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SUPPLEMENTAL INVESTIGATION REPORT

OSMOSE WOOD PRESERVING, INC.
BUFFALO, NEW YORK
NYS DEC SPILL #915143

July 28, 1992

Submitted to:

Mr. Michael E. Rider
Osmose Wood Preserving, Inc.
980 Ellicott Street
Buffalo, New York 14209

Submitted by:

Groundwater Technology, Inc.
12 Walker Way
Albany, New York 12205

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1.0 INTRODUCTION

1.1 Background

Osmose Wood Preserving, Inc. (Osmose) operates a facility which manufactures a variety of preservatives used in the treatment of wood and lumber products. The facility is located at 980 Ellicott Street, Buffalo, New York (Figure 1, Site Location Map). During removal of 3 underground storage tanks (USTs) in August, 1989, evidence of a release to the subsurface, believed to be #2 fuel oil and brushing grade creosote, was discovered.

In June, 1990, Osmose was notified by the NYS DEC of their inclusion in the New York State Registry of Inactive Hazardous Waste Disposal Sites, and assigned NYS DEC Site Number 915143. The site was classified as "2a". Osmose contracted Groundwater Technology, Inc. (Groundwater Technology) to prepare a work plan to investigate the extent of contamination at the Ellicott Street facility. The work plan, titled Subsurface Investigation Work Plan for Osmose Wood Preserving, Inc., Buffalo, New York, June, 1990 (Work Plan) was submitted to, reviewed and accepted by the NYS DEC.

The work tasks, as described in the Work Plan, were completed and a Subsurface Investigation Report (Report) dated June 28, 1991, was submitted to the NYS DEC for review. The Report included several recommendations for additional assessment work to fill data gaps which were identified during the initial (preliminary) assessment. Several additional areas of investigation, in addition to Groundwater Technology's recommendations, were identified during review of the Report by the NYS DEC. Correspondences between the NYS DEC and Groundwater Technology regarding these additional requirements are included in Appendix A. Based upon correspondence between Groundwater Technology, the NYS DEC, and Osmose, the requirements for additional assessment were defined. These requirements were presented in the Supplemental Investigation Work Plan dated March 9, 1992.

1.2 Objectives

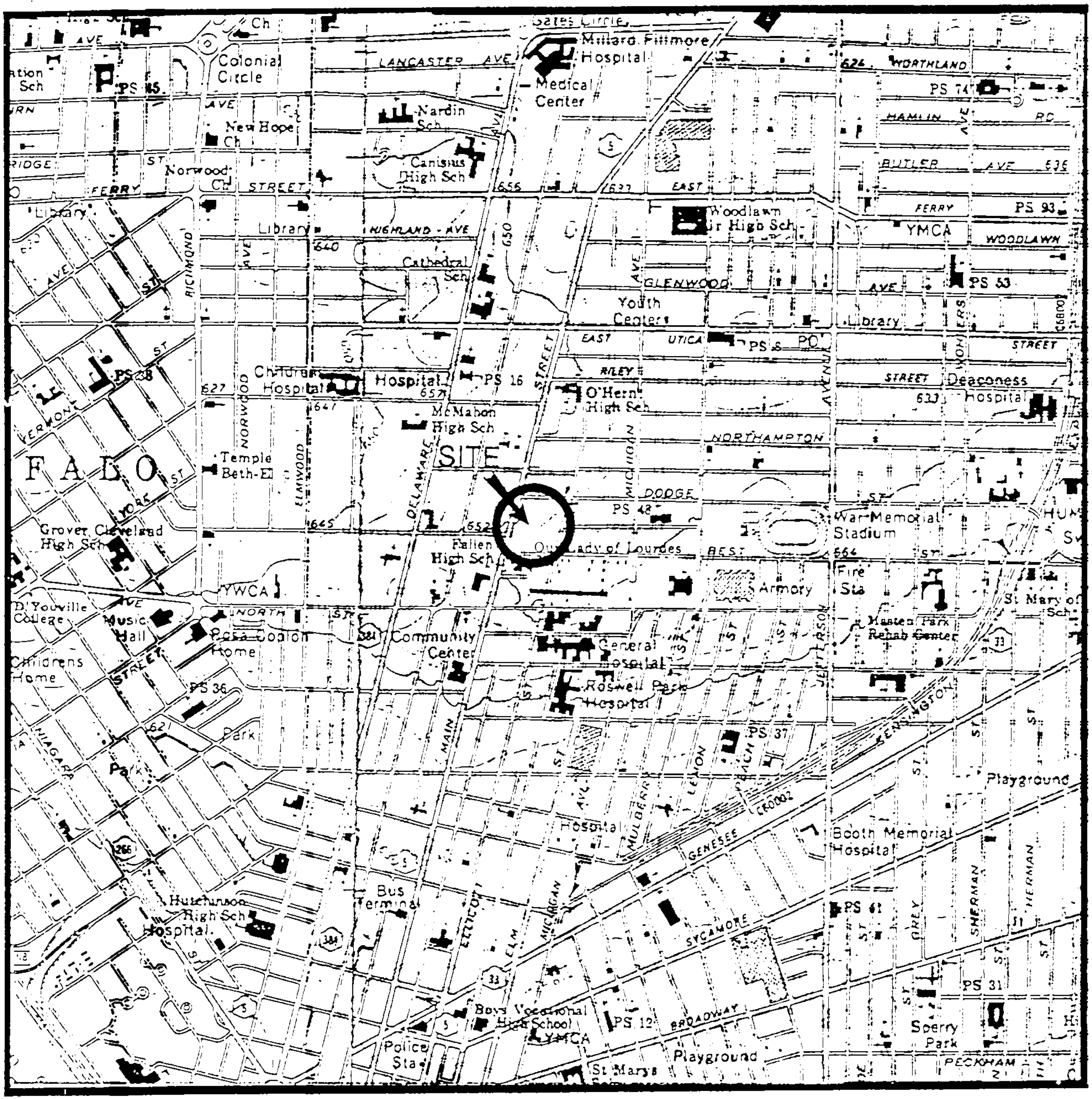
The objective of this report is to present the findings of the Supplemental Investigation Work Plan. The objective of the supplemental investigation was to fill data gaps which previously prevented full characterization of the Osmose site. Procedures and results are presented for soil boring/monitoring well installation, well development, collection of soil and groundwater samples, decontamination procedures, sample analysis and data validation.

FIGURE 1

SITE LOCATION MAP

OSMOSE WOOD PRESERVING, INC.

BUFFALO, NEW YORK



SOURSE: NYS DOT 7.5 MIN. BUFFALO NE & NW QUADS SCALE: 1 IN. EQUALS 2,000 FT.

GROUNDWATER TECHNOLOGY, INC

Specific objectives of the supplemental investigation were:

- Documentation of upgradient groundwater quality,
- Delineation of the extent of impacted soils in the MW-8 area,
- Delineation of the extent of separate phase (SP) product which exists downgradient of the former tank pit,
- Investigation of downgradient "deep" groundwater quality (groundwater just above bedrock), and
- Investigation of surface soils which are located proximate to the paved area which was temporarily used to stage impacted soils.

The report describes the field investigation procedures, investigation results and provides a summary discussion. Using this additional information, conceptual remediation alternatives were developed for the Osmose site and a remediation strategy selected.

The details of the procedures followed to accomplish the above objectives are presented in Section 2.0.

2.0 FIELD INVESTIGATION PROCEDURES

2.1 Soil Boring/Monitoring Well Installation

Earth Dimensions, Inc. was retained to perform the soil borings at the Osmose site, which occurred from March 17 to March 20, 1992. A hollow-stem auger drilling rig was used to complete four soil borings on site (Figure 2, Site Map). Previous soil boring data indicated that a clay and silt horizon (glacial lake deposits) was present at 3 to 8 feet below grade near the water/air interface, underlain with a layer of glacial outwash silts and sands (Subsurface Investigation Report: Figure 3, Geologic Cross Sections). Bedrock had previously been encountered at a depth of 63 feet.

Continuous split-spoon soil samples were collected at each boring location, and the lithologic descriptions were documented on soil logs by the field geologist. All soil samples were screened with a photoionization detector (PID). Three borings (MW-12, MW-13, and MW-14) were completed as two-inch fiberglass-reinforced epoxy (FRP) monitoring wells. Monitoring well construction details are included on the well logs in Appendix B; the screened interval for each well is shown below in Table 2-1.

The location of SB-2 was selected to help delineate the extent of near-surface adsorbed-phase polynuclear aromatic hydrocarbons (PAHs) previously detected in the vicinity of MW-8. To prevent contaminated soils from being brought down through the borehole as the augers were advanced, telescoping of augers was utilized. The outer augers were set at the top of the clay contact approximately 5 feet below grade. The boring was then completed by using smaller diameter augers within the outer augers. The boring was installed to a depth of 14 feet below grade.

The location of MW-12 was chosen to delineate the upgradient extent of adsorbed PAHs in the vicinity of MW-8 and to document upgradient groundwater quality. The Niagara Frontier Transit Authority (NFTA) refused to allow placement of a well on their property adjoining Osmose to the west. As a result, the upgradient well was located as close as possible to the property line. MW-12 was installed to 20 feet below grade. To ensure the collection of consistent hydraulic data, the screened interval for monitoring well MW-12 (10 - 20 feet below grade) was chosen to penetrate the same geologic formations as adjacent monitoring well MW-8. The drilling techniques used were identical to those utilized at SB-2.

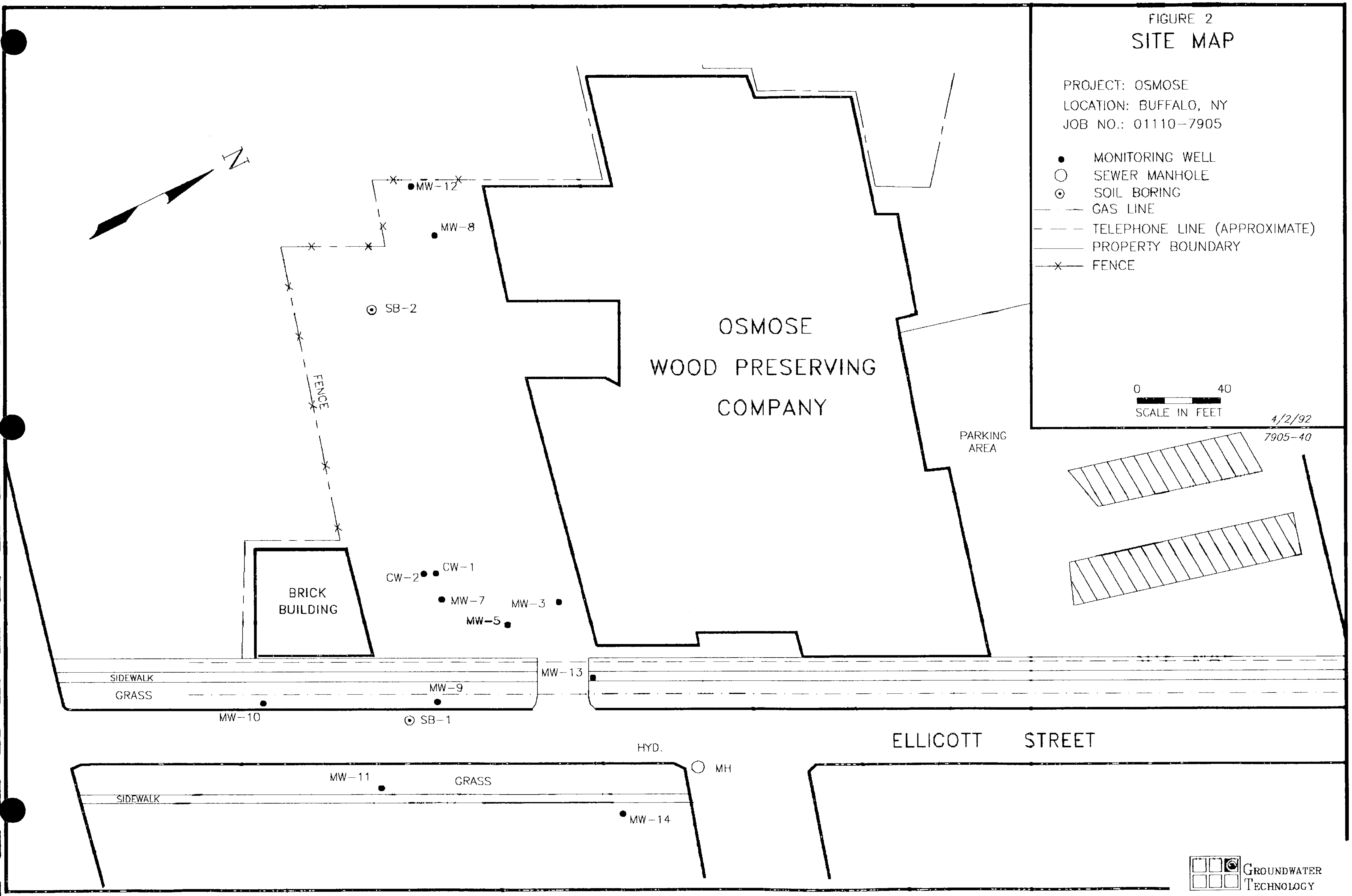


FIGURE 2

SITE MAP

PROJECT: OSMOSE
LOCATION: BUFFALO, NY
JOB NO.: 01110-7905

TABLE 2-1

MONITORING WELL SCREENED INTERVALS

WELL ID	SCREENED INTERVAL (feet below grade)
CW-1	57 - 62
CW-2	1.5 - 5.5
MW-8	16 - 21
MW-9	8 - 28
MW-10	11 - 25
MW-11	9 - 16
MW-12	10 - 20
MW-13	4 - 14
MW-14	57 - 62

NOTE: The shaded wells were installed during the supplemental investigation.

MW-13 was located in the sidewalk along the west side of Ellicott Street, in order to help delineate the downgradient extent of the separate-phase plume (Figure 2). The boring was advanced to a depth of approximately 14 feet below grade. Standard hollow stem auger drilling techniques were used at this location. The boring did not penetrate through the low permeability glacial lake deposits into the permeable underlying glacial outwash deposits.

The hydrogeologic evaluation of the site performed during the Subsurface Investigation Report indicated that the groundwater levels in the upper portion of the overburden aquifer ranged from 7 - 9 feet below grade during November, 1990 and January, 1991. Gaugings in MW-3 indicated that the seasonal high groundwater was 5 - 6 feet below grade in April and May. The screened interval in MW-13 was therefore extended from 4 to 14 feet below grade so that 1 to 4 feet of screen should always be above the water table.

In addition to the three shallow soil borings, a deep soil boring (MW-14) was installed in the right-of-way on the east side of Ellicott Street, approximately 80 feet north of MW-11. The deep boring penetrated the overburden to the top of bedrock at approximately 63 feet below grade. Standard hollow stem auger drilling techniques were used at this location. MW-14 was screened to sample groundwater just above the bedrock, with the screened interval extending from bedrock to 5 feet above bedrock (57 - 62 feet below grade).

All monitoring wells were constructed of threaded, flush-joint fiberglass-reinforced epoxy (FRP) well screen (0.020 inch) and casing. A clean, graded sand pack was placed in the annulus between the well and the borehole. The sand pack extended at least 2 inches beneath and 2 feet above the well screen (Appendix B, Well Logs). A two-foot bentonite seal was placed above the sand pack. A cement-bentonite grout was placed above the bentonite seal up to grade. All wells were completed with flush-mounted, traffic-approved road boxes and locking well caps.

Soils removed from the subsurface during drilling operations (cuttings/spoils) were stored on site in DOT-approved 55-gallon drums pending the completion of a waste characterization profile. The soils will be properly disposed of by Osmose.

During drilling operations vapor monitoring was performed as required by the site specific Health and Safety Plan (H&SP). Vapor monitoring logs are included in Appendix C.

2.2 Subsurface Soil Sampling

During soil boring installation, soil samples were continuously collected and monitored with a field PID. In addition, samples from each boring were sent for analysis at the contract laboratory (GTEL Environmental Laboratories, Milford, NH). From each boring, samples from above and below the water table that yielded the highest readings with the PID were chosen for laboratory analysis. Table 2-2 summarizes the soil samples which were selected for laboratory analysis.

TABLE 2-2
SUMMARY OF SOIL SAMPLE LOCATIONS
March 17 - 20, 1992

SAMPLE	SAMPLE LOCATION	LABORATORY ANALYSIS
SB-2	2 - 4 feet 8 - 10 feet	EPA 8310, EPA 8020 EPA 8310, EPA 8020
MW-12	6 - 8 feet 18 - 20 feet	EPA 8310, EPA 8020 EPA 8310, EPA 8020
MW-13	6 - 8 feet 8 - 10 feet	EPA 8310, EPA 8020 EPA 8310, EPA 8020
MW-14	10 - 12 feet 61 - 63 feet	EPA 8310, EPA 8020 EPA 8310, EPA 8020
SS-1	0.25 - 0.5 feet	EPA 8310
SS-2	0.25 - 0.5 feet	EPA 8310
SS-3	0.25 - 0.5 feet	EPA 8310

Soil sampling equipment, procedures, preservation technique and decontamination procedures are specified in the Subsurface Investigation Work Plan, June 7, 1990: Appendix D, Project-Specific QA/QC Plan, Section 6.2.

2.3 Surface Soil Sampling

During closure of the three USTs in August, 1989, soils containing elevated levels of hydrocarbons were staged on polyethylene liners, awaiting NYS DEC approval of an Interim Remedial Measure (IRM). The soils were covered with polyethylene sheets to prevent erosion and transport of contaminants by wind or rain.

In order to verify/determine that off-site migration of hydrocarbons did not occur, three surface grab samples were collected from the adjoining properties to the south and west of the Osmose facility (Figure 3, Soil Grab Sample Locations). The samples were taken within the vacant lots, approximately eight feet beyond the fence marking the Osmose property line. The samples were sent to the contract laboratory for analysis for PAHs by EPA Method 8310.

The surface soil samples were collected by removing the sod and sampling the soil at a depth of approximately 3 to 6 inches below grade. The samples were collected with a stainless steel scoop which was decontaminated between locations.

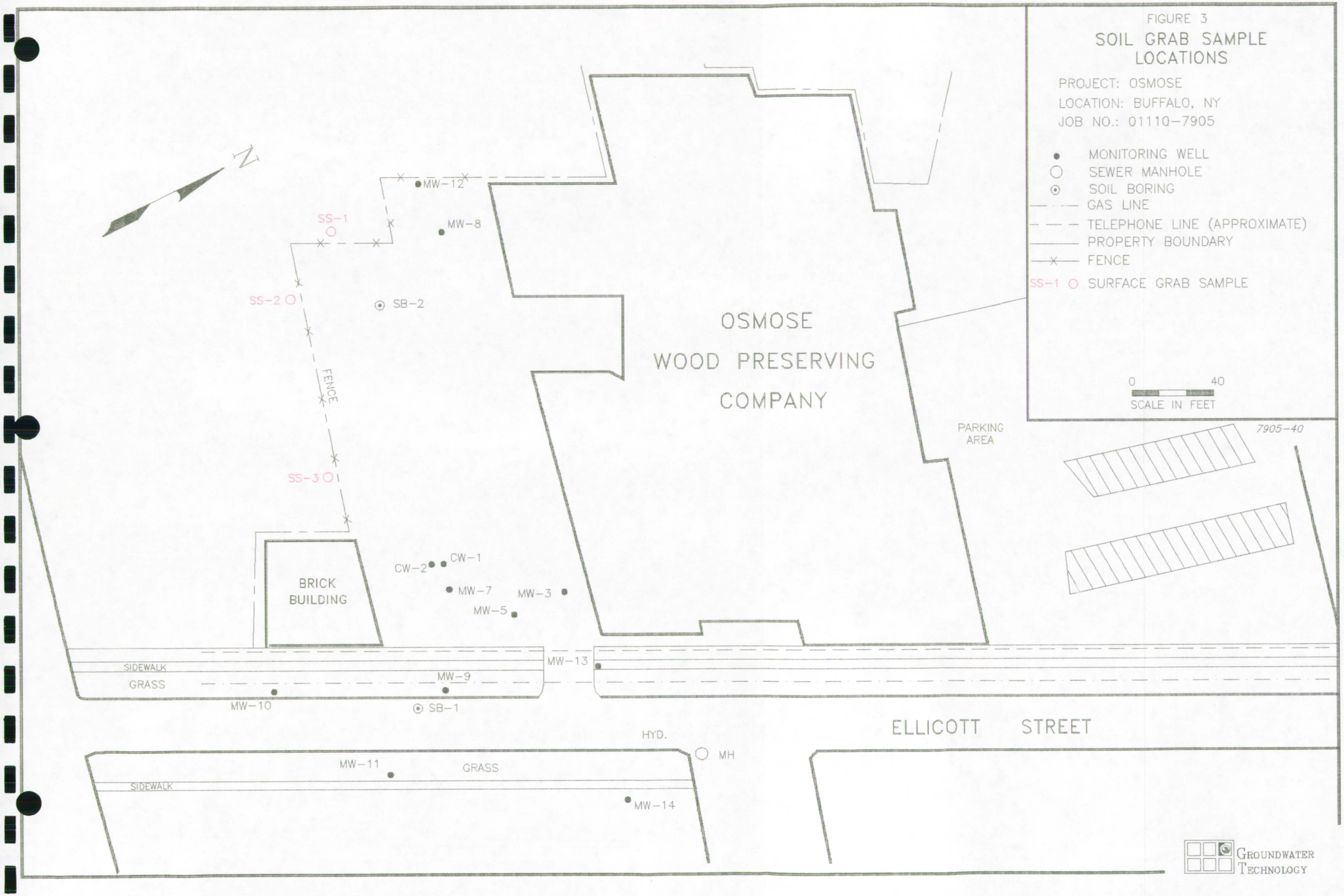


FIGURE 3

SOIL GRAB SAMPLE LOCATIONS

PROJECT: OSMOSE

LOCATION: BUFFALO, NY

JOB NO.: 01110-7905

2.4 Monitoring Well Development

Following installation, the monitoring wells were allowed to sit for approximately 24 hours to equilibrate before development. The monitoring wells were developed by repetitive surging and bailing until either:

1) the turbidity level was less than 50 Nephelometric Turbidity Units (NTUs) as measured with a portable turbidity meter;
2) the well had been developed 3 - 5 well volumes; or
3) the well was bailed dry.

Approximately 18 gallons of development water was generated during well development. This development water was stored on site in a DOT-approved 55-gallon drum for proper disposal by Osmose.

2.5 Groundwater Sample Collection

Monitoring wells were left undisturbed for one week after development to allow time for the wells to equilibrate with the surrounding aquifer. Groundwater samples were collected from all FRP wells on site (MW-8, MW-9, MW-10, MW-11, CW-1, MW-12, MW-13 and MW-14) on April 2, 1992. Prior to sample collection, 3 to 5 well volumes of water were evacuated from each well. A bailer was used for the evacuation of the wells. The purged water was stored on site in DOT-approved 55-gallon drums for proper disposal by Osmose. Before sampling, the turbidity of each well was measured and recorded in the field notebook.

All FRP wells on site were sampled from lowest VOC concentration to highest, based upon historical results from previously sampled wells and soil screening levels observed during drilling. Samples were collected for field analysis of temperature, pH and conductivity.

Water samples were collected using properly decontaminated teflon bailers and rope. Following field analysis, water samples were collected for laboratory analysis by pouring water directly from the bailers into properly prepared laboratory jars, and placed on ice until delivery to the contract laboratory. Samples were analyzed at the contract laboratory for Aromatic Volatile Organics by EPA Method 8020 and PAHs by EPA Method 8310. Proper chain-of-custody procedures were employed throughout the sampling. Sampling procedures are specified in detail in the Subsurface Investigation Work Plan: Appendix D, Project-Specific QA/QC Plan.

2.6 Groundwater Elevation Survey

For all existing monitoring wells, top-of-casing elevations were surveyed to a common datum to allow comparison of groundwater elevations to data previously collected. The depth to groundwater at each monitoring well was measured to an accuracy of +/-0.01 feet with an electronic Interface Probe.

2.7 Decontamination

Drilling equipment was decontaminated between boreholes. A steam cleaner was used to decontaminate augers, drill rods, spoon samplers, and other equipment that contacted contaminated soil or groundwater.

Bailers, interface probes, and other sampling equipment were decontaminated as specified in the Subsurface Investigation Work Plan, Appendix D: Project Specific QA/QC Plan.

2.8 Sample Management and Quality Control

The sample management and quality control procedures undertaken during sampling and analysis for this site are specified in Appendix D of the Subsurface Investigation Work Plan. Table 2-3, QA/QC Samples, summarizes the quality control samples which were analyzed during this investigation. The contract laboratory's data package deliverables conform to a "Project Specific Blue Level Package". The "Blue Level Package" reports the results of method blanks, surrogate recoveries, and matrix spike recoveries along with precision data and a QA non-conformance summary.

TABLE 2-3
QA/QC SAMPLES

MATRIX	QA/QC SAMPLE	EPA 8020 (VOCs)	EPA 8310 (PAHs)
Soil	Trip Blank	1	0
	Field Blank	1	1
	Rinseate Blank	1	1
	Method Blank*	3	2
	Matrix Spike*	2	1
	Matrix Spike Duplicate*	2	1
Water	Trip Blank	1	0
	Field Blank	1	1
	Rinseate Blank	1	1
	Method Blank*	2	1
	Matrix Spike*	2	1
	Matrix Spike Duplicate*	2	1

* These samples were generated internally by the laboratory.

The data collected during the supplemental field investigation was submitted to Ms. Kimberly McGhee-Gould, Chemist, Groundwater Technology, for QA/QC review. Ms. McGhee-Gould has been approved by Ms. Maureen Sarafini of the NYS DEC to validate data in New York State. The data validation procedure included the review of all data for:

- completeness,
- correctness,
- accuracy,
- precision, and
- representativeness.

The Data Validation Reports are included in Appendix D.

3.0 FIELD INVESTIGATION RESULTS

3.1 Geologic Evaluation

3.1.1 Regional Geology

Unconsolidated deposits in the region consist of glacial till, glacial outwash, fine-grained glacial lake deposits, recent swamp deposits, and alluvium. The glacial lake deposits are composed of fine sand, silt and clay.

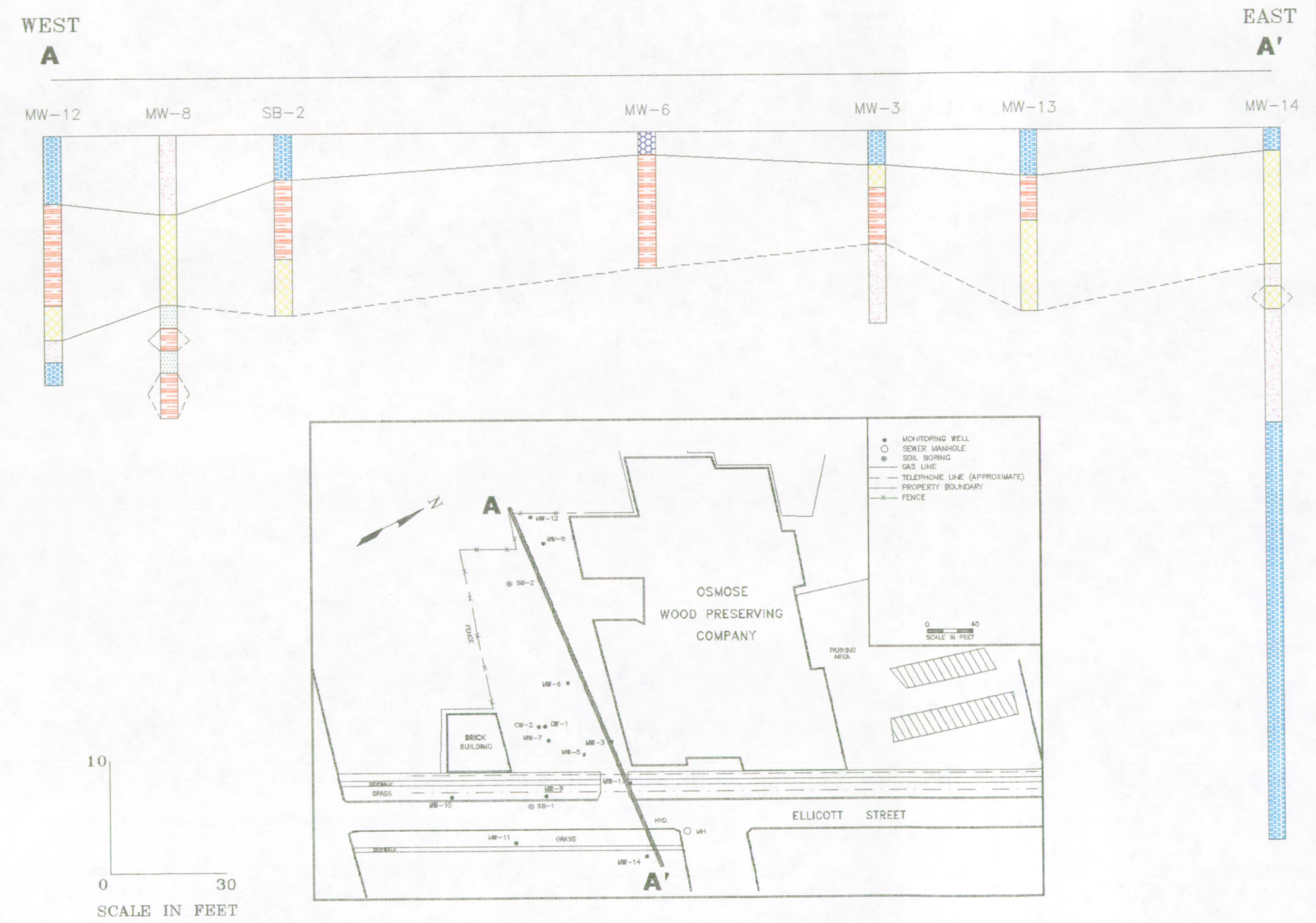
The bedrock in the area of investigation is the Onondaga Limestone. Structurally, the Onondaga Limestone dips gently to the south-southwest (Staubits and Miller, 1987) and has been encountered at depths ranging from above surface elevation (outcrops along Kensington Expressway) to 63 feet below grade (this investigation). The upper surface is typically irregular and contains deeply incised glacially carved channels, sink holes and solution features.

3.1.2 Site Geology

The subsurface geology encountered during this drilling event was consistent with that described in the initial Subsurface Investigation Report: Appendix B (Well Logs), Figure 3 (Geologic Cross Section). The site is underlain by approximately 63 feet of unconsolidated clay, silt, sand and gravel deposits which rest directly upon the bedrock. These deposits are fairly typical of glacial deposits of the area, and exhibit varied permeability. The area of highest relative permeability was the fill material (located in the upper few feet of section) and the native sand and gravel deposits.

A clay and silt horizon, with an upper boundary located approximately 5 feet below grade, presented the least permeable zone observed. This clay and silt unit, composed primarily of extremely low permeability glacial lake deposits, was encountered in all wells drilled and ranged in thickness from approximately 7 to 12 feet. The glacial lake deposits became coarser-grained glacial outwash deposits at approximately 10 to 18 feet below grade. Drill cuttings from MW-14 indicated that stratified glacial outwash deposits are present throughout the remainder of the overburden to the total depth of 63 feet. These deposits consist of interlayered silts, sands, and gravels of relatively high permeability. The contacts, based on the well logs, are marked with correlation lines in Figure 4, Geologic Cross-Section.

Bedrock was encountered at 63 feet below grade at both CW-1 and MW-14, indicating that the bedrock surface mirrors the land surface, dipping gently toward the east at approximately 0.7%. The top of bedrock in the vicinity of the Osmose site, therefore, appears to dip locally in the opposite direction from the regional bedrock surface (probably a slight undulation).



LEGEND

GLACIAL OUTWASH DEPOSITS AND FILL
- FINE SANDS
- FINE TO COARSE SANDS WITH SILT/CLAY
- COARSE SANDS WITH GRAVEL
- SILTY SANDS WITH GRAVEL

GLACIAL LAKE DEPOSITS
- SILTY SANDS, SILTS, CLAYEY SANDS
- CLAY

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12 WALKER WAY
ALBANY, NEW YORK 12205
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REV. NO.:	DRAWING DATE: 6/29/92	ACAD FILE: 7905-2X

GEOLOGIC CROSS-SECTION

CLIENT: OSMOSE WOOD PRESERVING INC.	PM: BWA
LOCATION: 980 ELLICOTT STREET BUFFALO, NEW YORK	PE/RG: JOG

DESIGNED:	DETAILED:	PROJECT NO.:	FIGURE:
	MET	01110-7905	4

3.2 Subsurface Soil Sampling Results

As described in Section 2.2, soil samples were collected from each boring at two separate intervals. The samples were sent to the contract laboratory for analysis of Aromatic Volatile Organic Compounds (VOCs) by Modified EPA Method 8020, and for PAHs by EPA Method 8310. Samples were analyzed from intervals ranging from 2 to 63 feet below grade.

3.2.1 Volatile Organic Compounds (VOCs)

A summary of the results of the VOC analysis are presented in Table 3-1, VOCs in Subsurface Soils. As indicated in the table, no benzene or chlorinated compounds were detected in any of the subsurface soil samples.

Low concentrations of total VOCs (<25 µg/kg) were present at three of the boring locations (SB-2, MW-12 and MW-14). Volatile compounds were not detected in the samples from SB-2 at 2 to 4 feet below grade or MW-14 at 10 to 12 feet below grade.

VOCs were detected in the highest concentrations at MW-13 (3,000 ppb and 7,200 ppb at 6-8 feet and 8-10 feet below grade, respectively). As shown in Table 3-1, at locations where VOCs were detected, xylenes were present at the highest concentrations. Complete laboratory analytical reports are included in Appendix E.

According to the "Petroleum Contaminated Soil Guidance" document (published by NYS DEC Bureau of Spill Prevention and Response: August 1, 1991), the only soil samples which would not be considered environmentally acceptable (based upon Water/Soil Partition Model) for groundwater quality protection were collected from MW-13.

TABLE 3-1

VOCs IN SUBSURFACE SOILS (ppb)
EPA Method 8020
March 17 - 20, 1992

ANALYTE	SB-2 (@ 2'-4')	SB-2 (@ 8'-10')	MW-12 (@ 6'-8')	MW-12 (@ 18'-20')	MW-13 (@ 6'-8')	MW-13 (@ 8'-10')	MW-14 (@ 10'-12')	MW-14 (@ 61'-63')	FIELD BLANK	EQUIP BLANK	TRIP BLANK
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	ND	6.8	7.5	5.8*	ND	380	ND	4.1*	ND	0.6	ND
Ethyl benzene	ND	2.3	3.2	2.0	ND	520	ND	2.0	ND	ND	ND
Xylenes (total)	ND	11	14	9.3	3,000	6,300	ND	8.3	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Volatiles	ND	20	25	17.1	3,000	7,200	ND	14.4	ND	0.6	ND

KEY
ppb = parts per billion
ND = not detected
* The presence of toluene is uncertain in these samples because the concentration detected was less than ten times that found in the equipment blank.

3.2.2 Semi-volatile Compounds

Table 3-2, PAHs in Subsurface Soils, summarizes the results of the laboratory data for PAHs by EPA Method 8310. The highest levels of PAH compounds were encountered in the samples from MW-13 at 6 to 8 feet and 8 to 10 feet below grade (35,100 μg/kg and 1,010,000 μg/kg, respectively).

Adsorbed PAH concentrations were significantly lower at the other boring locations. The lowest levels of total PAHs (<86 μg/kg) were present in MW-12 and MW-14. Samples from soil boring SB-2 contained 298 μg/kg total PAHs at a depth of 2 to 4 feet below grade, and 480 μg/kg at 8 to 10 feet below grade.

As shown in Table 3-2, 2-methylnaphthalene, phenanthrene, naphthalene and acenaphthene (all non-carcinogens) were the analytes present in the highest concentrations. Acenaphthylene and pyrene were not detected in any of the subsurface soils. The complete laboratory analytical reports are included in Appendix D.

At MW-13, the more complex PAHs (carbon # C18-C22) were present in lower relative concentrations (approximately 2%) than were the low complexity (C10-C13) and medium complexity (C14-C16) PAH compounds (approximately 76% and 22%, respectively). The opposite trend emerged at MW-12 (6 to 8 feet below grade), MW-14 (61 to 63 feet below grade) and at soil boring SB-2 (2 to 4 feet below grade). Graphs of PAH profiles were constructed by plotting each PAH analyte (in increasing complexity) against the reported concentrations for each analyte. These graphs were constructed for each soil boring location to illustrate the distribution and relative concentrations of PAHs. The graphs are presented in Appendix F.

To compare the distribution of PAHs found in the soil samples to the hydrocarbon products stored in the former USTs, virgin samples of brushing grade creosote and #2 fuel oil, and a sample of NAPL collected from MW-3 were sent to Worldwide Geoscience, Inc. in Houston, TX for GC/MS analysis. PAH profile graphs were constructed and are included in Appendix G.

When the profile graphs of the three NAPL samples are compared, the following key observations can be made:

- Acenaphthene is the PAH analyte present in the highest percentage in brushing grade creosote; anthracene is present in a very low percentage.
- Anthracene is the PAH analyte present in the highest concentration in #2 fuel oil; acenaphthene is present in a relatively much lower concentration.

TABLE 3-2

PAHS IN SUBSURFACE SOILS (ug/kg)

EPA Method 8310

March 17 - 20, 1992

ANALYTE	CN	MW-12 6'-8'	MW-12 18'-20'	MW-13 6'-8'	MW-13 8'-10'	MW-14 10'-12'	MW-14 61'-63'	SB-2 2'-4'	SB-2 8'-10'	RINSEATE BLANK	FIELD BLANK
Naphthalene	C10	ND	ND	7,000	230,000	ND	ND	ND	320	ND	ND
Acenaphthylene	C12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1-Methylnaphthalene	C11	ND	ND	2,000	57,000	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	C11	ND	ND	9,100	300,000	ND	ND	ND	150	ND	ND
Acenapthene	C12	ND	ND	3,000	120,000	ND	ND	ND	ND	ND	ND
Fluorene	C13	ND	ND	2,200	68,000	ND	ND	10	8.7	ND	ND
Phenanthrene	C14	ND	ND	9,000	150,000	ND	ND	ND	ND	ND	ND
Anthracene	C14	ND	ND	320	10,000	ND	ND	92	ND	ND	ND
Fluoranthene	C16	18	ND	1,900	59,000	ND	32	74	ND	ND	ND
Pyrene	C16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo{a}anthracene	C18	4.1	ND	230	7,500	ND	11	26	0.90	ND	ND
Chrysene	C18	ND	ND	72	2,600	ND	ND	90	ND	ND	ND
Benzo{b}fluoranthene	C20	5.8	0.78	75	2,700	ND	9.5	21	ND	ND	ND
Benzo{k}fluoranthene	C20	3.4	ND	52	1,800	ND	6.3	14	ND	ND	ND
Benzo{a}pyrene	C20	6.0	ND	92	2,900	ND	12	26	ND	ND	ND
Dibenzo{a,h}anthracene	C22	ND	ND	ND	200	ND	1.2	2.2	ND	ND	ND
Benzo{g,h,i}perylene	C22	3.5	ND	43	1,100	ND	8.6	15	ND	ND	ND
Indeno{1,2,3-cd}pyrene	C22	2.4	ND	ND	450	ND	5.1	8.3	ND	ND	ND
TOTAL SEMIVOLATILES		43	0.78	35,100	1,010,000	ND	86	298	480	ND	ND

ND = not detected

CN = carbon number

- The well product NAPL sample contained high concentrations of anthracene and acenaphthene and appeared to be a combination of the brushing grade creosote and #2 fuel oil profiles.
- None of the profile graphs showed substantial quantities of complex (C18 - C22) PAH analytes (< approximately 2%).

When the three NAPL profiles graphs are compared to the profile graphs constructed from the soil analyses, the following observations can be made:

- The PAH fingerprint graphs from MW-12 at 6 - 8 feet below grade and SB-2 at 2-4 feet below grade do not resemble the NAPL fingerprint graphs. Complex PAHs are present in much greater proportions than are the less complex PAHs.
- Anthracene and acenaphthene are not present in the MW-12 (6 - 8 feet) fingerprint graph; acenaphthene is not present at SB-2 (2 - 4 feet).

As part of the Subsurface Investigation Work Plan (June 7, 1990) prepared for the Osmose site, a baseline risk assessment was performed to determine which transport medias required remediation and to propose risk driven remediation goals for those media. As reported in the Subsurface Investigation Report (June 28, 1991), a very conservative approach was taken when developing acceptable soil concentrations (ASCs) by assuming all PAHs possess the carcinogenic characteristics of benzo(a)pyrene and the non-carcinogenic hazard index for naphthalene. These two PAHs have the most stringent available EPA health criteria (HEAST, 1991). Based upon this conservation approach, an ASC of 473 mg/kg total PAHs was developed for biocell, on-site (non-biocell) and off-site soils.

Of the soil samples analyzed during this supplemental investigation, only one sample, MW-13 at 8-10 feet below grade, exceed the ASC.

3.3 Surface Soil Sampling Results

Surface soil grab samples were collected on March 18, 1992 from three locations south and west of the Osmose parking lot (Figure 3, Soil Grab Sample Locations). The surface grab samples were sent to the contract laboratory for analysis by EPA Method 8310 (PAHs). The results are summarized in Table 3-3, PAHs in Surface Soils. The complete laboratory analytical reports are included in Appendix D.

Although elevated levels of PAH compounds were detected at all three locations, all levels were below the ASC of 473 mg/kg as developed for off-site soils in the health and environmental risk assessment.

Acenaphthylene, 1-methylnaphthalene, acenaphthene and pyrene were not detected in any of the surface samples.

TABLE 3-3

PAHS IN SURFACE SOILS (ug/kg)

EPA Method 8310

Sampling Dates: March 17 - 20, 1992

ANALYTE	CN	SS-1	SS-2	SS-3
Naphthalene	C10	ND	5,700	10,000
Acenaphthylene	C12	ND	ND	ND
1-Methylnaphthalene	C11	ND	ND	ND
2-Methylnaphthalene	C11	ND	6,900	ND
Acenapthene	C12	ND	ND	ND
Fluorene	C13	120	4,300	8,000
Phenanthrene	C14	440	20,000	29,000
Anthracene	C14	940	ND	ND
Fluoranthene	C16	1,200	30,000	50,000
Pyrene	C16	ND	ND	ND
Benzo{a}anthracene	C18	430	11,000	17,000
Chrysene	C18	200	5,100	8,300
Benzo{b}fluoranthene	C20	520	9,700	14,000
Benzo{k}fluoranthene	C20	300	5,800	8,500
Benzo{a}pyrene	C20	670	12,000	17,000
Dibenzo{a,h}anthracene	C22	79	1,500	2,200
Benzo{g,h,i}perylene	C22	400	5,900	8,500
Indeno{1,2,3-cd}pyrene	C22	280	4,900	6,400
TOTAL SEMIVOLATILES		5,600	123,000	179,000

ND = not detected

CN = carbon number

Fluoranthene (a non-carcinogenic) was present in the highest concentrations at all three surface sample locations. Fluoranthene comprised approximately 25% of the total PAHs detected at the three locations. Phenanthrene and benzo(a)pyrene comprised approximately 13.5% and 10.5%, respectively, of the total PAHs detected at each location.

Table 3-4, Distribution of PAHs in Surface Samples, shows the percentage of low-, medium-, and high-complexity PAHs in the surface grab samples. The more complex PAHs (carbon #C18-C22) contributed approximately 47% of the total PAH loading at each location. The medium-complexity PAHs (carbon #C14-C16) comprised approximately 44% of the loading, and the low-complexity PAHs (carbon #C10-C13) comprised of approximately 9% of the total.

PAH profiles were constructed and are included in Appendix F. When compared to the NAPL fingerprint graphs, the dissimilarities are evident.

The PAHs found in the surface soil grab samples are believed to be the result of two brush fires which occurred in 1991 in the area where the surface soils were collected (Appendix H, Brush Fire Locations). Both fires were reported to the Buffalo Fire Department. "The primary source of many PAHs ..... is the incomplete combustion of wood and fire.... as such, PAHs are ubiquitous products of combustion from common sources such as motor vehicles...., wood burning stoves...., natural sources include ..... forest fires." (Toxicological Profile for Polycyclic Aromatic Hydrocarbons, US Public Health Services Agency for Toxic Substances and Disease Registry, October, 1989, pp. 125-127.) PAHs in the fields could have also been produced if a building off site had burned down and soot was carried onto the site.

There are several observations that can be made from the above data that indicate that the source of PAHs was a brush fire. First, there is a predominance of high-complexity (multi-ring) compounds. These highly condensed compounds are common soot constituents, resulting from a carbonization reaction. Second, these highly condensed compounds are not predominant in the soils which were staged as part of the IRM. Third, the NAPL indicator analytes (acenaphthene and anthracene) were not present in surface sample SS-2 and SS-3, and acenaphthene was not present in SS-1.

TABLE 3-4

DISTRIBUTION OF PAHs IN SURFACE SAMPLES

CARBON #	SS-1	SS-2	SS-3	AVERAGE
C10 - C13	2%	14%	10%	8.7%
C14 - C16	46%	41%	44%	43.7%
C18 - C22	51%	45%	46%	47.3%

3.4 Hydrogeologic Evaluation

3.4.1 Regional Hydrogeology

A review of hydrogeologic reports of the area determined that the groundwater circulates through a regional flow system in a north-northwest direction from the Appalachian Uplands to the Erie-Ontario Lowlands, where it discharges near Tonawanda Creek. The glacial deposits recharge the soluble limestone bedrock (ie., Onondaga Limestone) by percolation into joints, fractures and solution channels. The zone of fracturing and solution that follows the upper surface of the soluble limestone rocks has been observed to be in hydraulic continuity with the glacial deposits (LaSala, 1968). Local secondary flow systems exist which discharge to tributary streams.

The transmissivity of the glacial deposits ranges from very low for the lake bed sediments and glacial till to very high (600,000 gpd per foot) for the outwash sand and gravel deposits. The Onondaga Limestone transmissivity varies greatly depending upon the number of solution channels present. Reported values range from 300 to 25,000 gpd per foot.

3.4.2 Site Hydrogeology

Monitoring well top-of-casing elevations were surveyed relative to an arbitrary benchmark in order to construct a groundwater contour map of the unconsolidated glacial aquifer. A groundwater contour map is included as Figure 5. The groundwater gradient in the shallow overburden wells was towards the east-southeast at approximately 1.1 percent. The direction of groundwater flow may be influenced by the local effects of a small knoll to the west of the site. The monitoring well data suggest that the small knoll and associated glacial stratification in the subsurface are exerting hydraulic control over groundwater flow in the upper portion of the overburden aquifer on site. The groundwater gradient is consistent with the results of past gauging events, with the exception of a low point centered at MW-9. The water table in the vicinity of Ellicott Street is probably subject to local distortions resulting from the storm sewer system and/or other subsurface artifacts.

The hydrogeologic evaluation of the site suggests that a complex aquifer system exists beneath the site. Groundwater levels in the upper portion of the overburden aquifer range from 5 to 10 feet below grade. Groundwater in the deep portion of the overburden aquifer was encountered at 20.50 feet below grade (MW-14) and 26.68 feet below grade (CW-1), indicating that a steep vertical gradient exists within this unit. The existence of a drop of over five feet in the groundwater elevation from MW-14 to CW-1 suggests that deep groundwater flow may differ significantly from shallow groundwater flow in both direction and gradient. Gauging data indicate that groundwater in the deep portion of the aquifer is flowing generally toward the west across the site. This would be consistent with regional groundwater flow in the area. Bedrock, however, as described in Section 3.1.2, mirrors the land surface by dipping gently toward the east.

The downward vertical gradient observed on site indicates that groundwater from the upper portion of the overburden aquifer acts to recharge the lower portion of the overburden aquifer. This is consistent with regional groundwater flow patterns (Section 3.4.1).

3.5 Groundwater Sampling Results

Groundwater samples were collected from all eight FRP monitoring wells on site (MW-8 through MW-14, CW-1) and analyzed for Aromatic Volatile Organics by Modified EPA Method 8020, and for Polynuclear Aromatic Hydrocarbons by EPA Method 8310. Field measurements were made of the turbidity of the groundwater after each well was purged. During sampling, field measurements were made of the pH, temperature, and conductivity of the groundwater.

3.5.1 Volatile Compounds

As shown in Table 3-5, VOCs in Groundwater, no dissolved BTEX compounds were detected in groundwater samples taken from monitoring wells MW-8, MW-10, MW-11 or MW-12. Monitoring wells MW-8 and MW-12 are located upgradient of the presumed source area. Monitoring wells MW-10 and MW-11 are located downgradient and crossgradient of the presumed source area. BTEX compounds were detected at MW-9, MW-13, MW-14, and CW-1. Total dissolved BTEX levels were highest at MW-13 (1600 μg/l) and MW-9 (530 μg/l), and substantially lower at CW-1 (34 μg/l) and MW-14 (2.5 μg/l).

TABLE 3-5

VOCs IN GROUNDWATER (μg/l)
EPA Method 8020
Sampling Date: April 2, 1992

ANALYTE	MW-8	MW-9	MW-10	MW-11	MW-12	MW-13	MW-14	CW-1	FIELD BLANK	EQUIP BLANK	TRIP BLANK	NYS Standard
Benzene	ND	170	ND	ND	ND	120	1.2B	21	ND	0.3	ND	0.7
Toluene	ND	150	ND	ND	ND	300	1.3	3.1	ND	ND	ND	5.0
Ethyl Benzene	ND	33	ND	ND	ND	90	ND	0.8	ND	ND	ND	5.0
Xylenes (total)	ND	180	ND	ND	ND	1100	ND	9.3	ND	ND	ND	15 total
Chlorobenzene	ND	ND	ND	ND	ND	790	ND	ND	ND	ND	ND	5.0
1,2-Dichlorobenzene	ND	22	ND	ND	ND	ND	ND	13	ND	ND	ND	4.7
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0
1,4-dichlorobenzene	ND	ND	ND	ND	ND	36	ND	ND	ND	ND	ND	4.7
Total Volatiles	ND	560	ND	ND	ND	2,400	1.3	47	ND	0.3	ND	—

KEY

μg/l = micrograms per liter
ND = not detected
B = The presence of benzene is uncertain in this sample because the concentration detected was less than five times that found in the equipment blank.

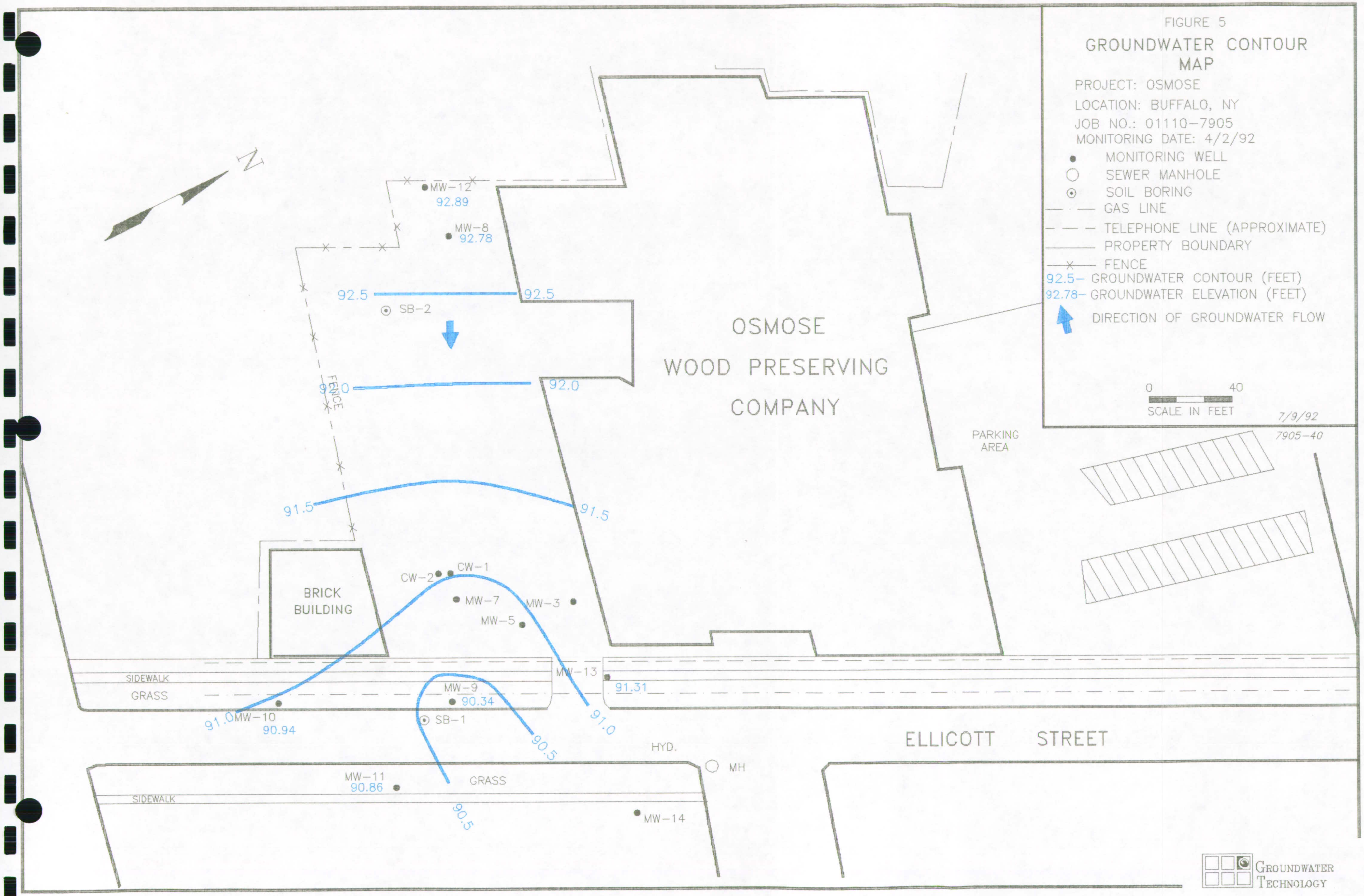


FIGURE 5

GROUNDWATER CONTOUR MAP

PROJECT: OSMOSE
LOCATION: BUFFALO, NY
JOB NO.: 01110-7905
MONITORING DATE: 4/2/92

The presence of benzene in the groundwater at MW-14 (deep well) is questionable because of the presence of benzene in the equipment blank. Toluene (at 1.3 ppb) was the only other volatile analyte present in MW-14. The level detected was below the NYS Standard of 5.0 ppb. At cluster well CW-1 (deep well), BTEX levels were all below NYS standards with the exception of benzene (present at 21 ppb). BTEX levels at MW-9 and MW-13 (shallow wells located downgradient of the presumed source area) were above groundwater standards. Figure 6, Dissolved BTEX Distribution Map, shows the areal extent of BTEX compounds in the groundwater on site.

Results of this sampling event were compared to the two previous sampling events performed in November, 1990 and January, 1991 for MW-8 through MW-11 and CW-1. The results correlated very well: Monitoring wells MW-8, MW-10 and MW-11 continued to show non-detectable levels of volatiles; CW-1 (deep well) decreased in dissolved BTEX concentrations; and dissolved levels in MW-9 increased. The reduction in dissolved BTEX concentrations in CW-1 (immediately downgradient of the former tank pit) may be attributed to the elimination of the presumed source area.

Chlorinated compounds were detected in the groundwater at three of the eight well locations. Chlorobenzene and 1,4-dichlorobenzene were detected at MW-13 at concentrations of 790 μg/l and 36 μg/l, respectively. 1,2-dichlorobenzene was detected at MW-9 (22 μg/l) and CW-1 (13 μg/l). All of the chlorinated compounds detected were present in concentrations that exceeded NYS DEC groundwater standards (Table 3-5).

The most recent chlorinated compounds sampling data were compared to the historical data available for MW-9 and CW-1. On two previous sampling events (November, 1990 and January, 1991) no chlorinated compounds were detected in either monitoring well. No historical data exists for MW-13; however, analysis of soils at MW-13 indicated that no chlorinated compounds were present. The organic carbon/water partition coefficient (K_{oc}) indicates the tendency of a compound to adsorb onto organic particles in the soil. Log K_{oc} values greater than zero indicate that a compound will reside in the soil at greater concentrations than in the groundwater. Chlorobenzene and dichlorobenzene have log K_{oc} values of 1.68 or greater. Therefore, one would expect these compounds to be present in the soil at concentrations at least fifty times greater than in the groundwater.

The groundwater sampling results are summarized in Table 3-5. The complete laboratory analytical reports are included in Appendix E.

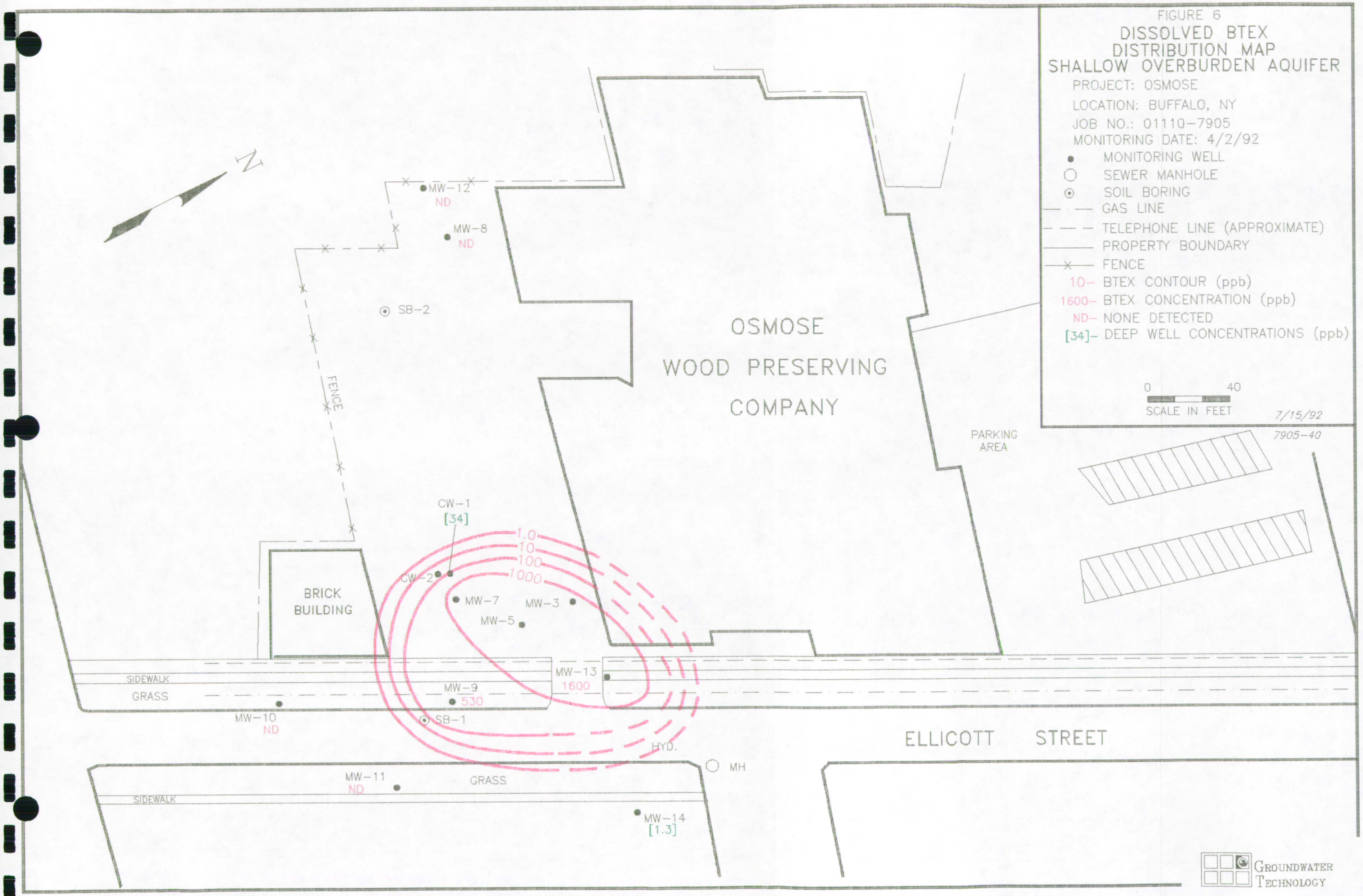


FIGURE 6

DISSOLVED BTEX DISTRIBUTION MAP SHALLOW OVERBURDEN AQUIFER

PROJECT: OSMOSE
LOCATION: BUFFALO, NY
JOB NO.: 01110-7905
MONITORING DATE: 4/2/92

3.5.2 Semi-volatile Compounds

In addition to volatile compounds, analysis was also performed to detect the presence of semi-volatile compounds by EPA Method 8310. The results of the semi-volatile (PAH) analyses are presented in Table 3-6, and in Figure 7, Dissolved PAH Distribution Map. Included in the table are the results of the previous sampling event (ASP, Category A reporting format) associated with the initial Subsurface Investigation (January, 1991). The data for November, 1990 are not included in the table because a different analytical procedure was used to measure dissolved PAHs (EPA Method 610).

Dissolved PAHs were detected in the groundwater during this sampling event at 7 of the 8 monitoring wells. Monitoring wells MW-10, MW-11, and MW-12 possessed total dissolved PAH levels below 1 ppb (ND, 0.11 ppb, and 0.055 ppb, respectively). Monitoring wells MW-8 and MW-14 (deep well) also possessed low levels to total dissolved PAHs (1.49 ppb and 0.76 ppb, respectively). The highest concentration of dissolved PAHs were present at MW-9 (70.1 ppb), CW-1 (284.1 ppb) and MW-13 (9,477.3 ppb).

Low levels of six dissolved PAHs compounds were detected in the equipment (rinseate) blank sample. It is conceivable, therefore, that the low levels of dissolved PAHs in MW-10, MW-11 and MW-12 may be related to equipment cross contamination. Three of the four PAH compounds detected at MW-10, however, were detected in similar concentrations during the January, 1991 sampling event. Based upon standard data validation protocol this potentially invalid data was not used.

Acenaphthylene, anthracene and pyrene were not detected in any of the groundwater samples during this sampling event.

Although the more complex PAHs (C18 - C22) were more pervasive in the groundwater, the lower complexity PAHs (C10-C16) were present in much higher concentrations. This is attributed to the lower complexity PAHs possessing higher solubility and lower K_{oc} values (refer to Subsurface Investigation Report, Section 4.7, Contaminant Characteristics). Naphthalene and methylnaphthalene accounted for approximately 77 percent of the total volume of dissolved PAHs detected on site.

Also presented in Table 3-6 are the Ambient Water Quality Standards and Guidance Values as published by NYS DEC, Division of Water in November, 1991 for toxic and non-conventional pollutants. A comparison of these standards or guidance values, where provided, with the results of the most recent sampling event (April, 1992) can be summarized as follows:

- Upgradient wells MW-8 and MW-12 exceeded groundwater guidance values for chrysene, and indeno(1,2,3-cd)pyrene. Indeno(1,2,3-cd)pyrene was also present at on-site and downgradient wells (MW-9, and MW-11) at similar levels.

TABLE 3-6

POLYNUCLEAR AROMATIC HYDROCARBONS IN GROUNDWATER (ug/l)

EPA METHOD 8310

Sampling Date: April 2, 1992

															BLANKS					NYS DEC
ANALYTE	CARBON	MW-8		MW-9		MW-10		MW-11		CW-1		MW-12	MW-13	MW-14	EQUIPMENT		FIELD		NYS DEC	GUIDANCE
	#	1/91	4/92	1/91	4/92	1/91	4/92	1/91	4/92	1/91	4/92	4/92	4/92	4/92	1/91	4/92	1/91	4/92	STANDARD	VALUE
Naphthalene	C10	ND	ND	7.8	70	ND	ND	ND	ND	160	170	ND	4,600	ND	ND	ND	ND	ND	NA	10
Acenaphthylene	C12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
1-Methylnaphthalene	C11	–	ND	–	ND	–	ND	–	ND	–	18	ND	540	ND	–	ND	–	ND	NA	NA
2-Methylnaphthalene	C11	–	ND	–	ND	–	ND	–	ND	–	49	ND	2,100	ND	–	ND	–	ND	NA	NA
Acenaphthene	C12	ND	ND	ND	ND	ND	ND	ND	ND	5.9	20	ND	740	ND	ND	ND	ND	ND	NA	20
Fluorene	C13	ND	ND	ND	ND	ND	ND	ND	ND	1.3	5.0	ND	360	ND	ND	ND	ND	ND	NA	50
Phenanthrene	C14	ND	0.84	ND	ND	ND	ND	ND	ND	1.3	7.0	ND	710	0.70	ND	ND	ND	ND	NA	50
Anthracene	C14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	50
Fluoranthene	C16	ND	1.1 B	ND	ND	ND	ND	ND	0.34 B	0.36	5.2	0.26 B	240	0.36 B	ND	0.44	ND	ND	NA	50
Pyrene	C16	ND	ND	ND	ND	ND	ND	ND	ND	0.54	ND	ND	ND	ND	ND	ND	ND	ND	NA	50
Benzo{a}anthracene	C18	ND	0.21 B	ND	0.043 B	0.026	0.020 B	ND	0.10 B	0.068	1.2	0.049 B	73	0.077 B	ND	0.095	ND	ND	NA	0.002
Chrysene	C18	ND	0.26	ND	ND	ND	ND	ND	ND	ND	1.3	ND	23	ND	ND	ND	ND	ND	NA	0.002
Benzo{b}fluoranthene	C20	ND	0.35 B	ND	0.054 B	0.030	0.033 B	ND	0.13 B	0.050	1.9	0.065 B	26	0.071 B	ND	0.14	ND	ND	NA	0.002
Benzo{k}fluoranthene	C20	ND	0.19 B	ND	0.030 B	ND	0.017 B	ND	0.072 B	0.028	0.98	0.034 B	15	0.042 B	ND	0.079	ND	ND	NA	0.002
Benzo{a}pyrene	C20	ND	0.44 B	ND	0.082 B	0.027	0.033 B	ND	0.18 B	0.047	2.2	0.087 B	35	0.10 B	ND	0.14	ND	ND	ND	NA
Dibenz{a,h}anthracene	C22	ND	0.064	ND	ND	ND	ND	ND	ND	ND	0.34	ND	1.9	ND	ND	ND	ND	ND	NA	NA
Benzo{g,h,i}perylene	C22	ND	0.20 B	ND	ND	ND	ND	ND	ND	ND	1.2	ND	10	ND	ND	0.085	ND	ND	NA	NA
Indeno{1,2,3-cd}pyrene	C22	ND	0.33	ND	0.055	ND	ND	ND	0.11	ND	0.82	0.055	3.4	0.057	ND	ND	ND	ND	NA	0.002
TOTAL PAHs		ND	1.5	7.8	70	0.083	ND	ND	0.11	170	280	0.055	9,500	0.76	ND	0.98	ND	ND	NA	NA

ug/l = micrograms per liter

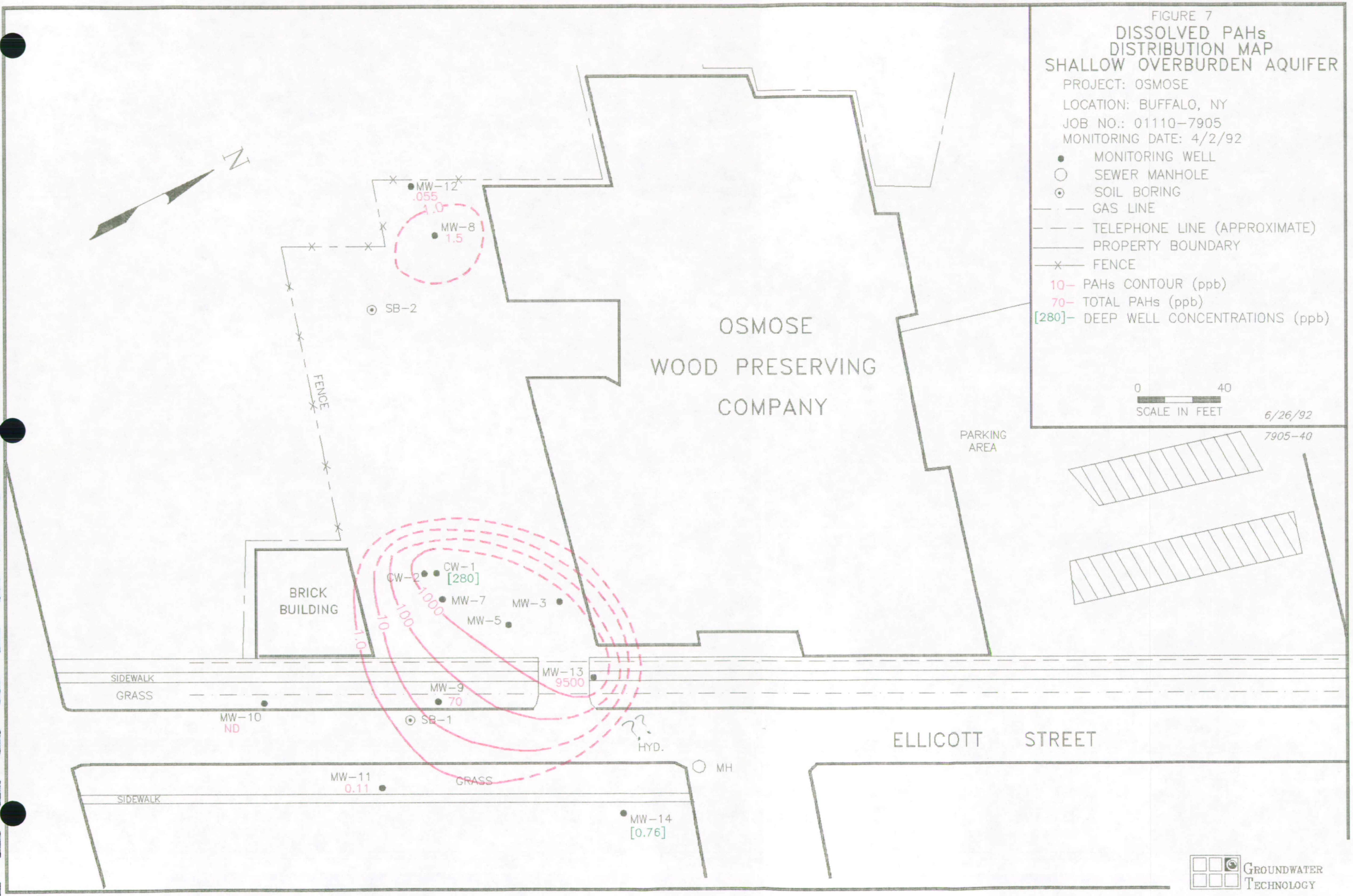
ND = not detected

B = The presence of these analytes is uncertain in these samples because the concentration detected was less than five times that found in the equipment blank.

FIGURE 7

DISSOLVED PAHs DISTRIBUTION MAP SHALLOW OVERBURDEN AQUIFER

PROJECT: OSMOSE
LOCATION: BUFFALO, NY
JOB NO.: 01110-7905
MONITORING DATE: 4/2/92



6/26/92
7905-40

GROUNDWATER TECHNOLOGY

- Groundwater samples from MW-9 and MW-14 exceeded groundwater guidance values for Indeno(1,2,3-cd)pyrene. In addition MW-9 exceeded the guidance value for Naphthalene.
- Groundwater samples collected from cluster well, CW-1, exceeded the groundwater guidance values for 6 PAH analytes.
- Groundwater samples collected from MW-13 exceeded guidance values for nine PAH analytes in addition to the groundwater standard for acenaphthene.
- Groundwater samples from MW-13 exceeded guidance values for 12 guidance values and one groundwater standard.

Inspection of the dissolved PAH data from the furthest upgradient monitoring well (MW-12) and the furthest downgradient well (MW-14) reveals that the same PAH analytes are present at each location and at similar concentrations. This would imply that these dissolved levels are indicative of regional groundwater quality.

A comparison between the historical groundwater quality data and most recent data reveals the following trends:

- An increase in the concentration of high complexity PAHs occurred in MW-8, MW-9, MW-11, and CW-1 (if potentially invalid data is considered).
- The dissolved level of PAHs increased in four of the five monitoring wells (MW-8, MW-9, MW-11, and CW-1).
- Monitoring well MW-10 showed no variation in PAH distribution or dissolved concentration.

The risk assessment performed as part of the initial subsurface investigation addressed potential risks associated with on- and off-site groundwater. The total carcinogenic risk estimate for groundwater was reported as approximately 1×10^{-8}, which is considerably less than the criterion for acceptable risk. Likewise the total hazard index for non-carcinogenic risks was approximately 6×10^{-2} (far below unity) which represents acceptable risks. Based upon the most recent groundwater sampling data, Groundwater Technology's Envirologic Data Division has recalculated the total carcinogenic risk estimate to be 2.37×10^{-6} and the total hazard index to be 4.05×10^{-1}. Both these index numbers show that the current groundwater quality represents an acceptable level of risk both on site and off site. Calculations, and summary tables, along with a brief narrative have been provided by Envirologic Data and are included in Appendix I.

3.5.3 Turbidity, Conductivity, Temperature, pH

Field measurements were made of each groundwater sample for turbidity, conductivity, temperature and pH during the sampling event (Table 3-7). As can be seen in the table, turbidity values were greater than 50 NTUs for several of the samples. The contract laboratory was consulted and verified that high turbidity would not interfere with the analyses to be performed. Conductivity, temperature, and pH were within normal parameters with the exception of the pH at MW-14 (11.85 pH units). This is most likely an anomalous measurement.

TABLE 3-7

GROUNDWATER FIELD MEASUREMENTS
April 2, 1992

Well ID	Turbidity (NTUs)	Conductivity (μS)	pH (pH units)	Temperature (degrees F)
CW-1	117.0	3160	8.45	39.8
MW-8	145.3	1783	7.85	44.1
MW-9	18.3	3073	7.63	39.4
MW-10	34.5	2020	7.64	42.2
MW-11	26.9	1510	8.15	40.6
MW-12	>200	1966	7.81	42.3
MW-13	151.1	4120	7.55	39.2
MW-14	>200	1578	11.85*	43.8

* Anomalous reading

4.0 SUMMARY DISCUSSION

The purpose of the following sections are to present a brief summary discussion of the results of the Supplemental Investigation. Specific objectives of the Supplemental Investigation were:

- Documentation of upgradient groundwater quality,
- Delineation of the extent of impacted soils,
- Delineation of the extent of separate phase (SP) product which exists downgradient of the former tank pit,
- Investigation of deep groundwater quality, and
- Investigation of surface soils which are located proximate of the area used to temporarily stage impacted soils.

4.1 Upgradient Groundwater Quality

Laboratory data collected from MW-12, located at the upgradient property boundary, indicates the following:

- Low levels of six dissolved complex PAHs exist at the upgradient property boundary of the Osmose facility (including the potentially invalid data). This would imply that these dissolved levels are representative of regional groundwater quality in the upper portion of the unconfined aquifer. This is supported by the groundwater sampling results from the furthest downgradient (off-site) monitoring well, MW-14. Groundwater samples from MW-14 showed that the same six PAH analytes were present at similar concentrations.
- Groundwater samples from upgradient well MW-12 did not contain any BTEX analytes. Upgradient well MW-8, similarly, did not contain any BTEX analytes. These results are assumed to be indicative of upgradient groundwater quality.

4.2 Delineation of Impacted Soils

The initial subsurface investigation detected a concentration of 500 ppm total PAHs at MW-8 at 2 - 4 feet below grade. Monitoring well MW-12 and soil boring SB-2 were installed to define the extent of the shallow contamination in this area. Since much lower adsorbed PAH levels were detected at MW-12 and SB-2, it appears that the areal extent of this zone is limited (Figure 8). A coal bin was historically located in the vicinity of MW-8 and may have been the source of this near-surface impact.

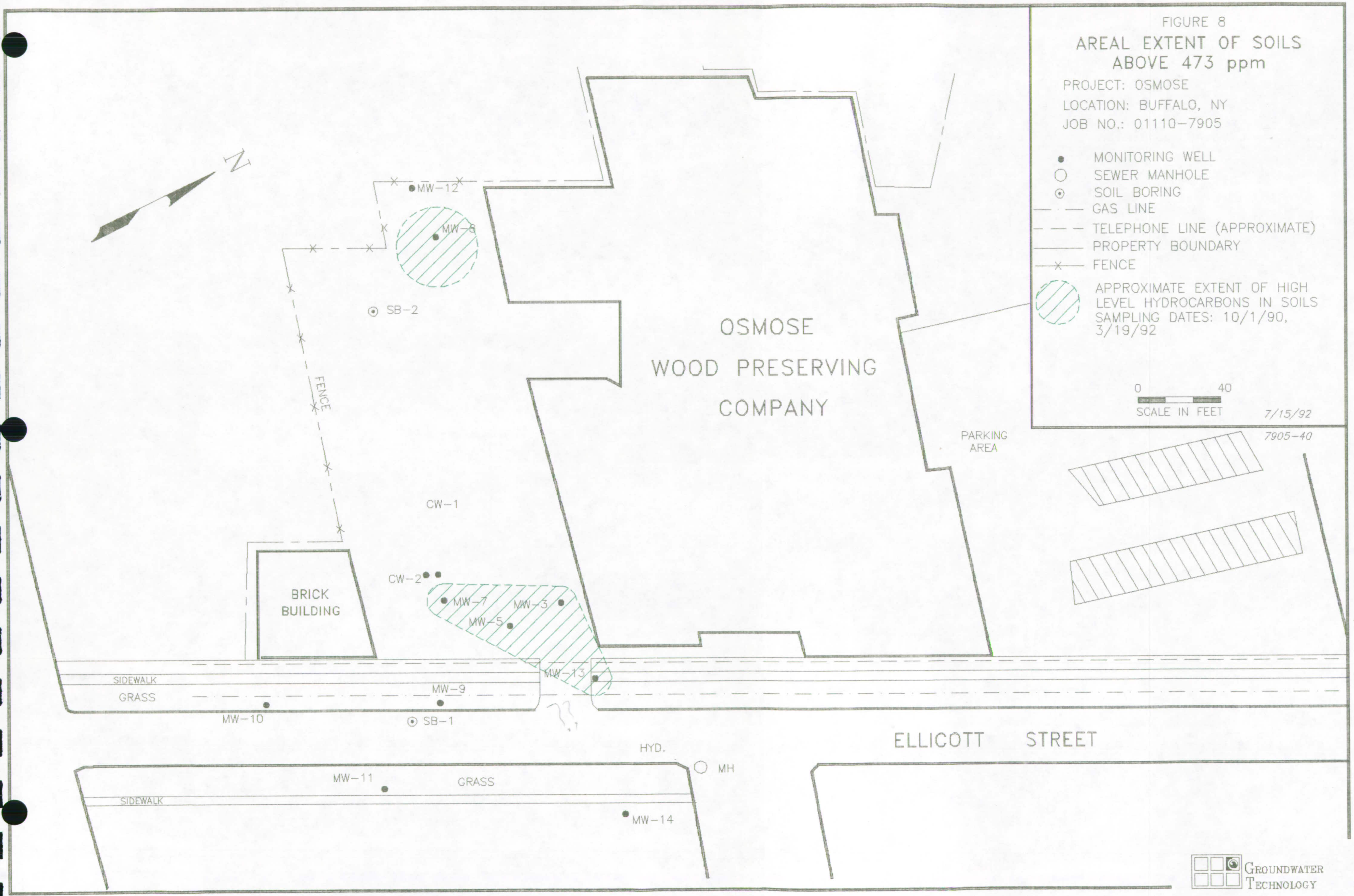


FIGURE 8

AREAL EXTENT OF SOILS ABOVE 473 ppm

PROJECT: OSMOSE
LOCATION: BUFFALO, NY
JOB NO.: 01110-7905

7/15/92

7905-40

During the Supplemental Investigation, total PAH levels above 473 mg/kg were detected at MW-13 at 8 - 10 feet below grade (1,010 mg/kg). Since MW-13 is downgradient from the presumed source area, it is likely to be part of a contiguous zone of soils above 473 mg/kg extending back to the former tank pit. An estimated areal extent of soils containing PAHs above 473 mg/kg, based upon available data, is also shown on Figure 8. Included also is Figure 9, Cross-Section of Soils above 473 mg/kg, which shows the vertical extent of soils above the proposed remedial goals.

Table 4-1 contains an estimate of the volume of soils in the MW-8 and MW-13 areas which contain concentrations of PAHs above the proposed 473 ppm remediation level. This rough estimate identifies approximately 85 yd^3 in the MW-8 area and approximately 370 yd^3 in the MW-13 area.

Based upon an average concentration of 500 mg/kg total PAHs in the impacted soils in the MW-8 vicinity (conservative estimate), approximately 130 pounds of PAHs are present. In the MW-13 area, assuming an average total PAH concentration of 1,000 mg/kg (again very conservative), approximately 1,100 pounds of adsorbed PAHs exist.

TABLE 4-1

ESTIMATED VOLUME OF SOIL > 473 ppm

	APPROXIMATE AREAL EXTENT OF SOILS > 473 ppm	ESTIMATED THICKNESS OF SOILS > 473 ppm	APPROXIMATE VOLUME
MW-8	38 ft. diameter circle (approx. 1150 sq.ft)	2 ft (2-4 feet below grade)	85 cu.yd
MW-13	Triangular area (approx. 2475 sq.ft)	4 ft (near top of water table)	367 cu.yd
Total			452 cu.yd

4.3 Delineation of Separate Phase Hydrocarbons

Light nonaqueous phase liquids (LNAPL) and an intermittent dense nonaqueous phase liquid (DNAPL) have been historically detected on site in PVC monitoring wells MW-3, MW-5 and MW-7. On June 24, 1992 during a routine gauging event, LNAPL was discovered in MW-13 in addition of MW-3, MW-5, and MW-7. LNAPL had not previously been detected in MW-13.

Missing Pages

5.3 Summary of Remedial Alternatives Screening

Based upon review of the remedial alternatives, ozonation was chosen as the technology which best addresses the project objectives. Ozone injection, although a promising technology, is an unproven technology. Ozonation works by oxidizing the single and double bonds in the PAHs. Available literature indicates a very rapid reaction rate can be achieved. Pilot testing is required prior to site wide remediation, to determine site specific reaction rates, design criteria and the effects of site specific geologic conditions. It is anticipated the pilot test will require approximately two months to complete.

It is anticipated that ozone injection will rapidly oxidize adsorbed PAHs in both the saturated and unsaturated zones. As part of the pilot test, an attempt will be made to determine the oxidation reaction rate of the separate phase LNAPL. The pilot test will determine, therefore, if additional technologies are required to recover the separate phase hydrocarbons which exist on site.

The conjunction with the proposed pilot test, two to three shallow soil borings, completed as monitoring wells, will be installed to better define the down and crossgradient extent of separate phase hydrocarbons existing at the site.

Upon completion of the pilot test, Groundwater Technology will provide the results and conclusions; including a scale-up design (if applicable) for site wide remediation..

4.5 Surface Soils

Although elevated levels of PAHs were detected at all sampling locations, all levels were below the proposed ASC of 473 mg/kg.

As referenced in Section 3.3, the PAHs found in the surface soil grab samples are believed to be the result of two brush fires which occurred in 1991. Several observations support this:

- PAH profiles from the surface soil grab samples do not resemble the PAH profiles from the stockpiled soils (profiles included in Appendix F). Profiles of the biocell baseline soil sampling event are used as representative profiles of the stockpiled soils. The profiles from the surface soils show a predominance of complex PAHs - the stockpiled soils do not.
- The reported occurrence of brush fires which are known to produce complex PAHs.

In addition, historical use of adjoining properties for industrial purposes are likely to have produced PAH residuals in soil. These historical uses, obtained from historical maps and directories, included:

- carriage works (located southwest of the current property lines),
- automotive repair shops (located along Ellicott Street located from the Osmose property south to Best Street).
- sheet metal works (Circa 1930 - 1940), and
- plumbing supplier (Circa 1950).

A more detailed description of historical site ownership is presented in the Subsurface Investigation Work Plan, Section 3.1, June 7, 1990.

5.0 CONCLUSIONS

5.1 Remediation Recommendations

The objective of this section is to present remediation objectives for each specific media at the Osmose site. These objectives are believed to be protective of short and long term adverse health and environmental impacts.

5.1.1 On-Site Soils

Based upon available data approximately 500 yd^3 of soils exist at the Osmose site which possess adsorbed levels of PAHs above the proposed ASC of 473 mg/kg. Remediation or removal of these soils is recommended.

5.1.2 On- and Off-Site Groundwater

Risk assessment calculations based upon the most recent groundwater quality data addressed potential risks associated with exposure to dissolved PAHs in on- and off-site groundwater. The total carcinogenic and non-carcinogenic risk estimates were below the proposed criterion for acceptable risk. No remedial action for on- and off-site groundwater to proposed.

5.1.3 Separate Phase Hydrocarbons

The continued presence of separate phase LNAPL in MW-3, MW-5, and MW-7, and the recent occurrence of LNAPL in MW-13 requires remediation. In addition, delineation of the extent of the separate phase plume is recommended.

5.2 Conceptual Remediation Screening

In order to determine the appropriate remedial action for the Osmose site, applicable technologies were screened for technical effectiveness, advantages, disadvantages and cost. The results are shown below in Table 5-1, Remedial Alternative Screening. The screening process assumed the proposed remediation goals, as developed in the risk assessment, and proposed in the Subsurface Investigation Report, June 28, 1991, are accepted in their entirety by the NYS DEC. The results of the preliminary screening process may need to be modified if remedial goals are modified.

The technologies selected for consideration during the screening process also comply with the EPA's and NYS DEC's requirements for:

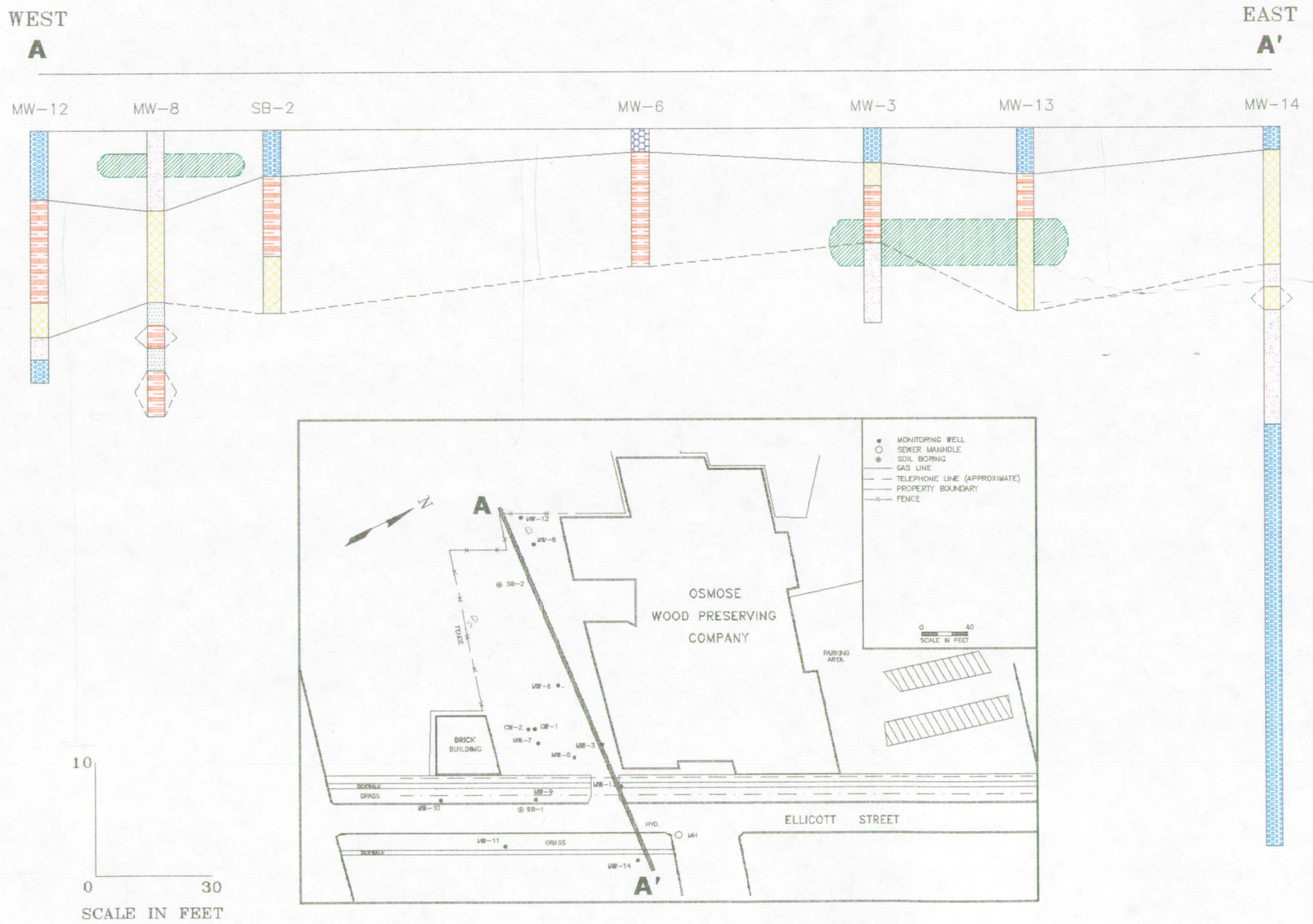
- Overall Protection of Human Health and the Environment;
- Compliance to Applicable or Relevant and Appropriate Requirement (ARARs);
- Long Term Effectiveness;
- Reduction of Toxicity, Mobility, or Volume of Contaminants;
- Short Term Effectiveness;
- Implementability; and
- State Acceptance.

TABLE 5-1

REMEDIAL ALTERNATIVES SCREENING

POTENTIAL REMEDIAL ALTERNATIVE	MEDIA ADDRESSED	FEASIBILITY/ EFFECTIVENESS	ADVANTAGES	DISADVANTAGES	ESTIMATED COST
Soil Vapor Extraction (SVE)	Adsorbed-phase	Low due to tight soils and semi-volatile compounds	Proven technology. Oxygen flow would stimulate biodegradation	Not effective at addressing semi-volatile compounds	N/A
Ozonation	Adsorbed-phase Separate-phase	Requires pilot test to determine applicability	Rapid destruction of adsorbed contaminants	Unproven technology. May require soil fracturing, lower reaction rates on separate-phase	$200 - $300K
In-Situ Bioremediation	Adsorbed-phase	Moderate	Destructive technology. Degrades low-to-medium complexity PAHs.	Low degradation rates of complex PAHs. May require soil fracturing	$350K
Excavation/Incineration	Adsorbed-phase	Moderate	Immediate removal of contaminated soils. May facilitate de-listing of site	Soils below saturated zone. Very expensive. Proximity of foundations and utilities.	$600 - $900K
Separate-phase (SP) only Pumping System	Separate-phase	Good	Cost. Low maintenance and recovery of SP	Influence of each RW limited. Seasonal fluctuation of groundwater will affect recovery rates	$200 - $225K*
Total Fluids Pumping System	Separate-phase	Very good	Increased SP recovery rates through hydraulic control	Requires groundwater treatment system and discharge permit.	$125 - $175K*
Thermal Enhanced Separate-Phase Recovery	Separate-phase	Requires pilot test to determine applicability	Increased SP recovery by lowering viscosity of NAPL	Un-proven technology. Proximity of underground utilities, conduits and foundations.	$150 - $225K*

* Installation plus 3 years monitoring and maintenance



LEGEND

GLACIAL OUTWASH DEPOSITS AND FILL	▨	FINE SANDS
	▨	FINE TO COARSE SANDS WITH SILT/CLAY
	▨	COARSE SANDS WITH GRAVEL
	▨	SILTY SANDS WITH GRAVEL
GLACIAL LAKE DEPOSITS	▨	SILTY SANDS, SILTS, CLAYEY SANDS
	▨	CLAY
	▨	SOILS ABOVE 473 ppm

GROUNDWATER TECHNOLOGY

12 WALKER WAY
ALBANY, NEW YORK 12205
(518) 456-2444

REV. NO.:	DRAWING DATE: 6/29/92	ACAD FILE: 7905-3X

CROSS-SECTION OF SOILS ABOVE 473 ppm

CLIENT: OSMOSE WOOD PRESERVING INC.			PM: BWA
LOCATION: 980 ELLICOTT STREET BUFFALO, NEW YORK			PE/RG: JOG
DESIGNED:	DETAILED: MET	PROJECT NO.: 01110-7905	FIGURE: 9

Manual gauging and bailing twice per week from the PVC wells has occurred as recommended in the Subsurface Investigation Report, June 28, 1991. A total of approximately 120 gallons of LNAPL has been recovered and properly disposed of by Osmose. An estimated volume of 75 - 150 gallons of LNAPL was presented in the Subsurface Investigation Report based upon a true product thickness of 0.1 feet (determined from bail down/recharge tests conducted on MW-3) and a porosity value of 0.3 (clayey sand). Because clay rich soils typically adsorb greater than 60% of separate phase petroleum hydrocarbons, the estimates obtained in the separate phase product volume calculations were considered low.

Separate phase petroleum has not been detected in downgradient wells MW-9, MW-10, MW-11 or MW-14. The existence of separate phase in MW-13 and not in MW-9 may be attributed to the presence of preferential migration pathways from former building foundations and utility conduits.

4.4 Deep Groundwater Quality

Groundwater samples collected from off-site, downgradient deep well MW-14 indicated:

- MW-14 did not possess any confirmed BTEX analytes above groundwater standards;
- the only PAH analytes detected were the same analytes detected in upgradient well MW-12 and in similar concentrations. These levels are presumed to be indicative of regional groundwater quality.

Groundwater samples collected from cluster well CW-1 indicate:

- BTEX analytes are present; however, only benzene exceeds groundwater standards. BTEX levels have decreased since the last sampling event.
- Fifteen PAH analytes were detected at similar or increased concentrations as compared to the previous sampling events.

Based upon the most recent sampling data, Groundwater Technology's Envirologic Data Division has recalculated the total carcinogenic risk estimate and total hazard index for on- and off-site groundwater to be 2.37 x 10^{-6} and 4.05 x 10^{-1}, respectively. Both these index numbers still show that typically acceptable levels of risk exist both on- and off-site.

A

GROUNDWATER
TECHNOLOGY

APPENDIX A

NYS DEC CORRESPONDENCE

New York State Department of Environmental Conservation
600 Delaware Ave., Buffalo, NY 14202-1073

Thomas C. Jorling
Commissioner

September 11, 1991

Mr. Bruce Ahrens
Ground Water Technology, Inc.
12 Walker Way
Albany, NY 12205

Dear Mr. Ahrens:

Osmose Wood Preserving Co.
Buffalo, NY - Site #915143

The Departments of Environmental Conservation (DEC) & Health (DOH) have reviewed the Subsurface Investigation Report by Groundwater Technology dated June, 1991.

The report has provided detailed information describing the hazardous waste problem at the site. In order to definitively determine the extent of contamination, and more accurately describe the potential health risks posed by this site, the following comments must be addressed:

Groundwater:

Groundwater tests data indicates that some wells are contaminated with PAHs and/or BTEX, which are above the New York State Groundwater Standards or Guidance Values. This investigation has not fully determined the extent of groundwater contamination. Installation of two shallow monitoring wells (one upgradient and one downgradient) to determine the extent of plume as recommended in the report, will not be adequate. The test results from GW-1 suggest that the contaminants have reached the bedrock. Therefore, it is recommended that in addition to the two shallow wells, at least one deep downgradient well should also be installed.

Health Risk Assessment:

a. Media- Specific Potential Exposure Pathways (6.5.3). In addition to exposure of workers at the site, identification of potential exposure pathways of the general public must be included as part of the Baseline Risk Assessment. The routes of exposure should include inhalation of vapors (basements) from contaminated off-site groundwater and exposure through dermal absorption and incidental ingestion of contaminated soil. Additional off-site surface soil and groundwater samples may have to be tested to evaluate these routes of exposure. The basis for eliminating potential residential exposure is inadequate and the Baseline Risk Assessment must include possible future residential use of the site.

b. Soil Exposure Point Concentrations (6.5.4.1.1). Reference is made to a personal communication with the New York State Department of Health on air particulate concentrations. A specific contact person must be identified in the references and a narrative provided describing how the 33 ug/m^3 respirable particle concentration was developed;

c. Risk Characteristic (6.6). The Risk Characterization as outlined in USEPA Risk Assessment Guidance document (Risk Assessment Guidance for Superfund, Volume 1,) Human Health Evaluation Manual, Part A, Interim Final, December 1989). Section 8-6 Page 8-25 states that "The results of the baseline evaluation should not be taken as a characterization of absolute risk. It is not the responsibility of the risk assessment to evaluate the significance of the risk program or whether and how the risk should be addressed". The baseline risk assessment should present the risks associated with the no action alternative and should not make risk management decisions about the acceptability of such risks.

d. Calculations of Acceptable Soil Concentration (Table 6-26). It is inappropriate to label the concentrations as presented in Table 6-26 as "acceptable". It is more appropriate to provide soil concentrations at various risk levels - say 10^{-4} to 10^{-6} or 10^{-7}. With respect to the calculations, it appears that the consultants use a toxicity value (administered dose) and an exposure value (absorbed dose). This is inappropriate. The administered dose must be compared to administered dose and not absorbed dose as outlined in Appendix A - Adjustments for Absorption Efficiency.

3. Remediation Objectives:

A review of the nature of contamination indicates the elevated concentrations in soil will continue to impact the groundwater resulting in contravention of standards. Therefore, a separate report which will develop an appropriate range of waste management options should be prepared. Appropriate waste management options that ensure the protection of human health and the environment may involve the complete elimination or destruction of hazardous substances at the site or the prevention of exposure to hazardous substances via engineering controls. It is suggested the report be fashioned similar to a Feasibility Study, however, the scope of the study can be narrowly focused to the soil/dissolved phase problems associated with this site.

I recommend that the comments contained in this letter and other issues pertaining to this site be discussed in a meeting. Please let me know when such a meeting can be held. In the meantime, if you have any questions, please call me at 716-847-4585.

Sincerely yours,

Jaspal Singh Walia

Jaspal S. Walia, P.E.
Environmental Engineer II

JSW/ad

cc: Mr. Martin Doster
Mr. Walter Demick/Mr. William Welling
Mr. Rick Tuers-NYSDOH
Mr. Michael Rider-Osmose

GROUNDWATER
TECHNOLOGY

Groundwater Technology, Inc.
12 Walker Way, Albany, NY 12205
Tel: (518) 456-2444

November 8, 1991

Mr. Jaspal S. Walia, P.E.
New York State Department of
Environmental Conservation
600 Delaware Ave.
Buffalo, New York 14202-1073

01110-5470

RE: Osmose Wood Preserving, Inc.
Site # 915143
Responses to NYS DEC comments

Dear Mr. Walia;

Presented below are responses to the New York State Department of Environmental Conservation's (NYS DEC's) comments on the Subsurface Investigation Report for the above referenced facility. These responses have been developed with Osmose and are presented in the same order as the comments presented in the letter dated September 11, 1991 from the NYS DEC to my attention.

Groundwater:

In addition to the two proposed shallow monitoring wells (one upgradient and one downgradient of the presumed source area) one deep downgradient soil boring will also be installed. The deep downgradient boring will be installed in the right-of-way on the east side of Ellicott Street approximately 80 feet north of MW-11. Continuous soil samples will be collected at all boring locations and screened with a field PID. Based upon the PID results, the "hottest" soil sample from above and below the water table from each boring will be shipped by overnight courier to the contract laboratory for analysis of volatile and semi-volatile hydrocarbons. Standard laboratory reporting and QA/QC protocols will be followed.

The deep boring will extend to the top of bedrock and will be completed as a 2 inch monitoring well. The well will be installed with a 5 foot screened interval just above the bedrock. All wells will consist of 2 inch diameter, threaded, flush-joint, FRP well screen and casing. A properly sized clean sand pack will be placed in the annular space between the well and the borehole. The pack will extend two feet above the screen. A bentonite seal of at least two feet will be placed above the screen. A cement-bentonite grout will be placed above the bentonite seal up to grade.

Offices throughout the U.S., Canada and Overseas

Risk Assessment:

a. (Media-Specific Potential Exposure Pathways). RE: Inclusion of inhalation of vapors (basements) of the general public as part of the Risk Assessment. Inspection of the soil sampling results from soils collected during the installation of monitor well MW-11 (closest soil boring to residential properties) indicates no detectable levels of volatile or semi-volatile compounds in a sample taken from 10' - 12' below grade. A soil sample collected from the same location at 4' - 6' below grade exhibited non-detectable levels of volatile compounds and 0.072 mg/kg total semi-volatiles. The predominant semi-volatile species included pyrene (0.028 mg/kg) and fluoranthene (0.011 mg/kg) which have vapor pressures of 6.85×10^{-7} mm @ 25°C and 5.0×10^{-6} mm @ 25°C, respectively. The absence of volatile compounds, and this low level of semi-volatile compounds, with low vapor pressures, is sufficient data to preclude the inclusion of inhalation of vapors in residential basements as an exposure pathway. Also in support of this exclusion as a potential exposure pathway, the modified soil gas survey (SGS) data collected from VP-13 and VP-14 (the farthest downgradient vapor extraction points, i.e. closest to the residentially zoned property) indicated non-detectable levels of both volatile and semi-volatile compounds. This data also correlates well with the PID readings collected during the installation of MW-11 which indicated that no volatile organic compounds were detected during monitor well installation.

Similarly, non-detectable levels of dissolved volatile and semi-volatile compounds were detected in MW-11 during the second (ASP Category A) sampling round with the exception of benzene at 0.2 ug/l. These low levels of dissolved hydrocarbons would also preclude the inclusion of vapor inhalation (basements) from off-site ground water as an exposure pathway.

During disturbance activities associated with the work plan (drilling) a Community Air Monitoring Plan was enforced. This plan included continuous monitoring downwind of the work zone for particulates with a Mini-Ram. No work stoppages or fugitive losses were recorded. In addition, any soils containing elevated hydrocarbon levels were maintained under a polyethylene cover until loaded into the biocell or properly disposed. The potential for off-site aeolian transport of contaminated soil particles is considered minimal.

Ambient levels of PAHs exist in the environment. Diesel engines produce soots which contain PAH constituents, wood stoves produce similar soots, asphalt pavement contains PAH constituents, humic compounds and other naturally occurring sources can produce low level (ppb) laboratory results. The presence of low levels of PAHs, if present, would be inconclusive as to their origin.

(Basis for eliminating potential residential exposure is inadequate and the Baseline Risk Assessment must include possible future residential use of the site). The possibility of future residential use of the site is very small, therefore it is unrealistic to include this scenario in the Baseline Risk Assessment. Osmose has no plans to develop the site for other than its present industrial use, and does not plan to sell the site anytime in the near future. Osmose's long term development plans include buying property adjacent to the site and continuing industrial activities. The assumption of continuing future industrial use is consistent with the statement in USEPA, 1989 that " an assumption of future residential land use may not be justifiable if the probability that the site will support residential use in the future is exceedingly small".

In addition, evaluating future residential development of the site would require adjusting contaminant concentrations to account for natural biodegradation. If the site were developed for residential purposes in the distant future, it is likely that contaminant concentrations would be greatly reduced by then due to natural degradation.

b. (Air Particulate Concentrations). The reference for the respirable particle concentration will be changed to: NYS DEC 1990. New York State Air Quality Report Ambient Air Monitoring System. DEC Publication, Division of Air. Annual 1990 DAR-91-1.

The following paragraph will be inserted at the end of section 6.5.4.1.1:

> In this study, 24-hour respirable particle concentrations were measured at three locations in the Buffalo area, within the Niagara Frontier Air Quality Control Region. Annual arithmetic means of measured respirable particle concentrations were calculated for the years 1988 to 1990. The means ranged from 21 to 33 ug/m^3. The highest value of 33 ug/m^3 was used to calculate exposure in the risk assessment.

c. (Risk Characterization). The Risk Characterization (section 6.6) was not meant to be a characterization of absolute risk. This section will be revised so that there will be no mention of "acceptable" risks. The assumption of 1 x 10^{-5} as the criterion of acceptable total risk to a receptor (section 6.6, third paragraph) will be removed. The calculated cancer and noncancer risk levels will be compared to the Superfund site remediation goals in NCP, 1990, such as the cancer risk range of 10^{-4} to 10^{-6} and noncancer hazard index of 1.0.

d. (Calculation of Acceptable Soil Concentrations). The word "acceptable" will not be used to refer to cleanup concentrations. Instead, the soil concentrations estimated to correspond with risk levels will be called cleanup concentrations.

In the risk assessment, Groundwater Technology, calculated soil concentrations corresponding to a cancer risk level of 10^{-5}. The calculation based on the risk level of 10^{-5} was felt to be appropriate for occupational exposures. Adult workers generally do not include sensitive subpopulations, such as children or elderly people. As mentioned in the discussion in section 6.6.4 (Comparable and Acceptable Risk), federal agencies have accepted risks greater than 10^{-4} for occupational exposures. For example, the U.S. Supreme Court has suggested that a lifetime occupational cancer risk of 1×10^{-3} be considered the benchmark for significant risk (Rodricks et al., 1987). Therefore, cleanup concentrations corresponding to a cancer risk level of 10^{-5} for occupational exposures is a conservative choice. If NYSDEC feels it is more appropriate to also include the soil concentrations corresponding to cancer risk levels of 10^{-4} and 10^{-6} at the Osmose site, these concentrations can be easily computed by multiplying by 10 the soil concentration corresponding to 10^{-5} and dividing it by 10, respectively. These soil concentrations will also be included in the report.

The risk calculations for the dermal route follow the protocol outlined in Appendix A - Adjustments for Absorption Efficiency (USEPA, 1989). Both the exposure value and the toxicity value are expressed as absorbed doses. The derivation of the absorption factor for the exposure value is explained in section 6.5.5.2.2 (Dermal Contact). The absorption factors for the toxicity values are shown in Tables 6-16 to 6-19 for cancer risk estimates, and in Tables 6-21 to 6-24 for the Hazard Index estimates. These factors are called ADFs (Adjustment Factors). These absorption factors were estimated from the study on which the dose-response information is based. Groundwater Technology will include an explanation in section 6 on the derivation of these ADFs.

<u>Remediation Objectives:</u>

A separate, narrowly focused report will be presented which will evaluate appropriate remedial responses at the Osmose site. Preliminary remedial screening and selection will be presented to, and discussed with the NYS DEC in a scheduled meeting. Subsequent to the meeting, the focussed report will be published.

Please review these responses and contact me at 518-456-2444 with any questions you may have. I am looking forward to confirming a meeting date with you to discuss this project.

Sincerely,

GROUNDWATER TECHNOLOGY, INC.

Bruce W. Ahrens
Project Manager
Senior Engineer

cc: M. Rider/Osmose
I. Chaudhuri/ELD
L. McGlynn/GTI

References

USEPA, 1989. Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual. Office of Emergency and Remedial Response. EPA/540/1-89/002. December 1989.

Rodricks, J.V., S. Brett and G.C. Wrenn. 1987. Significant Risk Decisions in Federal Regulatory Agencies. Environ Corporation, Washington, DC.

Montgomery, J.H. and Welkom, L.M. 1990. Groundwater Chemicals Desk Reference. Lewis Publishers, Inc.

New York State Department of Environmental Conservation

Thomas C. Jorling
Commissioner

RECEIVED
DEC 30 1991

December 24, 1991

Mr. Bruce Ahrens
Ground Water Technology, Inc.
12 Walker Way
Albany, NY 12205

Dear Mr. Ahrens:

Osmose Wood Preserving Company
Buffalo, NY - Site #915143

This is in response to your letter of November 8, 1991 which we received on December 3, 1991. We have viewed your response and have the following comments:

Groundwater:

We find your proposal to install two shallow and one deep overburden monitoring wells acceptable.

However, if the water elevations of deep wells indicate that the groundwater flow on top of the bedrock is influenced by the nearby subway tunnel, additional deep wells on south and west of the site will be required.

Off Site Surface Soil :

When the leaking underground tanks were removed, the contaminated soil was stock piled in the southwest corner of the parking lot for several months. In order to determine whether or not any offsite surficial contamination has occurred due to the pile, it is recommended that 3-4 surface soil samples from the adjoining property be collected and analyzed for PAHs. The sampling locations shall be selected in concurrence with the State representative.

Risk Assessment:

We also find your responses to our Risk Assessment comments and concerns acceptable.

Cleanup Levels:

As agreed in the Consent Order, NYSDEC will provide the cleanup levels upon completion of the next phase of investigation.

Please submit us a schedule for the next phase of investigation. In the mean time, if there are any questions, please feel free to call me at 716-851-7220.

Yours truly,

Jaspal Singh Walia

Jaspal S. Walia, P.E.
Environmental Engineer II

JSW/ad

cc: Mr. Michael Rider - Osmose

GROUNDWATER
TECHNOLOGY

Groundwater Technology, Inc.
12 Walker Way, Albany, NY 12205
Tel: (518) 456-2444

January 23, 1992

REFER: 01110-5470

Mr. Jaspal Walia, P.E.
New York State Department of
Environmental Conservation
270 Michigan Avenue
Buffalo, New York 14203

SUBJECT: Osmose Wood Preserving, Inc.
Site #915143
Responses to December 24, 1991 letter

Dear Mr. Walia,

Presented below are responses to the New York State Department of Environmental Conservation's (NYS DEC's) comments on the Subsurface Investigation Report for the above referenced facility. These responses have been developed with Osmose and are presented in the same order as the comments presented in your letter dated December 24, 1991 to my attention (received on our office December 30, 1991).

Groundwater:

After completion of the deep well installation (which is to be located in the right-of-way on the east side of Ellicott Street), the top of casing will be surveyed to a reference datum. The depth to water will be determined and compared with depth to water in deep well CW-1. If it is determined that the groundwater flow on top of bedrock flows in a direction that differs from the shallow groundwater, an additional well(s) may be required.

Off Site Surface Soil:

In order to determine if surficial contamination has occurred due to the stockpiling of soils at the Osmose facility, 3-4 surface soils will be collected from the adjoining property to the south. Details of the location and analyses performed on these soils will be presented in the Amendments to Work Plan, presented under separate cover.

Risk Assessment:

No comments.

Cleanup Levels:

As agreed upon in the Consent Order, the Respondent (Osmose) has submitted proposed cleanup levels for the IRM bioremediation project to the NYS DEC. These proposed cleanup levels were developed by performing a Baseline Risk Assessment conducted in conformance with EPA guidelines for risk assessment. This Baseline Risk Assessment was part of the Work Plan reviewed and approved by the Division of Hazardous Waste Remediation, NYS DEC. The Baseline Risk Assessment evaluated site specific conditions, performed a toxicity assessment (hazard identification and dose-response evaluation), evaluated potential exposure pathways, and performed a risk characterization. Based upon the review and acceptance of the Baseline Risk Assessment by the NYS DOH (as witnessed by the limited comments on the submitted assessment, and accepted responses to those comments), it is anticipated that the NYS DEC will accept the IRM (Biocell) cleanup levels provided in the Subsurface Investigation Report.

In addition to the IRM cleanup goals, it is also anticipated that the cleanup levels provided by the NYS DEC (upon completion of the next phase of investigation) for on-site, non-biocell soils, and on- and off-site ground water, be consistent with the results of the risk assessment.

On the basis of decision-making precedent by federal regulatory agencies, a risk level of one in one hundred thousand (1×10^{-5}) was selected for this assessment. Based upon this risk, the following soil remediation goals have been proposed:

o	IRM (Biocell) Soils:	473 ppm total PAHs
o	On Site (Non-Biocell) Soils:	473 ppm total PAHs
o	Off Site Soils:	473 ppm total PAHs

The risk assessment addressed potential risks associated with exposure to PAHs in on- and off- site groundwater. The existing total carcinogenic risk estimate for groundwater is approximately 1×10^{-3}. Based upon a telephone conversation with Ms. Janine Dinan, Toxics Integration Branch, EPA, Washington, D.C., regarding acceptable risk levels to be used in determining cleanup goals for sites, the following information was collected:

- o if the total site risk (including all exposure pathways) is between the risk range of 10^{-4} to 10^{-6}, then the EPA considers that further remediation at the site is not necessary. Essentially, this implies an acceptable risk level of 10^{-4} which may be used to estimate cleanup levels.

Ms. Dinan said that even though the ultimate decision of acceptable risk depends upon the reviewing agency, this is the policy that the EPA would follow.

Likewise, the total hazard index for noncarcinogenic risks in groundwater is approximately 6×10^{-2} (far below unity). Based on the Baseline Risk Assessment, the following groundwater remediation goals have been proposed:

o	On Site Groundwater:	No Action
o	Off Site Groundwater:	No Action

A separate document entitled Amendments to Work Plan is being prepared which will detail the next phase of the investigation. A copy of this document will be provided to the NYS DEC for review and comment by January 31, 1992. please feel free to contact me at 518-456-2444 with any comments or questions.

Sincerely,
GROUNDWATER TECHNOLOGY, INC.

Bruce W Ahrens

Bruce W. Ahrens
Project Manager
Senior Engineer

Copy: M. Rider/Osmose
W. Leonard/GTI
I. Chaudhuri/ELD

B

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APPENDIX B
WELL LOGS

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Drilling Log

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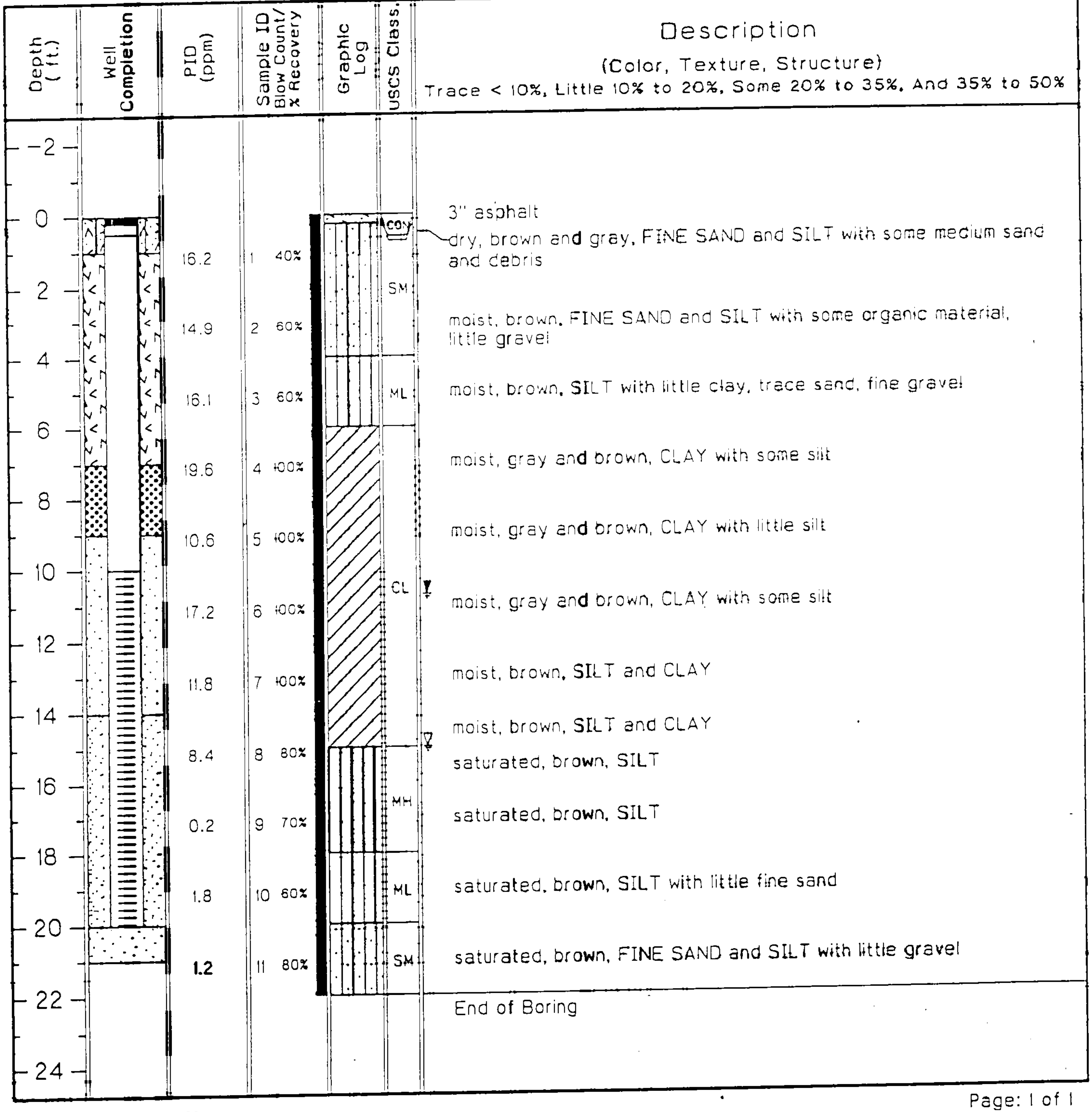
Monitoring Well **MW-12**

See Site Map
For Boring Location

Project *Osmose Supplemental Assessment* Owner *Osmose*
Location *980 Ellicott St. Buffalo, NY* Project No. *0110-7905* Date drilled *3/19/92*
Surface Elev. *102.70 ft.* Total Hole Depth *22 ft.* Diameter *.708 ft.*
Top of Casing *102.20 ft.* Water Level Initial *15.0 ft.* Static *10.75 ft.*
Screen: Dia *2 in.* Length *10 ft.* Type/Size *.020 in.*
Casing: Dia *2 in.* Length *10 ft.* Type *FRP*
Filter Pack Material *Graded Sand* Rig/Core Type *Split Spoon*
Drilling Company *Earth Dimensions* Method *HSA* Permit #
Driller *Tom Wittmeyer* Log By *J. O. Gustafson*
Checked By License No.

COMMENTS:

hole diameter 0-5'=15.5"



PID (ppm)	Sample ID Blow Count/ % Recovery		USCS Class.	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%
			COV	3" asphalt
16.2	1	40%	SM	dry, brown and gray, FINE SAND and SILT with some medium sand and debris
14.9	2	60%		moist, brown, FINE SAND and SILT with some organic material, little gravel
16.1	3	60%	ML	moist, brown, SILT with little clay, trace sand, fine gravel
19.6	4	100%		moist, gray and brown, CLAY with some silt
10.6	5	100%		moist, gray and brown, CLAY with little silt
17.2	6	100%	CL	moist, gray and brown, CLAY with some silt
11.8	7	100%		moist, brown, SILT and CLAY
				moist, brown, SILT and CLAY
8.4	8	80%		saturated, brown, SILT
0.2	9	70%	MH	saturated, brown, SILT
1.8	10	60%	ML	saturated, brown, SILT with little fine sand
1.2	11	80%	SM	saturated, brown, FINE SAND and SILT with little gravel

End of Boring

GROUNDWATER TECHNOLOGY

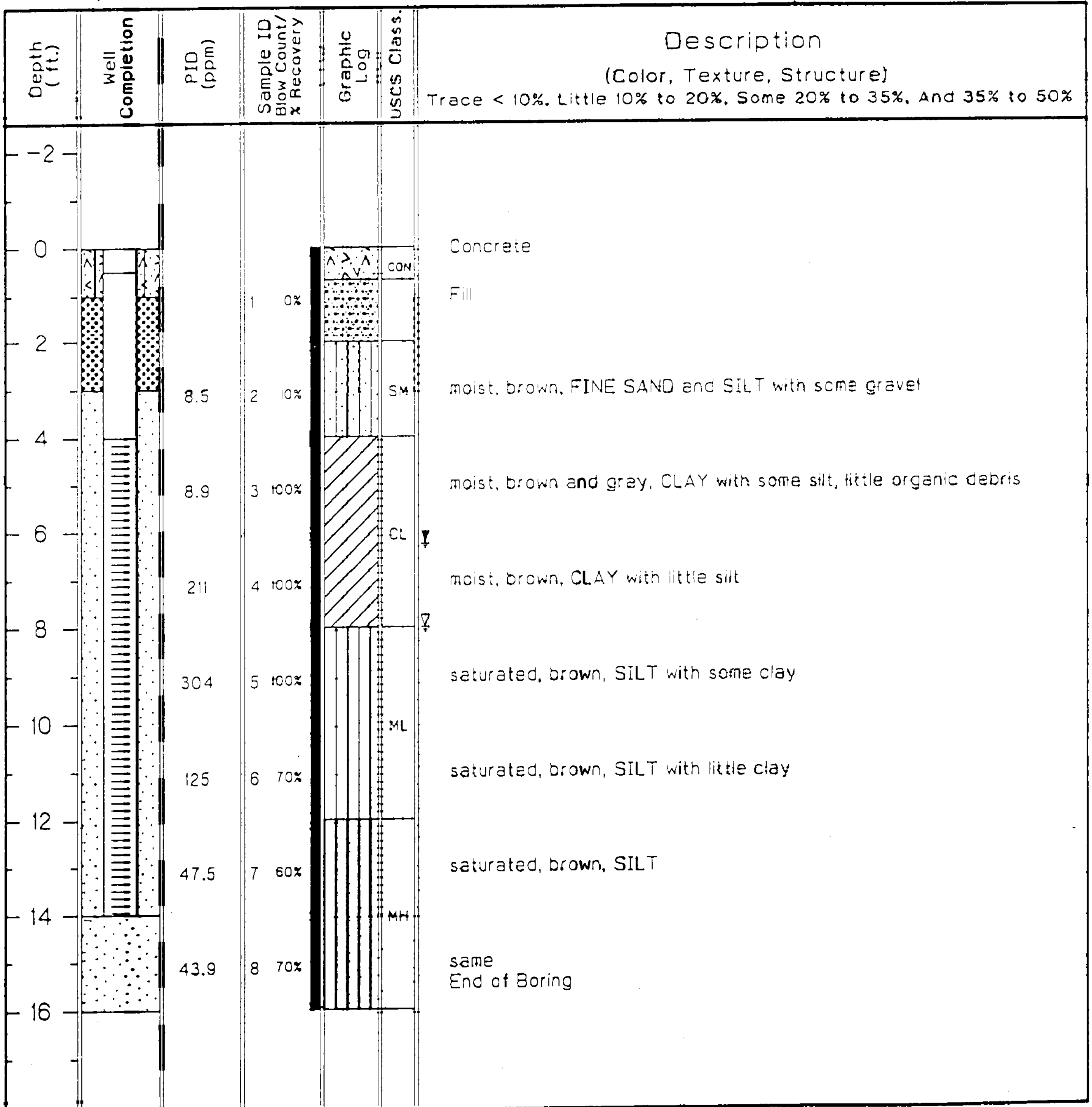
Drilling Log

Monitoring Well **MW-13**

Project *Osmose Supplemental Assessment* Owner *Osmose*
Location *980 Ellicott St. Buffalo, NY* Project No. *0110-7905* Date drilled *3/19/92-*
Surface Elev. *97.28 ft.* Total Hole Depth *16 ft.* Diameter *.708 ft.*
Top of Casing *96.78 ft.* Water Level Initial *8.0 ft.* Static *6.25 ft.*
Screen: Dia *2 in.* Length *10 ft.* Type/Size *.020 in.*
Casing: Dia *2 in.* Length *4 ft.* Type *FRP*
Filter Pack Material *Graded Sand* Rig/Core Type *Split Spoon*
Drilling Company *Earth Dimensions* Method *HSA* Permit #
Driller *Tom Wittmeyer* Log By *J. O. Gustafson*
Checked By License No.

See Site Map For Boring Location

COMMENTS:



PID (ppm)	Sample ID/Blow Count/% Recovery	USCS Class.	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%
		CON	Concrete
	1 0%		Fill
8.5	2 10%	SM	moist, brown, FINE SAND and SILT with some gravel
8.9	3 100%		moist, brown and gray, CLAY with some silt, little organic debris
		CL	
211	4 100%		moist, brown, CLAY with little silt
304	5 100%		saturated, brown, SILT with some clay
		ML	
125	6 70%		saturated, brown, SILT with little clay
47.5	7 60%		saturated, brown, SILT
		MH	
43.9	8 70%		same End of Boring

Drilling Log

GROUNDWATER
TECHNOLOGY

Monitoring Well **MW-14**

See Site Map
For Boring Location

COMMENTS:

Project *Osmose Supplemental Assessment* Owner *Osmose*
Location *980 Ellicott St. Buffalo, NY* Project No. *011107905* Date drilled *3/17/92*
Surface Elev. *97.55 ft.* Total Hole Depth *63 ft.* Diameter *.708 ft.*
Top of Casing *97.05 ft.* Water Level Initial *8.0 ft.* Static *15.0 ft.*
Screen: Dia *2 in.* Length *5 ft.* Type/Size *.020 in.*
Casing: Dia *2 in.* Length *57 ft.* Type *FRP*
Filter Pack Material *Graded Sand* Rig/Core Type *Split Spoon*
Drilling Company *Earth Dimensions* Method *HSA* Permit #
Driller *Tom Wittmeyer* Log By *J. O. Gustafson*
Checked By License No.

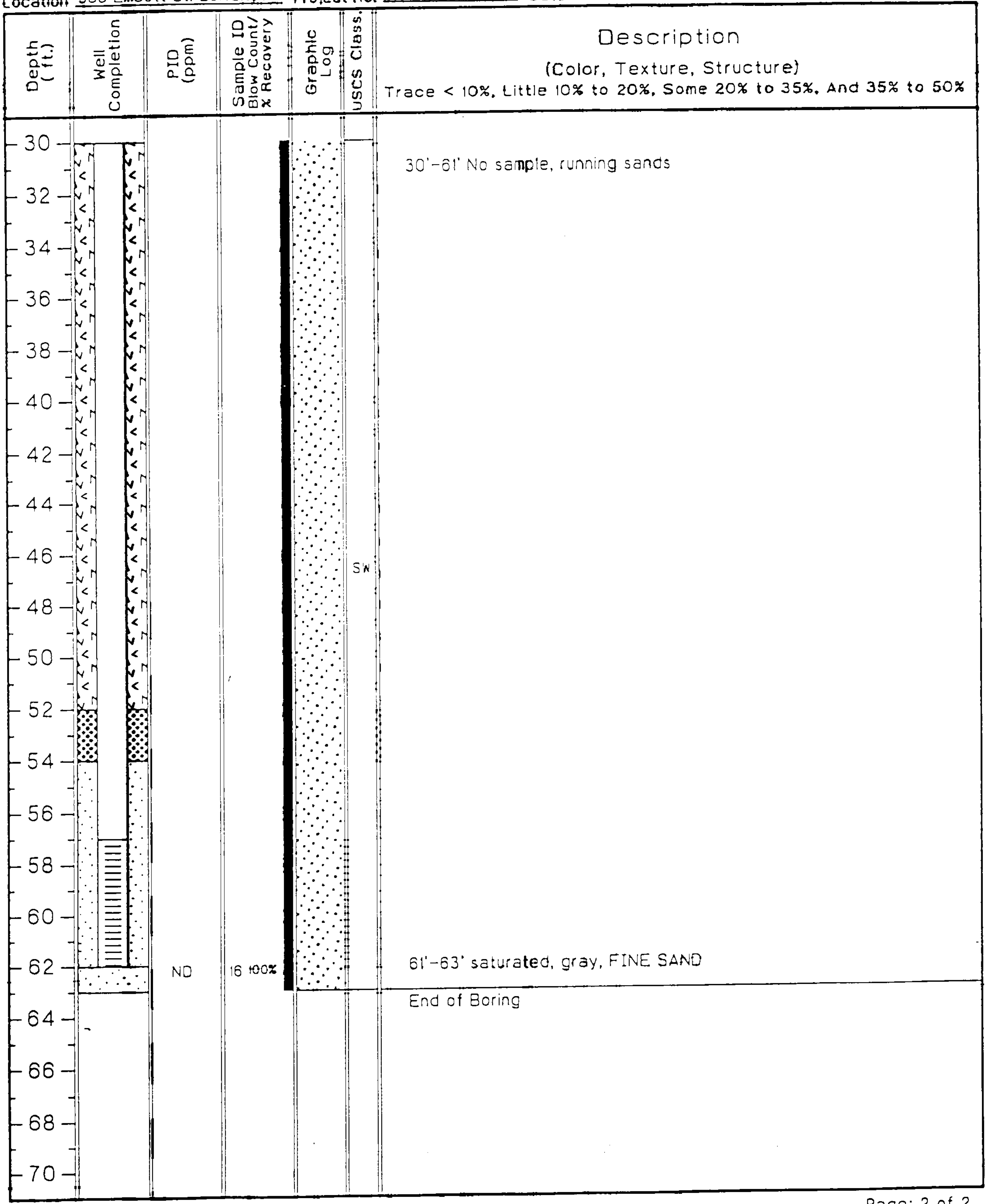
Depth (ft.)	PID (ppm)	Sample ID	Blow Count/ % Recovery	USCS Class.	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%
0–2	ND	1	60%	ML	0'-2' moist, brown, SILT with little sand, gravel, and organic material
2–4	ND	2	50%		2'-4' moist, brown, SILT with little fine sand, trace organic material
4–6	ND	3	75%		4'-6' moist, gray-brown, SILT with some clay
6–8	ND	4	100%		6'-8' moist, red-brown, SILT and CLAY
8–10	ND	5	100%		8'-10' saturated, red-brown, SILT with some clay
10–12	ND	6	100%		10'-12' same
12–14	ND	7	100%		12'-14' saturated, red-brown, SILT with trace medium sand
14–16	ND	8	100%	MH	14'-16' saturated, brown, SILT
16–18	ND	9	100%	SM	16'-18' saturated, brown, FINE SAND and SILT
18–20	ND	10	100%	ML	18'-20' saturated, brown, SILT with some fine sand
20–22	ND	11	100%		20'-22' saturated, gray, SILT and FINE SAND
22–24	ND	12	100%		22'-24' same
24–26	ND	13	100%		24'-26' saturated, gray, SILT with some fine sand, trace coarse sanc
26–28	ND	14	100%	SM	26'-28' saturated, gray, FINE SAND and SILT with trace gravel
28–30	ND	15	100%	SW	28'-30' saturated, gray, FINE SAND with little silt and trace gravel

Drilling Log

GROUNDWATER TECHNOLOGY

Monitoring Well **MW-14**

Project Osmose Supplemental Assessment Owner Osmose
Location 980 Ellicott St. Buffalo, NY Project No. 011107905 Date drilled 3/17/92



Description
(Color, Texture, Structure)
Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%

30'-61' No sample, running sands

61'-63' saturated, gray, FINE SAND

End of Boring

04/28/1992 lithlog-mar92

Drilling Log

GROUNDWATER TECHNOLOGY

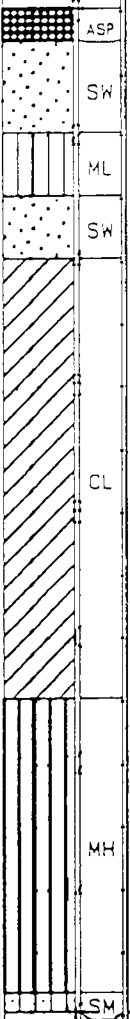
Soil Boring SB-2

See Site Map
For Boring Location

Project *Osmose Supplemental Assessment* Owner *Osmose*
Location *980 Ellicott St. Buffalo, NY* Project No. *01110-7905* Date drilled *3/20/92*
Surface Elev. ______ Total Hole Depth *16 ft.* Diameter *.708 ft.*
Top of Casing ______ Water Level Initial *9.75 ft.* Static ______
Screen: Dia *NA in.* Length *NA ft.* Type/Size *NA in.*
Casing: Dia *NA in.* Length *NA ft.* Type *NA*
Filter Pack Material ______ Rig/Core Type *Split Spoon*
Drilling Company *Earth Dimensions* Method *HSA* Permit # ______
Driller *Tom Wittmeyer* Log By *J. O. Gustafson*
Checked By ______ License No. ______

COMMENTS:

Hole diameter: 0'-5'= 15.5"
5'-14'= 8.5"



Depth (ft.)	PID (ppm)	Sample ID / Blow Count / % Recovery	USCS Class.	Description (Color, Texture, Structure) Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%
-2				
0			ASP	4" asphalt
	7.4	1 50%	SW	0-4' dry, gray, FINE SAND with little silt and gravel
2			ML	2'-3' moist, brown, SILT with some fine sand, trace gravel
	11.2	2 60%	SW	3'-4' saturated, light brown, FINE SAND with little silt
4	6.9	3 70%	CL	4'-6' moist, brown and gray, CLAY with some silt
6	8.5	4 100%		6'-8' moist, brown, CLAY with little silt
8	21.0	5 100%		8'-10' moist, brown, SILT and CLAY, bottom 4" saturated
10				10'-11' saturated, brown SILT and CLAY
	0.8	6 100%	MH	11'-12' saturated, brown, SILT
12	ND	7 70%		12'-14' saturated, brown, SILT
14	ND	8 100%		14'-15.7' SAME
			SM	15.7'-16' saturated, brown, FINE SAND and SILT
16				End of Boring

C

GROUNDWATER
TECHNOLOGY

APPENDIX C

VAPOR MONITORING LOGS

GROUNDWATER
TECHNOLOGY

GROUNDWATER
TECHNOLOGY, INC.

PROJECT NAME Osmose Supplemental Assessment
PROJECT NUMBER 011107905
DATE OF SAMPLING 3/17/92
CONTAMINANTS

RESULTS OF VAPOR MONITORING

TIME	IONIZATION DETECTOR READING			EXPLOSIMETER READING		RADIATION MONITOR READING	LOCATION	PURPOSE	INITIALS
	FID	10.2eV PID MicroTip	11.7eV PID	% LEL	% O_2	mR/hr			
10:00		0.0		0.0	20.9		parking lot	background	JOG
1:00		0.0		0.0	20.9		MW-14	monitor drilling	JOG
1:10		0.0		0.0	20.9		↓	↓	JOG
1:25		0.0		0.0	20.9		↓	↓	JOG
1:40		0.0		0.0	20.9		↓	↓	JOG
2:00		0.0		0.0	20.9		↓	↓	JOG
3:00		0.0		0.0	20.9		↓	↓	JOG
4:00		0.0		0.0	20.9		↓	↓	JOG
5:00		0.0		0.0	20.9		↓	↓	JOG
5:00		0.0		0.0	20.9		parking lot	background	JOG

GROUNDWATER
TECHNOLOGY, INC.

PROJECT NAME Osmose Supplemental Assessment
PROJECT NUMBER 01107905
SAMPLING DATE 3/17/92

Sampler - JOG

MINI-RAM SAMPLING LOG

TIME	READING	SA	TWA ~~TLV~~	SAMPLE LOCATION
10:00 AM	0.00	0.00	0.00	parking lot - background
1:00 PM	0.00	0.00	0.00	MW-14 - drilling
1:10	0.00	0.00	0.00	↓
1:25	0.00	0.00	0.00	
1:40	0.01	0.00	0.00	
2:00	0.02	0.00	0.01	
3:00	0.00	0.00	0.00	
4:00	0.00	0.00	0.00	
5:00	0.00	0.00	0.00	
5:00	0.00	0.00	0.00	parking lot - background

GROUNDWATER
TECHNOLOGY, INC.

PROJECT NAME Osmose Supplemental Assessment
PROJECT NUMBER 01107905
DATE OF SAMPLING 3/18/92
CONTAMINANTS

RESULTS OF VAPOR MONITORING

TIME	IONIZATION DETECTOR READING			EXPLOSIMETER READING		RADIATION MONITOR READING	LOCATION	PURPOSE	INITIALS
	FID	10.2eV PID MicroTip	11.7eV PID	% LEL	% O_2	mR/hr			
8:00		0.0		0.0	20.9		parking lot	background	JOG
9:00		0.0		0.0	20.9		MW-14	monitor drilling	JOG
10:00		0.0		0.0	20.9				JOG
11:00		0.0		0.0	20.9			↓	JOG
12:00		0.0		0.0	20.9			monitor well installation	JOG
1:00		0.0		0.0	20.9				JOG
2:00		0.0		0.0	20.9				JOG
3:00		0.0		0.0	20.9				JOG
4:00		0.0		0.0	20.9				JOG
5:00		0.0		0.0	20.9		↓	↓	JOG
5:00		0.0		0.0	20.9		parking lot	background	JOG

GROUNDWATER
TECHNOLOGY, INC.

PROJECT NAME Osmose Supplemental Assessment
PROJECT NUMBER 011107905
SAMPLING DATE 3/18/92

MINI-RAM SAMPLING LOG

TIME	READING	SA	TWA ~~TLV~~	SAMPLE LOCATION
8:00	0.00	0.00	0.00	parking lot - background
9:00	0.00	0.00	0.00	mw-14 - drilling
10:00	0.00	0.00	0.00	↓
11:00	0.02	0.00	0.00	↓
12:00	0.00	0.00	0.00	mw-14 - setting well
1:00	0.00	0.00	0.00	↓
2:00	0.00	0.00	0.00	↓
3:00	0.00	0.00	0.00	↓
4:00	0.00	0.00	0.00	↓
5:00	0.00	0.00	0.00	↓
5:00	0.00	0.00	0.00	parking lot - background

GROUNDWATER
TECHNOLOGY, INC.

PROJECT NAME Osmose Supplemental Assessment
PROJECT NUMBER 011107905
DATE OF SAMPLING 3/19/92 Page 1 of 2
CONTAMINANTS

RESULTS OF VAPOR MONITORING

TIME	IONIZATION DETECTOR READING			EXPLOSIMETER READING		RADIATION MONITOR READING	LOCATION	PURPOSE	INITIALS
	FID	10.2eV PID MicroTip	11.7eV PID	% LEL	% O_2	mR/hr			
7:00		0.0		0.0	20.9		parking lot	background	JOG
8:00		0.0		0.0	20.9		MW-14	monitor well installation	JOG
9:00		0.0		0.0	20.9		↓	↓	JOG
10:00		0.0		0.0	20.9		↓	↓	JOG
11:00		0.0		0.0	20.9		↓	monitor site clean-up	JOG
12:00		0.0		0.0	20.9		parking lot	monitor steam cleaning	JOG
1:00		0.0		0.0	20.9		↓	↓	JOG
2:00		0.0		0.0	20.9		MW-12	monitor drilling	JOG
2:10		0.0		0.0	20.9		↓	↓	JOG
2:25		0.0		0.0	20.9		↓	↓	JOG
2:45		0.0		0.0	20.9		↓	↓	JOG
3:05		0.0		0.0	20.9		↓	↓	JOG
3:45		0.0		0.0	20.9		↓	↓	JOG
4:30		0.0		0.0	20.9		↓	monitor well installation	JOG
5:30		0.0		0.0	20.9		↓	monitor site clean-up	JOG
5:45		0.0		0.0	20.9		MW-13	monitor drilling	JOG

GROUNDWATER
TECHNOLOGY, INC.

PROJECT NAME
PROJECT NUMBER
DATE OF SAMPLING 3/19/92 Page 2 of 2
CONTAMINANTS

RESULTS OF VAPOR MONITORING

TIME	IONIZATION DETECTOR READING			EXPLOSIMETER READING		RADIATION MONITOR READING	LOCATION	PURPOSE	INITIALS
	FID	10.2eV PID MicroTip	11.7eV PID	% LEL	% O_2	mR/hr			
6:00		8.2		0.0	20.9		MW-13	monitor drilling	JOG
6:15		0.9		0.0	20.9		↓	↓	JOG
6:30		0.0		0.0	20.9		↓	↓	JOG
7:15		0.0		0.0	20.9		↓	monitor well installation	JOG

GROUNDWATER
TECHNOLOGY, INC.

PROJECT NAME Osmose Supplemental Assessment
PROJECT NUMBER 011107905
SAMPLING DATE 3/19/92 (Page 1 of 2)

MINI-RAM SAMPLING LOG

TIME	READING	SA	TWA ~~TLV~~	SAMPLE LOCATION
7:00	0.00	0.00	0.00	parking lot - background
8:00	0.00	0.00	0.00	MW-14 - Well installation
9:00	0.00	0.00	0.00	↓
10:00	0.00	0.00	0.00	
11:00	0.00	0.00	0.00	MW-14 - clean-up
12:00	0.00	0.00	0.00	parking lot - steam cleaning
1:00	0.00	0.00	0.00	↓
2:00	0.00	0.00	0.00	MW-12 - monitor drilling
2:10	0.00	0.00	0.00	↓
2:25	0.00	0.00	0.00	
2:45	0.00	0.00	0.00	
3:05	0.00	0.00	0.00	
3:45	0.00	0.00	0.00	
4:30	0.00	0.00	0.00	MW-12 - well installation
5:30	0.00	0.00	0.00	MW-12 - clean-up
5:45	0.00	0.00	0.00	MW-13 - drilling

GROUNDWATER
TECHNOLOGY, INC.

PROJECT NAME
PROJECT NUMBER
SAMPLING DATE 3/19/92 (Page 2 of 2)

MINI-RAM SAMPLING LOG

TIME	READING	SA	TWA ~~TLV~~	SAMPLE LOCATION
6:00	0.00	0.00	0.00	MW-13 – drilling
6:15	0.00	0.00	0.00	↓
6:30	0.00	0.00	0.00	
7:15	0.00	0.00	0.00	MW-13 – well installation

GROUNDWATER
TECHNOLOGY, INC.

PROJECT NAME Osmose Supplemental Assessment
PROJECT NUMBER 011107905
DATE OF SAMPLING 3/20/92
CONTAMINANTS

RESULTS OF VAPOR MONITORING

TIME	IONIZATION DETECTOR READING			EXPLOSIMETER READING		RADIATION MONITOR READING	LOCATION	PURPOSE	INITIALS
	FID	10.2eV PID MicroTip	11.7eV PID	% LEL	% O_2	mR/hr			
8:00		0.0		0.0	20.9		parking lot	background	JOG
9:00		0.0		0.0	20.9		↓	monitor steam cleaning	JOG
10:00		0.0		0.0	20.9		SB	monitor drilling	JOG
10:10		0.0		0.0	20.9				JOG
10:25		0.0		0.0	20.9				JOG
10:40		0.0		0.0	20.9				JOG
10:55		0.0		0.0	20.9				JOG
12:00		0.0		0.0	20.9			↓	JOG
1:30		0.0		0.0	20.9			monitor grouting	JOG
2:15		0.0		0.0	20.9		↓	monitor clean-up	JOG

GROUNDWATER
TECHNOLOGY, INC.

PROJECT NAME Osmose Supplemental Assessment
PROJECT NUMBER 011107905
SAMPLING DATE 3/20/92

MINI-RAM SAMPLING LOG

TIME	READING	SA	TWA ~~TLV~~	SAMPLE LOCATION
8:00	0.00	0.00	0.00	parking lot - background
9:00	0.00	0.00	0.00	parking lot - steam cleaning
10:00	0.00	0.00	0.00	SB - drilling
10:10	0.00	0.00	0.00	↓
10:25	0.00	0.00	0.00	
10:40	0.00	0.00	0.00	
10:55	0.00	0.00	0.00	
12:00	0.00	0.00	0.00	
1:30	0.00	0.00	0.00	SB - grouting
2:15	0.00	0.00	0.00	SB - clean-up

D

GROUNDWATER
TECHNOLOGY

APPENDIX D

DATA VALIDATION REPORT

DATA VALIDATION REPORT
OSMOSE WOOD PRESERVING, INC.
BUFFALO, NEW YORK SITE

AROMATIC VOLATILE ORGANICS ANALYSIS

Samples Collected: March 17-20, 1992

Report Prepared: April 28, 1992

Prepared By:
Groundwater Technology, Inc.
223 Wilmington-West Chester Pike
Chadds Ford, Pennsylvania 19317

GROUNDWATER
TECHNOLOGY

Preface to Data Validation

The concept of data validation has been developed over the past decade to assure that the quality of the data generated as a result of laboratory analysis by USEPA's Contract Laboratory Program protocols is acceptable. Guidelines for data validation have been established by the USEPA Data Review Work Groups, for the Hazardous Site Evaluation Division, and are published in documents entitled, Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses, and Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses.

These documents are available to the public and will be strictly adhered to during the data review of these packages analyzed by GTEL Environmental Laboratories, Milford, New Hampshire. Before reading the data validation reports prepared by Groundwater Technology, Inc., some insight and explanation is offered for the application of the data.

The purpose of the data validation report is to inform the data user of problems that were encountered during the analysis of the samples. The qualifiers section states the major points of concern and places restrictions on the usage of data with "qualifiers" such as B, J, or R. Qualification of data with respect to the amount of contamination in the blanks (method, field, rinsate or trip) associated with a set of samples is a dependable means of assessing procedures, container cleanliness and laboratory procedure. For example, if acetone, a common laboratory contaminant, was found at 50 μg/l in a trip blank, 15 μg/l in the laboratory's method blank and 20 μg/l in the field blank, a qualifier would be written stating that, "all positive results in samples x,y,z, associated with the trip blank are questionable." This means that any positive results from a sample less than ten times the amount found in the blank having the highest contamination source (in this case the trip blank, at 50 μg/l) is probably from the blank. Any samples related to this trip blank having results less than 500 μg/l are questionable, attributable to the degree of container cleanliness. Other examples are attached.

Another area of concern is holding time and preservation of the samples. The chain-of-custody is examined for the date of sampling, date samples were relinquished to the courier, preservation methods, date received at the laboratory and any comments that were made by the laboratory's sample custodian. The date of sample collection is compared with the date of sample receipt, extraction and/or analysis; if the number of days between sample collection and sample extraction/analysis is outside of the acceptable range then these results must be considered

estimated. The methods of sample preservation used can alter the acceptable holding time range. The effects of long-term storage even under refrigeration cannot be predicted due to variable matrices from site to site, or from sample to sample on site.

A qualifier may also be applied to the data if surrogate spike recoveries fall outside the quality control limits. Surrogate spike compounds are added to every sample and blank to monitor the laboratory's performance, however the sample matrix itself may contribute to the poor recovery of surrogate compounds. For example, samples with interferences or high analyte concentrations may cause unusual surrogate recoveries. Sometimes reanalysis (or re-extraction) is necessary to determine if the source of the problem is laboratory- or sample matrix-related.

Initial and continuing calibrations, along with GC/MS tuning are evaluated and sometimes qualified for individual compounds (such as 2-butanone) in the volatile organics fraction. It is a chronic problem for many laboratories to obtain steady response factors for 2-butanone (methyl ethyl ketone) that are stable enough to fall inside the specified criteria. False negatives and valid detection limits are also of concern when qualifying the initial and continuing calibrations, and the GC/MS tuning.

The evaluation of blind field duplicates, matrix spike (MS) and matrix spike duplicates (MSD), are of importance in assessing field sampling techniques, sample homogeneity, representativeness of sample points, and laboratory precision. A relative percent difference is calculated for three or more samples. Criteria are listed on the attached sheets for field duplicates and MS/MSDs. It should be noted that a data package cannot be qualified solely on MS/MSD data. The MS/MSD data merely confirm matrix interferences and can be used as support for other qualifiers such as surrogate spike recoveries.

Identification of positively identified compounds is checked with respect to the guidelines. Also the compound quantitation calculation and the feasibility of obtaining the specified detection limits are checked.

The tentatively identified compounds (TICs) found by the mass spectral library search are checked for goodness of "fit" against the reference spectrum. If there is a discrepancy between the laboratory analyst's interpretation of the spectrum and Groundwater Technology's interpretation, a qualifier is placed on the compound in question stating that it is to be considered an unknown or an isomer of that compound. Most often the laboratory will qualify the results as estimated, due to the

fact that standards for that TIC have not been run (nor are they required). Quantitation of TICs is based on the total quantitation method.

Data that may not meet certain criteria rarely cause an entire case to be qualified as unusable (R) because other parameters validated are acceptable. However, data for particular analytes may be discarded due to calibration response factors of questionable integrity.

The findings section gives standard as well as judgmental reasons as to why the data are qualified. The summary explains point by point each qualifier and places a general status (acceptable, provisional or acceptable) on the entire data package.

QUALIFIER DEFINITIONS

R - Unusable data.

U - Analyzed but undetected.

J - Estimated.

UJ - Undetected but the associated value is estimated and may inaccurate or imprecise.

B - Compound has been detected in a blank. Indicates that the compound's presence is qualitatively questioned, due to contamination in an associated blank.

DF - Dilution Factor.

The following are examples of application of the blank qualification guidelines. Certain circumstances may warrant deviations from these guidelines.

Case 1: Sample result is greater than the Contract Required Quantitation Limit (CRQL), but is less than the required amount (5x or 10x) when compared to the blank result.

	RULE 10x	RULE 5x
Blank Result	7	7
CRQL	5	5
Sample Result	60	60
Qualified Sample Result	60B	60B

In the example for the 10x rule, a sample result less than 70 (10 x 7) would be qualified as questionable (B). In the case of the 5x rule, sample result less than 35 (5 x 7) would also be qualified as questionable (B).

Case 2: Sample result is less than the CRQL, and is also less than the required amount (5x or 10x) when compared to the blank result.

	RULE 10x	RULE 5x
Blank Result	6	6
CRQL	5	5
Sample Result	4J	4J
Qualified Sample Result	4B	4B

Case 3: Sample result is greater than the CRQL and the required amount (5x or 10x) when compared to the blank result.

	RULE 10x	RULE 5x
Blank Result	10	10
CRQL	5	5
Sample Result	120	60
Qualified Sample Result	120	60

For both the 10x and 5x rules, sample results exceeded the adjusted blank results of 100 (10 x 10) and 50 (5 x10), respectively.

AROMATIC VOLATILE ORGANICS ANALYSIS
OSMOSE WOOD PRESERVING, INC.
BUFFALO, NEW YORK SITE

1.0 INTRODUCTION

This review addresses eight soil samples and three aqueous quality control samples collected March 17-20, 1992 by Groundwater Technology, Inc. Albany, New York, and submitted to GTEL Environmental laboratories, Inc., Milford, New Hampshire for the analysis of aromatic volatile organic compounds.

Items reviewed in this data package include:

- chain-of-custody records,
- analytical holding times,
- calibration verification,
- all applicable blank samples,
- matrix spike recoveries,
- duplicate spike recoveries,
- data completeness, and
- an overall assessment of the batch.

It should be noted that these samples were analyzed using EPA methodology, but only a "Blue Level" data package was compiled. Therefore, no raw data was available to the reviewer. Where applicable, the reviewer used the laboratory QA nonconformance summary to validate the associated client sample results. Also, the results for total xylenes were not included in the original laboratory data package. The laboratory reissued the report to include the total xylenes results.

TABLE 1.0
APPLICABLE SAMPLE NUMBERS

GTI ID	LAB ID
MW-13 (6-8)	03652-05
MW-13 (8-10)	03652-06
SB-2 (2-4)	03652-13
MW-14 (10-12)	03652-01
MW-14 (61-63)	03652-02
MW-12 (6-8)	03652-03
MW-12 (18-20)	03652-04
SB-2 (8-10)	03652-14
RINSEATE BLANK	03652-10
FIELD BLANK	03652-11
TRIP BLANK	03652-12

TABLE 2.0
DATA QUALIFIERS

ANALYTE	SAMPLE ID(S)	ISSUE(S)	QUALIFIER(S)
TOLUENE	MW-13 (61-63)	(1)	B
TOLUENE	MW-12 (18-20)	(1)	B

(1) blank contaminant

2.0 FINDINGS AND DISCUSSION

- The results for toluene in samples MW-13 (61-63) and MW-12 (18-20) are questionable due to blank contamination. Specifically, toluene was detected in the associated rinseate blank at a concentration of 0.6 μg/l. Using the blank contamination rule for common contaminants, any toluene detected in the client samples at a concentration less than 6.0 μg/l (0.6 μg/l x 10) is considered questionable. Rinseate blank contamination can be an indication of improper decontamination procedures in the field.

3.0 SUMMARY

After thoroughly reviewing all available data it was determined that the laboratory has adequately performed all analyses since:

- chain-of-custody records were complete,
- calibration verification results were acceptable,
- all applicable laboratory blank samples were contaminant-free,
- matrix spike recoveries were acceptable,
- duplicate sample results were acceptable,
- surrogate spike recoveries were acceptable, and
- data were complete.

Although no major problems were associated with this batch, two minor issues were addressed:

- The matrix spike recovery for toluene is incorrect as reported (102 %R). The actual recovery is 107 %R. These results are still within the acceptability limits, 40-160 %R.
- The trip blank sample associated with this batch was analyzed one day past the fourteen day holding time. Actual sample results may be slightly higher.

For specifics on this quality assurance review, refer to the attached support documents.

GROUNDWATER TECHNOLOGY, INC.

Kimberly McGhee-Gould

Kimberly McGhee-Gould
QA/QC Supervisor

Date: April 28, 1992

KMG/ll:P:\projects\osmose\voc.rpt

AROMATIC VOLATILE ORGANIC SUPPORT DOCUMENTATION

GROUNDWATER
TECHNOLOGY

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

QA NONCONFORMANCE SUMMARY

1.0 Method Blank Analysis

1.1 Zero target compound(s) were found in the method blank.

2.0 Calibration Verification

2.1 The control limits were exceeded for zero calibration check compounds.

3.0 Surrogate Compound Recoveries

3.1 The recovery limits were exceeded for one surrogate compound for EPA Method 8310 in two samples due to interference from the presence of high concentrations of analytes in the samples. One surrogate out of control does not invalidate the reported results.

4.0 Matrix Spike (MS) Accuracy

4.1 The recovery limits were exceeded in the batch spike for zero compounds.

5.0 Sample Duplicate Precision

5.1 The maximum relative percent difference (RPD) was/were exceeded for zero compound(s) in the sample duplicate.

6.0 Sample Integrity

6.1 Sample handling and holding time criteria were met.

Page 1 of 1

DATA SUMMARY FORM: ORGANICS

Aromatic Volatile Organics in Soil

SOIL SAMPLES

(μg/Kg)

Site Name: OSmose

Case #: ______ **Sampling Date(s):** 3/17/92 - 3/20/92

To calculate sample quantitation limit:
(QL * Dilution Factor) / ((100 - % moisture)/100)

	Sample No.	MW-13 (6-8)		MW-13 (8-10)		SB-2 (2-4)		MW-14(10-12)		MW-14(61-63)		MW-12(6-8)		MW-12 (18-20		SB-2(8-10)			
	Dilution Factor																		
	% Moisture	12.2		13.6		16.6		18.1		13.2		20.0		14.2		11.4			
	Location																		
QL	COMPOUND																		
	Benzene																		
	Toluene			.38						4.1	B	7.5		5.8	B	6.8			
	Ethyl Benzene			.52						2.0		3.2		2.0		2.3			
	Chlorobenzene																		
	1,2-Dichlorobenzene																		
	1,3-Dichlorobenzene																		
	1,4-Dichlorobenzene																		
	Xylenes (total)	3.0		6.3						8.3		14		9.3		11			

QL = Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS
revised 07/90

Page 1 of 1

DATA SUMMARY FORM: ORGANICS

Aromatic Volatile Organics in Water

WATER SAMPLES

($\mu g/L$)

Site Name: Osmose

Case #: ______ Sampling Date(s): 3/17/92 - 3/20/92

To calculate sample quantitation limit:
(QL * Dilution Factor)

		Rinseat Blk.		Field Blk		Trip Blank													
	Benzene																		
	Toluene	0.6																	
	Ethyl Benzene																		
	Chlorobenzene																		
	1,2-Dichlorobenzene																		
	1,3-Dichlorobenzene																		
	1,4-Dichlorobenzene																		
	Xylenes (total)																		

QL = Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS
revised 07/90

Page / of /

GROUNDWATER TECHNOLOGY, INC.
VOLATILE HOLDING TIMES

Client: Osmose
Job # : 011-105-470 Matrix: sol/aq Units: ug/kg/l
Audit Date: 04/22/92
Audited By: KMG

Sample Number	Preserve		Sample Date	Date Rec'd	Analysis Date	Time	Guidelines			
	Yes	No					ECRA	40CFR	SW-846 CLP	Out
MW13 6-8	✓		3/19/92	3/24/92	3/26/92	N/A			✓	
MW13 8-1			3/19/92		3/26/92				✓	
SB2 2-4			3/20/92		3/26/92				✓	
MW14 10-			3/17/92		3/30/92				✓	
MW14 61-			3/18/92		3/31/92				✓	
MW12 6-8			3/19/92		3/31/92				✓	
MW12 18-			3/19/92		3/31/92				✓	
SB2 8-10			3/20/92		3/31/92				✓	
RINSEATE			3/20/92		4/1/92				✓	
FIELD BL			3/20/92		4/1/92				✓	
TRIP BLK			3/17/92		4/1/92					✓

soil samples preserved with ice to 4°C
aqueous samples preserved with ice to 4°C
trip blank preserved w/HCL
Rinseate and field blanks preserved w/HCL

N/A - information not available to reviewer

Guideline Holding Times:	ECRA	40 CFR Part 136	SW-846 (CLP)
Solid			14 days
Liquid			7 days (unpreserved) 14 days (preserved)

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

ANALYTICAL RESULTS

Aromatic Volatile Organics in Soil
Modified EPA Method 8020[a]

GTEL Sample Number		03652-05	03652-06	03652-13	--
Client Identification		MW-13 (6-8)	MW-13 (8-10)	SB-2 (2-4)	--
Date Sampled		03/19/92	03/19/92	03/20/92	--
Date Analyzed		03/26/92	03/26/92	03/26/92	--
Analyte	Detection Limit, mg/kg	Concentration, mg/kg (dry)			
Benzene	0.10	< 0.11	< 0.11	< 0.11	--
Toluene	0.25	< 0.28	**0.38**	< 0.27	--
Ethyl Benzene	0.40	< 0.44	**0.52**	< 0.44	--
Xylenes (total)	0.85	3.0	**6.3**	< 0.93	--
Chlorobenzene	0.20	< 0.22	< 0.23	< 0.22	--
1,2-Dichlorobenzene	0.26	< 0.29	< 0.29	< 0.29	--
1,3-Dichlorobenzene	0.26	< 0.29	< 0.29	< 0.29	--
1,4-Dichlorobenzene	0.20	< 0.22	< 0.23	< 0.22	--
Detection Limit Multiplier[b]		1.10	1.13	1.10	--
Percent Solids		87.8	86.4	83.4	--

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Methanolic extraction by EPA Method 5030 (purge and trap). Method modified to include additional compounds.

[b] The detection limit multiplier indicates the adjustments made to the data and detection limits as a result of dilutions and percent solids.

GTEL
ENVIRONMENTAL LABORATORIES, INC.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

ANALYTICAL RESULTS

Aromatic Volatile Organics in Soil - Low Level
Modified EPA Method 8020[a]

GTEL Sample Number		03652-01	03652-02	03652-03	03652-04
Client Identification		MW-14 (10-12)	MW-14 (61-63)	MW-12 (6-8)	MW-12 (18-20)
Date Sampled		03/17/92	03/18/92	03/19/92	03/19/92
Date Analyzed		03/30/92	03/31/92	03/31/92	03/31/92
Analyte	Detection Limit, ug/kg	Concentration, ug/kg (dry)			
Benzene	1.0	< 0.9	< 1.0	< 1.0	< 0.9
Toluene	1.7	< 1.6	4.1	7.5	5.8
Ethyl Benzene	1.0	< 0.9	2.0	3.2	2.0
Xylenes (total)	2.0	< 1.9	8.3	14	9.3
Chlorobenzene	1.0	< 0.9	< 1.0	< 1.0	< 0.9
1,2-Dichlorobenzene	1.7	< 1.6	< 1.6	< 1.7	< 1.6
1,3-Dichlorobenzene	1.7	< 1.6	< 1.6	< 1.7	< 1.6
1,4-Dichlorobenzene	1.7	< 1.6	< 1.6	< 1.7	< 1.6
Detection Limit Multiplier[b]		0.93	0.96	1.01	0.93
Percent Solids		81.9	86.8	80.0	85.8

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, Table 2, US EPA November 1986; sample prepared by low level solvent extraction and purge and trap. Method modified to include additional compounds. Results are reported on a dry weight basis.

[b] The detection limit multiplier indicates the adjustments made to the data and detection limits as a result of dilutions and percent solids.

GTEL ENVIRONMENTAL LABORATORIES, INC.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

ANALYTICAL RESULTS

Aromatic Volatile Organics in Soil - Low Level
Modified EPA Method 8020[a]

GTEL Sample Number		03652-14	--	--	--
Client Identification		SB-2 (8-10)	--	--	--
Date Sampled		03/20/92	--	--	--
Date Analyzed		03/31/92	--	--	--
Analyte	Detection Limit, ug/kg	Concentration, ug/kg (dry)			
Benzene	1.0	< 0.9	--	--	--
Toluene	1.7	6.8	--	--	--
Ethyl Benzene	1.0	2.3	--	--	--
Xylenes (total)	2.0	11	--	--	--
Chlorobenzene	1.0	< 0.9	--	--	--
1,2-Dichlorobenzene	1.7	< 1.5	--	--	--
1,3-Dichlorobenzene	1.7	< 1.5	--	--	--
1,4-Dichlorobenzene	1.7	< 1.5	--	--	--
Detection Limit Multiplier[b]		0.91	--	--	--
Percent Solids		88.6	--	--	--

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, Table 2, US EPA November 1986; sample prepared by low level solvent extraction and purge and trap. Method modified to include additional compounds. Results are reported on a dry weight basis.

[b] The detection limit multiplier indicates the adjustments made to the data and detection limits as a result of dilutions and percent solids.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

ANALYTICAL RESULTS

Aromatic Volatile Organics in Water
Modified EPA Method 8020[a]

GTEL Sample Number		03652-10	03652-11	03652-12	–
Client Identification		RINSEATE BLANK	FIELD BLANK	TRIP BLANK	–
Date Sampled		03/20/92	03/20/92	03/17/92	–
Date Analyzed		04/01/92	04/01/92	04/01/92	–
Analyte	Detection Limit, ug/L	Concentration, ug/L			
Benzene	0.2	< 0.2	< 0.2	< 0.2	--
Toluene	0.5	0.6	< 0.5	< 0.5	--
Ethyl Benzene	0.8	< 0.8	< 0.8	< 0.8	--
Xylenes (total)	1.7	< 1.7	< 1.7	< 1.7	--
Chlorobenzene	0.2	< 0.2	< 0.2	< 0.2	--
1,2-Dichlorobenzene	0.4	< 0.4	< 0.4	< 0.4	--
1,3-Dichlorobenzene	0.4	< 0.4	< 0.4	< 0.4	--
1,4-Dichlorobenzene	0.3	< 0.3	< 0.3	< 0.3	--
Detection Limit Multiplier[b]		1	1	1	--

a Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; extraction by EPA Method 5030 (purge and trap). Method modified to include additional compounds.

b The detection limit multiplier indicates the adjustments made to the data and detection limits for sample dilutions.

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GROUNDWATER TECHNOLOGY, INC.
VOLATILE BLANK ANALYSIS

Client: Osmose
Job # :011-105-470
Matrix:sol/aq
Units:ug/kg/l
Audit Date:04/22/92
Audited By: KMG

Sample Number	Analysis Date	Analysis Time	Correct# of Blanks Yes	No	Note	<5X CRDL Acetone Toluene, MeCl? Yes	No	Note	<CRDL for all other TCL Volatile Yes	No	Note
MW13 6-8	3/26/92	N/A	✓			✓			✓		
MW13 8-1											
SB2 2-4											
MW14 10-	3/30/92										
MW14 61-	3/31/92										
MW12 6-8	3/31/92										
MW12 18-	3/31/92										
SB2 8-10	3/31/92										
RINSEATE	4/1/92									(1)	
FIELD BL	4/1/92								✓		
TRIP BLK	4/1/92								✓		

Comments: (1) Rinseate blank - toluene 0.6 ug/l
all associated laboratory method blanks were contaminant-free
- Method Blank 3/26/92
- Method Blank 3/30/92
- Method Blank 4/1/92

CRDL = Contract Required Detection Limit, See Attached Detection Limits

n/a - information not available to reviewer

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

METHOD BLANK RESULTS

Aromatic Volatile Organics in Soil
Modified EPA Method 8020[a]

GTEL Sample Number		METHOD BLANK	--	--	--
GTEL File ID		20MBL0326A	--	--	--
Date Analyzed		03/26/92	--	--	--
Analyte	Detection Limit, mg/kg	Concentration, mg/kg (dry)			
Benzene	0.10	< 0.10	--	--	--
Toluene	0.25	< 0.25	--	--	--
Ethyl Benzene	0.40	< 0.40	--	--	--
Xylenes (total)	0.85	< 0.85	--	--	--
Chlorobenzene	0.20	< 0.20	--	--	--
1,2-Dichlorobenzene	0.26	< 0.26	--	--	--
1,3-Dichlorobenzene	0.26	< 0.26	--	--	--
1,4-Dichlorobenzene	0.20	< 0.20	--	--	--
Detection Limit Multiplier[b]		1.00	--	--	--

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Methanolic extraction by EPA Method 5030 (purge and trap). Method modified to include additional compounds.

[b] The detection limit multiplier indicates the adjustments made to the data and detection limits as a result of dilutions and percent solids.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

METHOD BLANK RESULTS

Aromatic Volatile Organics in Soil - Low Level
Modified EPA Method 8020[a]

	GTEL Sample Number	METHOD BLANK	--	--	--
	GTEL File ID	14SBL0330A	--	--	--
	Date Analyzed	03/30/92	--	--	--
Analyte	Detection Limit, ug/kg	Concentration, ug/kg (dry)			
Benzene	1.0	< 1.0	--	--	--
Toluene	1.7	< 1.7	--	--	--
Ethyl Benzene	1.0	< 1.0	--	--	--
Xylenes (total)	2.0	< 2.0	--	--	--
Chlorobenzene	1.0	< 1.0	--	--	--
1,2-Dichlorobenzene	1.7	< 1.7	--	--	--
1,3-Dichlorobenzene	1.7	< 1.7	--	--	--
1,4-Dichlorobenzene	1.7	< 1.7	--	--	--
Detection Limit Multiplier[b]		1.00	--	--	--

a Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, Table 2, US EPA November 1986; sample prepared by low level solvent extraction and purge and trap. Method modified to include additional compounds. Results are reported on a dry weight basis.

b The detection limit multiplier indicates the adjustments made to the data and detection limits as a result of dilutions and percent solids.

GTEL
ENVIRONMENTAL LABORATORIES, INC.

METHOD BLANK RESULTS

Purgeable Aromatics in Water
Modified EPA Method 8020[a]

GTEL Sample Number		METHOD BLANK	--	--	--
GTEL File ID		20WBL0401A	--	--	--
Date Analyzed		04/01/92	--	--	--
Analyte	Detection Limit, ug/L	Concentration, ug/L			
Benzene	0.2	< 0.2	--	--	--
Toluene	0.5	< 0.5	--	--	--
Ethyl Benzene	0.8	< 0.8	--	--	--
Xylenes (total)	1.7	< 1.7	--	--	--
Chlorobenzene	0.2	< 0.2	--	--	--
1,2-Dichlorobenzene	0.4	< 0.4	--	--	--
1,3-Dichlorobenzene	0.4	< 0.4	--	--	--
1,4-Dichlorobenzene	0.3	< 0.3	--	--	--
Detection Limit Multiplier		1	--	--	--

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Methanolic extraction by EPA Method 5030 (purge and trap). Method modified to include additional compounds.

GROUNDWATER TECHNOLOGY, INC.
VOLATILE SURROGATE SPIKES

Client: Osmose
Job # :011-105-470
Matrix:sol/aq
Units:ug/kg/l
Audit Date:04/22/92
Audited By: KMG

Sample Number	No. Spikes OK?			%Recovery OK?			Surrogates Outside Criteria
	Yes	No	Note	Yes	No	Note	
MW13 6-8	✓			✓			none
MW13 8-1							
SB2 2-4							
MW14 10-							
MW14 61-							
MW12 6-8							
MW12 18-							
SB2 8-10							
RINSEATE							
FIELD BL							
TRIP BLK							

%Recovery Range: Liquid Solid

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

SURROGATE RECOVERY RESULTS

Volatile Organics in Soil
(Trifluorotoluene)
EPA Method 8020

Sample	Amount Added, ug/L	Surrogate Recovery, %
METHOD BLANK (03/26/92)	47.6	75.2
03652-05	47.6	72.2
03652-06	47.6	72.4
03652-13	47.6	70.4
03652-01 MS	47.6	70.5
03652-01 DUP	47.6	69.4

Acceptability Limits[a] 45-125%

a	Laboratory generated acceptability limits updated 07/11/91.
MS	Matrix Spike.
DUP	Sample Duplicate.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

SURROGATE RECOVERY RESULTS

Volatile Organics in Soil - Low Level
(Trifluorotoluene)
EPA Method 8020

Sample	Amount Added, ug/L	Surrogate Recovery, %
METHOD BLANK (03/30/92)	47.6	90.3
03652-01	47.6	77.5
03652-02	47.6	81.2
03652-03	47.6	52.0
03652-04	47.6	66.2
03652-14	47.6	60.7
03652-01 MS	47.6	84.0
03652-01 DUP	47.6	86.3

Acceptability Limits[a] 45-125%

a Laboratory generated acceptability limits updated 07/11/91.
MS Matrix Spike.
DUP Sample Duplicate.

GTEL
ENVIRONMENTAL LABORATORIES, INC.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

SURROGATE RECOVERY RESULTS

Purgeable Aromatics
(Trifluorotoluene)
Modified EPA Method 8020

Sample	Amount Added, ug/L	Surrogate Recovery, %
METHOD BLANK (04/01/92)	47.6	67.2
03652-10	47.6	84.8
03652-11	47.6	83.4
03652-12	47.6	86.3

Acceptability Limits[a] 45-125%

a Laboratory generated acceptability limits updated 07/11/91.
MS Matrix Spike.
DUP Sample Duplicate.

GTEL ENVIRONMENTAL LABORATORIES, INC.

Page 1 Of 1

GROUNDWATER TECHNOLOGY, INC.
VOLATILE MATRIX SPIKES

Client: Osmose
Job # :011-105-470
Matrix:sol/aq
Units:ug/kg/l
Audit Date:04/22/92
Audited By: KMG

Sample Number	Analysis Date	Time	No. Spikes OK?			%Recovery OK?			Compounds out of spec
			Yes	No	Note	Yes	No	Note	
MW13 6-8	3/26/92	N/A	✓			✓			none
MW13 8-1									
SB2 2-4									
MW14 10-	3/30/92								
MW14 61-	3/31/92								
MW12 6-8									
MW12 18-									
SB2 8-10									
RINSEATE	4/1/92								
FIELD BL	4/1/92								
TRIP BLK	4/1/92								

Comments: n/a - not available to the reviewer

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

MATRIX SPIKE RECOVERY

Purgeable Aromatics
Modified EPA Method 8020

Sample Spiked: 03652-01
Date of Analysis: 03/26/92
Standard ID: B91SM1002

Client ID: MW-14 (10-12)
Matrix: Soil

Compound	Sample Results, mg/kg	Spike Amount, mg/kg	MS Results, mg/kg	MS % Percent Recovery	Acceptability Limits, %[a]
Benzene	< 0.12	10.1	10.3	102	40-160
Toluene	< 0.29	9.63	10.3	102	40-160
Ethyl Benzene	< 0.47	10.0	11.5	115	40-160
Xylenes (total)	< 1.90	30.5	34.5	113	40-160

a Laboratory generated acceptability limits updated 4/88.
NA Not Applicable; % Recovery is not calculated when original sample amount exceeds five times the spike amount.

DUPLICATE SAMPLE RECOVERY

Purgeable Aromatics
Modified EPA Method 8020

Sample Number: 03652-01
Date of Analysis: 03/26/92

Client ID: MW-14 (10-12)
Matrix: Soil

Compound	Sample Results, mg/kg	Duplicate Results, mg/kg	RPD, %	Acceptability Limits, %[a]
Benzene	< 0.12	< 0.11	NA	40
Toluene	< 0.29	< 0.28	NA	40
Ethyl Benzene	< 0.47	< 0.45	NA	40
Xylenes (total)	< 1.90	< 0.96	NA	40

a Laboratory generated acceptability limits updated 4/88.
NA Not Applicable; % RPD is not calculated when sample values are less than 10 times the detection limit.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

MATRIX SPIKE RECOVERY

Purgeable Aromatics - Low Level
Modified EPA Method 8020

Sample Spiked: 03652-01
Date of Analysis: 03/31/92
Standard ID: B92AC086

Client ID: MW-14 (10-12)
Matrix: Soil

Compound	Sample Results, ug/kg	Spike Amount, ug/kg	MS Results, ug/kg	MS % Percent Recovery	Acceptability Limits, %[a]
Benzene	< 0.93	20.0	22.2	111	40-160
Toluene	< 1.57	20.0	19.4	97.0	40-160
Ethyl Benzene	< 0.93	20.0	18.0	90.0	40-160
Xylenes (total)	< 1.85	60.0	55.8	93.0	40-160

a Laboratory generated acceptability limits updated 4/88.
NA Not Applicable; % Recovery is not calculated when original sample amount exceeds five times the spike amount.

DUPLICATE SAMPLE RECOVERY

Purgeable Aromatics - Low Level
Modified EPA Method 8020

Sample Number: 03652-01
Date of Analysis: 03/31/92

Client ID: MW-14 (10-12)
Matrix: Soil

Compound	Sample Results, ug/kg	Duplicate Results, ug/kg	RPD, %	Acceptability Limits, %[a]
Benzene	< 0.93	< 0.93	NA	40
Toluene	< 1.57	< 1.58	NA	40
Ethyl Benzene	< 0.93	< 0.93	NA	40
Xylenes (total)	< 1.85	< 1.86	NA	40

a Laboratory generated acceptability limits updated 4/88.
NA Not Applicable; % RPD is not calculated when sample values are less than 10 times the detection limit.

CHAIN-OF-CUSTODY RECORDS

GROUNDWATER
TECHNOLOGY

N2-03-652

GTEL
ENVIRONMENTAL LABORATORIES, INC.

MEADOWBROOK INDUSTRIAL PARK
MILFORD, NH 03055
(603) 672-4835
(800) 441-4835

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

42826

Post-it™ brand fax transmittal memo 7671 | # of pages ▸ 2

To Kim Gould	From V. Donndelinger
Co. GTI	Co. GTEL
Dept.	Phone #
Fax #	Fax #

Com

Com

Proj 70

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proc
of th 7

Field Sample ID	GTEL Lab # (Lab use only)	# Containers	Matrix: WATER	Matrix: SOIL	Matrix: AIR	Matrix: SLUDGE	Matrix: PRODUCT	Matrix: OTHER	Method Preserved: HCl	Method Preserved: HNO_3	Method Preserved: H_2SO_4	Method Preserved: ICE	Method Preserved: UNPRESERVED	Method Preserved: OTHER (SPECIFY)	Sampling: DATE	Sampling: TIME
MW-14 (10-12)	01	2		X								X			3/17	2:00
MW-14 (61-63)	02	2		X								X			3/18	11:30
MW-12 (6-8)	03	2		X								X			3/19	2:30
MW-12 (18-20)	04	2		X								X			3/19	4:00
MW-13 (6-8)	05	4		X								X			3/19	6:15
MW-13 (8-10)	06	4		X								X			3/19	6:25
SS-1	07	1		X								X			3/18	2:30
SS-2	08	2		X								X			3/18	2:45
SS-3	09	1		X								X			3/18	3:00

Field Sample ID	BTEX/602 ☐ 8020 ☐ with MTBE ☐	BTEX/Gas Hydrocarbons PID/FID ☐ with MTBE ☐	Hydrocarbons GC/FID Gas ☐ Diesel ☐ Screen ☐	Hydrocarbon Profile (SIMDIS) ☐	Oil and Grease 413.1 ☐ 413.2 ☐ SM 503 ☐	TPH/IR 418.1 ☐ SM 503 ☐	EDB by 504 ☐ DBCP by 504 ☐	EPA 503.1 ☐ EPA 502.2 ☐	EPA 601 ☐ EPA 8010 ☐	EPA 602 ☐ EPA 8020 ☒	EPA 608 ☐ 8080 ☐ PCB only ☐	EPA 624/PPL ☐ 8240/TAL ☐ NBS (+15) ☐	EPA 625/PPL ☐ 8270/TAL ☐ NBS (+25) ☐	EPA 610 ☐ 8310 ☒	EP TOX Metals ☐ Pesticides ☐ Herbicides ☐	TCLP Metals ☐ VOA ☐ Semi-VOA ☐ Pest ☐ Herb ☐	EPA Metals - Priority Pollutant ☐ TAL ☐ RCRA ☐	CAM Metals TTLC ☐ STLC ☐	Lead 239.2 ☐ 200.7 ☐ 7420 ☐ 7421 ☐ 6010 ☐	Organic Lead ☐	Corrosivity ☐ Flash Point ☐ Reactivity ☐			
MW-14 (10-12)										X				X										
MW-14 (61-63)										X				X										
MW-12 (6-8)										X				X										
MW-12 (18-20)										X				X										
MW-13 (6-8)										X				X										
MW-13 (8-10)										X				X										
SS-1										X				X										
SS-2														X										
SS-3														X										

TAT
Priority (24 hr) ☐
Expedited (48 hr) ☐
7 Business Days ☐
Other ________ Business Days ☐

Special Handling
GTEL Contact Vince Donndelinger
Quote/Contract # ________
Confirmation # ________
PO # ________

SPECIAL DETECTION LIMITS

REMARKS
Attn: Vince Donndelinger

Project-Specific
BLUE ☒ CLP ☐

QA / QC LEVEL
OTHER ________

SPECIAL REPORTING REQUIREMENTS

FAX ☒

Lab Use Only Lot #

Storage Location: 18LE

Work Order #

CUSTODY RECORD

Relinquished by Sampler: J. Olaf Gustafs	Date 3/23/92	Time 5:00	Received by:
Relinquished by:	Date	Time	Received by:
Relinquished by:	Date 3/24/92	Time 11.25	Received by Laboratory:

Waybill # 408 7273 013 / 424 7801 031

Rev. 7/91

GTEL
ENVIRONMENTAL LABORATORIES, INC.

MEADOWBROOK INDUSTRIAL PARK
MILFORD, NH 03055
(603) 672-4835
(800) 441-4835

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

42825

Company Name: GTI
Phone #:
FAX #:
Company Address: Albany
Site location: Buffalo, NY
Project Manager: Bruce Ahrens
Client Project ID: (#) 01110 5470
(NAME)
I attest that the proper field sampling procedures were used during the collection of these samples.
Sampler Name (Print): Olaf Gustafson

Field Sample ID	GTEL Lab # (Lab use only)	# Containers	Matrix: WATER	SOIL	AIR	SLUDGE	PRODUCT	OTHER	Method Preserved: HCl	HNO_3	H_2SO_4	ICE	UNPRESERVED	OTHER (SPECIFY)	Sampling: DATE	TIME
Rinseate Blank	10	3	X						X			X			3/20	11:00
Rinseate Blank	1D	2	X									X			3/20	11:00
Field Blank	11	3	X						X			X			3/20	2:00
Field Blank	11	2	X									X			3/20	2:00
Trip Blank	12	3	X						X			X			3/17	3:45
SB-2 (2-4)	13	2		X								X			3/20	10:00
SB-2 (8-10)	14	2		X								X			3/20	10:30

Field Sample ID	BTEX/602 ☐ 8020 ☐ with MTBE ☐	BTEX/Gas Hydrocarbons PID/FID ☐ with MTBE ☐	Hydrocarbons GC/FID Gas ☐ Diesel ☐ Screen ☐	Hydrocarbon Profile (SIMDIS) ☐	Oil and Grease 413.1 ☐ 413.2 ☐ SM 503 ☐	TPH/IR 418.1 ☐ SM 503 ☐	EDB by 504 ☐ DBCP by 504 ☐	EPA 503.1 ☐ EPA 502.2 ☐	EPA 601 ☐ EPA 8010 ☐	EPA 602 ☐ EPA 8020 ☒	EPA 608 ☐ 8080 ☐ PCB only ☐	EPA 624/PPL ☐ 8240/TAL ☐ NBS (+15) ☐	EPA 625/PPL ☐ 8270/TAL ☐ NBS (+25) ☐	EPA 610 ☐ 8310 ☒	EP TOX Metals ☐ Pesticides ☐ Herbicides ☐	TCLP Metals ☐ VOA ☐ Semi-VOA ☐ Pest ☐ Herb ☐	EPA Metals - Priority Pollutant ☐ TAL ☐ RCRA ☐	CAM Metals TTLC ☐ STLC ☐	Lead 239.2 ☐ 200.7 ☐ 7420 ☐ 7421 ☐ 6010 ☐	Organic Lead ☐	Corrosivity ☐ Flash Point ☐ Reactivity ☐
Rinseate Blank										X											
Rinseate Blank														X							
Field Blank										X											
Field Blank														X							
Trip Blank										X											
SB-2 (2-4)										X				X							
SB-2 (8-10)										X				X							

TAT
Priority (24 hr) ☐
Expedited (48 hr) ☐
7 Business Days ☐
Other ____ Business Days ☐

Special Handling
GTEL Contact Vince Donndelinger
Quote/Contract #
Confirmation #
PO #

SPECIAL DETECTION LIMITS

REMARKS
Attn: Vince Donndelinger

Project-Specific
BLUE ☒ CLP ☐
QA / QC LEVEL
OTHER

SPECIAL REPORTING REQUIREMENTS
FAX ☒

Lab Use Only Lot #
Storage Location: 242 18E
Work Order #

CUSTODY RECORD

Relinquished by Sampler: J. Olaf Gustafson
Date 3/23/92 Time 5:00
Received by:

Relinquished by:
Date Time
Received by:

Relinquished by:
Date 3/24/92 Time 11:25
Received by Laboratory: Tracie Saed

Waybill # 408 7273 013/424 7840

Rev. 7/91

GTEL
ENVIRONMENTAL LABORATORIES, INC.

MEADOWBROOK INDUSTRIAL PARK
MILFORD, NH 03055
(603) 6724835
(800) 4414835

CHAIN-OF-CUSTODY RECORD
AND ANALYSIS REQUEST

49661

ary Name: TEL Environmental LAB
Phone #: Above
FAX #: 603-673-8105
ary Address: Meadowbrook Ind. Park
Site location: FOR: Osmose Woodpreserving
Manager: Vincent Donndelinger
Client Project ID: (#) FOR:
(NAME Bruce Ahrens
t that the proper field sampling
ures were used during the collection
se samples.
Sampler Name (Print): Kyle Vautour

Field Sample ID	GTEL Lab # (Lab use only)	# Containers	Matrix: WATER	SOIL	AIR	SLUDGE	PRODUCT	OTHER	Method Preserved: HCl	HNO_3	H_2SO_4	ICE	UNPRESERVED	OTHER (SPECIFY)	Sampling: DATE	TIME
p Blank		3	X						X						3/17/92	3:45
ld Blank VOA		4	X												3/17/92	3:45
ld Blank PAH		3	X												3/17/92	3:45

ANALYSIS REQUEST

- BTEX/602 ☐ 8020 ☐ with MTBE ☐
- BTEX/Gas Hydrocarbons PID/FID ☐ with MTBE ☐
- Hydrocarbons GC/FID Gas ☐ Diesel ☐ Screen ☐
- Hydrocarbon Profile (SIMDIS) ☐
- Oil and Grease 413.1 ☐ 413.2 ☐ SM 503 ☐
- TPH/IR 418.1 ☐ SM 503 ☐
- EDB by 504 ☐ DBCP by 504 ☐
- EPA 503.1 ☐ EPA 502.2 ☐
- EPA 601 ☐ EPA 8010 ☐
- EPA 602 ☐ EPA 8020 ☐
- EPA 608 ☐ 8080 ☐ PCB only ☐
- EPA 624/PPL ☐ 8240/TAL ☐ NBS (+15) ☐
- EPA 625/PPL ☐ 8270/TAL ☐ NBS (+25) ☐
- EPA 610 ☐ 8310 ☐
- EP TOX Metals ☐ Pesticides ☐ Herbicides ☐
- TCLP Metals ☐ VOA ☐ Semi-VOA ☐ Pest ☐ Herb ☐
- EPA Metals - Priority Pollutant ☐ TAL ☐ RCRA ☐
- CAM Metals TTLC ☐ STLC ☐
- Lead 239.2 ☐ 200.7 ☐ 7420 ☐ 7421 ☐ 6010 ☐
- Organic Lead ☐
- Corrosivity ☐ Flash Point ☐ Reactivity ☐
- OTHER

TAT
y 24 hr ☐
itd (48 hr) ☐
iness Days ☐
ess Days ☐

Special Handling
GTEL Contact
Quote/Contract #
Confirmation #
PO #

QA / QC LEVEL
☐ CLP ☐ OTHER

SPECIAL DETECTION LIMITS

SPECIAL REPORTING REQUIREMENTS

FAX ☐

REMARKS
Please send TB and FB back to LAB on separate sample COC

Lab Use Only Lot #
Storage Location:
Work Order #

USTODY
ECORD

Relinquished by Sampler: Kyle Vautour
Date 3/17/92 Time 3:55
Received by: J. Olaf Gustafs 3/18/92

Relinquished by: Kyle Vautour
Date 3/17/92 Time 3:55
Received by:

Relinquished by:
Date Time
Received by Laboratory:

Waybill #

DATA VALIDATION REPORT
OSMOSE WOOD PRESERVING, INC.
BUFFALO, NEW YORK SITE

POLYNUCLEAR AROMATIC HYDROCARBONS ANALYSIS

Samples Collected: March 17-20, 1992

Report Prepared: April 28, 1992

Prepared By:
Groundwater Technology, Inc.
223 Wilmington-West Chester Pike
Chadds Ford, Pennsylvania 19317

GROUNDWATER
TECHNOLOGY

Preface to Data Validation

The concept of data validation has been developed over the past decade to assure that the quality of the data generated as a result of laboratory analysis by USEPA's Contract Laboratory Program protocols is acceptable. Guidelines for data validation have been established by the USEPA Data Review Work Groups, for the Hazardous Site Evaluation Division, and are published in documents entitled, Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses, and Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses.

These documents are available to the public and will be strictly adhered to during the data review of these packages analyzed by GTEL Environmental Laboratories, Milford, New Hampshire. Before reading the data validation reports prepared by Groundwater Technology, Inc., some insight and explanation is offered for the application of the data.

The purpose of the data validation report is to inform the data user of problems that were encountered during the analysis of the samples. The qualifiers section states the major points of concern and places restrictions on the usage of data with "qualifiers" such as B, J, or R. Qualification of data with respect to the amount of contamination in the blanks (method, field, rinsate or trip) associated with a set of samples is a dependable means of assessing procedures, container cleanliness and laboratory procedure. For example, if acetone, a common laboratory contaminant, was found at 50 µg/l in a trip blank, 15 µg/l in the laboratory's method blank and 20 µg/l in the field blank, a qualifier would be written stating that, "all positive results in samples x,y,z, associated with the trip blank are questionable." This means that any positive results from a sample less than ten times the amount found in the blank having the highest contamination source (in this case the trip blank, at 50 µg/l) is probably from the blank. Any samples related to this trip blank having results less than 500 µg/l are questionable, attributable to the degree of container cleanliness. Other examples are attached.

Another area of concern is holding time and preservation of the samples. The chain-of-custody is examined for the date of sampling, date samples were relinquished to the courier, preservation methods, date received at the laboratory and any comments that were made by the laboratory's sample custodian. The date of sample collection is compared with the date of sample receipt, extraction and/or analysis; if the number of days between sample collection and sample extraction/analysis is outside of the acceptable range then these results must be considered

estimated. The methods of sample preservation used can alter the acceptable holding time range. The effects of long-term storage even under refrigeration cannot be predicted due to variable matrices from site to site, or from sample to sample on site.

A qualifier may also be applied to the data if surrogate spike recoveries fall outside the quality control limits. Surrogate spike compounds are added to every sample and blank to monitor the laboratory's performance, however the sample matrix itself may contribute to the poor recovery of surrogate compounds. For example, samples with interferences or high analyte concentrations may cause unusual surrogate recoveries. Sometimes reanalysis (or re-extraction) is necessary to determine if the source of the problem is laboratory- or sample matrix-related.

Initial and continuing calibrations, along with GC/MS tuning are evaluated and sometimes qualified for individual compounds (such as 2-butanone) in the volatile organics fraction. It is a chronic problem for many laboratories to obtain steady response factors for 2-butanone (methyl ethyl ketone) that are stable enough to fall inside the specified criteria. False negatives and valid detection limits are also of concern when qualifying the initial and continuing calibrations, and the GC/MS tuning.

The evaluation of blind field duplicates, matrix spike (MS) and matrix spike duplicates (MSD), are of importance in assessing field sampling techniques, sample homogeneity, representativeness of sample points, and laboratory precision. A relative percent difference is calculated for three or more samples. Criteria are listed on the attached sheets for field duplicates and MS/MSDs. It should be noted that a data package cannot be qualified solely on MS/MSD data. The MS/MSD data merely confirm matrix interferences and can be used as support for other qualifiers such as surrogate spike recoveries.

Identification of positively identified compounds is checked with respect to the guidelines. Also the compound quantitation calculation and the feasibility of obtaining the specified detection limits are checked.

The tentatively identified compounds (TICs) found by the mass spectral library search are checked for goodness of "fit" against the reference spectrum. If there is a discrepancy between the laboratory analyst's interpretation of the spectrum and Groundwater Technology's interpretation, a qualifier is placed on the compound in question stating that it is to be considered an unknown or an isomer of that compound. Most often the laboratory will qualify the results as estimated, due to the

fact that standards for that TIC have not been run (nor are they required). Quantitation of TICs is based on the total quantitation method.

Data that may not meet certain criteria rarely cause an entire case to be qualified as unusable (R) because other parameters validated are acceptable. However, data for particular analytes may be discarded due to calibration response factors of questionable integrity.

The findings section gives standard as well as judgmental reasons as to why the data are qualified. The summary explains point by point each qualifier and places a general status (acceptable, provisional or acceptable) on the entire data package.

QUALIFIER DEFINITIONS

R - Unusable data.

U - Analyzed but undetected.

J - Estimated.

UJ - Undetected but the associated value is estimated and may inaccurate or imprecise.

B - Compound has been detected in a blank. Indicates that the compound's presence is qualitatively questioned, due to contamination in an associated blank.

DF - Dilution Factor.

The following are examples of application of the blank qualification guidelines. Certain circumstances may warrant deviations from these quidelines.

Case 1: Sample result is greater than the Contract Required Quantitation Limit (CRQL), but is less than the required amount (5x or 10x) when compared to the blank result.

	RULE	
	10x	5x
Blank Result	7	7
CRQL	5	5
Sample Result	60	60
Qualified Sample Result	60B	60B

In the example for the 10x rule, a sample result less than 70 (10 x 7) would be qualified as questionable (B). In the case of the 5x rule, sample result less than 35 (5 x 7) would also be qualified as questionable (B).

Case 2: Sample result is less than the CRQL, and is also less than the required amount (5x or 10x) when compared to the blank result.

	RULE	
	10x	5x
Blank Result	6	6
CRQL	5	5
Sample Result	4J	4J
Qualified Sample Result	4B	4B

Case 3: Sample result is greater than the CRQL and the required amount (5x or 10x) when compared to the blank result.

	RULE	
	10x	5x
Blank Result	10	10
CRQL	5	5
Sample Result	120	60
Qualified Sample Result	120	60

For both the 10x and 5x rules, sample results exceeded the adjusted blank results of 100 (10 x 10) and 50 (5 x10), respectively.

1.0 INTRODUCTION

This review addresses eleven soil samples and two aqueous quality control samples collected March 17-20, 1992 by Groundwater Technology, Inc, Albany, New York, and submitted to GTEL Environmental Laboratories, Inc., Milford, New Hampshire for the analysis of polynuclear aromatic hydrocarbons.

Items reviewed in this data package include:

- chain-of-custody records,
- analytical holding times,
- calibration verification,
- all applicable blank samples,
- matrix spike/matrix spike duplicate recoveries,
- surrogate spike recoveries,
- data completeness, and
- an overall assessment of the batch.

It should be noted that these samples were analyzed using EPA methodology, but only a "Blue Level" data package was compiled. Therefore, no raw data was available to the reviewer. Where applicable, the reviewer used the laboratory QA nonconformance summary to validate the associated client sample results.

TABLE 1.0 APPLICABLE SAMPLE NUMBER	
GTI ID	LAB ID
MW-14 (10-12)	03652-01
MW-14 (61-63)	03652-02
MW-12 (6-8)	03652-03
MW-12 (18-20)	03652-04
MW-13 (6-8	03652-05
MW-13 (8-10)	03652-06
SS-1	03652-07
SS-2	03652-08
SS-3	03652-09
SS-2 (2-4)	03652-13
SB-2 (8-10)	03652-14
RINSEATE BLANK	03652-10
FIELD BLANK	03652-11

2.0 FINDINGS AND DISCUSSION

After a thorough review of all available data it was determined that the use of data qualifiers is not necessary.

3.0 SUMMARY

After thoroughly reviewing all available data it was determined that the laboratory has adequately performed all analyses since:

- chain-of-custody records were complete,
- analytical holding times were met,
- all applicable blank samples were contaminant-free,
- matrix spike/matrix spike duplicate recoveries were acceptable, and
- data were complete.

Although no major problems were associated with this data package, one minor issue was addressed:

Poor terphenyl d-14 surrogate recoveries (%R) were associated with two samples:

- MW-13 (8-10) 358%R, and
- SS-3 255 %R

These results were outside of the quality control limits, 33-141 %R. High dilution factors were associated with these samples and it is possible that this occurrence affected the surrogate recoveries.

It should be noted that poor terphenyl d-14 results can be an indication of acid fraction interferences and might indicate the need to qualify the associated acid fraction results. In this particular case, only base-neutral fraction compound results were reported. Therefore, it was not necessary to qualify client sample results in this batch due to poor acid fraction surrogate results.

For specifics on this quality assurance review, refer to the attached support documents.

GROUNDWATER TECHNOLOGY, INC.

Kimberly McGhee-Gould

Kimberly McGhee-Gould
QA/QC Supervisor

Date: April 28, 1992

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POLYNUCLEAR AROMATIC HYDROCARBON SUPPORT DOCUMENTATION

GROUNDWATER
TECHNOLOGY

Page 1 of 1

DATA SUMMARY FORM: ORGANICS
Polynuclear Aromatic Hydrocarbons in Soil
SOIL SAMPLES
(μg/Kg)

Site Name: Osmose

Case #: ______ **Sampling Date(s):** 3/17/92 - 3/20/92

To calculate sample quantitation limit:
(QL * Dilution Factor) / ((100 - % moisture)/100)

	Sample No.	MW-14(10-12)	MW-14(61-63)	MW-12 (6-8)	MW-12 (18-20)	MW-13(6-8)	MW-13(8-10)	SS-1	SS-2	SS-3
	Dilution Factor									
	% Moisture	18.1	13.2	20.0	14.2	12.2	13.6	21.6	26.5	28.1
	Location									
QL	COMPOUND									
	Napthalene					7000	230000		5700	10000
	Acenaphthylene									
	1-Methylnapthalene					2000	570000			
	2-methylnapthalene					9100	300000		6900	
	Acenaphthene					3000	120000			
	Fluorene					2200	68000	120	4300	8000
	Phenanthrene					9000	150000	440	20000	29000
	Anthracene					320	10000	940		
	Fluoranthene		32	18		1900	59000	1200	30000	50000
	Pyrene									
	Benzo(a)anthracene		11	4.1		230	7500	430	11000	17000
	Chrysene					72	2600	200	5100	8300
	Benzo(b)fluoroanthene		9.5	5.8	0.18	75	2700	520	9700	14000
	Benzo(K)fluorcranthene		6.3	3.4		52	1800	300	5800	8500
	Benzo(a)pyrene		12.0	6.0		92	2900	670	12000	17000
	Dibenz[a,h]anthracene		1.2				200	79	1500	2200
	Benzo[g,h,i]perylene		8.6	3.5		43	1100	400	5900	8500
	Indeno[1,2,3-cd]pyrene		5.1	2.4			450	280	4900	6400

QL = Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITION

revised 07/9

Page 1 of 1

DATA SUMMARY FORM: ORGANICS

Polynuclear Aromatic Hydrocarbons in Soil

SOIL SAMPLES

(µg/Kg)

Site Name: Osmose

Case #: ______ **Sampling Date(s):** 3/17/92 - 3/20/92

To calculate sample quantitation limit:
(QL * Dilution Factor) / ((100 - % moisture)/100)

QL	COMPOUND									
	Sample No.	SS-3	SS-2 (2-4)	SS-2 (8-10)						
	Dilution Factor									
	% Moisture	28.1	16.6	11.4						
	Location									
	Napthalene	10000		320						
	Acenapthylene									
	1-Methylnapthalene									
	2-Methylnapthalene			150						
	Acenapthene									
	Fluorene	8000	10	8.7						
	Phenanthrene	29000								
	Anthracene		92							
	Fluoranthene	50000	74							
	Pyrene									
	Benzo(a)anthracene	17000	26	0.90						
	Chrysene	8300	9.0							
	Benzo[b]fluoranthene	14000	21							
	Benzo[k]fluoranthene	8500	14							
	Benzo[a] pyrene	17000	26							
	Dibenz[a,h]anthracene	2200	2.2							
	Benzo[g,h,i]perylene	8500	15							
	Indeno[1,2,3-cd] pyrene	6400	8.3							

QL = Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITION

revised 07/9

Page 1 of 1

DATA SUMMARY FORM: ORGANICS
Polynuclear Aromatic Hydrocarbons in Water
WATER SAMPLES
(µg/L)

Site Name: Osmose

Case #: ______ Sampling Date(s): 3/17/92 - 3/20/92

To calculate sample quantitation limit:
(QL * Dilution Factor)

		Rinseate Blk		Field Blank															
		1.0		1.0															
	Napthalene																		
	Acenapthylene																		
	1-methylnapthalene																		
	2-methylnapthalene																		
	Acenaphthene																		
	Fluorene																		
	Phenanthrene																		
	Anthracene																		
	Fluoranthene																		
	Pyrene																		
	Benzo[a]anthracene																		
	Chrysene																		
	Benzo[b]fluoranthene																		
	Benzo[k]fluoranthene																		
	Benzo[a]pyrene																		
	Dibenz[a,h]anthracene																		
	Benzo[g,h,i]perylene																		
	Indeno[1,2,3-cd]pyrene																		

QL = Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITION
revised 07/90

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

QA NONCONFORMANCE SUMMARY

1.0 Method Blank Analysis

1.1 Zero target compound(s) were found in the method blank.

2.0 Calibration Verification

2.1 The control limits were exceeded for zero calibration check compounds.

3.0 Surrogate Compound Recoveries

3.1 The recovery limits were exceeded for one surrogate compound for EPA Method 8310 in two samples due to interference from the presence of high concentrations of analytes in the samples. One surrogate out of control does not invalidate the reported results.

4.0 Matrix Spike (MS) Accuracy

4.1 The recovery limits were exceeded in the batch spike for zero compounds.

5.0 Sample Duplicate Precision

5.1 The maximum relative percent difference (RPD) was/were exceeded for zero compound(s) in the sample duplicate.

6.0 Sample Integrity

6.1 Sample handling and holding time criteria were met.

GTEL
ENVIRONMENTAL LABORATORIES, INC.

Page 1 Of 1

GROUNDWATER TECHNOLOGY, INC.
SEMI-VOLATILE HOLDING TIMES

Client: Osmose
Job # : 011-105-470
Matrix: sol/aq
Units: ug/kg/l
Audit Date: 04/22/92
Audited By: KMG

Sample Number	Sample Date	Date Rec'd	Xtract Date	Analysis Date	Time	Guidelines	40CFR	SW-846 CLP	Out
MW14 10-	3/17/92	3/24/92	3/26/92	4/3/92	N/A				
MW14 61-	3/18/92		3/26/92	4/3/92					
MW12 6-8	3/19/92		3/26/92	4/3/92					
MW12 18-	3/19/92		3/26/92	4/3/92					
MW-13 6-	3/19/92		3/26/92	4/3/92					(1)
MW13 8-1	3/19/92		3/26/92	4/4/92					(2)
SS-1	3/18/92		3/26/92	4/4/92					
SS-2	3/18/92		3/26/92	4/4/92					(3)
SS-3	3/18/92		3/26/92	4/4/92					(4)
SS-2 2-4	3/20/92		3/26/92	4/4/92					
SB-2 8-1	3/20/92		3/26/92	4/4/92					
RINSEATE	3/20/92	3/24/92	3/27/92	4/2/92					
FIELD BL	3/20/92	3/24/92	3/27/92	4/2/92					

Comments: N/A - information not available to reviewer

Guideline Holding Times:	ECRA	40 CFR Part 136	SW-846	CLP
Solid	14 days	----------	14 days	10 days
Liquid	7 days	7 days	14 days	5 days

(1) also analyzed 4/14/92

(2) also analyzed 4/10/92

(3) also analyzed 4/11/92

(4) also analyzed 4/11/92

} all still within holding times

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

ANALYTICAL RESULTS

Polynuclear Aromatic Hydrocarbons in Soil
EPA Method 8310[a]

GTEL Sample Number		03652-01	03652-02	03652-03	03652-04
Client Identification		MW-14 (10-12)	MW-14 (61-63)	MW-12 (6-8)	MW-12 (18-20)
Date Sampled		03/17/92	03/18/92	03/19/92	03/19/92
Date Extracted		03/26/92	03/26/92	03/26/92	03/26/92
Date Analyzed		04/03/92	04/03/92	04/03/92	04/03/92
Analyte	Detection Limit, ug/kg	Concentration, ug/kg			
Naphthalene	60	< 73	< 70	< 76	< 69
Acenaphthylene	77	< 93	< 89	< 98	< 89
1-Methylnaphthalene	60	< 73	< 70	< 76	< 69
2-Methylnaphthalene	60	< 73	< 70	< 76	< 69
Acenaphthene	60	< 73	< 70	< 76	< 69
Fluorene	7.0	< 8.5	< 8.1	< 8.9	< 8.1
Phenanthrene	21	< 25	< 24	< 27	< 24
Anthracene	22	< 27	< 26	< 28	< 25
Fluoranthene	7.0	< 8.5	32	18	< 8.1
Pyrene	9.0	< 11	< 10	< 11	< 10
Benzo[*a*]anthracene	0.43	< 0.52	11	4.1	< 0.49
Chrysene	5.0	< 6.1	< 5.8	< 6.4	< 5.8
Benzo[*b*]fluoranthene	0.60	< 0.73	9.5	5.8	0.78
Benzo[*k*]fluoranthene	0.57	< 0.69	6.3	3.4	< 0.66
Benzo[*a*]pyrene	0.77	< 0.93	12	6.0	< 0.89
Dibenzo[*a,h*]anthracene	1.0	< 1.2	1.2	< 1.3	< 1.2
Benzo[*g,h,i*]perylene	2.5	< 3.0	8.6	3.5	< 2.9
Indeno[1,2,3-*cd*]pyrene	1.4	< 1.7	5.1	2.4	< 1.6
Detection Limit Multiplier[b]		1.21	1.16	1.27	1.15
Percent Solids, %		81.9	86.8	80.0	85.8

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0. US EPA November 1986; Extraction by EPA Method 3550 (low level sonication). Results are reported on a dry weight basis.

[b] The detection limit multiplier indicates the adjustments made to the data and detection limits as a result of dilutions and percent solids.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

ANALYTICAL RESULTS

Polynuclear Aromatic Hydrocarbons in Soil
EPA Method 8310[a]

GTEL Sample Number		03652-05	03652-06	03652-07	03652-08
Client Identification		MW-13 (6-8)	MW-13 (8-10)	SS-1	SS-2
Date Sampled		03/19/92	03/19/92	03/18/92	03/18/92
Date Extracted		03/26/92	03/26/92	03/26/92	03/26/92
Date Analyzed		04/03/92[c]	04/04/92[d]	04/04/92	04/04/92[e]
Analyte	Detection Limit, ug/kg	Concentration, ug/kg			
Naphthalene	60	7000	230000[d]	< 770	5700
Acenaphthylene	77	< 880	< 3500	< 990	< 2100
1-Methylnaphthalene	60	2000	57000	< 770	< 1600
2-Methylnaphthalene	60	9100	300000[d]	< 770	6900
Acenaphthene	60	3000	120000	< 770	< 1600
Fluorene	7.0	2200	68000[d]	120	4300
Phenanthrene	21	9000[c]	150000[d]	440	20000[e]
Anthracene	22	320	10000	940	< 12000[e]
Fluoranthene	7.0	1900	59000[d]	1200	30000[e]
Pyrene	9.0	< 100	< 410	< 120	< 250
Benzo[*a*]anthracene	0.43	230	7500	430	11000[e]
Chrysene	5.0	72	2600	200	5100
Benzo[*b*]fluoranthene	0.60	75	2700	520	9700[e]
Benzo[*k*]fluoranthene	0.57	52	1800	300	5800[e]
Benzo[*a*]pyrene	0.77	92	2900	670	12000[e]
Dibenzo[a,*h*]anthracene	1.0	< 11	200	79	1500
Benzo[*g,h,i*]perylene	2.5	43	1100	400	5900
Indeno[1,2,3-*cd*]pyrene	1.4	< 16	450	280	4900
Detection Limit Multiplier[b]		11.4[c]	45.6	12.8	27.4[e]
Percent Solids, %		87.8	86.4	78.4	73.5

a Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Extraction by EPA Method 3550 (low level sonication). Results are reported on a dry weight basis.
b The detection limit multiplier indicates the adjustments made to the data and detection limits as a result of dilutions and percent solids.
c Detection Limit Multiplier for analyte noted = 114; Date Analyzed = 04/14/92.
d Detection Limit Multiplier for analyte noted = 912; Date Analyzed = 04/10/92.
e Detection Limit Multiplier for analytes noted = 548; Date Analyzed = 04/11/92.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

ANALYTICAL RESULTS

Polynuclear Aromatic Hydrocarbons in Soil
EPA Method 8310[a]

GTEL Sample Number		03652-09	03652-13	03652-14	--
Client Identification		SS-3	SS-2 (2-4)	SB-2 (8-10)	--
Date Sampled		03/18/92	03/20/92	03/20/92	--
Date Extracted		03/26/92	03/26/92	03/26/92	--
Date Analyzed		04/04/92[f]	04/04/92	04/04/92	--
Analyte	Detection Limit, ug/kg	Concentration, ug/kg			
Naphthalene	60	10000	< 73	320	--
Acenaphthylene	77	< 2000	< 93	< 85	--
1-Methylnaphthalene	60	< 1600	< 73	< 66	--
2-Methylnaphthalene	60	< 1600	< 73	150	--
Acenaphthene	60	< 1600	< 73	< 66	--
Fluorene	7.0	8000	10	8.7	--
Phenanthrene	21	29000[f]	< 25	< 23	--
Anthracene	22	< 12000[f]	92	< 24	--
Fluoranthene	7.0	50000[f]	74	< 7.7	--
Pyrene	9.0	< 240	< 11	< 9.9	--
Benzo[*a*]anthracene	0.43	17000[f]	26	0.90	--
Chrysene	5.0	8300[f]	9.0	< 5.5	--
Benzo[*b*]fluoranthene	0.60	14000[f]	21	< 0.66	--
Benzo[*k*]fluoranthene	0.57	8500[f]	14	< 0.63	--
Benzo[*a*]pyrene	0.77	17000[f]	26	< 0.85	--
Dibenzo[*a,h*]anthracene	1.0	2200	2.2	< 1.1	--
Benzo[*g,h,i*]perylene	2.5	8500	15	< 2.8	--
Indeno[1,2,3-*cd*]pyrene	1.4	6400	8.3	< 1.5	--
Detection Limit Multiplier[b]		26.6[f]	1.21	1.10	--
Percent Solids, %		71.9	83.4	88.6	--

a Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Extraction by EPA Method 3550 (low level sonication). Results are reported on a dry weight basis.

b The detection limit multiplier indicates the adjustments made to the data and detection limits as a result of dilutions and percent solids.

f Detection Limit Multiplier for analyte noted = 532; Date Analyzed = 04/11/92.

GTEL ENVIRONMENTAL LABORATORIES, INC.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

ANALYTICAL RESULTS

Polynuclear Aromatic Hydrocarbons in Water
EPA Method 8310[a]

GTEL Sample Number		03652-10	03652-11	--	--
Client Identification		RINSEATE BLANK	FIELD BLANK	--	--
Date Sampled		03/20/92	03/20/92	--	--
Date Extracted		03/27/92	03/27/92	--	--
Date Analyzed		04/02/92	04/02/92	--	--
Analyte	Detection Limit, ug/L	Concentration, ug/L			
Naphthalene	1.8	< 1.8	< 1.8	--	--
Acenaphthylene	2.3	< 2.3	< 2.3	--	--
1-Methylnaphthalene	1.8	< 1.8	< 1.8	--	--
2-Methylnaphthalene	1.8	< 1.8	< 1.8	--	--
Acenaphthene	1.8	< 1.8	< 1.8	--	--
Fluorene	0.21	< 0.21	< 0.21	--	--
Phenanthrene	0.64	< 0.64	< 0.64	--	--
Anthracene	0.66	< 0.66	< 0.66	--	--
Fluoranthene	0.21	< 0.21	< 0.21	--	--
Pyrene	0.27	< 0.27	< 0.27	--	--
Benzo[*a*]anthracene	0.013	< 0.013	< 0.013	--	--
Chrysene	0.15	< 0.15	< 0.15	--	--
Benzo[*b*]fluoranthene	0.018	< 0.018	< 0.018	--	--
Benzo/*k*]fluoranthene	0.017	< 0.017	< 0.017	--	--
Benzo[*a*]pyrene	0.023	< 0.023	< 0.023	--	--
Dibenzo[*a,h*]anthracene	0.030	< 0.030	< 0.030	--	--
Benzo[*g,h,i*]perylene	0.076	< 0.076	< 0.076	--	--
Indeno[1,2,3-*cd*]pyrene	0.043	< 0.043	< 0.043	--	--
Detection Limit Multiplier[b]		1.00	1.00	--	--

---

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Extraction by EPA Method 3510 (liquid-liquid).

[b] The detection limit multiplier indicates the adjustments made to the data and detection limits for sample dilutions.

GTEL
ENVIRONMENTAL LABORATORIES, INC.

Page 1 of 1

GROUNDWATER TECHNOLOGY, INC.
SEMI-VOLATILE BLANK ANALYSIS

Client: Osmose
Audit Date: 04/22/92
Job # : 011-105-470
Matrix: sol/aq
Units: ug/kg/l
Audited By: KMG

Sample Number	Analysis		Correct # of Blanks			<5X CRDL for Phthalates?			<CRDL for all TCL BNA in Blanks?		
	Date	Time	Yes	No	Note	Yes	No	Note	Yes	No	Note
MW14 10-	4/3/92	N/A	✓			✓			✓		
MW14 61-											
MW12 6-8											
MW12 18-											
MW-13 6-											
MW13 8-1	4/4/92										
SS-1											
SS-2											
SS-3											
SS-2 2-4											
SB-2 8-1											
RINSEATE	4/2/92										
FIELD BL	4/2/92										

Comments: method Blank BS0326-1 extracted 3/26/92 ND for all
analyzed 4/3/92 compounds

method Blank BW0327-1 extracted 3/27/92 ND for all
analyzed 4/2/92 compounds

N/A - information not available to reviewer

CRDL = Contract Required Detection Limit

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

METHOD BLANK RESULTS

Polynuclear Aromatic Hydrocarbons in Soil
EPA Method 8310[a]

	GTEL Blank ID	BS0326-1
	GTEL File ID	BS203261
	Date Extracted	03/26/92
	Date Analyzed	04/03/92
Analyte	Detection Limit, ug/kg	Concentration, ug/kg
Naphthalene	60	< 59
Acenaphthylene	77	< 76
1-Methylnaphthalene	60	< 59
2-Methylnaphthalene	60	< 59
Acenaphthene	60	< 59
Fluorene	7.0	< 6.9
Phenanthrene	21	< 21
Anthracene	22	< 22
Fluoranthene	7.0	< 6.9
Pyrene	9.0	< 8.9
Benzo[*a*]anthracene	0.43	< 0.42
Chrysene	5.0	< 4.9
Benzo[*b*]fluoranthene	0.60	< 0.59
Benzo[*k*]fluoranthene	0.57	< 0.56
Benzo[*a*]pyrene	0.77	< 0.76
Dibenzo[*a,h*]anthracene	1.0	< 0.99
Benzo[*g,h,i*]perylene	2.5	< 2.5
Indeno[1,2,3-*cd*]pyrene	1.4	< 1.4
Detection Limit Multiplier		0.987

a Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Extraction by EPA Method 3550 (low level sonication). Results are reported on a dry weight basis.

b The detection limit multiplier indicates the adjustments made to the data and detection limits as a result of dilutions and percent solids.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

METHOD BLANK RESULTS

Polynuclear Aromatic Hydrocarbons in Water
EPA Method 8310[a]

	GTEL Blank ID	BW0327-1
	GTEL File ID	BW20321
	Date Extracted	03/27/92
	Date Analyzed	04/02/92
Analyte	Detection Limit, ug/L	Concentration, ug/L
Naphthalene	1.8	< 1.8
Acenaphthylene	2.3	< 2.3
1-Methylnaphthalene	1.8	< 1.8
2-Methylnaphthalene	1.8	< 1.8
Acenaphthene	1.8	< 1.8
Fluorene	0.21	< 0.21
Phenanthrene	0.64	< 0.64
Anthracene	0.66	< 0.66
Fluoranthene	0.21	< 0.21
Pyrene	0.27	< 0.27
Benzo[*a*]anthracene	0.013	< 0.013
Chrysene	0.15	< 0.15
Benzo[*b*]fluoranthene	0.018	< 0.018
Benzo[*k*]fluoranthene	0.017	< 0.017
Benzo[*a*]pyrene	0.023	< 0.023
Dibenzo[*a,h*]anthracene	0.030	< 0.030
Benzo[*g,h,i*]perylene	0.076	< 0.076
Indeno[1,2,3-*cd*]pyrene	0.043	< 0.043
Detection Limit Multiplier		1.00

a Federal Register, Vol. 49, October 26, 1984. Sample preparation by liquid/liquid extraction.
b The detection limit multiplier indicates the adjustments made to the data and detection limits for sample dilutions.

GTEL
ENVIRONMENTAL LABORATORIES, INC.

Page 1 Of 1

GROUNDWATER TECHNOLOGY, INC.
SEMI-VOLATILE SURROGATE SPIKES

Client: Osmose
Job # : 011-105-470
Matrix: sol/aq
Units: ug/kg/l
Audit Date: 04/22/92
Audited By: KMG

Sample Number	No. Spikes OK? Yes	No. Spikes OK? No	No. Spikes OK? Note	%Recovery OK? Yes	%Recovery OK? No	%Recovery OK? Note	Surrogates Outside Criteria
MW14 10-	✓			✓			
MW14 61-				✓			
MW12 6-8				✓			
MW12 18-				✓			
MW-13 6-				✓			
MW13 8-1					✓		Terphenyl-d14 358% R QC limit 33-141% R
SS-1				✓			
SS-2				✓			
SS-3					✓		Terphenyl-d14 255% R QC limit 33-141% R
SS-2 2-4				✓			
SB-2 8-1				✓			
RINSEATE				✓			
FIELD BL				✓			

Comments:

	Liquid	Solid
%Recovery Range:		
%Recovery Range:		

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

SURROGATE RECOVERY SUMMARY

Polynuclear Aromatic Hydrocarbons in Soil
EPA Method 8310

GTEL Sample ID	Percent Recovery, %	
	S1 (NBZ)	S2 (TPH)
BS0326-1	81.6	118
03652-01	99.7	112
03652-02	94.2	117
03652-03	94.1	107
03652-04	93.9	109
03652-05 (04/03/92)	101	97.0
03652-05 (04/14/92)	108	103
03652-06 (04/04/92)	61.1	358*
03652-06 (04/10/92)	D	D
03652-07	60.0	56.3
03652-08 (04/04/92)	81.7	133
03652-08 (04/11/92)	D	D
03652-09 (04/04/92)	80.9	255*
03652-09 (04/11/92)	D	D
03652-13	86.3	113
03652-14	81.8	96.9
03652-02 MS	92.0	109
03652-02 MSD	96.2	111

	Surrogates		Recovery Limits[a]
S1	NBZ	Nitrobenzene-d5	33-141%
S2	TPH	Terphenyl-d14	33-141%

D Surrogate diluted out. % Recovery not calculated when surrogate diluted out.
* Indicates values outside of acceptability limits. See Nonconformance Summary Section 3.0.
a Recovery limits as per laboratory practice.
MS Matrix Spike.
MSD Matrix Spike Duplicate.

GTEL
ENVIRONMENTAL LABORATORIES, INC.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

SURROGATE RECOVERY SUMMARY

Polynuclear Aromatic Hydrocarbons in Water
EPA Method 8310

GTEL Sample ID	Percent Recovery, %	
	S1 (NBZ)	S2 (TPH)
BW0327-1	115	125
03652-10	122	131
03652-11	119	121

	Surrogates		Recovery Limits[a]
S1	NBZ	Nitrobenzene-d5	33-141%
S2	TPH	Terphenyl-d14	33-141%

D Surrogate diluted out. % Recovery not calculated when surrogate diluted out.
* Indicates values outside of acceptability limits.
a Recovery limits as per laboratory practice.
MS Matrix Spike.
MSD Matrix Spike Duplicate.

GTEL
ENVIRONMENTAL LABORATORIES, INC.

GROUNDWATER TECHNOLOGY, INC.
SEMI-VOLATILE MATRIX SPIKES

Client: Osmose
Audit Date: 04/22/92
Job # : 011-105-470
Matrix: sol/aq
Units: ug/kg/l
Audited By: KMG

Sample Number	Analysis		No. Spikes OK?			%Recovery OK?			Compounds out of spec
	Date	Time	Yes	No	Note	Yes	No	Note	
MW14 10-	4/3/92	n/A	✓			✓			none
MW14 61-									
MW12 6-8									
MW12 18-									
MW-13 6-									
MW13 8-1	4/4/92								
SS-1									
SS-2									
SS-3									
SS-2 2-4									
SB-2 8-1									
RINSEATE	4/2/92								
FIELD BL	4/2/92								

Comments: n/A - information not available to reviewer

% Recovery Range

Liquid Solid

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Polynuclear Aromatic Hydrocarbons in Soil
EPA Method 8310

Sample Spiked:	03652-02	Client ID:	MW-14 (61-63)
Date Analyzed:	04/03/92	Solution ID:	H91MS043A

Compound	Spike Added, ug/L	Sample Concentration, ug/L	MS Concentration, ug/L	MS Percent Recovery, %	Acceptability Limits, %
Naphthalene	378	38.3	417	100	D-122
Acenaphthylene	378	< 89.3	365	96.5	D-139
Acenaphthene	378	< 89.3	427	113	D-139
Fluorene	75.6	< 8.12	77.8	103	D-142
Phenanthrene	37.8	10.5	42.1	83.6	D-155
Anthracene	37.8	< 25.5	47.4	125	D-126
Benzo[*k*]fluoranthene	37.8	6.26	40.9	91.6	D-159
Indeno[1,2,3-*cd*]pyrene	37.8	< 1.62	42.1	111	D-116

Compound	Spike Added, ug/L	MSD Concentration, ug/L	MSD Percent Recovery, %	RPD, %	Acceptability Limits: RPD, %
Naphthalene	387	383	89.2	11.6	60
Acenaphthylene	387	379	98.0	1.55	60
Acenaphthene	387	433	112	0.822	60
Fluorene	77.3	76.6	99.1	3.77	60
Phenanthrene	38.7	34.9	63.1	27.9	60
Anthracene	38.7	48.1	124	0.751	60
Benzo[*k*]fluoranthene	38.7	41.4	90.9	0.784	60
Indeno[1,2,3-*cd*]pyrene	38.7	44.3	115	2.88	60

\# Column to be used to flag recovery and RPD values with an asterisk.
* Values outside of QC limits.

GTEL
ENVIRONMENTAL LABORATORIES, INC.

CHAIN-OF-CUSTODY RECORDS

GROUNDWATER
TECHNOLOGY

N2-03-652

GTEL
ENVIRONMENTAL LABORATORIES, INC.

MEADOWBROOK INDUSTRIAL PARK
MILFORD, NH 03055
(603) 672-4835
(800) 441-4835

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

42826

Post-it™ brand fax transmittal memo 7671 | # of pages > 2

To Kim Gould	From V. Donndelinger
Co. GTI	Co. GTEL
Dept.	Phone #
Fax #	Fax #

Field Sample ID	GTEL Lab # (Lab use only)	# Containers	Matrix: WATER	SOIL	AIR	SLUDGE	PRODUCT	OTHER	Method Preserved: HCl	HNO_3	H_2SO_4	ICE	UNPRESERVED	OTHER (SPECIFY)	Sampling: DATE	TIME
MW-14 (10-12)	01	2		X								X			3/17	2:00
MW-14 (61-63)	02	2		X								X			3/18	11:30
MW-12 (6-8)	03	2		X								X			3/19	2:30
MW-12 (18-20)	04	2		X								X			3/19	4:00
MW-13 (6-8)	05	4		X								X			3/19	6:15
MW-13 (8-10)	06	4		X								X			3/19	6:25
SS-1	07	1		X								X			3/18	2:30
SS-2	08	2		X								X			3/18	2:45
SS-3	09	1		X								X			3/18	3:00

Field Sample ID	BTEX/602 ☐ 8020 ☐ with MTBE ☐	BTEX/Gas Hydrocarbons PID/FID ☐ with MTBE ☐	Hydrocarbons GC/FID Gas ☐ Diesel ☐ Screen ☐	Hydrocarbon Profile (SIMDIS) ☐	Oil and Grease 413.1 ☐ 413.2 ☐ SM 503 ☐	TPH/IR 418.1 ☐ SM 503 ☐	EDB by 504 ☐ DBCP by 504 ☐	EPA 503.1 ☐ EPA 502.2 ☐	EPA 601 ☐ EPA 8010 ☐	EPA 602 ☐ EPA 8020 ☒	EPA 608 ☐ 8080 ☐ PCB only ☐	EPA 624/PPL ☐ 8240/TAL ☐ NBS (+15) ☐	EPA 625/PPL ☐ 8270/TAL ☐ NBS (+25) ☐	EPA 610 ☐ 8310 ☒	EP TOX Metals ☐ Pesticides ☐ Herbicides ☐	TCLP Metals ☐ VOA ☐ Semi-VOA ☐ Pest ☐ Herb ☐	EPA Metals - Priority Pollutant ☐ TAL ☐ RCRA ☐	CAM Metals TTLC ☐ STLC ☐	Lead 239.2 ☐ 200.7 ☐ 7420 ☐ 7421 ☐ 6010 ☐	Organic Lead ☐	Corrosivity ☐ Flash Point ☐ Reactivity ☐
MW-14 (10-12)										X				X							
MW-14 (61-63)										X				X							
MW-12 (6-8)										X				X							
MW-12 (18-20)										X				X							
MW-13 (6-8)										X				X							
MW-13 (8-10)										X				X							
SS-1														X							
SS-2														X							
SS-3														X							

TAT
Priority (24 hr) ☐
Expedited (48 hr) ☐
7 Business Days ☐
Other ______ Business Days ☐
Project-Specific
BLUE ☒ CLP ☐

Special Handling
GTEL Contact Vince Donndelinger
Quote/Contract #
Confirmation #
PO #
QA / QC LEVEL
OTHER

SPECIAL DETECTION LIMITS

SPECIAL REPORTING REQUIREMENTS
FAX ☒

REMARKS
Attn: Vince Donndelinger

Lab Use Only Lot #
Storage Location: 18LE
Work Order #

CUSTODY RECORD

Relinquished by Sampler: J. Olaf Gustafs	Date 3/23/92	Time 5:00	Received by:
Relinquished by:	Date	Time	Received by:
Relinquished by:	Date 3/24/92	Time 11.25	Received by Laboratory:
			Waybill # 408 7273 013 / 424 7861 030

Rev. 7/91

GTEL
ENVIRONMENTAL LABORATORIES, INC.

MEADOWBROOK INDUSTRIAL PARK
MILFORD, NH 03055
(603) 672-4835
(800) 441-4835

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

42825

Company Name: GTI
Phone #:
FAX #:
Company Address: Albany
Site location: Buffalo, NY
Project Manager: Bruce Ahrens
Client Project ID: (#) 011105470
(NAME)
I attest that the proper field sampling procedures were used during the collection of these samples.
Sampler Name (Print): Olaf Gustafson

Field Sample ID	GTEL Lab # (Lab use only)	# Containers	Matrix						Method Preserved						Sampling	
			WATER	SOIL	AIR	SLUDGE	PRODUCT	OTHER	HCl	HNO_3	H_2SO_4	ICE	UNPRESERVED	OTHER (SPECIFY)	DATE	TIME
Rinseate Blank	10	3	X						X			X			3/20	11:00
Rinseate Blank	1D	2	X									X			3/20	11:00
Field Blank	11	3	X						X			X			3/20	2:00
Field Blank	11	2	X									X			3/20	2:00
Trip Blank	12	3	X						X			X			3/17	3:45
SB-2 (2-4)	13	2		X								X			3/20	10:00
SB-2 (8-10)	14	2		X								X			3/20	10:30

Field Sample ID	BTEX/602 ☐ 8020 ☐ with MTBE ☐	BTEX/Gas Hydrocarbons PID/FID ☐ with MTBE ☐	Hydrocarbons GC/FID Gas ☐ Diesel ☐ Screen ☐	Hydrocarbon Profile (SIMDIS) ☐	Oil and Grease 413.1 ☐ 413.2 ☐ SM 503 ☐	TPH/IR 418.1 ☐ SM 503 ☐	EDB by 504 ☐ DBCP by 504 ☐	EPA 503.1 ☐ EPA 502.2 ☐	EPA 601 ☐ EPA 8010 ☐	EPA 602 ☐ EPA 8020	EPA 608 ☐ 8080 ☐ PCB only ☐	EPA 624/PPL ☐ 8240/TAL ☐ NBS (+15) ☐	EPA 625/PPL ☐ 8270/TAL ☐ NBS (+25) ☐	EPA 610 ☐ 8310	EP TOX Metals ☐ Pesticides ☐ Herbicides ☐	TCLP Metals ☐ VOA ☐ Semi-VOA ☐ Pest ☐ Herb ☐	EPA Metals - Priority Pollutant ☐ TAL ☐ RCRA ☐	CAM Metals TTLC ☐ STLC ☐	Lead 239.2 ☐ 200.7 ☐ 7420 ☐ 7421 ☐ 6010 ☐	Organic Lead ☐	Corrosivity ☐ Flash Point ☐ Reactivity ☐
Rinseate Blank										X											
Rinseate Blank														X							
Field Blank										X											
Field Blank														X							
Trip Blank										X											
SB-2 (2-4)										X				X							
SB-2 (8-10)										X				X							

TAT
Priority (24 hr) ☐
Expedited (48 hr) ☐
7 Business Days ☐
Other
Business Days ☐
Project-Specific

Special Handling
GTEL Contact Vince Donndelinger
Quote/Contract #
Confirmation #
PO #

SPECIAL DETECTION LIMITS

REMARKS
Attn: Vince Donndelinger

SPECIAL REPORTING REQUIREMENTS

BLUE ☒ CLP ☐

QA / QC LEVEL
OTHER

FAX ☒

Lab Use Only Lot #
Storage Location: 242 18E
Work Order #

CUSTODY RECORD

Relinquished by Sampler: J. Olaf Gustafson	Date 3/23/92	Time 5:00	Received by:
Relinquished by:	Date	Time	Received by:
Relinquished by:	Date 3/24/92	Time 11:25	Received by Laboratory: Tracie Sad
			Waybill # 408 7273 013/424 7840

Rev. 7/91

GTEL
ENVIRONMENTAL
LABORATORIES, INC.

MEADOWBROOK INDUSTRIAL PARK
MILFORD, NH 03055
(603) 6724835
(800) 4414835

CHAIN-OF-CUSTODY RECORD
AND ANALYSIS REQUEST

49661

ary Name: TEL Environmental LAB

Phone #: Above

FAX #: 603-673-8105

ary Address: leadowbrook Ind, Park

Site location: FOR: Osmose Woodpreserving

t Manager: incent Donndelinger

Client Project ID: (#) FOR:

(NAME Bruce Ahrens

t that the proper field sampling
dures were used during the collection
se samples.

Sample Name (Print): Kyle Vautour

ANALYSIS REQUEST — OTHER

Field Sample ID	GTEL Lab # (Lab use only)	# Containers	Matrix: WATER SOIL	AIR	SLUDGE	PRODUCT	OTHER	Method Preserved: HCl	HNO_3	H_2SO_4	ICE	UNPRESERVED	OTHER (SPECIFY)	Sampling: DATE	TIME	BTEX/602 ☐ 8020 ☐ with MTBE ☐	BTEX/Gas Hydrocarbons PID/FID ☐ with MTBE ☐	Hydrocarbons GC/FID Gas ☐ Diesel ☐ Screen ☐	Hydrocarbon Profile (SIMDIS) ☐	Oil and Grease 413.1 ☐ 413.2 ☐ SM 503 ☐	TPH/IR 418.1 ☐ SM 503 ☐	EDB by 504 ☐ DBCP by 504 ☐	EPA 503.1 ☐ EPA 502.2 ☐	EPA 601 ☐ EPA 8010 ☐	EPA 602 ☐ EPA 8020 ☐	EPA 608 ☐ 8080 ☐ PCB only ☐	EPA 624/PPL ☐ 8240/TAL ☐ NBS (+15) ☐	EPA 625/PPL ☐ 8270/TAL ☐ NBS (+25) ☐	EPA 610 ☐ 8310 ☐	EP TOX Metals ☐ Pesticides ☐ Herbicides ☐	TCLP Metals ☐ VOA ☐ Semi-VOA ☐ Pest ☐ Herb ☐	EPA Metals - Priority Pollutant ☐ TAL ☐ RCRA ☐	CAM Metals TTLC ☐ STLC ☐	Lead 239.2 ☐ 200.7 ☐ 7420 ☐ 7421 ☐ 6010 ☐	Organic Lead ☐	Corrosivity ☐ Flash Point ☐ Reactivity ☐	OTHER		
p Blank		3	X					X						3/17/92	3:45																								
ld Blank VOA		4	X											3/17/92	3:45																								
d Blank [illegible]		3	X											3/17/92	3:45																								

TAT
y (24 hr) ☐
lited (48 hr) ☐
iness Days ☐
ess Days ☐

Special Handling
GTEL Contact
Quote/Contract #
Confirmation #
PO #

QA / QC LEVEL
☐ CLP ☐
OTHER

SPECIAL DETECTION LIMITS

SPECIAL REPORTING REQUIREMENTS

FAX ☐

REMARKS
Please send TB and FB back to LAB on separate sample COC

Lab Use Only Lot #

Storage Location:

Work Order #

USTODY
ECORD

Relinquished by Sampler:	Date 3/17/92	Time 3:55	Received by: 3/18/92
Relinquished by:	Date 3/17/92	Time 3:55	Received by:
Relinquished by:	Date	Time	Received by Laboratory:

Waybill #

DATA VALIDATION REPORT
OSMOSE WOOD PRESERVING, INC.
BUFFALO, NEW YORK SITE

AROMATIC VOLATILE ORGANICS ANALYSIS

Samples Collected: April 2, 1992

Report Prepared: June 10, 1992

Prepared By:
Groundwater Technology, Inc.
223 Wilmington-West Chester Pike
Chadds Ford, Pennsylvania 19317

GROUNDWATER
TECHNOLOGY

Preface to Data Validation

The concept of data validation has been developed over the past decade to assure that the quality of the data generated as a result of laboratory analysis by USEPA's Contract Laboratory Program protocols is acceptable. Guidelines for data validation have been established by the USEPA Data Review Work Groups, for the Hazardous Site Evaluation Division, and are published in documents entitled, Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses, and Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses.

These documents are available to the public and will be strictly adhered to during the data review of these packages analyzed by GTEL Environmental Laboratories, Milford, New Hampshire. Before reading the data validation reports prepared by Groundwater Technology, Inc., some insight and explanation is offered for the application of the data.

The purpose of the data validation report is to inform the data user of problems that were encountered during the analysis of the samples. The qualifiers section states the major points of concern and places restrictions on the usage of data with "qualifiers" such as B, J, or R. Qualification of data with respect to the amount of contamination in the blanks (method, field, rinsate or trip) associated with a set of samples is a dependable means of assessing procedures, container cleanliness and laboratory procedure. For example, if acetone, a common laboratory contaminant, was found at 50 μg/l in a trip blank, 15 μg/l in the laboratory's method blank and 20 μg/l in the field blank, a qualifier would be written stating that, "all positive results in samples x,y,z, associated with the trip blank are questionable." This means that any positive results from a sample less than ten times the amount found in the blank having the highest contamination source (in this case the trip blank, at 50 μg/l) is probably from the blank. Any samples related to this trip blank having results less than 500 μg/l are questionable, attributable to the degree of container cleanliness. Other examples are attached.

Another area of concern is holding time and preservation of the samples. The chain-of-custody is examined for the date of sampling, date samples were relinquished to the courier, preservation methods, date received at the laboratory and any comments that were made by the laboratory's sample custodian. The date of sample collection is compared with the date of sample receipt, extraction and/or analysis; if the number of days between sample collection and sample extraction/analysis is outside of the acceptable range then these results must be considered

estimated. The methods of sample preservation used can alter the acceptable holding time range. The effects of long-term storage even under refrigeration cannot be predicted due to variable matrices from site to site, or from sample to sample on site.

A qualifier may also be applied to the data if surrogate spike recoveries fall outside the quality control limits. Surrogate spike compounds are added to every sample and blank to monitor the laboratory's performance, however the sample matrix itself may contribute to the poor recovery of surrogate compounds. For example, samples with interferences or high analyte concentrations may cause unusual surrogate recoveries. Sometimes reanalysis (or re-extraction) is necessary to determine if the source of the problem is laboratory- or sample matrix-related.

Initial and continuing calibrations, along with GC/MS tuning are evaluated and sometimes qualified for individual compounds (such as 2-butanone) in the volatile organics fraction. It is a chronic problem for many laboratories to obtain steady response factors for 2-butanone (methyl ethyl ketone) that are stable enough to fall inside the specified criteria. False negatives and valid detection limits are also of concern when qualifying the initial and continuing calibrations, and the GC/MS tuning.

The evaluation of blind field duplicates, matrix spike (MS) and matrix spike duplicates (MSD), are of importance in assessing field sampling techniques, sample homogeneity, representativeness of sample points, and laboratory precision. A relative percent difference is calculated for three or more samples. Criteria are listed on the attached sheets for field duplicates and MS/MSDs. It should be noted that a data package cannot be qualified solely on MS/MSD data. The MS/MSD data merely confirm matrix interferences and can be used as support for other qualifiers such as surrogate spike recoveries.

Identification of positively identified compounds is checked with respect to the guidelines. Also the compound quantitation calculation and the feasibility of obtaining the specified detection limits are checked.

The tentatively identified compounds (TICs) found by the mass spectral library search are checked for goodness of "fit" against the reference spectrum. If there is a discrepancy between the laboratory analyst's interpretation of the spectrum and Groundwater Technology's interpretation, a qualifier is placed on the compound in question stating that it is to be considered an unknown or an isomer of that compound. Most often the laboratory will qualify the results as estimated, due to the

fact that standards for that TIC have not been run (nor are they required). Quantitation of TICs is based on the total quantitation method.

Data that may not meet certain criteria rarely cause an entire case to be qualified as unusable (R) because other parameters validated are acceptable. However, data for particular analytes may be discarded due to calibration response factors of questionable integrity.

The findings section gives standard as well as judgmental reasons as to why the data are qualified. The summary explains point by point each qualifier and places a general status (acceptable, provisional or acceptable) on the entire data package.

The following are examples of application of the blank qualification guidelines. Certain circumstances may warrant deviations from these quidelines.

Case 1: Sample result is greater than the Contract Required Quantitation Limit (CRQL), but is less than the required amount (5x or 10x) when compared to the blank result.

	RULE	
	10x	5x
Blank Result	7	7
CRQL	5	5
Sample Result	60	60
Qualified Sample Result	60B	60B

In the example for the 10x rule, a sample result less than 70 (10 x 7) would be qualified as questionable (B). In the case of the 5x rule, sample result less than 35 (5 x 7) would also be qualified as questionable (B).

Case 2: Sample result is less than the CRQL, and is also less than the required amount (5x or 10x) when compared to the blank result.

	RULE	
	10x	5x
Blank Result	6	6
CRQL	5	5
Sample Result	4J	4J
Qualified Sample Result	4B	4B

Case 3: Sample result is greater than the CRQL and the required amount (5x or 10x) when compared to the blank result.

	RULE	
	10x	5x
Blank Result	10	10
CRQL	5	5
Sample Result	120	60
Qualified Sample Result	120	60

For both the 10x and 5x rules, sample results exceeded the adjusted blank results of 100 (10 x 10) and 50 (5 x10), respectively.

1.0 INTRODUCTION

This review addresses eight groundwater samples and three aqueous quality control samples collected April 2, 1992 by Groundwater Technology, Inc, Albany, New York, and submitted to GTEL Environmental laboratories, Inc., Milford, New Hampshire for the analysis of aromatic volatile organic compounds.

Items reviewed in this data package include:

- chain-of-custody records,
- analytical holding times,
- calibration verification,
- all applicable blank samples,
- matrix spike recoveries,
- duplicate spike recoveries,
- data completeness, and
- an overall assessment of the batch.

It should be noted that these samples were analyzed using EPA methodology, but only a "Blue Level" data package was compiled. Therefore, no raw data was available to the reviewer. Where applicable, the reviewer used the laboratory QA nonconformance summary to validate the associated client sample results.

TABLE 1.0 APPLICABLE SAMPLE NUMBERS	
GTI ID	LAB ID
MW-8	04128-04
MW-9	04128-06
MW-10	04128-05
MW-11	04128-02
MW-12	04128-03
MW-13	04128-07
MW-14	04128-01
CW-1	04128-08
RINSEATE BLANK	04130-01
FIELD BLANK	04128-09
TRIP BLANK	04130-02

TABLE 2.0 DATA QUALIFIERS			
ANALYTE	SAMPLE ID	ISSUE	QUALIFIER
BENZENE	MW-14	(1)	B

(1) blank contaminant

2.0 FINDINGS AND DISCUSSION

- The result for benzene in sample MW-14 is questionable due to blank contamination. Specifically, benzene was detected in the associated rinseate blank at a concentration of 0.3 μg/l. Using the blank contamination rule, any benzene detected in the client samples at a concentration less than 1.5 μg/l (0.3 μg/l x 5) is considered questionable. Rinseate blank contamination can be an indication of improper decontamination procedures in the field.

3.0 SUMMARY

After thoroughly reviewing all available data it was determined that the laboratory has adequately performed all analyses since:

- chain-of-custody records were complete,
- calibration verification results were acceptable,
- all applicable laboratory blank samples were contaminant-free,
- matrix spike recoveries were acceptable,
- duplicate sample results were acceptable,
- surrogate spike recoveries were acceptable, and
- data were complete.

For specifics on this quality assurance review, refer to the attached support documents.

GROUNDWATER TECHNOLOGY, INC.

Kimberly McGhee-Gould

Kimberly McGhee-Gould
QA/QC Supervisor

Date: June 10, 1992

KMG/ll:P:\projects\osmose\voc.rpt

AROMATIC VOLATILE ORGANIC SUPPORT DOCUMENTATION

GROUNDWATER
TECHNOLOGY

Page 1 of 1

Aromatic Volatile Organics in H_2O

DATA SUMMARY FORM: ORGANICS

Site Name: Osmose

WATER SAMPLES
(µg/L)

Case #: ______ **Sampling Date(s):** 4/2/92

To calculate sample quantitation limit:
(QL * Dilution Factor)

	MW-8		MW-9		MW-10		MW-11		MW-12		MW-13		MW-14		CW-1		RB	
Benzene			170								120		1.2	B	21		0.3	
Toluene			150								300		1.3		3.1			
Ethyl Benzene			33								90				0.8		—	
Xylenes (total)			180								1100				9.3			
Chlorobenzene											790							
1,2-dichlorobenzene			22												13			
1,3-dichlorobenzene																		
1,4-dichlorobenzene											36							

QL = Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITION:
revised 07/90

Page 1 of 1

Aromatic Volatile Organics in H_2O

DATA SUMMARY FORM: ORGANICS

WATER SAMPLES
(µg/L)

Site Name: Osmose

Case #: ______ Sampling Date(s): 4/2/92

To calculate sample quantitation limit:
(QL * Dilution Factor)

		FB		TB															
	Benzene																		
	Toluene																		
	Ethyl Benzene																		
	Xylenes (total)																		
	Chlorobenzene																		
	1,2-dichlorobenzene																		
	1,3-dichlorobenzene																		
	1,4-dichlorobenzene																		

QL = Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS
revised 07/90

GROUNDWATER TECHNOLOGY, INC.
VOLATILE HOLDING TIMES

Client: Osmose
Job # : 011-105-470 Matrix: aqueous Units: ug/l
Audit Date: 06/08/92
Audited By: KMG

Sample Number	Preserve		Sample Date	Date Rec'd	Analysis Date	Time	Guidelines			
	Yes	No					ECRA	40CFR	SW-846 ASPCLP	Out
MW-8	✓		4/2/92	4/4/92	4/10/92	N/A				
MW-9					4/10/92					
MW-10					4/10/92					
MW-11					4/9/92					
MW-12					4/9/92					
MW-13					4/10/92					
MW-14					4/9/92					
CW-1					4/10/92					
FB					4/10/92					
RB					4/9/92					
TB					4/9/92					

Samples preserved W/HCL to pH < 2.0
N/A - information not available to reviewer

Guideline
Holding Times: ECRA 40 CFR Part 136 SW-846
Solid
Liquid

Client Number: 011105470
Project ID: Osmose
Work Order Number: N2-04-128
N2-04-130

ANALYTICAL RESULTS

Aromatic Volatile Organics in Water
Modified EPA Method 8020[a]

	GTEL Sample Number	04128-01	04128-02	04128-03	04128-04
	Client Identification	MW14	MW11	MW12	MW8
	Date Sampled	04/02/92	04/02/92	04/02/92	04/02/92
	Date Analyzed	04/09/92	04/09/92	04/09/92	04/10/92
Analyte	Detection Limit, ug/L	Concentration, ug/L			
Benzene	0.2	1.2	< 0.2	< 0.2	< 0.2
Toluene	0.5	1.3	< 0.5	< 0.5	< 0.5
Ethyl Benzene	0.8	< 0.8	< 0.8	< 0.8	< 0.8
Xylenes (total)	1.7	< 1.7	< 1.7	< 1.7	< 1.7
Chlorobenzene	0.2	< 0.2	< 0.2	< 0.2	< 0.2
1,2-Dichlorobenzene	0.4	< 0.4	< 0.4	< 0.4	< 0.4
1,3-Dichlorobenzene	0.4	< 0.4	< 0.4	< 0.4	< 0.4
1,4-Dichlorobenzene	0.3	< 0.3	< 0.3	< 0.3	< 0.3
Detection Limit Multiplier[b]		1	1	1	1

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; extraction by EPA Method 5030 (purge and trap). Method modified to include additional compounds.

[b] The detection limit multiplier indicates the adjustments made to the data and detection limits for sample dilutions.

GTEL
ENVIRONMENTAL LABORATORIES INC

Client Number: 011105470
Project ID: Osmose
Work Order Number: N2-04-128
N2-04-130

ANALYTICAL RESULTS

Aromatic Volatile Organics in Water
Modified EPA Method 8020[a]

GTEL Sample Number		04128-05	04128-06	04128-07	04128-08
Client Identification		MW10	MW9	MW13	CW1
Date Sampled		04/02/92	04/02/92	04/02/92	04/02/92
Date Analyzed		04/10/92	04/10/92	04/10/92	04/10/92
Analyte	Detection Limit, ug/L	Concentration, ug/L			
Benzene	0.2	< 0.2	170	120	21
Toluene	0.5	< 0.5	150	300	3.1
Ethyl Benzene	0.8	< 0.8	33	90	0.8
Xylenes (total)	1.7	< 1.7	180	1100	9.3
Chlorobenzene	0.2	< 0.2	< 0.4	790	< 0.2
1,2-Dichlorobenzene	0.4	< 0.4	22	< 2.0	13
1,3-Dichlorobenzene	0.4	< 0.4	< 0.8	< 2.0	< 0.4
1,4-Dichlorobenzene	0.3	< 0.3	< 0.6	36	< 0.3
Detection Limit Multiplier[b]		1	2	5	1

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; extraction by EPA Method 5030 (purge and trap). Method modified to include additional compounds.

[b] The detection limit multiplier indicates the adjustments made to the data and detection limits for sample dilutions.

GTEL
ENVIRONMENTAL LABORATORIES INC

Page / of/

GROUNDWATER TECHNOLOGY, INC.
VOLATILE BLANK ANALYSIS

Client: Osmose
Job # :011-105-470
Matrix:aqueous Units: ug/l
Audit Date:06/08/92
Audited By: KMG

Sample Number	Analysis		Correct# of Blanks			<5X CRDL Acetone Toluene, MeCl?			<CRDL for all other TCL Volatile		
	Date	Time	Yes	No	Note	Yes	No	Note	Yes	No	Note
MW-8	4/10/92	N/A	✓			✓			✓		U)
MW-9											
MW-10											
MW-11	4/9/92										
MW-12											
MW-13	4/10/92										
MW-14	4/9/92										
CW-1	4/10/92										
FB											
RB	4/9/92										
TB											

Comments: N/A-information not available to reviewer

Rinsate blank - benzene 0.3 ug/l

CRDL = Contract Required Detection Limit, See Attached Detection Limits

Client Number: 011105470
Project ID: Osmose
Work Order Number: N2-04-128
N2-04-130

ANALYTICAL RESULTS

Aromatic Volatile Organics in Water
Modified EPA Method 8020[a]

	GTEL Sample Number	04128-09	04130-01	04130-02	–
	Client Identification	FIELD BLANK	RINSEATE	TRIP BLANK	–
	Date Sampled	04/02/92	04/03/92	04/03/92	–
	Date Analyzed	04/10/92	04/09/92	04/09/92	–
Analyte	Detection Limit, ug/L	Concentration, ug/L			
Benzene	0.2	< 0.2	0.3	< 0.2	–
Toluene	0.5	< 0.5	< 0.5	< 0.5	–
Ethyl Benzene	0.8	< 0.8	< 0.8	< 0.8	–
Xylenes (total)	1.7	< 1.7	< 1.7	< 1.7	–
Chlorobenzene	0.2	< 0.2	< 0.2	< 0.2	–
1,2-Dichlorobenzene	0.4	< 0.4	< 0.4	< 0.4	–
1,3-Dichlorobenzene	0.4	< 0.4	< 0.4	< 0.4	–
1,4-Dichlorobenzene	0.3	< 0.3	< 0.3	< 0.3	–
Detection Limit Multiplier[b]		1	1	1	–

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; extraction by EPA Method 5030 (purge and trap). Method modified to include additional compounds.

[b] The detection limit multiplier indicates the adjustments made to the data and detection limits for sample dilutions.

Client Number: 011105470
Project ID: Osmose
Work Order Number: N2-04-128
N2-04-130

METHOD BLANK RESULTS

Aromatic Volatile Organics in Water
Modified EPA Method 8020[a]

	GTEL File ID	08WBL0408C	19WBL0409A	--	--
	Client Identification	METHOD BLANK	METHOD BLANK	--	--
	Date Analyzed	04/08/92	04/09/92	--	--
Analyte	Detection Limit, ug/L	Concentration, ug/L			
Benzene	0.2	< 0.2	< 0.2	--	--
Toluene	0.5	< 0.5	< 0.5	--	--
Ethyl Benzene	0.8	< 0.8	< 0.8	--	--
Xylenes (total)	1.7	< 1.7	< 1.7	--	--
Chlorobenzene	0.2	< 0.2	< 0.2	--	--
1,2-Dichlorobenzene	0.4	< 0.4	< 0.4	--	--
1,3-Dichlorobenzene	0.4	< 0.4	< 0.4	--	--
1,4-Dichlorobenzene	0.3	< 0.3	< 0.3	--	--
Detection Limit Multiplier[b]		1	1	--	--

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; extraction by EPA Method 5030 (purge and trap). Method modified to include additional compounds.

[b] The detection limit multiplier indicates the adjustments made to the data and detection limits for sample dilutions.

Page 1 Of 1

GROUNDWATER TECHNOLOGY, INC.
VOLATILE MATRIX SPIKES

Client: Osmose
Job # :011-105-470
Matrix:aqueous Units: ug/l
Audit Date:06/08/92
Audited By: KMG

Sample Number	Analysis Date	Time	No. Spikes OK?			%Recovery OK?			Compounds out of spec
			Yes	No	Note	Yes	No	Note	
MW-8	4/10/92	N/A	✓			✓			none
MW-9									
MW-10									
MW-11	4/9/92								
MW-12									
MW-13	4/10/92								
MW-14	4/9/92								
CW-1	4/10/92								
FB									
RB	4/9/92								
TB									

Comments:
N/A - information not available to reviewer

Client Number: 011105470
Project ID: Osmose
Work Order Number: N2-04-128
N2-04-130

MATRIX SPIKE RECOVERY

Aromatic Volatile Organics in Water
Modified EPA Method 8020

Sample Spiked: 04175-01
Date of Analysis: 04/10/92
Standard ID: BX92QC0003C

Client ID: BATCH QC
Matrix: Water

Compound	Sample Results, ug/L	Spike Amount, ug/L	MS Results, ug/L	MS % Percent Recovery	Acceptability Limits, %[a]
Benzene	< 0.2	20.0	18.8	94.0	39-150
Toluene	< 0.5	20.0	19.0	95.0	46-148
Ethyl Benzene	< 0.8	20.0	19.3	96.5	32-160
Total Xylenes	< 1.7	60.0	58.5	97.5	36-163

a Laboratory generated acceptability limits updated 4/88.
NA Not Applicable; % Recovery is not calculated when original sample amount exceeds five times the spike amount.

DUPLICATE SAMPLE RECOVERY

Aromatic Volatile Organics in Water
Modified EPA Method 8020

Sample Number: 04170-01
Date of Analysis: 04/10/92

Client ID: BATCH QC
Matrix: Water

Compound	Sample Results, ug/L	Duplicate Results, ug/L	RPD, %	Acceptability Limits, %[a]
Benzene	14000	15000	6.90	34
Toluene	33000	35000	5.88	31
Ethyl Benzene	2500	2800	11.3	38
Total Xylenes	16000	17000	6.06	38

a Laboratory generated acceptability limits updated 4/88.
NA Not Applicable; % RPD is not calculated when sample values are less than 10 times the detection limit.

Client Number: 011105470
Project ID: Osmose
Work Order Number: N2-04-128
N2-04-130

MATRIX SPIKE RECOVERY

Aromatic Volatile Organics in Water
Modified EPA Method 8020

Sample Spiked: 04128-05
Date of Analysis: 04/10/92
Standard ID: BX92QC003

Client ID: BATCH QC
Matrix: Water

Compound	Sample Results, ug/L	Spike Amount, ug/L	MS Results, ug/L	MS % Percent Recovery	Acceptability Limits, %[a]
Benzene	< 0.2	20.0	20.0	100	39-150
Toluene	< 0.5	20.0	19.8	99.0	46-148
Ethyl Benzene	< 0.8	20.0	20.8	104	32-160
Total Xylenes	< 1.7	60.0	57.9	96.5	36-163

a Laboratory generated acceptability limits updated 4/88.
NA Not Applicable; % Recovery is not calculated when original sample amount exceeds five times the spike amount.

DUPLICATE SAMPLE RECOVERY

Aromatic Volatile Organics in Water
Modified EPA Method 8020

Sample Number: 04128-04
Date of Analysis: 04/10/92

Client ID: BATCH QC
Matrix: Water

Compound	Sample Results, ug/L	Duplicate Results, ug/L	RPD, %	Acceptability Limits, %[a]
Benzene	< 0.2	< 0.2	NA	34
Toluene	< 0.5	< 0.5	NA	31
Ethyl Benzene	< 0.8	< 0.8	NA	38
Total Xylenes	< 1.7	< 1.7	NA	38

a Laboratory generated acceptability limits updated 4/88.
NA Not Applicable; % RPD is not calculated when sample values are less than 10 times the detection limit.

GTEL
ENVIRONMENTAL LABORATORIES, INC.

Page 1 Of 1

GROUNDWATER TECHNOLOGY, INC.
VOLATILE SURROGATE SPIKES

Client: Osmose
Job # :011-105-470

Matrix:aqueous Units: ug/l

Audit Date:06/08/92
Audited By: KMG

Sample Number	No. Spikes OK?			%Recovery OK?			Surrogates Outside Criteria
	Yes	No	Note	Yes	No	Note	
MW-8	✓			✓			NONE
MW-9							
MW-10							
MW-11							
MW-12							
MW-13							
MW-14							
CW-1							
FB							
RB							
TB							

	Liquid	Solid
%Recovery Range:	45-115% R	

Client Number: 011105470
Project ID: Osmose
Work Order Number: N2-04-128
N2-04-130

SURROGATE RECOVERY RESULTS

Aromatic Volatile Organics in Water
(Trifluorotoluene)
Modified EPA Method 8020

Sample	Amount Added, ug/L	Surrogate Recovery, %
METHOD BLANK (04/08/92)	47.6	105
METHOD BLANK (04/09/92)	47.6	61.3
04128-01	47.6	65.1
04128-02	47.6	61.4
04128-03	47.6	59.7
04128-04	47.6	63.4
04128-05	47.6	63.5
04128-06	47.6	64.2
04128-07	47.6	94.5
04128-08	47.6	64.1
04128-09	47.6	65.9
04130-01	47.6	91.7
04130-02	47.6	94.2
04128-05 MS	47.6	62.1
04128-04 DUP	47.6	67.1
04175-01 MS	47.6	92.5
04170-01 DUP	47.6	96.4

Acceptability Limits[a] 45-125%

a	Laboratory generated acceptability limits updated 07/11/91.
MS	Matrix Spike.
DUP	Sample Duplicate.

Client Number: 011105470
Project ID: Osmose
Work Order Number: N2-04-128
N2-04-130

QA NONCONFORMANCE SUMMARY

1.0 Method Blank Analysis

1.1 Zero target compound(s) were found in the method blank.

2.0 Calibration Verification

2.1 The control limits were exceeded for zero calibration check compounds.

3.0 Surrogate Compound Recoveries

3.1 The recovery limits were exceeded for zero surrogate compounds.

4.0 Matrix Spike (MS) Accuracy

4.1 The recovery limits were exceeded in the matrix spike for zero compounds.

5.0 Sample Duplicate Precision

5.1 The maximum relative percent difference (RPD) was exceeded for zero compound(s) in the duplicate samples.

6.0 Sample Integrity

6.1 Sample handling and holding time criteria were met.

CHAIN-OF-CUSTODY RECORDS

GROUNDWATER
TECHNOLOGY

GTEL

Meadowbrook Industrial Park
Milford, New Hampshire 03055
(603) 672-4835 / FAX: (603) 673-8105

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

No. 30141

Project Manager: BRUCE AHRENS
Phone #: 515-456-2444
Address (Office): 2 WINNER WAY ALBANY NY
Site Location: BUFFALO NY
Project Number: 01110-5470
Project Name: OSMOSE
I attest that the proper field sampling procedures were used during the collection of these samples.
Sampler Name (Print): DANIEL KEENE

Field Sample ID	Source of Sample	GTEL Lab # (Lab use only)	# CONTAINERS	Matrix: WATER	SOIL	AIR	SLUDGE	OTHER (Specify)	Method Preserved: HCl	HNO_3	H_2SO_4	ICE	NONE	OTHER (Specify)	Sampling: DATE	TIME
MW-17		01	6	X					X			X			4/2	12:45
MW 11		02	6	X					X			X			4/2	1:15
MW 12		03	6	X					X			X			4/2	1:45
MW 8		04	6	X					X			X			4/2	2:00
MW10		05	6	X					X			X			4/2	4:00
MW 7		06	6	X					X			X			4/2	4:30
MW [illegible]		07	6	X					X			X			4/2	4:45
CW 1		08	6	X					X			X			4/2	5:15
FIELD BLANK		09	6	X					X			X			4/2	3:30
RINSEATE		10		X					X			X			4/2	5:45
TRIP	BLANK	11		X								X				

ANALYSIS REQUEST

Field Sample ID	Gas. Hydrocarbons by 602 ☐ 8020 ☐ with MTBE ☐	BTEX only by 602 ☐ 8020 ☐ with MTBE ☐	EDB by 504 ☐	Oil and Grease 413.1 ☐ 413.2 ☐ 503B-D ☐	TPH 418.1 ☐ 503B,D-E ☐ by GC ☐	EPA 503.1 ☐ 502.2 ☐	EPA 601 ☐ 8010 ☐ DCA only ☐	EPA 602 ☐ 8020 ☒	EPA 608 ☐ 8080 ☐ PCB only ☐	EPA 624 ☐ 8240 ☐ NBS(+15) ☐	EPA BNA 625 ☐ 8270 ☐ NBS(+25) ☐	EPA625 BN only ☐ 8270 BN only ☐ NBS(+15) ☐	EPA625 AE only ☐ 8270 AE only ☐ NBS(+10) ☐	EPA 610 ☐ 8310 ☒	EPTOX-Metals ☐ Pesticides ☐ Herbicides ☐	TCLP Metals ☐ VOA ☐ Semi VOA ☐	EPA Metals - Priority Pollutant ☐ HSL ☐ RCRA ☐	LEAD 239.2 ☐ 200.7 ☐ 7420 ☐ 6010 ☐	Corrosivity ☐ Flash Point ☐ Reactivity ☐	Product ID by GC (SimDis) ☐	OTHER
MW-17								3						3							
MW 11								3						3							
MW 12								3						3							
MW 8								3						3							
MW10								3						3							
MW 7								3						3							
MW [illegible]								3						3							
CW 1								3						3							
FIELD BLANK								3						[illegible]							
RINSEATE								3						3							
TRIP BLANK																					

CUSTODY RECORD

Relinquished by:	Date	Time	Received by:
Relinquished by Sampler: Daniel Keene	4/3/92	11:00	
Relinquished by:			
Relinquished by	4/4/92	13:55	Received by Laboratory: Tricia [illegible] Waybill # 2511739332

SPECIAL HANDLING

EXPEDITED (48 hrs) ☐
SEVEN BUSINESS DAYS ☐
OTHER ___ (#) BUSINESS DAYS ☐
QA/QC Level CLP ☐ Blue ☐
CONTACT PERSON ________
QUOTE # ________
CONTRACT # ________
FAX ☐

SPECIAL DETECTION LIMITS (Specify)

SPECIAL REPORTING REQUIREMENTS (Specify)

REMARKS:

LAB USE ONLY
Storage Location 22B, 4:3
Lot #
Work Order #

DATA VALIDATION REPORT
OSMOSE WOOD PRESERVING, INC.
BUFFALO, NEW YORK SITE

POLYNUCLEAR AROMATIC HYDROCARBONS ANALYSIS

Samples Collected: April 2, 1992

Report Prepared: June 10, 1992

Prepared By:
Groundwater Technology, Inc.
223 Wilmington-West Chester Pike
Chadds Ford, Pennsylvania 19317

GROUNDWATER
TECHNOLOGY

Preface to Data Validation

The concept of data validation has been developed over the past decade to assure that the quality of the data generated as a result of laboratory analysis by USEPA's Contract Laboratory Program protocols is acceptable. Guidelines for data validation have been established by the USEPA Data Review Work Groups, for the Hazardous Site Evaluation Division, and are published in documents entitled, Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses, and Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses.

These documents are available to the public and will be strictly adhered to during the data review of these packages analyzed by GTEL Environmental Laboratories, Milford, New Hampshire. Before reading the data validation reports prepared by Groundwater Technology, Inc., some insight and explanation is offered for the application of the data.

The purpose of the data validation report is to inform the data user of problems that were encountered during the analysis of the samples. The qualifiers section states the major points of concern and places restrictions on the usage of data with "qualifiers" such as B, J, or R. Qualification of data with respect to the amount of contamination in the blanks (method, field, rinsate or trip) associated with a set of samples is a dependable means of assessing procedures, container cleanliness and laboratory procedure. For example, if acetone, a common laboratory contaminant, was found at 50 μg/l in a trip blank, 15 μg/l in the laboratory's method blank and 20 μg/l in the field blank, a qualifier would be written stating that, "all positive results in samples x,y,z, associated with the trip blank are questionable." This means that any positive results from a sample less than ten times the amount found in the blank having the highest contamination source (in this case the trip blank, at 50 μg/l) is probably from the blank. Any samples related to this trip blank having results less than 500 μg/l are questionable, attributable to the degree of container cleanliness. Other examples are attached.

Another area of concern is holding time and preservation of the samples. The chain-of-custody is examined for the date of sampling, date samples were relinquished to the courier, preservation methods, date received at the laboratory and any comments that were made by the laboratory's sample custodian. The date of sample collection is compared with the date of sample receipt, extraction and/or analysis; if the number of days between sample collection and sample extraction/analysis is outside of the acceptable range then these results must be considered

estimated. The methods of sample preservation used can alter the acceptable holding time range. The effects of long-term storage even under refrigeration cannot be predicted due to variable matrices from site to site, or from sample to sample on site.

A qualifier may also be applied to the data if surrogate spike recoveries fall outside the quality control limits. Surrogate spike compounds are added to every sample and blank to monitor the laboratory's performance, however the sample matrix itself may contribute to the poor recovery of surrogate compounds. For example, samples with interferences or high analyte concentrations may cause unusual surrogate recoveries. Sometimes reanalysis (or re-extraction) is necessary to determine if the source of the problem is laboratory- or sample matrix-related.

Initial and continuing calibrations, along with GC/MS tuning are evaluated and sometimes qualified for individual compounds (such as 2-butanone) in the volatile organics fraction. It is a chronic problem for many laboratories to obtain steady response factors for 2-butanone (methyl ethyl ketone) that are stable enough to fall inside the specified criteria. False negatives and valid detection limits are also of concern when qualifying the initial and continuing calibrations, and the GC/MS tuning.

The evaluation of blind field duplicates, matrix spike (MS) and matrix spike duplicates (MSD), are of importance in assessing field sampling techniques, sample homogeneity, representativeness of sample points, and laboratory precision. A relative percent difference is calculated for three or more samples. Criteria are listed on the attached sheets for field duplicates and MS/MSDs. It should be noted that a data package cannot be qualified solely on MS/MSD data. The MS/MSD data merely confirm matrix interferences and can be used as support for other qualifiers such as surrogate spike recoveries.

Identification of positively identified compounds is checked with respect to the guidelines. Also the compound quantitation calculation and the feasibility of obtaining the specified detection limits are checked.

The tentatively identified compounds (TICs) found by the mass spectral library search are checked for goodness of "fit" against the reference spectrum. If there is a discrepancy between the laboratory analyst's interpretation of the spectrum and Groundwater Technology's interpretation, a qualifier is placed on the compound in question stating that it is to be considered an unknown or an isomer of that compound. Most often the laboratory will qualify the results as estimated, due to the

fact that standards for that TIC have not been run (nor are they required). Quantitation of TICs is based on the total quantitation method.

Data that may not meet certain criteria rarely cause an entire case to be qualified as unusable (R) because other parameters validated are acceptable. However, data for particular analytes may be discarded due to calibration response factors of questionable integrity.

The findings section gives standard as well as judgmental reasons as to why the data are qualified. The summary explains point by point each qualifier and places a general status (acceptable, provisional or acceptable) on the entire data package.

The following are examples of application of the blank qualification guidelines. Certain circumstances may warrant deviations from these quidelines.

Case 1: Sample result is greater than the Contract Required Quantitation Limit (CRQL), but is less than the required amount (5x or 10x) when compared to the blank result.

	RULE	
	10x	5x
Blank Result	7	7
CRQL	5	5
Sample Result	60	60
Qualified Sample Result	60B	60B

In the example for the 10x rule, a sample result less than 70 (10 x 7) would be qualified as questionable (B). In the case of the 5x rule, sample result less than 35 (5 x 7) would also be qualified as questionable (B).

Case 2: Sample result is less than the CRQL, and is also less than the required amount (5x or 10x) when compared to the blank result.

	RULE	
	10x	5x
Blank Result	6	6
CRQL	5	5
Sample Result	4J	4J
Qualified Sample Result	4B	4B

Case 3: Sample result is greater than the CRQL and the required amount (5x or 10x) when compared to the blank result.

	RULE	
	10x	5x
Blank Result	10	10
CRQL	5	5
Sample Result	120	60
Qualified Sample Result	120	60

For both the 10x and 5x rules, sample results exceeded the adjusted blank results of 100 (10 x 10) and 50 (5 x10), respectively.

QUALIFIER DEFINITIONS

R - Unusable data.

U - Analyzed but undetected.

J - Estimated.

UJ - Undetected but the associated value is estimated and may inaccurate or imprecise.

B - Compound has been detected in a blank. Indicates that the compound's presence is qualitatively questioned, due to contamination in an associated blank.

DF - Dilution Factor.

QUALITY ASSURANCE REVIEW

POLYNUCLEAR AROMATIC
HYDROCARBONS ANALYSIS
OSMOSE WOOD PRESERVING, INC.
BUFFALO, NEW YORK SITE

1.0 INTRODUCTION

This review addresses eight groundwater samples and two aqueous quality control samples collected April 2, 1992 by Groundwater Technology, Inc, Albany, New York, and submitted to GTEL Environmental Laboratories, Inc., Milford, New Hampshire for the analysis of polynuclear aromatic hydrocarbons.

Items reviewed in this data package include:

- chain-of-custody records,
- analytical holding times,
- calibration verification,
- all applicable blank samples,
- matrix spike/matrix spike duplicate recoveries,
- surrogate spike recoveries,
- data completeness, and
- an overall assessment of the batch.

It should be noted that these samples were analyzed using EPA methodology, but only a "Blue Level" data package was compiled. Therefore, no raw data was available to the reviewer. Where applicable, the reviewer used the laboratory QA nonconformance summary to validate the associated client sample results.

TABLE 1.0
APPLICABLE SAMPLE NUMBERS

GTI ID	LAB ID
MW-8	04128-04
MW-9	04128-06
MW-10	04128-05
MW-11	04128-02
MW-12	04128-03
MW-13	04128-07
MW-14	04128-01
CW-1	04128-08
FIELD BLANK	04128-09
RINSEATE BLANK	04130-01

TABLE 2.0
DATA QUALIFIERS

ANALYTE	SAMPLE ID(S)	ISSUE(S)	QUALIFIER(S)
Fluoranthene	MW-8, MW-11, MW-12, MW -14	(1)	B
Benzo(a)Anthracene	MW-8, MW-9, MW-10, MW-11, MW-12, MW-14	(1)	B
Benzo(b)Fluoranthene	MW-8, MW-9, MW-10, MW-11, MW-12, MW-14	(1)	B
Benzo(k)Fluoranthene	MW-8, MW-9, MW-10, MW-11, MW-12, MW-14	(1)	B
Benzo(a)Pyrene	MW-8, MW-9, MW-10, MW-11, MW-12, MW-14	(1)	B
Benzo(g,h,i)Perylene	MW-8	(1)	B

(1) Blank Contaminant

2.0 FINDINGS AND DISCUSSION

- The results for fluoranthene in samples MW-8, MW-11, MW-12, and MW-14 are questionable due to blank contamination. Specifically, fluoranthene was detected in the associated rinseate blank, .44 μg/l. Using the blank contamination rule, any fluoranthene detected in the associated client samples at a concentration less than 2.2 μg/l (.44 μg/l x 5) is considered questionable.

- The results for benzo(a)anthracene in samples MW-8, MW-9, MW-10, MW-11, MW-12, and MW-14 are questionable due to blank contamination. Specifically, benzo(a)anthracene was detected in the associated rinseate blank, .095 μg/l. Using the blank contamination rule, any benzo(a)anthracene detected in the associated client samples at a concentration less than 0.475 μg/l (.095 μg/l x 5) is considered questionable.

- The results for benzo(b)fluoranthene in samples MW-8, MW-9, MW-10, MW-11, MW-12, and MW-14 are questionable due to blank contamination. Specifically, benzo(b)fluoranthene was detected in the associated rinseate blank, 0.14 μg/l. Using the blank contamination rule, any benzo(b)fluoranthene detected in the associated client samples at a concentration less than 0.70 μg/l (0.14 μg/l x 5) is considered questionable.

- The results for benzo(k)fluoranthene in samples MW-8, MW-9, MW-10, MW-11, MW-12, and MW-14 are questionable due to blank contamination. Specifically, benzo(k)fluoranthene was detected in the associated rinseate blank, 0.079 μg/l. Using the blank contamination rule, any benzo(k)fluoranthene detected in the associated client samples at a concentration less than 0.395 μg/l (0.079 x 5) is considered questionable.

- The results for benzo(a)pyrene is samples MW-8, MW-9, MW-10, MW-11, MW-12, and MW-14 are questionable due to blank contamination. Specifically, benzo(a)pyrene was detected in the associated rinseate blank, 0.14 μg/l. Using the blank contamination rule, any benzo(a)pyrene detected in the associated client samples at a concentration less than 0.70 μg/l (0.14 μg/l x 5) is considered questionable.

- The result for benzo(g,h,i)perylene in sample MW-8 is questionable due to blank contamination. Specifically, benzo(g,h,i)perylene was detected in the associated rinseate blank, 0.085 μg/l. Using the blank contamination rule, any benzo(g,h,i)perylene detected in the associated client samples at a concentration less than 0.425 μg/l (0.085 μg/l x 5) is considered questionable.

It should be noted that rinseate blank contamination is a common problem and can be an indication of improper decontamination procedures in the field.

3.0 SUMMARY

After thoroughly reviewing all available data it was determined that the laboratory has adequately performed all analyses since:

- chain-of-custody records were complete,
- analytical holding times were met,
- all applicable laboratory blank samples were contaminant-free,
- matrix spike/matrix spike duplicate recoveries were acceptable, and
- data were complete.

Although no major problems were associated with this data package, one minor issue was addressed:

> Poor nitrobenzene-d5 and terphenyl-d14 surrogate recoveries (%R) were associated with one sample:
>
> - MW-13 0 %R, and 0 %R respectively.

These results were outside of the quality control limits, 33-141 %R. A high dilution factor was associated with this sample which caused the surrogate solution to be diluted out. Acceptable surrogate recoveries were associated with the fraction of this sample that had a lower dilution factor, therefore the reviewer did not qualify the associated results.

For specifics on this quality assurance review, refer to the attached support documents.

GROUNDWATER TECHNOLOGY, INC.

Kimberly McGhee-Gould

Kimberly McGhee-Gould
QA/QC Supervisor

Date: June 10, 1992

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Page 1 of 1

DATA SUMMARY FORM: ORGANICS

Site Name: Osmose

WATER SAMPLES
(µg/L)

Case #: ______ Sampling Date(s): 4/2/92

To calculate sample quantitation limit:
(QL * Dilution Factor)

	MW-8		mw-9		mw-10		mw-11		mw-12		mw-13		mw-14		CW-1		FB	
Naphthalene											4600				170			
Acenaphthylene																		
1-Methylnaphthalene											540				18			
2-Methylnaphthalene											2100				49			
Acenaphthalene											740				20			
Fluorene											360				5.0			
Phenanthrene	.84										710		.70		7.0			
Anthracene																		
Fluoranthene	1.1	B					0.34	B	.26	B	240		.36	B	5.2			
Pyrene																		
Benzo(a)anthracene	0.21	B	.043	B	.020	B	.10	B	.049	B	73		.077	B	1.2			
Chrysene	0.26										23				1.3			
Benzo(b)fluoranthene	0.35	B	.054	B	.033	B	.13	B	.065	B	26		.071	B	1.9			
Benzo(k)fluoranthene	0.19	B	.030	B	.017	B	.072	B	.034	B	15		.042	B	0.98			
Benzo(a) pyrene	0.44	B	.082	B	.033	B	.18	B	.087	B	35		0.10	B	2.2			
Dibenz(a,h)anthracene	0.064										1.9				0.34			
Benzo(g,h,i)perylene	0.20	B									10				1.2			
Indeno[1,2,3-cd]pyrene	0.33		.055				.11		.055		3.4		.057		0.82			

QL = Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS
revised 07/90

Page 1 of 1

DATA SUMMARY FORM: ORGANICS

Site Name: Osmose

WATER SAMPLES
(µg/L)

Case #: ______ Sampling Date(s): 4/2/92

To calculate sample quantitation limit:
(QL * Dilution Factor)

		RB																	
	Naphthalene																		
	Acenaphthalene																		
	1-Methylnaphthalene																		
	2-Methylnaphthalene																		
	Acenaphthalene																		
	Fluorene																		
	Phenanthrene																		
	Anthracene																		
	Fluoranthene	0.44																	
	Pyrene																		
	Benzo(a)anthracene	.095																	
	Chrysene																		
	Benzo(b)fluoranthene	0.14																	
	Benzo(k)fluoranthene	0.079																	
	Benzo(a)pyrene	0.14																	
	Dibenz(a,h)anthracene																		
	Benzo(g,h,i)perylene	0.085																	
	Indeno[1,2,3-cd]pyrene																		

QL = Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS
revised 07/90

POLYNUCLEAR AROMATIC HYDROCARBON SUPPORT DOCUMENTATION

GROUNDWATER
TECHNOLOGY

GROUNDWATER TECHNOLOGY, INC.
SEMI-VOLATILE HOLDING TIMES

Client: Osmose
Job # : 011-105-470
Matrix: aqueous
Units: ug/l
Audit Date: 06/08/92
Audited By: KMG

Sample Number	Sample Date	Date Rec'd	Xtract Date	Analysis Date	Time	Guidelines			
						CLP SOW	40CFR	SW-846 NYS DEC ASP	Out
MW-8	4/2/92	4/4/92	4/7/92	4/14/92	N/A				
MW-9				4/15/92					
MW-10				4/15/92					
MW-11				4/14/92					
MW-12				4/14/92					
MW-13				4/15/92					
MW-14				4/14/92					
CW-1				4/15/92					
FB				4/15/92					
RB				4/14/92					

Comments: N/A - information not available to reviewers

Guideline Holding Times:

	ECRA	40 CFR Part 136	SW-846	CLP
Solid	14 days	----------	14 days	10 days
Liquid	7 days	7 days	14 days	5 days

Client Number: 011105470
Project ID: Osmose
Work Order Number: N2-04-128
N2-04-130

ANALYTICAL RESULTS

Polynuclear Aromatic Hydrocarbons in Water
EPA Method 8310[a]

GTEL Sample Number		04128-01	04128-02	04128-03	04128-04
Client Identification		MW14	MW11	MW12	MW8
Date Sampled		04/02/92	04/02/92	04/02/92	04/02/92
Date Extracted		04/07/92	04/07/92	04/07/92	04/07/92
Date Analyzed		04/14/92	04/14/92	04/14/92	04/14/92
Analyte	Detection Limit, ug/L	Concentration, ug/L			
Naphthalene	1.8	< 1.8	< 1.8	< 1.8	< 1.8
Acenaphthylene	2.3	< 2.3	< 2.3	< 2.3	< 2.3
1-Methylnaphthalene	1.8	< 1.8	< 1.8	< 1.8	< 1.8
2-Methylnaphthalene	1.8	< 1.8	< 1.8	< 1.8	< 1.8
Acenaphthene	1.8	< 1.8	< 1.8	< 1.8	< 1.8
Fluorene	0.21	< 0.21	< 0.21	< 0.21	< 0.21
Phenanthrene	0.64	0.70	< 0.64	< 0.64	0.84
Anthracene	0.66	< 0.66	< 0.66	< 0.66	< 0.66
Fluoranthene	0.21	0.36	0.34	0.26	1.1
Pyrene	0.27	< 0.27	< 0.27	< 0.27	< 0.27
Benzo[*a*]anthracene	0.013	0.077	0.10	0.049	0.21
Chrysene	0.15	< 0.15	< 0.15	< 0.15	0.26
Benzo[*b*]fluoranthene	0.018	0.071	0.13	0.065	0.35
Benzo[*k*]fluoranthene	0.017	0.042	0.072	0.034	0.19
Benzo[*a*]pyrene	0.023	0.10	0.18	0.087	0.44
Dibenzo[*a,h*]anthracene	0.030	< 0.030	< 0.030	< 0.030	0.064
Benzo[*g,h,i*]perylene	0.076	< 0.076	< 0.076	< 0.076	0.20
Indeno[1,2,3-*cd*]pyrene	0.043	0.057	0.11	0.055	0.33
Detection Limit Multiplier[b]		1.00	1.00	1.00	1.00

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Extraction by EPA Method 3510 (liquid-liquid).

[b] The detection limit multiplier indicates the adjustments made to the data and detection limits for sample dilutions.

Client Number: 011105470
Project ID: Osmose
Work Order Number: N2-04-128
N2-04-130

ANALYTICAL RESULTS

Polynuclear Aromatic Hydrocarbons in Water
EPA Method 8310[a]

GTEL Sample Number		04128-05	04128-06	04128-07	04128-08
Client Identification		MW10	MW9	MW13	CW1
Date Sampled		04/02/92	04/02/92	04/02/92	04/02/92
Date Extracted		04/07/92	04/07/92	04/07/92	04/07/92
Date Analyzed		04/15/92	04/15/92	04/15/92[c]	04/15/92[d]
Analyte	Detection Limit, ug/L	Concentration, ug/L			
Naphthalene	1.8	< 1.8	70	4600[c]	170[d]
Acenaphthylene	2.3	< 2.3	< 2.3	< 23	< 2.3
1-Methylnaphthalene	1.8	< 1.8	< 1.8	540[c]	18
2-Methylnaphthalene	1.8	< 1.8	< 1.8	2100[c]	49
Acenaphthene	1.8	< 1.8	< 1.8	740[c]	20
Fluorene	0.21	< 0.21	< 0.21	360[c]	5.0
Phenanthrene	0.64	< 0.64	< 0.64	710[c]	7.0
Anthracene	0.66	< 0.66	< 0.66	< 6.6	< 0.66
Fluoranthene	0.21	< 0.21	< 0.21	240[c]	5.2
Pyrene	0.27	< 0.27	< 0.27	< 2.7	< 0.27
Benzo[*a*]anthracene	0.013	0.020	0.043	73	1.2
Chrysene	0.15	< 0.15	< 0.15	23	1.3
Benzo[*b*]fluoranthene	0.018	0.033	0.054	26	1.9
Benzo[*k*]fluoranthene	0.017	0.017	0.030	15	0.98
Benzo[*a*]pyrene	0.023	0.033	0.082	35	2.2
Dibenzo[*a,h*]anthracene	0.030	< 0.030	< 0.030	1.9	0.34
Benzo[*g,h,i*]perylene	0.076	< 0.076	< 0.076	10	1.2
Indeno[1,2,3-*cd*]pyrene	0.043	< 0.043	0.055	3.4	0.82
Detection Limit Multiplier[b]		1.00	1.00	10.0[c]	1.00[d]

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Extraction by EPA Method 3510 (liquid-liquid).

[b] The detection limit multiplier indicates the adjustments made to the data and detection limits for sample dilutions.

[c] Detection Limit Multiplier for analytes noted = 100; Date Analyzed = 04/15/92.

[d] Detection Limit Multiplier for analyte noted = 4.00; Date Analyzed = 04/15/92.

Page 1 of 1

GROUNDWATER TECHNOLOGY, INC.
SEMI-VOLATILE BLANK ANALYSIS

Client: Osmose
Job # : 011-105-470 Matrix: aqueous Units: ug/l
Audit Date: 06/08/92
Audited By: KMG

Sample Number	Analysis Date	Analysis Time	Correct # of Blanks Yes	Correct # of Blanks No	Correct # of Blanks Note	<5X CRDL for Phthalates? Yes	<5X CRDL for Phthalates? No	<5X CRDL for Phthalates? Note	<CRDL for all TCL BNA in Blanks? Yes	<CRDL for all TCL BNA in Blanks? No	<CRDL for all TCL BNA in Blanks? Note
MW-8	4/14/92	n/A	✓			✓					(1)
MW-9	4/15/92										
MW-10	4/15/92										
MW-11	4/14/92										
MW-12	4/14/92										
MW-13	4/15/92										
MW-14	4/14/92										
CW-1	4/15/92										
FB	4/15/92										
RB	4/14/92										

Comments: (1) Rinseate Blank

n/A - Not available to reviewer

		x5
Fluoranthene	0.44	(2.2)
Benzo(a) anthracene	.095	(.475)
Benzo(b) fluoranthene	0.14	(0.70)
Benzo(k) " "	0.079	(.395)
Benzo(a) pyrene	0.14	(0.70)
Benzo(g,h,i) perylene	0.085	(.425)

CRDL = Contract Required Detection Limit

Client Number: 011105470
Project ID: Osmose
Work Order Number: N2-04-128
N2-04-130

ANALYTICAL RESULTS

Polynuclear Aromatic Hydrocarbons in Water
EPA Method 8310[a]

GTEL Sample Number		04128-09	04130-01	--	--
Client Identification		FIELD BLANK	RINSEATE	--	--
Date Sampled		04/02/92	04/02/92	--	--
Date Extracted		04/07/92	04/07/92	--	--
Date Analyzed		04/15/92	04/14/92	--	--
Analyte	Detection Limit, ug/L	Concentration, ug/L			
Naphthalene	1.8	< 1.8	< 1.8	--	--
Acenaphthylene	2.3	< 2.3	< 2.3	--	--
1-Methylnaphthalene	1.8	< 1.8	< 1.8	--	--
2-Methylnaphthalene	1.8	< 1.8	< 1.8	--	--
Acenaphthene	1.8	< 1.8	< 1.8	--	--
Fluorene	0.21	< 0.21	< 0.21	--	--
Phenanthrene	0.64	< 0.64	< 0.64	--	--
Anthracene	0.66	< 0.66	< 0.66	--	--
Fluoranthene	0.21	< 0.21	0.44	--	--
Pyrene	0.27	< 0.27	< 0.27	--	--
Benzo[*a*]anthracene	0.013	< 0.013	0.095	--	--
Chrysene	0.15	< 0.15	< 0.15	--	--
Benzo[*b*]fluoranthene	0.018	< 0.018	0.14	--	--
Benzo[*k*]fluoranthene	0.017	< 0.017	0.079	--	--
Benzo[*a*]pyrene	0.023	< 0.023	0.14	--	--
Dibenzo[*a,h*]anthracene	0.030	< 0.030	< 0.030	--	--
Benzo[*g,h,i*]perylene	0.076	< 0.076	0.085	--	--
Indeno[1,2,3-*cd*]pyrene	0.043	< 0.043	< 0.043	--	--
Detection Limit Multiplier[b]		1.00	1.00	--	--

a Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Extraction by EPA Method 3510 (liquid-liquid).

b The detection limit multiplier indicates the adjustments made to the data and detection limits for sample dilutions.

Client Number: 011105470
Project ID: Osmose
Work Order Number: N2-04-128
N2-04-130

METHOD BLANK RESULTS

Polynuclear Aromatic Hydrocarbons in Water
EPA Method 8310[a]

	GTEL Blank ID	BW0407-1
	GTEL File ID	BW204071
	Date Extracted	04/07/92
	Date Analyzed	04/09/92
Analyte	Detection Limit, ug/L	Concentration, ug/L
Naphthalene	1.8	< 1.8
Acenaphthylene	2.3	< 2.3
1-Methylnaphthalene	1.8	< 1.8
2-Methylnaphthalene	1.8	< 1.8
Acenaphthene	1.8	< 1.8
Fluorene	0.21	< 0.21
Phenanthrene	0.64	< 0.64
Anthracene	0.66	< 0.66
Fluoranthene	0.21	< 0.21
Pyrene	0.27	< 0.27
Benzo[*a*]anthracene	0.013	< 0.013
Chrysene	0.15	< 0.15
Benzo[*b*]fluoranthene	0.018	< 0.018
Benzo[*k*]fluoranthene	0.017	< 0.017
Benzo[*a*]pyrene	0.023	< 0.023
Dibenzo[*a,h*]anthracene	0.030	< 0.030
Benzo[*g,h,i*]perylene	0.076	< 0.076
Indeno[1,2,3-*cd*]pyrene	0.043	< 0.043
Detection Limit Multiplier		1.00

---

a Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Extraction by EPA Method 3510 (liquid-liquid).

b The detection limit multiplier indicates the adjustments made to the data and detection limits for sample dilutions.

Page 1 Of 1

GROUNDWATER TECHNOLOGY, INC.
SEMI-VOLATILE MATRIX SPIKES

Client: Osmose
Job # : 011-105-470 Matrix: aqueous Units: ug/l
Audit Date: 06/08/92
Audited By: KMG

Sample Number	Analysis Date	Analysis Time	No. Spikes OK? Yes	No. Spikes OK? No	No. Spikes OK? Note	%Recovery OK? Yes	%Recovery OK? No	%Recovery OK? Note	Compounds out of spec
MW-8	4/14/92	N/A	✓			✓			NONE
MW-9	4/15/92								
MW-10	4/15/92								
MW-11	4/14/92								
MW-12	4/14/92								
MW-13	4/15/92								
MW-14	4/14/92								
CW-1	4/15/92								
FB	4/15/92								
RB	4/14/92								

Comments:

% Recovery Range

Liquid Solid

Client Number: 011105470
Project ID: Osmose
Work Order Number: N2-04-128
N2-04-130

MATRIX SPIKE RECOVERY

Polynuclear Aromatic Hydrocarbons
EPA Method 610

Sample Spiked:	04128-04	Client ID:	MW8
Date Analyzed:	04/14/92	Solution ID:	H91MS043A

Compound	Spike Added, ug/L	Sample Concentration, ug/L	MS Concentration, ug/L	MS Percent Recovery, %	Acceptability Limits, %
Naphthalene	20.0	< 1.80	19.3	96.5	D-122
Acenaphthylene	20.0	< 2.30	20.4	102	D-139
Acenaphthene	20.0	< 1.80	22.6	113	D-124
Fluorene	4.00	< 0.210	3.98	100	D-142
Phenanthrene	2.00	0.843	2.22	68.9	D-155
Anthracene	2.00	< 0.660	1.78	89.0	D-126
Benzo[*k*]fluoranthene	2.00	0.190	2.09	95.0	D-159
Indeno[1,2,3-*cd*]pyrene	2.00	0.330	2.00	83.5	D-116

Compound	Spike Added, ug/L	MSD Concentration, ug/L	MSD Percent Recovery, %	RPD, %	Acceptability Limits: RPD, %
Naphthalene	20.0	18.4	92.0	4.77	60
Acenaphthylene	20.0	19.5	97.5	4.51	60
Acenaphthene	20.0	22.5	113	0.443	60
Fluorene	4.00	3.98	100	0	60
Phenanthrene	2.00	2.20	67.9	1.46	60
Anthracene	2.00	1.31	65.5	30.4	60
Benzo[*k*]fluoranthene	2.00	1.96	88.5	7.08	60
Indeno[1,2,3-*cd*]pyrene	2.00	1.88	77.5	7.45	60

#	Column to be used to flag recovery and RPD values with an asterisk.
*	Values outside of QC limits.
D	Detection

Page / Of /

GROUNDWATER TECHNOLOGY, INC.
SEMI-VOLATILE SURROGATE SPIKES

Client: Osmose
Job # : 011-105-470 Matrix: aqueous Units: ug/l
Audit Date: 06/08/92
Audited By: KMG

Sample Number	No. Spikes OK? Yes	No	Note	%Recovery OK? Yes	No	Note	Surrogates Outside Criteria
MW-8	✓			✓			
MW-9	|			✓			
MW-10	|			✓			
MW-11	|			✓			
MW-12	|			✓			
MW-13	|			✓			DF of 10 acceptable recovery DF of 100 - Surrogate solution diluted ou
MW-14	|			✓			
CW-1	|			✓			
FB	|			✓			
RB	|			✓			

Comments:

	Liquid	Solid
%Recovery Range:		
%Recovery Range:		

Client Number: 011105470
Project ID: Osmose
Work Order Number: N2-04-128
N2-04-130

SURROGATE RECOVERY SUMMARY

Polynuclear Aromatic Hydrocarbons in Water
EPA Method 8310

GTEL Sample ID	Percent Recovery, %	
	S1 (NBZ)	S2 (TPH)
BW0407-1	103	106
04128-01	92.5	85.3
04128-02	90.0	110
04128-03	94.4	81.9
04128-04	105	79.8
04128-05	94.6	100
04128-06	119	102
04128-07 (DLM=10)	90.8	132
04128-07 (DLM=100)	D	D
04128-08	113	99.5
04128-09	104	95.2
04130-01	95.4	78.5
04128-04 MS	107	111
04128-04 MSD	101	103
04128-08 (DLM=4)	103	89.3

	Surrogates		Recovery Limits[a]
S1	NBZ	Nitrobenzene-d5	33-141%
S2	TPH	Terphenyl-d14	33-141%

D Surrogate diluted out. % Recovery not calculated when surrogate diluted out.
* Indicates values outside of acceptability limits.
a Recovery limits as per laboratory practice.
MS Matrix Spike.
MSD Matrix Spike Duplicate.

Client Number: 011105470
Project ID: Osmose
Work Order Number: N2-04-128
N2-04-130

QA NONCONFORMANCE SUMMARY

1.0 Method Blank Analysis

1.1 Zero target compound(s) were found in the method blank.

2.0 Calibration Verification

2.1 The control limits were exceeded for zero calibration check compounds.

3.0 Surrogate Compound Recoveries

3.1 The recovery limits were exceeded for zero surrogate compounds.

4.0 Matrix Spike (MS) Accuracy

4.1 The recovery limits were exceeded in the matrix spike for zero compounds.

5.0 Sample Duplicate Precision

5.1 The maximum relative percent difference (RPD) was exceeded for zero compound(s) in the duplicate samples.

6.0 Sample Integrity

6.1 Sample handling and holding time criteria were met.

GTEL
ENVIRONMENTAL LABORATORIES, INC.

CHAIN-OF-CUSTODY RECORDS

GROUNDWATER
TECHNOLOGY

GTEL

Meadowbrook Industrial Park
Milford, New Hampshire 03055
(603) 672-4835 / FAX: (603) 673-8105

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

No. 35141

Project Manager: BRUCE AHRENS
Phone #: 518-456-2444
Address (Office): 2 Walker Way ALBANY NY
Site Location: Buffalo NY
Project Number: 0110-5470
Project Name: OSMOSE
I attest that the proper field sampling procedures were used during the collection of these samples.
Sampler Name (Print): DANIEL KEENE

Field Sample ID	Source of Sample	GTEL Lab # (Lab use only)	# CONTAINERS	Matrix: WATER	Matrix: SOIL	Matrix: AIR	Matrix: SLUDGE	Matrix: OTHER (Specify)	Method Preserved: HCl	Method Preserved: HNO₃	Method Preserved: H₂SO₄	Method Preserved: ICE	Method Preserved: NONE	Method Preserved: OTHER (Specify)	Sampling: DATE	Sampling: TIME
MW 17		01	6	X					X			X			4/2	12:45
MW 11		02	6	X					X			X			4/2	1:15
MW 12		03	6	X					X			X			4/2	1:45
MW 8		04	6	X					X			X			4/2	2:00
MW 10		05	6	X					X			X			4/2	4:00
MW 7		06	6	X					X			X			4/2	4:30
MW 13		07	6	X					X			X			4/2	4:45
EW 1		08	6	X					X			X			4/2	5:15
FIELD BLANK		09	6	X					X			X			4/2	3:30
RINSEATE		10		X					X			X			4/2	5:45
TRIP	BLANK	11		X								X				

ANALYSIS REQUEST

Field Sample ID	Gas. Hydrocarbons by 602 ☐ 8020 ☐ with MTBE ☐	BTEX only by 602 ☐ 8020 ☐ with MTBE ☐	EDB by 504 ☐	Oil and Grease 413.1 ☐ 413.2 ☐ 503B•D ☐	TPH 418.1 ☐ 503B,D•E ☐ by GC ☐	EPA 503.1 ☐ 502.2 ☐	EPA 601 ☐ 8010 ☐ DCA only ☐	EPA 602 ☐ 8020 ☒	EPA 608 ☐ 8080 ☐ PCB only ☐	EPA 624 ☐ 8240 ☐ NBS(+15) ☐	EPA BNA 625 ☐ 8270 ☐ NBS(+25) ☐	EPA 625 BN only ☐ 8270 BN only ☐ NBS(+15) ☐	EPA 625 AE only ☐ 8270 AE only ☐ NBS(+10) ☐	EPA 610 ☐ 8310 ☒	EPTOX - Metals ☐ Pesticides ☐ Herbicides ☐	TCLP Metals ☐ VOA ☐ Semi VOA ☐	EPA Metals - Priority Pollutant ☐ HSL ☐ RCRA ☐	LEAD 239.2 ☐ 200.7 ☐ 7420 ☐ 6010 ☐	Corrosivity ☐ Flash Point ☐ Reactivity ☐	Product ID by GC (SimDis) ☐	OTHER	OTHER	OTHER	OTHER
MW 17								3						3										
MW 11								3						3										
MW 12								3						3										
MW 8								3						3										
MW 10								3						3										
MW 7								3						3										
MW 13								3						3										
EW 1								3						3										
FIELD BLANK								3						3										
RINSEATE								3						3										
TRIP BLANK																								

SPECIAL HANDLING

EXPEDITED (48 hrs) ☐
SEVEN BUSINESS DAYS ☐
OTHER ___ (#) BUSINESS DAYS ☐
QA/QC Level CLP ☐ Blue ☐
CONTACT PERSON ______
QUOTE # ______
CONTRACT # ______
FAX ☐

SPECIAL DETECTION LIMITS (Specify)

SPECIAL REPORTING REQUIREMENTS (Specify)

REMARKS:

LAB USE ONLY
Lot #
Storage Location 22B, 43
Work Order #

CUSTODY RECORD

Relinquished by Sampler: Daniel Keene	Date 4/3/92	Time 11:00	Received by:
Relinquished by:	Date	Time	Received by:
Relinquished by:	Date 4/4/92	Time 12:55	Received by Laboratory: Tricia

Airbill 25117383332

E

GROUNDWATER
TECHNOLOGY

APPENDIX E

LABORATORY ANALYTICAL REPORTS

GTEL
ENVIRONMENTAL
LABORATORIES, INC.

Northeast Region
Meadowbrook Industrial Park
Milford, NH 03055
(603) 672-4835
(603) 673-8105 (FAX)

Client Number: 011105470
Project ID: Osmose
Work Order Number: N2-04-128
N2-04-130

RECEIVED
APR 30 1992

April 28, 1992

Bruce Ahrens
Groundwater Technology, Inc.
12 Walker Way
Albany, NY 12205

Dear Mr. Ahrens:

Enclosed please find the analytical results for the samples received by GTEL Environmental Laboratories, Inc. on 04/04/92 under chain-of-custody record 36141.

A formal Quality Assurance / Quality Control (QA/QC) program is maintained by GTEL, which is designed to meet or exceed the EPA requirements. Analytical work for this project met QA/QC criteria unless otherwise stated in the footnotes.

GTEL is certified (approved) by the State of New York under certificate number 10599.

If you have any questions regarding this analysis, or if we can be of further assistance, please call our Customer Service Representative.

Sincerely,
GTEL Environmental Laboratories, Inc.

Susan C. Uhler
Laboratory Director

Roseanna Dube
Quality Assurance Officer

Client Number: 011105470
Project ID: Osmose
Work Order Number: N2-04-128
N2-04-130

ANALYTICAL RESULTS

Aromatic Volatile Organics in Water
Modified EPA Method 8020[a]

	GTEL Sample Number	04128-01	04128-02	04128-03	04128-04
	Client Identification	MW14	MW11	MW12	MW8
	Date Sampled	04/02/92	04/02/92	04/02/92	04/02/92
	Date Analyzed	04/09/92	04/09/92	04/09/92	04/10/92
Analyte	Detection Limit, ug/L	Concentration, ug/L			
Benzene	0.2	1.2	< 0.2	< 0.2	< 0.2
Toluene	0.5	1.3	< 0.5	< 0.5	< 0.5
Ethyl Benzene	0.8	< 0.8	< 0.8	< 0.8	< 0.8
Xylenes (total)	1.7	< 1.7	< 1.7	< 1.7	< 1.7
Chlorobenzene	0.2	< 0.2	< 0.2	< 0.2	< 0.2
1,2-Dichlorobenzene	0.4	< 0.4	< 0.4	< 0.4	< 0.4
1,3-Dichlorobenzene	0.4	< 0.4	< 0.4	< 0.4	< 0.4
1,4-Dichlorobenzene	0.3	< 0.3	< 0.3	< 0.3	< 0.3
Detection Limit Multiplier[b]		1	1	1	1

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; extraction by EPA Method 5030 (purge and trap). Method modified to include additional compounds.

[b] The detection limit multiplier indicates the adjustments made to the data and detection limits for sample dilutions.

GTEL
ENVIRONMENTAL LABORATORIES, INC.

Client Number: 011105470
Project ID: Osmose
Work Order Number: N2-04-128
N2-04-130

ANALYTICAL RESULTS

Aromatic Volatile Organics in Water
Modified EPA Method 8020[a]

GTEL Sample Number		04128-05	04128-06	04128-07	04128-08
Client Identification		MW10	MW9	MW13	CW1
Date Sampled		04/02/92	04/02/92	04/02/92	04/02/92
Date Analyzed		04/10/92	04/10/92	04/10/92	04/10/92
Analyte	Detection Limit, ug/L	Concentration, ug/L			
Benzene	0.2	< 0.2	170	120	21
Toluene	0.5	< 0.5	150	300	3.1
Ethyl Benzene	0.8	< 0.8	33	90	0.8
Xylenes (total)	1.7	< 1.7	180	1100	9.3
Chlorobenzene	0.2	< 0.2	< 0.4	790	< 0.2
1,2-Dichlorobenzene	0.4	< 0.4	22	< 2.0	13
1,3-Dichlorobenzene	0.4	< 0.4	< 0.8	< 2.0	< 0.4
1,4-Dichlorobenzene	0.3	< 0.3	< 0.6	36	< 0.3
Detection Limit Multiplier[b]		1	2	5	1

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; extraction by EPA Method 5030 (purge and trap). Method modified to include additional compounds.

[b] The detection limit multiplier indicates the adjustments made to the data and detection limits for sample dilutions.

Client Number: 011105470
Project ID: Osmose
Work Order Number: N2-04-128
N2-04-130

ANALYTICAL RESULTS

Aromatic Volatile Organics in Water
Modified EPA Method 8020[a]

GTEL Sample Number		04128-09	04130-01	04130-02	--
Client Identification		FIELD BLANK	RINSEATE	TRIP BLANK	--
Date Sampled		04/02/92	04/03/92	04/03/92	--
Date Analyzed		04/10/92	04/09/92	04/09/92	--
Analyte	Detection Limit, ug/L	Concentration, ug/L			
Benzene	0.2	< 0.2	0.3	< 0.2	--
Toluene	0.5	< 0.5	< 0.5	< 0.5	--
Ethyl Benzene	0.8	< 0.8	< 0.8	< 0.8	--
Xylenes (total)	1.7	< 1.7	< 1.7	< 1.7	--
Chlorobenzene	0.2	< 0.2	< 0.2	< 0.2	--
1,2-Dichlorobenzene	0.4	< 0.4	< 0.4	< 0.4	--
1,3-Dichlorobenzene	0.4	< 0.4	< 0.4	< 0.4	--
1,4-Dichlorobenzene	0.3	< 0.3	< 0.3	< 0.3	--
Detection Limit Multiplier[b]		1	1	1	--

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; extraction by EPA Method 5030 (purge and trap). Method modified to include additional compounds.

[b] The detection limit multiplier indicates the adjustments made to the data and detection limits for sample dilutions.

Client Number: 011105470
Project ID: Osmose
Work Order Number: N2-04-128
N2-04-130

ANALYTICAL RESULTS

Polynuclear Aromatic Hydrocarbons in Water
EPA Method 8310[a]

GTEL Sample Number		04128-01	04128-02	04128-03	04128-04
Client Identification		MW14	MW11	MW12	MW8
Date Sampled		04/02/92	04/02/92	04/02/92	04/02/92
Date Extracted		04/07/92	04/07/92	04/07/92	04/07/92
Date Analyzed		04/14/92	04/14/92	04/14/92	04/14/92
Analyte	Detection Limit, ug/L	Concentration, ug/L			
Naphthalene	1.8	< 1.8	< 1.8	< 1.8	< 1.8
Acenaphthylene	2.3	< 2.3	< 2.3	< 2.3	< 2.3
1-Methylnaphthalene	1.8	< 1.8	< 1.8	< 1.8	< 1.8
2-Methylnaphthalene	1.8	< 1.8	< 1.8	< 1.8	< 1.8
Acenaphthene	1.8	< 1.8	< 1.8	< 1.8	< 1.8
Fluorene	0.21	< 0.21	< 0.21	< 0.21	< 0.21
Phenanthrene	0.64	0.70	< 0.64	< 0.64	0.84
Anthracene	0.66	< 0.66	< 0.66	< 0.66	< 0.66
Fluoranthene	0.21	0.36	0.34	0.26	1.1
Pyrene	0.27	< 0.27	< 0.27	< 0.27	< 0.27
Benzo[*a*]anthracene	0.013	0.077	0.10	0.049	0.21
Chrysene	0.15	< 0.15	< 0.15	< 0.15	0.26
Benzo[*b*]fluoranthene	0.018	0.071	0.13	0.065	0.35
Benzo[*k*]fluoranthene	0.017	0.042	0.072	0.034	0.19
Benzo[*a*]pyrene	0.023	0.10	0.18	0.087	0.44
Dibenzo[*a,h*]anthracene	0.030	< 0.030	< 0.030	< 0.030	0.064
Benzo[*g,h,i*]perylene	0.076	< 0.076	< 0.076	< 0.076	0.20
Indeno[1,2,3-*cd*]pyrene	0.043	0.057	0.11	0.055	0.33
Detection Limit Multiplier[b]		1.00	1.00	1.00	1.00

a Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Extraction by EPA Method 3510 (liquid-liquid).

b The detection limit multiplier indicates the adjustments made to the data and detection limits for sample dilutions.

Client Number: 011105470
Project ID: Osmose
Work Order Number: N2-04-128
N2-04-130

ANALYTICAL RESULTS

Polynuclear Aromatic Hydrocarbons in Water
EPA Method 8310[a]

GTEL Sample Number		04128-05	04128-06	04128-07	04128-08
Client Identification		MW10	MW9	MW13	CW1
Date Sampled		04/02/92	04/02/92	04/02/92	04/02/92
Date Extracted		04/07/92	04/07/92	04/07/92	04/07/92
Date Analyzed		04/15/92	04/15/92	04/15/92[c]	04/15/92[d]
Analyte	Detection Limit, ug/L	Concentration, ug/L			
Naphthalene	1.8	< 1.8	70	4600[c]	170[d]
Acenaphthylene	2.3	< 2.3	< 2.3	< 23	< 2.3
1-Methylnaphthalene	1.8	< 1.8	< 1.8	540[c]	18
2-Methylnaphthalene	1.8	< 1.8	< 1.8	2100[c]	49
Acenaphthene	1.8	< 1.8	< 1.8	740[c]	20
Fluorene	0.21	< 0.21	< 0.21	360[c]	5.0
Phenanthrene	0.64	< 0.64	< 0.64	710[c]	7.0
Anthracene	0.66	< 0.66	< 0.66	< 6.6	< 0.66
Fluoranthene	0.21	< 0.21	< 0.21	240[c]	5.2
Pyrene	0.27	< 0.27	< 0.27	< 2.7	< 0.27
Benzo[*a*]anthracene	0.013	0.020	0.043	73	1.2
Chrysene	0.15	< 0.15	< 0.15	23	1.3
Benzo[*b*]fluoranthene	0.018	0.033	0.054	26	1.9
Benzo[*k*]fluoranthene	0.017	0.017	0.030	15	0.98
Benzo[*a*]pyrene	0.023	0.033	0.082	35	2.2
Dibenzo[*a,h*]anthracene	0.030	< 0.030	< 0.030	1.9	0.34
Benzo[*g,h,i*]perylene	0.076	< 0.076	< 0.076	10	1.2
Indeno[1,2,3-*cd*]pyrene	0.043	< 0.043	0.055	3.4	0.82
Detection Limit Multiplier[b]		1.00	1.00	10.0[c]	1.00[d]

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Extraction by EPA Method 3510 (liquid-liquid).

[b] The detection limit multiplier indicates the adjustments made to the data and detection limits for sample dilutions.

[c] Detection Limit Multiplier for analytes noted = 100; Date Analyzed = 04/15/92.

[d] Detection Limit Multiplier for analyte noted = 4.00; Date Analyzed = 04/15/92.

Client Number: 011105470
Project ID: Osmose
Work Order Number: N2-04-128
N2-04-130

ANALYTICAL RESULTS

Polynuclear Aromatic Hydrocarbons in Water
EPA Method 8310[a]

GTEL Sample Number		04128-09	04130-01	--	--
Client Identification		FIELD BLANK	RINSEATE	--	--
Date Sampled		04/02/92	04/02/92	--	--
Date Extracted		04/07/92	04/07/92	--	--
Date Analyzed		04/15/92	04/14/92	--	--
Analyte	Detection Limit, ug/L	Concentration, ug/L			
Naphthalene	1.8	< 1.8	< 1.8	--	--
Acenaphthylene	2.3	< 2.3	< 2.3	--	--
1-Methylnaphthalene	1.8	< 1.8	< 1.8	--	--
2-Methylnaphthalene	1.8	< 1.8	< 1.8	--	--
Acenaphthene	1.8	< 1.8	< 1.8	--	--
Fluorene	0.21	< 0.21	< 0.21	--	--
Phenanthrene	0.64	< 0.64	< 0.64	--	--
Anthracene	0.66	< 0.66	< 0.66	--	--
Fluoranthene	0.21	< 0.21	0.44	--	--
Pyrene	0.27	< 0.27	< 0.27	--	--
Benzo[*a*]anthracene	0.013	< 0.013	0.095	--	--
Chrysene	0.15	< 0.15	< 0.15	--	--
Benzo[*b*]fluoranthene	0.018	< 0.018	0.14	--	--
Benzo[*k*]fluoranthene	0.017	< 0.017	0.079	--	--
Benzo[*a*]pyrene	0.023	< 0.023	0.14	--	--
Dibenzo[*a,h*]anthracene	0.030	< 0.030	< 0.030	--	--
Benzo[*g,h,i*]perylene	0.076	< 0.076	0.085	--	--
Indeno[1,2,3-*cd*]pyrene	0.043	< 0.043	< 0.043	--	--
Detection Limit Multiplier[b]		1.00	1.00	--	--

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Extraction by EPA Method 3510 (liquid-liquid).

[b] The detection limit multiplier indicates the adjustments made to the data and detection limits for sample dilutions.

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QA NONCONFORMANCE SUMMARY

1.0 Method Blank Analysis

- 1.1 Zero target compound(s) were found in the method blank.

2.0 Calibration Verification

- 2.1 The control limits were exceeded for zero calibration check compounds.

3.0 Surrogate Compound Recoveries

- 3.1 The recovery limits were exceeded for zero surrogate compounds.

4.0 Matrix Spike (MS) Accuracy

- 4.1 The recovery limits were exceeded in the matrix spike for zero compounds.

5.0 Sample Duplicate Precision

- 5.1 The maximum relative percent difference (RPD) was exceeded for zero compound(s) in the duplicate samples.

6.0 Sample Integrity

- 6.1 Sample handling and holding time criteria were met.

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METHOD BLANK RESULTS

Aromatic Volatile Organics in Water
Modified EPA Method 8020[a]

	GTEL File ID	08WBL0408C	19WBL0409A	–	–
	Client Identification	METHOD BLANK	METHOD BLANK	–	–
	Date Analyzed	04/08/92	04/09/92	–	–
Analyte	Detection Limit, ug/L	Concentration, ug/L			
Benzene	0.2	< 0.2	< 0.2	--	–
Toluene	0.5	< 0.5	< 0.5	--	–
Ethyl Benzene	0.8	< 0.8	< 0.8	--	--
Xylenes (total)	1.7	< 1.7	< 1.7	–	--
Chlorobenzene	0.2	< 0.2	< 0.2	--	--
1,2-Dichlorobenzene	0.4	< 0.4	< 0.4	--	--
1,3-Dichlorobenzene	0.4	< 0.4	< 0.4	--	–
1,4-Dichlorobenzene	0.3	< 0.3	< 0.3	--	–
Detection Limit Multiplier[b]		1	1	–	--

a Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; extraction by EPA Method 5030 (purge and trap). Method modified to include additional compounds.

b The detection limit multiplier indicates the adjustments made to the data and detection limits for sample dilutions.

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METHOD BLANK RESULTS

Polynuclear Aromatic Hydrocarbons in Water
EPA Method 8310[a]

Analyte	Detection Limit, ug/L	Concentration, ug/L
	GTEL Blank ID	BW0407-1
	GTEL File ID	BW204071
	Date Extracted	04/07/92
	Date Analyzed	04/09/92
Naphthalene	1.8	< 1.8
Acenaphthylene	2.3	< 2.3
1-Methylnaphthalene	1.8	< 1.8
2-Methylnaphthalene	1.8	< 1.8
Acenaphthene	1.8	< 1.8
Fluorene	0.21	< 0.21
Phenanthrene	0.64	< 0.64
Anthracene	0.66	< 0.66
Fluoranthene	0.21	< 0.21
Pyrene	0.27	< 0.27
Benzo[*a*]anthracene	0.013	< 0.013
Chrysene	0.15	< 0.15
Benzo[*b*]fluoranthene	0.018	< 0.018
Benzo[*k*]fluoranthene	0.017	< 0.017
Benzo[*a*]pyrene	0.023	< 0.023
Dibenzo[*a,h*]anthracene	0.030	< 0.030
Benzo[*g,h,i*]perylene	0.076	< 0.076
Indeno[1,2,3-*cd*]pyrene	0.043	< 0.043
Detection Limit Multiplier		1.00

a Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Extraction by EPA Method 3510 (liquid-liquid).

b The detection limit multiplier indicates the adjustments made to the data and detection limits for sample dilutions.

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SURROGATE RECOVERY RESULTS

Aromatic Volatile Organics in Water
(Trifluorotoluene)
Modified EPA Method 8020

Sample	Amount Added, ug/L	Surrogate Recovery, %
METHOD BLANK (04/08/92)	47.6	105
METHOD BLANK (04/09/92)	47.6	61.3
04128-01	47.6	65.1
04128-02	47.6	61.4
04128-03	47.6	59.7
04128-04	47.6	63.4
04128-05	47.6	63.5
04128-06	47.6	64.2
04128-07	47.6	94.5
04128-08	47.6	64.1
04128-09	47.6	65.9
04130-01	47.6	91.7
04130-02	47.6	94.2
04128-05 MS	47.6	62.1
04128-04 DUP	47.6	67.1
04175-01 MS	47.6	92.5
04170-01 DUP	47.6	96.4

Acceptability Limits[a] 45-125%

a	Laboratory generated acceptability limits updated 07/11/91.
MS	Matrix Spike.
DUP	Sample Duplicate.

Client Number: 011105470
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SURROGATE RECOVERY SUMMARY

Polynuclear Aromatic Hydrocarbons in Water
EPA Method 8310

GTEL Sample ID	Percent Recovery, %	
	S1 (NBZ)	S2 (TPH)
BW0407-1	103	106
04128-01	92.5	85.3
04128-02	90.0	110
04128-03	94.4	81.9
04128-04	105	79.8
04128-05	94.6	100
04128-06	119	102
04128-07 (DLM=10)	90.8	132
04128-07 (DLM=100)	D	D
04128-08	113	99.5
04128-09	104	95.2
04130-01	95.4	78.5
04128-04 MS	107	111
04128-04 MSD	101	103
04128-08 (DLM=4)	103	89.3

	Surrogates		Recovery Limits[a]
S1	NBZ	Nitrobenzene-d5	33-141%
S2	TPH	Terphenyl-d14	33-141%

D Surrogate diluted out. % Recovery not calculated when surrogate diluted out.
* Indicates values outside of acceptability limits.
a Recovery limits as per laboratory practice.
MS Matrix Spike.
MSD Matrix Spike Duplicate.

Client Number: 011105470
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MATRIX SPIKE RECOVERY

Aromatic Volatile Organics in Water
Modified EPA Method 8020

Sample Spiked: 04128-05
Date of Analysis: 04/10/92
Standard ID: BX92QC003

Client ID: BATCH QC
Matrix: Water

Compound	Sample Results, ug/L	Spike Amount, ug/L	MS Results, ug/L	MS % Percent Recovery	Acceptability Limits, %[a]
Benzene	< 0.2	20.0	20.0	100	39-150
Toluene	< 0.5	20.0	19.8	99.0	46-148
Ethyl Benzene	< 0.8	20.0	20.8	104	32-160
Total Xylenes	< 1.7	60.0	57.9	96.5	36-163

a Laboratory generated acceptability limits updated 4/88.
NA Not Applicable; % Recovery is not calculated when original sample amount exceeds five times the spike amount.

DUPLICATE SAMPLE RECOVERY

Aromatic Volatile Organics in Water
Modified EPA Method 8020

Sample Number: 04128-04
Date of Analysis: 04/10/92

Client ID: BATCH QC
Matrix: Water

Compound	Sample Results, ug/L	Duplicate Results, ug/L	RPD, %	Acceptability Limits, %[a]
Benzene	< 0.2	< 0.2	NA	34
Toluene	< 0.5	< 0.5	NA	31
Ethyl Benzene	< 0.8	< 0.8	NA	38
Total Xylenes	< 1.7	< 1.7	NA	38

a Laboratory generated acceptability limits updated 4/88.
NA Not Applicable; % RPD is not calculated when sample values are less than 10 times the detection limit.

Client Number: 011105470
Project ID: Osmose
Work Order Number: N2-04-128
N2-04-130

MATRIX SPIKE RECOVERY

Aromatic Volatile Organics in Water
Modified EPA Method 8020

Sample Spiked: 04175-01
Date of Analysis: 04/10/92
Standard ID: BX92QC0003C

Client ID: BATCH QC
Matrix: Water

Compound	Sample Results, ug/L	Spike Amount, ug/L	MS Results, ug/L	MS % Percent Recovery	Acceptability Limits, %[a]
Benzene	< 0.2	20.0	18.8	94.0	39-150
Toluene	< 0.5	20.0	19.0	95.0	46-148
Ethyl Benzene	< 0.8	20.0	19.3	96.5	32-160
Total Xylenes	< 1.7	60.0	58.5	97.5	36-163

a Laboratory generated acceptability limits updated 4/88.
NA Not Applicable; % Recovery is not calculated when original sample amount exceeds five times the spike amount.

DUPLICATE SAMPLE RECOVERY

Aromatic Volatile Organics in Water
Modified EPA Method 8020

Sample Number: 04170-01
Date of Analysis: 04/10/92

Client ID: BATCH QC
Matrix: Water

Compound	Sample Results, ug/L	Duplicate Results, ug/L	RPD, %	Acceptability Limits, %[a]
Benzene	14000	15000	6.90	34
Toluene	33000	35000	5.88	31
Ethyl Benzene	2500	2800	11.3	38
Total Xylenes	16000	17000	6.06	38

a Laboratory generated acceptability limits updated 4/88.
NA Not Applicable; % RPD is not calculated when sample values are less than 10 times the detection limit.

Client Number: 011105470
Project ID: Osmose
Work Order Number: N2-04-128
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MATRIX SPIKE RECOVERY

Polynuclear Aromatic Hydrocarbons
EPA Method 610

Sample Spiked:	04128-04	Client ID:	MW8
Date Analyzed:	04/14/92	Solution ID:	H91MS043A

Compound	Spike Added, ug/L	Sample Concentration, ug/L	MS Concentration, ug/L	MS Percent Recovery, %	Acceptability Limits, %
Naphthalene	20.0	< 1.80	19.3	96.5	D-122
Acenaphthylene	20.0	< 2.30	20.4	102	D-139
Acenaphthene	20.0	< 1.80	22.6	113	D-124
Fluorene	4.00	< 0.210	3.98	100	D-142
Phenanthrene	2.00	0.843	2.22	68.9	D-155
Anthracene	2.00	< 0.660	1.78	89.0	D-126
Benzo[*k*]fluoranthene	2.00	0.190	2.09	95.0	D-159
Indeno[1,2,3-*cd*]pyrene	2.00	0.330	2.00	83.5	D-116

Compound	Spike Added, ug/L	MSD Concentration, ug/L	MSD Percent Recovery, %	RPD, %	Acceptability Limits: RPD, %
Naphthalene	20.0	18.4	92.0	4.77	60
Acenaphthylene	20.0	19.5	97.5	4.51	60
Acenaphthene	20.0	22.5	113	0.443	60
Fluorene	4.00	3.98	100	0	60
Phenanthrene	2.00	2.20	67.9	1.46	60
Anthracene	2.00	1.31	65.5	30.4	60
Benzo[*k*]fluoranthene	2.00	1.96	88.5	7.08	60
Indeno[1,2,3-*cd*]pyrene	2.00	1.88	77.5	7.45	60

#	Column to be used to flag recovery and RPD values with an asterisk.
*	Values outside of QC limits.
D	Detection

GTEL
ENVIRONMENTAL LABORATORIES, INC.

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Meadowbrook Industrial Park
Milford, New Hampshire 03055
(603) 672-4835 / FAX (603) 673-8105

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

No. 36341

Project Manager: BRUCE AHRENS
Phone #: 515-456-5444
Address (Office): 12 WALKER WAY ALBANY NY
Site Location: Buffalo NY
Project Number: 0110-5470
Project Name: OSMOSE
I attest that the proper field sampling procedures were used during the collection of these samples.
Sampler Name (Print): DANIEL KEENE

Field Sample ID	Source of Sample	GTEL Lab # (Lab use only)	# CONTAINERS	Matrix: WATER	SOIL	AIR	SLUDGE	OTHER (Specify)	Method Preserved: HCl	HNO₃	H₂SO₄	ICE	NONE	OTHER (Specify)	Sampling: DATE	TIME
MW 17		01	6	X					X			X			4/2	12:45
MW 11		02	6	X					X			X			4/2	1:15
MW 12		03	6	X					X			X			4/2	1:45
MW 8		04	6	X					X			X			4/2	2:00
MW 10		05	6	X					X			X			4/2	4:00
MW 9		06	6	X					X			X			4/2	4:30
MW 13		07	6	X					X			X			4/2	4:45
GW 1		08	6	X					X			X			4/2	5:15
FIELD BLANK		09	6	X					X			X			4/2	3:30
RINSEATE		10		X					X			X			4/2	5:45
TRIP	BLANK	11		X								X				

ANALYSIS REQUEST

Field Sample ID	Gas. Hydrocarbons by 602 ☐ 8020 ☐ with MTBE ☐	BTEX only by 602 ☐ 8020 ☐ with MTBE ☐	EDB by 504 ☐	Oil and Grease 413.1 ☐ 413.2 ☐ 503B-D ☐	TPH 418.1 ☐ 503B.D-E ☐ by GC ☐	EPA 503.1 ☐ 502.2 ☐	EPA 601 ☐ 8010 ☐ DCA only ☐	EPA 602 ☐ 8020 ☒	EPA 608 ☐ 8080 ☐ PCB only ☐	EPA 624 ☐ 8240 ☐ NBS(+15) ☐	EPA BNA 625 ☐ 8270 ☐ NBS(+25) ☐	EPA 625 BN only ☐ 8270 BN only ☐ NBS(+15) ☐	EPA 625 AE only ☐ 8270 AE only ☐ NBS(+10) ☐	EPA 610 ☐ 8310 ☒	EPTOX-Metals ☐ Pesticides ☐ Herbicides ☐	TCLP Metals ☐ VOA ☐ Semi VOA ☐	EPA Metals - Priority Pollutant ☐ HSL ☐ RCRA ☐	LEAD 239.2 ☐ 200.7 ☐ 7420 ☐ 6010 ☐	Corrosivity ☐ Flash Point ☐ Reactivity ☐	Product ID by GC (SimDis) ☐	OTHER			
MW 17								3						3										
MW 11								3						3										
MW 12								3						3										
MW 8								3						3										
MW 10								3						3										
MW 9								3						3										
MW 13								3						3										
GW 1								3						3										
FIELD BLANK								3						[illegible]										
RINSEATE								3						3										
TRIP BLANK																								

CUSTODY RECORD

Relinquished by	Date	Time	Received by
Relinquished by Sampler: Daniel Keene	4/3/92	11:00	Received by:
Relinquished by:	Date	Time	Received by:
Relinquished by:	4/4/92	12:55	Received by Laboratory: Tricia Hellwedel Waybill # 29173933[illegible]

SPECIAL HANDLING

EXPEDITED (48 hrs) ☐
SEVEN BUSINESS DAYS ☐
OTHER ___ (#) BUSINESS DAYS ☐
QA/QC Level CLP ☐ Blue ☐
CONTACT PERSON ________
QUOTE # ________
CONTRACT # ________
FAX ☐

SPECIAL DETECTION LIMITS (Specify)

SPECIAL REPORTING REQUIREMENTS (Specify)

REMARKS

LAB USE ONLY
Storage Location 22B, 4:3
Lot #
Work Order #

GTEL
ENVIRONMENTAL
LABORATORIES, INC.

Northeast Region
Meadowbrook Industrial Park
Milford, NH 03055
(603) 672-4835
(603) 673-8105 (FAX)

7905
Client Number: 01110~~5470~~
Project ID: Not Applicable
Work Order Number: N2-03-652

RECEIVED
JUN 19 1992

June 17, 1992

Bruce Ahrens
Groundwater Technology, Inc.
12 Walker Way
Albany, NY 12205

Dear Mr. Ahrens:

This report, previously dated 04/15/92, is a reissue.

Enclosed please find the analytical results for the samples received by GTEL Environmental Laboratories, Inc. on 03/24/92 under chain-of-custody records 42825 and 42826.

A formal Quality Assurance / Quality Control (QA/QC) program is maintained by GTEL, which is designed to meet or exceed the EPA requirements. Analytical work for this project met QA/QC criteria unless otherwise stated in the footnotes.

GTEL is certified (approved) by the State of New York under certificate number 10599.

If you have any questions regarding this analysis, or if we can be of further assistance, please call our Customer Service Representative.

Sincerely,
GTEL Environmental Laboratories, Inc.

Susan C. Uhler
Laboratory Director

Roseanna Dube
Quality Assurance Officer

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

ANALYTICAL RESULTS

Aromatic Volatile Organics in Soil
Modified EPA Method 8020[a]

GTEL Sample Number		03652-05	03652-06	03652-13	--
Client Identification		MW-13 (6-8)	MW-13 (8-10)	SB-2 (2-4)	--
Date Sampled		03/19/92	03/19/92	03/20/92	--
Date Analyzed		03/26/92	03/26/92	03/26/92	--
Analyte	Detection Limit, mg/kg	Concentration, mg/kg (dry)			
Benzene	0.10	< 0.11	< 0.11	< 0.11	--
Toluene	0.25	< 0.28	0.38	< 0.27	--
Ethyl Benzene	0.40	< 0.44	0.52	< 0.44	--
Xylenes (total)	0.85	3.0	6.3	< 0.93	--
Chlorobenzene	0.20	< 0.22	< 0.23	< 0.22	--
1,2-Dichlorobenzene	0.26	< 0.29	< 0.29	< 0.29	--
1,3-Dichlorobenzene	0.26	< 0.29	< 0.29	< 0.29	--
1,4-Dichlorobenzene	0.20	< 0.22	< 0.23	< 0.22	--
Detection Limit Multiplier[b]		1.10	1.13	1.10	--
Percent Solids		87.8	86.4	83.4	--

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Methanolic extraction by EPA Method 5030 (purge and trap). Method modified to include additional compounds.

[b] The detection limit multiplier indicates the adjustments made to the data and detection limits as a result of dilutions and percent solids.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

ANALYTICAL RESULTS

Aromatic Volatile Organics in Soil - Low Level
Modified EPA Method 8020[a]

GTEL Sample Number		03652-01	03652-02	03652-03	03652-04
Client Identification		MW-14 (10-12)	MW-14 (61-63)	MW-12 (6-8)	MW-12 (18-20)
Date Sampled		03/17/92	03/18/92	03/19/92	03/19/92
Date Analyzed		03/30/92	03/31/92	03/31/92	03/31/92
Analyte	Detection Limit, ug/kg	Concentration, ug/kg (dry)			
Benzene	1.0	< 0.9	< 1.0	< 1.0	< 0.9
Toluene	1.7	< 1.6	4.1	7.5	5.8
Ethyl Benzene	1.0	< 0.9	2.0	3.2	2.0
Xylenes (total)	2.0	< 1.9	8.3	14	9.3
Chlorobenzene	1.0	< 0.9	< 1.0	< 1.0	< 0.9
1,2-Dichlorobenzene	1.7	< 1.6	< 1.6	< 1.7	< 1.6
1,3-Dichlorobenzene	1.7	< 1.6	< 1.6	< 1.7	< 1.6
1,4-Dichlorobenzene	1.7	< 1.6	< 1.6	< 1.7	< 1.6
Detection Limit Multiplier[b]		0.93	0.96	1.01	0.93
Percent Solids		81.9	86.8	80.0	85.8

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, Table 2, US EPA November 1986; sample prepared by low level solvent extraction and purge and trap. Method modified to include additional compounds. Results are reported on a dry weight basis.

[b] The detection limit multiplier indicates the adjustments made to the data and detection limits as a result of dilutions and percent solids.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

ANALYTICAL RESULTS

Aromatic Volatile Organics in Soil - Low Level
Modified EPA Method 8020[a]

GTEL Sample Number		03652-14	–	–	–
Client Identification		SB-2 (8-10)	–	–	–
Date Sampled		03/20/92	--	–	--
Date Analyzed		03/31/92	–	--	–
Analyte	Detection Limit, ug/kg	Concentration, ug/kg (dry)			
Benzene	1.0	< 0.9	--	--	--
Toluene	1.7	6.8	--	--	--
Ethyl Benzene	1.0	2.3	--	--	--
Xylenes (total)	2.0	11	--	--	--
Chlorobenzene	1.0	< 0.9	--	--	--
1,2-Dichlorobenzene	1.7	< 1.5	--	--	--
1,3-Dichlorobenzene	1.7	< 1.5	--	--	--
1,4-Dichlorobenzene	1.7	< 1.5	--	--	--
Detection Limit Multiplier[b]		0.91	--	--	--
Percent Solids		88.6	--	--	--

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, Table 2, US EPA November 1986; sample prepared by low level solvent extraction and purge and trap. Method modified to include additional compounds. Results are reported on a dry weight basis.

[b] The detection limit multiplier indicates the adjustments made to the data and detection limits as a result of dilutions and percent solids.

GTEL
ENVIRONMENTAL LABORATORIES, INC.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

ANALYTICAL RESULTS

Aromatic Volatile Organics in Water
Modified EPA Method 8020[a]

GTEL Sample Number		03652-10	03652-11	03652-12	--
Client Identification		RINSEATE BLANK	FIELD BLANK	TRIP BLANK	--
Date Sampled		03/20/92	03/20/92	03/17/92	--
Date Analyzed		04/01/92	04/01/92	04/01/92	--
Analyte	Detection Limit, ug/L	Concentration, ug/L			
Benzene	0.2	< 0.2	< 0.2	< 0.2	--
Toluene	0.5	0.6	< 0.5	< 0.5	--
Ethyl Benzene	0.8	< 0.8	< 0.8	< 0.8	--
Xylenes (total)	1.7	< 1.7	< 1.7	< 1.7	--
Chlorobenzene	0.2	< 0.2	< 0.2	< 0.2	--
1,2-Dichlorobenzene	0.4	< 0.4	< 0.4	< 0.4	--
1,3-Dichlorobenzene	0.4	< 0.4	< 0.4	< 0.4	--
1,4-Dichlorobenzene	0.3	< 0.3	< 0.3	< 0.3	--
Detection Limit Multiplier[b]		1	1	1	--

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; extraction by EPA Method 5030 (purge and trap). Method modified to include additional compounds.

[b] The detection limit multiplier indicates the adjustments made to the data and detection limits for sample dilutions.

GTEL ENVIRONMENTAL LABORATORIES, INC.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

ANALYTICAL RESULTS

Polynuclear Aromatic Hydrocarbons in Soil
EPA Method 8310[a]

GTEL Sample Number		03652-01	03652-02	03652-03	03652-04
Client Identification		MW-14 (10-12)	MW-14 (61-63)	MW-12 (6-8)	MW-12 (18-20)
Date Sampled		03/17/92	03/18/92	03/19/92	03/19/92
Date Extracted		03/26/92	03/26/92	03/26/92	03/26/92
Date Analyzed		04/03/92	04/03/92	04/03/92	04/03/92
Analyte	Detection Limit, ug/kg	Concentration, ug/kg			
Naphthalene	60	< 73	< 70	< 76	< 69
Acenaphthylene	77	< 93	< 89	< 98	< 89
1-Methylnaphthalene	60	< 73	< 70	< 76	< 69
2-Methylnaphthalene	60	< 73	< 70	< 76	< 69
Acenaphthene	60	< 73	< 70	< 76	< 69
Fluorene	7.0	< 8.5	< 8.1	< 8.9	< 8.1
Phenanthrene	21	< 25	< 24	< 27	< 24
Anthracene	22	< 27	< 26	< 28	< 25
Fluoranthene	7.0	< 8.5	32	18	< 8.1
Pyrene	9.0	< 11	< 10	< 11	< 10
Benzo[*a*]anthracene	0.43	< 0.52	11	4.1	< 0.49
Chrysene	5.0	< 6.1	< 5.8	< 6.4	< 5.8
Benzo[*b*]fluoranthene	0.60	< 0.73	9.5	5.8	0.78
Benzo[*k*]fluoranthene	0.57	< 0.69	6.3	3.4	< 0.66
Benzo[*a*]pyrene	0.77	< 0.93	12	6.0	< 0.89
Dibenzo[*a,h*]anthracene	1.0	< 1.2	1.2	< 1.3	< 1.2
Benzo[*g,h,i*]perylene	2.5	< 3.0	8.6	3.5	< 2.9
Indeno[1,2,3-*cd*]pyrene	1.4	< 1.7	5.1	2.4	< 1.6
Detection Limit Multiplier[b]		1.21	1.16	1.27	1.15
Percent Solids, %		81.9	86.8	80.0	85.8

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Extraction by EPA Method 3550 (low level sonication). Results are reported on a dry weight basis.

[b] The detection limit multiplier indicates the adjustments made to the data and detection limits as a result of dilutions and percent solids.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

ANALYTICAL RESULTS

Polynuclear Aromatic Hydrocarbons in Soil
EPA Method 8310[a]

GTEL Sample Number		03652-05	03652-06	03652-07	03652-08
Client Identification		MW-13 (6-8)	MW-13 (8-10)	SS-1	SS-2
Date Sampled		03/19/92	03/19/92	03/18/92	03/18/92
Date Extracted		03/26/92	03/26/92	03/26/92	03/26/92
Date Analyzed		04/03/92[c]	04/04/92[d]	04/04/92	04/04/92[e]
Analyte	Detection Limit, ug/kg	Concentration, ug/kg			
Naphthalene	60	7000	230000[d]	< 770	5700
Acenaphthylene	77	< 880	< 3500	< 990	< 2100
1-Methylnaphthalene	60	2000	57000	< 770	< 1600
2-Methylnaphthalene	60	9100	300000[d]	< 770	6900
Acenaphthene	60	3000	120000	< 770	< 1600
Fluorene	7.0	2200	68000[d]	120	4300
Phenanthrene	21	9000[c]	150000[d]	440	20000[e]
Anthracene	22	320	10000	940	< 12000[e]
Fluoranthene	7.0	1900	59000[d]	1200	30000[e]
Pyrene	9.0	< 100	< 410	< 120	< 250
Benzo[*a*]anthracene	0.43	230	7500	430	11000[e]
Chrysene	5.0	72	2600	200	5100
Benzo[*b*]fluoranthene	0.60	75	2700	520	9700[e]
Benzo[*k*]fluoranthene	0.57	52	1800	300	5800[e]
Benzo[*a*]pyrene	0.77	92	2900	670	12000[e]
Dibenzo[*a,h*]anthracene	1.0	< 11	200	79	1500
Benzo[*g,h,i*]perylene	2.5	43	1100	400	5900
Indeno[1,2,3-*cd*]pyrene	1.4	< 16	450	280	4900
Detection Limit Multiplier[b]		11.4[c]	45.6	12.8	27.4[e]
Percent Solids, %		87.8	86.4	78.4	73.5

a Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Extraction by EPA Method 3550 (low level sonication). Results are reported on a dry weight basis.

b The detection limit multiplier indicates the adjustments made to the data and detection limits as a result of dilutions and percent solids.

c Detection Limit Multiplier for analyte noted = 114; Date Analyzed = 04/14/92.

d Detection Limit Multiplier for analyte noted = 912; Date Analyzed = 04/10/92.

e Detection Limit Multiplier for analytes noted = 548; Date Analyzed = 04/11/92.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

ANALYTICAL RESULTS

Polynuclear Aromatic Hydrocarbons in Soil
EPA Method 8310[a]

GTEL Sample Number		03652-09	03652-13	03652-14	--
Client Identification		SS-3	SS-2 (2-4)	SB-2 (8-10)	--
Date Sampled		03/18/92	03/20/92	03/20/92	--
Date Extracted		03/26/92	03/26/92	03/26/92	--
Date Analyzed		04/04/92[f]	04/04/92	04/04/92	--
Analyte	Detection Limit, ug/kg	Concentration, ug/kg			
Naphthalene	60	10000	< 73	320	--
Acenaphthylene	77	< 2000	< 93	< 85	--
1-Methylnaphthalene	60	< 1600	< 73	< 66	--
2-Methylnaphthalene	60	< 1600	< 73	150	--
Acenaphthene	60	< 1600	< 73	< 66	--
Fluorene	7.0	8000	10	8.7	--
Phenanthrene	21	29000[f]	< 25	< 23	--
Anthracene	22	< 12000[f]	92	< 24	--
Fluoranthene	7.0	50000[f]	74	< 7.7	--
Pyrene	9.0	< 240	< 11	< 9.9	--
Benzo[*a*]anthracene	0.43	17000[f]	26	0.90	--
Chrysene	5.0	8300[f]	9.0	< 5.5	--
Benzo[*b*]fluoranthene	0.60	14000[f]	21	< 0.66	--
Benzo[*k*]fluoranthene	0.57	8500[f]	14	< 0.63	--
Benzo[*a*]pyrene	0.77	17000[f]	26	< 0.85	--
Dibenzo[*a,h*]anthracene	1.0	2200	2.2	< 1.1	--
Benzo[*g,h,i*]perylene	2.5	8500	15	< 2.8	--
Indeno[1,2,3-*cd*]pyrene	1.4	6400	8.3	< 1.5	--
Detection Limit Multiplier[b]		26.6[f]	1.21	1.10	--
Percent Solids, %		71.9	83.4	88.6	--

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Extraction by EPA Method 3550 (low level sonication). Results are reported on a dry weight basis.

[b] The detection limit multiplier indicates the adjustments made to the data and detection limits as a result of dilutions and percent solids.

[f] Detection Limit Multiplier for analyte noted = 532; Date Analyzed = 04/11/92.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

ANALYTICAL RESULTS

Polynuclear Aromatic Hydrocarbons in Water
EPA Method 8310[a]

GTEL Sample Number		03652-10	03652-11	--	--
Client Identification		RINSEATE BLANK	FIELD BLANK	--	--
Date Sampled		03/20/92	03/20/92	--	--
Date Extracted		03/27/92	03/27/92	--	--
Date Analyzed		04/02/92	04/02/92	--	--
Analyte	Detection Limit, ug/L	Concentration, ug/L			
Naphthalene	1.8	< 1.8	< 1.8	--	--
Acenaphthylene	2.3	< 2.3	< 2.3	--	--
1-Methylnaphthalene	1.8	< 1.8	< 1.8	--	--
2-Methylnaphthalene	1.8	< 1.8	< 1.8	--	--
Acenaphthene	1.8	< 1.8	< 1.8	--	--
Fluorene	0.21	< 0.21	< 0.21	--	--
Phenanthrene	0.64	< 0.64	< 0.64	--	--
Anthracene	0.66	< 0.66	< 0.66	--	--
Fluoranthene	0.21	< 0.21	< 0.21	--	--
Pyrene	0.27	< 0.27	< 0.27	--	--
Benzo[*a*]anthracene	0.013	< 0.013	< 0.013	--	--
Chrysene	0.15	< 0.15	< 0.15	--	--
Benzo[*b*]fluoranthene	0.018	< 0.018	< 0.018	--	--
Benzo[*k*]fluoranthene	0.017	< 0.017	< 0.017	--	--
Benzo[*a*]pyrene	0.023	< 0.023	< 0.023	--	--
Dibenzo[*a,h*]anthracene	0.030	< 0.030	< 0.030	--	--
Benzo[*g,h,i*]perylene	0.076	< 0.076	< 0.076	--	--
Indeno[1,2,3-*cd*]pyrene	0.043	< 0.043	< 0.043	--	--
Detection Limit Multiplier[b]		1.00	1.00	--	--

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Extraction by EPA Method 3510 (liquid-liquid).

[b] The detection limit multiplier indicates the adjustments made to the data and detection limits for sample dilutions.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

QA NONCONFORMANCE SUMMARY

1.0 Method Blank Analysis

1.1 Zero target compound(s) were found in the method blank.

2.0 Calibration Verification

2.1 The control limits were exceeded for zero calibration check compounds.

3.0 Surrogate Compound Recoveries

3.1 The recovery limits were exceeded for one surrogate compound for EPA Method 8310 in two samples due to interference from the presence of high concentrations of analytes in the samples. One surrogate out of control does not invalidate the reported results.

4.0 Matrix Spike (MS) Accuracy

4.1 The recovery limits were exceeded in the batch spike for zero compounds.

5.0 Sample Duplicate Precision

5.1 The maximum relative percent difference (RPD) was/were exceeded for zero compound(s) in the sample duplicate.

6.0 Sample Integrity

6.1 Sample handling and holding time criteria were met.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

METHOD BLANK RESULTS

Aromatic Volatile Organics in Soil
Modified EPA Method 8020[a]

GTEL Sample Number		METHOD BLANK	--	--	--
GTEL File ID		20MBL0326A	--	--	--
Date Analyzed		03/26/92	--	--	--
Analyte	Detection Limit, mg/kg	Concentration, mg/kg (dry)			
Benzene	0.10	< 0.10	--	--	--
Toluene	0.25	< 0.25	--	--	--
Ethyl Benzene	0.40	< 0.40	--	--	--
Xylenes (total)	0.85	< 0.85	--	--	--
Chlorobenzene	0.20	< 0.20	--	--	--
1,2-Dichlorobenzene	0.26	< 0.26	--	--	--
1,3-Dichlorobenzene	0.26	< 0.26	--	--	--
1,4-Dichlorobenzene	0.20	< 0.20	--	--	--
Detection Limit Multiplier[b]		1.00	--	--	--

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Methanolic extraction by EPA Method 5030 (purge and trap). Method modified to include additional compounds.

[b] The detection limit multiplier indicates the adjustments made to the data and detection limits as a result of dilutions and percent solids.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

METHOD BLANK RESULTS

Aromatic Volatile Organics in Soil - Low Level
Modified EPA Method 8020[a]

	GTEL Sample Number	METHOD BLANK	--	--	--
	GTEL File ID	14SBL0330A	--	--	--
	Date Analyzed	03/30/92	--	--	--
Analyte	Detection Limit, ug/kg	Concentration, ug/kg (dry)			
Benzene	1.0	< 1.0	--	--	--
Toluene	1.7	< 1.7	--	--	--
Ethyl Benzene	1.0	< 1.0	--	--	--
Xylenes (total)	2.0	< 2.0	--	--	--
Chlorobenzene	1.0	< 1.0	--	--	--
1,2-Dichlorobenzene	1.7	< 1.7	--	--	--
1,3-Dichlorobenzene	1.7	< 1.7	--	--	--
1,4-Dichlorobenzene	1.7	< 1.7	--	--	--
Detection Limit Multiplier[b]		1.00	--	--	--

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, Table 2, US EPA November 1986; sample prepared by low level solvent extraction and purge and trap. Method modified to include additional compounds. Results are reported on a dry weight basis.

[b] The detection limit multiplier indicates the adjustments made to the data and detection limits as a result of dilutions and percent solids.

GTEL ENVIRONMENTAL LABORATORIES, INC.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

METHOD BLANK RESULTS

Purgeable Aromatics in Water
Modified EPA Method 8020[a]

GTEL Sample Number		METHOD BLANK	--	--	--
GTEL File ID		20WBL0401A	--	--	--
Date Analyzed		04/01/92	--	--	--
Analyte	Detection Limit, ug/L	Concentration, ug/L			
Benzene	0.2	< 0.2	--	--	--
Toluene	0.5	< 0.5	--	--	--
Ethyl Benzene	0.8	< 0.8	--	--	--
Xylenes (total)	1.7	< 1.7	--	--	--
Chlorobenzene	0.2	< 0.2	--	--	--
1,2-Dichlorobenzene	0.4	< 0.4	--	--	--
1,3-Dichlorobenzene	0.4	< 0.4	--	--	--
1,4-Dichlorobenzene	0.3	< 0.3	--	--	--
Detection Limit Multiplier		1	--	--	--

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Methanolic extraction by EPA Method 5030 (purge and trap). Method modified to include additional compounds.

GTEL
ENVIRONMENTAL LABORATORIES, INC.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

SURROGATE RECOVERY RESULTS

Volatile Organics in Soil
(Trifluorotoluene)
EPA Method 8020

Sample	Amount Added, ug/L	Surrogate Recovery, %
METHOD BLANK (03/26/92)	47.6	75.2
03652-05	47.6	72.2
03652-06	47.6	72.4
03652-13	47.6	70.4
03652-01 MS	47.6	70.5
03652-01 DUP	47.6	69.4

Acceptability Limits[a] 45-125%

a	Laboratory generated acceptability limits updated 07/11/91.
MS	Matrix Spike.
DUP	Sample Duplicate.

GTEL
ENVIRONMENTAL LABORATORIES, INC.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

SURROGATE RECOVERY RESULTS

Volatile Organics in Soil - Low Level
(Trifluorotoluene)
EPA Method 8020

Sample	Amount Added, ug/L	Surrogate Recovery, %
METHOD BLANK (03/30/92)	47.6	90.3
03652-01	47.6	77.5
03652-02	47.6	81.2
03652-03	47.6	52.0
03652-04	47.6	66.2
03652-14	47.6	60.7
03652-01 MS	47.6	84.0
03652-01 DUP	47.6	86.3

Acceptability Limits[a] 45-125%

a	Laboratory generated acceptability limits updated 07/11/91.
MS	Matrix Spike.
DUP	Sample Duplicate.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

SURROGATE RECOVERY RESULTS

Purgeable Aromatics
(Trifluorotoluene)
Modified EPA Method 8020

Sample	Amount Added, ug/L	Surrogate Recovery, %
METHOD BLANK (04/01/92)	47.6	67.2
03652-10	47.6	84.8
03652-11	47.6	83.4
03652-12	47.6	86.3

Acceptability Limits[a] 45-125%

a Laboratory generated acceptability limits updated 07/11/91.
MS Matrix Spike.
DUP Sample Duplicate.

GTEL
ENVIRONMENTAL LABORATORIES, INC.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

MATRIX SPIKE RECOVERY

Purgeable Aromatics
Modified EPA Method 8020

Sample Spiked: 03652-01
Date of Analysis: 03/26/92
Standard ID: B91SM1002

Client ID: MW-14 (10-12)
Matrix: Soil

Compound	Sample Results, mg/kg	Spike Amount, mg/kg	MS Results, mg/kg	MS % Percent Recovery	Acceptability Limits, %[a]
Benzene	< 0.12	10.1	10.3	102	40-160
Toluene	< 0.29	9.63	10.3	102	40-160
Ethyl Benzene	< 0.47	10.0	11.5	115	40-160
Xylenes (total)	< 1.90	30.5	34.5	113	40-160

a Laboratory generated acceptability limits updated 4/88.
NA Not Applicable; % Recovery is not calculated when original sample amount exceeds five times the spike amount.

DUPLICATE SAMPLE RECOVERY

Purgeable Aromatics
Modified EPA Method 8020

Sample Number: 03652-01
Date of Analysis: 03/26/92

Client ID: MW-14 (10-12)
Matrix: Soil

Compound	Sample Results, mg/kg	Duplicate Results, mg/kg	RPD, %	Acceptability Limits, %[a]
Benzene	< 0.12	< 0.11	NA	40
Toluene	< 0.29	< 0.28	NA	40
Ethyl Benzene	< 0.47	< 0.45	NA	40
Xylenes (total)	< 1.90	< 0.96	NA	40

a Laboratory generated acceptability limits updated 4/88.
NA Not Applicable; % RPD is not calculated when sample values are less than 10 times the detection limit.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

MATRIX SPIKE RECOVERY

Purgeable Aromatics - Low Level
Modified EPA Method 8020

Sample Spiked: 03652-01
Date of Analysis: 03/31/92
Standard ID: B92AC086

Client ID: MW-14 (10-12)
Matrix: Soil

Compound	Sample Results, ug/kg	Spike Amount, ug/kg	MS Results, ug/kg	MS % Percent Recovery	Acceptability Limits, %[a]
Benzene	< 0.93	20.0	22.2	111	40-160
Toluene	< 1.57	20.0	19.4	97.0	40-160
Ethyl Benzene	< 0.93	20.0	18.0	90.0	40-160
Xylenes (total)	< 1.85	60.0	55.8	93.0	40-160

a Laboratory generated acceptability limits updated 4/88.
NA Not Applicable; % Recovery is not calculated when original sample amount exceeds five times the spike amount.

DUPLICATE SAMPLE RECOVERY

Purgeable Aromatics - Low Level
Modified EPA Method 8020

Sample Number: 03652-01
Date of Analysis: 03/31/92

Client ID: MW-14 (10-12)
Matrix: Soil

Compound	Sample Results, ug/kg	Duplicate Results, ug/kg	RPD, %	Acceptability Limits, %[a]
Benzene	< 0.93	< 0.93	NA	40
Toluene	< 1.57	< 1.58	NA	40
Ethyl Benzene	< 0.93	< 0.93	NA	40
Xylenes (total)	< 1.85	< 1.86	NA	40

a Laboratory generated acceptability limits updated 4/88.
NA Not Applicable; % RPD is not calculated when sample values are less than 10 times the detection limit.

METHOD BLANK RESULTS

Polynuclear Aromatic Hydrocarbons in Soil
EPA Method 8310[a]

GTEL Blank ID		BS0326-1
GTEL File ID		BS203261
Date Extracted		03/26/92
Date Analyzed		04/03/92
Analyte	Detection Limit, ug/kg	Concentration, ug/kg
Naphthalene	60	< 59
Acenaphthylene	77	< 76
1-Methylnaphthalene	60	< 59
2-Methylnaphthalene	60	< 59
Acenaphthene	60	< 59
Fluorene	7.0	< 6.9
Phenanthrene	21	< 21
Anthracene	22	< 22
Fluoranthene	7.0	< 6.9
Pyrene	9.0	< 8.9
Benzo[*a*]anthracene	0.43	< 0.42
Chrysene	5.0	< 4.9
Benzo[*b*]fluoranthene	0.60	< 0.59
Benzo[*k*]fluoranthene	0.57	< 0.56
Benzo[*a*]pyrene	0.77	< 0.76
Dibenzo[*a,h*]anthracene	1.0	< 0.99
Benzo[*g,h,i*]perylene	2.5	< 2.5
Indeno[1,2,3-*cd*]pyrene	1.4	< 1.4
Detection Limit Multiplier		0.987

[a] Test Methods for Evaluating Solid Waste, SW-846, Third Edition, Revision 0, US EPA November 1986; Extraction by EPA Method 3550 (low level sonication). Results are reported on a dry weight basis.

[b] The detection limit multiplier indicates the adjustments made to the data and detection limits as a result of dilutions and percent solids.

GTEL
ENVIRONMENTAL LABORATORIES, INC.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

METHOD BLANK RESULTS

Polynuclear Aromatic Hydrocarbons in Water
EPA Method 8310[a]

	GTEL Blank ID	BW0327-1
	GTEL File ID	BW20321
	Date Extracted	03/27/92
	Date Analyzed	04/02/92
Analyte	Detection Limit, ug/L	Concentration, ug/L
Naphthalene	1.8	< 1.8
Acenaphthylene	2.3	< 2.3
1-Methylnaphthalene	1.8	< 1.8
2-Methylnaphthalene	1.8	< 1.8
Acenaphthene	1.8	< 1.8
Fluorene	0.21	< 0.21
Phenanthrene	0.64	< 0.64
Anthracene	0.66	< 0.66
Fluoranthene	0.21	< 0.21
Pyrene	0.27	< 0.27
Benzo[*a*]anthracene	0.013	< 0.013
Chrysene	0.15	< 0.15
Benzo[*b*]fluoranthene	0.018	< 0.018
Benzo[*k*]fluoranthene	0.017	< 0.017
Benzo[*a*]pyrene	0.023	< 0.023
Dibenzo[*a,h*]anthracene	0.030	< 0.030
Benzo[*g,h,i*]perylene	0.076	< 0.076
Indeno[1,2,3-*cd*]pyrene	0.043	< 0.043
Detection Limit Multiplier		1.00

a Federal Register, Vol. 49, October 26, 1984. Sample preparation by liquid/liquid extraction.
b The detection limit multiplier indicates the adjustments made to the data and detection limits for sample dilutions.

GTEL ENVIRONMENTAL LABORATORIES, INC.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

SURROGATE RECOVERY SUMMARY

Polynuclear Aromatic Hydrocarbons in Soil
EPA Method 8310

GTEL Sample ID	Percent Recovery, %	
	S1 (NBZ)	S2 (TPH)
BS0326-1	81.6	118
03652-01	99.7	112
03652-02	94.2	117
03652-03	94.1	107
03652-04	93.9	109
03652-05 (04/03/92)	101	97.0
03652-05 (04/14/92)	108	103
03652-06 (04/04/92)	61.1	358*
03652-06 (04/10/92)	D	D
03652-07	60.0	56.3
03652-08 (04/04/92)	81.7	133
03652-08 (04/11/92)	D	D
03652-09 (04/04/92)	80.9	255*
03652-09 (04/11/92)	D	D
03652-13	86.3	113
03652-14	81.8	96.9
03652-02 MS	92.0	109
03652-02 MSD	96.2	111

	Surrogates		Recovery Limits[a]
S1	NBZ	Nitrobenzene-d5	33-141%
S2	TPH	Terphenyl-d14	33-141%

D Surrogate diluted out. % Recovery not calculated when surrogate diluted out.
* Indicates values outside of acceptability limits. See Nonconformance Summary Section 3.0.
a Recovery limits as per laboratory practice.
MS Matrix Spike.
MSD Matrix Spike Duplicate.

GTEL
ENVIRONMENTAL LABORATORIES, INC.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

SURROGATE RECOVERY SUMMARY

Polynuclear Aromatic Hydrocarbons in Water
EPA Method 8310

GTEL Sample ID	Percent Recovery, %	
	S1 (NBZ)	S2 (TPH)
BW0327-1	115	125
03652-10	122	131
03652-11	119	121

	Surrogates		Recovery Limits[a]
S1	NBZ	Nitrobenzene-d5	33-141%
S2	TPH	Terphenyl-d14	33-141%

D Surrogate diluted out. % Recovery not calculated when surrogate diluted out.
* Indicates values outside of acceptability limits.
a Recovery limits as per laboratory practice.
MS Matrix Spike.
MSD Matrix Spike Duplicate.

Client Number: 011105470
Project ID: Not Applicable
Work Order Number: N2-03-652

MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Polynuclear Aromatic Hydrocarbons in Soil
EPA Method 8310

Sample Spiked:	03652-02	Client ID:	MW-14 (61-63)
Date Analyzed:	04/03/92	Solution ID:	H91MS043A

Compound	Spike Added, ug/L	Sample Concentration, ug/L	MS Concentration, ug/L	MS Percent Recovery, %	Acceptability Limits, %
Naphthalene	378	38.3	417	100	D-122
Acenaphthylene	378	< 89.3	365	96.5	D-139
Acenaphthene	378	< 89.3	427	113	D-139
Fluorene	75.6	< 8.12	77.8	103	D-142
Phenanthrene	37.8	10.5	42.1	83.6	D-155
Anthracene	37.8	< 25.5	47.4	125	D-126
Benzo[*k*]fluoranthene	37.8	6.26	40.9	91.6	D-159
Indeno[1,2,3-*cd*]pyrene	37.8	< 1.62	42.1	111	D-116

Compound	Spike Added, ug/L	MSD Concentration, ug/L	MSD Percent Recovery, %	RPD, %	Acceptability Limits: RPD, %
Naphthalene	387	383	89.2	11.6	60
Acenaphthylene	387	379	98.0	1.55	60
Acenaphthene	387	433	112	0.822	60
Fluorene	77.3	76.6	99.1	3.77	60
Phenanthrene	38.7	34.9	63.1	27.9	60
Anthracene	38.7	48.1	124	0.751	60
Benzo[*k*]fluoranthene	38.7	41.4	90.9	0.784	60
Indeno[1,2,3-*cd*]pyrene	38.7	44.3	115	2.88	60

Column to be used to flag recovery and RPD values with an asterisk.
* Values outside of QC limits.

GTEL
ENVIRONMENTAL LABORATORIES, INC.

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GROUNDWATER
TECHNOLOGY

APPENDIX F

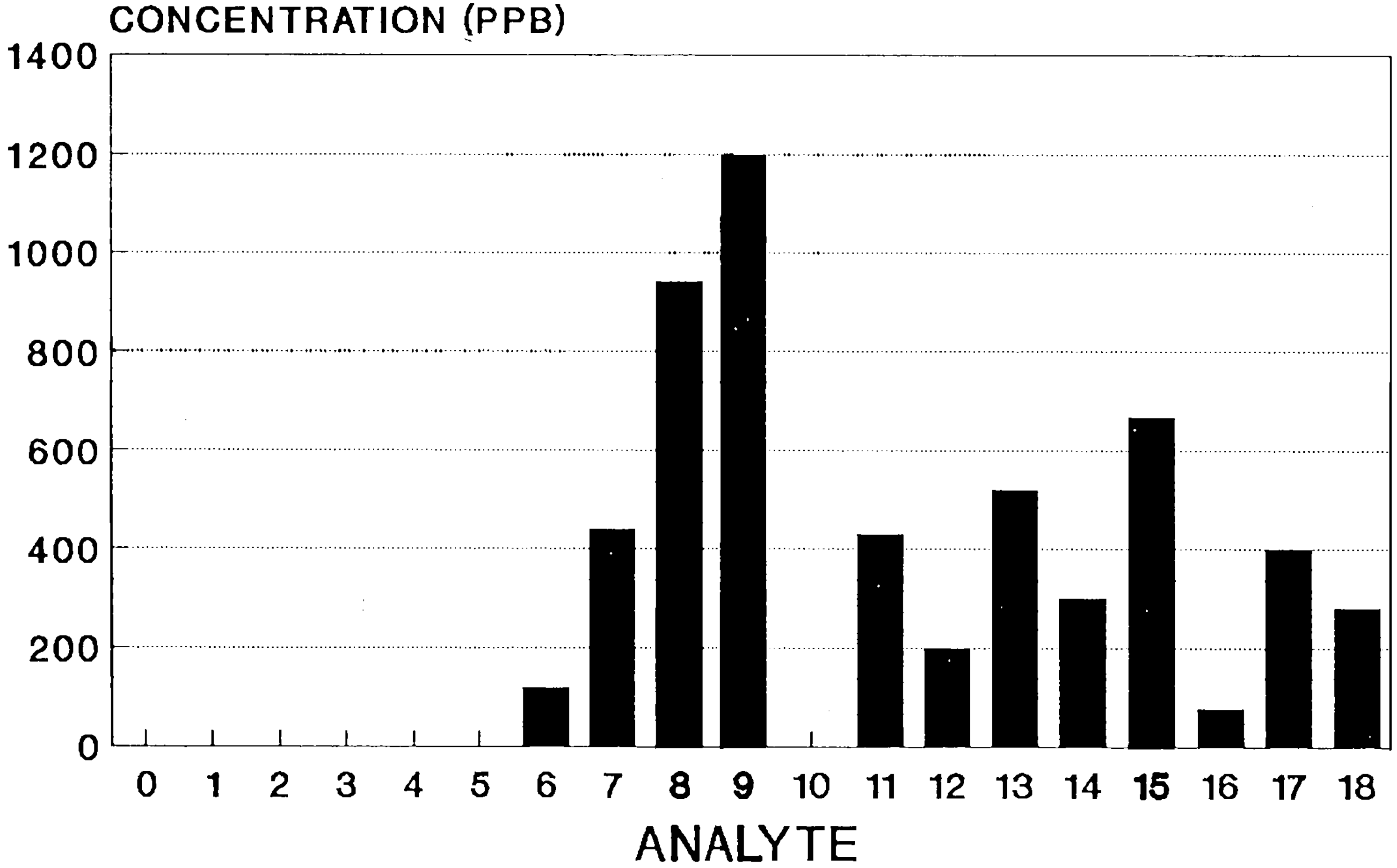
PAH PROFILE GRAPHS

OSMOSE WOOD PRESERVING, INC.
PAHs IN BIOCELL SOILS

Analyte Number	**PAH Analyte**
1	Napthalene
2	2-Methylnapthalene
3	Acenapthylene
4	Acenaphthene
5	1-Methylnaphthalene
6	Fluorene
7	Phenanthrene
8	Anthracene
9	Fluoranthene
10	Pyrene
11	Benz[a]anthracene
12	Chrysene
13	Benzo[b]fluoranthene
14	Benzo[k]fluoranthene
15	Benzo[a]pyrene
16	Dibenz[a,h]anthracene
17	Benzo[g,h,i]perylene
18	Indeno[1,2,3-cd]pyrene

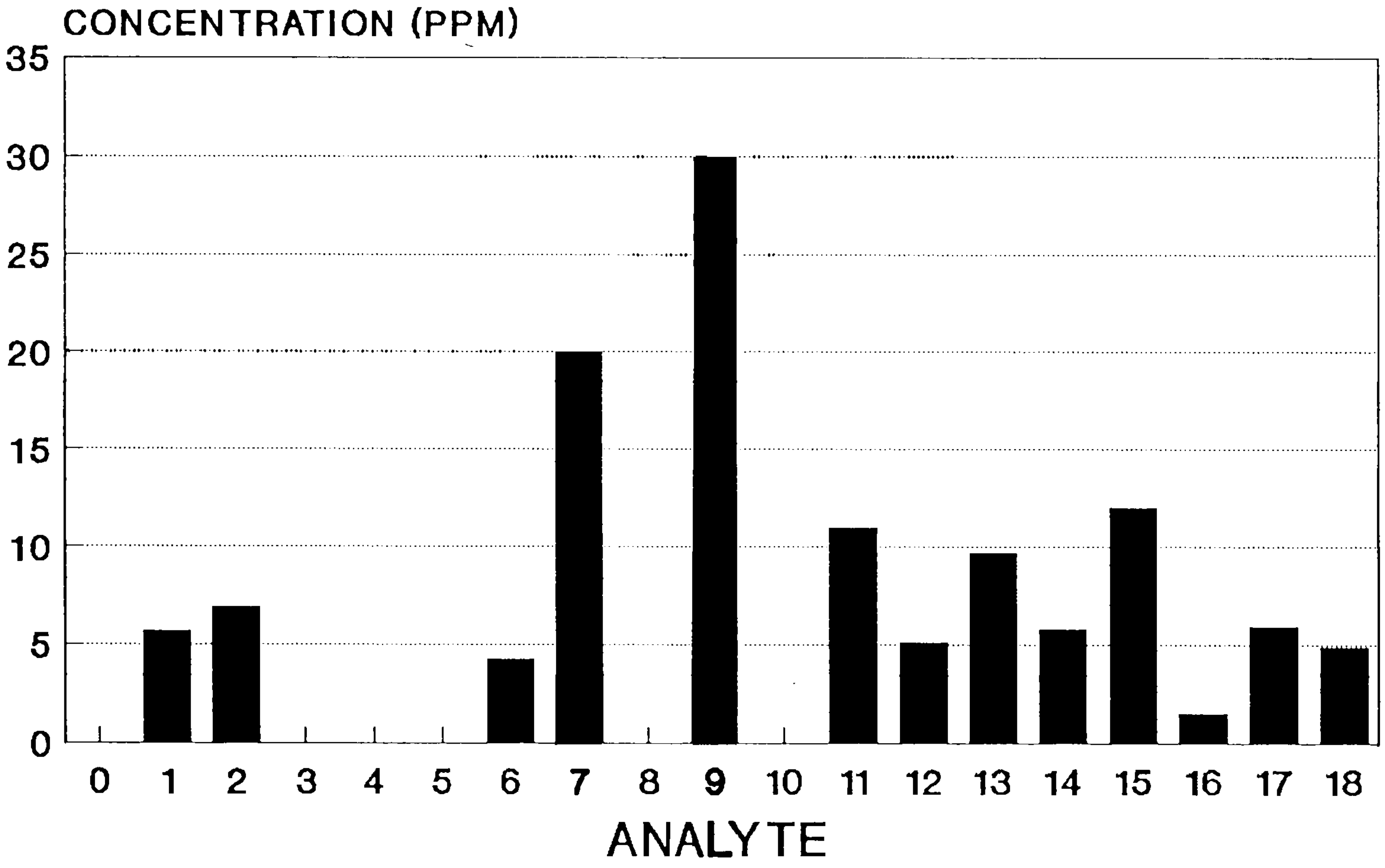
PAH Profile

SS-1



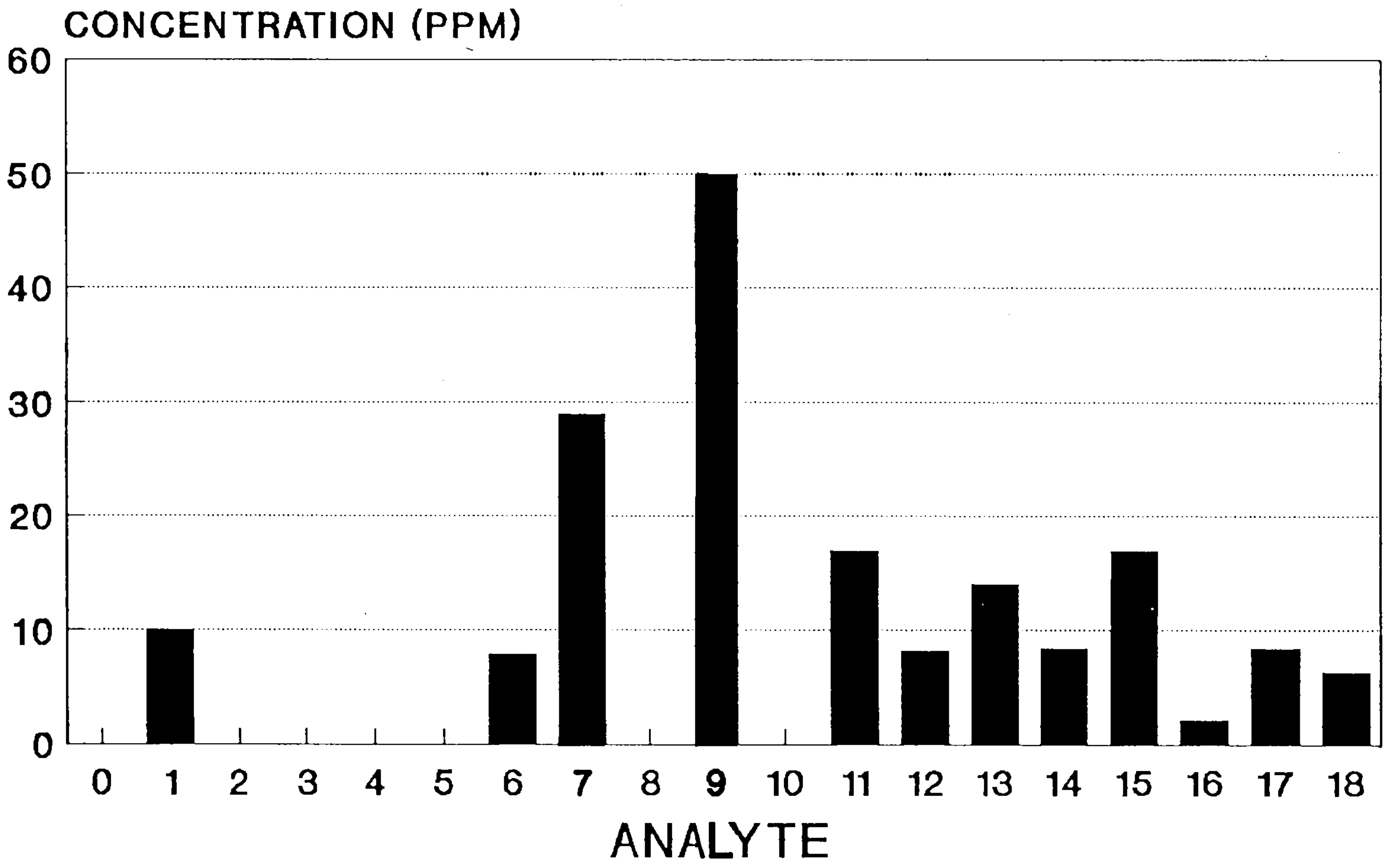
PAH Profile

SS-2



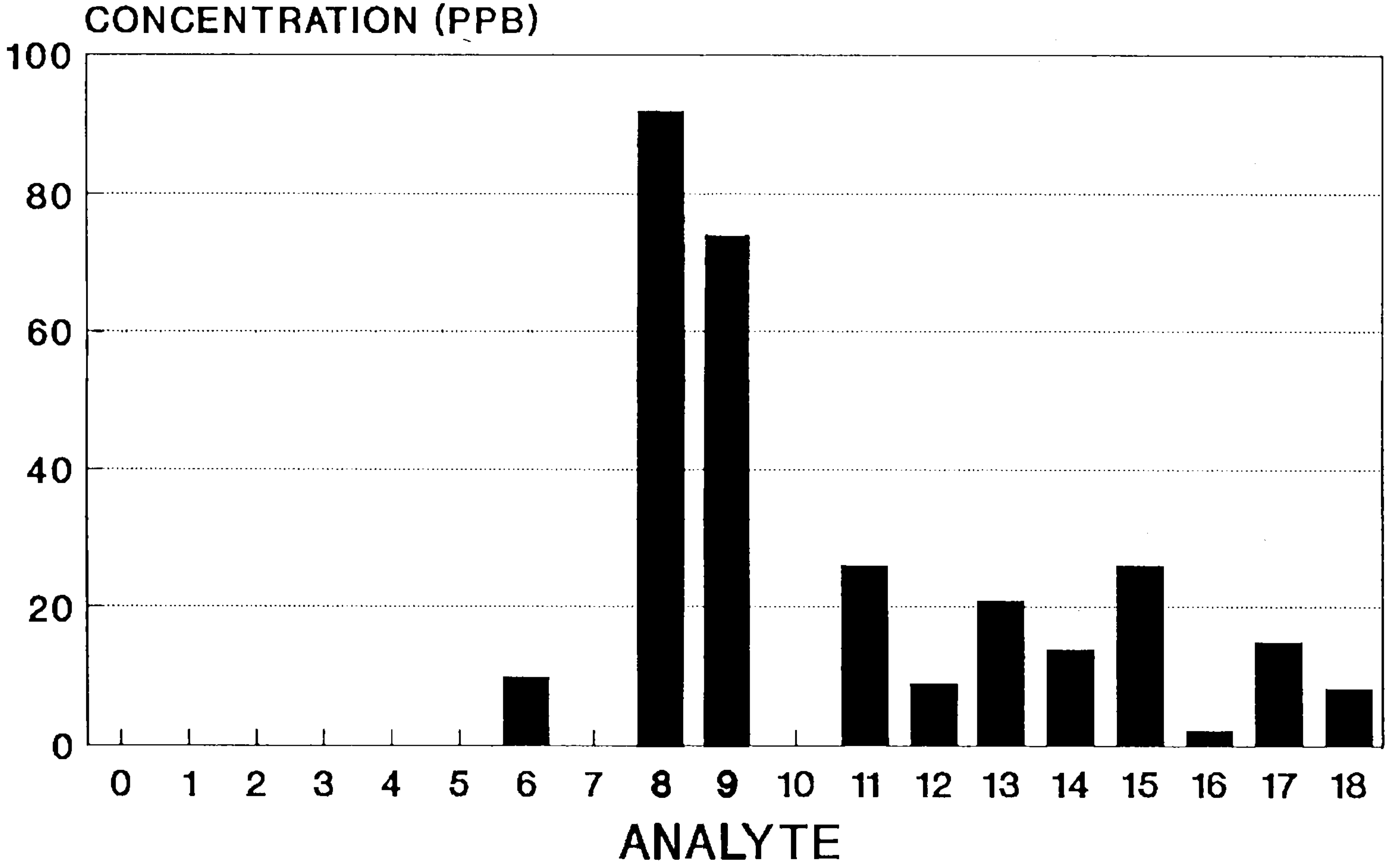
PAH Profile

SS-3



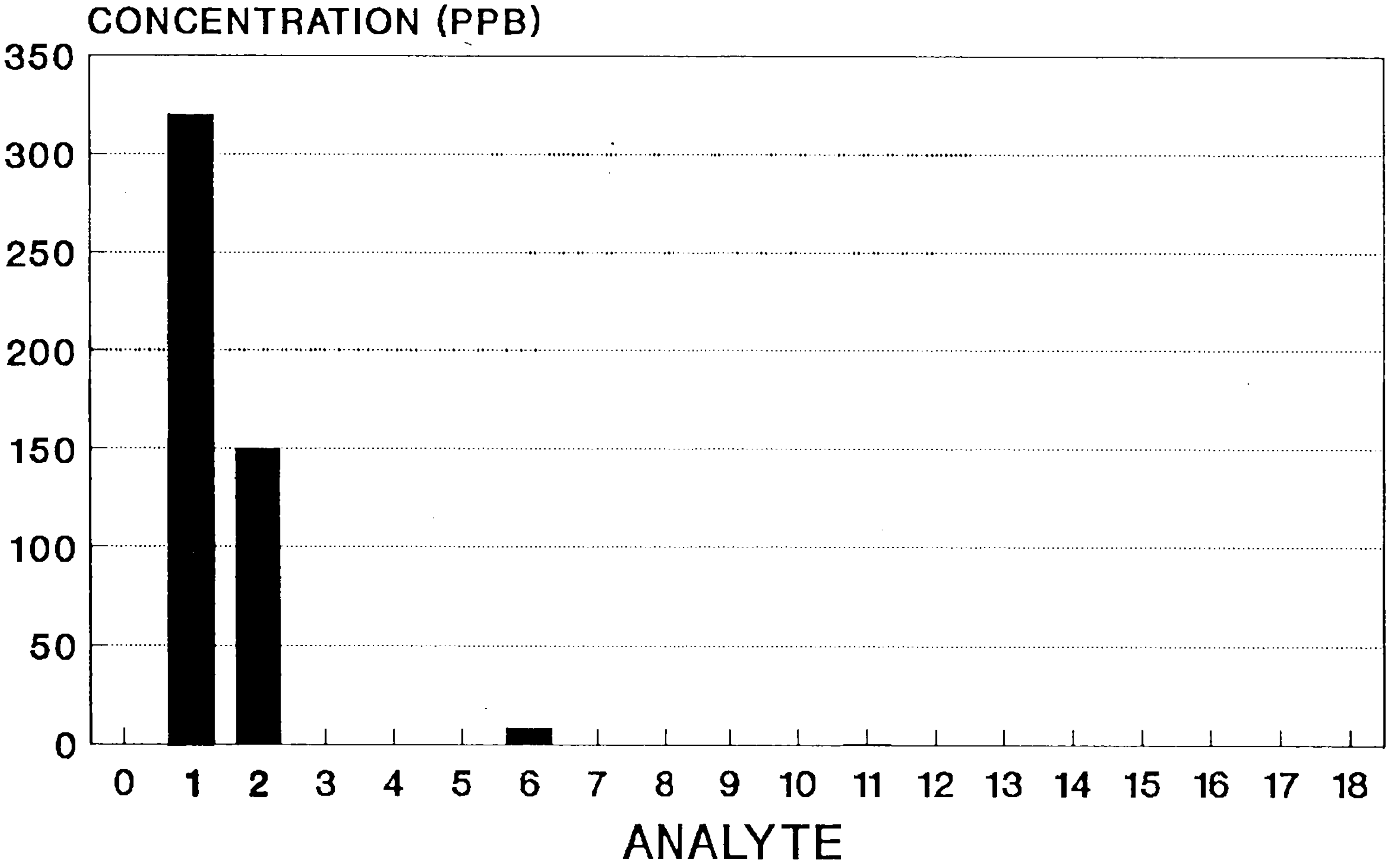
PAH Profile

SB-2 (2-4)



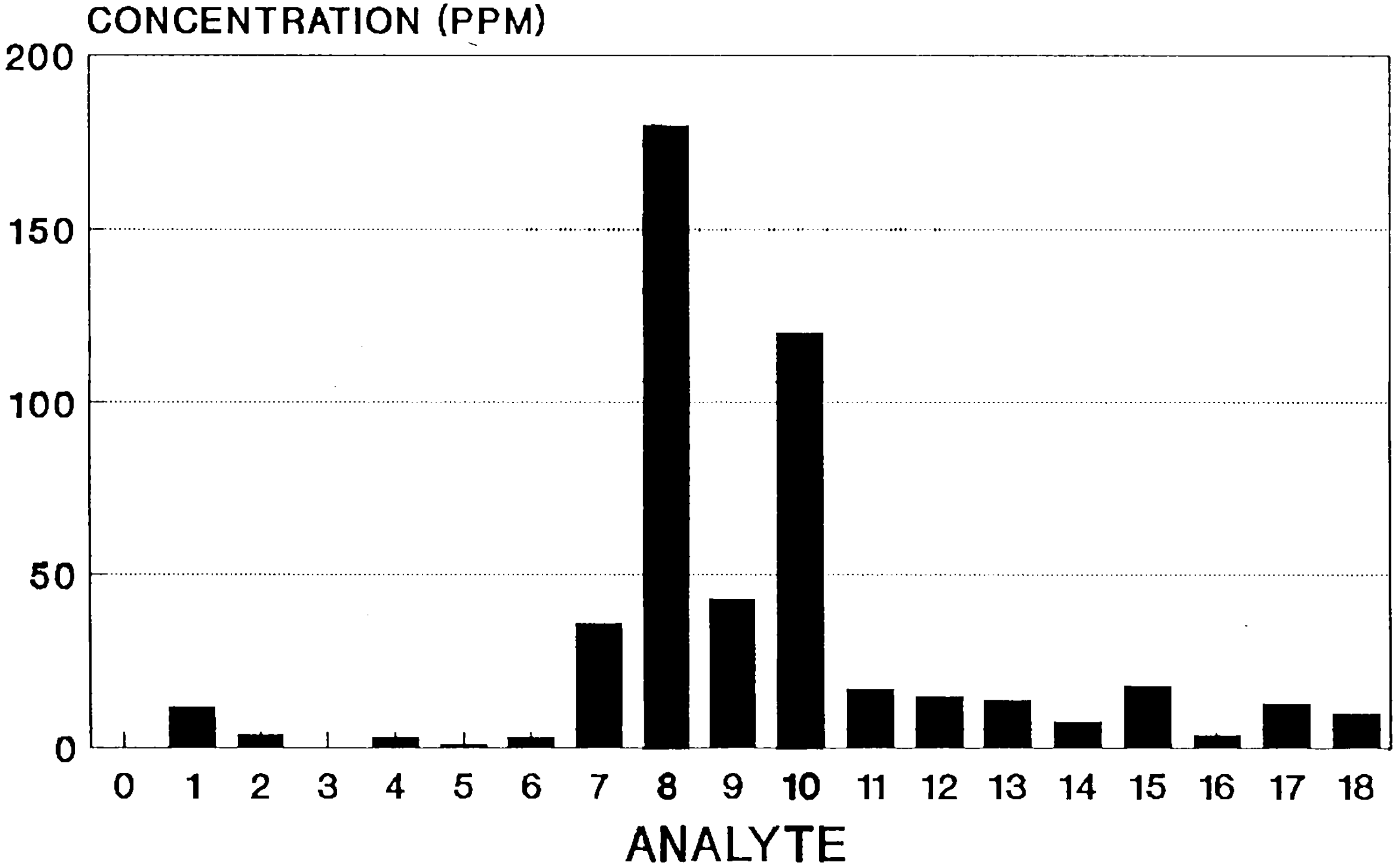
PAH Profile

SB-2 (8-10)



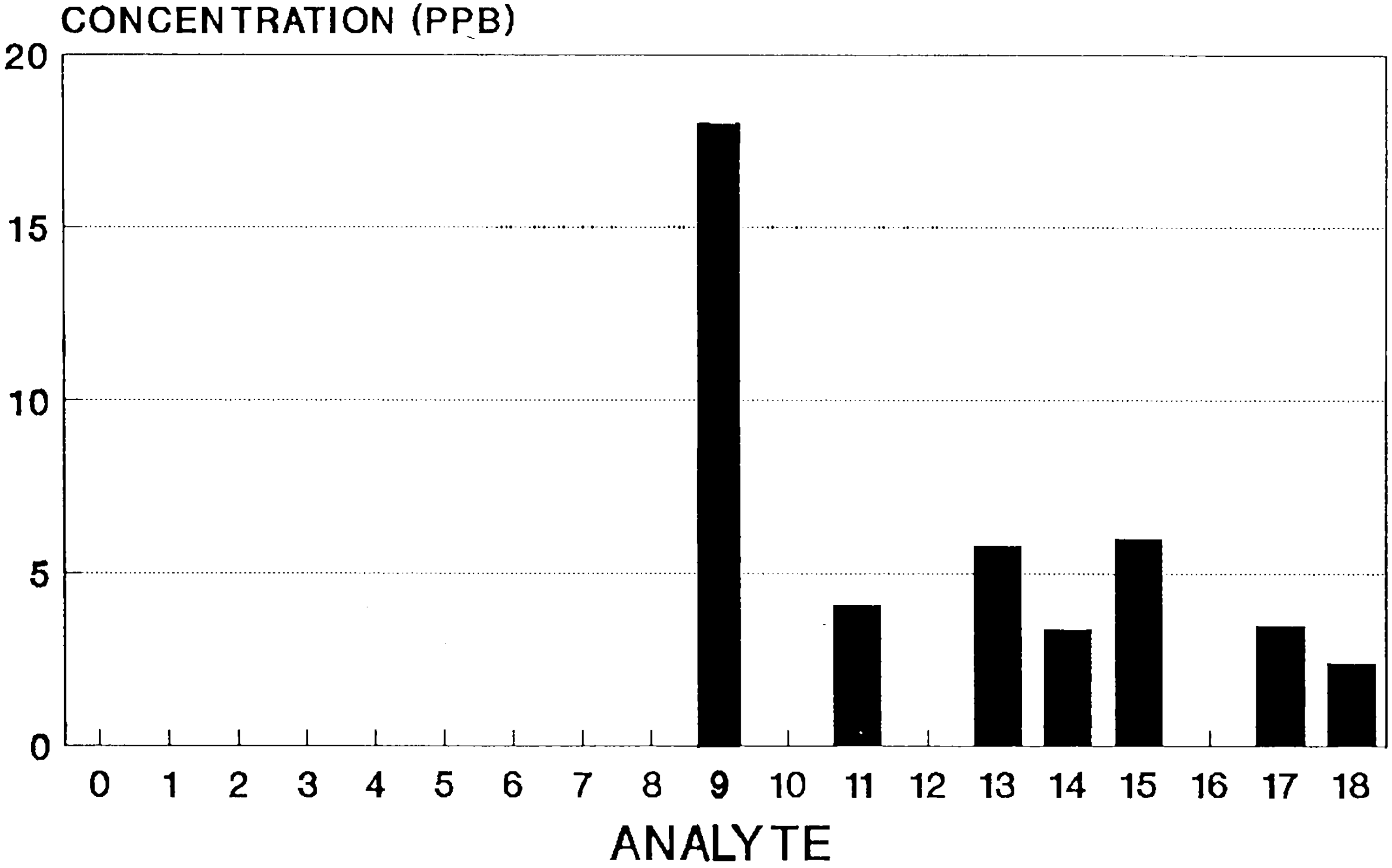
PAH Profile

MW-8 (2-4)



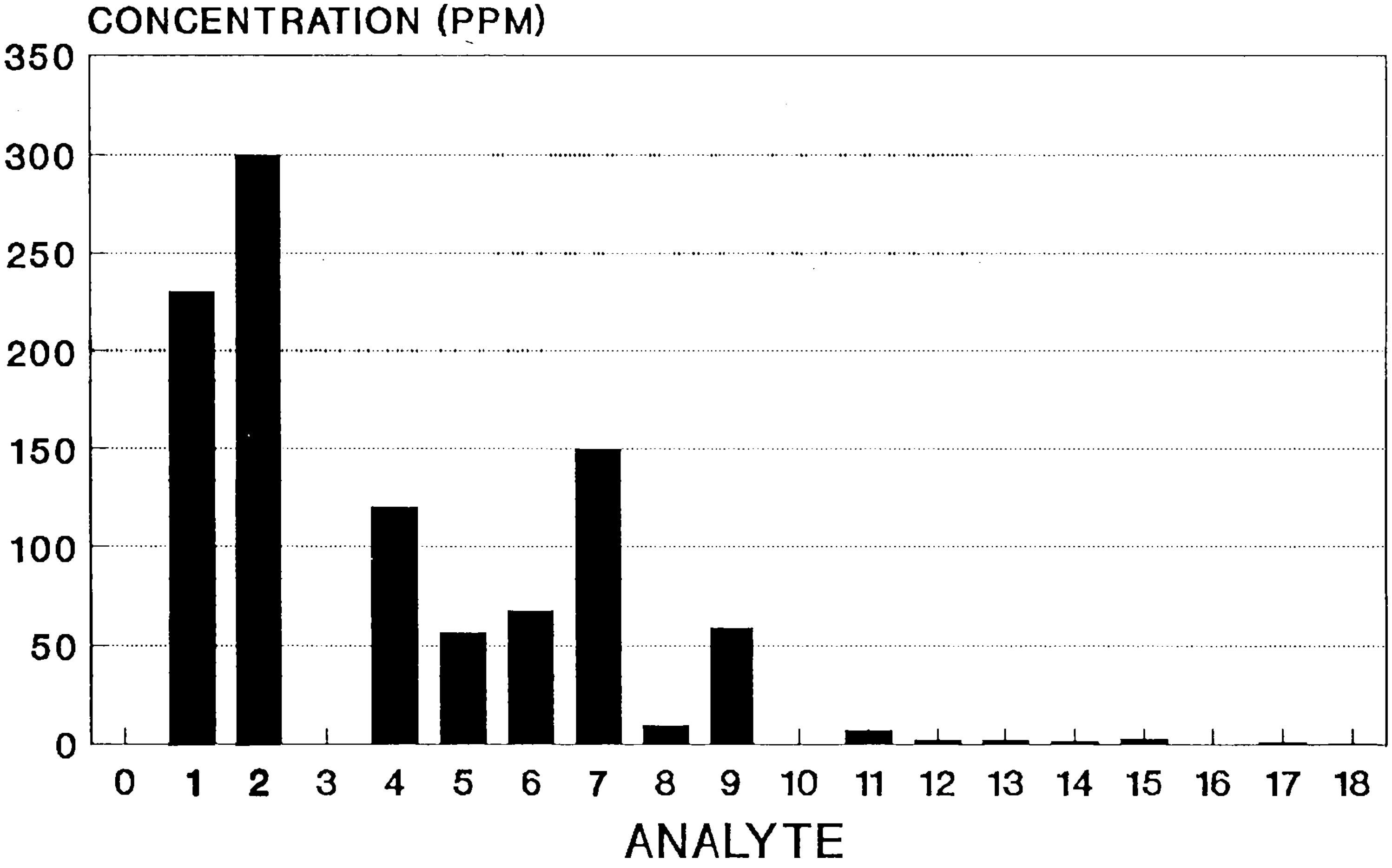
PAH Profile

MW-12 (6-8)



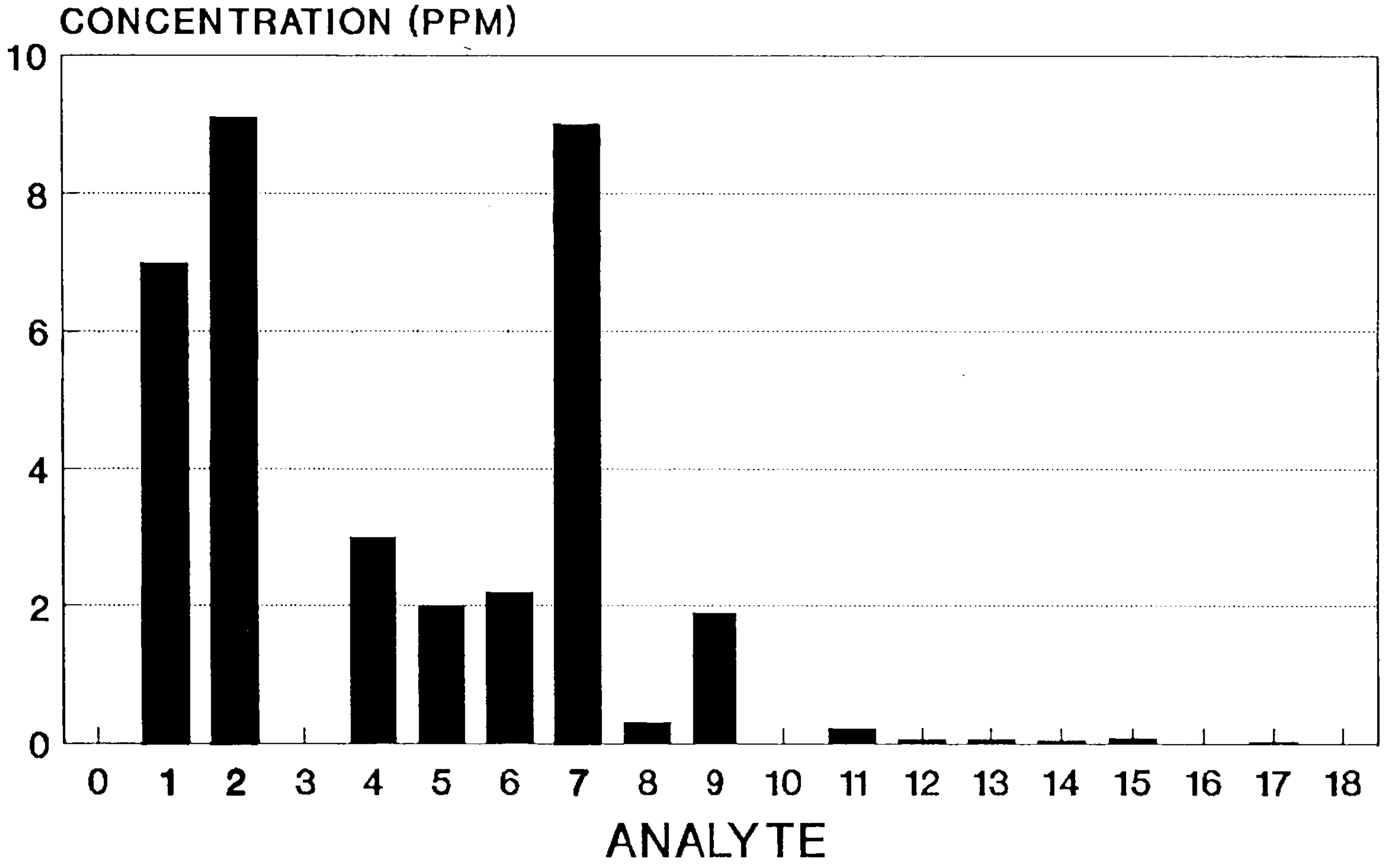
PAH Profile

MW-13 (8-10)



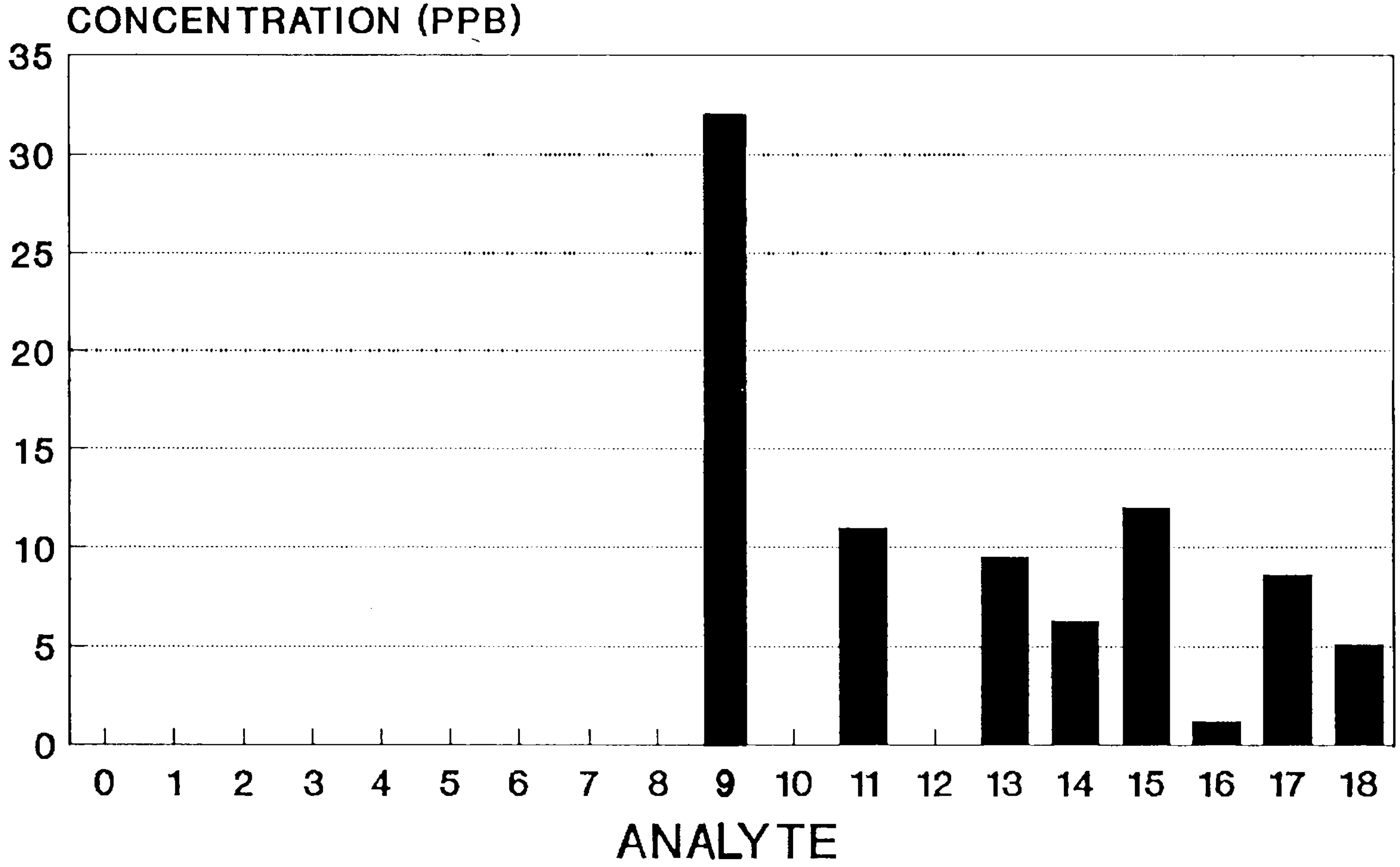
PAH Profile

MW-13 (6-8)



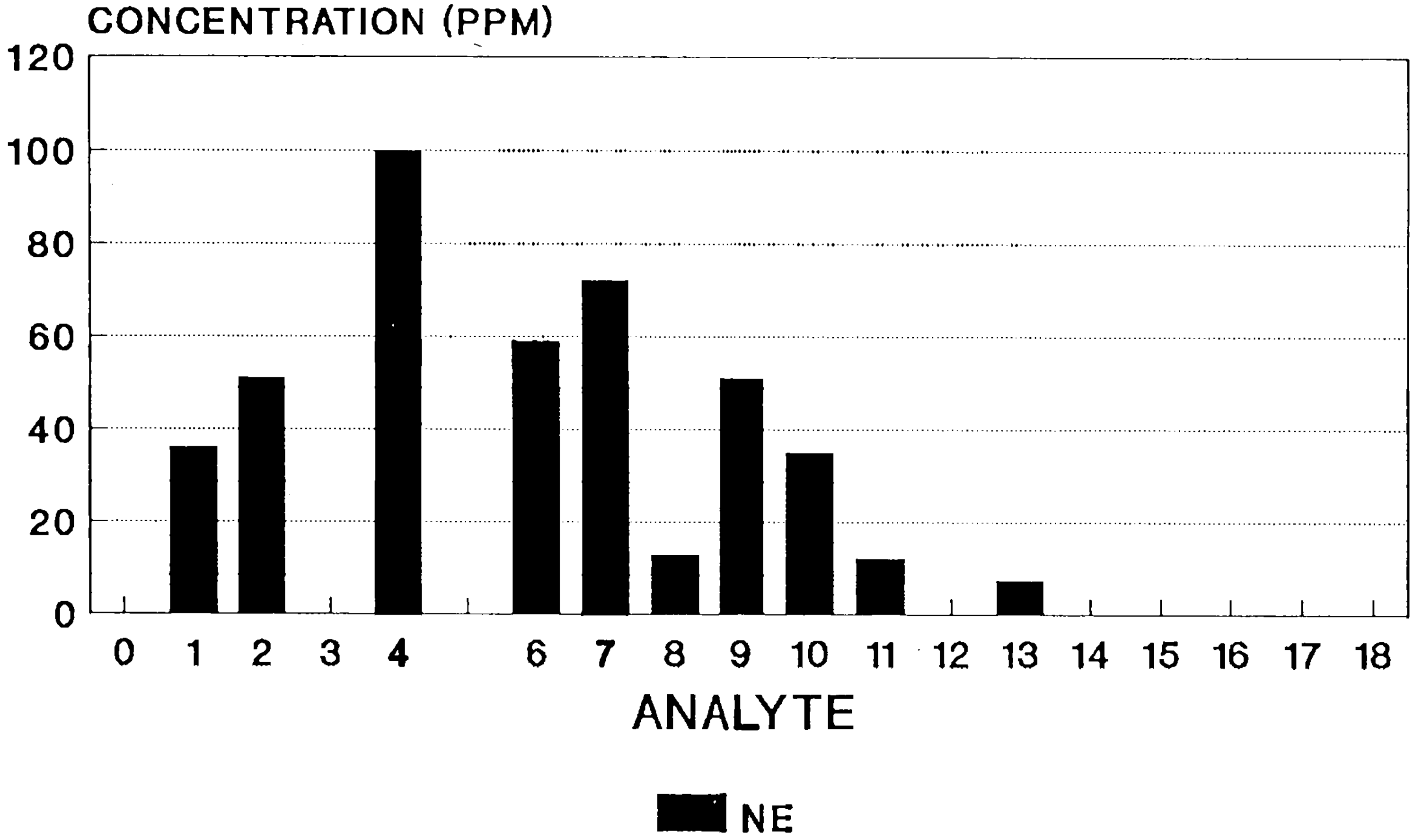
PAH Profile

MW-14 (61-63)



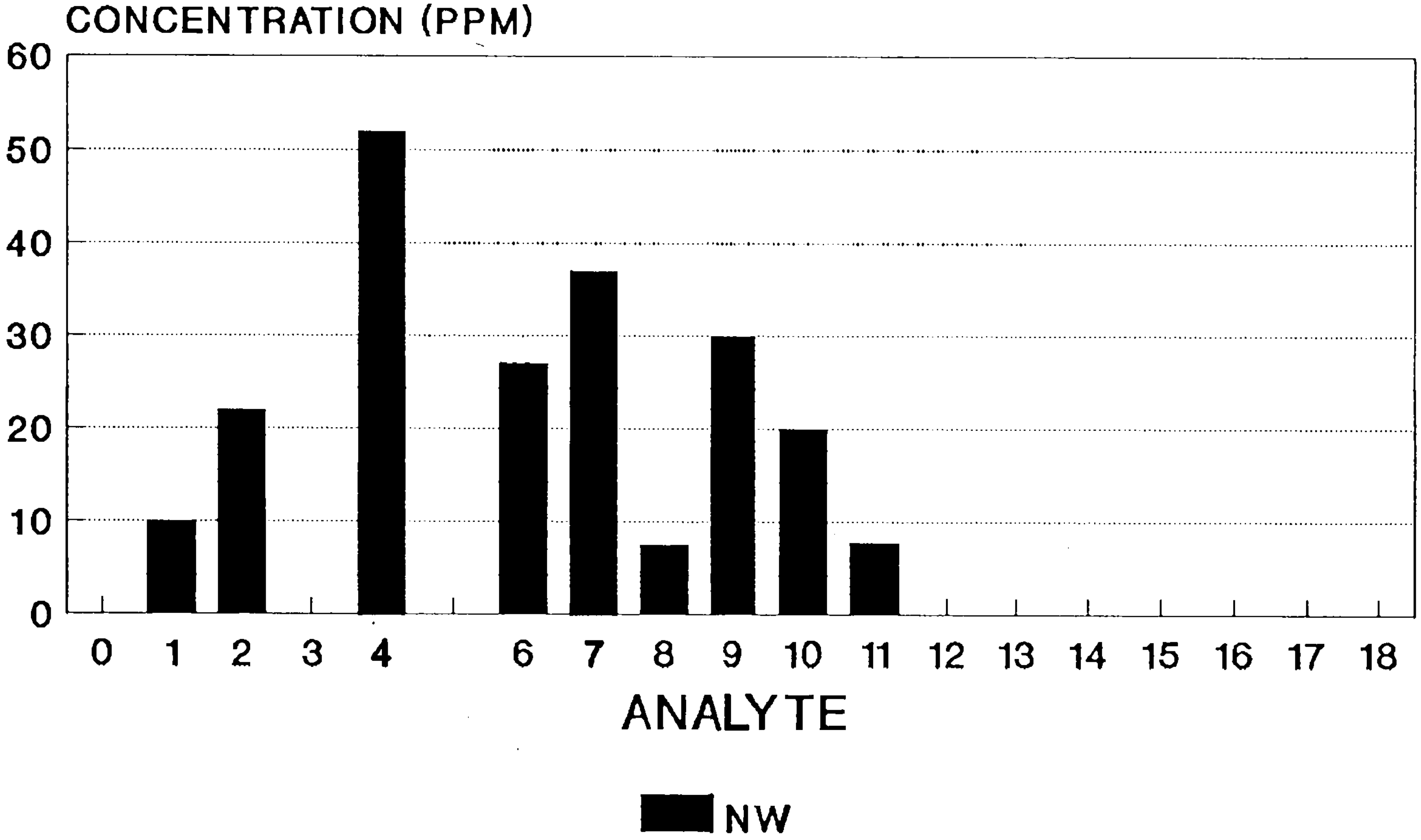
PAH Profile

Biocell Soil (NE)



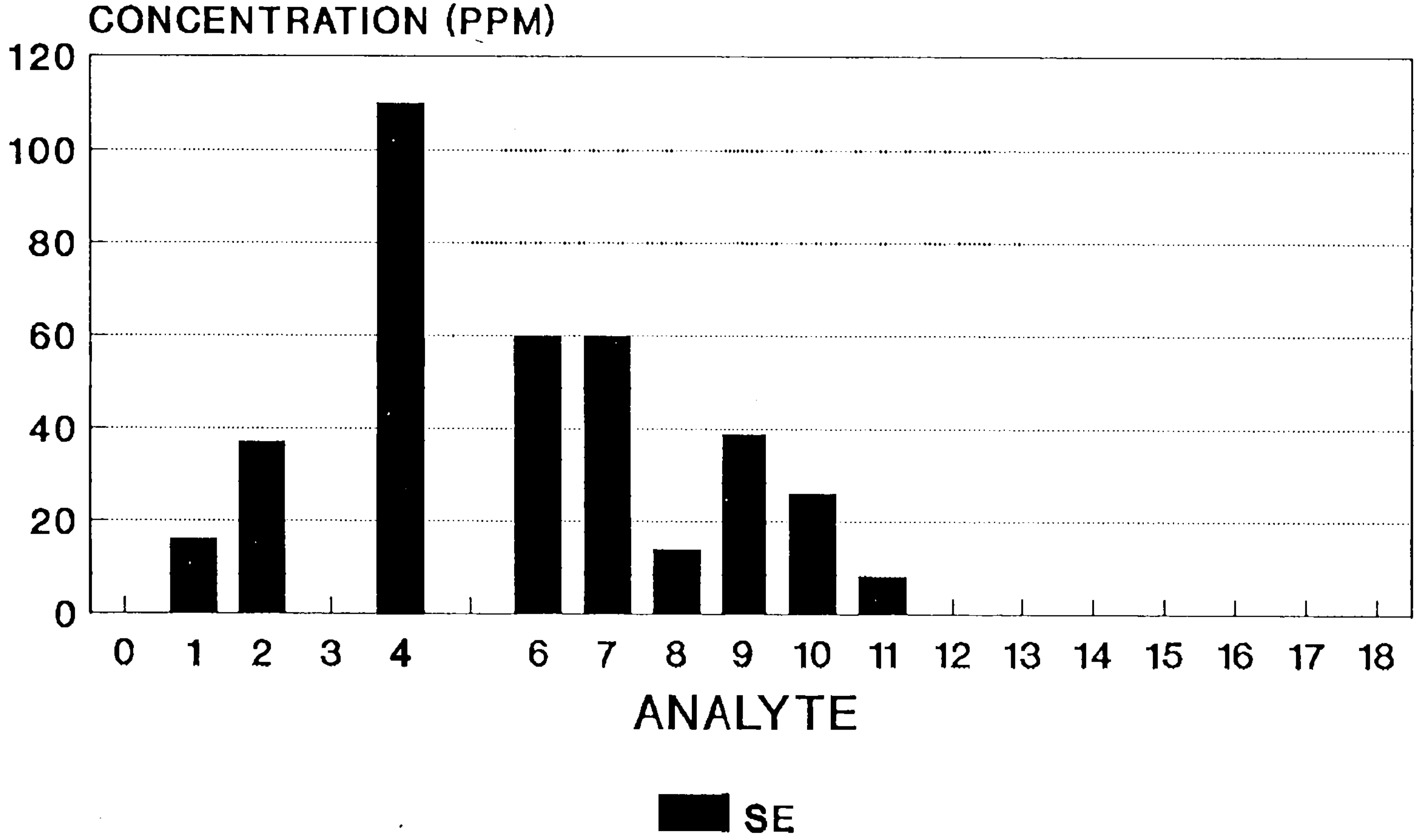
PAH Profile

Biocell Soil (NW)



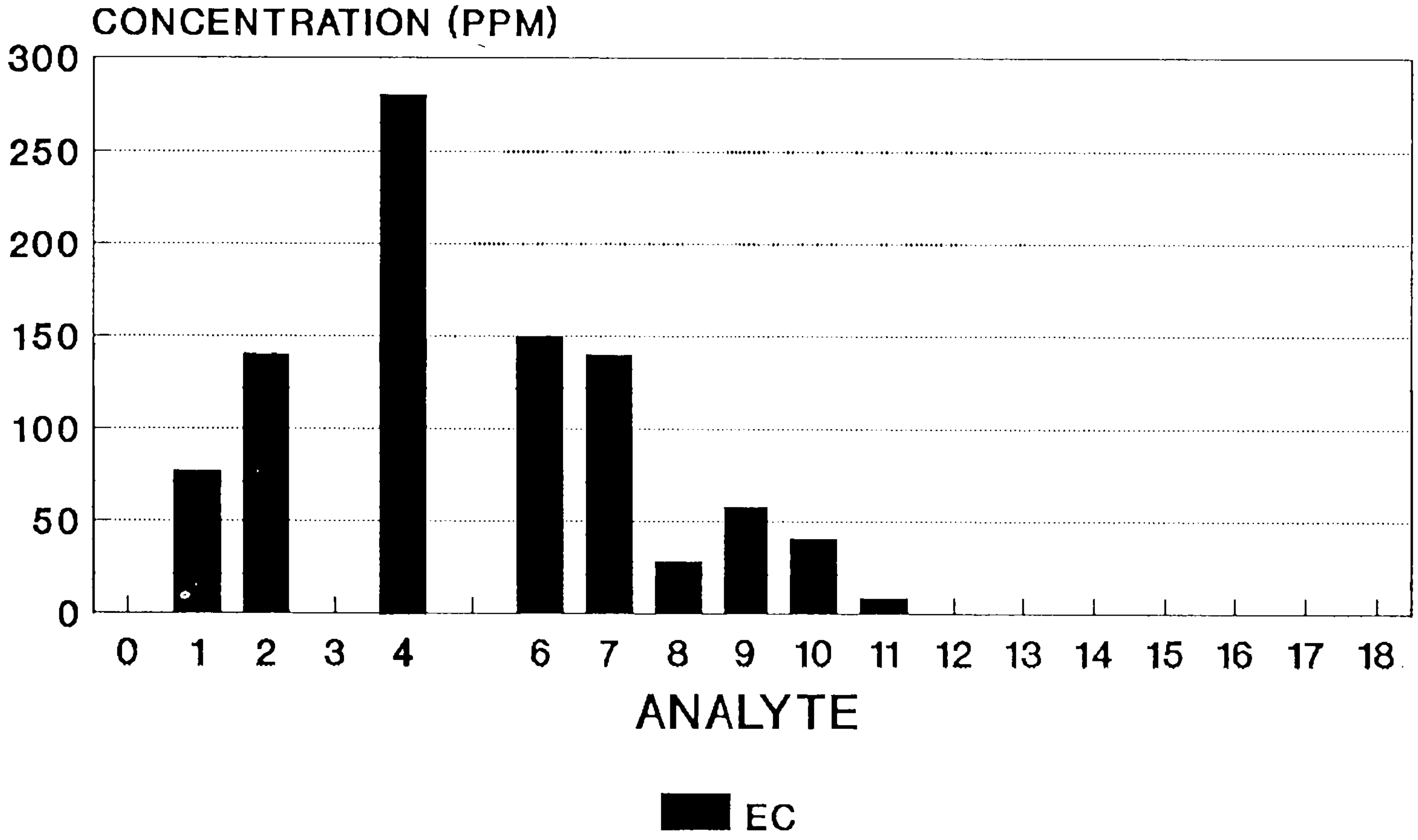
PAH Profile

Biocell Soil (SE)



PAH Profile

Biocell Soil (EC)



G

GROUNDWATER
TECHNOLOGY

APPENDIX G

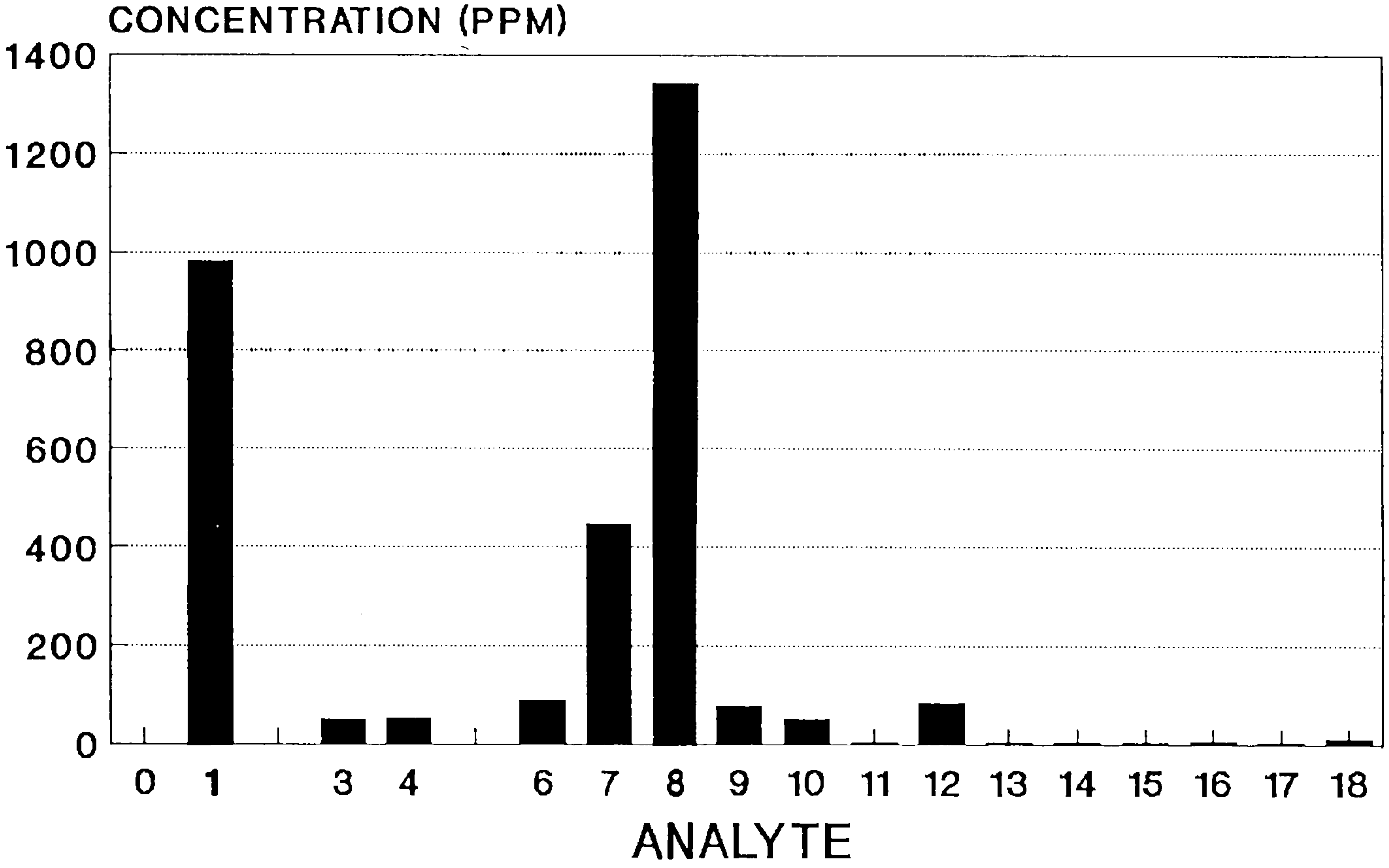
NAPL PROFILE GRAPHS

OSMOSE WOOD PRESERVING, INC.
PAHs IN BIOCELL SOILS

Analyte Number	PAH Analyte
1	Napthalene
2	2-Methylnapthalene
3	Acenapthylene
4	Acenaphthene
5	1-Methylnaphthalene
6	Fluorene
7	Phenanthrene
8	Anthracene
9	Fluoranthene
10	Pyrene
11	Benz[a]anthracene
12	Chrysene
13	Benzo[b]fluoranthene
14	Benzo[k]fluoranthene
15	Benzo[a]pyrene
16	Dibenz[a,h]anthracene
17	Benzo[g,h,i]perylene
18	Indeno[1,2,3-cd]pyrene

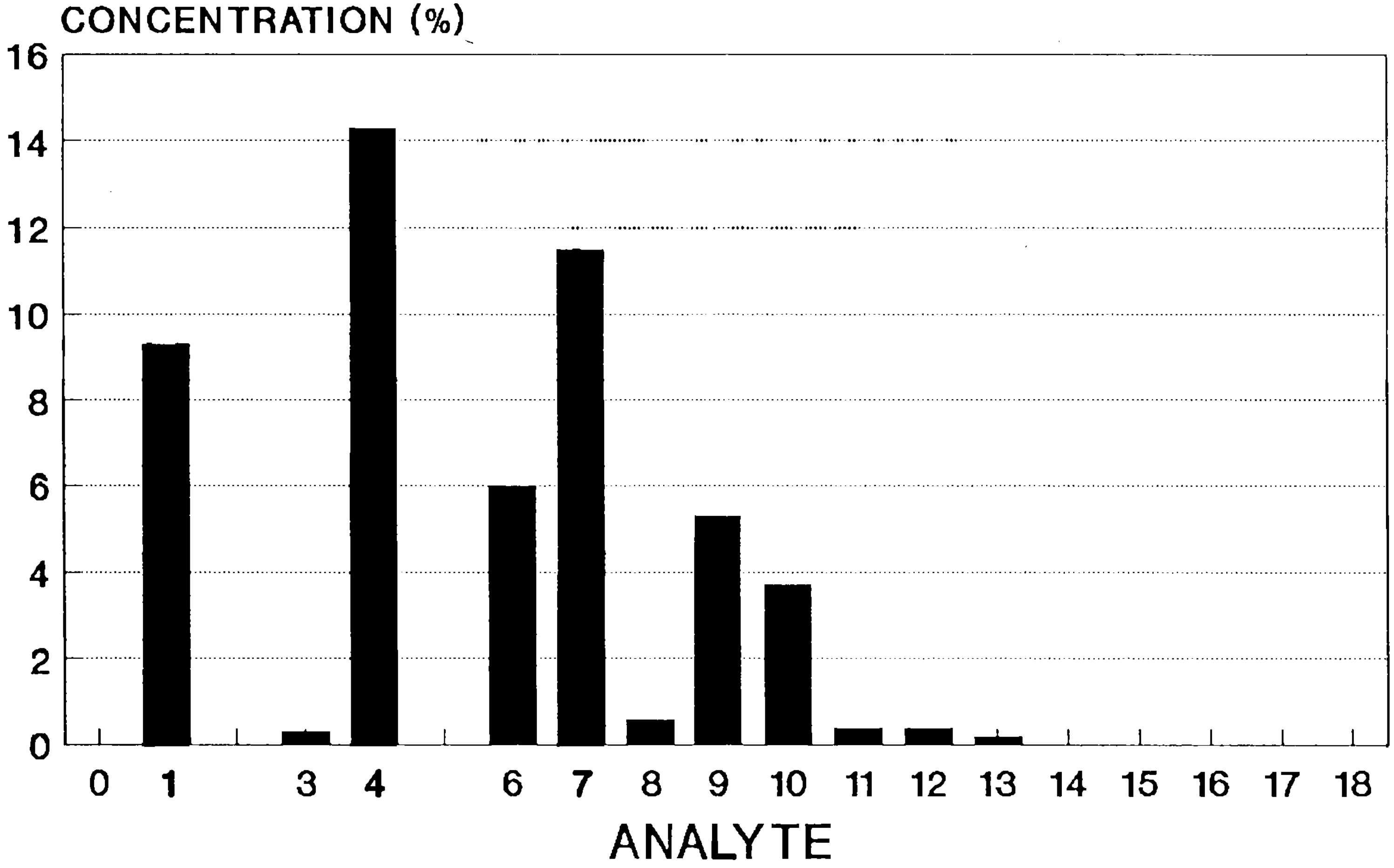
PAH Profile

#2 Fuel Oil



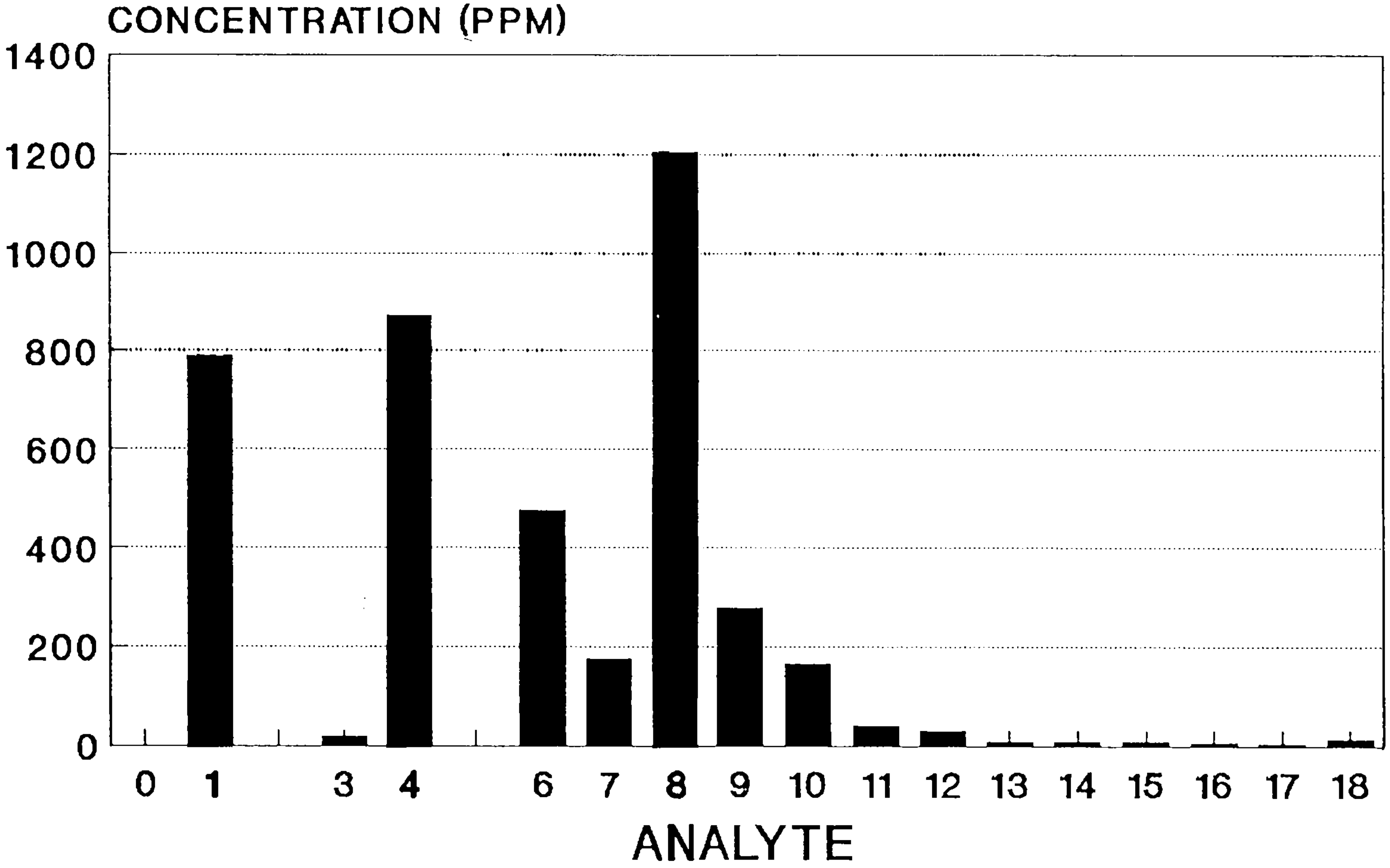
PAH Profile

Creosote



PAH Profile

Well Product



World Wide Geoscience
6100 Corporate Drive
Suite 320
Houston, TX 77036

Attn: Neil Peterson

Certificate #: 20626031
Sample ID: Creosote
Date Received: June 26, 1992

GC/MS ANALYSIS OF PAH'S

Compound	area %
Naphthalene	9.3
Acenaphthylene	.3
Acenaphthene	14.3
Fluorene	6.0
Phenanthrene	11.5
Anthracene	.6
Fluoranthene	5.3
Pyrene	3.7
Chrysene	.4
Benzo(a)anthracene	.4
Benzo(b)fluoranthene	.2
Benzo(k)fluoranthene	<.1
Benzo(a)pyrene	<.1
Indeno(1,2,3,-c,d)pyrene	<.1
Dibenzo(a,h)anthracene	<.1
Benzo(g,h,i)perylene	<.1

Daniel Kowalski

World Wide Geoscience
6100 Corporate Drive
Suite 320
Houston, TX 77036

Attn: Neil Peterson

Certificate #: 20626033
Sample ID: WELL Product mix From MW3, MW7
Date Received: June 26, 1992

GC/MS ANALYSIS OF PAH'S

Naphthalene	789 mg/L
Acenaphthylene	18.6 mg/L
Acenaphthene	873 mg/L
Fluorene	477 mg/L
Phenanthrene	177 mg/L
Anthracene	1203 mg/L
Fluoranthene	279 mg/L
Pyrene	166 mg/L
Chrysene	32.4 mg/L
Benzo(a)anthracene	40.4 mg/L
Benzo(b)fluoranthene	10.3 mg/L
Benzo(k)fluoranthene	10.3 mg/L
Benzo(a)pyrene	10.8 mg/L
Indeno(1,2,3,-c,d)pyrene	14.5 mg/L
Dibenzo(a,h)anthracene	7.5 mg/L
Benzo(g,h,i)perylene	5.6 mg/L

Daniel Kowalski

World Wide Geoscience
6100 Corporate Drive
Suite 320
Houston, TX 77036

Sample ID: #2 Fuel oil
Date Received: June 26, 1992

GC/MS ANALYSIS OF PAH'S

Naphthalene	982	mg/L
Acenaphthylene	51.4	mg/L
Acenaphthene	53.8	mg/L
Fluorene	91.3	mg/L
Phenanthrene	446	mg/L
Anthracene	1342	mg/L
Fluoranthene	77.3	mg/L
Pyrene	51.6	mg/L
Chrysene	86.3	mg/L
Benzo(a)anthracene	5.4	mg/L
Benzo(b)fluoranthene	4.7	mg/L
Benzo(k)fluoranthene	4.7	mg/L
Benzo(a)pyrene	4.9	mg/L
Indeno(1,2,3,-c,d)pyrene	13.3	mg/L
Dibenzo(a,h)anthracene	6.9	mg/L
Benzo(g,h,i)perylene	5.2	mg/L

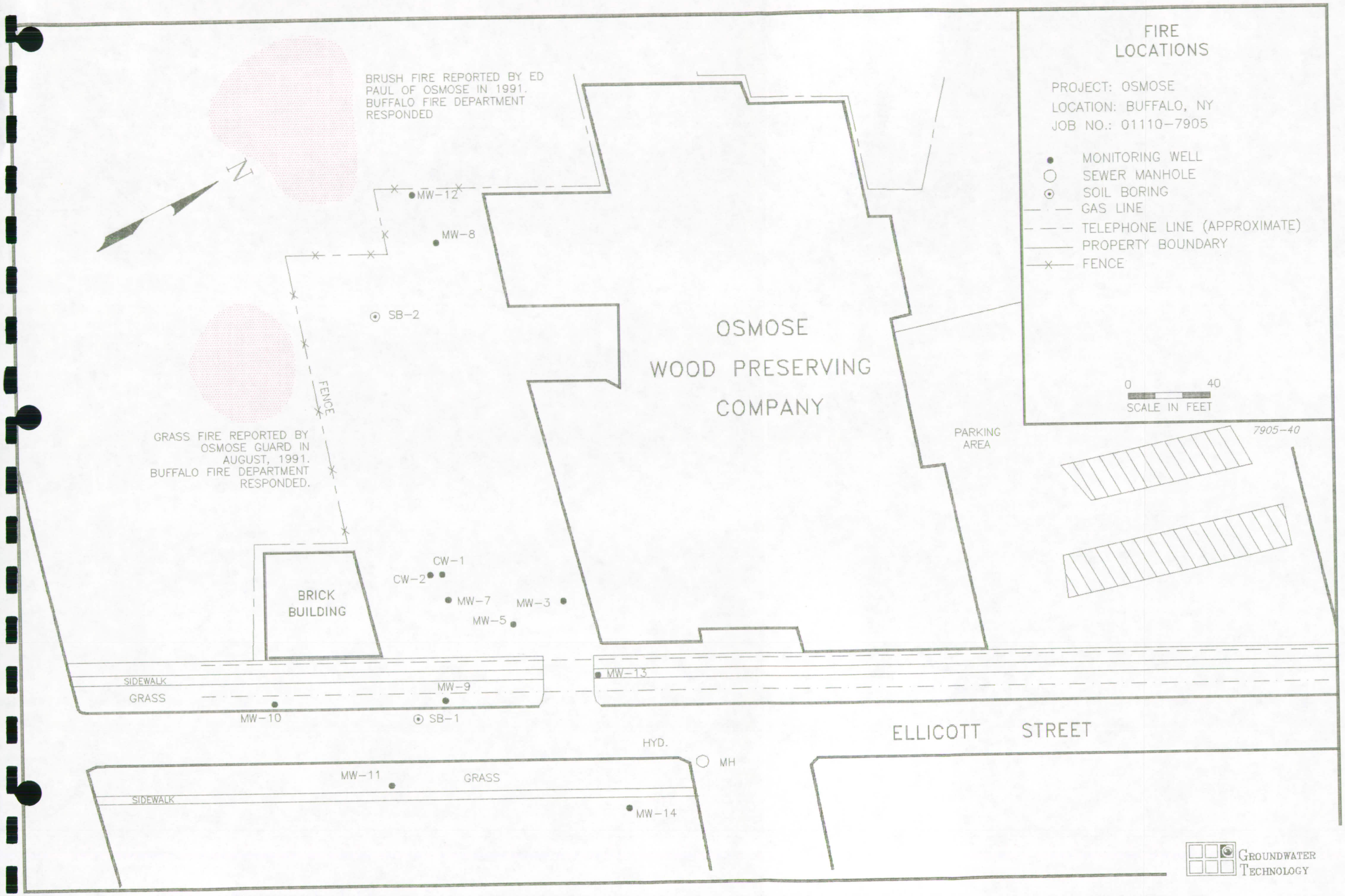
Daniel Kowalski

H

GROUNDWATER
TECHNOLOGY

APPENDIX H

BRUSH FIRE LOCATIONS


FIRE LOCATIONS
PROJECT: OSMOSE
LOCATION: BUFFALO, NY
JOB NO.: 01110-7905
● MONITORING WELL
○ SEWER MANHOLE
⊙ SOIL BORING
GAS LINE
TELEPHONE LINE (APPROXIMATE)
PROPERTY BOUNDARY
FENCE
0
40
SCALE IN FEET
7905-40
BRUSH FIRE REPORTED BY ED PAUL OF OSMOSE IN 1991. BUFFALO FIRE DEPARTMENT RESPONDED
GRASS FIRE REPORTED BY OSMOSE GUARD IN AUGUST, 1991. BUFFALO FIRE DEPARTMENT RESPONDED.
N
MW-12
MW-8
SB-2
FENCE
OSMOSE WOOD PRESERVING COMPANY
PARKING AREA
CW-1
CW-2
MW-7
MW-3
MW-5
BRICK BUILDING
SIDEWALK
GRASS
MW-13
MW-9
MW-10
SB-1
ELLICOTT STREET
HYD.
MH
MW-11
GRASS
SIDEWALK
MW-14
GROUNDWATER TECHNOLOGY

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GROUNDWATER
TECHNOLOGY

APPENDIX I

RISK ASSESSMENT CALCULATIONS

GROUNDWATER
TECHNOLOGY

CALCULATION OF DERMAL EXPOSURE TO UTILITY REPAIR WORKERS USING RECENT GROUNDWATER DATA

The estimated non-carcinogenic and carcinogenic risks from dermal exposure to groundwater to utility repair workers were updated from the original risk assessment report to reflect the installation of new monitoring wells. Groundwater data were collected from eight monitoring wells (MW-8, MW-9, MW-10, MW-11, MW-12, MW-13, MW-14, and CW-1) in April of 1992.

Using these data the 95th upper confidence limit (UCL) of the arithmetic mean also known as the reasonable maximum exposure (RME) was calculated. With the exception of CW-1 all monitoring wells were included in the calculation. As in the original risk assessment CW-1 is considered a deep well. Exposure to this deep well is unlikely to occur. The attached table calculates the 95th UCL which was used as the exposure point concentration for the compounds selected as chemicals of concern.

The new exposure point concentrations were put into Table 6-15 from the original report to estimate intake to a utility repair worker from dermal contact with groundwater. To estimate intake for both carcinogenic and non-carcinogenic effects from dermal exposure the equation recommended in the Risk Assessment Guidance for Superfund (US EPA, 1989[1]) was used. It should be noted that the calculation of intake from the original report was updated based on information in RAGS, however, all exposure assumptions which were used in the original report remain the same. The equation for calculation of intake by dermal exposure to groundwater is as follows:

$$\text{INTAKE (mg/kg-day)} = CW \times SA \times PC \times ET \times EF \times ED \times CF \times 1/BW \times 1/AT$$

where:

CW = concentration in water (mg/l)
SA = skin area available for contact (2300 cm^2)
PC = permeability constant (cm/hr)
ET = exposure time (8 hours/day)
EF = exposure frequency (5 days/year)
ED = exposure duration (1 year)
CF = conversion factor (liter/1000 cm^3)

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[1] US Environmental Protection Agency (EPA). 1989. Risk Assessment Guidance for Superfund. (RAGS). Volume I: Human Health Evaluation Manual. Office of Emergency and Remedial Response: Washington, DC.

BW = body weight (70 kg)

AT = averaging time (75 years x 365 days/year for carcinogenic; ED x 365 days/year for non-carcinogenic)

The resulting maximum daily doses (MDD) for non-carcinogenic effects and lifetime average daily dose (LADD) for carcinogenic effects were used to estimate potential risk. Cancer risk estimates were updated in Table 6-19 of the original report by taking the LADD and multiplying it by the cancer potency and an adjustment factor. The adjustment factor is used to modify the calculated intake (MDD or LADD) into an absorbed dose. Total estimated cancer risk from dermal exposure to groundwater by a utility repair worker is 2.37×10^{-6}. Table 6-20 of the original report summarizes this cancer risk. This value is within EPA's acceptable cancer risk range of 1×10^{-4} and 1×10^{-6}.

Table 6-24 of the original report takes the MDD and divides it by the average daily intake (ADI) and the adjustment factor. The result is a chemical hazard quotient which estimates the potential risk for non-carcinogenic effects. The total hazard quotient is 4.05×10^{-1} (0.4) which is presented in Table 6-24. This value is below EPA's defined acceptable hazard quotient of 1.0.

The results of this reanalysis show that even though the concentrations have increased in groundwater both cancer and non-cancer risks are within EPA-defined acceptable risks levels from dermal exposure to ground water by a utility repair worker.

OSMOSE 95TH UCL BASED ON 4/92 GROUNDWATER DATA

COMPOUND	MW-8	MW-9	MW-10	MW-11	MW-12	MW-13	MW-14	MINIMUM	MAXIMUM	MEAN	SD	95TH UCL
VOCs				(ug/l)								
Benzene	0.1	170	0.1	0.1	0.1	120	1.2	0.1	170	41.66	66.71	90.65
Toluene	0.25	150	0.25	0.25	0.25	300	1.3	0.25	300	64.61	109.07	144.72
Ethyl Benzene	0.4	33	0.4	0.4	0.4	90	0.4	0.4	90	17.86	31.53	41.01
Xylenes (total)	0.85	180	0.85	0.85	0.85	1100	0.85	0.85	1100	183.46	379.25	461.98
PAHs												
Acenaphthene	0.9	0.9	0.9	0.9	0.9	740	0.9	0.9	740	106.49	258.63	296.42
Anthracene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	1.1	0.105	0.105	0.34	0.26	240	0.36	0.105	240	34.61	83.85	96.19
Fluorene	0.105	0.105	0.105	0.105	0.105	360	0.105	0.105	360	51.52	125.94	144.00
1-Methylnaphthalene	0.9	0.9	0.9	0.9	0.9	540	0.9	0.9	540	77.91	188.65	216.45
2-Methylnaphthalene	0.9	0.9	0.9	0.9	0.9	2100	0.9	0.9	2100	300.77	734.53	840.20
Naphthalene	0.9	70	0.9	0.9	0.9	4800	0.9	0.9	4800	696.36	1675.47	1926.80
Phenathrene	0.84	0.32	0.32	0.32	0.32	710	0.7	0.32	710	101.83	248.28	284.17
Pyrene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	0.21	0.043	0.02	0.1	0.049	73	0.077	0.02	73	10.50	25.52	29.24
Benzo(a)pyrene	0.44	0.082	0.033	0.18	0.087	35	0.1	0.033	35	5.13	12.19	14.09
Benzo(b)fluoranthene	0.35	0.054	0.033	0.13	0.065	26	0.071	0.033	26	3.81	9.06	10.47
Benzo(k)fluoranthene	0.19	0.03	0.017	0.072	0.034	15	0.042	0.017	15	2.20	5.23	6.04
Benzo(g,h,i)perylene	0.2	0.038	0.038	0.038	0.038	10	0.038	0.038	10	1.48	3.48	4.04
Dibenzo(a,h)anthracene	0.064	0.015	0.015	0.015	0.015	1.9	0.015	0.015	1.9	0.29	0.66	0.77
Indeno(1,2,3-cd)pyrene	0.39	0.056	0.0215	0.11	0.055	3.4	0.057	0.0215	3.4	0.58	1.16	1.43

ND - Not Detected
t value = 1.943 (Gilbert, 1987)

TABLE 6-15

UTILITY REPAIR WORKER
DERMAL CONTACT WITH GROUNDWATER

EQUATION

[1] $\mathrm{MDD} = \mathrm{CW} * \mathrm{SA} * \mathrm{PC} * \mathrm{ET} * \mathrm{EF} * \mathrm{ED} * \mathrm{CF} * 1/\mathrm{BW} * 1/\mathrm{AT}$

[2] $\mathrm{LADD} = \mathrm{CW} * \mathrm{SA} * \mathrm{PC} * \mathrm{ET} * \mathrm{EF} * \mathrm{ED} * \mathrm{CF} * 1/\mathrm{BW} * 1/\mathrm{AT}$

SYMBOLS AND DESCRIPTIONS	UNITS	VALUES
CW = Concentration in Water	mg/l	See Below
SA = Skin Area Available for Contact	cm2	2300
PC =Permeability Constant	cm/hr	See Below
CF = Conversion Factor	1L/1000cm3	0.001
EF = Exposure Frequency	days/year	5
ED = Exposure Duration	years	1
ET = ExposureTime	hrs/day	8
BW = Body Weight	kg	70
AT = Averaging Time	days (noncarcinogenic)	365
	days (carcinogenic)	27375
MDD = Maximum Daily Dose	mg/kg-day	EQ[1]
LADD = Lifetime Average Daily Dose	mg/kg-day	EQ[2]

RESULTS

Chemical	Exposure Point Concentration (mg/l)	PC	INTAKE
NONCARCINOGENIC			MDD
Benzene	0.091	0.02	6.35E-06
Toluene	0.145	0.05	2.42E-05
Ethylbenzene	0.041	0.07	9.71E-06
Xylene	0.462	0.07	1.13E-04
Acenaphthene	0.296	0.09	9.98E-05
Anthracene	0.000	0.09	0.00E+00
Fluoranthene	0.096	0.10	3.42E-05
Fluorene	0.144	0.09	4.77E-05
1-methylnaphthalene	0.216	0.07	5.75E-05
2-methylnaphthalene	0.840	0.07	2.23E-04
Naphthalene	1.927	0.07	5.12E-04
Phenanthrene	0.284	0.09	9.71E-05
Pyrene	0.000	0.10	0.00E+00
CARCINOGENIC			LADD
Benzene	0.091	0.02	8.51E-08
Benzo(a)anthracene	0.029	0.10	1.39E-07
Benzo(a)pyrene	0.014	0.10	6.74E-08
Benzo(b)fluoranthene	0.010	0.10	5.02E-08
Benzo(k)fluoranthene	0.006	0.10	2.90E-08
Benzo(g,h,i)perylene	0.004	0.10	1.92E-08
Dibenzo(a,h)anthracene	0.001	0.10	3.68E-09
Indeno(1,2,3-cd)pyrene	0.001	0.10	6.86E-09

Table 6-19. UTILITY WORKER: CANCER RISK ESTIMATES, FOR INDIVIDUAL CHEMICALS, BY RECEPTOR AND EXPOSURE PATHWAY

Receptor / Pathway	Chemical	LADD (mg/kg-day)	Cancer Potency (mg/kg-day)-1	AF	Chemical Risk	Total Exposure Pathway Risk
UTILITY REPAIR WORKER DERMAL CONTACT WITH GROUNDWATER						
	Benzene	8.51E-08	0.029	1.0	2.47E-09	
	Benzo(a)anthracene	1.39E-07	1.7	0.5	4.73E-07	
	Benzo(a)pyrene	6.74E-08	11.5	0.5	1.55E-06	
	Benzo(b)fluoranthene	5.02E-08	1.6	0.5	1.61E-07	
	Benzo(k)fluoranthene	2.90E-08	0.76	0.5	4.41E-08	
	Benzo(g,h,i)perylene	1.92E-08	0.253	0.5	9.72E-09	
	Dibenzo(a,h)anthracene	3.68E-09	12.77	0.5	9.40E-08	
	Indeno(1,2,3-cd)pyrene	6.86E-09	2.67	0.5	3.66E-08	
						2.37E-06

RISK = LADD * CPF
LADD = Lifetime Average Daily Dose (mg/kg-day)
CPF = Cancer Potency Factor (mg/kg-day)-1
AF = Adjustment factor (to correspond to absorbed dose)

Table 6-20: CUMULATIVE CANCER RISK ESTIMATES FOR INDIVIDUAL AND COMBINED RECEPTORS

Receptor	Exposure Pathway	Pathway Risk	Contribution to Total Risk	Cumulative Risk
Construction Worker, Biocell				9.07E-08
	Incidental Ingestion of Soil	1.50E-08	16.54%	
	Dermal Contact with Soil	7.55E-08	83.24%	
	Inhalation of Fugitive Dust	2.05E-10	0.23%	
Construction Worker, On-Site (Non-Biocell)				1.01E-06
	Incidental Ingestion of Soil	1.67E-07	16.48%	
	Dermal Contact with Soil	8.44E-07	83.29%	
	Inhalation of Fugitive Dust	2.30E-09	0.23%	
Construction Worker, Off-site				2.87E-10
	Incidental Ingestion of Soil	4.75E-11	16.54%	
	Dermal Contact with Soil	2.39E-10	83.23%	
	Inhalation of Fugitive Dust	6.51E-13	0.23%	
Utility Repair Worker				2.37E-06
	Dermal Contact With Groundwater	2.37E-06	100.00%	

Table 6-24. UTILITY WORKER: HAZARD INDEX ESTIMATES, FOR INDIVIDUAL CHEMICALS, BY RECEPTOR AND EXPOSURE PATHWAY

Receptor / Pathway	Chemical	MDD (mg/kg-day)	ADI	AF	Chemical Hazard Quotient	Exposure Pathway Hazard Index
UTILITY REPAIR WORKER DERMAL CONTACT WITH GROUNDWATER						
	Benzene	6.35E-06	0.047	1	1.35E-04	
	Toluene	2.42E-05	0.2	1	1.21E-04	
	Ethylbenzene	9.71E-06	0.1	1	9.71E-05	
	Xylene	1.13E-04	2	1	5.65E-05	
	Acenaphthene	9.88E-05	0.06	0.5	3.29E-03	
	Anthracene	0.00E+00	0.3	0.5	0.00E+00	
	Fluoranthene	3.42E-05	0.04	0.5	1.71E-03	
	Fluorene	4.77E-05	0.04	0.5	2.39E-03	
	1-methylnaphthalene	5.75E-05	0.004	0.5	2.88E-02	
	2-methylnaphthalene	2.23E-04	0.004	0.5	1.12E-01	
	Naphthalene	5.12E-04	0.004	0.5	2.56E-01	
	Phenanthrene	9.71E-05	0.3	0.5	6.47E-04	
	Pyrene	0.00E+00	0.03	0.5	0.00E+00	
						4.05E-01

Hazard Quotient = MDD / ADI
MDD = Maximum Daily Dose (mg/kg-day)
ADI = Acceptable Daily Intake (Reference Dose) (mg/kg-day)
AF = Adjustment factor (to correspond to absorbed dose)

Table 6-25: TOTAL HAZARD INDEX ESTIMATES BY RECEPTOR

Receptor	Exposure Pathway	Hazard Index	Contribution to Total Hazard Index	Total Hazard Index
Construction Worker, Biocell				1.14E-01
	Incidental Ingestion of Soil	3.22E-02	28.25%	
	Dermal Contact with Soil	8.11E-02	71.14%	
	Inhalation of Fugitive Dust	4.79E-04	0.42%	
Construction Worker, On-Site (Non-Biocell)				4.62E-02
	Incidental Ingestion of Soil	1.31E-02	28.35%	
	Dermal Contact with Soil	3.29E-02	71.21%	
	Inhalation of Fugitive Dust	1.95E-04	0.42%	
Construction Worker, Off-site				1.78E-06
	Incidental Ingestion of Soil	5.03E-07	28.26%	
	Dermal Contact with Soil	1.27E-06	71.35%	
	Inhalation of Fugitive Dust	7.49E-09	0.42%	
Utility Repair Worker				4.05E-01
	Dermal Contact With Groundwater	4.05E-01	100.00%	