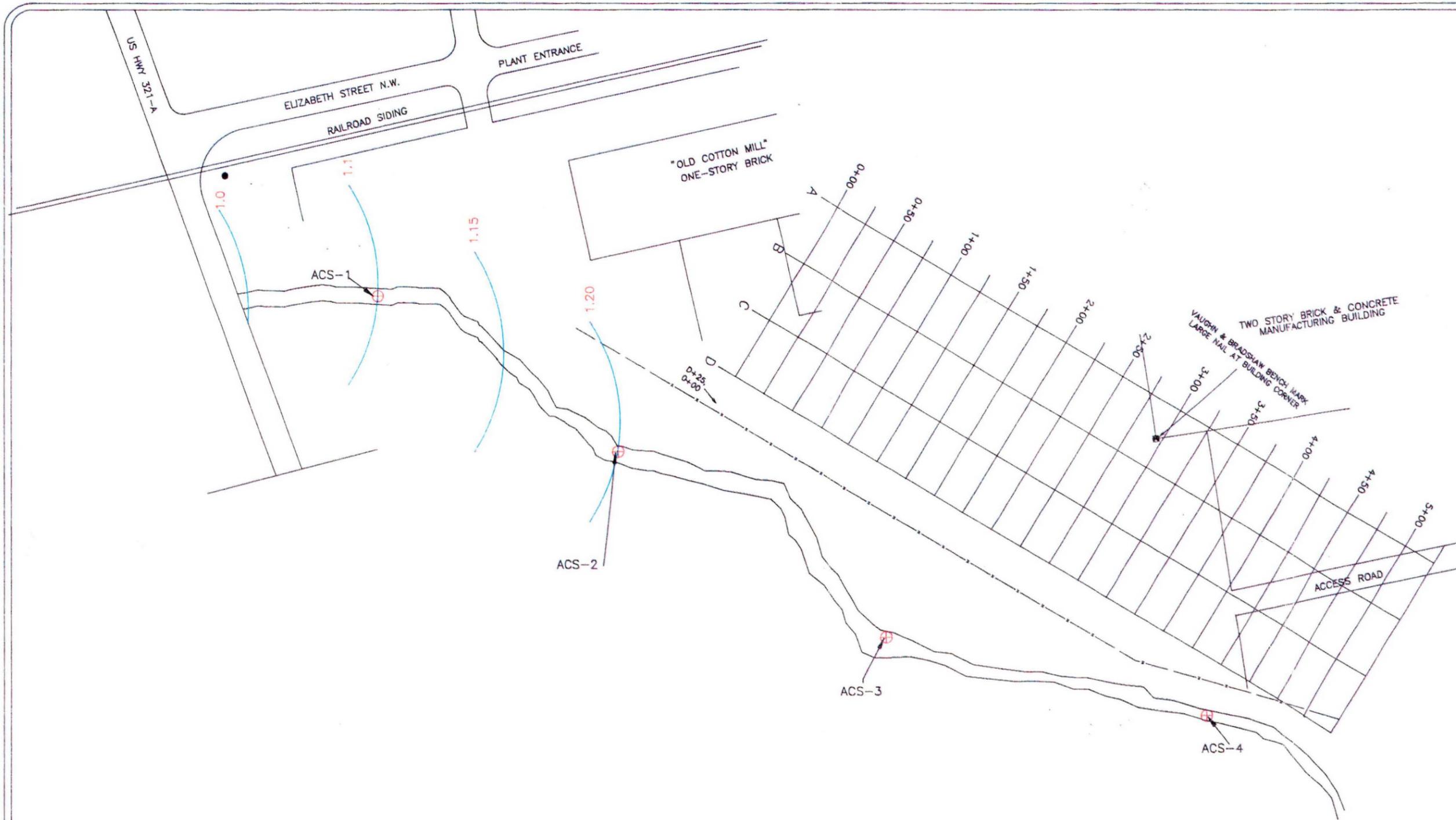
5.2.2 Blair Fork Creek Aqueous Hydrocarbons and Organic Halogens

Table 5 presents a summary of Total Polar and Non-Polar Petroleum Hydrocarbons, Oil & Grease, and Total Organic Halogen positive analytical results for aqueous phase creek samples obtained from Blair Fork Creek (see discussion above about Polar vs. Non-Polar Petroleum Hydrocarbons). Data obtained from Total Polar Petroleum Hydrocarbon (alcohols & ethers) analysis appears to be in good agreement with observations and potential conclusions drawn from the same test performed on monitoring wells at the TFI facility (see above discussion). In summary, higher concentrations appear to occur toward the north, away from areas with concentrated SIRS targets (see Appendix C). These results, for monitoring well and creek water samples, are generally supported by soil gas survey results discussed below. All three sets of data indicate higher concentrations of hydrocarbons in the direction of the Reliance facility, probably indicating a source in that direction.

Positive analytical results for Total Non-Polar Hydrocarbons, by IR (fuel hydrocarbons), are summarized in Table 5 (see Appendix C). As seen in the Table, only the downgradient aqueous creek sample detected Non-Polar Hydrocarbon constituents.

Oil & Grease analytical results shown in Table 5 indicate increased concentrations upgradient of the TFI facility (see Figure 13). This data correlates with groundwater and soil gas data discussed above and below, respectively.

Analytical results for Total Organic Halogen are included in Table 5. The results suggest that halogenated compound concentrations decrease with distance downstream of the Reliance facility. Another possibility is that the halogenated compounds, usually heavier than water, are sinking into the shallow aquifer system as they migrate downgradient. This scenario requires a point source upgradient of ACS #1 or, at a minimum, a source near the sampling point of ACS #1.



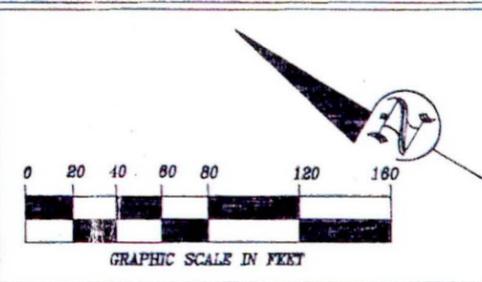
ANALYTICAL RESULTS AT WELL/SAMPLE LOCATIONS	
AQUEOUS CREEK SAMPLE #	ppm
ACS-1	1.1
ACS-2	1.2
ACS-3	0
ACS-4	0

ISOCONCENTRATION CONTOUR
CONTOUR INTERVAL = .05 ppm

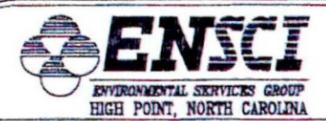
NOTE: DATA SET INCLUDES AQUEOUS SAMPLE LOCATION INFORMATION ONLY.

ANALYTICAL RESULTS OBTAINED FROM:
ANALYTIKEM INC., TEST REPORT NO., A81565, DATED 10/25/91

COMPOUND:
OIL & GREASE



NOTE:
CREEK LOCATION IS APPROXIMATE. NO CREEK LOCATION SURVEY WAS COMPLETED. LOCATION OF CREEK DETERMINED USING DRAWING DATED 1-4-72. DRAWN BY HUTH ENGINEERS INC., OF LANCASTER, PA., REFERENCE NO., TFI-LN-RE-2.



FOR: TFI INCORPORATED

TITLE: OIL AND GREASE ISOCONCENTRATION MAP

SCALE: 1" = 80' DWN BY: DJ FIGURE: 13

DATE: 12/6/91 CK BY: BB JOB #: 91017A

TABLE 5

BLAIR FORK CREEK AQUEOUS SAMPLES
 POSITIVE ANALYTICAL RESULTS
 REPORTED IN ppm

Samples Collected 9/27/91

TOTAL POLAR PETROLEUM HYDROCARBONS, BY IR

ACS #1	ACS #2	ACS #3	ACS #4
11.0	11.0	9.4	ND

TOTAL NON-POLAR PETROLEUM HYDROCARBONS, BY IR

ACS #1	ACS #2	ACS #3	ACS #4
ND	ND	ND	57.0

OIL & GREASE

ACS #1	ACS #2	ACS #3	ACS #4
1.1	1.2	ND	ND

TOTAL ORGANIC HALOGEN

ACS #1	ACS #2	ACS #3	ACS #4
.014	.007	.008	ND

Polar Petroleum Hydrocarbons - Possibly Alcohol

ND = Not Detected

Non-Polar Petroleum Hydrocarbons - Typical Fuel Hydrocarbons

5.2.3 Sedimentary Total Hydrocarbons and Organic Halogens

A summary of analytical results for Blair Fork Creek sediment samples can be found in Table 6 (see Appendix C). As seen in the Table, positive analytical results have been reported for Total Polar and Non-Polar Hydrocarbons, Oil & Grease, and Organic Halogen. Monitoring well data for this test method indicates highest concentrations of Polar compounds in the vicinity of MW #2 (4.7 ppm). Blair Fork Creek aqueous samples show equal concentrations of Polar compounds in both upgradient sample positions (ACS #1 & ACS #2). Observing the positions of SIRS hyperbolic target concentrations and SCS #2 & SCS #3 in Figures 2 and 6, it becomes obvious that the detected Polar compounds in the creek sediment would need to migrate strongly upgradient to appear at the sediment sample locations.

Upgradient migration is often possible when the released materials have very light density and groundwater flows at a very slow rate. In this instance, given the geology and miscibility of Polar compounds in water, a scenario such as this seems unlikely. A more plausible explanation for the high detected levels in the middle two samples might be a manifestation of the proposed gaining stream theory presented above. As explained, the detected contaminants are upwelling through the stream channel as the plume intersects the stream at a low angle with respect to the direction of flow. Given the detected levels of Polar compounds in the middle stream sediment samples (up to 94 ppm), and the low values detected in aqueous stream and groundwater samples, the two middle sediment samples may represent portions of the upwelling plume through the stream bottom. This theory would require a source in the direction of the Reliance facility that is migrating onto TFI property.

Non-Polar Petroleum Hydrocarbon (typical fuel hydrocarbon) results for creek sediment samples indicate a Non-Polar high in the vicinity of SCS #2 that decreases with distance downstream. These observations are in agreement with other hydrocarbon analyses discussed above and soil gas results discussed below. As discussed above, Blair Fork Creek appears to be a gaining stream; this data lends support to conclusions drawn above about a low angle intersection of the stream with a plume sourced hydraulically upgradient.

Oil & Grease analytical results for creek sediment samples are included in Table 6. These analytical results are variable and do not correlate well with the other TPH analyses discussed above. The results suggest two hot spots, with each high followed downgradient by lower values of TPH. If the detected levels of TPH are correct, the data could indicate two plumes intersecting the creek in a manner discussed above.

Results of a Total Organic Halogen test performed on creek sediment samples are included in Table 6. These results indicate the

TABLE 6

BLAIR FORK CREEK SEDIMENT SAMPLES
 POSITIVE ANALYTICAL RESULTS
 REPORTED IN ppm

Samples Collected 9/27/91

TOTAL POLAR PETROLEUM HYDROCARBONS, BY IR

SCS #1	SCS #2	SCS #3	SCS #4
73.0	91.0	94.0	66.0

TOTAL NON-POLAR PETROLEUM HYDROCARBONS, BY IR

SCS #1	SCS #2	SCS #3	SCS #4
ND	46.0	39.0	36.0

OIL & GREASE

SCS #1	SCS #2	SCS #3	SCS #4
120.0	75.0	190.0	54.0

TOTAL ORGANIC HALOGEN, BY IC

SCS #1	SCS #2	SCS #3	SCS #4
1.4	1.5	ND	ND

Polar Petroleum Hydrocarbons - Possibly Alcohol

Non-Polar Petroleum Hydrocarbons - Typical Fuel Hydrocarbons

ND = Not Detected

presence of halogenated compounds in the upgradient sample positions (SCS #1 & SCS #2) and no halogenated compound detection in the two downstream positions. This data may reflect a sinking of the heavier molecules with distance from the source (see discussion above).

PRECAUTIONARY NOTE: There is a potential that many of the compounds detected in the creek water and sediment originated at a facility or spill upgradient of both TFI and Reliance which is unknown to ENSCI. The only unequivocal conclusion that can be drawn is that Blair Fork Creek has been, and continues to be, impacted by a source(s) that is/are variable in character with respect to the nature of the constituents being sourced.

6. Soil Gas Survey

To detect soil gas anomalies which are associated with buried drums, ENSCI installed Northeast Research Institute, Inc. Petrex sampling tubes. Petrex tubes are passive soil gas samplers that possess one or two activated carbon-coated ferromagnetic sorbent wires inside of a Pyrex screw-top tube (see Appendix D).

6.1 Soil Gas Survey Methodology

Petrex tubes are buried in a grid pattern across the area of interest at similar depth. After burial, the collectors reside for an optimally measured period to assure time integrative soil gas collection. The optimal time determination is accomplished by time calibration detectors that are removed at certain intervals and analyzed to calculate loading of the activated carbon by organic compounds. These detectors, after residing in the ground for a period from a few hours to several days, are removed and shipped to the laboratory for analysis (see Appendix D).

In the laboratory, the activated carbon is desorbed using a Curie Point desorption inlet interfaced to a quadruple mass spectrometer. Using this type of analysis, all volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) are collected in a mass range of 30 to 240 (C2-C16) when the carbon is desorbed. This resulting ion count data is downloaded into a computer that has a library of VOCs and SVOCs to which the data is compared. Two types of interpretations can then be performed. The first is a map generation showing relative concentrations of VOCs and SVOCs as related to the grid pattern. The second interpretation focuses on composite VOC/SVOC response at each sampling location. These sampling points are treated as discreet soil gas fingerprints and are compared to the library for compound identification. These results are then compared to the survey set to distinguish plumes of different chemical composition. This plume definition is useful when attempting to trace the plume(s) back to the source(s). The Petrex survey, as are all soil gas surveys, is incapable of placing

actual concentration numbers on the sampling points. All information generated is presented as relative to the background levels detected in the peripheral boundary of the survey grid. To determine actual concentrations, physical samples need to be analyzed in a laboratory.

Prior to initiation of the Petrex sampling tube survey, ENSCI Corporation installed five time calibration tubes. These time calibration tubes were installed in the area suspected of possessing the highest concentrations of soil gas to establish an optimal exposure time for the activated carbon wires. The optimal Petrex tube residence time is calculated based on total ion sorption during a known interval of time. Following laboratory desorption of four time calibration tubes, it was determined that an optimal residence time for this soil gas survey was on the order of twenty-four hours. Table 7 presents a summary of the Petrex tube ID Number, Station Number, Installation Time, Removal Time, and data on the conditions of the boring into which the tube was installed.

As seen in Table 7, ENSCI Corporation installed a total of 55 Petrex sampling tubes at the TFI Facility. These sampling tubes were installed on a grid system established prior to initiation of the soil gas survey (see Figure 2). With the exception of sampling points seven and eight, all of the Petrex tubes were installed into 18-inch lengths of EMT electrical conduit 1½-inch in diameter (see Figure 14). In the field, a hammer drill was used to advance each of the bore holes. This hammer drill was equipped with a carbide tip drill bit 18" long. Following advancement of the drill bit, the EMT conduit was placed in the bore hole. Each of the Petrex sampling tubes were attached to a piece of decontaminated iron wire and lowered into the galvanized tube, open end down (see Figure 14).

After removal of the Petrex tubes, all of the tubes were sent via express courier to Northeast Research Institute, Incorporated Laboratories in Farmington, Connecticut. At the laboratory, the survey tubes were analyzed using the methodology summarized above. Included in Appendix D is a standard protocol for the use of Petrex tubes in performing a soil gas survey. This protocol was diligently followed, with any exceptions noted above.

6.2 Soil Gas Survey Results

Figures 15 - 20 are isoconcentration maps generated from total ion count data detected by the Petrex soil gas survey. As seen in the Figures, a variety of organic compounds have been detected at the facility. These organics include petroleum hydrocarbons, cycloalkanes/alkenes, and halogenated compounds. These compounds have been detected at various sampling points in the survey grid. As stated in Section 6.2.1, each individual sampling point in the

**TABLE 7-A
PETREX SAMPLING TUBE SURVEY
INSTALLATION/REMOVAL DATA**

TUBE ID NUMBER	STATION NUMBER	INSTALLATION TIME	REMOVAL TIME	DRY HOLE	WET HOLE	LOT #	OTHER
ROW A							
21	A, 1+25	2124	2121	X		681	
22	A, 1+75	2125	2122	X		681	
23	A, 2+25	2126	2123	X		681	
24	A, 3+75	2127	2124	X		681	
25	A, 4+25	2128	2125	X		681	
26	A, 4+75	2129	2126	X		681	
27	A, 5+25	2130	2127	X		681	
ROW B							
28	B, 0+50	2133	2131	X		681	
29	B, 1+00	2134	2133	X		681	
30	B, 1+50	2135	2135	X		681	
31	B, 2+00	2136	2136		X	681	Damp
32	B, 2+50	2137	2137		X	681	
33	B, 3+00	2138	2139	X		681	Damp
34	B, 3+50	2140	2140	X		681	
35	B, 4+00	2141	2141	X		681	
36	B, 4+50	2142	2142	X		681	
37	B, 4+75	2143	2143	X		681	

TABLE 7-B
 PETREX SAMPLING TUBE SURVEY
 INSTALLATION/REMOVAL DATA

TUBE ID NUMBER	STATION NUMBER	INSTALLATION TIME	REMOVAL TIME	DRY HOLE	WET HOLE	LOT #	OTHER
ROW C							
38	C,0+00	2206	2206	X		681	
39	C,0+25	2207	2207	X		681	
40	C,0+75	2208	2208	X		681	
41	C,1+25	2209	2212	X		681	Broke coming out of the tube. Took metal strips and put them in another tube.
42	C,1+75	2210	2213	X		681	
43	C,2+25	2211	2214		X	681	Wet
44	C,2+75	2212	2215	X		681	
45	C,3+25	2213	2216	X		681	
46	C,3+75	2214	2217	X		680	
47	C,4+25	2215	2218		X	680	Damp hole
48	C,4+75	2215	2219	X		680	

TABLE 7-C
 PETREX SAMPLING TUBE SURVEY
 INSTALLATION/REMOVAL DATA

TUBE ID NUMBER	STATION NUMBER	INSTALLATION TIME	REMOVAL TIME	DRY HOLE	WET HOLE	LOT #	OTHER
ROW C+25 (SURVEY)							
100	C+25, 2+100	2226	2242	X		682	Pulled up tube, but not taken out.
101	C+25, 2+25	2227	2241	X		682	May have been tampered with.
102	C+25, 2+50	2230	2240	X		682	
103	C+25, 2+75	2232	2239	X		682	
104	C+25, 3+00	2234	2236	X		682	

TABLE 7-D
 PETREX SAMPLING TUBE SURVEY
 INSTALLATION/REMOVAL DATA

TUBE ID NUMBER	STATION NUMBER	INSTALLATION TIME	REMOVAL TIME	DRY HOLE	WET HOLE	LOT #	OTHER
ROW D							
13	D,0+00	2148	2224	X		680	
50	D,0+50	2149	2226	X		680	
51	D,1+00	2150	2228	X		680	
52	D,1+50	2151	2229	X		680	
53	D,2+00	2155	2230	X		680	
54	D,2+50	2156	2231	X		680	
55	D,3+00	2157	2232	X		680	
56	D,3+50	2158	2233	X		680	
15	D,4+00	2200	2234	X		680	
ROW D+25							
105	D+25,1+75	2221	2250	X		680	
106	D+25,2+25	2222	2249	X		680	
107	D+25,2+75	2223	2248	X		680	
108	D+25,3+25	2224	2248	X		680	
16	D+25,0+00	2219	2252	X		680	

**TABLE 7-E
PETREX SAMPLING TUBE SURVEY
INSTALLATION/REMOVAL DATA**

TUBE ID NUMBER	STATION NUMBER	INSTALLATION TIME	REMOVAL TIME	DRY HOLE	WET HOLE	LOT #	OTHER
ROW FENCE							
1	X	1630	1630	X		680	
2	X	1632	1632	X		680	
3	X	1637	1637	X		680	Broke and placed in bottle. Now marked #3. Handle with aluminum foil.
4	X	1638	1638	X		680	
5	X	1640	1640	X		680	
6	X	1640	1640	X		680	
ROW CREEK							
7	X	1642	1642			680	Moist
8	X	1643	1642			680	Moist

PETREX SOIL GAS SAMPLING TUBE BOREHOLE DIAGRAM

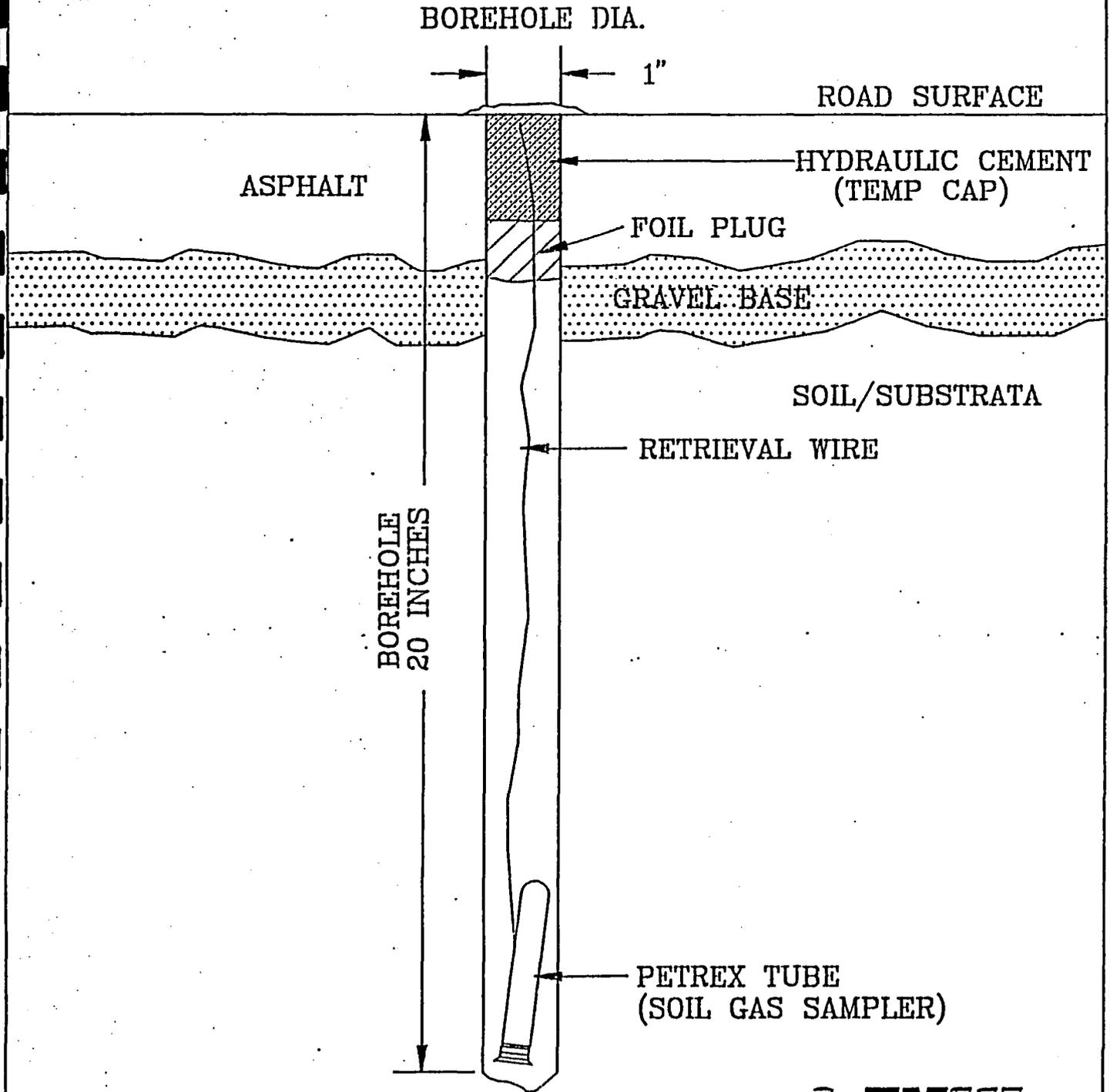
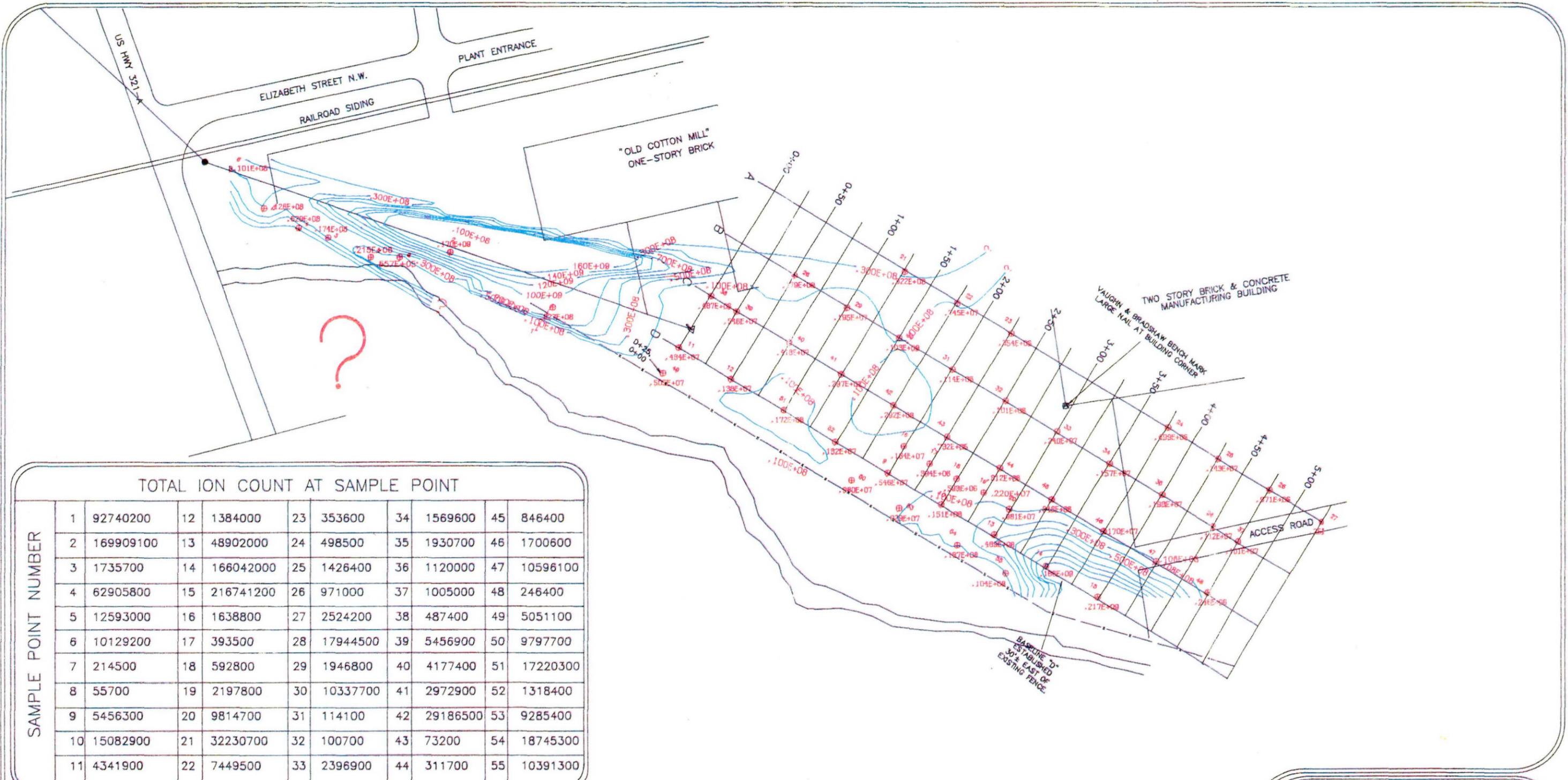


Figure 14



TOTAL ION COUNT AT SAMPLE POINT

SAMPLE POINT NUMBER	1	92740200	12	1384000	23	353600	34	1569600	45	846400
	2	169909100	13	48902000	24	498500	35	1930700	46	1700600
	3	1735700	14	166042000	25	1426400	36	1120000	47	10596100
	4	62905800	15	216741200	26	971000	37	1005000	48	246400
	5	12593000	16	1638800	27	2524200	38	487400	49	5051100
	6	10129200	17	393500	28	17944500	39	5456900	50	9797700
	7	214500	18	592800	29	1946800	40	4177400	51	17220300
	8	55700	19	2197800	30	10337700	41	2972900	52	1318400
	9	5456300	20	9814700	31	114100	42	29186500	53	9285400
	10	15082900	21	32230700	32	100700	43	73200	54	18745300
	11	4341900	22	7449500	33	2396900	44	311700	55	10391300

8.4

ISOCONCENTRATION CONTOUR

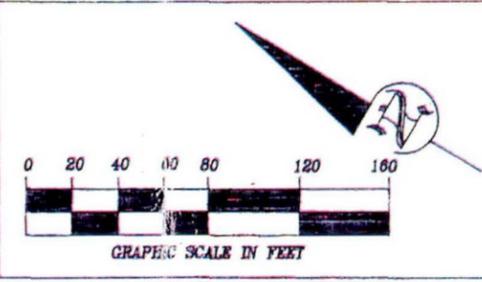
● — SAMPLE NUMBER

⊕ — SAMPLE LOCATION

.138E+07 — TOTAL ION COUNT FOR SAMPLE

ANALYTICAL RESULTS OBTAINED FROM:
NORTHEAST RESEARCH INSTITUTE
FARMINGTON, CT.

COMPOUND:
PETROLEUM HYDROCARBONS



NOTE:
CREEK LOCATION IS APPROXIMATE. NO CREEK LOCATION SURVEY WAS COMPLETED LOCATION OF CREEK DETERMINED USING DRAWING DATED 1-4-72. DRAWN BY HUTH ENGINEERS INC., OF LANCASTER PA., REFERENCE NUMBER TFI-LN-RE-2.

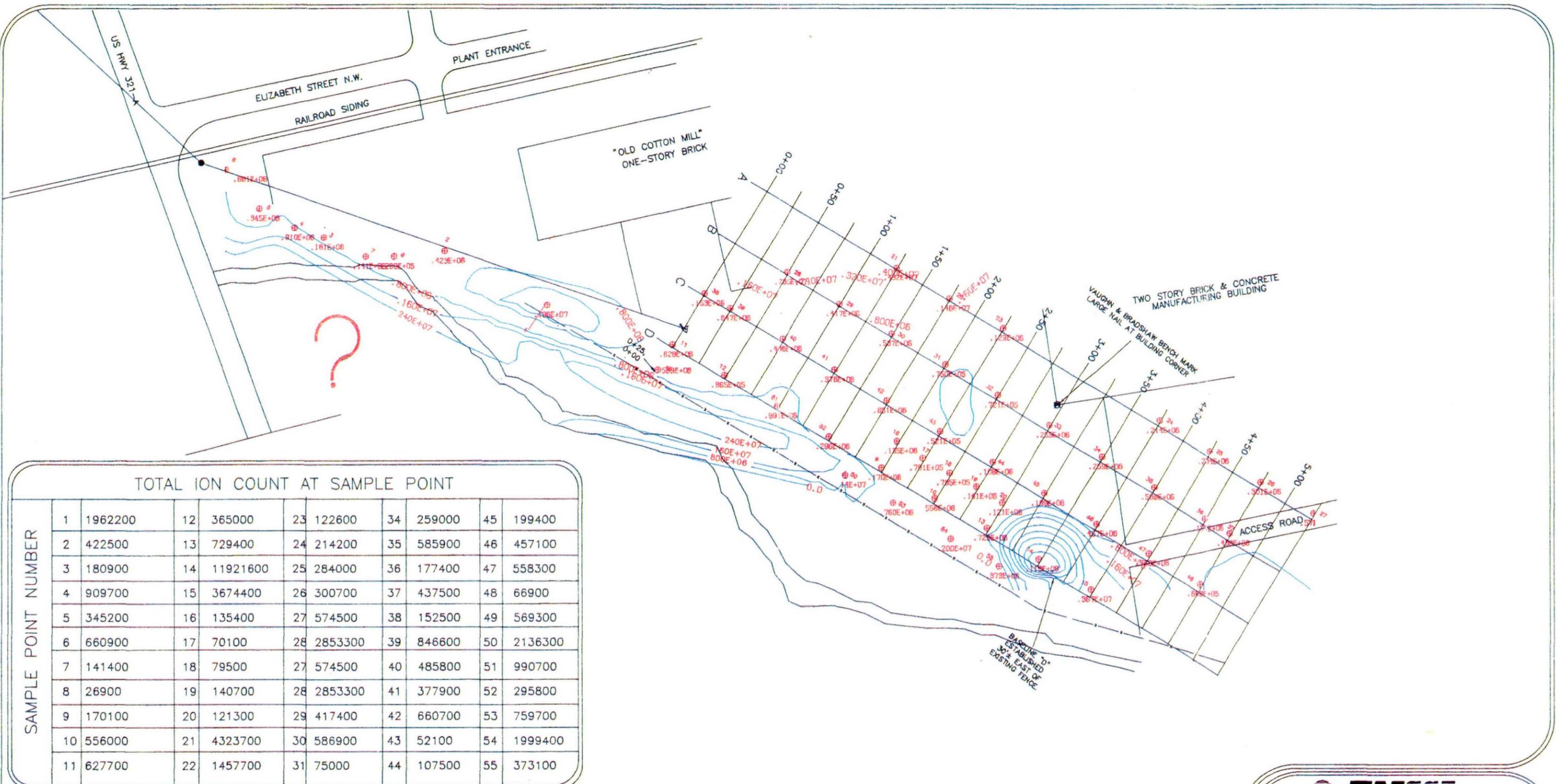
ENSCI
ENVIRONMENTAL SERVICES GROUP
HIGH POINT, NORTH CAROLINA

FOR: TFI INCORPORATED

TITLE: PETROLEUM HYDROCARBONS ION COUNT MAP

SCALE: 1"=80' DWN BY: DJ FIGURE: 15

DATE: 12/91 CK BY: BB JOB #: H91017A



TOTAL ION COUNT AT SAMPLE POINT

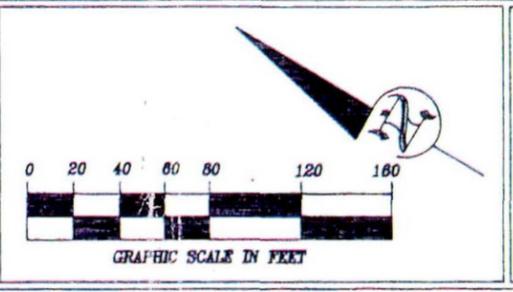
SAMPLE POINT NUMBER	1	1962200	12	365000	23	122600	34	259000	45	199400
	2	422500	13	729400	24	214200	35	585900	46	457100
	3	180900	14	11921600	25	284000	36	177400	47	558300
	4	909700	15	3674400	26	300700	37	437500	48	66900
	5	345200	16	135400	27	574500	38	152500	49	569300
	6	660900	17	70100	28	2853300	39	846600	50	2136300
	7	141400	18	79500	29	574500	40	485800	51	990700
	8	26900	19	140700	30	2853300	41	377900	52	295800
	9	170100	20	121300	31	417400	42	660700	53	759700
	10	556000	21	4323700	32	586900	43	52100	54	1999400
	11	627700	22	1457700	33	75000	44	107500	55	373100

8.4 ISOCONCENTRATION CONTOUR

⊕ — SAMPLE NUMBER
 ⊕ — SAMPLE LOCATION
 .136E+07 — TOTAL ION COUNT FOR SAMPLE

ANALYTICAL RESULTS OBTAINED FROM:
 NORTHEAST RESEARCH INSTITUTE
 FARMINGTON, CT.

COMPOUND:
 BENZENE



NOTE:
 CREEK LOCATION IS APPROXIMATE. NO CREEK LOCATION SURVEY WAS COMPLETED. LOCATION OF CREEK DETERMINED USING DRAWING DATED 1-4-72. DRAWN BY HUTH ENGINEERS INC., OF LANCASTER PA., REFERENCE NUMBER TFI-LN-RE-2.

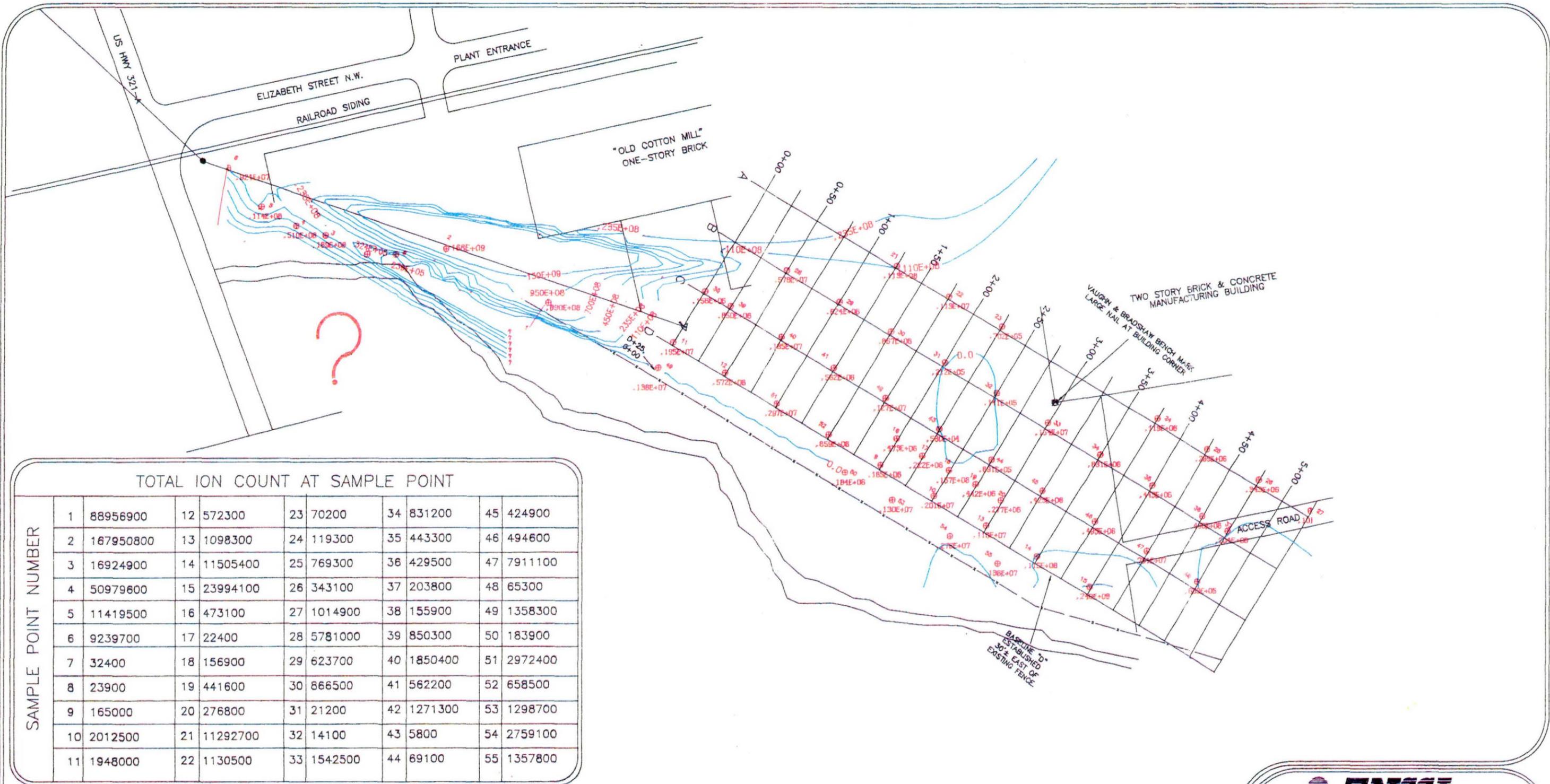
ENSCI
 ENVIRONMENTAL SERVICES GROUP
 HIGH POINT, NORTH CAROLINA

FOR: TFI INCORPORATED

TITLE: BENZENE ION COUNT MAP

SCALE: 1" = 80' DWN BY: DJ FIGURE: 16

DATE: 12/91 CK BY: BB JOB #: H91017A



TOTAL ION COUNT AT SAMPLE POINT

SAMPLE POINT NUMBER	1	88956900	12	572300	23	70200	34	831200	45	424900
	2	167950800	13	1098300	24	119300	35	443300	46	494600
	3	16924900	14	11505400	25	769300	36	429500	47	7911100
	4	50979600	15	23994100	26	343100	37	203800	48	65300
	5	11419500	16	473100	27	1014900	38	155900	49	1358300
	6	9239700	17	22400	28	5781000	39	850300	50	183900
	7	32400	18	156900	29	623700	40	1850400	51	2972400
	8	23900	19	441600	30	866500	41	562200	52	658500
	9	165000	20	276800	31	21200	42	1271300	53	1298700
	10	2012500	21	11292700	32	14100	43	5800	54	2759100
	11	1948000	22	1130500	33	1542500	44	69100	55	1357800

8.4

ISOCONCENTRATION CONTOUR

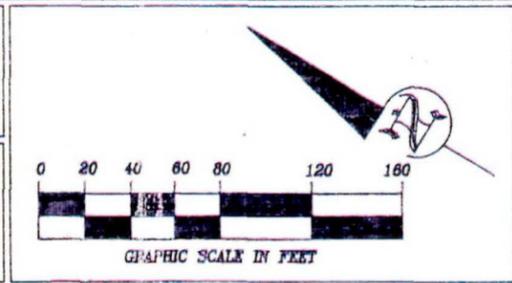
⊗ — SAMPLE NUMBER

⊕ — SAMPLE LOCATION

.136E+07 — TOTAL ION COUNT FOR SAMPLE

ANALYTICAL RESULTS OBTAINED FROM:
NORTHEAST RESEARCH INSTITUTE
FARMINGTON, CT.

COMPOUND:
TOLUENE



NOTE:
CREEK LOCATION IS APPROXIMATE. NO CREEK LOCATION SURVEY WAS COMPLETED. LOCATION OF CREEK DETERMINED USING DRAWING DATED 1-4-72. DRAWN BY HUTH ENGINEERS INC., OF LANCASTER PA., REFERENCE NUMBER TFI-LN-RE-2.

ENSCI
ENVIRONMENTAL SERVICES GROUP
HIGH POINT, NORTH CAROLINA

FOR: TFI INCORPORATED

TITLE: TOLUENE ION COUNT

SCALE: 1" = 80'

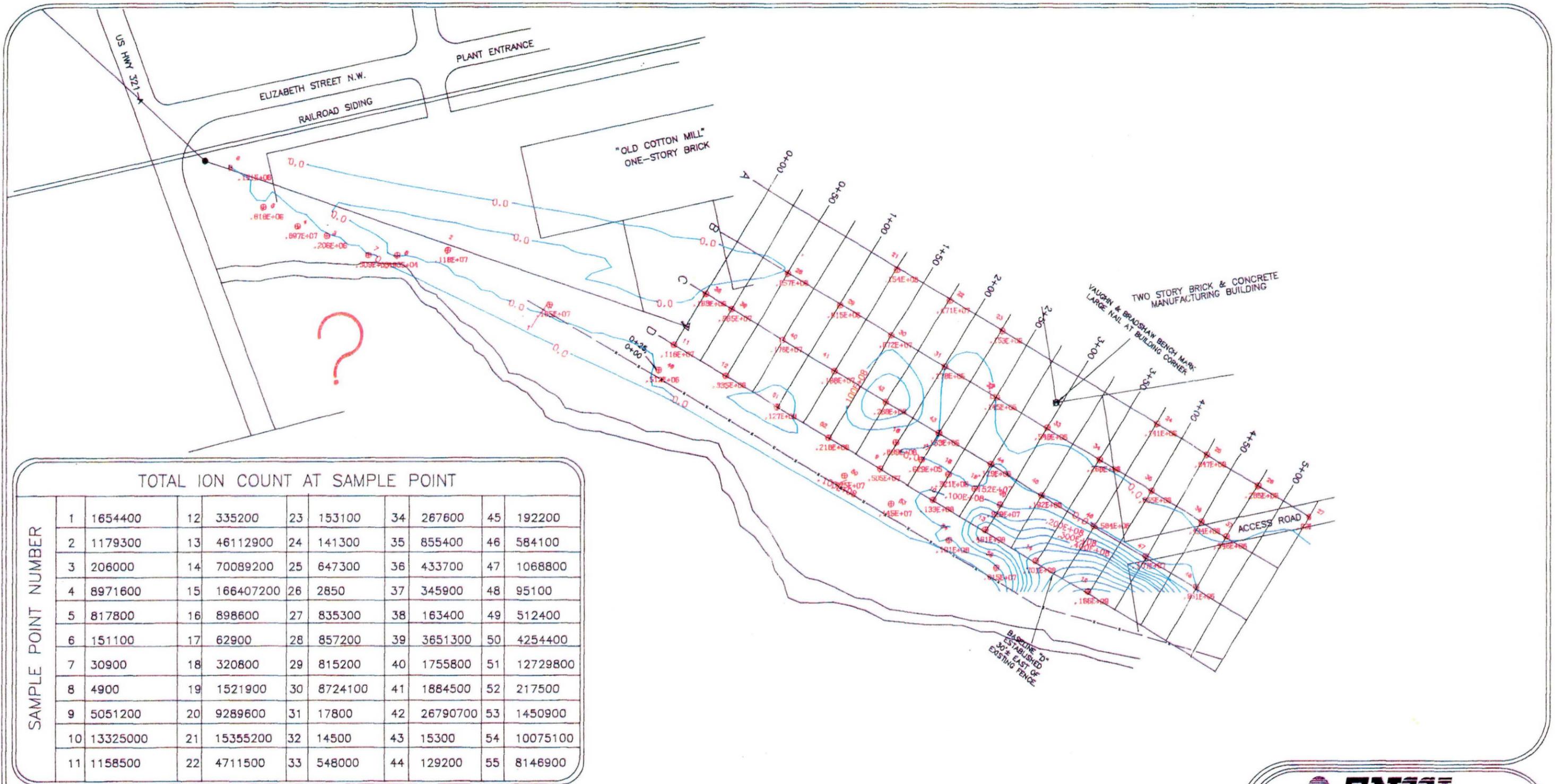
DATE: 12/91

DWN BY: DJ

CK BY: BB

FIGURE: 18

JOB #: H91017A



TOTAL ION COUNT AT SAMPLE POINT

SAMPLE POINT NUMBER	1	1654400	12	335200	23	153100	34	267600	45	192200
	2	1179300	13	46112900	24	141300	35	855400	46	584100
	3	206000	14	70089200	25	647300	36	433700	47	1068800
	4	8971600	15	166407200	26	2850	37	345900	48	95100
	5	817800	16	898600	27	835300	38	163400	49	512400
	6	151100	17	62900	28	857200	39	3651300	50	4254400
	7	30900	18	320800	29	815200	40	1755800	51	12729800
	8	4900	19	1521900	30	8724100	41	1884500	52	217500
	9	5051200	20	9289600	31	17800	42	26790700	53	1450900
	10	13325000	21	15355200	32	14500	43	15300	54	10075100
	11	1158500	22	4711500	33	548000	44	129200	55	8146900

8.4

ISOCONCENTRATION CONTOUR

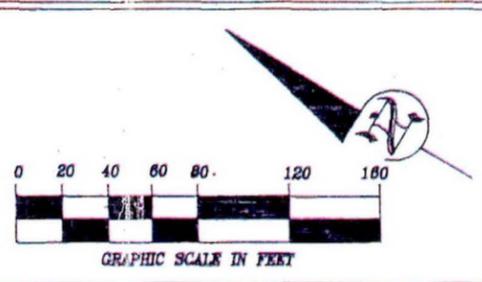
⊙ — SAMPLE NUMBER

⊕ — SAMPLE LOCATION

.136E+07 — TOTAL ION COUNT FOR SAMPLE

ANALYTICAL RESULTS OBTAINED FROM:
NORTHEAST RESEARCH INSTITUTE
FARMINGTON, CT.

COMPOUND:
CYCLOALKANES/ALKENES



NOTE:
CREEK LOCATION IS APPROXIMATE. NO CREEK LOCATION SURVEY WAS COMPLETED. LOCATION OF CREEK DETERMINED USING DRAWING DATED 1-4-72. DRAWN BY HUTH ENGINEERS INC., OF LANCASTER PA., REFERENCE NUMBER TFI-LN-RE-2.

ENSCI
ENVIRONMENTAL SERVICES GROUP
HIGH POINT, NORTH CAROLINA

FOR: TFI INCORPORATED

TITLE: CYCLOALKANES/ALKENES ION COUNT MAP

SCALE: 1" = 80'

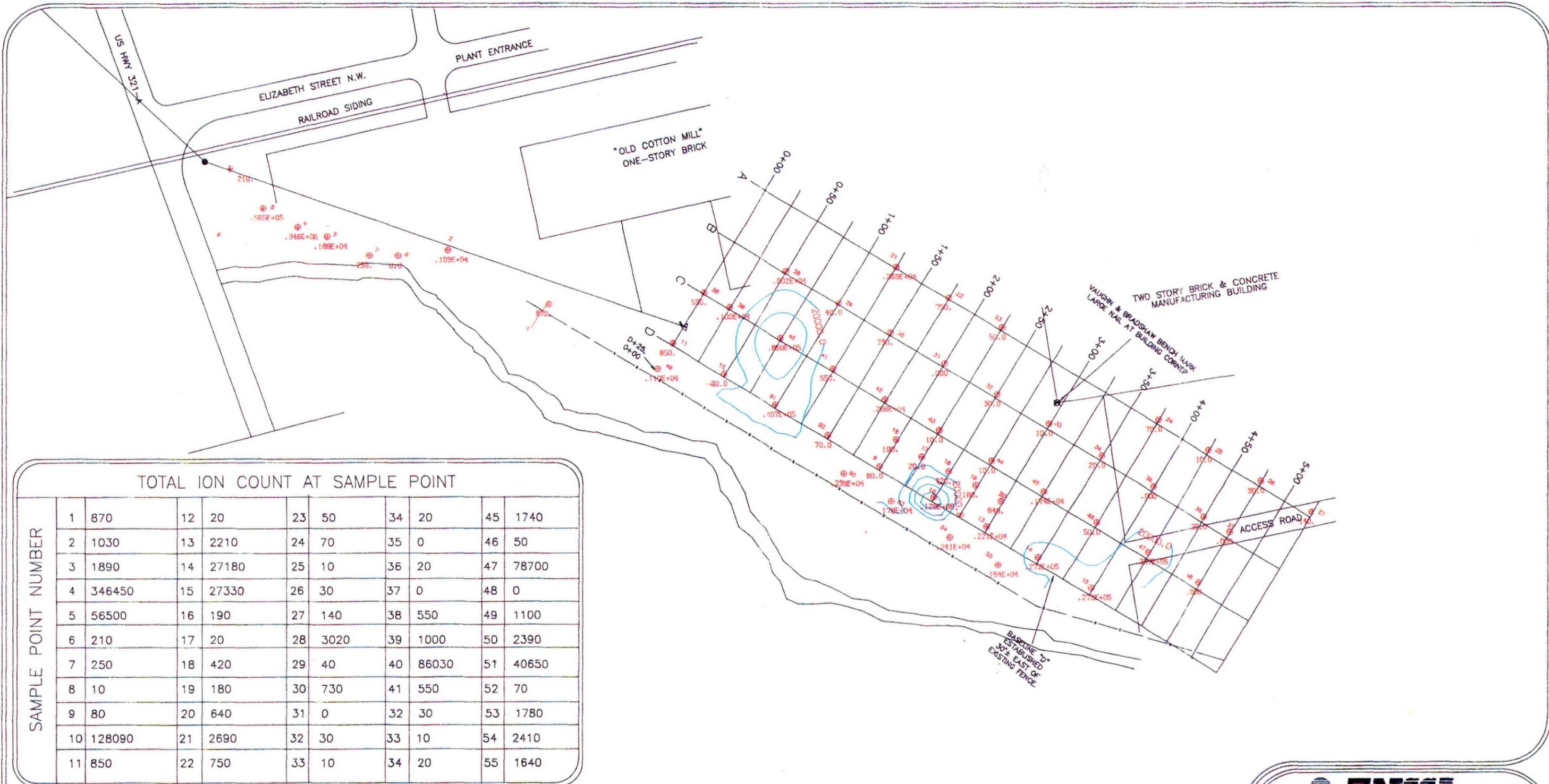
DATE: 12/91

DWN BY: DJ

CK BY: BB

FIGURE: 19

JOB #: HS1017A



TOTAL ION COUNT AT SAMPLE POINT

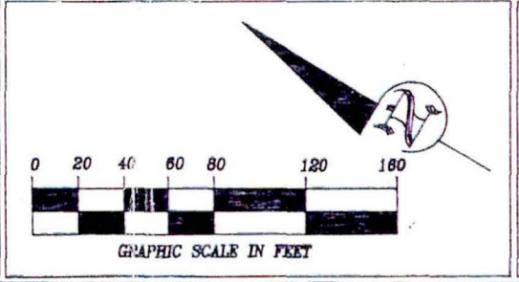
SAMPLE POINT NUMBER	1	870	12	20	23	50	34	20	45	1740
	2	1030	13	2210	24	70	35	0	46	50
	3	1890	14	27180	25	10	36	20	47	78700
	4	346450	15	27330	26	30	37	0	48	0
	5	56500	16	190	27	140	38	550	49	1100
	6	210	17	20	28	3020	39	1000	50	2390
	7	250	18	420	29	40	40	86030	51	40650
	8	10	19	180	30	730	41	550	52	70
	9	80	20	640	31	0	32	30	53	1780
	10	128090	21	2690	32	30	33	10	54	2410
	11	850	22	750	33	10	34	20	55	1640

8.4 ISOCONCENTRATION CONTOUR

⊙ — SAMPLE NUMBER
 ⊕ — SAMPLE LOCATION
 .136E+07 — TOTAL ION COUNT FOR SAMPLE

ANALYTICAL RESULTS OBTAINED FROM:
 NORTHEAST RESEARCH INSTITUTE
 FARMINGTON, CT.

COMPOUND:
 TRICHLOROETHANE/FREON



NOTE:
 CREEK LOCATION IS APPROXIMATE. NO CREEK LOCATION SURVEY WAS COMPLETED. LOCATION OF CREEK DETERMINED USING DRAWING DATED 1-4-72. DRAWN BY HUTH ENGINEERS INC., OF LANCASTER PA., REFERENCE NUMBER TFI-LN-FE-2.

ENSCI
 ENVIRONMENTAL SERVICES GROUP
 HIGH POINT, NORTH CAROLINA

FOR: TFI INCORPORATED

TITLE: TRICHLOROETHANE/FREON ION COUNT MAP

SCALE: 1"=80' DWN BY: DJ FIGURE: 20

DATE: 12/91 CK BY: BB JOB #: HS1017A

Petrex survey has the ability to generate multiple "fingerprints" from soil gas. These fingerprints are then used to create the various maps shown in Figures 15-20. The isoconcentration maps generated from this data ONLY demonstrate relative concentrations of the identified compounds as related to background levels. The information shown in the Figures pertains to soil gas only and should not be interpreted as reflective of actual concentrations of the identified constituent in soil or groundwater.

Figure 15 shows isoconcentrations of petroleum hydrocarbons detected at the TFI facility. The petroleum hydrocarbons shown in this map are totals of benzene, toluene, ethylbenzene, and xylene (BTEX) detected at each Petrex sampling point. As seen in the Figure, two areas of the TFI facility possess high levels of petroleum hydrocarbons in soil gas. These soil gas concentration areas occur in the northern portions and southwestern corner of the Petrex survey grid. The southwestern soil gas concentration may be connected to the SIRS target data discussed in Section 4.2. The soil gas concentration detected in the northern portion of Petrex survey suggests that an upgradient source is present.

Figures 16, 17, and 18 are the individual BTEX constituents making up the petroleum hydrocarbon map seen in Figure 15. By reviewing these maps in conjunction with Figure 15, it can be seen that the southwestern soil gas plume is composed mostly of benzene, ethylbenzene, and xylene. Toluene is present in the southwestern corner, but in low concentration compared to background levels. The interesting feature observed while reviewing Figures 15 to 18 is that the soil gas high detected in the northern Petrex survey area is composed almost entirely of toluene. It is very unlikely that a plume composed mostly of one constituent would fractionate from a general population of released materials and then migrate up a steep hydraulic gradient to the current position. A source of toluene almost certainly is present in the upgradient direction.

Figure 19 is an isoconcentration map of cycloalkanes/alkenes generated from the Petrex survey. Reviewing this map and Figure 15 demonstrates that these constituents contribute to a large portion of the southwestern soil gas plume. This group of organics is probably represented by alicyclic and aromatic hydrocarbon compounds. Examples of alicyclic hydrocarbons include naphthenes and cyclohexanes. Aromatic hydrocarbons would include benzene and naphthalene group hydrocarbons.

Several Petrex sampling tubes detected elevated levels of halogenated compounds in the survey area. Isoconcentrations of these compounds are presented in Figure 20. As shown in the Figure, the compound is thought to be trichloroethane or some type of freon, based on the mass weight of the ions. The identification of the compound as trichloroethane does not agree with current analytical data generated from Phase II monitoring well sampling. However, as indicated in the discussion under Section 5.1.1,

trichloroethane was picked up below a detection limit of 1 ppb in the Phase I analytical work. It may be possible to reconcile this disparity through additional sampling and analysis of monitoring wells near the halogenated soil gas high (MW #2 & MW #4).

7. Conclusions

Based on the results of the SIRS investigation, Petrex survey, and analytical work, the following conclusions can be drawn:

- SIRS data indicates several linear alignments of hyperbolic reflections, but a very random pattern also exists in the northern area of high target density.
- SIRS detected targets are on the order of 200+ individual hyperbolic reflections with 50% coverage of the suspect area. Due to SIRS limitations, this value only represents the uppermost or first target encountered.
- The detected materials are a combination of petroleum hydrocarbons and widespread, low-level halogenated compounds.
- Soil gas anomalies indicate a plume composed almost exclusively of toluene is present well north of SIRS clusters, possibly indicating a source near/at the Reliance facility.
- Soil gas plume definition, groundwater plume definition and impacted soil delineation has not been completed to the south/southwest along Blair Fork Creek.
- North Carolina State Superfund Section reports indicate the Reliance facility is fraught with plumes of widely disparate chemicals that impact Blair Fork Creek, groundwater, and soil to an undetermined extent.

APPENDIX A
GROUND PENETRATING RADAR PROTOCOL

APPENDIX I

THE COMPANY

GSSI was founded in 1970 to develop and apply impulse radar technology for non-destructive subsurface investigation at shallow depths. Since that time, the company has been in the forefront of radar technology as applied to subsurface investigations. GSSI has manufactured SIR Systems that have been employed all over the world for a wide variety of applications such as: locating hazardous waste, finding reinforcement bars and voids in concrete structures, recording depths of geological interfaces, bedrock, and fractures, producing lake, glacial, and sea ice profiles, and detecting voids, pipes, tanks, and other anomalous subsurface objects. GSSI, considered to be the leader in the field of Subsurface Interface Radar technology, has continued to develop and introduce new products to advance the performance of SIR Systems.

SIR SYSTEM OPERATION

GSSI's SIR System is an impulse radar that transmits short time duration pulses of electromagnetic energy that reflect off interfaces. These reflections are received, processed, and printed on a line scan graphic recorder (analogous to seismic or sonar systems, but employing electromagnetic rather than acoustic or mechanical energy). A more detailed description of the system operation, interpretation, and limitations follows.

Figure 1 shows a block diagram of a typical SIR System. Starting with the Radar Control Unit, a circuit generates a trigger pulse signal which is a continuous train of voltage level changes at a repetition rate of 50 KHz (see Figure 2). The trigger pulse signal is fed through the system's control cable to the transducer where it is connected to the input terminals of the transmitter. The transmitter, a solid state impulse generator, produces a very fast rise time voltage pulse for each trigger pulse. The output of the impulse generator connects to the terminals of the transducer's dipole antenna. The radar pulse propagates along the antenna into the material coupled to the transducer. The physical size of the antenna determines the center frequency of the energy (larger antenna = lower frequency).

The receiving antenna detects pulses that reflect back from interfaces where the dielectric constant of the material(s) change. The receiver converts these electromagnetic (EM) signals, only a few nanoseconds in duration, to the audio frequency. The signals are then transmitted to the Control Unit for amplification and processing. The data displayed as travel time is printed on the graphic recorder and/or digitized and stored on magnetic tape for playback after an area has been surveyed (see Figure 1). As the transducer is pulled along a

transect line, the graphic recorder prints a continuous profile of the radar reflections. These reflection profiles appear as a close approximation of a vertical cross-section of the material beneath the transect line (see figure 3).

VELOCITY AND TRAVEL TIME

In order to interpret the depth of a reflecting interface, it is necessary to determine the propagation velocity of the EM pulses. The dielectric permittivity of the material (ϵ_r) through which the EM pulse travels determines the propagation velocity according to the formula:

$$\epsilon_r = \left(\frac{c}{v_m} \right)^2$$

where c = propagation velocity in free space (3×10^8 m/sec)

v_m = propagation velocity through a material

The dielectric constant is usually unknown (except in laboratories or controlled situations). There are two methods for interpreting the depth to a target. With the most accurate method, it is necessary to utilize a reflector of known depth. The propagation velocity (v_m) can be derived from the relationship:

$$v_m = 2D/t$$

where D = Measured depth to the reflecting interface
 t = 2 way travel time of received pulse

Since radar data is displayed as travel time, it is convenient to express these relationships as units of time rather than velocity. Accordingly, one way travel time can be determined from the dielectric constant by the relationship:

$$\sqrt{\epsilon_r} \approx ns/ft.$$

Since the pulse travels from the surface to the reflecting interface and back to the surface again, this value is multiplied by 2. By comparing calibration time pulses with reflecting pulses, two way travel time can be determined allowing calibration of the dielectric constant:

$$\epsilon_r = (ns/ft.)^2 / 2$$

The second method for determining depth is to estimate the dielectric constant by using a table of dielectric constants to match the soil type to travel time. The enclosed table of electromagnetic properties shows a list of the dielectric constants and pulse travel times for various materials. Note that the dielectric values range from 1 for air to 81 for water. This method is an estimation due to the generalization of material and the strong effect that a change in water saturation has on the dielectric constant of a material (see Figure 6A).

PENETRATION DEPTH

The conductivity value of a dielectric medium (e.g. soil, rock, concrete, pavement, water) must also be considered as it causes the electromagnetic pulse to lose energy in the form of heat. There are many factors that influence this value. The conductivity of a material is primarily governed by water content, and by amount of salt in solutions, amount and type of clay, presence of metallic or chemically conductive fill material, density, temperature, and frequency of the penetrating electromagnetic energy. Conductivity is related to loss tangent (dissipation factor) by:

$$\tan \delta = \frac{\sigma}{2\pi f \epsilon_0 \epsilon_r}$$

where σ = conductivity (mhos/meter)

f = frequency (Hz)

ϵ_0 = 8.85×10^{-12} farads/meter (dielectric constant of free space)

ϵ_r = relative dielectric constant

Since conductivity causes heat loss of pulse energy, this parameter governs the depth of penetration. The higher the conductivity, the higher the heat loss over a given distance and hence, the greater the signal attenuation. Therefore the approximate attenuating rate for various materials can be calculated from:

$$A = 12.863 \times 10^{-8} f \sqrt{\epsilon_r} (\sqrt{\tan^2 \delta + 1} - 1)^{1/2}$$

where A = dB/m

It can be seen from the slope of the lines in Figures 4, 5, and 6 that a small change in moisture content or density causes a large change in dielectric constant and conductivity. For this reason the successful application of Subsurface Interface Radar is dependent on the electrical properties of the material investigated. To assist in determining the potential success with SIR, examples of conductivity values for various materials are reported in the table of electromagnetic properties.

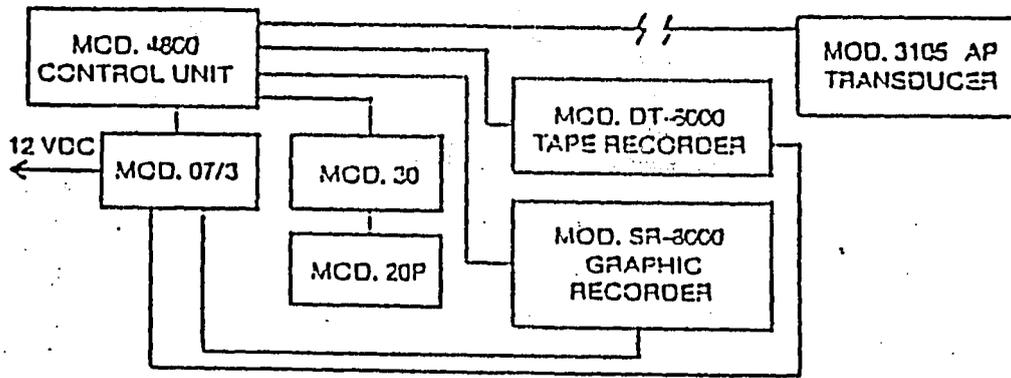


Figure 1: SIR SYSTEM BLOCK DIAGRAM

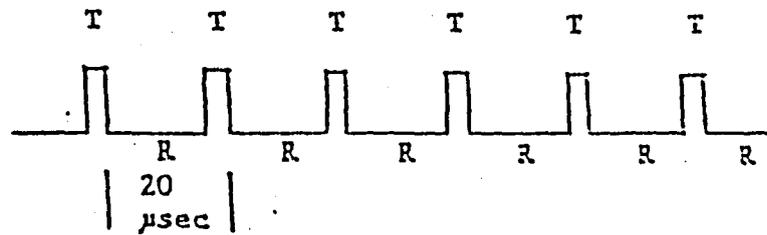
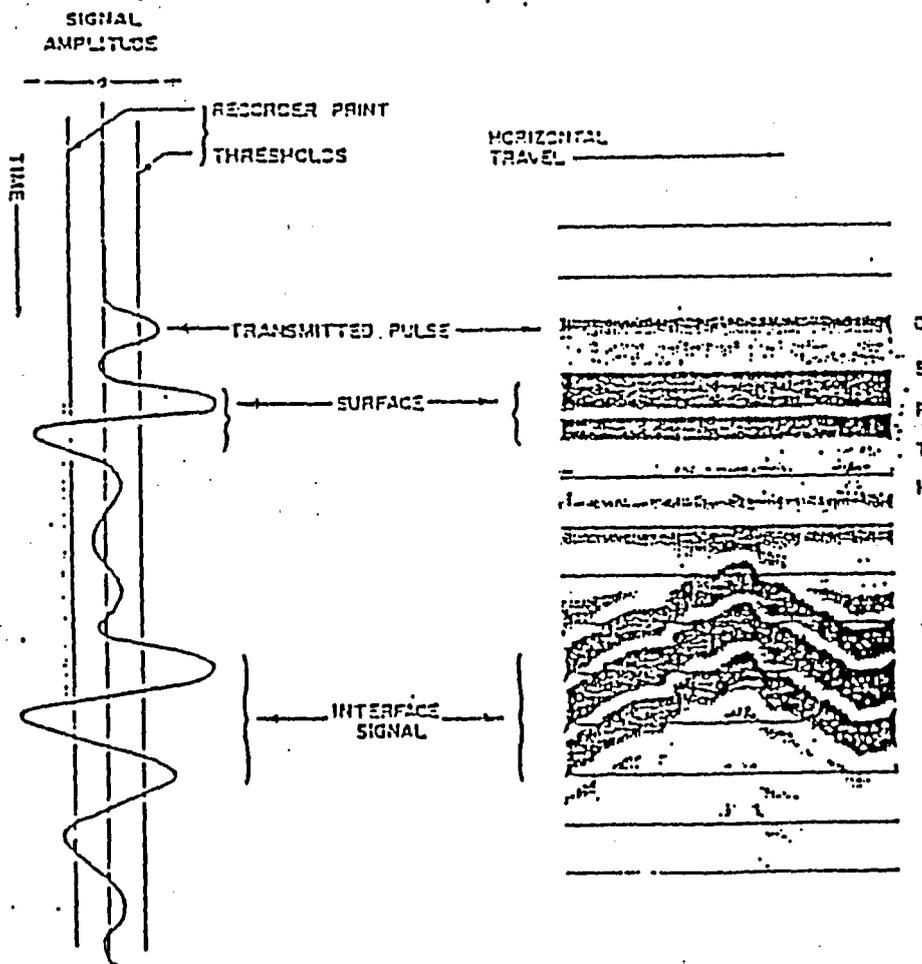


Figure 2: Illustration of Continuous 50 kHz Voltage Train (trigger pulse)



a) SKETCH OF A SINGLE SIR PULSE AND REFLECTIONS AS SEEN BY THE RECEIVER

b) EXAMPLE OF PROFILE INFORMATION AS DISPLAYED BY THE SIR GRAPHIC RECORDER

Figure 3: Typical SIR System data

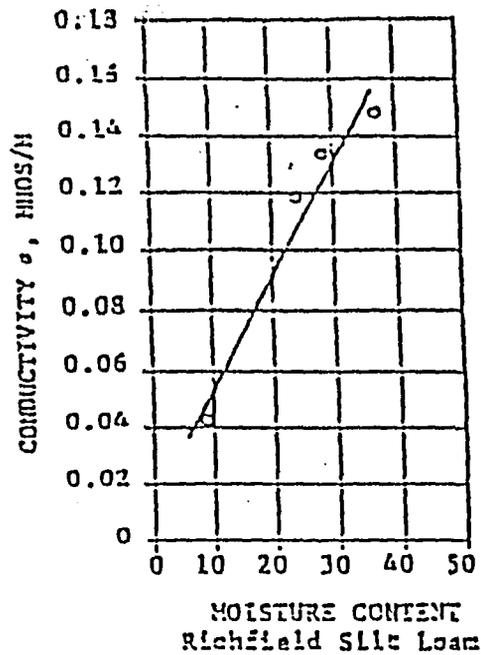
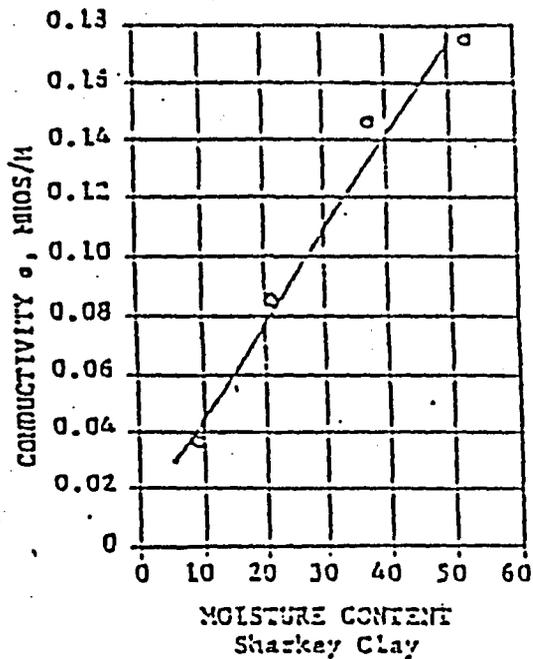


Figure 4. Conductivity vs Moisture Content*

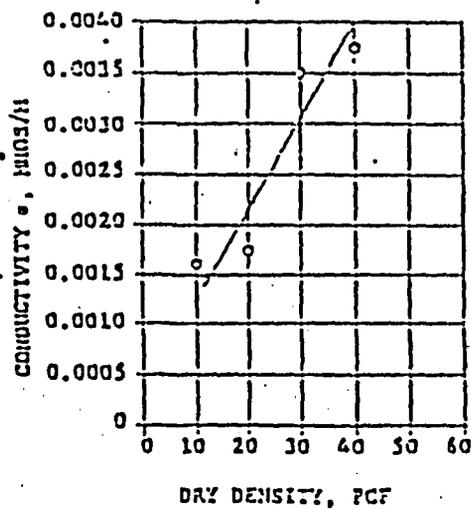


Figure 5. Conductivity vs Density*

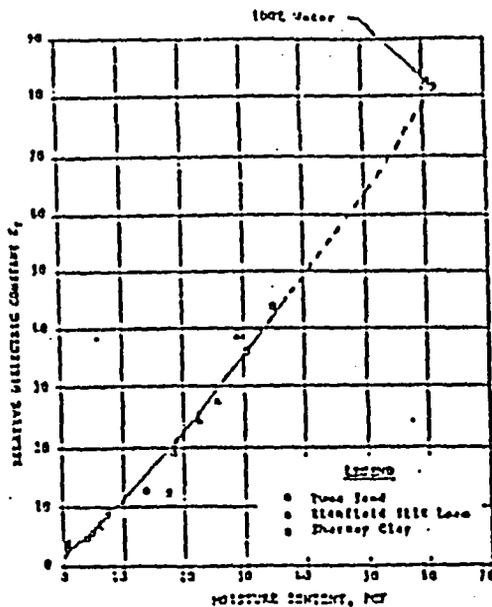


Figure 6. Relative Dielectric Constant Vs Moisture Content.*

* for soil classification data see Plate 2 and Appendix A of Lundien, J.R., Terrain Analysis by Electromagnetic Means, Technical Report 3-693, U.S. Army Waterways Experiment Station, 1955



APPROXIMATE VHF ELECTROMAGNETIC PROPERTIES OF VARIOUS MATERIALS

MATERIAL	CONDUCTIVITY (σ) (mho/m)	Dielectric Constant ϵ_r	Pulse Travel Times ϵ_r in ns/ft (one way)
	0	1	1
Fresh Water	10^{-4} to 3×10^{-2}	81	9
Sea Water	4	81	9
(dry)	10^{-7} to 10^{-3}	4-6	2-2.4
Soil (saturated)	10^{-4} to 10^{-2}	30	5.5
(saturated)	10^{-3} to 10^{-2}	10	3.1
Clay (saturated)	10^{-1} to 1	8-12	2.8 - 3.3
Sandy Coastal and	2×10^{-3}	10	3.1
Grass Forested and	5 - 8×10^{-3}	12 - 13	3.5 - 3.6
Grass Soils		6 - 12	2.5 - 3.5
Rich Agricultural	10^{-2}	15	3.9
Fresh Water Ice	10^{-4} to 10^{-2}	4	2
Permafrost	10^{-5} to 10^{-2}	4-8	2 - 2.9
Granite (dry)	10^{-8}	5	2.2
Limestone (dry)	10^{-9}	7-9	2.6
Dolomite		6.8 - 8	2.4 - 2.8
Quartz		4.3	2.1
Alumina		4-5	2 - 2.2
Concrete		5 - 10	2.2 - 3.2
Asphalt		3-5	1.7 - 2.5
Sea Ice		4-12 (8)	2.2 - 3.3
VC, Epoxy, Polyesters, Vinyls, Rubber		3	2

APPENDIX B

GROUNDWATER SAMPLING - FIELD DATA SHEETS



Field Data Sheet for Ground-Water Sampling

Date 9/26/91
 Field Personnel K. Cranford
 Facility Name TEI - Lenoir
 EPA ID NO. NCD054290770
 Well ID NO. MW #2
 Upgradient Downgradient
 Weather Conditions Rainy/Clear/Windy/Partly Cloudy/Warm/Hot
 Air Temperature 58 °F
 Total Well Depth (TWD) 10 1/100 ft
 Depth to Groundwater (DGW) 7.97 1/100 ft
 Length of Water Column (LWC) = TWD - DGW = 2 ft
 1 Casing Volume (OCV) = LWC \times .163 = .326 gal
 3 Casing Volumes = .978 gal = Standard Evacuation Volume
 Method of Well Evacuation Submersible Pump/GEL T Baller/ B-K Pump
 Method of Sample Collection Dedicated T Baller/GEL T Baller/B-K Baller
 Total Volume of Water Removed 1 gal

Casing Diameter 2 inches 4 inches
 Casing Material PVC Teflon Steel
 Measuring Point Elevation (MSL) _____ 1/100 ft
 Water Table Elevation (MSL) _____ 1/100 ft
 pH/sp. cond. meter calibration (Date/Time) _____
 pH buffer solution used _____
 Steel Guard Pipe around Casing yes no
 Locking Cap yes no
 Protective Abutment yes no
 Well Integrity Satisfactory yes no
 Well Yield Low Medium High

(CONTINUED)

Personnel	Date	Time	No.	Type	Priority	Parall.

Field Analysis

Volume Purged (gallons)

Time (military)

pH (s.u.)

Conductivity

Water Temp (°C)

Turbidity (subjective)*

Odor (subjective)**

0	1/4	1/2	3/4	1		
	0250	0300	0500	0600		
1	1	1	1	1		
1	1	1	1	1		

* (1) clear (2) slight (3) moderate (4) high ** (1) none (2) faint (3) moderate (4) strong



Field Data Sheet for Ground-Water Sampling

Date 9/26/91
 Field Personnel H. Bawener
 Facility Name TFL - Lenoir
 EPA ID NO. NC054290770
 Well ID NO. HN #3
 Upgradient Downgradient
 Weather Conditions Rainy/Clear/Windy/Partly Cloudy/Warm/Hot
 Air Temperature 60 °F
 Total Well Depth (TWD) 1/100 ft
 Depth to Groundwater (DGF) 1/100 ft
 Length of Water Column (LWC) = TWD - DGF = 7 ft
 1 Casing Volume (OCV) = LWC x .163 = 1.141 gal
 3 Casing Volumes = 3.423 gal = Standard Evacuation Volume
 Method of Well Evacuation Submersible Pump/GEL T Baller/ H-K Pump
 Method of Sample Collection Dedicated T Baller/GEL T Baller/B-K Baller
 Total Volume of Water Removed 4 gal

Casing Diameter 2 inches 4 inches
 Casing Material PVC Teflon Steel
 Measuring Point Elevation (MSL) 1/100 ft
 Water Table Elevation (MSL) 1/100 ft
 pH/sp. cond. meter calibration (Date/Time) _____
 pH buffer solution used _____
 Steel Guard Pipe around Casing yes no
 Locking Cap yes no
 Protective Abutment yes no
 Well Integrity Satisfactory yes no
 Well Yield Low Medium High

(Containers)

Personnel	Date	Time	No.	Type	Preserv.	Parall.

Field Analysis

Volume Purged (gallons)
 Time (military)
 pH (s.u.)
 Conductivity
 Water Temp (°C)
 Turbidity (subjective)*
 Odor (subjective)**

0	1.2	2.4	3.4	4		
0100	0104	0108	0112	0115		
2	3	3	3	3		
1	4	4	4	4		

* (1) clear (2) slight (3) moderate (4) high ** (1) none (2) faint (3) moderate (4) strong



Field Data Sheet for Ground-Water Sampling

Date 9/26/91
 Field Personnel K Cranford
 Facility Name IFI - Lenoir
 EPA ID NO. NCD054290770
 Well ID NO. MW #4
 Upgradient Downgradient
 Weather Conditions Rainy/Clear/Windy/Partly Cloudy/Warm/Hot
 Air Temperature 60 °F
 Total Well Depth (TWD) 15 1/100 ft
 Depth to Groundwater (DGW) 8.13 1/100 ft
 Length of Water Column (LWC) = TWD - DGW = 7 ft
 1 Casing Volume (OCV) = LWC x .163 = 1.141 gal
 3 Casing Volumes = 3.423 gal = Standard Evacuation Volume
 Method of Well Evacuation Submersible Pump/GEL T Baller/ B-K Pump
 Method of Sample Collection Dedicated T Baller/GEL T Baller/B-K Baller
 Total Volume of Water Removed 4.5 gal

Casing Diameter 2 inches 4 inches
 Casing Material PVC Teflon Steel
 Measuring Point Elevation (MSL) _____ 1/100 ft
 Water Table Elevation (MSL) _____ 1/100 ft
 pH/sp. cond. meter calibration (Date/Time) _____
 pH buffer solution used _____
 Steel Guard Pipe around Casing yes no
 Locking Cap yes no
 Protective Abutment yes no
 Well Integrity Satisfactory yes no
 Well Yield Low Medium High

Personnel	Date	Time	No.	Type	Priority	Param.

Field Analysis

Volume Purged (gallons)
 Time (military)
 pH (s.v.)
 Conductivity
 Water Temp (°C)
 Turbidity (subjective) *
 Odor (subjective) **

0	1	2	3	4	4.5	
0205	0207	0209	0212	0214	0215	
2	2	2	2	1	1	
2	2	2	2	2	2	

* (1) clear (2) slight (3) moderate (4) high ** (1) none (2) faint (3) moderate (4) strong



Field Data Sheet for Ground-Water Sampling

Date 9/25/91
 Field Personnel M. Cook
 Facility Name TEI - Lenoir
 EPA ID NO. NCD054290770
 Well ID NO. WR #5
 Upgradient Downgradient
 Weather Conditions Rainy/Clear/Windy/Partly Cloudy/Warm/Hot
 Air Temperature 60 °F
 Total Well Depth (TWD) 15 1/100 ft
 Depth to Groundwater (DGT) 5.5 1/100 ft
 Length of Water Column (LWC) = TWD - DGT = 9.5 ft
 1 Casing Volume (OCV) = LWC x .163 = 2.0375 gal
 3 Casing Volumes = 6.1125 gal = Standard Evacuation Volume
 Method of Well Evacuation Submersible Pump/GEL T Baller/B-K Pump
 Method of Sample Collection Dedicated T Baller/GEL T Baller/B-K Baller
 Total Volume of Water Removed 10 gal

Casing Diameter 2 inches 4 inches
 Casing Material PVC Teflon Steel
 Measuring Point Elevation (MSL) _____ 1/100 ft
 Water Table Elevation (MSL) _____ 1/100 ft
 pH/sp. cond. meter calibration (Date/Time) _____
 pH buffer solution used _____
 Steel Guard Pipe around Casing yes no
 Locking Cap yes no
 Protective Abutment yes no
 Well Integrity Satisfactory yes no
 Well Yield Low Medium High

Personnel	Date	Time	No.	Containers		Param.
				Type	Preserv.	

Field Analysis

Volume Purged (gallons)
 Time (minutes)
 pH (s.u.)
 Conductivity
 Water Temp (°C)
 Turbidity (subjective) *
 Odor (subjective) **

0	1.5	3.0	4.5	6.1125	10	
0005	0010	0015	0020	0025	0030	
1	3	3	3	3	2	
1	2	2	2	2	2	

* (1) clear (2) slight (3) moderate (4) high ** (1) none (2) faint (3) moderate (4) strong



Field Data Sheet for Ground-Water Sampling

Date 9/26/91
 Field Personnel M. Cook
 Facility Name TEI - Lenoir
 EPA ID NO. NCD054290770
 Well ID NO. MW #7
 Upgradient Downgradient
 Weather Conditions Rainy/Clear/Windy/Partly Cloudy/Warm/Hot
 Air Temperature 50 1/100 ft
 Total Well Depth (TWD) 40.0 1/100 ft
 Depth to Groundwater (DGW) 8.21 1/100 ft
 Length of Water Column (LWC) = TWD - DGW = 32 gal
 1 Casing Volume (OCV) = LWC x .163 = 5.216
 3 Casing Volumes = 15.6 gal = Standard Evacuation Volume
 Method of Well Evacuation Submersible Pump/CGL T Baller/ B-K Pump
 Method of Sample Collection Dedicated T Baller/CGL T Baller/B-K Baller
 Total Volume of Water Removed 17 gal

Casing Diameter 2 inches 4 inches
 Casing Material PVC Teflon Steel
 Measuring Point Elevation (MSL) 1/100 ft
 Water Table Elevation (MSL) 1/100 ft
 pH/sp. cond. meter calibration (Date/Time) _____
 pH buffer solution used _____
 Steel Guard Pipe around Casing yes no
 Locking Cap yes no
 Protective Abutment yes no
 Well Integrity Satisfactory yes no
 Well Yield Low Medium High

(Continued)

Personnel	Date	Time	No.	Type	Priority	Param.

Field Analysis

Volume Purged (gallons)
 Time (military)
 pH (s.u.)
 Special Condition (umhos/cm)
 Water Temp (°C)
 Turbidity (subjective)*
 Odor (subjective)**

0	5	10	15	17		
0147	0155	0210	0220	0222		
2	2	1	1	1		
2	2	2	2	2		

* (1) clear (2) slight (3) moderate (4) high ** (1) none (2) faint (3) moderate (4) strong



Field Data Sheet for Ground-Water Sampling

Date 10-16-91
 Field Personnel K. Cranford
 Facility Name TFI-Lenoir
 EPA ID NO. NCD054290770
 Well ID NO. MW #2
 Upgradient Downgradient
 Weather Conditions Rainy/Clear/Windy/Partly Cloudy/Tornado/Hot
 Air Temperature 40 °F
 Total Well Depth (TWD) 10 1/100 ft
 Depth to Groundwater (DGW) 7.97 1/100 ft
 Length of Water Column (LWC) = TWD - DGW = 2.03 ft
 1 Casing Volume (OCV) = LWC x .163 = .330 gal
 3 Casing Volumes = .992 gal = Standard Evacuation Volume
 Method of Well Evacuation Submersible Pump/GEL T Bailor/B-X Pump
 Method of Sample Collection Dedicated T Bailor/GEL T Bailor/B-X Bailor
 Total Volume of Water Removed 1 gal

Casing Diameter 2 inches 4 inches
 Casing Material PVC Teflon Steel
 Measuring Point Elevation (MSL) _____ 1/100 ft
 Water Table Elevation (MSL) _____ 1/100 ft
 pH/sp. cond. meter calibration (Date/Time) _____
 pH buffer solution used _____
 Steel Guard Pipe around Casing yes no
 Locking Cap yes no
 Protective Abutment yes no
 Well Integrity Satisfactory yes no
 Well Yield Low Medium High

(Containers)

Personnel	Date	Time	No.	Type	Preserv.	Param.

Field Analysis

Volume Purged (gallons)
 Time (military)
 pH (s.u.)
 Conductivity
 Water Temp (°C)
 Turbidity (subjective)*
 Odor (subjective)**

0	1/4	1/2	3/4	1		
	2030	2045	2145	2230 *		

* (1) clear (2) slight (3) moderate (4) high ** (1) none (2) faint (3) moderate (4) strong

* Took One Additional Hour To Pull 1X950 ml Sample



Field Data Sheet for Ground-Water Sampling

Date 10-16-91

Field Personnel K. Cranford

Facility Name TEL-Jenoir

EPA ID NO. NC054290770

Well ID NO. W-7

Upgradient Downgradient

Weather Conditions Rainy/Clear/Windy/Partly Cloudy/Fair/Hot

Air Temperature 42 °F

Total Well Depth (TWD) 40.0 1/100 ft

Depth to Groundwater (DGW) 8.21 1/100 ft

Length of Water Column (LWC) = TWD - DGW = 31.79 ft

1 Casing Volume (OCV) = LWC x .163 = 5.181 gal

3 Casing Volumes = 15.545 gal = Standard Evacuation Volume

Method of Well Evacuation Submersible Pump/GEL T Bailor/B-X Pump

Method of Sample Collection Dedicated T Bailor/GEL T Bailor/B-X Bailor

Total Volume of Water Removed 16 gal

Casing Diameter 2 inches 4 inches

Casing Material PVC Teflon Steel

Measuring Point Elevation (MSL) _____ 1/100 ft

Water Table Elevation (MSL) _____ 1/100 ft

pH/sp. cond. meter calibration (Date/Time) _____

pH buffer solution used _____

Steel Guard Pipe around Casing yes no

Locking Cap yes no

Protective Abutment yes no

Well Integrity Satisfactory yes no

Well Yield Low Medium High

Containers						
Personnel	Date	Time	No.	Type	Preserv.	Param.

Field Analysis

Volume Purged (gallons)

Time (military)

pH (s.u.)

Conductivity

Water Temp (°C)

Turbidity (subjective)

Odor (subjective)

0	5	10	15	16		
2000	2005	2010	2015	2020		
2	2	2	1	1		
2	2	2	2	2		

* (1) clear (2) slight (3) moderate (4) high ** (1) none (2) faint (3) moderate (4) strong

APPENDIX C

ANALYTICAL RESULTS

TEST REPORT #72A - OCTOBER 22, 1991
TEST REPORT #72A - SUPPLEMENTAL - OCTOBER 25, 1991
TEST REPORT #72A - REVISION - DECEMBER 2, 1991

AnalytiKEM Inc.
454 S. Anderson Road, BTC 532
Rock Hill, SC 29730
803/329-9690
Fax: 803/324-3982

TEST REPORT NO. A81565

October 22, 1991

Prepared for:

Ensci
1108 West Thomasville Road
High Point, NC 27260

Attention: Druce Brasewell

Project: TFI (#72A)

Date of Sample Receipt: September 26, 1991

Reviewed &
Approved by:

Name: Michael Shmookler, Ph.D.

Title: Technical Director

TABLE OF CONTENTS

	<u>Page</u>
I. Certification	1
II. Definition of Terms	2
III. Sample Designations	3
IV. Methodology	4 - 8
V. Analytical Results	9 - 38
VI. Quality Control Data	39 - 51

I. Certification

**AnalytiKEM, Inc.
Current Certifications/Regulatory Approvals**

Tabulated below are the current laboratory certifications that are held by each AnalytiKEM Laboratory. Analyses performed at multiple AnalytiKEM locations will be noted in the test report.

Cherry Hill, NJ		Rock Hill, SC		Houston Analytical, Tx	
State	Cert #	State	Cert #	State	Cert #
Arkansas	*	S. Carolina	46067	N. Dakota	R-006
Connecticut	PH-0715	N. Carolina	316	Oklahoma	8403
Florida	880985G	New Jersey	79795	Texas Water Commission *	
Massachusetts	NJ117			Louisiana *	
New Jersey	04012				
New York	10815				
N. Carolina	258				
N. Dakota	R-038				
Pennsylvania	68366				
S. Carolina	94004				
Tennessee	02908				
Vermont	*				

* No certification numbers are issued for these states.

II. Definition of Terms

<u>Term</u>	<u>Definition</u>
D	Detected; result must be greater than zero.
DI	Deionized Water
J	Compound was detected at levels below the practical quantitation limit. The level reported is approximate.
MS/MSD	Matrix Spike/Matrix Spike Duplicate.
NA	Analysis not applicable to the sample matrix.
ND	Not Detected
NR	Not Requested
NTU	Nephelometric Turbidity Units
RPD	Relative Percent Difference
RSD	Relative Standard Deviation
TON	Threshold Odor Number
U	Compound was analyzed for but not detected. The preceding number is the practical quantitation limit for the compound.
ppb	Parts-per-billion; may be converted to ppm by dividing by 1,000.
ppm	Parts-per-million; may be converted to ppb by multiplying by 1,000.
ug/l	Micrograms of constituent per liter of sample; equivalent to parts-per-billion.
ug/kg	Micrograms of constituent per kilogram of sample; equivalent to parts-per-billion.
ug/kg dw	Micrograms of constituent per kilogram of sample reported on a dry weight basis.
CCC	Calibration Check Compound; used to verify the precision of a GC/MS calibration curve.
SPCC	System Performance Check Compound; used to verify the correct operation of a GC/MS instrument.
PQL	Practical Quantitation Limit; the minimum level at which compounds can be dependably quantitated.
B	Analyte detected in associated blank as well as the sample. It indicates possible/probable blank contamination.

III. Sample Designations

AnalytiKEM

<u>AnalytiKEM Designation</u>	<u>Client Designation</u>	<u>Matrix</u>	<u>Date Sampled</u>
A81565-1	NW-1	Aqueous	9/26/91
A81565-2	NW-2	Aqueous	9/26/91
A81565-3	NW-3	Aqueous	9/26/91
A81565-4	NW-4	Aqueous	9/26/91
A81565-5	NW-5	Aqueous	9/25/91
A81565-6	NW-6	Aqueous	9/26/91
A81565-7	NW-7	Aqueous	9/26/91
A81565-8	NW-8	Aqueous	9/25/91
A81565-9	ACS-1	Aqueous	9/27/91
A81565-10	ACS-2	Aqueous	9/27/91
A81565-11	ACS-3	Aqueous	9/27/91
A81565-12	ACS-4	Aqueous	9/27/91
A81565-13	SCS-1	Nonaqueous	9/27/91
A81565-14	SCS-2	Nonaqueous	9/27/91
A81565-15	SCS-3	Nonaqueous	9/27/91
A81565-16	SCS-4	Nonaqueous	9/27/91

Note: Samples will be held for 30 days beyond the test report date unless otherwise requested.

IV. Methodology

Volatiles

Aqueous

Method 624, Purgeables, Federal Register 40 CFR Part 136, Vol. 49, No. 209 October 26, 1984.

Method 8240, Gas Chromatography/Mass Spectrometry for Volatile Organics, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846. Second Edition, USEPA, 1986 with all promulgated revisions.

Nonaqueous

Method 5030, Purge and Trap, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, Second Edition, USEPA, 1986 with all promulgated revisions.

Method 8240, Gas Chromatography/Mass Spectrometry for Volatile Organics, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846. Third Edition, USEPA, 1986 with all promulgated revisions.

Semivolatiles

Aqueous

Method 625, Base/Neutrals and Acids, Federal Register, 40 CFR Part 136, Vol 49, No. 209, October 26, 1984.

Method 3510, Separatory Funnel Liquid-Liquid Extraction, Test Methods for Evaluating Solid Waste, Physical Chemical Methods, SW846, Third Edition, USEPA, 1986 with all promulgated revisions.

Nonaqueous

Method 3550, Sonication Extraction, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, Second Edition, USEPA 1986 with all promulgated revisions.

Method 3510, Separatory Funnel Liquid-Liquid Extraction, Test Methods for Evaluating Solid Waste, Physical Chemical Methods, SW846, Third Edition, USEPA, 1986 with all promulgated revisions.

Method 8270, Gas Chromatography/Mass Spectrometry for Semivolatile Organics: Capillary Column Technique, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, Second Edition, USEPA 1986 with all promulgated revisions.

IV. Methodology (Cont'd)

Polychlorinated Biphenyls

Aqueous

Method 608, Organochlorine Pesticides and PCBs, Federal Register, 40 CFR Part 136, Vol. 49, No. 209, October 26, 1984.

Method 3520, Continuous Liquid-Liquid Extraction, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, Third Edition, USEPA 1986 with all promulgated revisions.

Non Aqueous

Method 3550, Sonication Extraction, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, Second Edition, USEPA 1986 with all promulgated revisions.

Method 3510, Separatory Funnel Liquid-Liquid Extraction, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, Third Edition, USEPA 1986 with all promulgated revisions.

Method 8080, Organochlorine Pesticides and PCBs, Test Methods for Evaluating Solid Waste Physical/Chemical Methods, SW846, Second Edition, USEPA 1986 with all promulgated revisions.

General Gas Chromatography

Polar Organics

Aqueous/Nonaqueous

AnalytiKEM Method FIDG-INH-OH-0789, Determination of Volatile Polar Organics by Direct Aqueous Injection, 1989 (unpublished).

IV. Methodology (Cont'd)

Metals

Aqueous

Method 3010, Acid Digestion of Aqueous Samples and Extracts for Total Metals for Analysis by Flame Atomic Absorption Spectroscopy or Inductively Coupled Plasma Spectroscopy, Test Methods for Evaluating Solid Waste. Physical/Chemical Methods, SW846, Second Edition, USEPA, 1986 with all promulgated revisions.

Method 3020, Acid Digestion of Aqueous Samples and Extracts for Total Metals for Analysis by Furnace Atomic Absorption Spectroscopy, Test Methods for Evaluating Solid Waste. Physical/Chemical Methods, SW846, Second Edition, USEPA, 1986 with all promulgated revisions.

Method 200, Metals, Methods for Chemical Analysis of Water and Wastes, EPA-600/4/020, USEPA, 1979. (ICP, 1982)

- o Method 200.7, Inductively Coupled Plasma - Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes.
- o Method 206.2, Arsenic, AA, Furnace
- o Method 239.2, Lead, AA, Furnace
- o Method 245.1, Mercury, Cold Vapor, Manual
- o Method 270.2, Selenium, AA, Furnace

IV. Methodology (Cont'd)

Metals

Nonaqueous

Method 3050, Acid Digestion of Sediments, Sludges, and Soils, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, Second Edition, USEPA, 1986 with all promulgated revisions.

Method 6010, Inductively Coupled Plasma Atomic Emission Spectroscopy, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, Second Edition, USEPA, 1986 with all promulgated revisions.

Method 7000, Atomic Absorption Methods, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, Second Edition, USEPA, 1986 with all promulgated revisions.

- o Method 7060, Arsenic, AA, Furnace
 - o Method 7421, Lead, AA, Furnace
- o Method 7471, Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique)
- o Method 7740, Selenium, AA, Furnace

IV. Methodology (Cont'd)

AnalytiKEM

General Chemistry

Method 1010, Flashpoint (Pensky-Martens Closed-Cup Method for Determining Ignitability), Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, Third Edition, USEPA, 1986 with all promulgated revisions.

Method 9071, Oil and Grease Extraction Method for Sludge Samples, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, Third Edition, USEPA, 1986 with all promulgated revisions.

Method 418.1, Petroleum Hydrocarbons, Total Recoverable (Spectrophotometric, Infrared), Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, USEPA, 1979.

Method 418.1 (modified), Petroleum Hydrocarbons, Total Recoverable (Spectrophotometric, Infrared), Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, USEPA, 1979. Modified for soils/solids as noted in Attachment 2 to the ECRA Draft Sampling Plan Guide, June 6, 1986.

Method 9070, Total Recoverable Oil and Grease (Gravimetric, Separatory Funnel Extraction), Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, Third Edition, USEPA, 1986 with all promulgated revisions.

Method 9020, Total Organic Halides (TOX), Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, Second Edition, USEPA, 1986 with all promulgated revisions.

V. Analytical Results

AnalytiKEM

Volatile Organics

Parameter	<u>Sample Designation</u>			
	Aqueous Method	A81565-1	A81565-5	A81565-6
	Blank 1	MW-1	MW-5	MW-6
Chloromethane	2.0 U	2.0 U	2.0 U	2.0 U
Bromomethane	2.0 U	2.0 U	2.0 U	2.0 U
Vinyl Chloride	2.0 U	2.0 U	2.0 U	2.0 U
Chloroethane	2.0 U	2.0 U	2.0 U	2.0 U
Methylene Chloride	0.24 J	1.0	0.89 J	0.88 J
2-Propanone (Acetone)	20 U	20 U	20 U	20 U
Carbon Disulfide	1.0 U	1.6	3.6	2.8
1,1-Dichloroethene	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethene (total)	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform	1.0 U	1.0 U	1.0 U	0.27 J
1,2-Dichloroethane	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone (MEK)	20 U	20 U	20 U	20 U
1,1,1-Trichloroethane	1.0 U	1.0 U	1.0 U	0.32 J
Carbon Tetrachloride	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl Acetate	10 U	10 U	10 U	10 U
Bromodichloromethane	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	1.0 U	1.0 U	1.0 U	1.0 U
Benzene	1.0 U	1.0 U	0.56 J	1.0 U
trans-1,3-Dichloropropene	1.0 U	1.0 U	1.0 U	1.0 U
2-Chloroethyl Vinyl Ether	2.0 U	2.0 U	2.0 U	2.0 U
Bromoform	1.0 U	1.0 U	1.0 U	1.0 U
4-Methyl-2-Pentanone (MIBK)	10 U	10 U	10 U	10 U
2-Hexanone	10 U	10 U	10 U	10 U
Tetrachloroethene	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	1.0 U	1.0 U	1.0 U	1.0 U
Styrene	1.0 U	1.0 U	1.0 U	1.0 U
m-Xylene	1.0 U	1.0 U	10	1.0 U
o,p-Xylene	1.0 U	1.0 U	0.63 J	1.0 U
1,3-Dioxolane	6.0 U	6.0 U	6.0 U	6.0 U
Units	(ug/l)	(ug/l)	(ug/l)	(ug/l)

V. Analytical Results (Cont'd)

AnalytiKEM

Volatile Organics

Parameter	Sample Designation			
	Aqueous Method	A81565-7	A81565-9	A81565-10
	Blank 1	MW-7	ACS-1	ACS-2
Chloromethane	2.0 U	2.0 U	2.0 U	2.0 U
Bromomethane	2.0 U	2.0 U	2.0 U	2.0 U
Vinyl Chloride	2.0 U	2.0 U	2.0 U	2.0 U
Chloroethane	2.0 U	2.0 U	2.0 U	2.0 U
Methylene Chloride	0.24 J	0.63 J	0.19 J	0.59 J
2-Propanone (Acetone)	20 U	20 U	470 *	510 *
Carbon Disulfide	1.0 U	3.1	1.0 U	1.0 U
1,1-Dichloroethene	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethene (total)	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform	1.0 U	0.44 J	1.0 U	1.0 U
1,2-Dichloroethane	1.0 U	1.0 U	1.0 U	1.0 U
2-Butanone (MEK)	20 U	20 U	24	20
1,1,1-Trichloroethane	1.0 U	1.0 U	1.0 U	1.0 U
Carbon Tetrachloride	1.0 U	1.0 U	1.0 U	1.0 U
Vinyl Acetate	10 U	10 U	10 U	10 U
Bromodichloromethane	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	1.0 U	1.0 U	1.0 U	1.0 U
Dibromochloromethane	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	1.0 U	1.0 U	1.0 U	1.0 U
Benzene	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	1.0 U	1.0 U	1.0 U	1.0 U
2-Chloroethyl Vinyl Ether	2.0 U	2.0 U	2.0 U	2.0 U
Bromoform	1.0 U	1.0 U	1.0 U	1.0 U
4-Methyl-2-Pentanone (MIBK)	10 U	10 U	10 U	10 U
2-Hexanone	10 U	10 U	10 U	10 U
Tetrachloroethene	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	1.0 U	1.0 U	7.6	3.6
Chlorobenzene	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	1.0 U	1.0 U	11	4.9
Styrene	1.0 U	1.0 U	1.0 U	1.0 U
m-Xylene	1.0 U	1.0 U	25	17
o,p-Xylene	1.0 U	1.0 U	18	12
1,3-Dioxolane	6.0 U	6.0 U	6.0 U	6.0 U
Units	(ug/l)	(ug/l)	(ug/l)	(ug/l)

* Result obtained from rerun due to saturation in original run.

V. Analytical Results (Cont'd)

AnalytiKEM

Volatile Organics

<u>Parameter</u>	<u>Sample Designation</u>		
	<u>Aqueous</u>	<u>A81565-11</u>	<u>A81565-12</u>
	<u>Method</u>	<u>ACS-3</u>	<u>ACS-4</u>
	<u>Blank 1</u>		
Chloromethane	2.0 U	2.0 U	2.0 U
Bromomethane	2.0 U	2.0 U	2.0 U
Vinyl Chloride	2.0 U	2.0 U	2.0 U
Chloroethane	2.0 U	2.0 U	2.0 U
Methylene Chloride	0.24 J	0.55 J	0.48 J
2-Propanone (Acetone)	20 U	630 *	660 *
Carbon Disulfide	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	1.0 U	1.0 U	1.0 U
1,1-Dichloroethane	1.0 U	1.0 U	1.0 U
1,2-Dichloroethene (total)	1.0 U	1.0 U	1.0 U
Chloroform	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	1.0 U	1.0 U	1.0 U
2-Butanone (MEK)	20 U	6.9	20 U
1,1,1-Trichloroethane	1.0 U	1.0 U	1.0 U
Carbon Tetrachloride	1.0 U	1.0 U	1.0 U
Vinyl Acetate	10 U	10 U	10 U
Bromodichloromethane	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	1.0 U	1.0 U	1.0 U
Trichloroethene	1.0 U	1.0 U	1.0 U
Dibromochloromethane	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	1.0 U	1.0 U	1.0 U
Benzene	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	1.0 U	1.0 U	1.0 U
2-Chloroethyl Vinyl Ether	2.0 U	2.0 U	2.0 U
Bromoform	1.0 U	1.0 U	1.0 U
4-Methyl-2-Pentanone (MIBK)	10 U	10 U	23
2-Hexanone	10 U	10 U	10 U
Tetrachloroethene	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	1.0 U	1.0 U	1.0 U
Toluene	1.0 U	1.0 U	3.4
Chlorobenzene	1.0 U	1.0 U	1.0 U
Ethylbenzene	1.0 U	1.0 U	5.0
Styrene	1.0 U	1.0 U	1.0 U
m-Xylene	1.0 U	9.7	13
o,p-Xylene	1.0 U	7.6	11
1,3-Dioxolane	6.0 U	6.0 U	6.0 U
Units	(ug/l)	(ug/l)	(ug/l)

* Result obtained from rerun due to saturation in original run.

V. Analytical Results (Cont'd)

Volatile Organics

<u>Parameter</u>	<u>Sample Designation</u>			
	<u>Nonaqueous Method Blank</u>	<u>A81565-14 SCS-2</u>	<u>A81551-15 SCS-3</u>	<u>A81551-16 SCS-4</u>
Chloromethane	500 U	660 U	660 U	660 U
Bromomethane	500 U	660 U	660 U	660 U
Vinyl Chloride	500 U	660 U	660 U	660 U
Chloroethane	500 U	660 U	660 U	660 U
Methylene Chloride	120 J	200 J	210 J	140 J
2-Propanone (Acetone)	5,000 U	6,600 U	850 J	1,200 J
Carbon Disulfide	160 J	260 J	300 J	270 J
1,1-Dichloroethene	250 U	330 U	330 U	330 U
1,1-Dichloroethane	250 U	330 U	330 U	330 U
trans-1,2-Dichloroethene	250 U	330 U	330 U	330 U
Chloroform	250 U	330 U	330 U	330 U
1,2-Dichloroethane	250 U	330 U	330 U	330 U
2-Butanone (MEK)	5,000 U	6,600 U	6,600 U	6,600 U
1,1,1-Trichloroethane	250 U	330 U	330 U	330 U
Carbon Tetrachloride	250 U	330 U	330 U	330 U
Vinyl Acetate	2,500 U	3,300 U	3,300 U	3,300 U
Bromodichloromethane	250 U	330 U	330 U	330 U
1,2-Dichloropropane	250 U	330 U	330 U	330 U
trans-1,3-Dichloropropene	250 U	330 U	330 U	330 U
Trichloroethene	250 U	330 U	330 U	330 U
Dibromochloromethane	250 U	330 U	330 U	330 U
1,1,2-Trichloroethane	250 U	330 U	330 U	330 U
Benzene	250 U	330 U	330 U	330 U
cis-1,3-Dichloropropene	250 U	330 U	330 U	330 U
2-Chloroethyl Vinyl Ether	500 U	660 U	660 U	660 U
Bromoform	250 U	330 U	330 U	330 U
4-Methyl-2-Pentanone (MIBK)	2,500 U	3,300 U	3,300 U	3,300 U
2-Hexanone	2,500 U	3,300 U	3,300 U	3,300 U
Tetrachloroethene	250 U	330 U	92 J	330 U
1,1,2,2-Tetrachloroethane	250 U	330 U	330 U	330 U
Toluene	250 U	330 U	330 U	330 U
Chlorobenzene	250 U	330 U	330 U	330 U
Ethylbenzene	250 U	330 U	330 U	330 U
Styrene	250 U	330 U	330 U	330 U
m-Xylene	250 U	330 U	330 U	330 U
o,p-Xylene	250 U	330 U	330 U	330 U
1,3-Dioxolane	1,500 U	2,000 U	2,000 U	2,000 U
Units	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)

V. Analytical Results (Cont'd)

Volatile Organics

<u>Parameter</u>	<u>Sample Designation</u>	
	<u>Aqueous Method Blank 2</u>	<u>A81565-13 SCS-1</u>
Chloromethane	10 U	660 U
Bromomethane	10 U	660 U
Vinyl Chloride	10 U	660 U
Chloroethane	10 U	660 U
Methylene Chloride	5.0 U	190 J
2-Propanone (Acetone)	100 U	6,600 U
Carbon Disulfide	5.0 U	260 J
1,1-Dichloroethene	5.0 U	330 U
1,1-Dichloroethane	5.0 U	330 U
1,2-Dichloroethene (total)	5.0 U	330 U
Chloroform	5.0 U	330 U
1,2-Dichloroethane	5.0 U	330 U
2-Butanone (MEK)	100 U	6,600 U
1,1,1-Trichloroethane	5.0 U	330 U
Carbon Tetrachloride	5.0 U	330 U
Vinyl Acetate	50 U	3,300 U
Bromodichloromethane	5.0 U	330 U
1,2-Dichloropropane	5.0 U	330 U
cis-1,3-Dichloropropene	5.0 U	330 U
Trichloroethene	5.0 U	330 U
Dibromochloromethane	5.0 U	330 U
1,1,2-Trichloroethane	5.0 U	330 U
Benzene	5.0 U	330 U
trans-1,3-Dichloropropene	5.0 U	330 U
2-Chloroethyl Vinyl Ether	10 U	660 U
Bromoform	5.0 U	330 U
4-Methyl-2-Pentanone (MIBK)	50 U	3,300 U
2-Hexanone	50 U	3,300 U
Tetrachloroethene	5.0 U	330 U
1,1,2,2-Tetrachloroethane	5.0 U	330 U
Toluene	5.0 U	330 U
Chlorobenzene	5.0 U	330 U
Ethylbenzene	5.0 U	330 U
Styrene	5.0 U	330 U
m-Xylene	5.0 U	330 U
o,p-Xylene	5.0 U	330 U
1,3-Dioxolane	30 U	2,000 U
Units	(ug/l)	(ug/kg)

V. Analytical Results (Cont'd)

AnalytiKEM

Semivolatiles Organics (Page 1 of 2)

<u>Parameter</u>	<u>Sample Designation</u>		
	<u>Aqueous Method Blank</u>	<u>A81565-1 MW-1</u>	<u>A81565-5 MW-5</u>
N-Nitrosodimethylamine	5.0 U	5.0 U	5.0 U
Phenol	5.0 U	5.0 U	5.0 U
Bis(2-chloroethyl) Ether	5.0 U	5.0 U	5.0 U
2-Chlorophenol	5.0 U	5.0 U	5.0 U
1,3-Dichlorobenzene	5.0 U	5.0 U	5.0 U
1,4-Dichlorobenzene	5.0 U	5.0 U	5.0 U
Benzyl Alcohol	5.0 U	5.0 U	5.0 U
1,2-Dichlorobenzene	5.0 U	5.0 U	5.0 U
2-Methylphenol	5.0 U	5.0 U	5.0 U
Bis(2-chloroisopropyl) Ether	5.0 U	5.0 U	5.0 U
4-Methylphenol	5.0 U	5.0 U	5.0 U
N-Nitrosodipropylamine	5.0 U	5.0 U	5.0 U
Hexachloroethane	5.0 U	5.0 U	5.0 U
Nitrobenzene	5.0 U	5.0 U	5.0 U
Isophorone	5.0 U	5.0 U	5.0 U
2-Nitrophenol	5.0 U	5.0 U	5.0 U
2,4-Dimethylphenol	5.0 U	5.0 U	4.2 J
Benzoic Acid	25 U	25 U	8.2 J
Bis(2-chloroethoxy)methane	5.0 U	5.0 U	5.0 U
2,4-Dichlorophenol	5.0 U	5.0 U	5.0 U
1,2,4-Trichlorobenzene	5.0 U	5.0 U	5.0 U
Naphthalene	5.0 U	5.0 U	7.9
4-Chloroaniline	5.0 U	5.0 U	5.0 U
Hexachlorobutadiene	5.0 U	5.0 U	5.0 U
4-Chloro-3-methylphenol	5.0 U	5.0 U	5.0 U
2-Methylnaphthalene	5.0 U	5.0 U	6.2
Hexachlorocyclopentadiene	5.0 U	5.0 U	5.0 U
2,4,6-Trichlorophenol	5.0 U	5.0 U	5.0 U
2,4,5-Trichlorophenol	25 U	25 U	25 U
2-Chloronaphthalene	5.0 U	5.0 U	5.0 U
2-Nitroaniline	25 U	25 U	25 U
Dimethyl Phthalate	5.0 U	5.0 U	5.0 U
Acenaphthylene	5.0 U	5.0 U	5.0 U
3-Nitroaniline	25 U	25 U	25 U
Acenaphthene	5.0 U	5.0 U	5.0 U
2,4-Dinitrophenol	25 U	25 U	25 U
Units	(ug/l)	(ug/l)	(ug/l)

V. Analytical Results (Cont'd)

AnalytiKEM

Semivolatile Organics (Page 2 of 2)

Parameter	Sample Designation		
	Aqueous Method Blank	AB1565-1 MW-1	AB1565-5 MW-5
4-Nitrophenol	25 U	25 U	25 U
Dibenzofuran	5.0 U	5.0 U	5.0 U
2,4-Dinitrotoluene	5.0 U	5.0 U	5.0 U
2,6-Dinitrotoluene	5.0 U	5.0 U	5.0 U
Diethyl Phthalate	5.0 U	5.0 U	5.0 U
4-Chlorophenyl Phenyl Ether	5.0 U	5.0 U	5.0 U
Fluorene	5.0 U	5.0 U	5.0 U
4-Nitroaniline	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25 U	25 U	25 U
N-Nitrosodiphenylamine	5.0 U	5.0 U	5.0 U
4-Bromophenyl Phenyl Ether	5.0 U	5.0 U	5.0 U
Hexachlorobenzene	5.0 U	5.0 U	5.0 U
Pentachlorophenol	5.0 U	5.0 U	5.0 U
Phenanthrene	5.0 U	5.0 U	5.0 U
Anthracene	5.0 U	5.0 U	5.0 U
Dibutyl Phthalate	3.6 J	5.0 U	5.0 U
Fluoranthene	5.0 U	5.0 U	5.0 U
Benzidine	25 U	25 U	25 U
Pyrene	5.0 U	5.0 U	5.0 U
Butylbenzyl Phthalate	5.0 U	5.0 U	5.0 U
3,3'-Dichlorobenzidine	10 U	10 U	10 U
Benzo(a)anthracene	5.0 U	5.0 U	5.0 U
Bis(2-ethylhexyl) Phthalate	8.1	1.3 J	3.9 J
Chrysene	5.0 U	5.0 U	5.0 U
Diethyl Phthalate	5.0 U	5.0 U	5.0 U
Benzo(b)fluoranthene	5.0 U	5.0 U	5.0 U
Benzo(k)fluoranthene	5.0 U	5.0 U	5.0 U
Benzo(a)pyrene	5.0 U	5.0 U	5.0 U
Indeno(1,2,3-cd)pyrene	5.0 U	5.0 U	5.0 U
Dibenzo(a,h)anthracene	5.0 U	5.0 U	5.0 U
Benzo(g,h,i)perylene	5.0 U	5.0 U	5.0 U
Units	(ug/l)	(ug/l)	(ug/l)

V. Analytical Results (Cont'd)

AnalytiKEM

Semivolatile Organics (Page 1 of 2)

Parameter	Sample Designation			
	Aqueous Method	A81565-6	A81565-7	A81565-9
	Blank	MW-6	MW-7	ASC-1
N-Nitrosodimethylamine	5.0 U	5.0 U	5.0 U	5.0 U
Phenol	5.0 U	5.0 U	5.0 U	5.0 U
Bis(2-chloroethyl) Ether	5.0 U	5.0 U	5.0 U	5.0 U
2-Chlorophenol	5.0 U	5.0 U	5.0 U	5.0 U
1,3-Dichlorobenzene	5.0 U	5.0 U	5.0 U	5.0 U
1,4-Dichlorobenzene	5.0 U	5.0 U	5.0 U	5.0 U
Benzyl Alcohol	5.0 U	5.0 U	5.0 U	5.0 U
1,2-Dichlorobenzene	5.0 U	5.0 U	5.0 U	5.0 U
2-Methylphenol	5.0 U	5.0 U	5.0 U	5.0 U
Bis(2-chloroisopropyl) Ether	5.0 U	5.0 U	5.0 U	5.0 U
4-Methylphenol	5.0 U	5.0 U	5.0 U	5.0 U
N-Nitrosodipropylamine	5.0 U	5.0 U	5.0 U	5.0 U
Hexachloroethane	5.0 U	5.0 U	5.0 U	5.0 U
Nitrobenzene	5.0 U	5.0 U	5.0 U	5.0 U
Isophorone	5.0 U	5.0 U	5.0 U	5.0 U
2-Nitrophenol	5.0 U	5.0 U	5.0 U	5.0 U
2,4-Dimethylphenol	5.0 U	5.0 U	5.0 U	5.0 U
Benzoic Acid	25 U	25 U	3.5 J	25 U
Bis(2-chloroethoxy)methane	5.0 U	5.0 U	5.0 U	5.0 U
2,4-Dichlorophenol	5.0 U	5.0 U	5.0 U	5.0 U
1,2,4-Trichlorobenzene	5.0 U	5.0 U	5.0 U	5.0 U
Naphthalene	5.0 U	5.0 U	5.0 U	5.0 U
4-Chloroaniline	5.0 U	5.0 U	5.0 U	5.0 U
Hexachlorobutadiene	5.0 U	5.0 U	5.0 U	5.0 U
4-Chloro-3-methylphenol	5.0 U	5.0 U	5.0 U	5.0 U
2-Methylnaphthalene	5.0 U	5.0 U	5.0 U	5.0 U
Hexachlorocyclopentadiene	5.0 U	5.0 U	5.0 U	5.0 U
2,4,6-Trichlorophenol	5.0 U	5.0 U	5.0 U	5.0 U
2,4,5-Trichlorophenol	25 U	25 U	25 U	25 U
2-Chloronaphthalene	5.0 U	5.0 U	5.0 U	5.0 U
2-Nitroaniline	25 U	25 U	25 U	25 U
Dimethyl Phthalate	5.0 U	5.0 U	5.0 U	5.0 U
Acenaphthylene	5.0 U	5.0 U	5.0 U	5.0 U
3-Nitroaniline	25 U	25 U	25 U	25 U
Acenaphthene	5.0 U	5.0 U	5.0 U	5.0 U
2,4-Dinitrophenol	25 U	25 U	25 U	25 U
Units	(ug/l)	(ug/l)	(ug/l)	(ug/l)

V. Analytical Results (Cont'd)

AnalytiKEM

Semivolatile Organics (Page 2 of 2)

<u>Parameter</u>	<u>Sample Designation</u>			
	<u>Aqueous Method Blank</u>	<u>A81565-6 MW-6</u>	<u>A81565-7 MW-7</u>	<u>A81565-9 ACS-1</u>
4-Nitrophenol	25 U	25 U	25 U	25 U
Dibenzofuran	5.0 U	5.0 U	5.0 U	5.0 U
2,4-Dinitrotoluene	5.0 U	5.0 U	5.0 U	5.0 U
2,6-Dinitrotoluene	5.0 U	5.0 U	5.0 U	5.0 U
Diethyl Phthalate	5.0 U	5.0 U	5.0 U	5.0 U
4-Chlorophenyl Phenyl Ether	5.0 U	5.0 U	5.0 U	5.0 U
Fluorene	5.0 U	5.0 U	5.0 U	5.0 U
4-Nitroaniline	25 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25 U	25 U	25 U	25 U
N-Nitrosodiphenylamine	5.0 U	5.0 U	5.0 U	5.0 U
4-Bromophenyl Phenyl Ether	5.0 U	5.0 U	5.0 U	5.0 U
Hexachlorobenzene	5.0 U	5.0 U	5.0 U	5.0 U
Pentachlorophenol	5.0 U	5.0 U	5.0 U	5.0 U
Phenanthrene	5.0 U	5.0 U	5.0 U	5.0 U
Anthracene	5.0 U	5.0 U	5.0 U	5.0 U
Dibutyl Phthalate	3.6 J	5.0 U	1.0 J	1.5 J
Fluoranthene	5.0 U	5.0 U	5.0 U	5.0 U
Benzidine	25 U	25 U	25 U	25 U
Pyrene	5.0 U	5.0 U	5.0 U	5.0 U
Butylbenzyl Phthalate	5.0 U	5.0 U	5.0 U	5.0 U
3,3'-Dichlorobenzidine	10 U	10 U	10 U	10 U
Benzo(a)anthracene	5.0 U	5.0 U	5.0 U	5.0 U
Bis(2-ethylhexyl) Phthalate	8.1	1.1 J	3.3 J	2.6 J
Chrysene	5.0 U	5.0 U	5.0 U	5.0 U
Diethyl Phthalate	5.0 U	5.0 U	5.0 U	5.0 U
Benzo(b)fluoranthene	5.0 U	5.0 U	5.0 U	5.0 U
Benzo(k)fluoranthene	5.0 U	5.0 U	5.0 U	5.0 U
Benzo(a)pyrene	5.0 U	5.0 U	5.0 U	5.0 U
Indeno(1,2,3-cd)pyrene	5.0 U	5.0 U	5.0 U	5.0 U
Dibenzo(a,h)anthracene	5.0 U	5.0 U	5.0 U	5.0 U
Benzo(g,h,i)perylene	5.0 U	5.0 U	5.0 U	5.0 U
Units	(ug/l)	(ug/l)	(ug/l)	(ug/l)

V. Analytical Results (Cont'd)

AnalytiKEM

Semivolatile Organics (Page 1 of 2)

<u>Parameter</u>	<u>Aqueous Method Blank</u>	<u>Sample Designation</u>		
		<u>A81565-10 ACS-2</u>	<u>A81565-11 ACS-3</u>	<u>A81565-12 ACS-4</u>
N-Nitrosodimethylamine	5.0 U	5.0 U	5.0 U	5.0 U
Phenol	5.0 U	5.0 U	5.0 U	1.8 J
Bis(2-chloroethyl) Ether	5.0 U	5.0 U	5.0 U	5.0 U
2-Chlorophenol	5.0 U	5.0 U	5.0 U	5.0 U
1,3-Dichlorobenzene	5.0 U	5.0 U	5.0 U	5.0 U
1,4-Dichlorobenzene	5.0 U	5.0 U	5.0 U	5.0 U
Benzyl Alcohol	5.0 U	5.0 U	5.0 U	5.0 U
1,2-Dichlorobenzene	5.0 U	5.0 U	5.0 U	5.0 U
2-Methylphenol	5.0 U	5.0 U	5.0 U	11
Bis(2-chloroisopropyl) Ether	5.0 U	5.0 U	5.0 U	5.0 U
4-Methylphenol	5.0 U	5.0 U	5.0 U	5.0 U
N-Nitrosodipropylamine	5.0 U	5.0 U	5.0 U	5.0 U
Hexachloroethane	5.0 U	5.0 U	5.0 U	5.0 U
Nitrobenzene	5.0 U	5.0 U	5.0 U	5.0 U
Isophorone	5.0 U	5.0 U	5.0 U	5.0 U
2-Nitrophenol	5.0 U	5.0 U	5.0 U	5.0 U
2,4-Dimethylphenol	5.0 U	5.0 U	5.0 U	5.0 U
Benzoic Acid	25 U	25 U	25 U	14 J
Bis(2-chloroethoxy)methane	5.0 U	5.0 U	5.0 U	5.0 U
2,4-Dichlorophenol	5.0 U	5.0 U	5.0 U	5.0 U
1,2,4-Trichlorobenzene	5.0 U	5.0 U	5.0 U	5.0 U
Naphthalene	5.0 U	5.0 U	5.0 U	5.0 U
4-Chloroaniline	5.0 U	5.0 U	5.0 U	5.0 U
Hexachlorobutadiene	5.0 U	5.0 U	5.0 U	5.0 U
4-Chloro-3-methylphenol	5.0 U	5.0 U	5.0 U	5.0 U
2-Methylnaphthalene	5.0 U	5.0 U	5.0 U	5.0 U
Hexachlorocyclopentadiene	5.0 U	5.0 U	5.0 U	5.0 U
2,4,6-Trichlorophenol	5.0 U	5.0 U	5.0 U	5.0 U
2,4,5-Trichlorophenol	25 U	25 U	25 U	25 U
2-Chloronaphthalene	5.0 U	5.0 U	5.0 U	5.0 U
2-Nitroaniline	25 U	25 U	25 U	25 U
Dimethyl Phthalate	5.0 U	5.0 U	5.0 U	5.0 U
Acenaphthylene	5.0 U	5.0 U	5.0 U	5.0 U
3-Nitroaniline	25 U	25 U	25 U	25 U
Acenaphthene	5.0 U	5.0 U	5.0 U	5.0 U
2,4-Dinitrophenol	25 U	25 U	25 U	25 U
Units	(ug/l)	(ug/l)	(ug/l)	(ug/l)

V. Analytical Results (Cont'd)

AnalytiKEM

Semivolatile Organics (Page 2 of 2)

<u>Parameter</u>	<u>Sample Designation</u>			
	<u>Aqueous</u>	<u>A81565-10</u>	<u>A81565-11</u>	<u>A81565-12</u>
	<u>Method</u> <u>Blank</u>	<u>ACS-2</u>	<u>ACS-3</u>	<u>ACS-4</u>
4-Nitrophenol	25 U	25 U	25 U	25 U
Dibenzofuran	5.0 U	5.0 U	5.0 U	5.0 U
2,4-Dinitrotoluene	5.0 U	5.0 U	5.0 U	5.0 U
2,6-Dinitrotoluene	5.0 U	5.0 U	5.0 U	5.0 U
Diethyl Phthalate	5.0 U	5.0 U	5.0 U	5.0 U
4-Chlorophenyl Phenyl Ether	5.0 U	5.0 U	5.0 U	5.0 U
Fluorene	5.0 U	5.0 U	5.0 U	5.0 U
4-Nitroaniline	25 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25 U	25 U	25 U	25 U
N-Nitrosodiphenylamine	5.0 U	5.0 U	5.0 U	5.0 U
4-Bromophenyl Phenyl Ether	5.0 U	5.0 U	5.0 U	5.0 U
Hexachlorobenzene	5.0 U	5.0 U	5.0 U	5.0 U
Pentachlorophenol	5.0 U	5.0 U	5.0 U	5.0 U
Phenanthrene	5.0 U	5.0 U	5.0 U	5.0 U
Anthracene	5.0 U	5.0 U	5.0 U	5.0 U
Dibutyl Phthalate	3.6 J	1.2 J	5.0 U	3.6 J
Fluoranthene	5.0 U	5.0 U	5.0 U	5.0 U
Benzidine	25 U	25 U	25 U	25 U
Pyrene	5.0 U	5.0 U	5.0 U	5.0 U
Butylbenzyl Phthalate	5.0 U	5.0 U	5.0 U	5.0 U
3,3'-Dichlorobenzidine	10 U	10 U	10 U	10 U
Benzo(a)anthracene	5.0 U	5.0 U	5.0 U	5.0 U
Bis(2-ethylhexyl) Phthalate	8.1	5.3	5.0 U	2.7 J
Chrysene	5.0 U	5.0 U	5.0 U	5.0 U
Diocetyl Phthalate	5.0 U	5.0 U	5.0 U	5.0 U
Benzo(b)fluoranthene	5.0 U	5.0 U	5.0 U	5.0 U
Benzo(k)fluoranthene	5.0 U	5.0 U	5.0 U	5.0 U
Benzo(a)pyrene	5.0 U	5.0 U	5.0 U	5.0 U
Indeno(1,2,3-cd)pyrene	5.0 U	5.0 U	5.0 U	5.0 U
Dibenzo(a,h)anthracene	5.0 U	5.0 U	5.0 U	5.0 U
Benzo(g,h,i)perylene	5.0 U	5.0 U	5.0 U	5.0 U
Units	(ug/l)	(ug/l)	(ug/l)	(ug/l)

V. Analytical Results (Cont'd)

AnalytiKEM

Semivolatile Organics (Page 1 of 2)

<u>Parameter</u>	<u>Sample Designation</u>		
	<u>Nonaqueous</u>	<u>A81565-13</u>	<u>A81565-14</u>
	<u>Method</u>	<u>SCS-1</u>	<u>SCS-2</u>
	<u>Blank</u>		
N-Nitrosodimethylamine	330 U	330 U	330 U
Phenol	330 U	330 U	37 J
Bis(2-chloroethyl) Ether	330 U	330 U	330 U
2-Chlorophenol	330 U	330 U	330 U
1,3-Dichlorobenzene	330 U	330 U	330 U
1,4-Dichlorobenzene	330 U	330 U	330 U
Benzyl Alcohol	330 U	330 U	330 U
1,2-Dichlorobenzene	330 U	330 U	330 U
2-Methylphenol	330 U	330 U	330 U
Bis(2-chloroisopropyl) Ether	330 U	330 U	330 U
4-Methylphenol	330 U	330 U	330 U
N-Nitrosodipropylamine	330 U	330 U	330 U
Hexachloroethane	330 U	330 U	330 U
Nitrobenzene	330 U	330 U	330 U
Isophorone	330 U	330 U	330 U
2-Nitrophenol	330 U	330 U	330 U
2,4-Dimethylphenol	330 U	330 U	330 U
Benzoic Acid	1,600 U	410 J	166 J
Bis(2-chloroethoxy)methane	330 U	330 U	330 U
2,4-Dichlorophenol	330 U	330 U	330 U
1,2,4-Trichlorobenzene	330 U	330 U	330 U
Naphthalene	330 U	330 U	330 U
4-Chloroaniline	330 U	330 U	330 U
Hexachlorobutadiene	330 U	330 U	330 U
4-Chloro-3-methylphenol	330 U	330 U	330 U
2-Methylnaphthalene	330 U	330 U	330 U
Hexachlorocyclopentadiene	330 U	330 U	330 U
2,4,6-Trichlorophenol	330 U	330 U	330 U
2,4,5-Trichlorophenol	1,600 U	1,600 U	1,600 U
2-Chloronaphthalene	330 U	330 U	330 U
2-Nitroaniline	1,600 U	1,600 U	1,600 U
Dimethyl Phthalate	330 U	330 U	330 U
Acenaphthylene	330 U	330 U	330 U
3-Nitroaniline	1,600 U	1,600 U	1,600 U
Acenaphthene	330 U	330 U	330 U
2,4-Dinitrophenol	1,600 U	1,600 U	1,600 U
Units	(ug/kg)	(ug/kg)	(ug/kg)

V. Analytical Results (Cont'd)

AnalytiKEM

Semivolatile Organics (Page 2 of 2)

Parameter	Sample Designation		
	Nonaqueous Method	A81565-13	A81565-14
	Blank	SCS-1	SCS-2
4-Nitrophenol	1,600 U	1,600 U	1,600 U
Dibenzofuran	330 U	330 U	330 U
2,4-Dinitrotoluene	330 U	330 U	330 U
2,6-Dinitrotoluene	330 U	330 U	330 U
Diethyl Phthalate	330 U	330 U	330 U
4-Chlorophenyl Phenyl Ether	330 U	330 U	330 U
Fluorene	330 U	330 U	330 U
4-Nitroaniline	1,600 U	1,600 U	1,600 U
4,6-Dinitro-2-methylphenol	1,600 U	1,600 U	1,600 U
N-Nitrosodiphenylamine	330 U	330 U	330 U
4-Bromophenyl Phenyl Ether	330 U	330 U	330 U
Hexachlorobenzene	330 U	330 U	330 U
Pentachlorophenol	330 U	330 U	60 J
Phenanthrene	330 U	330 U	330 U
Anthracene	330 U	330 U	330 U
Dibutyl Phthalate	330 U	330 U	330 U
Fluoranthene	330 U	330 U	330 U
Benzidine	1,600 U	1,600 U	1,600 U
Pyrene	330 U	330 U	330 U
Butylbenzyl Phthalate	330 U	330 U	330 U
3,3'-Dichlorobenzidine	660 U	660 U	660 U
Benzo(a)anthracene	330 U	330 U	330 U
Bis(2-ethylhexyl) Phthalate	330 U	58 J	330 U
Chrysene	330 U	330 U	330 U
Diethyl Phthalate	330 U	330 U	330 U
Benzo(b)fluoranthene	330 U	330 U	330 U
Benzo(k)fluoranthene	330 U	330 U	330 U
Benzo(a)pyrene	330 U	330 U	330 U
Indeno(1,2,3-cd)pyrene	330 U	330 U	330 U
Dibenzo(a,h)anthracene	330 U	330 U	330 U
Benzo(g,h,i)perylene	330 U	330 U	330 U
Units	(ug/kg)	(ug/kg)	(ug/kg)

V. Analytical Results (Cont'd)

AnalytikEM

Semivolatile Organics (Page 1 of 2)

Parameter	Sample Designation		
	Nonaqueous Method Blank	AB1565-15	AB1565-16
		SCS-3	SCS-4
N-Nitrosodimethylamine	330 U	330 U	330 U
Phenol	330 U	330 U	330 U
Bis(2-chloroethyl) Ether	330 U	330 U	330 U
2-Chlorophenol	330 U	330 U	330 U
1,3-Dichlorobenzene	330 U	330 U	330 U
1,4-Dichlorobenzene	330 U	330 U	330 U
Benzyl Alcohol	330 U	330 U	330 U
1,2-Dichlorobenzene	330 U	330 U	330 U
2-Methylphenol	330 U	330 U	330 U
Bis(2-chloroisopropyl) Ether	330 U	330 U	330 U
4-Methylphenol	330 U	220 J	330 U
N-Nitrosodipropylamine	330 U	330 U	330 U
Hexachloroethane	330 U	330 U	330 U
Nitrobenzene	330 U	330 U	330 U
Isophorone	330 U	330 U	330 U
2-Nitrophenol	330 U	330 U	330 U
2,4-Dimethylphenol	330 U	330 U	330 U
Benzoic Acid	1,600 U	1,600 U	370 J
Bis(2-chloroethoxy)methane	330 U	330 U	330 U
2,4-Dichlorophenol	330 U	330 U	330 U
1,2,4-Trichlorobenzene	330 U	330 U	330 U
Naphthalene	330 U	330 U	330 U
4-Chloroaniline	330 U	330 U	330 U
Hexachlorobutadiene	330 U	330 U	330 U
4-Chloro-3-methylphenol	330 U	330 U	330 U
2-Methylnaphthalene	330 U	330 U	330 U
Hexachlorocyclopentadiene	330 U	330 U	330 U
2,4,6-Trichlorophenol	330 U	330 U	330 U
2,4,5-Trichlorophenol	1,600 U	1,600 U	1,600 U
2-Chloronaphthalene	330 U	330 U	330 U
2-Nitroaniline	1,600 U	1,600 U	1,600 U
Dimethyl Phthalate	330 U	330 U	330 U
Acenaphthylene	330 U	330 U	330 U
3-Nitroaniline	1,600 U	1,600 U	1,600 U
Acenaphthene	330 U	330 U	330 U
2,4-Dinitrophenol	1,600 U	1,600 U	1,600 U
Units	(ug/kg)	(ug/kg)	(ug/kg)

V. Analytical Results (Cont'd)

AnalytiKEM

Semivolatile Organics (Page 2 of 2)

<u>Parameter</u>	<u>Sample Designation</u>		
	<u>Nonaqueous</u>	<u>AB1565-15</u>	<u>AB1565-16</u>
	<u>Method</u>	<u>SCS-3</u>	<u>SCS-4</u>
	<u>Blank</u>		
4-Nitrophenol	1,600 U	1,600 U	1,600 U
Dibenzofuran	330 U	330 U	330 U
2,4-Dinitrotoluene	330 U	330 U	330 U
2,6-Dinitrotoluene	330 U	330 U	330 U
Diethyl Phthalate	330 U	330 U	330 U
4-Chlorophenyl Phenyl Ether	330 U	330 U	330 U
Fluorene	330 U	330 U	330 U
4-Nitroaniline	1,600 U	1,600 U	1,600 U
4,6-Dinitro-2-methylphenol	1,600 U	1,600 U	1,600 U
N-Nitrosodiphenylamine	330 U	330 U	330 U
4-Bromophenyl Phenyl Ether	330 U	330 U	330 U
Hexachlorobenzene	330 U	330 U	330 U
Pentachlorophenol	330 U	330 U	330 U
Phenanthrene	330 U	330 U	330 U
Anthracene	330 U	330 U	330 U
Dibutyl Phthalate	330 U	330 U	330 U
Fluoranthene	330 U	330 U	44 J
Benzidine	1,600 U	1,600 U	1,600 U
Pyrene	330 U	330 U	45 J
Butylbenzyl Phthalate	330 U	330 U	330 U
3,3'-Dichlorobenzidine	660 U	660 U	660 U
Benzo(a)anthracene	330 U	330 U	330 U
Bis(2-ethylhexyl) Phthalate	330 U	330 U	57 J
Chrysene	330 U	330 U	330 U
Diocetyl Phthalate	330 U	330 U	330 U
Benzo(b)fluoranthene	330 U	330 U	330 U
Benzo(k)fluoranthene	330 U	330 U	330 U
Benzo(a)pyrene	330 U	330 U	330 U
Indeno(1,2,3-cd)pyrene	330 U	330 U	330 U
Dibenzo(a,h)anthracene	330 U	330 U	330 U
Benzo(g,h,i)perylene	330 U	330 U	330 U
Units	(ug/kg)	(ug/kg)	(ug/kg)

V. Analytical Results (Cont'd)

EPA/NIH/NBS Nontargetted Library Search

No nontargetted compounds were detected in the following samples:

- Aqueous Volatile Method Blank 1
- Aqueous Volatile Method Blank 2
- Nonaqueous Volatile Method Blank
- Nonaqueous Semivolatile Method Blank

AnalytiKEM Designation Aqueous Semivolatile Method Blank

CAS Number	Compound Name	Fraction	Scan Number	Estimated Concentration (ug/l)
	Unknown Compound	BNA	139	19
	Unknown Compound	BNA	1436	4.0
	Unknown Compound	BNA	1495	5.0

AnalytiKEM Designation AB1565-1

Client Designation MW-1

CAS Number	Compound Name	Fraction	Scan Number	Estimated Concentration (ug/l)
	None Detected	VOA	--	--
	Unknown Compound	BNA	1495	100
	Unknown Compound	BNA	1543	4.0
	Unknown Compound	BNA	1871	10

Note: Estimated concentration is calculated against the nearest eluting internal standard.

V. Analytical Results (Cont'd)

EPA/NIH/NBS Nontargetted Library Search

AnalytiKEM Designation A81565-5

Client Designation MW-5

CAS Number	Compound Name	Fraction	Scan Number	Estimated Concentration (ug/l)
110827	Cyclohexane	VOA	375	2.0
590669	1,1-Dimethylcyclohexane	VOA	578	5.0
	Unknown Cycloalkane Isomer	VOA	743	1.0
	Unknown Cycloalkane Isomer	VOA	1087	1.0
	Unknown Compound	BNA	110	7.0
100414	Ethylbenzene	BNA	158	88
	Unknown Compound	BNA	290	6.0
	Unknown Compound	BNA	357	8.0
	Unknown Compound	BNA	403	5.0
	Unknown Compound	BNA	426	8.0
	Unknown Compound	BNA	466	9.0
	Unknown Compound	BNA	603	5.0
	Unknown Compound	BNA	643	4.0
	Unknown Compound	BNA	678	5.0
	Unknown Compound	BNA	1151	10
	Unknown Compound	BNA	1213	8.0
	Unknown Compound	BNA	1491	180

Note: Estimated concentration is calculated against the nearest eluting internal standard.

V. Analytical Results (Cont'd)

EPA/NIH/NBS Nontargetted Library Search

AnalytiKEM Designation A81565-6

Client Designation MW-6

CAS Number	Compound Name	Fraction	Scan Number	Estimated Concentration (ug/l)
	None Detected	VOA	--	--
	Unknown Compound	BNA	1495	120
	Unknown Compound	BNA	1901	5.0

AnalytiKEM Designation A81565-7

Client Designation MW-7

CAS Number	Compound Name	Fraction	Scan Number	Estimated Concentration (ug/l)
	None Detected	VOA	--	--
	Unknown Compound	BNA	139	7.0
	Unknown Compound	BNA	173	5.0
	Unknown Compound	BNA	305	5.0
	Unknown Compound	BNA	491	8.0
	Unknown Compound	BNA	516	4.0
	Unknown Compound	BNA	1155	7.0
	Unknown Compound	BNA	1497	180
	Unknown Compound	BNA	1902	6.0

Note: Estimated concentration is calculated against the nearest eluting internal standard.

V. Analytical Results (Cont'd)EPA/NIH/NBS Nontargetted Library SearchAnalytiKEM Designation A81565-9Client Designation ACS-1

CAS Number	Compound Name	Fraction	Scan Number	Estimated Concentration (ug/l)
	Unknown Compound	VOA	283	4.0
	Unknown Compound	VOA	614	1.0
	Unknown Compound	BNA	105	21
	Benzene Derivative	BNA	133	14
100414	Ethylbenzene	BNA	159	17
	Unknown Compound	BNA	1153	7.0
	Unknown Compound	BNA	1495	170

AnalytiKEM Designation A81565-10Client Designation ACS-2

CAS Number	Compound Name	Fraction	Scan Number	Estimated Concentration (ug/l)
	None Detected	VOA	--	--
100414	Ethylbenzene	BNA	160	9.0
	Unknown Compound	BNA	1466	5.0
	Unknown Compound	BNA	1495	230

Note: Estimated concentration is calculated against the nearest eluting internal standard.

V. Analytical Results (Cont'd)EPA/NIH/NBS Nontargetted Library Search:AnalytiKEM Designation AB1565-11Client Designation ACS-3

CAS Number	Compound Name	Fraction	Scan Number	Estimated Concentration (ug/l)
	None Detected	VOA	--	--
	Ethylbenzene	BNA	159	16
	Unknown Phthalic Compound	BNA	1676	4

AnalytiKEM Designation AB1565-12Client Designation ACS-4

CAS Number	Compound Name	Fraction	Scan Number	Estimated Concentration (ug/kg)
	None Detected	VOA	--	--
	Unknown Xylene Isomer	BNA	160	12
	Unknown Carboxylic Acid	BNA	221	9
	Unknown Benzene Derivative	BNA	632	12
	Unknown Ester	BNA	1492	28
	Unknown Phthalate Isomer	BNA	1541	8
	Unknown Phthalate Isomer	BNA	1674	8
	Unknown Phthalate Isomer	BNA	1691	4
	Unknown Phthalate Isomer	BNA	1703	4
	Unknown Alkylated Alkene Isomer	BNA	1722	4
	Unknown Compound	BNA	1874	4

Note: Estimated concentration is calculated against the nearest eluting internal standard.

V. Analytical Results (Cont'd)

EPA/NIH/NBS Nontargetted Library Search

AnalytiKEM Designation A81565-13

Client Designation SCS-1

CAS Number	Compound Name	Fraction	Scan Number	Estimated Concentration (ug/l)
79345	1,1,2,2-Tetrachloroethane	VOA	--	--
	Unknown Compound	BNA	216	12
	Unknown Compound	BNA	223	280
	Unknown Compound	BNA	250	346
	Unknown Compound	BNA	255	2,300
	Unknown Compound	BNA	281	150
	Unknown Compound	BNA	362	230
	Unknown Compound	BNA	544	210
	Unknown Compound	BNA	1201	510
	Unknown Compound	BNA	1255	670

AnalytiKEM Designation A81565-14

Client Designation SCS-2

CAS Number	Compound Name	Fraction	Scan Number	Estimated Concentration (ug/l)
	Difluorobenzene Isomer	VOA	521	4,200
	Unknown Compound	BNA	147	1,300
	Unknown Compound	BNA	1213	300

Note: Estimated concentration is calculated against the nearest eluting internal standard.

V. Analytical Results (Cont'd)

EPA/NIH/NBS Nontargetted Library Search

AnalytiKEM Designation A81565-15

Client Designation SCS-3

CAS Number	Compound Name	Fraction	Scan Number	Estimated Concentration (ug/kg)
	None Detected	VOA	--	--
	Unknown Compound	BNA	115	150
	Unknown Compound	BNA	147	1,300
	Unknown Compound	BNA	627	210
	Unknown Compound	BNA	1200	290
	Unknown Compound	BNA	1214	740
	Unknown Compound	BNA	1270	880
	Unknown Phthalate Compound	BNA	1346	180
	Unknown Phthalate Compound	BNA	1646	260
	Unknown Phthalate Compound	BNA	1657	220
	Unknown Phthalate Compound	BNA	1671	1,500
	Unknown Phthalate Compound	BNA	1688	1,100
	Unknown Phthalate Compound	BNA	1701	980
	Unknown Phthalate Compound	BNA	1735	390
	Unknown Phthalate Compound	BNA	1748	390
	Unknown Phthalate Compound	BNA	1776	150
	Unknown Compound	BNA	1869	450
	Unknown Compound	BNA	1875	250
	Unknown Compound	BNA	1916	150
	Unknown Compound	BNA	1975	510
	Unknown Compound	BNA	1981	600
	Unknown Compound	BNA	1987	330

Note: Estimated concentration is calculated against the nearest eluting internal standard.

V. Analytical Results (Cont'd)

EPA/NIH/NBS Nontargetted Library Search

AnalytiKEM Designation A81565-16

Client Designation SCS-4

CAS Number	Compound Name	Fraction	Scan Number	Estimated Concentration (ug/kg)
	None Detected	VOA	--	--
	Unknown Compound	BNA	554	180
	Unknown Compound	BNA	1269	500
	Unknown Compound	BNA	1630	150
	Unknown Compound	BNA	1652	190
	Unknown Compound	BNA	1786	190
	Unknown Compound	BNA	1858	230

Note: Estimated concentration is calculated against the nearest eluting internal standard.

V. Analytical Results (Cont'd)

Polychlorinated Biphenyls

Sample Designation

<u>Parameter</u>	<u>Aqueous Method Blank</u>	<u>Sample Designation</u>			
		<u>A81565-1 MW-1</u>	<u>A81565-2 MW-2</u>	<u>A81565-3 MW-3</u>	<u>A81565-4 MW-4</u>
Aroclor 1016	10 U	10 U	10 U	10 U	10 U
Aroclor 1221	10 U	10 U	10 U	10 U	10 U
Aroclor 1232	10 U	10 U	10 U	10 U	10 U
Aroclor 1242	10 U	10 U	10 U	10 U	10 U
Aroclor 1248	10 U	10 U	10 U	10 U	10 U
Aroclor 1254	10 U	10 U	10 U	10 U	10 U
Aroclor 1260	10 U	10 U	10 U	10 U	10 U
Units	(ug/l)	(ug/l)	(ug/l)	(ug/l)	(ug/l)

Sample Designation

<u>Parameter</u>	<u>Aqueous Method Blank</u>	<u>Sample Designation</u>			
		<u>A81565-5 MW-5</u>	<u>A81565-6 MW-6</u>	<u>A81565-7 MW-7</u>	<u>A81565-8 MW-8</u>
Aroclor 1016	10 U	10 U	10 U	10 U	10 U
Aroclor 1221	10 U	10 U	10 U	10 U	10 U
Aroclor 1232	10 U	10 U	10 U	10 U	10 U
Aroclor 1242	10 U	10 U	10 U	10 U	10 U
Aroclor 1248	10 U	10 U	10 U	10 U	10 U
Aroclor 1254	10 U	10 U	10 U	10 U	10 U
Aroclor 1260	10 U	10 U	10 U	10 U	10 U
Units	(ug/l)	(ug/l)	(ug/l)	(ug/l)	(ug/l)

V. Analytical Results (Cont'd)

Polychlorinated Biphenyls

<u>Parameter</u>	<u>Aqueous Method</u>	<u>Sample Designation</u>			
		<u>AB1565-9</u>	<u>AB1565-10</u>	<u>AB1565-11</u>	<u>AB1565-12</u>
		<u>Blank</u>	<u>ACS-1</u>	<u>ACS-2</u>	<u>ACS-3</u>
Aroclor 1016	10 U	10 U	10 U	10 U	10 U
Aroclor 1221	10 U	10 U	10 U	10 U	10 U
Aroclor 1232	10 U	10 U	10 U	10 U	10 U
Aroclor 1242	10 U	10 U	10 U	10 U	10 U
Aroclor 1248	10 U	10 U	10 U	10 U	10 U
Aroclor 1254	10 U	10 U	10 U	10 U	10 U
Aroclor 1260	10 U	10 U	10 U	10 U	10 U
Units	(ug/l)	(ug/l)	(ug/l)	(ug/l)	(ug/l)

<u>Parameter</u>	<u>Nonaqueous Method</u>	<u>Sample Designation</u>			
		<u>AB1565-13</u>	<u>AB1565-14</u>	<u>AB1565-15</u>	<u>AB1565-16</u>
		<u>Blank</u>	<u>SCS-1</u>	<u>SCS-2</u>	<u>SCS-3</u>
Aroclor 1016	330 U	330 U	330 U	330 U	330 U
Aroclor 1221	330 U	330 U	330 U	330 U	330 U
Aroclor 1232	330 U	330 U	330 U	330 U	330 U
Aroclor 1242	330 U	330 U	330 U	330 U	330 U
Aroclor 1248	330 U	330 U	330 U	330 U	330 U
Aroclor 1254	330 U	330 U	330 U	330 U	330 U
Aroclor 1260	330 U	330 U	330 U	330 U	330 U
Units	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)

V. Analytical Results (Cont'd)

General Chromatography

Sample Designation

<u>Parameter</u>	<u>Aqueous Method</u>	<u>A81565-1</u>	<u>A81565-2</u>	<u>A81565-3</u>	<u>A81565-4</u>
	<u>Blank</u>	<u>MW-1</u>	<u>MW-2</u>	<u>MW-3</u>	<u>MW-4</u>
N-Butanol	600 U	600 U	600 U	600 U	600 U
Isopropanol	600 U	600 U	600 U	600 U	600 U
Units	(ug/l)	(ug/l)	(ug/l)	(ug/l)	(ug/l)

Sample Designation

<u>Parameter</u>	<u>Aqueous Method</u>	<u>A81565-5</u>	<u>A81565-6</u>	<u>A81565-7</u>	<u>A81565-8</u>
	<u>Blank</u>	<u>MW-5</u>	<u>MW-6</u>	<u>MW-7</u>	<u>MW-8</u>
N-Butanol	600 U	600 U	600 U	600 U	600 U
Isopropanol	600 U	600 U	600 U	600 U	600 U
Units	(ug/l)	(ug/l)	(ug/l)	(ug/l)	(ug/l)

Sample Designation

<u>Parameter</u>	<u>Aqueous Method</u>	<u>A81565-9</u>	<u>A81565-10</u>	<u>A81565-11</u>	<u>A81565-12</u>
	<u>Blank</u>	<u>ACS-1</u>	<u>ACS-2</u>	<u>ACS-3</u>	<u>ACS-4</u>
N-Butanol	600 U	600 U	600 U	600 U	600 U
Isopropanol	600 U	600 U	600 U	600 U	600 U
Units	(ug/l)	(ug/l)	(ug/l)	(ug/l)	(ug/l)

Sample Designation

<u>Parameter</u>	<u>Nonaqueous Method</u>	<u>A81565-13</u>	<u>A81565-14</u>	<u>A81565-15</u>	<u>A81565-16</u>
	<u>Blank</u>	<u>SCS-1</u>	<u>SCS-2</u>	<u>SCS-3</u>	<u>SCS-4</u>
N-Butanol	600 U	600 U	600 U	600 U	600 U
Isopropanol	600 U	600 U	600 U	600 U	600 U
Units	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)

V. Analytical Results (Cont'd)

Metals

<u>Parameter</u>	<u>Aqueous Method</u>	<u>Sample Designation</u>			
		<u>A81565-9</u>	<u>A81565-10</u>	<u>A81565-11</u>	<u>A81565-12</u>
		<u>Blank</u>	<u>ACS-1</u>	<u>ACS-2</u>	<u>ACS-3</u>
Arsenic, total	10 U	10 U	10 U	10 U	10 U
Barium, total	200 U	88 J	47 J	170 J	25 J
Cadmium, total	10 U	10 U	10 U	10 U	10 U
Chromium, total	50 U	50 U	50 U	18 J	50 U
Lead, total	50 U	19 J	8.0 J	30 J	50 U
Mercury, total	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Selenium, total	10 U	10 U	10 U	10 U	10 U
Silver, total	50 U	50 U	50 U	50 U	50 U
Units	(ug/l)	(ug/l)	(ug/l)	(ug/l)	(ug/l)

Metals

<u>Parameter</u>	<u>Aqueous Method</u>	<u>Sample Designation</u>			
		<u>A81565-13</u>	<u>A81565-14</u>	<u>A81565-15</u>	<u>A81565-16</u>
		<u>Blank</u>	<u>SCS-1</u>	<u>SCS-2</u>	<u>SCS-3</u>
Arsenic, total	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U
Barium, total	20,000 U	16,000 J	28,000	21,000	31,000
Cadmium, total	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U
Chromium, total	5,000 U	4,800 J	6,500	11,000	9,400
Lead, total	10,000 U	2,800 J	2,400 J	3,500 J	4,200 J
Mercury, total	200 U	200 U	200 U	200 U	200 U
Selenium, total	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U
Silver, total	4,000 U	4,000 U	4,000 U	4,000 U	4,000 U
Units	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)

V. Analytical Results (Cont'd)

General Chemistry

<u>Parameter</u>	<u>Method</u> <u>Blank</u>	<u>Sample Designation</u>			
		<u>A81565-1</u> <u>MW-1</u>	<u>A81565-2</u> <u>MW-2</u>	<u>A81565-3</u> <u>MW-3</u>	<u>A81565-4</u> <u>MW-4</u>
Total Petroleum Hydrocarbons, by IR †	1,000 U	1,000 U	1,200	1,000 U	1,100
Total Petroleum Hydrocarbons, by IR ††	1,000 U	1,000 U	4,700	1,000 U	2,200
Total Organic Halogen	5.0 U	15	43	29	14
Oil & Grease	1,000 U	1,000 U	*	1,000 U	*
Flashpoint, closed cup, °F	>180	>180	>180	>180	>180
Units	(ug/l)	(ug/l)	(ug/l)	(ug/l)	(ug/l)

<u>Parameter</u>	<u>Sample Designation</u>			
	<u>A81565-5</u> <u>MW-5</u>	<u>A81565-6</u> <u>MW-6</u>	<u>A81565-7</u> <u>MW-7</u>	<u>A81565-8</u> <u>MW-8</u>
Total Petroleum Hydrocarbons, by IR †	1,100	1,000 U	1,000 U	1,000 U
Total Petroleum Hydrocarbons, by IR ††	1,400	1,000 U	1,000 U	1,000 U
Total Organic Halogen	22	20	13	48
Oil & Grease	1,000 U	1,000 U	1,000 U	1,000 U
Flashpoint, closed cup, °F	120	131	>180	>180
Units	(ug/l)	(ug/l)	(ug/l)	(ug/l)

† Non -Polar

†† Polar

* Sample was depleted

V. Analytical Results (Cont'd)

General Chemistry

<u>Parameter</u>	<u>Method</u> <u>Blank</u>	<u>Sample Designation</u>			
		<u>A81565-9</u> <u>ACS-1</u>	<u>A81565-10</u> <u>ACS-2</u>	<u>A81565-11</u> <u>ACS-3</u>	<u>A81565-12</u> <u>ACS-4</u>
Total Petroleum Hydrocarbons, by IR †	1,000 U	1,000 U	1,000 U	1,000 U	57,000
Total Petroleum Hydrocarbons, by IR ††	1,000 U	11,000	11,000	9,400	1,000 U
Total Organic Halogen	5.0 U	14	6.8	8.1	5.0 U
Oil & Grease	1,000 U	1,100	1,200	1,000 U	1,000 U
Flashpoint, closed cup, °F	>180	>180	>180	>180	>180
Units	(ug/l)	(ug/l)	(ug/l)	(ug/l)	(ug/l)

<u>Parameter</u>	<u>Method</u> <u>Blank</u>	<u>Sample Designation</u>			
		<u>A81565-13</u> <u>SCS-1</u>	<u>A81565-14</u> <u>SCS-2</u>	<u>A81565-15</u> <u>SCS-3</u>	<u>A81565-16</u> <u>SCS-4</u>
Total Petroleum Hydrocarbons, by IR †	20,000 U	20,000 U	46,000	39,000	36,000
Total Petroleum Hydrocarbons, by IR ††	20,000 U	73,000	91,000	94,000	66,000
Total Organic Halogen, by IC	1,000 U	1,400	1,500	1,000	1,000 U
Oil & Grease	5,000 U	120,000	75,000	190,000	54,000
Units	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)

† Non -Polar

†† Polar

VI. Quality Control Data

Volatile Organics

Nonaqueous Matrix Spike/Matrix Spike Duplicate Recovery Data

Sample Spiked A81555-13

<u>Parameter</u>	<u>Amount of Spike</u>	<u>Recovery</u>			<u>Control Limits</u>	
		<u>MS</u>	<u>MSD</u>	<u>RPD</u>	<u>Recovery</u>	<u>Max. RPD</u>
1,1-Dichloroethene	0.25	94	100	6	79-121	10
Trichloroethene (TCE)	0.25	79	83	4	82-120	7
Benzene	0.25	83	88	5	70-136	8
Toluene	0.25	96	101	5	74-128	15
Chlorobenzene	0.25	92	97	5	78-118	5
Units	(ppb)	(%)	(%)	(%)	(%)	(%)

Recovery: 0 out of 10 outside control limits

RPD: 0 out of 5 outside control limits

Nonaqueous Surrogate Recovery Data

<u>Sample Designation</u>	<u>Surrogate Recovery</u>		
	<u>1,2-Dichloroethane-d₄</u> <u>(100 ppb Added)</u>	<u>Toluene-d₈</u> <u>(100 ppb Added)</u>	<u>4-Bromofluorobenzene</u> <u>(100 ppb Added)</u>
Nonaqueous Method Blank	96	110	110
Aqueous Method Blank	86	98	96
A81555-13 Spike	103	99	91
A81555-13 Spike Dup.	105	96	92
A81565-13	80	95	93
A81565-14	78	93	90
A81565-15	83	97	97
A81565-16	81	94	95
Units	(%)	(%)	(%)
Control Limits	70-130	70-130	70-130

0 out of 15 surrogate recoveries are outside control limits.

VI. Quality Control Data

Volatile Organics

Aqueous Matrix Spike/Matrix Spike Duplicate Recovery Data

Sample Spiked A81565-1

<u>Parameter</u>	<u>Amount of Spike</u>	<u>Recovery</u>			<u>Control Limits</u>	
		<u>MS</u>	<u>MSD</u>	<u>RPD</u>	<u>Recovery</u>	<u>Max. RPD</u>
1,1-Dichloroethene	0.25	111	105	6	79-121	10
Trichloroethene (TCE)	0.25	103	103	0	82-120	7
Benzene	0.25	105	105	0	70-136	8
Toluene	0.25	106	106	0	74-128	15
Chlorobenzene	0.25	100	100	0	78-118	5
Units	(ppb)	(%)	(%)	(%)	(%)	(%)

Recovery: 0 out of 10 outside control limits

RPD: 0 out of 5 outside control limits

Aqueous Surrogate Recovery Data

Surrogate Recovery

<u>Sample Designation</u>	<u>1,2-Dichloroethane-d₄ (50 ppb Added)</u>	<u>Toluene-d₈ (50 ppb Added)</u>	<u>4-Bromofluorobenzene (50 ppb Added)</u>
Method Blank	86	102	100
A81565-1 Spike	102	100	104
A81565-1 Spike Dup.	104	106	108
A81565-1	88	106	94
A81565-5	90	105	95
A81565-6	91	101	101
A81565-7	89	102	101
A81565-9	87	105	94
A81565-9 Rerun	85	100	97
A81565-10	87	101	100
A81565-10 Rerun	86	99	96
A81565-11	91	99	101
A81565-11 Rerun	88	98	97
A81565-12	92	102	101
A81565-12 Rerun	86	100	99
A81565-13	80	95	93
Units	(%)	(%)	(%)

Control Limits 76-114 88-110 86-115

0 out of 51 surrogate recoveries are outside control limits.

VI. Quality Control Data (Cont'd)

Semivolatile Organics

Nonaqueous Matrix Spike/Matrix Spike Duplicate Recovery Data

Sample Spiked A81536-7

<u>Parameter</u>	<u>Amount of Spike</u>	<u>Recovery</u>			<u>Control Limits</u>	
		<u>MS</u>	<u>MSD</u>	<u>RPD</u>	<u>Recovery</u>	<u>Max. RPD</u>
1,4-Dichlorobenzene	50	73	71	3	18-120	43
N-Nitrosodipropylamine	50	60	56	7	10-156	31
1,2,4-Trichlorobenzene	50	78	76	2	24-161	17
Acenaphthene	50	110	107	3	10-151	16
2,4-Dinitrotoluene	50	66	63	5	10-197	33
Pyrene	50	92	100	8	10-167	31
Phenol	100	77	73	5	10-141	41
2-Chlorophenol	100	74	72	3	33-101	19
4-Chloro-3-methylphenol	100	69	64	8	26-117	25
4-Nitrophenol	100	27	22	20	10-221	36
Pentachlorophenol	100	50	48	4	10-179	16
Units	(ppb)	(%)	(%)	(%)	(%)	(%)

Recovery: 0 out of 22 outside control limits

RPD: 0 out of 11 outside control limits

VI. Quality Control Data (Cont'd)

Semivolatile Organics

Nonaqueous Surrogate Recovery Data

Surrogate Recovery

<u>Sample Designation</u>	<u>2-Fluorophenol (200 ppb Added)</u>	<u>Phenol-d₅ (200 ppb Added)</u>	<u>2,4,6-Tribromophenol (200 ppb Added)</u>
Method Blank	57	68	87
A81536-7 Spike	67	71	74
A81536-7 Spike Dup.	66	70	75
A81565-13	68	79	49
A81565-14	59	64	50
A81565-15	50	61	48
A81565-16	62	70	54
Units	(%)	(%)	(%)
Control Limits	27-106	30-88	42-89

Surrogate Recovery

<u>Sample Designation</u>	<u>Nitrobenzene-d₅ (100 ppb Added)</u>	<u>2-Fluorobiphenyl (100 ppb Added)</u>	<u>Terphenyl-d₁₄ (100 ppb Added)</u>
Method Blank	63	72	74
A81536-7 Spike	64	82	74
A81536-7 Spike Dup.	65	83	81
A81565-13	71	82	79
A81565-14	58	78	58
A81565-15	52	48	55
A81565-16	68	88	84
Units	(%)	(%)	(%)
Control Limits	34-107	10-157	10-175

0 out of 12 surrogate recoveries are outside control limits.

VI. Quality Control Data (Cont'd)Semivolatile OrganicsAqueous Matrix Spike/Matrix Spike Duplicate Recovery DataSample Spiked 72704-EEF.Control Limits

<u>Parameter</u>	<u>Amount of Spike</u>	<u>Recovery MS</u>	<u>Recovery MSD</u>	<u>RPD</u>	<u>Recovery</u>	<u>Max. RPD</u>
1,4-Dichlorobenzene	50	48	46	4	10-110	15
N-Nitrosodipropylamine	50	66	68	3	10-151	27
1,2,4-Trichlorobenzene.	50	54	50	8	20-136	24
Acenaphthene	50	78	76	2	17-120	5
2,4-Dinitrotoluene	50	58	60	3	10-175	17
Pyrene	50	86	94	9	10-175	19
Phenol	100	47	45	4	40-89	18
2-Chlorophenol	100	69	64	8	47-106	16
4-Chloro-3-methylphenol	100	79	74	7	48-115	30
4-Nitrophenol	100	31	23	30	10-175	30
Pentachlorophenol	100	97	81	18	64-118	11
Pentachlorophenol ϕ	100	79	--	--	64-118	11
Units	(ppb)	(%)	(%)	(%)	(%)	(%)

Recovery: 0 out of 23 outside control limitsRPD: 1 out of 11 outside control limits ϕ Spike performed on DI Water.

VI. Quality Control Data (Cont'd)

Semivolatile Organics

Aqueous Surrogate Recovery Data

Sample Designation	<u>Surrogate Recovery</u>		
	<u>2-Fluorophenol (100 ppb Added)</u>	<u>Phenol-d₅ (100 ppb Added)</u>	<u>2,4,6-Tribromophenol (100 ppb Added)</u>
Method Blank	34	32	54
A72704-Eff. Spike	47	31	73
A72704-Eff. Spike Dup.	41	35	64
A81565-1	34	27	35
A81565-5	23	18	38
A81565-6	36	31	36
A81565-7	*	*	*
A81565-7 Rerprep	*	*	14
A81565-9	38	28	39
A81565-10	11	12	16
A81565-11	32	24	42
A81565-12	13	12	10
Units	(%)	(%)	(%)
Control Limits	10-90	10-90	10-142

Sample Designation	<u>Surrogate Recovery</u>		
	<u>Nitrobenzene-d₅ (50 ppb Added)</u>	<u>2-Fluorobiphenyl (50 ppb Added)</u>	<u>Terphenyl-d₁₄ (50 ppb Added)</u>
Method Blank	54	62	63
A72704-Eff. Spike	54	62	64
A72704-Eff. Spike Dup.	50	60	68
A81565-1	46	61	54
A81565-5	27	40	54
A81565-6	51	62	56
A81565-7	51	64	55
A81565-7 Rerprep	60	61	50
A81565-9	51	64	53
A81565-10	29	44	39
A81565-11	55	72	62
A81565-12	19	27	23
Units	(%)	(%)	(%)
Control Limits	10-133	10-165	10-175

5 out of 66 surrogate recoveries are outside control limits.

* Not recovered due to matrix interference.

VI. Quality Control Data (Cont'd)

Polychlorinated Biphenyls

Nonaqueous Matrix Spike/Matrix Spike Duplicate Recovery Data

Sample Spiked A81578-3

<u>Parameter</u>	<u>Amount of Spike</u>	<u>Recovery</u>		<u>RPD</u>	<u>Control Limits</u>	
		<u>MS</u>	<u>MSD</u>		<u>Recovery</u>	<u>Max. RPD</u>
Aroclor 1248	20	85	79	9	10-168	10
Units	(ppb)	(%)	(%)	(%)	(%)	(%)

Recovery: 0 out of 2 outside control limits

RPD: 0 out of 1 outside control limits

VI. Quality Control Data (Cont'd)

Polychlorinated Biphenyls

Nonaqueous Surrogate Recovery Data and Retention Time Shift

Dibutylchloroendate
(2.0 ug Added)

<u>Sample Designation</u>	<u>Recovery</u>	<u>Retention Time Shift</u>
Method Blank	104	0.2
A81578-3 Spike	139	0.5
A81578-3 Spike Dup.	135	0.6
A81565-13	41	1.6
A81565-14	43	1.4
A81565-15	41	1.2
A81565-16	45	1.1
Units	(%)	(%)

0 out of 7 surrogate recoveries are outside control limits.

VI. Quality Control Data (Cont'd)

Polychlorinated Biphenyls

Aqueous Matrix Spike/Matrix Spike Duplicate Recovery Data

Sample Spiked A72688-0

<u>Parameter</u>	<u>Amount of Spike</u>	<u>Recovery</u>		<u>Control Limits</u>		<u>Max. RPD</u>
		<u>MS</u>	<u>MSD</u>	<u>RPD</u>	<u>Recovery</u>	
Aroclor 1260	20	88	104	17	79-121	10
Units	(ug)	(%)	(%)	(%)	(%)	(%)

Recovery: 0 out of 2 outside control limits

RPD: 0 out of 1 outside control limits

VI. Quality Control Data (Cont'd)

Polychlorinated Biphenyls

Aqueous Surrogate Recovery Data and Retention Time Shift

Sample Designation	Dibutylchloroendate (2.0 ug Added)	
	Recovery	Retention Time Shift
Method Blank	104	0.2
A72688-0 Spike	71	0.3
A72688-0 Spike Dup.	92	0.4
A81565-1	167	0.7
A81565-2	35	0.5
A81565-3	*	1.0
A81565-4	44	0.2
A81565-5	72	1.9
A81565-6	70	0.8
A81565-7	65	0.6
A81565-8	57	0.9
A81565-9	49	1.0
A81565-10	60	1.0
A81565-11	51	0.7
A81565-12	79	0.8
Units	(%)	(%)
Control Limits	15-175	0-2

1 out of 15 surrogate recoveries are outside control limits.

* Not recovered due to prep error.

VI. Quality Control Data (Cont'd)

General Chromatography

Nonaqueous Matrix Spike/Matrix Spike Duplicate Recovery Data

Sample Spiked A81565-16

<u>Parameter</u>	<u>Amount of Spike</u>	<u>Recovery</u>		<u>RPD</u>	<u>Control Limits</u>	
		<u>MS</u>	<u>MSD</u>		<u>Recovery</u>	<u>Max. RPD</u>
Isobutanol	2,000	87	89	2	79-129	14
n-Butanol	2,000	82	81	1	67-130	5
Methanol	2,000	20	55	91	66-121	10
Isopropanol	4,000	87	87	0	70-130	30
Units	(ppb)	(%)	(%)	(%)	(%)	(%)

Recovery: 2 out of 8 outside control limits

RPD: 1 out of 4 outside control limits

VI. Quality Control Data (Cont'd)

General Chromatography

Aqueous Matrix Spike/Matrix Spike Duplicate Recovery Data

Sample Spiked AB1565-12

<u>Parameter</u>	<u>Amount of Spike</u>	<u>Recovery</u>			<u>Control Limits</u>	
		<u>MS</u>	<u>MSD</u>	<u>RPD</u>	<u>Recovery</u>	<u>Max. RPD</u>
Isobutanol	4,000	131	120	7	79-129	14
n-Butanol	4,000	121	113	7	67-130	5
Methanol	4,000	84	71	8	66-121	10
Isopropanol	4,000	111	102	8	70-130	30
Units	(ppb)	(%)	(%)	(%)	(%)	(%)

Recovery: 1 out of 8 outside control limits

RPD: 1 out of 4 outside control limits

VI. Quality Control Data (Cont'd)

Metals

Nonaqueous Matrix Spike/Matrix Spike Duplicate Recovery Data

Sample Spiked AB1565-16

<u>Parameter</u>	<u>Amount of Spike</u>	<u>Recovery</u>			<u>Control Limits</u>	
		<u>MS</u>	<u>MSD</u>	<u>RPD</u>	<u>Recovery</u>	<u>Max. RPD</u>
Arsenic	100	99	98	1	80-109	10
Barium	300	94	98	4	74-106	10
Cadmium	300	97	102	5	71-108	10
Chromium	300	96	100	4	73-109	10
Lead	300	105	103	2	69-107	10
Mercury	20	71	76	7	75-125	20
Selenium	100	106	106	0	64-117	12
Silver	300	32	43	29	10-100	38
Units	(ug)	(%)	(%)	(%)	(%)	(%)

Recovery: 0 out of 16 outside control limits

RPD: 0 out of 8 outside control limits

VI. Quality Control Data (Cont'd)

Metals

Aqueous Matrix Spike/Matrix Spike Duplicate Recovery Data

<u>Parameter</u>	<u>Sample Spiked</u>	<u>Amount of Spike</u>	<u>Recovery</u>			<u>Control Limits</u>	
			<u>MS</u>	<u>MSD</u>	<u>RPD</u>	<u>Recovery</u>	<u>Max. RPD</u>
Arsenic	A81565-12	500	110	114	4	70-116	10
Barium	A81589-1	500	91	96	5	60-119	5
Cadmium	A81565-12	500	91	93	2	66-110	4
Chromium	A81589-1	500	96	98	2	72-106	4
Lead	A81565-12	500	102	99	3	65-110	4
Mercury	A81565-12	20	96	91	5	63-129	5
Selenium	A81565-12	500	82	79	4	75-125	30
Silver	A81589-1	500	73	67	9	10-131	30
Units		(ug)	(%)	(%)	(%)	(%)	(%)

Recovery: 0 out of 16 outside control limits

RPD: 0 out of 8 outside control limits

VI. Quality Control Data (Cont'd)

General Chemistry

Nonaqueous Matrix Spike/Matrix Spike Duplicate Recovery Data

<u>Parameter</u>	<u>Sample Spiked</u>	<u>Amount of Spike</u>	<u>Recovery</u>		<u>RPD</u>	<u>Control Limits</u>	
			<u>MS</u>	<u>MSD</u>		<u>Recovery</u>	<u>Max. RPD</u>
Petroleum Hydrocarbons	A25769-1	5,000	73	74	1	52-121	19
Flouride	A81480-4	10	94	94	0	30-175	30
Chloride	A81480-4	15	92	92	0	30-175	30
Bromide	A81480-4	75	92	92	0	30-175	30
Oil & Grease	A81555-17	25,000	92	92	0	40-130	30
Units		(ug)	(%)	(%)	(%)	(%)	(%)

Recovery: 0 out of 10 outside control limits

RPD: 0 out of 8 outside control limits

VI. Quality Control Data (Cont'd)

General Chemistry

Aqueous Matrix Spike/Matrix Spike Duplicate Recovery Data

<u>Parameter</u>	<u>Sample Spiked</u>	<u>Amount of Spike</u>	<u>Recovery</u>		<u>RPD</u>	<u>Control Limits</u>	
			<u>MS</u>	<u>MSD</u>		<u>Recovery</u>	<u>Max. RPD</u>
Petroleum Hydrocarbons	DI Water	25,000	82	77	6	54-121	25
Total Organic Halogen	A81565-1	10	100	108	8	64-128	36
Units		(ug)	(%)	(%)	(%)	(%)	(%)

Recovery: 0 out of 4 outside control limits

RPD: 0 out of 2 outside control limits

Chain-of-Custody Record

A/B# 1154234664

Program Area: Drinking Water Wastewater Groundwater Solid and Hazardous Waste

Client: Analytiken Sample Collector: _____

Project: ESCI AnalytiKEM Contact: FATTI deAndino

Laboratory 2324 Vemsdale Road Rock Hill, South Carolina 29731 (803) 324-5310 Fax: (803) 324-8378	Sales Office 454 South Anderson Road BTC 532 Rock Hill, South Carolina 29730 (803) 329-9690 Fax: (803) 329-9689
---	--

ITEM NUMBER	SAMPLE DESIGNATION	DATE	TIME	MATRIX	ANALYSIS METHODS								PARAMETERS	
					Grab or Composite	40 ml vials	950 ml Org. Pres.	250 ml Unpres.	ml HNO ₃	250 ml H ₂ SO ₄	ml NaOH	ml HCL		
1	MW1	7/26		AQ			1	1						Tox, TPH-IR
2	MW2													TPH-IR POLAR AND NONPOLAR
3	MW3													
4	MW4	↓												
5	MW5	7/25												
6	MW6	7/26												
7	MW7	↓												
8	MW8	7/25		↓			↓	↓						
9														
10														Results due by: 10/17/91

TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	TRANSFERS ACCEPTED BY	DATE	TIME	REMARKS
1	1-8	C. Hudson		7/26/91	5:30pm	
2			C. Jones	7/27	9:30am	
3						
4						SAMPLER'S SIGNATURE

AnalytiKEM Inc.
454 S. Anderson Road, BTC 532
Rock Hill, SC 29730
803/329-8690
Fax: 803/324-3982

TEST REPORT NO. A81565, Supplemental

October 25, 1991

Prepared for:

ENSCI
1108 Thomasville Rd.
High Point, NC 27260

Attention: Bruce Braswell

Project: TFI (#72A)

Date of Sample Receipt: October 21, 1991

Reviewed &
Approved by:

Name: Michael Shookler, Ph.D.

Title: Technical Director

TABLE OF CONTENTS

	<u>Page</u>
I. Certification	1
II. Definition of Terms	2
III. Sample Designations	3
IV. Methodology	4
V. Analytical Results	5
VI. Quality Control Data	5

I. Certification

AnalytiKEM, Inc.

Current Certifications/Regulatory Approvals

Tabulated below are the current laboratory certifications that are held by each AnalytiKEM Laboratory. Analyses performed at multiple AnalytiKEM locations will be noted in the test report.

Cherry Hill, NJ		Rock Hill, SC		Houston Analytical, Tx	
State	Cert #	State	Cert #	State	Cert #
Arkansas	*	S. Carolina	46067	N. Dakota	R-006
Connecticut	PH-0715	N. Carolina	316	Oklahoma	8403
Florida	880985G	New Jersey	79795	Texas Water Commission *	
Massachusetts	NJ117			Louisiana *	
New Jersey	04012				
New York	10815				
N. Carolina	258				
N. Dakota	R-038				
Pennsylvania	68366				
S. Carolina	94004				
Tennessee	02908				
Vermont	*				

* No certification numbers are issued for these states.

II. Definition of Terms

<u>Term</u>	<u>Definition</u>
D	Detected; result must be greater than zero.
DI	Deionized Water
J	Compound was detected at levels below the practical quantitation limit. The level reported is approximate.
MS/MSD	Matrix Spike/Matrix Spike Duplicate.
NA	Analysis not applicable to the sample matrix.
ND	Not Detected
NR	Not Requested
NTU	Nephelometric Turbidity Units
RPD	Relative Percent Difference
RSD	Relative Standard Deviation
TON	Threshold Odor Number
U	Compound was analyzed for but not detected. The preceding number is the practical quantitation limit for the compound.
ppb	Parts-per-billion; may be converted to ppm by dividing by 1,000.
ppm	Parts-per-million; may be converted to ppb by multiplying by 1,000.
ug/l	Micrograms of constituent per liter of sample; equivalent to parts-per-billion.
ug/kg	Micrograms of constituent per kilogram of sample; equivalent to parts-per-billion.
ug/kg dw	Micrograms of constituent per kilogram of sample reported on a dry weight basis.
GCG	Calibration Check Compound; used to verify the precision of a GC/MS calibration curve.
SPCG	System Performance Check Compound; used to verify the correct operation of a GC/MS instrument.
PQL	Practical Quantitation Limit; the minimum level at which compounds can be dependably quantitated.
B	Analyte detected in associated blank as well as the sample. It indicates possible/probable blank contamination.

III. Sample Designations

AnalytiKEM

<u>AnalytiKEM Designation</u>	<u>Client Designation</u>	<u>Matrix</u>	<u>Date Sampled</u>
A81565-2	NW #2	Aqueous	10/16/91
A81565-4	NW #4	Aqueous	10/16/91
A81565-7	NW #7	Aqueous	10/16/91

Note: Samples will be held for 30 days beyond the test report date unless otherwise requested.

IV. Methodology

General Chemistry

Method 9070, Total Recoverable Oil and Grease (Gravimetric, Separatory Funnel Extraction), Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, Third Edition, USEPA, 1986 with all promulgated revisions.

V. Analytical Results

AnalytiKEM

General Chemistry

Sample Designation

<u>Parameter</u>	<u>Method</u>	<u>A81565-2</u>	<u>A81565-4</u>	<u>A81565-7</u>
	<u>Blank</u>	<u>HW #2</u>	<u>HW #4</u>	<u>HW #7</u>
Oil & Grease	100 U	300	2,200	3,600
Units	(ug/l)	(ug/l)	(ug/l)	(ug/l)

VI. Quality Control Data

General Chemistry

Aqueous Matrix Spike/Matrix Spike Duplicate Recovery Data

Sample Spiked A72789-G

<u>Parameter</u>	<u>Amount of Spike</u>	<u>Recovery</u>			<u>Control Limits</u>	
		<u>MS</u>	<u>HSD</u>	<u>RPD</u>	<u>Recovery</u>	<u>Max. RPD</u>
Oil & Grease	25,000	80	82	2	47-128	18
Units	(ug/l)	(%)	(%)	(%)	(%)	(%)

Recovery: 0 out of 2 outside control limits

RPD: 0 out of 1 outside control limits

Chain-of-Custody Record

81565

Program Area: Drinking Water Wastewater Groundwater Solid and Hazardous Waste

Client: ENSCI Sample Collector: K. Cranford

Project: Thomasville Furniture Industries AnalytikEM Contact: T.J.

Laboratory 2324 Vernsdale Road Rock Hill, South Carolina 29731 (803) 324-5310 Fax: (803) 324-8378	Sales Office 454 South Anderson Road BTC 532 Rock Hill, South Carolina 29730 (803) 329-9690 Fax: (803) 329-9689
--	--

ITEM NUMBER	SAMPLE DESIGNATION	DATE	TIME	MATRIX	ANALYSIS										PARAMETERS		
					Grab or Composite	40 ml vials	950 ml Org. Pres.	1 ml Unpres.	1 ml HNO ₃	1 ml H ₂ SO ₄	1 ml NaOH	1 ml HCL					
1	MW #2	16 Oct 91	2350	Aqueous													Replacement Samples / Oil & Grease
2	MW #4	16 Oct 91	1450	Aqueous													" "
3	MW #7	16 Oct 91	2020	Aqueous													" "
4																	
5																	
6																	
7																	
8																	
9																	
10																	

TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	TRANSFERS ACCEPTED BY	DATE	TIME	REMARKS
1	1-3	<i>[Signature]</i>	<i>[Signature]</i>	10/15/91	9:40 a.m.	
2		<i>[Signature]</i>	<i>[Signature]</i>	10/18/91	12:20 p.m.	
						<i>[Signature]</i> SAMPLER'S SIGNATURE

AnalytiKEM Inc.
454 S. Anderson Road, BTC 532
Rock Hill, SC 29730
803/329-9690
Fax: 803/324-3982

TEST REPORT NO. A81565, Supplemental, Revision

December 2, 1991

Prepared for:

ENSCI
1108 Thomasville Rd.
High Point, NC 27260

Attention: Bruce Braswell

Project: TFI (#72A)

Date of Sample Receipt: October 21, 1991

Reviewed &
Approved by:


Name: Michael Shmookler, Ph.D.

Title: Technical Director

TABLE OF CONTENTS

	<u>Page</u>
I. Certification	1
II. Definition of Terms	2
III. Sample Designations	3
IV. Methodology	4
V. Analytical Results	5
VI. Quality Control Data	5

I. Certification

AnalytiKEM, Inc.

Current Certifications/Regulatory Approvals

Tabulated below are the current laboratory certifications that are held by each AnalytiKEM Laboratory. Analyses performed at multiple AnalytiKEM locations will be noted in the test report.

Cherry Hill, NJ		Rock Hill, SC		Houston Analytical, Tx	
State	Cert #	State	Cert #	State	Cert #
Arkansas	*	S. Carolina	46067	N. Dakota	R-006
Connecticut	PH-0715	N. Carolina	316	Oklahoma	8403
Florida	880985G	New Jersey	79795	Texas Water Commission *	
Massachusetts	NJ117			Louisiana *	
New Jersey	04012				
New York	10815				
N. Carolina	258				
N. Dakota	R-038				
Pennsylvania	68366				
S. Carolina	94004				
Tennessee	02908				
Vermont	*				

* No certification numbers are issued for these states.

II. Definition of Terms

<u>Term</u>	<u>Definition</u>
D	Detected; result must be greater than zero.
DI	Deionized Water
J	Compound was detected at levels below the practical quantitation limit. The level reported is approximate.
MS/MSD	Matrix Spike/Matrix Spike Duplicate.
NA	Analysis not applicable to the sample matrix.
ND	Not Detected
NR	Not Requested
NTU	Nephelometric Turbidity Units
RPD	Relative Percent Difference
RSD	Relative Standard Deviation
TON	Threshold Odor Number
U	Compound was analyzed for but not detected. The preceding number is the practical quantitation limit for the compound.
ppb	Parts-per-billion; may be converted to ppm by dividing by 1,000.
ppm	Parts-per-million; may be converted to ppb by multiplying by 1,000.
ug/l	Micrograms of constituent per liter of sample; equivalent to parts-per-billion.
ug/kg	Micrograms of constituent per kilogram of sample; equivalent to parts-per-billion.
ug/kg dw	Micrograms of constituent per kilogram of sample reported on a dry weight basis.
GGC	Calibration Check Compound; used to verify the precision of a GC/MS calibration curve.
SPGC	System Performance Check Compound; used to verify the correct operation of a GC/MS instrument.
PQL	Practical Quantitation Limit; the minimum level at which compounds can be dependably quantitated.
B	Analyte detected in associated blank as well as the sample. It indicates possible/probable blank contamination.

III. Sample Designations

AnalytiKEM

<u>AnalytiKEM Designation</u>	<u>Client Designation</u>	<u>Matrix</u>	<u>Date Sampled</u>
A81565-2	MW #2	Aqueous	10/16/91
A81565-4	MW #4	Aqueous	10/16/91
A81565-7	MW #7	Aqueous	10/16/91

Note: Samples will be held for 30 days beyond the test report date unless otherwise requested.

IV. Methodology

General Chemistry

Method 9070, Total Recoverable Oil and Grease (Gravimetric, Separatory Funnel Extraction), Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, Third Edition, USEPA, 1986 with all promulgated revisions.

V. Analytical Results

AnalytiKEM

General Chemistry

Sample Designation

<u>Parameter</u>	<u>Method</u>	<u>A81565-2</u>	<u>A81565-4</u>	<u>A81565-7</u>
	<u>Blank</u>	<u>MW #2</u>	<u>MW #4</u>	<u>MW #7</u>
Oil & Grease	1,000 U	300 J	2,200	3,600
Units	(ug/l)	(ug/l)	(ug/l)	(ug/l)

VI. Quality Control Data

General Chemistry

Aqueous Matrix Spike/Matrix Spike Duplicate Recovery Data

Sample Spiked A72789-G

<u>Parameter</u>	<u>Amount of Spike</u>	<u>Control Limits</u>				
		<u>Recovery MS</u>	<u>Recovery MSD</u>	<u>RPD</u>	<u>Recovery</u>	<u>Max. RPD</u>
Oil & Grease	25,000	80	82	2	47-128	18
Units	(ug/l)	(%)	(%)	(%)	(%)	(%)

Recovery: 0 out of 2 outside control limits

RPD: 0 out of 1 outside control limits

APPENDIX D
PETREX TECHNIQUE
STANDARD OPERATING PROCEDURES

STANDARD OPERATING PROCEDURES
FOR APPLYING
THE PETREX TECHNIQUE
TO
ENVIRONMENTAL SOIL GAS SURVEYS

March 1988

Revised August 1990

STANDARD OPERATING PROCEDURES FOR APPLYING THE PETREX TECHNIQUE TO
ENVIRONMENTAL SOIL GAS SURVEYS

1.0 OPENING STATEMENT CONCERNING THE PURPOSE OF THIS DOCUMENT

As the title of this document points out, the steps and information herein are the "Standard Procedures" for carrying out a Petrex environmental survey. Possible deviations from standard procedures may occasionally be implemented onsite by our field staff to adjust for unique survey conditions. The Petrex Technique is also frequently used for oil and gas, geothermal, and mineral exploration which force slight variations on these "Standard Operating Procedures". Also, surveys performed in winter in frozen ground offer a unique situation and slightly different field practices.

The fact that the standard procedures may occasionally be altered is done to maintain quality service while using the Petrex Technique. It must also be understood that the ion flux data from one survey at a given site and a given time interval should not be compared to the flux numbers from another survey. Since the data is semi-quantitative, only the flux patterns of a survey or the relative difference between flux values off two samples from the same survey should be considered during interpretation.

If any questions arise upon review of this document, please address your questions to NERI technical staff at:

Northeast Research Institute, Inc. (203) 677-9666
309 Farmington Avenue, Suite A-100, Farmington, Connecticut 06032

-or-

Northeast Research Institute, Inc. (303) 238-0090
605 Parfet Street, Suite 100, Lakewood, Colorado 80215

2.0 SAMPLE PRODUCTION AND PREPARATION

2.1 Charcoal Sieving

The static VOC (Volatile Organic Compound) collector is prepared by applying presieved activated charcoal to the end of a ferromagnetic wire.

2.2 Charcoal Bonding

The details of the procedure for preparing the activated charcoal is proprietary information. The procedure results in the production of a collector consisting of size-sorted activated charcoal bonded to the area within 1 cm of the end of a ferromagnetic wire with a Curie point of 358°C.

2.3 Collector Containers

Culture tubes, measuring 25 mm X 125 mm and having a screw cap closure, are washed in a biodegradable detergent, rinsed in methanol, and baked at 180°C for one hour.

2.4 Wire Cleaning

The previously constructed wires are cleaned by heating in a special apparatus at 358°C a total of 35 times under high vacuum. The wires are cleaned in lots of 32 wires. From each lot, two wires are removed for immediate analysis to verify the cleanliness of the lot. The remaining 30 wires are then sealed in one clean culture tube under an inert atmosphere and placed in inventory.

2.5 Packaging for Client

Immediately prior to shipping the wires to the field, the tubes containing 30 wires are removed from inventory and the wires are repackaged under an inert atmosphere in individual tubes. All of the repackaged tubes contain two wires. Ten percent of these have three wires. The collectors are packaged by bagging in Ziploc bags in an inert atmosphere. These bags are then placed in inventory in a temperature-controlled room. The basis for having two wires in each tube is that it allows NERI to analyze one wire by our standard Thermal Desorption-Mass Spectrometry (TD-MS) while the second sample is available for TD-GC/MS or as a backup to the TD-MS. The third wire in selected samples from each survey is used to establish optimum instrument parameters.

2.6 Quality Control and Quality Assurance

Prior to releasing stocked wires for a field survey, two single wires from each lot are checked for cleanliness and collecting potential. This QA/QC phase measures and documents collector preparedness when leaving the laboratory. One of these wires is analyzed without exposure in order to demonstrate that the lot is clean, and the other wire is exposed to hexane vapor for two seconds and then analyzed in order to verify that the charcoal is highly adsorptive. The triplicate wires are used when the wires return from the field. These wires help determine the required machine sensitivity and act as a measure of reproducibility.

2.7 Custody Document

A "custody document" accompanies each group of collectors leaving the laboratory and remains with the group until the collectors have been exposed, analyzed, and disposed of.

3.0 FIELD OPERATIONS

3.1 Locating Sample Sites

Sample placement sites, usually predetermined on an accepted survey proposal, are located from a nearby, surveyable landmark using a compass and pacing or some other measuring device (e.g., pacing wheel, hip chain, or tape measure). A transit may be used for more accurate placement, but such accuracy is seldom required.

3.2 Soil Coring

Once a sample site has been established, a hole is cored to a predetermined depth (sample placement depth is held constant for a given survey). This is accomplished using a variety of tools depending on the nature of the material to be cored. The holes should be vertical and as free from debris as possible. When the sampling is performed in areas covered by asphalt or concrete, a generator-powered rotary hammer drill with a carbide-tipped bit is used to drill a 1-1/2 inch diameter hole in the cover. A hand auger is used to remove the cuttings and road base from the hole.

3.3 Collector Placement

Immediately after the hole is cored, a collector tube is removed from the Ziploc bag and the bag is resealed. The cap is then removed from the tube, and the tube is placed vertically, open end down, into the hole. The hole is then backfilled with the soil core which was removed. The cap is placed in a clean Ziploc bag

and stored until collector retrieval. Collectors placed under asphalt or concrete are treated the same as those in uncovered soil, except for modifications to permit easy retrieval and to avoid potential down-hole contamination from surface cuttings. To allow retrieval of these collectors, a piece of galvanized wire is twisted around the neck of the tube and run to the surface so that the sample may be recovered by pulling the retrieval wire. An aluminum plug is then placed near the top of the hole, and the remainder of the hole is plugged with quick setting hydraulic cement.

3.4 Site Identification

Each site is flagged using pin flags, spray paint or ribbon flagging, and the site location is marked and numbered on a base map. A field notebook is used to record the date, collector number, site location description, soil type, and general observations.

3.5 Exposure Time

Time calibration collectors are included as part of every survey. These are QA collectors used to monitor sample loading during the survey. These collectors are placed in an area of known or suspected contamination, and sets are retrieved and analyzed at intervals to indicate the appropriate residence time for survey samples. Separate "travel blank" collectors are also included as a QC measure in every survey. These collectors are transported along with the survey collectors but the tubes are never opened. These control collectors monitor for potential contamination during transport or placement.

3.6 Collector Retrieval

The collectors are retrieved when the time calibration collectors reveal that there has been sufficient loading of gases on the charcoal absorbent. In the field, the soil is removed until the tube is exposed. A cap is taken from the sealed Ziploc bag. The Viton seal is checked to make sure it is seated inside the cap. The culture tube is removed from the hole and any dirt that is on the threads of the tube is wiped off with a clean cloth. In the event the tube is broken or cracked, the collector wire is transferred to a new tube using forceps. The tube is capped and sealed. All flagging material is retrieved.

3.7 Collector Numbering

Each tube is immediately numbered according to the scheme established in the field notes and on the base map. The collector number is written on adhesive labels which are applied to the tube cap. No two sites may have the same number.

3.8 Collector Shipment

Once the collectors have been retrieved, they are sealed in Ziploc bags and then wrapped with bubble packing. Material such as Styrofoam peanuts or newsprint can introduce possible contaminants to the collectors and should not be used for packaging. The collectors, field notes, base map, and chain-of-custody document are either hand carried back to NERI's analytical laboratories, or are shipped by overnight carrier service.

3.9 Decontamination

All down-hole equipment and tool parts which contact excavated soil are constructed of heavy gauge steel and have no natural or synthetic components which could absorb and retain most soil-borne organic contaminants. These tools are decontaminated between use at each sampling location by rotation through a four step cleaning process. These steps are:

1. Immersion and vigorous scrubbing in a mild solution of laboratory grade detergent until all visual accumulations of soil are removed.
2. Thorough rinsing with potable water.
3. Spray rinsing with methyl alcohol.
4. Air Dry.

All derived liquids (and sediment) are contained in dedicated disposable vessels.

4.0 COLLECTOR ANALYSIS

4.1 Numbering Check

Upon receipt of the collectors, the number on each tube is recorded and any missing or duplicated numbers are noted. A missing number generally indicates that the collector could not be retrieved. Samples with identical numbers generally cannot be used unless their true site location can be established.

4.2 Sample Holding

A Petrex soil gas sample consists of a minute quantity of various volatile organic compounds sorbed onto a charcoal element and enclosed in a protective container with a near impervious Viton seal.

Maximum sample holding time is a function of both the chemical stability of the sorbed compounds and the integrity of the seal of the container.

It has been the experience of Northeast Research Institute, Inc. (NERI) that Petrex soil gas samples that are properly repackaged after retrieval from the field and stored under environmentally controlled conditions typically remain compositionally and quantitatively unchanged through periods of greater than four months.

All samples scheduled for analysis via Curie-point pyrolysis/mass spectrometry are analyzed within three weeks of retrieval from the field.

4.3 Instrumentation

Thermal desorption is accomplished using a Fisher radio frequency power supply and a Curie point pyrolyzer designed by NERI and Extrel. The mass spectrometer used is an Extrel SpectrEL quadrupole mass spectrometer. The analysis is controlled and recorded by DEC PDP 11/23 microcomputer. Following the analysis, all data are collected and archived on a PDP 11/73 microcomputer. Data for all active jobs are stored on both of the PDP 11 computers, as well as on magnetic tape. Data for all completed jobs are stored on magnetic tape in perpetuity.

4.4 Calibration

An Extranuclear Quadrupole Spectrometer equipped with a Curie-point pyrolysis/thermal desorption inlet is used for collector analysis. Mass assignment and resolution are manually adjusted using a Perfluorotributylamine (PFTBA) standard. A linear correction, based on the known spectrum of PFTBA, is calculated. This correction is applied to a second PFTBA spectrum. If correct mass (M/Z) values are obtained, the operator proceeds to the next tuning step. If not, Step 1 is repeated until correct masses are obtained.

Peak intensity ratios are set from the major peaks in the PFTBA spectrum using the following values:

Mass <u>(M/Z)</u>		Spectrum <u>Intensities</u>
69	=	100%
131	=	25%±5%
219	=	35%±5%
502	=	5%±2%

During the ion signal for mass (M/Z) 69 of PFIBA is measured at a preset sample pressure and detector voltage and compared to previous values at the same setting.

Electron energy is set to 70 electron volts and emission is set at 12 milliseconds. All other operating parameters, such as scans, scan range, mass offset are established in the computer program. These values may only be changed by the laboratory manager.

Tuning is performed at the beginning of a run, so that an individual survey is analyzed at the same set of instrument conditions. The samples are analyzed in random order.

4.5 Instrument Parameters

The instrument is operated with the following parameters.

Vacuum	-	$< 3 \times 10^{-6}$ torr
Ionization Energy	-	70.0 eV
Ionization Current	-	12.0 mA
Desorption Time	-	5.0 sec
Desorption Temperature	-	358°C
Number of Scans/Sample	-	30
Scan Rate	-	1,250 amu/sec

4.6 Mass Spectrometer Analysis and QA/QC

Each collector wire is analyzed in random order. The entire group of survey collectors are analyzed as one run without interruption from other surveys.

The organic gases adsorbed on the carbon are thermally desorbed from the carbon, separated according to ion mass, counted, and a mass spectrum of masses from 29 to 240 is obtained.

Periodic (approximately every 20 samples) machine background analyses are performed as a QC measure to assure minimal influence from internal communication. If there are peaks that are not related to atmospheric gases, the supervisor is notified and the mass spectrometer is shut down and cleaned as necessary.

A written sample number record is kept during the analysis to prevent accidental cross numbering.

The mass spectrometer control program prompts the operator with a warning if a sample number is entered that has already been used. The operator then checks the current number, along with the disk storage location of the previously entered number, to resolve the true numbering situation.

4.7 Data Filing

The raw data file generated by the sample analysis is labeled for storage under a unique file name.

4.8 Schedule of Maintenance

- 1,000 Samples Cleaning of sample introduction area, ion source, and expansion chamber by in-house technicians.
- 4,000 Samples: Above noted procedures plus cleaning of lenses and quadrapoles
- Annually: Preventative maintenance program conducted by manufactures's service representative.

5.0 DATA INTERPRETATION AND PRESENTATION

5.1 Map Generation

The sample location maps are created by placing the field base map on a digitizing board and entering each site as an X-Y coordinate relative to an origin. The relative ion counts for each compound can then be plotted at the sample locations. Cultural and topographic features can also be digitized onto the map as reference points.

5.2 Compound Identification

The mass spectrum that is drawn for each sample is compared to a library of mass spectra derived from known volatile organic compounds. Several thousand pure compound spectra have been developed by the Bureau of Standards and are available for spectra comparison. NERI has also developed its own library of spectra through headspace analysis of pure compounds using the Petrex wires. Once a compound has been identified in this manner, the ion current or "flux" for this compound is defined as the total ion current for the "parent peak" or least interfered peak of that compound.

5.3 Relative Flux Determination

The process of determining ion currents (relative intensities) of indicator peaks is computerized. All ion current data are extracted from the original data file and are processed for identification.

The relative ion current intensity (relative intensities) of the gases that are desorbed from the collectors are matched with sample locations on a map of the survey area. These relative intensities are useful for inferring the areal extent of contamination and relative differences in the concentrations of the compounds in the soil or groundwater. This can aid in determining the location of source areas or direction of movement of contamination.

These surface collections and analyses cannot be used to determine the depth to the source contaminants or the precise concentration at depth.

Because compounds can be differentiated by their spectra, analyses from the carbon collectors can be used to help differentiate multiple compounds and multiple source areas within a single survey.

5.4 Data Interpretation

Once the relative intensities for a compound are mapped, the data can be contoured to reveal those areas with "hot spots" and the orientation of plume migration. All other available data, such as geologic setting, soil types, groundwater conditions, type of contaminant, site history, and other factors are taken into account as the interpreter draws his conclusions.

5.5 Additional Uses of Petrex Collectors

Some of the other uses of the Petrex Technique that are utilized in surveys are headspacing of soil and water samples and depth profiling.

5.5.1 Headspace

A headspace soil sample is analyzed by collecting approximately 25 grams of soil, which are transferred to a thermochemically cleaned headspace container. Several adsorption wires are added and the headspace container is sealed and allowed to equilibrate for up to 24 hours, depending on the level of contamination. The wires are then removed and prepared for desorption mass spectrometric analysis as described earlier. An identical process is performed for screening water samples.

5.5.2 Depth Profiling

In order to determine if the source of the soil gas signal is near surface or in a deeper vadose/saturated zone, depth profiling can be used.

At each selected location, shallow bore holes are drilled a few feet apart to depths such as 1, 2, 4, and 6 feet deep. After all the loose cuttings and cavings have been removed from the bottom of the hole, a core of soil may be taken for headspace analysis. Next, a Petrex collector is lowered into the hole and backfilled. The collectors remain in place for the same length of time as the survey wires.

Each of the sampling methods addresses a different aspect that will help indicate the nature of the VOC source. In the case of composite soil sampling, detection of VOCs during analysis implies that the VOCs are actually contained within the soil matrix. When the VOC is anthropogenic in nature, the VOC presence is indicative of soil contamination at that depth interval.

When performing an in situ time-integrated sampling program with Petrex collectors, the collector serves as both an extended headspace sampler relative to the soil matrix in its immediate vicinity, as well as measuring the soil gas flux through that zone during the exposure period.

Soil gas movement through the vadose zone is theorized to be a diffusion process. If the headspace data indicate that the VOC is not present in the soil matrix, then the in situ depth profiling collectors should show a relative increase of ion counts as the depth increases. By combining both pieces of data, the nature of the VOC source (near surface or deep vadose/saturated) can be inferred.

5.6 Data Presentation

Once the data have been compiled, interpreted, and mapped, a report is produced for the client's use. Also, the maps are printed which display the relative intensity of the compounds of the client's specifications. These reports and maps are for the client's use only, and no report or map is released to anyone else without prior written consent of the client. This confidentiality policy is never breached.

6.0 INTERPRETATION OF PELREX MAPS

The policies outlined in this Standard Operating Procedure are strictly followed on each survey. It should be noted that the relative intensities for any compound at one sample location can only be compared to another location within the same survey for the same compound. Relative intensities of different compounds cannot be compared to each other. Also, the relative intensities of one survey cannot be compared to the relative intensities of any other survey, even between two surveys at different times of the year over the same site. However, the same "hot spots" and plumes should contour in the same place over multiple surveys at a given site, allowing for migration.