Consulting Geotechnical
Engineers and Geologists

GeoEngineers

REPORT
PHASE 1 ENVIRONMENTAL SITE ASSESSMENT
NORTHWEST PLATING COMPANY
SEATTLE, WASHINGTON
FOR
WASHINGTON INDUSTRIES, INC.

NWP 0001

REPORT

PHASE 1 ENVIRONMENTAL SITE ASSESSMENT

NORTHWEST PLATING COMPANY

SEATTLE, WASHINGTON

FOR

WASHINGTON INDUSTRIES, INC.

GeoEngineers

Consulting Geotechnical
Engineers and Geologists

May 5, 1989

Helsell, Fetterman, Martin, Todd & Hokanson
P.O. Box 21846
Seattle, Washington 98111

Attention: Mr. Gary Linden

This transmits five copies of the report which summarizes our Phase 1 Environmental Site Assessment of the Northwest Plating Company property in Seattle, Washington. Our services were authorized on February 16, 1989 by Washington Industries.

We appreciate the opportunity to assist you with this project. Should you have any questions or need additional information, please call.

Yours very truly,

GeoEngineers, Inc.

James A. Miller, P.E.
Principal

SCP:JAM:cs

File No. 1531-01-4

GeoEngineers, Inc.
2405 140th Ave. NE, Suite 105
Bellevue, WA 98005
Telephone (206) 746-5200
Fax. (206) 746-5068

GeoEngineers

TABLE OF CONTENTS

List of Figures

APPENDIX A

List of Appendix A Figures

APPENDIX B

GeoEngineers

REPORT

PHASE 1 ENVIRONMENTAL SITE ASSESSMENT

NORTHWEST PLATING COMPANY

SEATTLE, WASHINGTON

FOR

WASHINGTON INDUSTRIES, INC.

INTRODUCTION AND SCOPE

The results of our Phase 1 Environmental Site Assessment (ESA) of the Northwest Plating Company site are presented in this report. The Northwest Plating Company property, referred to herein as "the site", is located at 825 South Dakota Street in Seattle, Washington. The site location, shown relative to its physical surroundings, is shown in Figure 1.

The purpose of our services is to assist Washington Industries, Inc. (as owners of the site and Northwest Plating Company) in evaluation of potential environmental risk associated with ownership of the property. This Phase 1 ESA was designed to identify whether significant subsurface environmental contamination is present beneath the property. Our approach involved the installation and testing of shallow ground water monitor wells and the evaluation of potential contaminant migration pathways from operating areas within the building to the subsurface environment. Specifically, our scope of services included:

1. Performing a walk-through survey of the interior of the building to identify areas where liquids could enter the subsurface.
2. Installing four shallow ground water monitor wells at locations around the perimeter of the building.
3. Surveying the elevation of each ground water monitor well. Water level measurements were made in each well to evaluate the direction of ground water movement in the vicinity of the site.
4. Obtaining ground water samples from each of the wells and analyzing the water for pH, selected metals, cyanide and volatile organic compounds.

OVERVIEW OF FACILITY OPERATIONS

Our representative visited Northwest Plating Company on March 7, 1989 and met with Mr. Milt Haworth, the General Manager, and Mr. Vern Haworth, the Shop Manager. During that meeting we discussed materials and processes involved in operation of the facility. After that meeting we toured the facility to observe the items discussed and to look for potential pathways through which contaminants could migrate into underlying soils.

Northwest Plating Company began operations on the northeastern part of the site in 1957. They grew to their present size over several years and have occupied the entire site since about 1962. Plating operations have generally remained the same since that time.

Services provided by Northwest Plating Company include (1) cadmium, chrome, copper, nickel, and zinc plating; (2) anodizing; (3) application of special metal coatings; (4) metal inspection services; (5) metal polishing and finishing; and (6) spray painting.

Most of the plating, anodizing and coating application processes are performed in open-top tanks. According to a tank inventory provided by Mr. Haworth, 40 different process tanks at the facility have a total storage capacity of 16,900 gallons. This inventory does not include rinse tanks or degreasing tanks. Most of the liquids contained in the tanks are classified as hazardous according to state and/or federal regulations. Most of the tanks observed were of metal, box-type construction. At least one tank was constructed of wood with a metal liner. Many of the liquids used in the plating process are highly alkaline (high pH) or very acidic (low pH) and contain very high concentrations of metals and/or cyanide in solution. According to routine testing information, the pH in the tanks ranges from 0.10 to 12.29 pH units. Acids routinely used at the facility include boric, chromic, hydrochloric, hydrofluoric, nitric, phosphoric and sulfuric acid.

Degreasing of metal parts is also routinely done as part of the plating process. Degreasing is accomplished using a chlorinated solvent that consists primarily of trichloroethene (also known as TCE or trichloroethylene).

The facility has a waste water treatment system that accepts acid waste and caustic/cyanide waste. The waste water is treated through a multi-stage process and then discharged to the METRO sanitary sewer. We understand that Northwest Plating Company presently discharges about 12,000 to 13,000 gallons of waste water per day, as allowed by their METRO discharge permit.

SITE CONDITIONS

GENERAL

The site is located along the eastern edge of the lower Duwamish River industrial area (Figure 1). This area is typically underlain by dredge fill placed during the early development of Seattle. Prior to filling and development, this area consisted of a river estuary under the influence of tidal changes. Around the turn of the century, the general site area was occupied by a large brick manufacturing plant which obtained clay from a quarry located on the hillside located northeast of the brick plant. Brick fragments are common in the upper layer of fill soils in this area.

The site is presently occupied by an 18,000-square-foot brick and masonry building with concrete slab floors (Figure 2). The exterior portion of the property is limited to driveways and border planter areas. The north and east sides of the property border South Dakota Street and South Ninth Avenue, respectively. Interstate Highway 5 is located immediately east of South Ninth Avenue. The west side of the property borders an active Burlington Northern Railroad line. The southern side of the building is contiguous with a building identified as the John Perine Company, which is apparently a manufacturer or distributor of nuts, bolts, and screws.

BUILDING INTERIOR SURVEY

We conducted a brief walk-through tour of the interior of the building to examine existing facilities and practices that could result in releases of hazardous materials to the subsurface environment. During this brief tour, we observed the conditions of the floors, sumps, tanks and operating practices.

The floors in the building consist mainly of bare concrete. The floors appear to have been placed in different sections of the building at different times. There are several areas where joints between adjacent slabs may allow leakage of surface spills to the underlying soil. In many areas the floors were etched by corrosive materials. We were not able to examine the condition of the floor beneath most of the tanks.

We were shown three small sumps in the northern half of the building. We understand that liquid collecting in one of these sumps is pumped to the waste water treatment system. The other two sumps apparently contain standing water and do not drain to the waste water collection system. There are several covered, shallow, concrete-lined trenches in the concrete floors that contain piping for the waste water treatment system. These trenches apparently drain to sumps.

At a location next to a cadmium pickle tank (pH 0.10), several waste water pipes extend below grade into concrete or compacted soil between the tank and a concrete slab. The soil or concrete around one of the pipes was eroded (or corroded) to form an opening around the exterior of the pipe. We observed running water draining into this void space surrounding the pipe.

There is one large sump near the east edge of the building. The sump measures approximately 30 by 40 feet and has a soil base at about 6 feet below floor grade. More than ten tanks are located within this sump, and most of these tanks are founded on narrow, soil-supported concrete foundations. We understand that one of the tanks extends down into the underlying soil. We visually examined the condition of soil in the base of this sump. It appeared to consist of reddish-brown silt or clay and was extensively cracked, indicating that it has been exposed to periods of wetting and drying. Walkways between tanks in this sump area consist of wood planking spaced to allow drainage between the planks.

Degreasing operations using chlorinated solvents take place in several parts of the facility. The largest degreasing tank is about 4 feet wide by 12 feet long and is about 8 feet deep. This tank extends 4 feet above grade and four feet below grade. The base of this tank cannot be inspected.

Most of the tanks in the facility are aligned along production lines so that metal parts being processed can be sequentially dipped. The space between tanks varies from several inches to several feet. Based upon our observations, we expect that it is not uncommon for some minor dripping to take place between the tanks as parts being processed are moved from tank to tank.

We did not observe any specific area for the storage of stock hazardous materials (such as strong acids or bases). It appeared that much of the stock materials are stored adjacent to their use areas.

SUBSURFACE CONDITIONS

We explored subsurface conditions outside the building by advancing one boring using hand-operated equipment and three borings using a truck-mounted drill rig with hollow-stem auger drilling equipment. The boring locations are shown on Figure 2. The boring advanced by hand (MW-1) extended to a depth of 11-1/2 feet. The other three borings extended to a depth of 14 feet. A ground water monitor well was constructed in each boring. The elevation of each well was determined relative to an assumed datum with an engineer's level. Construction details for the wells are given in Appendix A. We measured water levels in the wells at least five days after the wells were installed and developed.

Fill and soil conditions encountered in the borings were relatively uniform across the site. Subsoils at the boring locations were found to consist of 1 to 5 feet of gravel and silty sand fill overlying what we interpret to be fine to medium sand dredge fill. One of the borings, MW-1, encountered gray silt with fine sand at a depth of 10 feet below grade.

The water table at the site is present at a depth of about 6-1/2 to 8-1/2 feet below the ground surface. Ground water movement appears to be toward the northwest. The observed ground water gradient (slope of the water table) was not uniform across the site. This could be due to infiltration of liquids from within the building, or due to improved subsurface drainage around the underground utilities in South Dakota Street.

We obtained ground water samples for chemical analysis from each of the ground water monitor wells on March 23, 1989. Ground water sampling procedures are described in Appendix A. Ground water was analyzed for pH and electrical conductivity in the field at the time of sampling. Ground water from Wells MW-2 and MW-3 had a yellow color with a greenish tinge. The ground water samples were analyzed for cyanide, volatile organic compounds, and selected metals (arsenic, cadmium, total chromium, hexavalent chromium, copper, lead, nickel, and zinc). Water samples analyzed for metals were filtered to remove suspended sediment before the samples were tested. Analyses were performed using standard EPA methods. All analyses were performed by Analytical Technologies, Inc., a participant in the EPA's contract laboratory program.

The results of ground water analyses are summarized on Table 1. Analytical reports are included in Appendix B. Ground water from all of the wells showed evidence of significant contamination by hazardous materials routinely used at the site. The most serious contamination included chlorinated solvent contamination in Wells MW-1 and MW-3, chromium contamination in Wells MW-2 and MW-3, and cyanide contamination in Wells MW-1, MW-2 and MW-3.

Trichloroethene (TCE), the predominant chlorinated solvent found in the ground water, is slightly soluble in water, is more dense than water, and tends to readily partition into the vapor phase. TCE is relatively persistent in the subsurface environment and does not tend to degrade. TCE has a tendency to adsorb onto organic carbon in the subsurface environment. Because of its properties, TCE plumes sometimes "sink" in ground water, meaning that it may move downward through contaminated aquifers. Soil vapors with relatively high concentrations of TCE are likely present beneath the site and may also be migrating away from the site.

The distribution of chromium and cyanide within the shallow aquifer will be affected by the presence of fine-grained clay minerals in the soil and the presence of organic carbon. Chromium and cyanide are less likely to move to deeper parts of the aquifer.

An evaluation of the beneficial uses of ground water resources in the vicinity of the site was beyond the scope of services for this Phase 1 study. However, we believe that ground water withdrawal is not occurring in this area.

The investigation of potential soil contamination at this site was not addressed as part of this Phase 1 study.

CONCLUSIONS AND RECOMMENDATIONS

Testing of ground water beneath the site indicates the presence of significant contamination by chlorinated solvents, cyanide and metals. The spectrum of contaminants encountered in ground water correspond with those materials used at the site. Review of the interior of the building identified numerous actual and potential pathways for liquid contaminants to enter the subsurface environment.

Based on existing data and our past experience with other sites, it is our opinion that significant ground water contamination likely extends onto neighboring properties and the public right-of-way located northwest of this site. The degree and extent of such contamination cannot be determined by on-site studies.

Ground water contaminants may be behaving as discrete plumes due to the different properties of the contaminants. A TCE vapor plume is likely present beneath the site within soils above the water table, and this vapor plume may extend to off-site areas.

We recommend that three areas of action be pursued as a result of the findings of this Phase 1 study:

1. The ground water contamination encountered should be reported to the Northwest Regional Office of the Washington Department of Ecology pursuant to reporting requirements in WAC 173-303.
2. Action should be taken to prevent further releases of hazardous materials to the subsurface environment. Specific actions are discussed later in this report.
3. Additional studies should be undertaken to evaluate the location and degree of soil and ground water contamination on and off the site. These studies should be adequate to begin design of a

remediation plan. A general outline for further studies is presented later in this report.

Our walk-through survey of the interior of the building identified a number of areas where the potential for releases to the subsurface environment are possible. Immediate attention should be given to those locations where chromium, cyanide, and degreasing solvents may be released. We recommend that tanks containing these materials be inspected for leaks if possible and, where appropriate, relining or replacement of tanks may be warranted. Areas beneath tanks should be protected by a continuous concrete slab treated with a corrosion-proof coating.

Buried piping should be avoided since it cannot be inspected and is subject to building settlement stresses and corrosion. We recommend that piping be removed and placed in specially constructed trenches in those cases where piping is presently located beneath concrete slabs. All piping trenches should drain into sumps where accumulated fluids can be removed. Sumps should not be allowed to collect standing fluids. Each sump should be equipped with a pump so that accumulated fluids can be discharged to the waste water treatment system. Existing sumps and pipe trenches should be drained, cleaned and inspected for cracks and or joints where leakage may occur and for evidence of corrosion. They should then be relined as appropriate and treated with a corrosion-proof sealant. The waste water treatment system should also be inspected and upgraded as appropriate.

Measures should be taken to prevent the entry of fluids into the large, soil-bottomed sump. Presently, fluids may enter this sump in the form of floor wash down water and leaks, drips and spills associated with the tanks located over the sump. We recommend against the installation of a permanent lining in this sump at this time since excavation will likely be necessary to remove accumulated sediment.

Further studies should be designed to address both on-site and off-site contamination. On-site studies should include installation of soil borings and ground water monitor wells at selected locations within the building. Soil and ground water from these borings should be sampled for testing. Physical and chemical testing of soils should be designed to

(1) characterize the type and degree of contamination, (2) determine the designation of the soil so that it can be properly disposed of if excavated, and (3) characterize soil properties that may be pertinent to the design of remedial options. Ground water from beneath the site should be analyzed to evaluate the type and extent of contamination and to evaluate treatability and/or disposal options.

Additional ground water monitor wells should be installed outside the building to characterize the vertical distribution of contaminants. At least one well should be installed into a deeper aquifer downgradient of the site to determine if contamination extends beneath the shallow aquifer.

The extent of off-site ground water contamination should be evaluated by the installation of ground water monitor wells in public right-of-ways downgradient (northwest) of the site. Water from these wells should be tested for metals, cyanide and chlorinated solvents.

Beneficial uses of ground water in the vicinity of the site should be investigated. The depth and alignment of major buried utilities should also be explored in the area west and northwest of the site to evaluate whether a ground water plume and/or a vapor plume could be intercepted and redirected by porous backfill.

LIMITATIONS

We have prepared this Phase 1 report for use by Washington Industries, Inc. This report is not intended for use by others and the information contained herein may not be applicable to other sites.

This report is not intended to be a final report of site conditions. Additional investigation and cleanup activities are warranted at this site, as discussed in this report.

Environmental regulations are presently in a state of significant modification. Recommendations made herein are made with respect to current environmental regulation in Washington State.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in this area at the time this report was prepared. No other conditions, express or implied, should be understood.

- o 0 o -

We appreciate the opportunity to assist you with this project. Please call if you have any questions.

Yours very truly,

GeoEngineers, Inc.

Stephen C. Perrigo
Waste Management Specialist

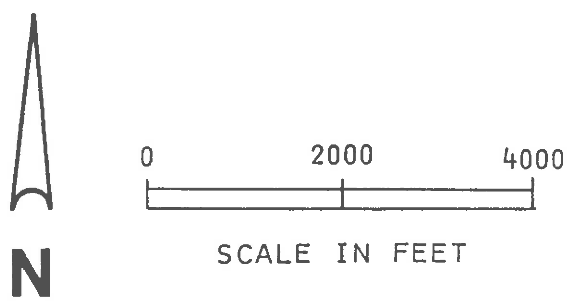
James A. Miller, P.E.
Principal

SCP:JAM:cs

TABLE 1
GROUND WATER ANALYSIS

Parameter	Units	MW-1 West	MW-2 North	MW-3 NW	MW-4 East
Field Parameters					
pH	pH units	6.8	6.6	6.4	6.6
electrical conductance	umhos	700.	2300.	1100.	700.
Metals					
arsenic	ppm	< 0.005	< 0.005	< 0.005	< 0.005
cadmium	ppm	0.17	0.16	0.07	0.005
chromium (total)	ppm	0.03	180.	30.	0.43
chromium (hexavalent)	ppm	< 0.025	110.	25.	0.30
copper	ppm	0.10	0.06	0.02	< 0.02
lead	ppm	< 0.005	< 0.005	< 0.005	< 0.005
nickel	ppm	0.09	0.09	2.4	< 0.03
zinc	ppm	0.13	0.06	0.08	< 0.01
Cyanide	ppb	2700.	520.	110.	30.
Volatile Organic Compounds *					
chloroform	ppb	3.5	0.4	2.0	< 0.2
1,1-dichloroethene	ppb	< 2.0	< 0.2	3.0	< 0.2
cis-1,2-dichloroethene	ppb	390.	7.6	2700.	< 0.2
trans-1,2-dichloroethene	ppb	4.1	0.5	11.	< 0.2
tetrachloroethene (PERC)	ppb	86.	0.5	130.	0.3
methylene chloride	ppb	< 10.	1.9	<1.0	< 1.0
1,1,1-trichloroethane	ppb	12.	0.5	8.2	1.0
1,1,2-trichloroethane	ppb	< 2.0	< 0.2	2.8	< 0.2
trichloroethene (TCE)	ppb	9500.	170.	8300.	94.
vinyl chloride	ppb	< 5.0	< 0.5	7.5	< 0.5

Notes:
"ppm" signifies "parts per million" (mg/l)
"ppb" signifies "parts per billion" (ug/l)
"<" signifies "less than"
* only VOCs detected are listed. See Appendix B for a complete list of analytes.
VOCs analyzed by EPA Methods 601/602



REFERENCE: USGS 7.5' TOPOGRAPHIC QUADRANGLE MAP "SEATTLE SOUTH, WASH."

GeoEngineers

VICINITY MAP

FIGURE 1

1531-01-4 SCP:KKT 5-4-89

GeoEngineers

APPENDIX A

APPENDIX A

FIELD EXPLORATIONS

The surface and subsurface soil and ground water conditions outside the building area at the site were explored by installing monitor wells in soil borings. Four monitor wells were installed at the locations shown in Figure 2. Monitor Well MW-1 was installed using hand operated drilling equipment on March 9, 1989. Monitor Wells MW-2, MW-3 and MW-4 were installed on March 18 using truck-mounted, hollow-stem auger drilling equipment owned and operated by R&R Drilling, Inc. The drilling equipment was cleaned with a hot-water pressure washer before each boring. Soil samplers were steam-cleaned before each sampling attempt.

A geologist from our staff determined the boring locations, examined and classified the soils encountered, and prepared a detailed log of each boring. Soils encountered were classified visually in accordance with ASTM D-2488-83, which is described in Figure A-1. An explanation of the boring log symbols is presented in Figure A-2. The boring logs are given in Figures A-3 through A-6.

Relatively undisturbed soil samples were obtained from Borings MW-2 through MW-4 using a Dames & Moore split-barrel sampler (2.4-inch ID). The sampler was driven 18 inches by a 300-pound weight falling a vertical distance of approximately 30 inches. The number of blows needed to advance the sampler the final 12 inches is indicated to the left of the corresponding sample notations on the boring logs.

MONITOR WELL CONSTRUCTION

Two-inch-diameter, Schedule 40 PVC pipe was installed in each boring at the completion of drilling. The lower portion of the PVC pipe is machine slotted (0.02-inch slot width) to allow entry of ground water into the well casings. Coarse sand or fine gravel was placed in the borehole annulus surrounding the slotted portion of the wells. The well casings are protected within flush-grade surface monuments. Monitor well construction is indicated in Figures A-3 through A-6.

The monitor well screens were developed by removing water from the wells with a stainless steel bailer. We determined the elevations of the well casings to the nearest 0.01 foot with an engineer's level on March 23, 1989. An elevation datum of 20.00 feet was assumed at the center of a catch basin located near the northwest corner of the building. Elevations referenced to this datum are included on the monitor well logs.

GROUND WATER ELEVATIONS

The depth to the ground water table relative to the monitor well casing rims was measured on March 23, 1989. The site measurements were made using a weighted fiberglass tape and water-finding paste. The tape was cleaned prior to use at each well with a trisodium phosphate wash and a distilled water rinse. Ground water elevations were calculated by subtracting the water table depth from the casing rim elevations. Water table positions measured on March 23, 1989 are shown on the monitor well logs and in Figure 2.

GROUND WATER SAMPLING PROGRAM

Ground water samples were collected from the monitor wells by GeoEngineers on March 23, 1988. The water samples were collected with a teflon bailer after at least two well volumes of water were removed from each well casing. The bailer was cleaned prior to each sampling attempt with a fresh water rinse, trisodium phosphate wash, and a distilled water rinse. Ground water was analyzed in the field for pH and electrical conductance.

The water samples obtained for analysis of dissolved metals were filtered through a membrane filter with a pore size of 45 microns and preserved with nitric acid. Ground water samples were transferred to appropriate containers provided by the analytical laboratory. Samples were kept cool during transport to the testing laboratory. Standard chain-of-custody methods were used in labeling and transporting the water samples to the laboratory.

CHEMICAL ANALYTICAL PROGRAM

Four ground water samples were analyzed by Analytical Technologies Inc. The water samples were analyzed for volatile organic compounds using EPA Methods 601 and 602, cyanide using EPA Method 335.3, and metals using EPA Methods as follows: arsenic (7060), cadmium (7130 and 7131), chromium (7190), hexavalent chromium (7196), copper (7210), lead (7421), nickel (7520), and zinc (7950). Analytical results are presented in Appendix B.

SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE GRAINED SOILS MORE THAN 50% RETAINED ON NO. 200 SIEVE	GRAVEL MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVEL	GW	WELL-GRADED GRAVEL, FINE TO COARSE GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVEL WITH FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SAND MORE THAN 50% OF COARSE FRACTION PASSES NO. 4 SIEVE	CLEAN SAND	SW	WELL-GRADED SAND, FINE TO COARSE SAND
			SP	POORLY-GRADED SAND
		SAND WITH FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE GRAINED SOILS MORE THAN 50% PASSES NO. 200 SIEVE	SILT AND CLAY LIQUID LIMIT LESS THAN 50	INORGANIC	ML	SILT
			CL	CLAY
		ORGANIC	OL	ORGANIC SILT, ORGANIC CLAY
	SILT AND CLAY LIQUID LIMIT 50 OR MORE	INORGANIC	MH	SILT OF HIGH PLASTICITY, ELASTIC SILT
			CH	CLAY OF HIGH PLASTICITY, FAT CLAY
		ORGANIC	OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			PT	PEAT

NOTES:

1. Field classification is based on visual examination of soil in general accordance with ASTM D2488-83.
2. Soil classification using laboratory tests is based on ASTM D2487-83.
3. Descriptions of soil density or consistency are based on interpretation of blowcount data, visual appearance of soils, and/or test data.

SOIL MOISTURE MODIFIERS:

Dry – Absence of moisture, dusty, dry to the touch

Moist – Damp, but no visible water

Wet – Visible free water or saturated, usually soil is obtained from below water table

GeoEngineers

SOIL CLASSIFICATION SYSTEM

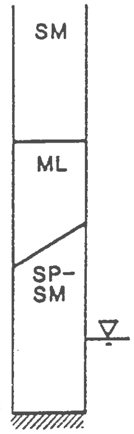
FIGURE A-1

GEI 85-88

LABORATORY TESTS:

AL	Atterberg limits
CP	Compaction
CS	Consolidation
DS	Direct shear
GS	Grain-size analysis
HA	Hydrometer analysis
K	Permeability
M	Moisture content
MD	Moisture and density
SP	Swelling pressure
TX	Triaxial compression
UC	Unconfined compression
CA	Chemical Analysis

SOIL GRAPH:



Soil Group Symbol (See Note 1)

Distinct contact between Soil Strata

Gradual Change between Soil Strata

Water Level

Bottom of Boring

BLOW-COUNT/SAMPLE DATA:

Blows required to drive Dames & Moore sampler 12 inches or other indicated distances using pound hammer falling inches.

"P" indicates sampler pushed with weight of hammer or hydraulics of drill rig.

22 ■ Location of relatively undisturbed sample

12 ⊠ Location of disturbed sample

P □ Location of sampling attempt with no recovery

10 ◪ Location of sample attempt using Standard Penetration Test procedures

40 ⬓ Location of relatively undisturbed sample using 140 pound hammer falling 30 inches.

NOTES:

1. Soil classification system is summarized in Figure A-1.

2. The reader must refer to the discussion in the report text as well as the exploration logs for a proper understanding of subsurface conditions.

GeoEngineers

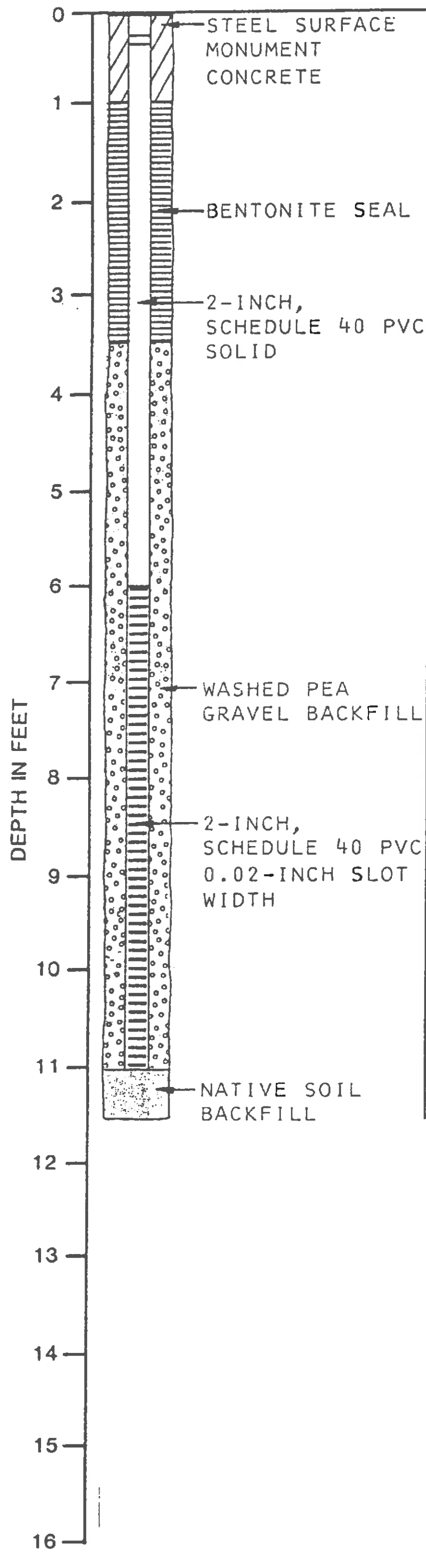
KEY TO BORING LOG SYMBOLS

FIGURE A-2

GEI 86-88

MONITOR WELL NO. MW-1

WELL SCHEMATIC
Casing Elevation: 19.77
Casing Stickup: -0.38



Vapor Conc.(ppm) / Sheen	Blow-Count	Samples	Group Symbol	DESCRIPTION Surface Elevation: 20.15 FEET
			GW	BROWN FINE TO COARSE GRAVEL WITH SAND AND A TRACE OF SILT, CONCRETE, BRICK RUBBLE AND METAL (MEDIUM DENSE, MOIST) (FILL)
			SM	GRAYISH-BROWN SILTY FINE TO MEDIUM SAND WITH BRICK, METAL, GLASS, PLASTIC, LENSES OF GRAVEL, AND CHARCOAL (LOOSE, MOIST) (FILL)
			SP-SM	BROWN FINE TO MEDIUM SAND WITH SILT (LOOSE, MOIST TO WET) (FILL)
				∇ WATER LEVEL AT 8.0 FEET ON 3/23/89
			ML	GRAY SILT WITH FINE SAND (MEDIUM STIFF, WET)

BORING COMPLETED AT 11.5 FEET ON 3/9/89

Note: See figure A-2 for explanation of symbols

GEI 108-101 1531-01-4 TTF:RK:KT 05/04/89

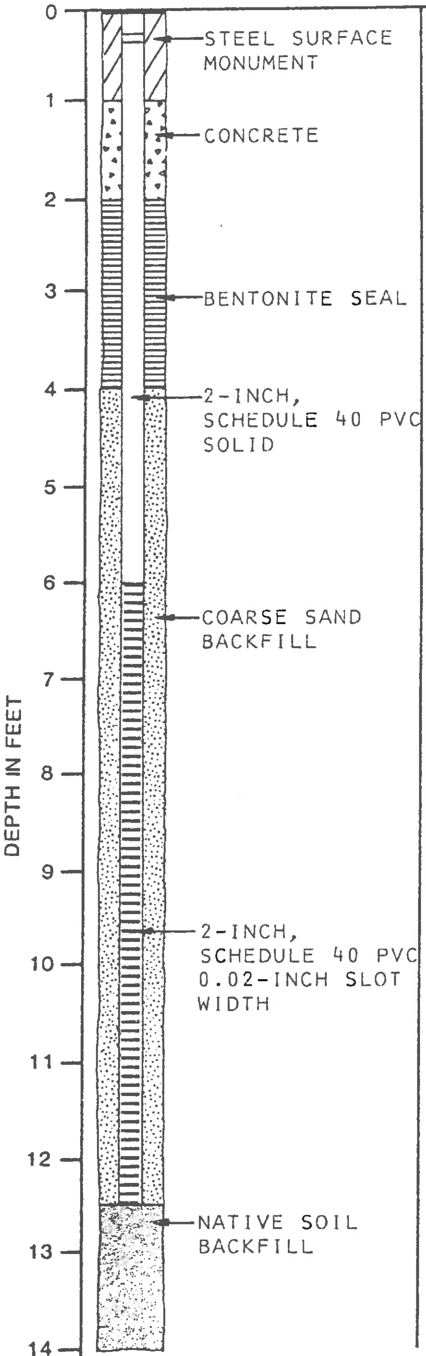
GeoEngineers

LOG OF MONITOR WELL

FIGURE A-3

MONITOR WELL NO. MW-2

WELL SCHEMATIC
Casing Elevation: 20.57
Casing Stickup: -0.35



Vapor Conc.(ppm) / Sheen	Blow-Count	Samples	Group Symbol	DESCRIPTION Surface Elevation: 20.92 FEET
			SM	DARK BROWN SILTY SAND WITH GRAVEL CHARCOAL, ORGANIC MATERIAL (LOOSE, MOIST) (FILL)
			SM	BROWN SILTY FINE TO MEDIUM SAND WITH GRAVEL, BRICK, FRAGMENTS OF ORGANIC MATERIAL (DENSE, MOIST) (FILL)
	45	⊠		
			SP-SM	DARK BROWN FINE TO MEDIUM SAND WITH SILT, OCCASIONAL GRAVEL, BRICK FRAGMENTS (LOOSE, MOIST TO WET) (FILL)
				▽ WATER LEVEL AT 6.8 FEET ON 3/23/89
	8	⊠		
			SM	GRAY SILTY VERY FINE SAND WITH OCCASIONAL BRICK, SHELLS (MEDIUM DENSE, WET) (FILL)
	12	⊠		

BORING COMPLETED AT 14.0 FEET ON 3/18/89

Note: See figure A-2 for explanation of symbols

GeoEngineers

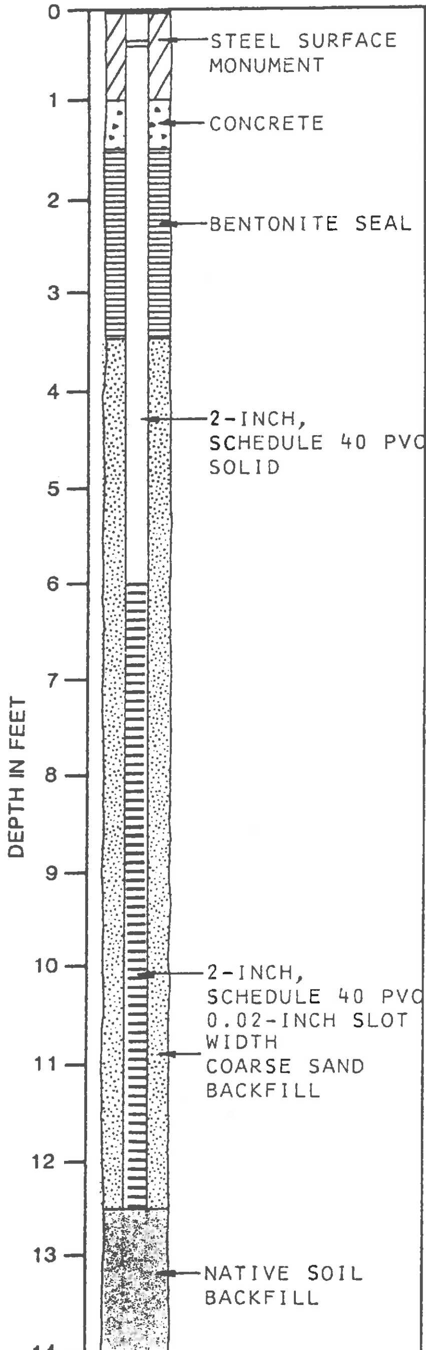
LOG OF MONITOR WELL

FIGURE A-4

GEI 108-101 1531-01-4 TTF:RK:KT 05/04/89

MONITOR WELL NO. MW-3

WELL SCHEMATIC
Casing Elevation: 19.95
Casing Stickup: -0.42



DESCRIPTION
Surface Elevation: 20.37 FEET

Depth (feet)	Vapor Conc.(ppm) / Sheen	Blow-Count	Samples	Group Symbol	Description
0				SP	LIGHT BROWN FINE TO MEDIUM SAND WITH GRAVEL (FILL)
1				SM	GRAY SILTY FINE SAND WITH BRICK FRAGMENTS (MEDIUM DENSE, MOIST) (FILL)
3		29	☒		
5				SP	BROWN FINE TO MEDIUM SAND WITH A TRACE OF SILT (DENSE, MOIST)
8		40	☒		
8.5					WATER LEVEL AT 8.5 FEET ON 3/23/89
13		5	☒		BECOMES LOOSE

BORING COMPLETED AT 14.0 FEET ON 3/18/89

Note: See figure A-2 for explanation of symbols

GEI 108-101

GeoEngineers

LOG OF MONITOR WELL

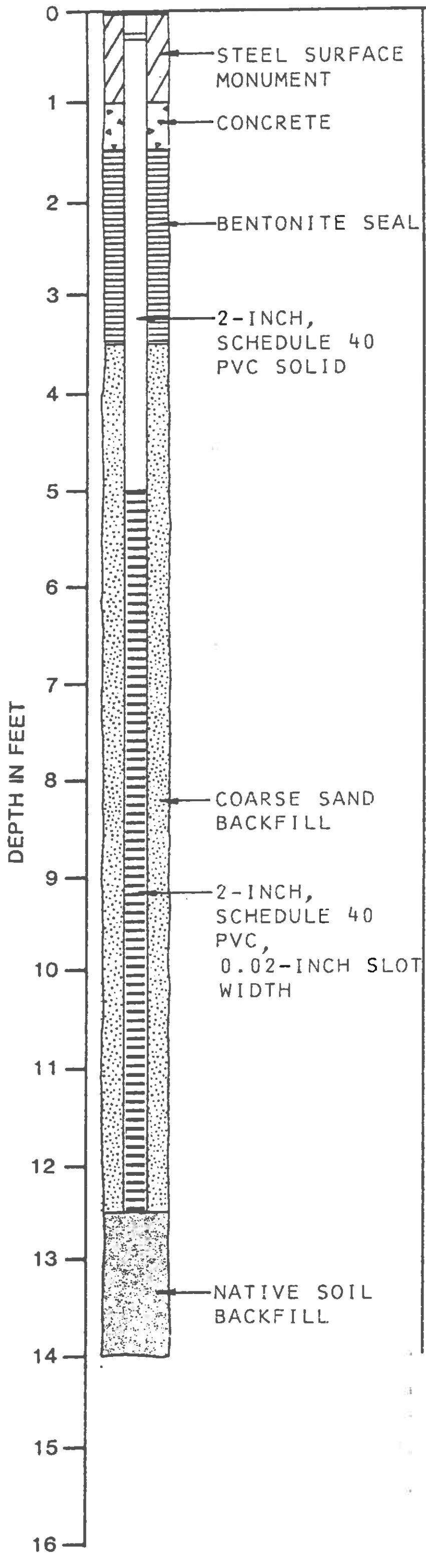
FIGURE A-5

NWP 0026

MONITOR WELL NO. MW-4

WELL SCHEMATIC
Casing Elevation: 21.68
Casing Stickup: -0.23

Surface Elevation: 21.91 FEET



Depth (feet)	Vapor Conc.(ppm) / Sheen	Blow-Count	Samples	Group Symbol	DESCRIPTION
0–1				SM	DARK BROWN SILTY FINE TO MEDIUM SAND WITH OCCASIONAL GRAVEL AND ORGANIC MATTER (LOOSE, MOIST) (FILL)
1–8.4				SP-SM	DARK BROWN FINE TO MEDIUM SAND WITH SILT AND A TRACE OF ORGANIC MATERIAL (MEDIUM DENSE, MOIST) (FILL)
3		12	☒		
7					WATER LEVEL AT 7.0 FEET ON 3/23/89
8		16	☒		
8.4–14				SP	DARK BROWN FINE TO COARSE SAND WITH A TRACE OF SILT AND ORGANIC MATERIAL (MEDIUM DENSE, MOIST TO WET)
13		47	☒		

BORING COMPLETED AT 14.0 FEET ON 3/18/89

Note: See figure A-2 for explanation of symbols

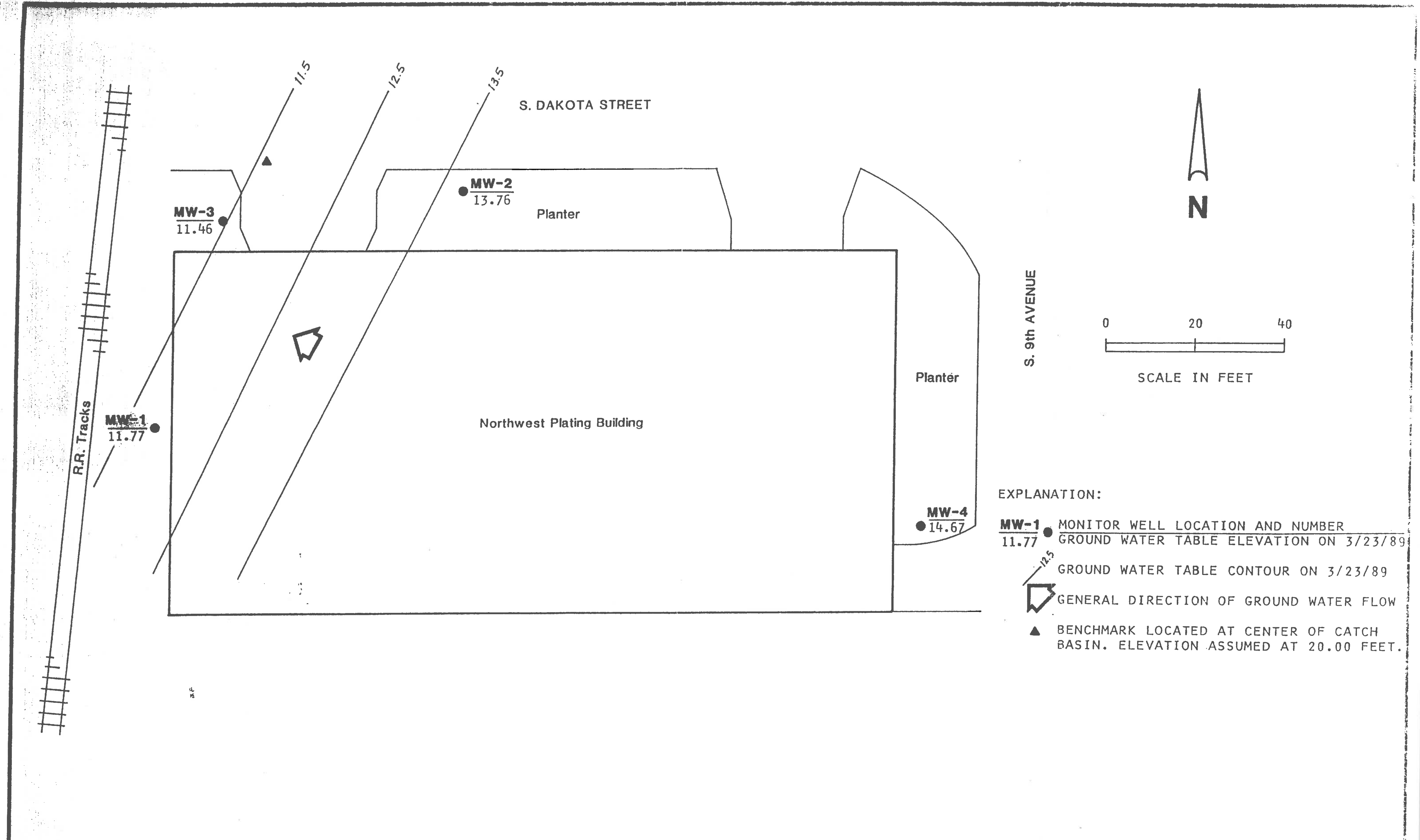
GeoEngineers

LOG OF MONITOR WELL

FIGURE A-6

NWP 0027

1531-01-4 TTF:KKT 3-28-89



GeoEngineers

SITE PLAN

FIGURE 2

GeoEngineers

APPENDIX B

Analytical Technologies, Inc. 560 Naches Avenue, S.W., Suite 101, Renton, WA 98055 (206) 228-8335

ATI I.D. # 8903-112

GeoEngineers

APR 14 1989

Routing SCP
File 1531-01-4

April 12, 1989

Geoengineers, Inc.
2405 140th Avenue N.E.
Suite 105
Bellevue, WA 98005

Attention : Steve Perrigo

Project Number : 1531-01-4

Project Name : Washington Industries

On March 23, 1989 Analytical Technologies, Inc. received four water samples for analyses. The samples were analyzed with EPA methodology or equivalent methods as specified in the attached analytical schedule. The results, sample cross reference, and the quality control data are enclosed.

Mary Silva
GC Chemist

Frederick W. Grothkopp
Technical Manager

FWG/nah

Analytical**Technologies**,Inc.

ATI I.D. # 8903-112

SAMPLE CROSS REFERENCE SHEET

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1531-01-4
PROJECT NAME : WASHINGTON INDUSTRIES

ATI #	CLIENT DESCRIPTION	MATRIX	DATE SAMPLED
8903-112-1	MW-2	WATER	03/23/89
8903-112-2	MW-4	WATER	03/23/89
8903-112-3	MW-3	WATER	03/23/89
8903-112-4	MW-1	WATER	03/23/89

----- TOTALS -----

MATRIX	# SAMPLES
WATER	4

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of this report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

ATI I.D. # 8903-112

ANALYTICAL SCHEDULE

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1531-01-4
PROJECT NAME : WASHINGTON INDUSTRIES

ANALYSIS	TECHNIQUE	REFERENCE/METHOD
PURGEABLE HALOCARBONS	GC/HALL	EPA 601
PURGEABLE AROMATICS	GC/PID	EPA 602
ARSENIC	AA/GF	EPA 7060
CADMIUM	AA/F	EPA 7130
CADMIUM	AA/GF	EPA 7131
CHROMIUM	AA/F	EPA 7190
COPPER	AA/F	EPA 7210
HEXAVALENT CHROMIUM	COLORIMETRIC	EPA 7196
LEAD	AA/GF	EPA 7421
NICKEL	AA/F	EPA 7520
ZINC	AA/F	EPA 7950

Analytical Technologies, Inc.

ATI I.D. # 8903-112

VOLATILE ORGANIC ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: N/A
PROJECT #	: 1531-01-4	DATE RECEIVED	: N/A
PROJECT NAME	: WASHINGTON INDUSTRIES	DATE EXTRACTED	: N/A
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 03/31/89
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 601/602	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	<0.5
BROMODICHLOROMETHANE	<0.2
BROMOFORM	<0.2
BROMOMETHANE	<0.5
CARBON TETRACHLORIDE	<0.2
CHLOROBENZENE	<0.5
CHLOROETHANE	<0.5
CHLOROFORM	<0.2
CHLOROMETHANE	<2.0
DIBROMOCHLOROMETHANE	<0.2
1,3-DICHLOROBENZENE	<0.5
1,2-DICHLOROBENZENE	<0.5
1,4-DICHLOROBENZENE	<0.5
1,1-DICHLOROETHANE	<0.2
1,2-DICHLOROETHANE	<0.2
1,1-DICHLOROETHENE	<0.2
CIS-1,2-DICHLOROETHENE	<0.2
TRANS-1,2-DICHLOROETHENE	<0.2
1,2-DICHLOROPROPANE	<0.2
CIS-1,3-DICHLOROPROPENE	<0.2
TRANS-1,3-DICHLOROPROPENE	<0.2
ETHYLBENZENE	<0.5
METHYLENE CHLORIDE	<1.0
1,1,2,2-TETRACHLOROETHANE	<0.2
TETRACHLOROETHENE	<0.2
TOLUENE	<0.5
1,1,1-TRICHLOROETHANE	<0.2
1,1,2-TRICHLOROETHANE	<0.2
TRICHLOROETHENE	<0.2
TRICHLOROFLUOROMETHANE	<0.5
VINYL CHLORIDE	<0.5
META & PARA XYLENE	<0.5
ORTHO XYLENE	<0.5

SURROGATE PERCENT RECOVERIES

BROMOCHLOROMETHANE	95
BROMOFLUOROBENZENE	95

NWP 0032

Analytical Technologies, Inc

ATI I.D. # 8903-112

VOLATILE ORGANIC ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: N/A
PROJECT #	: 1531-01-4	DATE RECEIVED	: N/A
PROJECT NAME	: WASHINGTON INDUSTRIES	DATE EXTRACTED	: N/A
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 04/04/89
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 601/602	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	<0.5
BROMODICHLOROMETHANE	<0.2
BROMOFORM	<0.2
BROMOMETHANE	<0.5
CARBON TETRACHLORIDE	<0.2
CHLOROBENZENE	<0.5
CHLOROETHANE	<0.5
CHLOROFORM	<0.2
CHLOROMETHANE	<2.0
DIBROMOCHLOROMETHANE	<0.2
1,3-DICHLOROBENZENE	<0.5
1,2-DICHLOROBENZENE	<0.5
1,4-DICHLOROBENZENE	<0.5
1,1-DICHLOROETHANE	<0.2
1,2-DICHLOROETHANE	<0.2
1,1-DICHLOROETHENE	<0.2
CIS-1,2-DICHLOROETHENE	<0.2
TRANS-1,2-DICHLOROETHENE	<0.2
1,2-DICHLOROPROPANE	<0.2
CIS-1,3-DICHLOROPROPENE	<0.2
TRANS-1,3-DICHLOROPROPENE	<0.2
ETHYLBENZENE	<0.5
METHYLENE CHLORIDE	<1.0
1,1,2,2-TETRACHLOROETHANE	<0.2
TETRACHLOROETHENE	<0.2
TOLUENE	<0.5
1,1,1-TRICHLOROETHANE	<0.2
1,1,2-TRICHLOROETHANE	<0.2
TRICHLOROETHENE	<0.2
TRICHLOROFLUOROMETHANE	<0.5
VINYL CHLORIDE	<0.5
META & PARA XYLENE	<0.5
ORTHO XYLENE	<0.5

SURROGATE PERCENT RECOVERIES

BROMOCHLOROMETHANE	89
BROMOFLUOROBENZENE	88

Analytical Technologies, Inc

ATI I.D. # 8903-112-1

VOLATILE ORGANIC ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 03/23/89
PROJECT #	: 1531-01-4	DATE RECEIVED	: 03/23/89
PROJECT NAME	: WASHINGTON INDUSTRIES	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-2	DATE ANALYZED	: 04/04/89
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 601/602	DILUTION FACTOR	: 1 & 10

COMPOUNDS	RESULTS
BENZENE	<0.5
BROMODICHLOROMETHANE	<0.2
BROMOFORM	<0.2
BROMOMETHANE	<0.5
CARBON TETRACHLORIDE	<0.2
CHLOROBENZENE	<0.5
CHLOROETHANE	<0.5
CHLOROFORM	0.4
CHLOROMETHANE	<2.0
DIBROMOCHLOROMETHANE	<0.2
1,3-DICHLOROBENZENE	<0.5
1,2-DICHLOROBENZENE	<0.5
1,4-DICHLOROBENZENE	<0.5
1,1-DICHLOROETHANE	<0.2
1,2-DICHLOROETHANE	<0.2
1,1-DICHLOROETHENE	<0.2
CIS-1,2-DICHLOROETHENE	7.6
TRANS-1,2-DICHLOROETHENE	0.5
1,2-DICHLOROPROPANE	<0.2
CIS-1,3-DICHLOROPROPENE	<0.2
TRANS-1,3-DICHLOROPROPENE	<0.2
ETHYLBENZENE	<0.5
METHYLENE CHLORIDE	1.9
1,1,2,2-TETRACHLOROETHANE	<0.2
TETRACHLOROETHENE	0.5
TOLUENE	<0.5
1,1,1-TRICHLOROETHANE	0.5
1,1,2-TRICHLOROETHANE	<0.2
TRICHLOROETHENE	170 *
TRICHLOROFLUOROMETHANE	<0.5
VINYL CHLORIDE	<0.5
META & PARA XYLENE	<0.5
ORTHO XYLENE	<0.5

SURROGATE PERCENT RECOVERIES

BROMOCHLOROMETHANE	94
BROMOFLUOROBENZENE	90

* Dilution factor = 10, analyzed on 3/31/89

ATI I.D. # 8903-112-2

VOLATILE ORGANIC ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 03/23/89
PROJECT #	: 1531-01-4	DATE RECEIVED	: 03/23/89
PROJECT NAME	: WASHINGTON INDUSTRIES	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-4	DATE ANALYZED	: 04/04/89
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 601/602	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	<0.5
BROMODICHLOROMETHANE	<0.2
BROMOFORM	<0.2
BROMOMETHANE	<0.5
CARBON TETRACHLORIDE	<0.2
CHLOROBENZENE	<0.5
CHLOROETHANE	<0.5
CHLOROFORM	<0.2
CHLOROMETHANE	<2.0
DIBROMOCHLOROMETHANE	<0.2
1,3-DICHLOROBENZENE	<0.5
1,2-DICHLOROBENZENE	<0.5
1,4-DICHLOROBENZENE	<0.5
1,1-DICHLOROETHANE	<0.2
1,2-DICHLOROETHANE	<0.2
1,1-DICHLOROETHENE	<0.2
CIS-1,2-DICHLOROETHENE	<0.2
TRANS-1,2-DICHLOROETHENE	<0.2
1,2-DICHLOROPROPANE	<0.2
CIS-1,3-DICHLOROPROPENE	<0.2
TRANS-1,3-DICHLOROPROPENE	<0.2
ETHYLBENZENE	<0.5
METHYLENE CHLORIDE	<1.0
1,1,2,2-TETRACHLOROETHANE	<0.2
TETRACHLOROETHENE	0.3
TOLUENE	<0.5
1,1,1-TRICHLOROETHANE	1.0
1,1,2-TRICHLOROETHANE	<0.2
TRICHLOROETHENE	94 *
TRICHLOROFLUOROMETHANE	<0.5
VINYL CHLORIDE	<0.5
META & PARA XYLENE	<0.5
ORTHO XYLENE	<0.5

SURROGATE PERCENT RECOVERIES

BROMOCHLOROMETHANE	93
BROMOFLUOROBENZENE	89

* Dilution factor = 10, analyzed on 03/31/89

AnalyticalTechnologies,Inc.

ATI I.D. # 8903-112-3

VOLATILE ORGANIC ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 03/23/89
PROJECT #	: 1531-01-4	DATE RECEIVED	: 03/23/89
PROJECT NAME	: WASHINGTON INDUSTRIES	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-3	DATE ANALYZED	: 04/04/89
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 601/602	DILUTION FACTOR	: 10 & 1000

COMPOUNDS	RESULTS
BENZENE	<5.0
BROMODICHLOROMETHANE	<2.0
BROMOFORM	<2.0
BROMOMETHANE	<5.0
CARBON TETRACHLORIDE	<2.0
CHLOROBENZENE	<5.0
CHLOROETHANE	<5.0
CHLOROFORM	2.0
CHLOROMETHANE	<20
DIBROMOCHLOROMETHANE	<2.0
1,3-DICHLOROBENZENE	<5.0
1,2-DICHLOROBENZENE	<5.0
1,4-DICHLOROBENZENE	<5.0
1,1-DICHLOROETHANE	<2.0
1,2-DICHLOROETHANE	<2.0
1,1-DICHLOROETHENE	3.0
CIS-1,2-DICHLOROETHENE	2700 *
TRANS-1,2-DICHLOROETHENE	11
1,2-DICHLOROPROPANE	<2.0
CIS-1,3-DICHLOROPROPENE	<2.0
TRANS-1,3-DICHLOROPROPENE	<2.0
ETHYLBENZENE	<5.0
METHYLENE CHLORIDE	<1.0
1,1,2,2-TETRACHLOROETHANE	<2.0
TETRACHLOROETHENE	130
TOLUENE	<5.0
1,1,1-TRICHLOROETHANE	8.2
1,1,2-TRICHLOROETHANE	2.8
TRICHLOROETHENE	8300 *
TRICHLOROFLUOROMETHANE	<5.0
VINYL CHLORIDE	7.5
META & PARA XYLENE	<5.0
ORTHO XYLENE	<5.0

SURROGATE PERCENT RECOVERIES

BROMOCHLOROMETHANE	96
BROMOFLUOROBENZENE	87

* Dilution factor = 1000, analyzed on 03/31/89

NWP 0036

Analytical Technologies, Inc

ATI I.D. # 8903-112-4

VOLATILE ORGANIC ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 03/23/89
PROJECT #	: 1531-01-4	DATE RECEIVED	: 03/23/89
PROJECT NAME	: WASHINGTON INDUSTRIES	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-1	DATE ANALYZED	: 04/04/89
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 601/602	DILUTION FACTOR	: 10 & 1000

COMPOUNDS	RESULTS
BENZENE	<5.0
BROMODICHLOROMETHANE	<2.0
BROMOFORM	<2.0
BROMOMETHANE	<5.0
CARBON TETRACHLORIDE	<2.0
CHLOROBENZENE	<5.0
CHLOROETHANE	<5.0
CHLOROFORM	3.5
CHLOROMETHANE	<20
DIBROMOCHLOROMETHANE	<2.0
1,3-DICHLOROBENZENE	<5.0
1,2-DICHLOROBENZENE	<5.0
1,4-DICHLOROBENZENE	<5.0
1,1-DICHLOROETHANE	<2.0
1,2-DICHLOROETHANE	<2.0
1,1-DICHLOROETHENE	<2.0
CIS-1,2-DICHLOROETHENE	390
TRANS-1,2-DICHLOROETHENE	4.1
1,2-DICHLOROPROPANE	<2.0
CIS-1,3-DICHLOROPROPENE	<2.0
TRANS-1,3-DICHLOROPROPENE	<2.0
ETHYLBENZENE	<5.0
METHYLENE CHLORIDE	<10
1,1,2,2-TETRACHLOROETHANE	<2.0
TETRACHLOROETHENE	86
TOLUENE	<5.0
1,1,1-TRICHLOROETHANE	12
1,1,2-TRICHLOROETHANE	<2.0
TRICHLOROETHENE	9500 *
TRICHLOROFLUOROMETHANE	<5.0
VINYL CHLORIDE	<5.0
META & PARA XYLENE	<5.0
ORTHO XYLENE	<5.0

SURROGATE PERCENT RECOVERIES

BROMOCHLOROMETHANE	113
BROMOFLUOROBENZENE	94

* Dilution factor = 10, analyzed on 03/31/89

ATI I.D. # 8903-112

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: N/A
PROJECT #	: 1531-01-4	DATE RECEIVED	: N/A
PROJECT NAME	: WASHINGTON INDUSTRIES	DATE EXTRACTED	: N/A
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 03/28/89
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 602	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
METHYL ETHYL KETONE	<10

SURROGATE PERCENT RECOVERIES

BROMOFLUOROBENZENE	105

ATI I.D. # 8903-112-1

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 03/23/89
PROJECT #	: 1531-01-4	DATE RECEIVED	: 03/23/89
PROJECT NAME	: WASHINGTON INDUSTRIES	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-2	DATE ANALYZED	: 03/28/89
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 602	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
METHYL ETHYL KETONE	<10

SURROGATE PERCENT RECOVERIES

BROMOFLUOROBENZENE	106

AnalyticalTechnologies,Inc.

ATI I.D. # 8903-112-2

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 03/23/89
PROJECT #	: 1531-01-4	DATE RECEIVED	: 03/23/89
PROJECT NAME	: WASHINGTON INDUSTRIES	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-4	DATE ANALYZED	: 03/28/89
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 602	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
METHYL ETHYL KETONE	<10

SURROGATE PERCENT RECOVERIES

BROMOFLUOROBENZENE	102

ATI I.D. # 8903-112-3

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 03/23/89
PROJECT #	: 1531-01-4	DATE RECEIVED	: 03/23/89
PROJECT NAME	: WASHINGTON INDUSTRIES	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-3	DATE ANALYZED	: 03/28/89
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 602	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
METHYL ETHYL KETONE	<10

SURROGATE PERCENT RECOVERIES

BROMOFLUOROBENZENE	101

ATI I.D. # 8903-112-4

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 03/23/89
PROJECT #	: 1531-01-4	DATE RECEIVED	: 03/23/89
PROJECT NAME	: WASHINGTON INDUSTRIES	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-1	DATE ANALYZED	: 03/28/89
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 602	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
METHYL ETHYL KETONE	<10

SURROGATE PERCENT RECOVERIES

BROMOFLUOROBENZENE	99

NWP 0042

ATI I.D. # 8903-112

VOLATILE ORGANIC
QUALITY CONTROL DATA

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1531-01-4
PROJECT NAME : WASHINGTON INDUSTRIES
EPA METHOD : 601/602

SAMPLE I.D. : 8903-112-1
DATE ANALYZED : 03/31/89
SAMPLE MATRIX : WATER
UNITS : ug/L

COMPONENT	SAMPLE RESULT	SPIKE ADDED	SPIKED SAMPLE	% REC	DUP SPIKED SAMPLE	DUP % REC	RPD
BENZENE	<0.5	12.0	11.8	98	11.8	98	0
CHLOROBENZENE	<0.5	12.0	11.6	97	11.5	96	1
1,1-DICHLOROETHENE	<0.2	4.00	3.76	94	3.64	91	3
TETRACHLOROETHENE	<0.2	4.00	3.84	96	3.82	96	1
TOLUENE	<0.5	12.0	12.0	100	12.0	100	0
TRICHLOROETHENE	2.1	4.00	6.55	111	6.41	108	2
META & PARA XYLENE	<0.5	21.9	21.4	98	21.6	99	1

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative \% Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc.

ATI I.D.# 8903-112

METALS RESULTS

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1531-01-4
PROJECT NAME : WASHINGTON INDUSTRIES

SAMPLE MATRIX : WATER
UNITS : mg/L

PARAMETER	-1	-2	-3	-4
ARSENIC	<0.005	<0.005	<0.005	<0.005
CADMIUM	0.16	0.0051	0.07	0.17
CHROMIUM	180	0.43	30	0.03
COPPER	0.06	<0.02	0.02	0.10
HEXAVALENT CHROMIUM	110	0.30	25	<0.025
LEAD	<0.005	<0.005	<0.005	<0.005
NICKEL	0.09	<0.03	2.4	0.09
ZINC	0.06	<0.01	0.08	0.13

AnalyticalTechnologies,Inc.

ATI I.D. # 8903-112

METALS QUALITY CONTROL

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1531-01-4
PROJECT NAME : WASHINGTON INDUSTRIES

SAMPLE MATRIX : WATER

UNITS : mg/L

PARAMETER	ATI I.D.	SAMPLE RESULT	DUP RESULT	RPD	SPIKED SAMPLE	SPIKE CONC	% REC
ARSENIC	8903-101-5	<0.005	<0.005	0	0.041	0.050	82
ARSENIC	8903-142-3	<0.005	<0.005	0	0.040	0.050	80
CADMIUM	8903-112-4	0.17	0.17	0	0.66	0.50	98
CADMIUM	8903-112-2	0.0009	0.0008	12	0.0029	0.0020	100
CHROMIUM	8903-112-4	0.03	0.03	0	1.95	2.00	96
CHROMIUM	8903-142-3	<0.02	<0.02	0	1.72	2.00	86
COPPER	8903-112-4	0.10	0.10	0	1.06	1.00	96
HEXAVALENT CHROMIUM	8903-112-4	<0.025	<0.025	0	0.44	0.50	88
LEAD	8903-112-4	<0.005	<0.005	0	0.057	0.050	114
NICKEL	8903-112-5	0.06	0.07	15	4.74	5.00	94
ZINC	8903-116-5	0.17	0.17	0	0.65	0.50	96

NWP 0045

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative \% Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc.

ATI I.D. # 8903-112

GENERAL CHEMISTRY RESULTS

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1531-01-4
PROJECT NAME : WASHINGTON INDUSTRIES

SAMPLE MATRIX : WATER

PARAMETER	UNITS	-1	-2	-3	-4
CYANIDE, TOTAL	mg/L	0.52	0.03	0.11	2.7

ATI I.D. # 8903-112

GENERAL CHEMISTRY QUALITY CONTROL

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1531-01-4
PROJECT NAME : WASHINGTON INDUSTRIES

SAMPLE MATRIX : WATER

PARAMETER	UNITS	ATI I.D.	SAMPLE RESULT	DUP RESULT	RPD	SPIKED CONC	SPIKE ADDED	% REC
CYANIDE, TOTAL	mg/L	90332601	<0.01	<0.01	0	0.52	0.50	104

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative \% Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

AnalyticalTechnologies,Inc.
San Diego ● Phoenix ● Seattle

Chain of Custody

DATE 3/23/89 PAGE 1 OF 1

PROJ. MGR. Steve Perrigo
COMPANY GeoEngineers Inc.
ADDRESS 2405 140th Ave NE
Bellevue, WA 98005

SAMPLERS (SIGNATURE) Terry Fisk (PHONE NO.) 746-5200

ANALYSIS REQUEST

SAMPLE ID.	DATE	TIME	MATRIX	LAB ID.	BASE/NEU/ACID CMPDS. GC/MS/ 625/8270	VOLATILE CMPDS. GC/MS/ 624/8240	PESTICIDES/PCB 608/8080	POLYNUCLEAR AROMATIC 610/8310	PHENOLS, SUB PHENOLS 604/8040	HALOGENATED VOLATILES 601/8010	AROMATIC VOLATILES 602/8020	TOTAL ORGANIC CARBON 415/9060	TOTAL ORGANIC HALIDES 9020	PETROLEUM HYDROCARBONS 418	Cr+6	Cyanide
MW-2	3/23	11:30	H_2O	-1						X	X				X	X
MW-4	3/23	13:00	H_2O	-2						X	X				X	X
MW-3	3/23	14:30	H_2O	-3						X	X				X	X
MW-1 *	3/23		H_2O	-4						X	X				X	X

SAMPLE ID.	PRIORITY POLLUTANT METALS (13)	CAM METALS (18) TTLC/STLC	EP TOX METALS (8)	SWDA-INORGANICS PRIMARY/SECONDARY	HAZARDOUS WASTE PROFILE	* Metals			NUMBER OF CONTAINERS
MW-2						X			5
MW-4						X			5
MW-3						X			5
MW-1 *						X			5

* Please filter MW-1 sample for dissolved metals, unable to field filter this sample.

PROJECT INFORMATION
PROJECT: Washington Industries
PO NO. 1531-01-4
SHIPPING ID. NO.
VIA: In Person

SAMPLE RECEIPT

TOTAL NO. OF CONTAINERS	20
CHAIN OF CUSTODY SEALS	Y
REC'D GOOD CONDITION/COLD	Y
CONFORMS TO RECORD	Y
LAB NO.	8903-112

RELINQUISHED BY 1.
(Signature) Terry Fisk (Time) 16:21
(Printed Name) Terry Fisk (Date) 3/23/89
(Company) Geo Engineers

RELINQUISHED BY 2.
(Signature) (Time)
(Printed Name) (Date)
(Company)

RELINQUISHED BY 3.
(Signature) (Time)
(Printed Name) (Date)
(Company)

RECEIVED BY 1.
(Signature) (Time)
(Printed Name) (Date)
(Company)

RECEIVED BY 2.
(Signature) (Time)
(Printed Name) (Date)
(Company)

RECEIVED BY (LABORATORY) 3.
(Signature) Frederick W. Grothkopp (Time) 1621
(Printed Name) FREDERICK W GROTHKOPP (Date) 3/23/89
ANALYTICAL TECHNOLOGIES, INC.

SPECIAL INSTRUCTIONS/COMMENTS:
*Metals: Arsenic, Cadmium, Chromium, Copper, Lead, Nickel, Zinc
Please Include MEK with 602 anal.

NWP 0048

B - 20