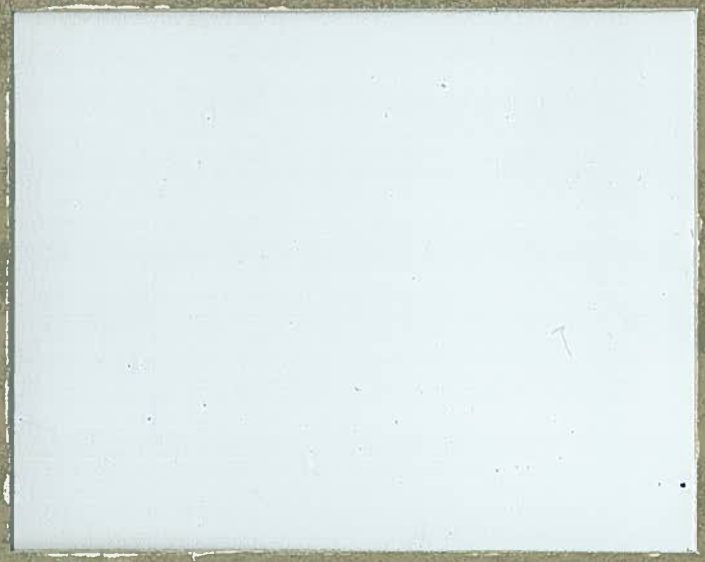
Consulting Geotechnical
Engineers and Geologists

GeoEngineers



REPORT OF GEOTECHNICAL SERVICES
SUBSURFACE CONTAMINATION STUDY
AND REMEDIAL ACTION MONITORING
CIRCLE K FACILITY 1461
SEATTLE, WASHINGTON

3/6/90

GeoEngineers

March 6, 1990

Consulting Geotechnical
Engineers and Geologists

The Circle K Corporation
P.O. Box 52084
Phoenix, Arizona 85072

Attention: Mr. Robert F. Staab

We are submitting two copies of our geotechnical report regarding subsurface contamination and remedial action monitoring at the site of Circle K Facility No. 1461 in Seattle, Washington. The Circle K Corporation requested that GeoEngineers provide geotechnical consulting services in response to a gasoline leak from an underground storage tank at the subject site. The general scope of our services is described in our confirming agreement dated September 1, 1989. Our services were authorized by Mr. Robert F. Staab of the Circle K Corporation on September 5, 1989.

We appreciate the opportunity to be of service to the Circle K Corporation. Please call if you have any questions regarding this report.

Yours very truly,

GeoEngineers, Inc.

James A. Miller
Principal

OKP:JAM:cs

cc: √Mr. Joseph Hickey
Washington Dept. of Ecology
Northwest Regional Office
4350 - 150th Ave. NE
Redmond, WA 98052-5301

File No. 1780-001-B04

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

GeoEngineers

TABLE OF CONTENTS

Geo Engineers

List of Tables

List of Figures

APPENDIX A

List of Appendix A Figures

GeoEngineers

APPENDICES

GeoEngineers

REPORT OF GEOTECHNICAL SERVICES
SUBSURFACE CONTAMINATION STUDY
AND REMEDIAL ACTION MONITORING
CIRCLE K FACILITY 1461
SEATTLE, WASHINGTON

INTRODUCTION

The results of our subsurface contamination study and remediation activities at Circle K Facility No. 1461 are presented in this report. Facility No. 1461 consists of a convenience store which also markets leaded and unleaded gasoline. The store is located at 2350 - 24th Avenue East in Seattle, Washington. The site location relative to surrounding physical features is shown in Figure 1. A generalized site plan of the facility is presented as Figure 2.

On August 7, 1989, a leak was discovered in one of the site's underground gasoline storage tanks (Figure 2). A review of the inventory records for this 4,000-gallon tank indicated that approximately 4,000 to 6,000 gallons of gasoline were released between June 22, 1989 and August 7, 1989. The product remaining in the leaking tank was removed and the Washington State Department of Ecology (Ecology) was notified of the release on August 7, 1989.

Fuel vapors were observed in a restroom located in the basement of the Museum of History and Industry subsequent to the discovery of the leak in the underground fuel tank. The Museum is located approximately 2000 feet north of the Circle K site as shown in Figure 1. Seattle Engineering Department personnel responsible for wastewater discharge performed a qualitative investigation of potential sources for the fuel vapors. According to the Seattle Engineering Department, the vapors appeared to originate from the sanitary sewer system.

Fuel odors were observed at several locations in the sanitary sewer lines upgradient of the Museum of History and Industry. The vapors appeared to be concentrated in areas of the sewer lines associated with construction activities along Lake Washington Boulevard (Figure 1). Because the area upgradient of the Museum is almost exclusively residential, the nearest potential source of the fuel vapors observed in the sanitary sewer system was believed to be the Circle K facility. As shown in Figure 2, the leaky

underground fuel tank at the Circle K facility was located within 40 feet of the main sanitary sewer line beneath East McGraw Street. Several reports of fuel odors in the general vicinity of the Circle K site suggested that the underground storage tank leak had potentially affected off-site locations.

This report presents results from the assessment of subsurface contamination at the site and the initial phase of soil and ground water remediation.

PURPOSE AND SCOPE

The purposes of our geotechnical services were to (1) explore and evaluate subsurface conditions, (2) develop recommendations for remedial actions, (3) coordinate and observe remedial construction activities, and (4) monitor the effectiveness of the initial remedial measures at the site. The general scope of services provided by GeoEngineers during this investigation is listed below.

1. Research potential pathways for the migration of fuel and/or gasoline vapors from the site to the sanitary sewer system.
2. Explore and evaluate subsurface contamination at the site through several phases of exploratory drilling and monitor well installations.
3. Monitor the excavation and removal of six underground storage tanks (USTs).
4. Design and monitor the installation of a free (floating) product recovery and ground water treatment system.
5. Design and monitor the installation of a soil vapor extraction system (VES).
6. Interface with regulatory agencies, contractors, and neighboring residents during all phases of this investigation.
7. Evaluate the field and laboratory data with regard to existing regulatory concerns.

A description of the specific scope of services completed during each phase of this investigation is included in subsequent sections of the report.

SITE CONDITIONS

GENERAL

Circle K Facility No. 1461 is located southeast of the intersection between 24th Avenue East and East McGraw Street, approximately 1800 feet south of Lake Washington. The area surrounding the site consists mainly of residential houses and buildings, with some small commercial businesses located west of the site along 24th Avenue East. The regional topography in the vicinity of the site slopes downward toward the north and northeast. The ground surface elevation at the site is approximately 70 feet above mean sea level.

The general layout of Circle K Facility No. 1461 is shown in Figure 2. At the start of our site assessment activities, facilities on the property included the store building, a fuel pump service island, four underground fuel storage tanks, one underground waste oil tank, and one underground heating oil tank. The four underground fuel tanks were used for the storage of regular and unleaded gasoline. The underground waste oil and heating oil tanks were not being used at the time of our site assessment.

As shown in Figure 2, several underground sewer lines are located beneath the north part of the site. All of these lines drain north toward the main sanitary sewer line located beneath the center of East McGraw Street. The sanitary sewer line on East McGraw Street is located at a depth of approximately 12 feet below the surface of the street. The upgradient terminus of this sewer line is located immediately west of the manhole in front of the store. The sewer line slopes downward toward the east. The two catch basins located on the Circle K property drain surface water runoff into the sanitary sewer system.

The specific scope of services completed for the subsurface contamination assessment of the site is listed below.

1. Drill sixteen exploration borings located both on-site and off-site using hollow-stem auger equipment.
2. Obtain soil samples at five-foot intervals in each boring, and field screen each sample for evidence of fuel hydrocarbon contamination using visual, headspace vapor, and water sheen techniques.

3. Analyze selected soil samples from each boring for benzene, ethylbenzene, toluene, and xylenes (BETX) using EPA Method 8020, and for fuel hydrocarbons using modified EPA Method 8015.
4. Install ground water monitor wells in the exploration borings.
5. Determine the monitor well casing elevations to an accuracy of 0.01 feet using an assumed site datum.
6. Measure the ground water table elevations in the monitor wells and sample each well for the presence of free (floating) fuel hydrocarbons.
7. Measure the air space in each well casing for combustible hydrocarbon vapors using a Bacharach TLV Sniffer.
8. Obtain ground water samples from the monitor wells for laboratory analysis of BETX compounds using EPA Method 602, and total petroleum hydrocarbons (TPH) using EPA Method 418.1.
9. Measure the free (floating) product recovery rates in three of the monitor wells following bailer drawdown tests.
10. Evaluate the field and laboratory data with regard to existing regulatory concerns and the feasibility of various soil and ground water remediation options.

SUBSURFACE SOIL CONDITIONS

Subsurface soil conditions beneath and adjacent to the Circle K site were explored by drilling sixteen hollow-stem auger borings at the locations indicated in Figure 3. The borings were drilled and sampled to depths ranging from 19.0 to 31.0 feet below ground surface. Details of the field exploration program and boring logs are presented in Appendix A. The exploration borings were drilled in September, October, and December 1989 during three separate phases of the site assessment.

Layers of sandy silt and silty fine sand were encountered beneath the surface layers of asphaltic concrete, concrete, and fill material. The individual layers of sandy silt and silty sand vary in thickness over short distances, and are often laterally discontinuous. Occasional gravel and cobbles were encountered in some of the silt and sand layers. A very dense to hard layer consisting of fine-grained glacial sediments was encountered at depths greater than approximately 14 feet in most of the borings.

GROUND WATER CONDITIONS

Ground water conditions in the vicinity of the site were explored by installing monitor wells in the sixteen borings. Construction details for the monitor wells are included with the boring logs in Appendix A. The depth to ground water in each well was measured periodically throughout the duration of this study. A summary of ground water elevations measured in the monitor wells between September 1989 and late December 1989 is presented in Table 1.

The ground water table in the site vicinity ranges from approximately 10 to 12 feet below the ground surface. Ground water elevations measured on October 9 and December 28, 1989 were used to construct the ground water contour maps presented as Figures 4 and 5, respectively. The ground water elevations measured in MW-5 and MW-12 (not shown in Figures 4 or 5) are consistent with the ground water contours shown in Figures 4 and 5. Based on our ground water monitoring data, shallow ground water in the vicinity of the site flows toward the northeast at a gradient of approximately 125 feet/mile (.024 ft/ft). Ground water elevations in individual wells fluctuated during this study in response to (1) seasonal precipitation, (2) nearby open excavations affecting local recharge or discharge of ground water, (3) the thickness of free product on the water table, and (4) operation of the fuel recovery system.

SUBSURFACE CONTAMINATION

Potential subsurface contamination at the site was evaluated by field observations, collecting and analyzing soil and ground water samples, measuring the concentration of hydrocarbon vapors in the monitor wells, and measuring the thickness of free product in the monitor wells. The subsurface contamination data resulting from our investigation of site conditions are summarized in Tables 2, 3, 4 and 5. Laboratory data sheets and chain-of-custody records for the soil samples collected from the borings are included in Appendix B. Appendix C contains laboratory data sheets and chain-of-custody records for the ground water samples collected from the monitor wells.

The field screening methods used to detect the potential presence of petroleum hydrocarbons in soil samples collected from the borings included

visual examination, headspace vapor measurements, and sheen testing. A description of the field screening techniques used during this investigation are included in Appendix A. Field screening results for soil samples collected from the monitor well borings are noted in the boring logs (Appendix A).

Fuel hydrocarbon odors were detected during the drilling of MW-2, MW-3, MW-4, MW-6, MW-8, MW-9, MW-10, MW-13, and MW-15. Headspace vapor measurements were made in the field on soil samples using a Bacharach TLV Sniffer. The highest headspace vapor concentrations were detected in samples collected from MW-2, MW-3, MW-4, MW-6, MW-8, MW-9, MW-13 and MW-15. Headspace vapor concentrations ranged up to greater than 10,000 ppm (91 percent LEL) in the soil samples collected from these eight monitor wells.

Based on field screening results, selected soil samples were analyzed for the presence of BETX and fuel hydrocarbons. As shown in Table 2, BETX and fuel hydrocarbons were not detected in most of the soil samples. Relatively low concentrations of BETX were detected in the soil samples obtained from MW-3, MW-7, MW-13, MW-15 and MW-16. The highest concentration of fuel hydrocarbons was 1200 ppm, detected in the soil sample collected from MW-4 at a depth of 8.5 feet. This sample also contained the highest concentrations of ethylbenzene (27,000 ppb), toluene (27,000 ppb) and xylenes (159,000 ppb). Well MW-4 is located immediately downgradient from the leaky underground fuel tank, and the depth of this soil sample corresponds laterally to the approximate depth of the tank bottom.

The concentrations of combustible hydrocarbon vapors in the well casings were measured with a Bacharach TLV Sniffer on December 28, 1989. Table 3 presents the results of the vapor measurements. Hydrocarbon vapors were detected at concentrations greater than 10,000 ppm (91 percent LEL) in MW-2, MW-3, MW-4, MW-6, MW-8, MW-9, MW-13 and MW-15. Hydrocarbon vapor concentrations of 480 and 1600 ppm were detected in MW-7 and MW-16, respectively. The concentrations of hydrocarbons vapors in the remaining wells were less than 400 ppm, which is typical of "background" conditions for measurements in monitor well casings with a Bacharach TLV Sniffer.

Free (floating) product was detected in MW-2, MW-3, MW-4, MW-8 and MW-9. Table 4 presents free product thickness data collected from

September 1989 through December 1989. Contour maps of the apparent thickness of free product as measured in the wells casings on October 9 and December 28, 1989 are presented as Figures 6 and 7. Based on our measurements, free product appears to have flowed in a northwest direction away from the leaky underground tank. As shown in Table 4, Wells MW-8 and MW-9, located northwest of the leaky underground tank, contained a significant thickness of free product. Between October 9 and December 8, 1989 the thickness of free product in Well MW-8 increased from 0.11 feet to 9.50 feet, while the thickness of free product in Well MW-9 decreased from 4.63 feet to 0.50 feet. On December 28, 1989 the thickness of free product in MW-8 was 0.37 feet and in MW-9 was 0.27 feet. Maximum product thickness measured on October 9, 1989 was 5.90 feet in Well MW-4. Maximum product thickness measured on December 28, 1989 was 0.55 feet in MW-4.

Water/product bail-down tests were performed on Wells MW-2, MW-3 and MW-4 in September 1989. The ground water depth and free product thickness were measured in each well over a period of six days after removing all of the free product present in the well. Results from this test indicated relatively low product thickness recovery rates (0.14-0.65 feet/day).

Ground water samples collected from the monitor wells were analyzed for the presence of BETX by EPA Method 602. Ground water samples collected from MW-1 and MW-5 were also analyzed for the presence of TPH by EPA Method 418.1. A summary of the water quality results is presented in Table 5.

Water samples collected from wells which contained free product were not analyzed because of potential mixing of free product with the water. However, very high concentrations of BETX can be assumed for shallow ground water in the vicinity of wells containing free product.

The water samples collected from MW-6, MW-13, and MW-15 contained the highest concentrations of BETX. These three wells are located near the edge of the free product plume. Samples collected from the other monitor wells contained relatively low or undetected concentrations of BETX. Total petroleum hydrocarbons (TPH) were not detected in the ground water samples obtained from MW-1 and MW-5.

SITE REMEDIATION ACTIVITIES

GENERAL

Based on the results of our initial phase of site assessment activities, we recommended that the Circle K Corporation secure the site and begin immediate cleanup actions. Implementation of these recommendations resulted in concurrent site assessment and remediation activities.

A remedial action plan was developed prior to the removal of the underground storage tanks. The plan included an outline of proposed field activities, and preliminary specifications and design for the VES, water treatment and product recovery systems. The plan was submitted to all appropriate agencies with an interest in the tank removal and remediation activities at the site, and was approved by the Washington State Department of Ecology (Ecology) prior to starting site remediation activities.

GeoEngineers coordinated and monitored remediation activities concerning fuel-contaminated soil and ground water at the site. The Circle K Corporation contracted Chemical Processors, Inc., Environmental Services Division (ChemPro) for the excavation, construction, and equipment installation activities associated with site remediation. Remediation activities included the removal of six USTs, excavation of contaminated soil, and installation of ground water and soil remediation systems. Excavation of the underground storage tanks began on October 11, 1989, and installation of the recovery and treatment systems was completed on December 5, 1989.

Our specific scope of services completed for remediation of contaminated ground water and soil beneath the site is listed below.

1. Develop a remedial action plan for contaminated soil and ground water beneath the site.
2. Obtain permits as required by the appropriate regulatory agencies for construction and operation activities associated with the installation of the soil and ground water treatment systems.
3. Monitor the excavation and removal of two 4000-gallon and two 6000-gallon steel underground gasoline storage tanks.
4. Monitor the excavation and removal of one 500-gallon steel underground waste oil tank and one 500-gallon steel underground heating oil tank.

5. Monitor the excavation of approximately 900 cubic yards of contaminated soil adjacent to the USTs. Use field screening techniques to detect the potential presence of petroleum-related contaminants in the excavations.
6. Analyze soil samples from the waste oil and heating oil tank excavations for the presence of total petroleum hydrocarbons (TPH) using EPA Method 418.1. Chemical analyses of selected soil samples were used to document clean conditions at the limits of the excavations.
7. Analyze soil samples from the gasoline tank excavation and the recovery trench excavations for the presence of fuel hydrocarbons using modified EPA Method 8015, and BETX using EPA Method 8020. Chemical analyses of selected soil samples were used to evaluate the types and concentrations of fuel-related contaminants remaining at the limits of the excavations.
8. Obtain composite samples from the contaminated soil stockpiles for chemical analyses as required by landfill operators, using EPA Methods 418.1 (TPH), 8010 (halogenated volatile organic compounds), 8020 (BETX), 8080 (polychlorinated biphenyl compounds), 1010 (flash point), and EP Toxicity - 7000 Series (metals). Assist ChemPro in coordinating the disposal of the contaminated soil stockpiles.
9. Assist ChemPro in locating and exposing sewer lines located near the excavations which may have allowed free product to enter the sanitary sewer system. Monitor the relocation or abandonment of the lateral sewer and catch basin discharge lines.
10. Design and monitor the installation of the free product recovery and ground water treatment system.
11. Design and monitor the installation of the soil vapor extraction system (VES).
12. Monitor the backfilling and paving of the excavations.
13. Test the operation of the free product, ground water, and soil vapor recovery and treatment systems.

TANK REMOVAL AND EXCAVATION OF CONTAMINATED SOIL

Installation of an effective subsurface remediation system required the removal of the four underground fuel storage tanks. During our site assessment fieldwork, a waste oil tank and heating oil tank were discovered at the site (Figure 2). These two tanks were not being used as part of facility operations, and were likely installed and maintained by the service station which formerly occupied the site.

The limits of the excavations for removal of underground tanks at the Circle K site are shown in Figure 8. Tables 6 and 7 summarize the chemical data resulting from the laboratory analyses of soil samples collected from the excavations. A summary of the analytical data for samples collected from the soil stockpiles is presented in Table 8. Laboratory data sheets and chain-of-custody records for the soil samples collected from the excavations and stockpiles are included in Appendix D.

The waste oil and heating oil tanks contained significant quantities of residual product prior to removal. ChemPro removed the residual products from the USTs. All of the USTs were excavated, removed and transported off-site by ChemPro.

Approximately 900 cubic yards of contaminated soil were removed from the excavations and placed in covered stockpiles for temporary storage at the Circle K site. The stockpiles were segregated according to the type and relative concentrations of contaminants observed during the excavation of the soil. All of the contaminated soil was transported off-site for disposal at the Olympic View Sanitary Landfill, located in Kitsap County, Washington.

One of the objectives of the remedial activities was to excavate and expose the lateral sanitary and stormwater sewer lines located beneath the north part of the property. These sewer lines drain into the main sanitary sewer line beneath East McGraw Street. Because fuel vapors previously had been detected in the sanitary sewer lines in the vicinity of the site, we examined the lateral sewer lines located in the area of the free product plume for evidence of leakage of free product into the sewer system.

During the excavation of the underground fuel tanks and the recovery trenches, several abandoned sewer and drain lines were encountered which were previously not known to exist. These abandoned lines were encountered

at depths ranging from 3 to 6 feet below existing grade along the northern property line, which is shallower than the bottom of the leaky tank. The locations of sewer and catch basin drain lines known to exist beneath the site are shown in Figure 2. All of the sewer lines which were not being used to drain existing structures or catch basins were completely removed or abandoned in place by grouting the ends of the pipes.

Waste Oil and Heating Oil Tanks: The underground waste oil and heating oil tanks were excavated and removed on October 11, 1989. Table 6 presents a summary of the laboratory data resulting from the chemical analyses of soil samples collected from the limits of the tank excavations.

Visual examination of the waste oil and heating oil tanks after excavation and removal revealed some surface pitting of the exterior tank walls, but no perforations. Field screening of soil samples indicated the presence of petroleum-related contaminants in the soil surrounding each of the tanks. Soil which appeared to be contaminated with petroleum hydrocarbons was removed from each of the tank excavations prior to collecting soil samples for laboratory analysis.

Less than 10 cubic yards of contaminated soil were removed from the heating oil tank excavation after removing the tank. Petroleum-related contamination appeared to be confined to the soil immediately surrounding this UST.

Approximately 80 cubic yards of contaminated soil were removed from the waste oil tank excavation. Most of the soil contamination was encountered below the base of the waste oil tank and along the east wall of the tank excavation. Excavation of contaminated soil extended to a maximum depth of approximately 11 feet below ground surface.

As shown in Table 6, all of the soil samples collected from the limits of the waste oil and heating oil tank excavations contained TPH concentrations of less than 200 parts per million (ppm), which is currently used by Ecology as a soil cleanup guideline for evaluating contamination at underground tank sites.

Gasoline Storage Tanks: The four underground gasoline storage tanks were excavated and removed on October 16, 1989. Free product was visible at the bottom of the excavation after removing each of the tanks. Except

for the leaky tank, perforations, pitting and excessive corrosion were not observed on any of the gasoline tanks after they were removed from the excavation.

An area of apparent minor corrosion was observed at the base of the leaky tank immediately after removal of the tank from the excavation. Approximately one-half hour after the leaky tank was excavated and removed, a one-inch diameter perforation was visible in the corroded area on the tank bottom, and some residual product was observed leaking from this perforation.

Additional Soil Excavation near Former Gasoline Tanks: Additional areas of contaminated and uncontaminated soil were excavated within and adjacent to the gasoline tank excavation to assist with the remediation of contaminated soil and ground water. These soil excavations were designed to assist with the recovery of (1) free product on the water table, (2) contaminated ground water, and (3) fuel-related soil vapors. The locations and approximate limits of the soil excavations are shown in Figure 8.

After removing the four underground gasoline tanks from the site, contaminated soil was excavated from the tank excavation to a depth of approximately 14 to 16 feet below existing grade. The recovery well excavation, located along the north wall of the tank excavation, extended to a depth of about 21.5 feet below existing grade. Three ground water/free product recovery trenches were excavated to depths ranging from 12 to 14 feet below existing grade along the north wall of the tank excavation (Figure 8). Approximately 80 to 100 gallons of free product were recovered from the open excavations. The recovered free product was transported off-site by ChemPro.

Eight soil samples were collected from the walls of the gasoline tank and recovery trench excavations at the locations indicated in Figure 8. These samples were collected and analyzed to determine the concentrations of fuel-related contaminants present at the limits of excavation. A summary of the analytical results for these samples is presented in Table 7. Each soil sample was analyzed for fuel hydrocarbons by modified EPA Method 8015, and for BETX by EPA Method 8020.

All of the samples collected from the walls of the tank excavation, except for EW-1, contained high concentrations of BETX and fuel

hydrocarbons. The three samples collected near the distal ends of the recovery trenches (Sample Nos. WT-1, MT-1 and ET-3) contained relatively low concentrations of BETX and fuel hydrocarbons. However, field screening of soil samples collected during excavation of the west and middle recovery trenches indicated extensive fuel-related contamination. The soil encountered during the excavation of the east recovery trench did not appear to contain high concentrations of fuel hydrocarbons based on field screening techniques.

Sampling and Disposal of the Soil Stockpiles: All of the soil removed from the various excavations was stored temporarily in covered stockpiles at the site. Several composite soil samples were collected from the stockpiles for laboratory analysis to characterize the soil for landfill disposal. A summary of the laboratory results for these composite samples is presented in Table 8.

Sample No. WO-11 was collected from a stockpile of soil removed from the waste oil tank excavation and which appeared to be slightly contaminated by petroleum hydrocarbons. This soil required excavation and removal to provide access to soil containing higher concentrations of petroleum contaminants. As shown in Table 8, Sample No. WO-11 contained a TPH concentration of 108 ppm, which is less than the Ecology guideline of 200 ppm (TPH) for soil requiring remediation at underground tank sites. This soil stockpile was used to backfill part of the waste oil tank excavation.

Sample No. C-1 was collected from the stockpile composed of gasoline-contaminated soil removed from the gasoline tank and recovery trench excavations. This soil contained high concentrations of BETX, TPH and gasoline (Table 8). Sample No. C-2, collected from the stockpile composed of contaminated soil excavated from the heating oil and waste oil tank excavations, contained a high TPH concentration (488 ppm). Both of these stockpiles were removed from the site and transported to the Olympic View Sanitary Landfill between October 21 and November 8, 1989.

INSTALLATION OF GROUND WATER AND SOIL REMEDIATION SYSTEMS

Free Product Recovery and Ground Water Treatment System: The ground water and free product remediation system is designed to recover subsurface

free product and contaminated ground water, and to treat the fuel-contaminated ground water. The system installed at the site consists of (1) a recovery well and a series of recovery trenches, (2) a dual pumping system for recovering free product and contaminated ground water, and (3) an aboveground ground water treatment system using a series of activated carbon filters. Construction details for the recovery well are shown in Figure 9. Figures 10 and 11 present a plan view and schematic diagram of the ground water treatment and free product recovery system.

A 30-inch-diameter steel recovery well was installed on the north edge of the gasoline tank excavation. The recovery well excavation extended to a maximum depth of approximately 21.5 feet below existing grade. The base of the well screen is located at a depth of 19.5 feet. The depth of the well and the surrounding filter pack should allow for a significant cone of depression when the ground water table is at the seasonal minimum elevation.

Because the native subsurface soils consist of sandy silt and silty sand which have relatively low hydraulic conductivity (permeability), the three recovery trenches were excavated toward the free product plume located north of the fuel tank excavation. The three recovery trenches and the fuel tank excavation were backfilled with pea gravel.

The dual pumping system installed in the recovery well consists of an ORS Filter Scavenger pump system, a water table depression pump, and a water level probe. The Filter Scavenger is designed to recover free product floating on the surface of the ground water in the well when the thickness of free product is greater than 1/4 inch. The water table depression pump is used to form a cone of depression on the water table around the recovery well, which increases the flow rate of free product and contaminated ground water to the recovery well. All of the piping and electrical wiring required to operate this system were installed below existing grade as shown in Figure 11. A utility trench was excavated to a depth of approximately 2 feet below ground surface to route the remediation system piping to the east side of the Circle K building, where the water treatment system and free product storage container are located (Figure 10).

Free product recovered from the well is pumped into the 55-gallon product storage drum, which contains an overfill probe and shut-off switch. This switch will automatically shut the Filter Scavenger pump off if the

drum accumulates more than 50 gallons of product. The 55-gallon product storage drum was placed in an 80-gallon "overpack" drum to provide secondary containment should the automatic shut-off switch fail.

As shown in Figure 11, ground water recovered from the well is pumped through a particulate filter and then through two 55-gallon Calgon activated carbon filters in series. After exiting the second carbon filter, the treated water passes through a flow meter and is discharged directly into a lateral sanitary sewer line located at the northeast corner of the store building (Figure 10). The maximum flow rate through the carbon filters for effective filtration of fuel-related contaminants is 10 gallons per minute (gpm). Three sampling ports were installed in the piping adjacent to the carbon filters for the collection of water quality samples at the locations shown in Figure 11.

Soil Vapor Extraction System: The vapor extraction system (VES) was designed to recover and treat fuel vapors from subsurface soil located in the unsaturated zone. A permit was obtained from the Puget Sound Air Pollution Control Agency (PSAPCA) prior to completing the VES installation. The VES consists of subsurface horizontal slotted PVC pipe, a 1-HP electric exhaust blower, and two activated carbon filters in series.

As shown in Figure 12, the soil excavations for the free product and ground water recovery system were also used to install the VES. Slotted PVC pipe was installed as vapor recovery lines at depths ranging from 4 to 5 feet below existing grade. The relatively shallow installation depth was used because of the potential for high seasonal water table elevations at the site. Figure 13 presents a schematic section of the VES.

The vapor recovery pipes are connected to a blower fan designed to extract the soil vapors at a maximum flow rate of 98 cubic feet per minute (cfm). Because fine-grained native soils are located beneath the site, we anticipate flow rates will range between 30 and 50 cfm when the VES is operating. Vapors extracted from the subsurface soils by the vacuum blower will flow through a condensate trap, a particulate filter, and a series of two aboveground 55-gallon Calgon activated carbon filters (Figure 13). After passing through the carbon filters, the treated vapors will be released to

the atmosphere at the emissions stack. The two carbon filters are designed to remove the fuel vapors from the emissions in accordance with PSAPCA guidelines.

Four sampling ports were installed in the VES piping at the locations indicated in Figure 13. The sampling ports will be used to monitor the concentrations of hydrocarbon vapors as the vapors flow through this treatment system.

Because fuel vapors previously had been observed in the sanitary sewer lines, an additional set of vapor recovery lines, consisting of solid PVC pipe, were connected to two of the lateral sewer lines at the locations indicated in Figure 12. Although presently not connected to the VES, these recovery lines will provide an option to extract fuel vapors directly from the sanitary sewer system if high fuel vapor concentrations are detected in the sanitary sewer line at a later date.

BACKFILLING OF REMEDIAL EXCAVATIONS

Pea gravel was used to backfill the fuel tank and recovery trench excavations to a depth of approximately 2 feet below existing grade. As shown in Figure 13, a layer of crushed rock was placed on top of the pea gravel backfill to support the asphalt concrete pavement.

The waste oil and heating oil tank excavations were backfilled with a combination of clean excavated soil and imported sand and gravel fill material. A thin layer of crushed rock aggregate base was placed on top of the fill material.

All of the excavations were paved with asphaltic concrete. The ground surface overlying the former excavations was tested for air leaks with the VES operating. No significant air leaks were observed through the surface of the asphalt or in the vicinity of the recovery well vault.

MONITORING OF REMEDIATION SYSTEMS

Continuous operation of the ground water treatment and free product recovery system began on December 6, 1989. The VES was tested on December 6, 1989, but will not be operated until most of the free product has been recovered from the vicinity of the gasoline tank excavation.

ChemPro is responsible for maintenance of the remediation equipment, transport and off-site disposal of free product recovered at the site, and periodic replacement of the activated carbon filters.

This report includes results from the initial monitoring of the remediation systems between December 6, 1989 through January 5, 1990. The specific scope of services completed by GeoEngineers during this phase of remediation monitoring is listed below.

1. Monitor the operation of the free product recovery and ground water treatment system, and coordinate the maintenance of the system with ChemPro personnel.
2. Measure ground water elevations and free product thicknesses in the monitor wells.
3. Monitor the thickness of free product and the depth of the ground water in the recovery well, and the amount of free product recovered by the well.
4. Collect water samples from the sampling ports on the water treatment system, and analyze the samples for BETX using EPA Method 602.
5. Collect the first round of monthly water samples from the water treatment discharge to fulfill the requirements outlined in the Authorization for Discharge obtained from the Municipality of Metropolitan Seattle (Metro). Analyze the samples for pH and the presence of fats/oil/grease (EPA Method 413.2), cyanide (EPA Method 9010), and nine selected metals (EPA Method 7000 series).
6. Monitor the discharge from the water treatment system for combustible vapors, and calculate the volume and rate of total discharge to the sanitary sewer system as required by the Metro Authorization for Discharge.
7. Submit the first round of monthly water quality results for the water treatment system to Metro.
8. Test the operation of the soil vapor extraction system (VES), and collect some preliminary measurements of the vapor concentrations from the VES sampling ports.
9. Evaluate the effectiveness of the free product recovery and ground water treatment system.

10. Develop a schedule of activities for ongoing monitoring of the remediation systems with regard to regulatory concerns.

Ground water elevations and free product thickness measurements were obtained while monitoring the remediation systems, and are included in Tables 1 and 5. Ground water contours based on measurements obtained on December 28, 1989 are shown in Figure 5. Figure 7 is a contour map of the thickness of free product measured in the wells on December 28, 1989. These measurements were obtained approximately three weeks after starting ground water pumping.

The ground water depression pump began continuous operation on December 6, 1989, and maintains the ground water level in the recovery well at a depth of approximately 15.5 feet below ground surface. The average rate of ground water recovery decreased from a maximum of 6 to 9 gallons per minute (gpm) during the first few days of operation, to a rate of 0.5 to 0.7 gpm from December 15, 1989 to January 5, 1990. This decrease in the average recovery rate represents the dewatering of the soil excavations filled with porous pea gravel, and the development of a stable cone of depression. As shown in Figure 5, the recovery well appears to be drawing shallow ground water from the vicinity of all wells in which free product has been detected. The radius of influence for the water depression pump may also include Wells MW-14, MW-15 and MW-16.

As shown in Figure 7, the thickness of free product measured in the monitor wells decreased to less than 1 foot in each well after the remediation system began operation. The recovery rate of free product from the recovery well decreased from approximately 38 gallons per day (gpd) during the first week of pumping and recovery, to an average of 3 gpd since December 20, 1989.

Water samples were collected from the sampling ports on the water treatment system on December 11, 18 and 28, 1989. Tables 9 and 10 summarize the analytical results obtained from sampling the ground water treatment system. Laboratory data sheets and chain-of-custody records for the samples collected from the treatment system are included in Appendix E.

Two rounds of water samples were collected for BETX from the three sampling ports on December 11 and 28, 1989. These two rounds of samples were obtained to verify the removal of BETX from the contaminated ground

water as it flows through the two carbon filters. Elevated concentrations of benzene (16,000 to 36,000 ppb) were detected in the samples collected from the water flowing from the first carbon filter into the second carbon filter (Sampling Port No. 2). The results from these two rounds of sampling indicated that the first carbon filter was saturated with benzene. This spent carbon filter was replaced on January 5, 1990.

The discharge from the water treatment system was monitored and sampled in accordance with the requirements outlined in the Metro Authorization for Discharge. A sample of the treated discharge water was collected from Sampling Port No. 3 on December 18, 1989. Results from the chemical analysis of this sample are summarized in Table 10. The analytical results indicate undetected or trace concentrations of the compounds which were tested. The pH of the discharge water is typical of clean ground water, and combustible vapors were not detected at the point of discharge to the lateral sewer pipe. The results of our first episode of monthly sampling and monitoring of the ground water treatment system were submitted to Metro on January 16, 1990.

The VES was tested after completing installation of the remediation equipment. The exhaust blower fan was operated for approximately 30 minutes on December 6, 1989. The average vacuum pressure in the VES was approximately 15 inches of water, which corresponds to an average flow rate of approximately 80 cubic feet per minute (cfm) for the blower fan. A Bacharach TLV Sniffer was used to measure the hydrocarbon vapor concentrations in the VES. Measurements at Sampling Port No. 1, located upstream of the carbon filters, indicated a hydrocarbon vapor concentration of 8,500 ppm. The concentrations of hydrocarbon vapors in Sampling Port Nos. 2 and 3 were 160 ppm and 140 ppm, respectively.

DISCUSSION OF RESULTS

ASSESSMENT OF SUBSURFACE CONTAMINATION

Free product was detected on the ground water table in five of the monitor wells installed during our subsurface contamination study. Ground water is located at a depth of approximately 10 to 12 feet beneath the site, and the direction of ground water flow is toward the northeast. Free product thickness measurements suggest that the free product appears to have

flowed initially in a direction transverse to the direction of shallow ground water flow in the vicinity of the site. The location of the free product plume northwest of the leaky tank is probably related to discontinuous layers of permeable sediments within the ground water table zone, which provided a preferential pathway for the migration of free product. The variations in the free product thicknesses measured in MW-8 and MW-9 during our site assessment activities may indicate a gradual shift in the flow of the free product plume from a northwest direction to a northeast direction, coincident with the direction of ground water flow. The lateral extent of the free product plume was defined based on free product thickness measurements, and appears to be confined to a relatively small area north of the leaky underground fuel tank.

Fuel-contaminated ground water was encountered in the monitor wells located immediately outside of the edge of the free product plume. Data resulting from the chemical analyses of water quality samples collected from MW-6, MW-13, and MW-15 indicate benzene concentrations ranging from 250 to 13,000 ppb. These concentrations exceed Ecology's current ground water cleanup guideline of 66 ppb benzene at underground storage tank sites. The current drinking water quality standard for benzene is 5 ppb.

Measurements of hydrocarbon vapors in the monitor well casings indicate high concentrations of vapors in the wells located in the vicinity of the free product plume. However, based on vapor measurements in the remaining wells, the subsurface hydrocarbon vapors in the soil have not migrated far from the free product plume. Subsurface hydrocarbon vapors are not regulated by a cleanup standard.

Subsurface gasoline-related soil contamination appears to limited to the vicinity of the former underground gasoline storage tanks. Samples collected from the north, south, and west walls of the gasoline tank excavation contained concentrations of fuel hydrocarbons and/or BETX which exceed current Ecology cleanup guidelines for soil contamination at underground storage tank sites. The current Ecology cleanup guidelines are 200 ppm for TPH or fuel hydrocarbons, and 660 ppb for benzene.

High concentrations of fuel hydrocarbons and BETX were detected in the soil sample collected at a depth of 8.5 feet in MW-4, located north of the

leaky UST. This sample exceeded the Ecology cleanup guideline of 200 ppm TPH. Soil samples collected for chemical analyses from the other monitor well borings did not contain fuel-related contaminants in concentrations exceeding Ecology's guidelines. However, soil with high concentrations of gasoline and benzene can be expected in the water table zone throughout the limits of the free product (Figure 7).

Laboratory analysis of fuel hydrocarbons (modified EPA Method 8015) indicate the presence of elevated concentrations of diesel fuel in several of the soil samples collected from the limits of the gasoline tank and recovery trench excavations (Table 7). The presence of diesel fuel contamination is not consistent with the gasoline leak that is considered the principal source of subsurface contamination at the site. The compound identified as diesel fuel may be a degradation product from the free gasoline product dissolving the tar coating observed around some of the underground fuel tanks. The presence of diesel fuel in these soil samples could also be the result of leakage from one or more of the site's former USTs, which may have stored diesel fuel.

Soil samples obtained from the limits of the heating oil and waste oil tank excavations indicate that soil remaining in these areas does not contain TPH concentrations greater than the Ecology cleanup guideline of 200 ppm.

A few sections of the lateral and main sanitary sewer lines are located at a depth corresponding to the limits and depth of the free product plume, and free product may have directly entered the sewer system prior to site remediation activities. Although fuel vapors were detected by the Seattle Engineering Department in the sanitary sewer system downstream of the site in August 1989, no evidence of the direct transport of free product from the site into the sanitary sewer system was observed during our subsurface studies. However, fuel vapors originating from the site also could be migrating from the soil into the sewer system through damaged sections of the sewer lines.

Repairs were made on some of the lateral sewer and drain lines located in the vicinity of the gasoline tank excavation to eliminate potential pathways for future migration of free product and vapor into the sanitary

sewer system. We anticipate that the operation of the free product recovery system and the soil VES will further reduce the potential for migration of subsurface fuel vapors into the sewer system.

REMEDIATION OF CONTAMINATED SOIL AND GROUND WATER

Based on the results of our initial site remedial action monitoring, the free product recovery and ground water treatment system is operating within the design specifications. Our monitoring indicates that the remediation system is effective in recovering free product and contaminated ground water from the entire limits of the free product plume. Ground water elevations measured in the monitor wells confirm the presence of a stable cone of depression encompassing the estimated lateral extent of the free product plume.

Approximately 280 gallons of free product were recovered from the ground water table between December 6, 1989 and January 5, 1990. The rate of free product pumped from the recovery well has decreased from approximately 38 gallons per day (gpd) during the first week of active pumping and recovery, to an average of 3 gpd after December 20, 1989. This decrease in product recovery probably reflects dewatering of the excavation backfill and transition to recovering ground water and free product from the surrounding native soils. We anticipate an average gasoline recovery rate of 2 to 3 gpd during the next few months of site remediation.

Sampling of the ground water treatment system indicates effective treatment of contaminated ground water containing high concentrations of BETX. Approximately 46,500 gallons of contaminated ground water were treated successfully and discharged to the sanitary sewer system in accordance with the standards set by the Metro Authorization for Discharge.

The results of our initial testing of the soil VES indicate that the system is effective in removing and treating hydrocarbon vapors from the subsurface. Preliminary measurements indicate that the VES carbon filters reduced the concentrations of hydrocarbons from approximately 8,500 ppm to less than 200 ppm. The low concentration of hydrocarbons in the treated soil vapors meets PSAPCA emissions standards.

The high concentration of hydrocarbon vapors entering the carbon filters probably represents the stripping of volatile compounds from the

backfill of the gasoline tank and recovery trench excavations. Continued operation of the VES at similar untreated hydrocarbon vapor concentrations will result in very short operating lives for the carbon filters. Hydrocarbon vapor concentrations removed by the VES are likely to be less when the average rate of free product recovery decreases to less than 1 gpd.

The installation of a separate set of vapor recovery lines connected to the sewer lines will allow direct remediation of fuel vapors present in the sewer system if high fuel vapor concentrations are detected in the sanitary sewer lines at a later date. If necessary, a separate aboveground VES will be installed to remove and treat fuel vapors which may be present in the sewer system. However, the recovery of sewer vapors is not anticipated because the combination of the existing soil VES and free product recovery system is expected to prevent the entry of significant concentrations of subsurface fuel vapors into the sanitary sewer system.

CONCLUSIONS

Based on the results of our subsurface contamination study at Circle K Facility No. 1463, on-site and off-site ground water and soil contamination have resulted from a leak in one of the site's underground fuel storage tanks. Although fuel odors were detected in the sanitary sewer lines downgradient from the leaky tank, we observed no evidence of free product or fuel vapors flowing directly into the sanitary sewer system during site assessment and remediation activities.

The lateral extent of the free product plume was defined and appears to be confined to a relatively small area north of the leaky underground fuel tank. Fuel-contaminated ground water and high concentrations of hydrocarbon vapors were encountered in the monitor wells located immediately outside of the edge of the free product plume.

All of the existing underground storage tanks were excavated and removed from the site. Contaminated soil removed from the tank excavations and the recovery trenches was transported off-site for landfill disposal. Soil samples collected during remediation activities indicate high concentrations of BETX in the soil surrounding the former underground

gasoline tanks, and in the soil in the vicinity of the free product plume. The most extensive soil contamination appears to be located north and west of the gasoline tank excavation.

A free product recovery and ground water treatment system was installed and operated during this phase of site remediation. Our initial monitoring of the remediation systems indicate effective recovery of free product and contaminated ground water. Approximately 280 gallons of free product were recovered from the ground water table during this phase of site remediation. Laboratory data indicate effective treatment of approximately 46,500 gallons of contaminated ground water. A soil vapor extraction system was installed, successfully tested, and is ready for continuous operation after the rate of free product recovery decreases.

The remedial action plan implemented to recover free product and treat contaminated soil and ground water is progressing successfully. Results from our initial monitoring of the site remediation systems indicate a positive effect on containing and reducing subsurface contamination in the area. We anticipate that the combined operation of the free product recovery system and the soil VES will minimize the potential for the discharge of subsurface fuel vapors into the sewer system.

RECOMMENDATIONS

Continued operation and monitoring of the free product recovery and ground water treatment system is recommended. The ground water elevation, free product thickness, and concentration of hydrocarbon vapors should be measured monthly in each of the fourteen existing monitor wells. Water quality samples should be collected from the wells located near the edge of the free product plume, and the samples should be analyzed for the presence of BETX. The monitor wells should be sampled semi-annually in March and September, corresponding to the maximum and minimum seasonal water levels in the wells.

Monthly sampling and monitoring of the treated water discharged into the sanitary sewer system is required by the Metro Authorization for Discharge. Monthly reports containing results from the sampling and analyses outlined in the Authorization for Discharge are required by Metro. Additional samples should be collected from the three water sampling ports

on a routine basis and analyzed for BETX to verify the effectiveness of the treatment system and to evaluate whether the filters need replacement.

We anticipate longer time intervals between carbon filter replacements due to the decrease in the pumping rate of contaminated ground water flowing through the treatment system. Alternative ground water treatments systems will be evaluated if the carbon filtration system consumes excessive quantities of activated carbon.

We recommend that the VES not be operated until the average rate of free product recovery decreases to less than 1 gpd. After the VES begins continuous operation, we recommend monitoring the vapor concentrations using the installed sampling ports and a Bacharach TLV Sniffer. Monitoring of the treated and untreated soil vapors is required for compliance with the PSAPCA Permit, and for verification of effective trapping of vapors in each of the carbon filters. Periodic collection of air samples from the sampling ports for BETX analysis (EPA Method 8020) is also recommended. Vacuum pressure and hydrocarbon vapor concentration should be measured monthly in selected monitor wells once the VES is operating.

Relatively high rates of carbon consumption may occur during operation of the VES. Optional methods for treatment of the recovered vapors should be evaluated if carbon replacement costs become excessive.

LIMITATIONS

We have prepared this report for use by the Circle K Corporation. The report may be made available to regulatory agencies. This report is not intended for use by others, and the information contained herein may not be applicable to other sites.

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, expressed or implied, should be understood.

- o O o -

Please call if your have questions regarding this report.

Respectfully submitted,

GeoEngineers, Inc.

Otto K. Paris
Project Geologist

James A. Miller, P.E.
Principal

OKP:JAM:db

TABLE 1
GROUND WATER ELEVATIONS IN MONITOR WELLS, SEPTEMBER 1989 THROUGH DECEMBER 1989

Monitor Well Number	TOC Elevation (Feet)	GROUND WATER SURFACE ELEVATIONS (Feet)											
		09/13/89	09/19/89	09/22/89	10/05/89	10/09/89	11/06/89	12/06/89	12/08/89	12/11/89	12/13/89	12/18/89	12/28/89
MW-1	100.94	89.26	89.23	89.24	NM	89.06	89.29	90.48	90.37	NM	NM	NM	89.32
MW-2*	98.58	87.95	88.00	87.96	NM	87.77	---	---	---	---	---	---	---
MW-3*	99.63	88.57	88.66	88.60	NM	88.64	---	---	---	---	---	---	---
MW-4*	98.38	88.16	88.61	88.39	NM	89.43	88.45	90.56	87.85	85.67	85.68	85.46	84.70
MW-5	90.94	79.24	79.21	79.22	NM	79.01	79.45	NM	80.72	NM	NM	NM	80.47
MW-6	97.92	---	---	---	87.25	87.33	NM	NM	87.71	87.17	87.06	NM	86.52
MW-7	97.43	---	---	---	85.86	85.81	NM	NM	88.58	88.55	88.52	NM	87.98
MW-8*	98.36	---	---	---	87.85	87.81	NM	NM	89.58	88.24	88.14	87.34	86.31
MW-9*	99.03	---	---	---	88.32	88.14	88.60	NM	88.81	88.37	88.22	87.95	87.63
MW-10	97.55	---	---	---	86.50	86.56	87.15	NM	87.85	87.72	87.75	NM	87.37
MW-11	98.62	---	---	---	88.23	88.15	88.74	91.93	91.69	NM	90.84	NM	89.25
MW-12	96.56	---	---	---	83.71	84.76	85.31	86.27	86.40	NM	NM	NM	86.21
MW-13	99.95	---	---	---	---	---	---	---	---	---	---	---	87.54
MW-14	98.07	---	---	---	---	---	---	---	---	---	---	---	88.41
MW-15	99.04	---	---	---	---	---	---	---	---	---	---	---	88.22
MW-16	99.04	---	---	---	---	---	---	---	---	---	---	---	88.57
R-WELL*	95.29	---	---	---	---	---	88.44	92.07	87.35	84.36	84.47	NM	83.62

Notes:

"TOC" = Top of well casing; elevations based on assumed datum of 100.00 feet.

"NM" = Not measured

"---" = Monitor well not yet constructed, or destroyed during remediation activities.

"*" = Free product present in well

R-WELL = Ground water recovery well; depression pump was activated after measuring the water levels on 12/06/89.

Reported water surface elevations are corrected for the equivalent column height of water for wells containing free product.

TABLE 2

SUMMARY OF SOIL SAMPLE ANALYTICAL DATA, MONITOR WELL BORINGS

Sample Number	Depth (feet)	Sample Date	EPA Method 8020				Modified EPA Method 8015	
			Benzene (ppb)	Ethyl-Benzene (ppb)	Toluene (ppb)	Total Xylenes (ppb)	Gasoline (ppm)	Diesel (ppm)
MW-1	8.5	09/11/89	ND	ND	ND	ND	ND	ND
MW-2	8.5	09/11/89	ND	ND	ND	ND	ND	ND
MW-3	8.5	09/12/89	ND	57	72	310	9	ND
MW-4	8.5	09/12/89	ND	27,000	27,000	159,000	1,200	ND
MW-5	8.5	09/12/89	ND	ND	ND	ND	ND	ND
MW-6	8.0	10/02/89	ND	ND	ND	ND	ND	ND
MW-6	10.0	10/02/89	ND	ND	ND	ND	ND	ND
MW-7	10.0	10/02/89	ND	29	100	175	ND	ND
MW-8	10.0	10/03/89	ND	ND	ND	ND	ND	ND
MW-9	10.0	10/03/89	ND	ND	ND	ND	ND	ND
MW-10	10.0	10/03/89	ND	ND	ND	ND	ND	ND
MW-11	11.0	10/04/89	ND	ND	ND	ND	ND	ND
MW-12	10.0	10/04/89	ND	ND	ND	ND	ND	ND
MW-13	8.0	12/20/89	460	220	1100	1200	ND	ND
MW-14	13.0	12/20/89	ND	ND	ND	ND	ND	ND
MW-15	8.0	12/21/89	ND	ND	ND	ND	ND	ND
MW-15	13.0	12/21/89	510	90	840	510	ND	ND
MW-16	8.0	12/21/89	ND	ND	63	ND	ND	ND

Notes:
"ppb" = parts per billion
"ppm" = parts per million
"ND" = "not detected"; see lab data sheets in Appendix B for analyte detection limits

Geo Engineers

TABLE 3
HYDROCARBON VAPOR CONCENTRATIONS IN GROUND WATER MONITOR WELL CASINGS ON DECEMBER 28, 1989

Monitor Well Number	Hydrocarbon Vapor Concentrations (ppm)
MW-1	260
MW-2*	>10,000
MW-3*	>10,000
MW-4	>10,000
MW-5	<100
MW-6	>10,000
MW-7	480
MW-8	>10,000
MW-9	>10,000
MW-10	200
MW-11	230
MW-12	210
MW-13	>10,000
MW-14	380
MW-15	>10,000
MW-16	1,600

Notes:

"ppm" = "parts per million"

*Hydrocarbon vapor concentrations as measured on September 13, 1989. Wells MW-2 and MW-3 were destroyed during remediation activities in October 1989.

Hydrocarbon vapor concentrations were measured in the monitor well casings using a Bacharach TLV Sniffer calibrated to hexane (110 ppm = 1% LEL)

TABLE 4
THICKNESS OF FREE PRODUCT IN GROUND WATER MONITOR WELLS, SEPTEMBER 1989 THROUGH DECEMBER 1989

Monitor Well Number	THICKNESS OF FREE PRODUCT (Feet)											
	09/13/89	09/19/89	09/22/89	10/05/89	10/09/89	11/06/89	12/06/89	12/08/89	12/11/89	12/13/89	12/18/89	12/28/89
MW-2	0.10	1.15	1.60	NM	2.11	---	---	---	---	---	---	---
MW-3	0.32	2.08	2.81	NM	4.43	---	---	---	---	---	---	---
MW-4	0.80	5.34	6.28	NM	5.90	1.73	3.35	5.30	1.80	1.75	0.50	0.55
MW-8	---	---	---	0.19	0.11	NM	NM	9.50	9.20	6.10	2.33	0.37
MW-9	---	---	---	2.98	4.63	2.73	NM	0.50	0.61	0.65	0.30	0.27
R-WELL	---	---	---	---	---	0.10	0.02	0.08	0.15	0.10	NM	0.06

Notes:

"NM" = Not measured

"---" = Monitor well not yet constructed, or destroyed during remediation activities.

R-WELL = Ground water recovery well; depression pump was activated after measuring the thickness of free product on 12-06-89.

TABLE 5
SUMMARY OF GROUND WATER QUALITY DATA, MONITOR WELL SAMPLES

Monitor Well Number	Sample Date	EPA Method 602				EPA Method 418.1
		Benzene (ppb)	Ethyl-Benzene (ppb)	Toluene (ppb)	Total Xylenes (ppb)	TPH (ppm)
MW-1	09/13/89	1.5	ND	1.9	1.6	ND
MW-5	09/13/89	1.1	ND	2.5	2.6	ND
MW-6	10/09/89	250	ND	3.2	110	NA
MW-7	10/09/89	2.8	ND	1.4	ND	NA
MW-10	10/09/89	1.2	ND	ND	ND	NA
MW-11	10/09/89	2.6	ND	ND	3.0	NA
MW-12	10/09/89	ND	ND	ND	ND	NA
MW-13	12/21/89	13,000	1,700	20,000	8,800	NA
MW-14	12/21/89	1.1	1.9	5.7	13	NA
MW-15	12/21/89	7,300	1,000	9,000	5,800	NA
MW-16	12/21/89	4.3	7.1	20	36	NA

Notes:
"ppb" = parts per billion
"ppm" = parts per million
"ND" = "not detected"; see laboratory data sheets in Appendix C for analyte detection limits
"NA" = not analyzed

TABLE 6
SUMMARY OF SOIL SAMPLE ANALYTICAL DATA, WASTE OIL AND HEATING OIL TANK EXCAVATIONS

Tank Excavation	Sample Number	Sample Date	Location	Depth (feet)	TPH (ppm)
Waste Oil Tank	WO-2	10/11/89	Excavation floor	8.0	76
	WO-6	10/12/89	Excavation floor	11.0	2
	WO-7	10/12/89	North wall	10.0	<1
	WO-8	10/12/89	East wall	9.5	6
	WO-9	10/12/89	South wall	10.0	1
	WO-10	10/12/89	West wall	9.5	<1
Heating Oil Tank	HO-2	10/13/89	North wall	6.0	8
	HO-3	10/13/89	East wall	7.0	1
	HO-4	10/13/89	South wall	6.5	2
	HO-5	10/13/89	West wall	6.5	110
	HO-6	10/13/89	Excavation floor	8.5	14

Notes:
"TPH" = Total Petroleum Hydrocarbons by EPA Method 418.1
"ppm" = parts per million

TABLE 7
SUMMARY OF SOIL SAMPLE ANALYTICAL DATA, GASOLINE TANK AND RECOVERY TRENCH EXCAVATIONS

Sample Number	Sample Date	Depth (feet)	EPA Method 8020				Modified EPA Method 8015	
			Benzene (ppb)	Ethyl-Benzene (ppb)	Toluene (ppb)	Total Xylenes (ppb)	Gasoline (ppm)	Diesel (ppm)
EW-1	10/20/89	10.0	ND	ND	ND	ND	ND	ND
WW-1	10/20/89	13.0	1,300	9,700	20,000	53,000	270	600
NW-1	10/20/89	13.0	31,000	55,000	140,000	300,000	1,700	4,100
SW-1	10/20/89	9.0	1,000	1,600	6,300	10,000	360	ND
NW-2	10/23/89	10.0	1,300	12,000	17,000	57,000	230	400
WT-1	10/26/89	12.0	110	390	1,000	3,500	59	150
MT-1	10/26/89	10.0	ND	74	250	610	11	55
ET-3	10/27/89	10.0	140	ND	190	310	ND	7

Notes:
"ppb" = parts per billion
"ppm" = parts per million
"ND" = not detected; see laboratory data sheets in Appendix D for analyte detection limits
Sample locations shown in Figure 6

GeoEngineers

TABLE 8
SUMMARY OF SOIL SAMPLE ANALYTICAL DATA, SOIL STOCKPILE COMPOSITE SAMPLES

Laboratory Analysis (EPA Method)	Units	Soil Excavation Stockpiles		
		Sample C-1 GasolineTank/ Recovery Trench	Sample C-2 Waste Oil/ Heating Oil Tanks	Sample WO-11 Waste Oil Tank
Benzene (8020)	(ppb)	6,500	1.8	NA
Ethylbenzene (8020)	(ppb)	9,500	120	NA
Toluene (8020)	(ppb)	10,500	12	NA
Total Xylenes (8020)	(ppb)	20,500	550	NA
TPH (418.1)	(ppm)	2,248	488	108
Gasoline (Mod. 8015)	(ppm)	4,400	NA	NA
Flash Point (1010)	--	<32 F	NA	NA
PCBs (8080)	(ppm)	NA	All <1.0	NA
VOCs (8010)	(ppb)	NA	All <1.0	NA
Arsenic (EP Tox/Metals)	(ppm)	NA	0.25	NA
Barium (EP Tox/Metals)	(ppm)	NA	1.07	NA
Cadmium (EP Tox/Metals)	(ppm)	NA	0.14	NA
Chromium (EP Tox/Metals)	(ppm)	NA	0.005	NA
Lead (EP Tox/Metals)	(ppm)	NA	1.32	NA
Mercury (EP Tox/Metals)	(ppm)	NA	0.0001	NA
Selenium (EP Tox/Metals)	(ppm)	NA	0.05	NA
Silver (EP Tox/Metals)	(ppm)	NA	0.003	NA

Notes:
"ppb" = parts per billion
"ppm" = parts per million
"TPH" = total petroleum hydrocarbons
"PCBs" = polychlorinated biphenyl compounds
"VOCs" = halogenated volatile organic compounds
"NA" = not analyzed
Composite Samples C-1 and C-2 were collected on October 18, 1989.
Composite Sample WO-11 was collected on October 12, 1989.

TABLE 9
SUMMARY OF BETX ANALYSIS, WATER TREATMENT SYSTEM SAMPLES

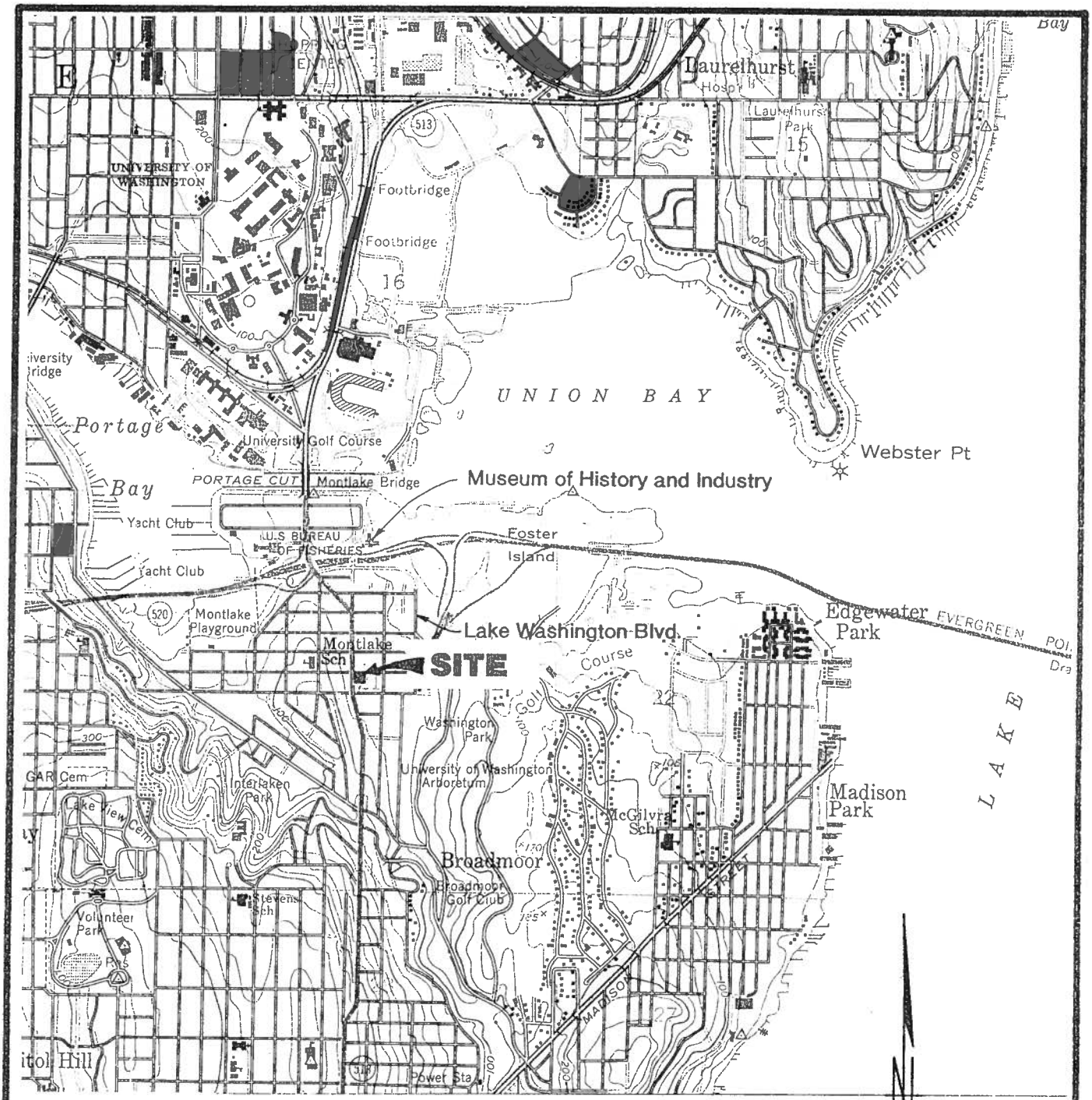
Sampling Port Number	Sample Date	EPA Method 602 (ppb)			
		Benzene	Ethylbenzene	Toluene	Total Xylenes
1	12/11/89	23,000	740	17,000	3,000
1	12/28/89	23,000	1,000	19,000	6,000
2	12/11/89	16,000	<500	800	<500
2	12/28/89	36,000	<500	6,000	<500
3	12/11/89	<0.5	<0.5	6.4	<0.5
3	12/28/89	14	<0.5	<0.5	<0.5

Notes:
"ppb" = parts per billion
Sampling port locations shown in Figure 9.

TABLE 10
SUMMARY OF WATER QUALITY DATA, DISCHARGE FROM WATER TREATMENT SYSTEM DECEMBER 18, 1989

Compound	EPA Method	Concentration (ppm)
Arsenic	7060	0.008
Cadmium	7131	<0.0003
Chromium	7190	<0.02
Copper	7210	<0.02
Lead	7421	<0.005
Mercury	7470	<0.0005
Nickel	7520	0.09
Silver	7760	<0.01
Zinc	7950	0.10
Cyanide	9012	<0.01
Oil and Grease	413.2	0.31
pH	150.1	6.8

Notes:
"ppm" = parts per million
Samples collected from Sampling Port No. 3 on December 18, 1989; these samples are representative of water discharged into the sanitary sewer system after undergoing treatment.



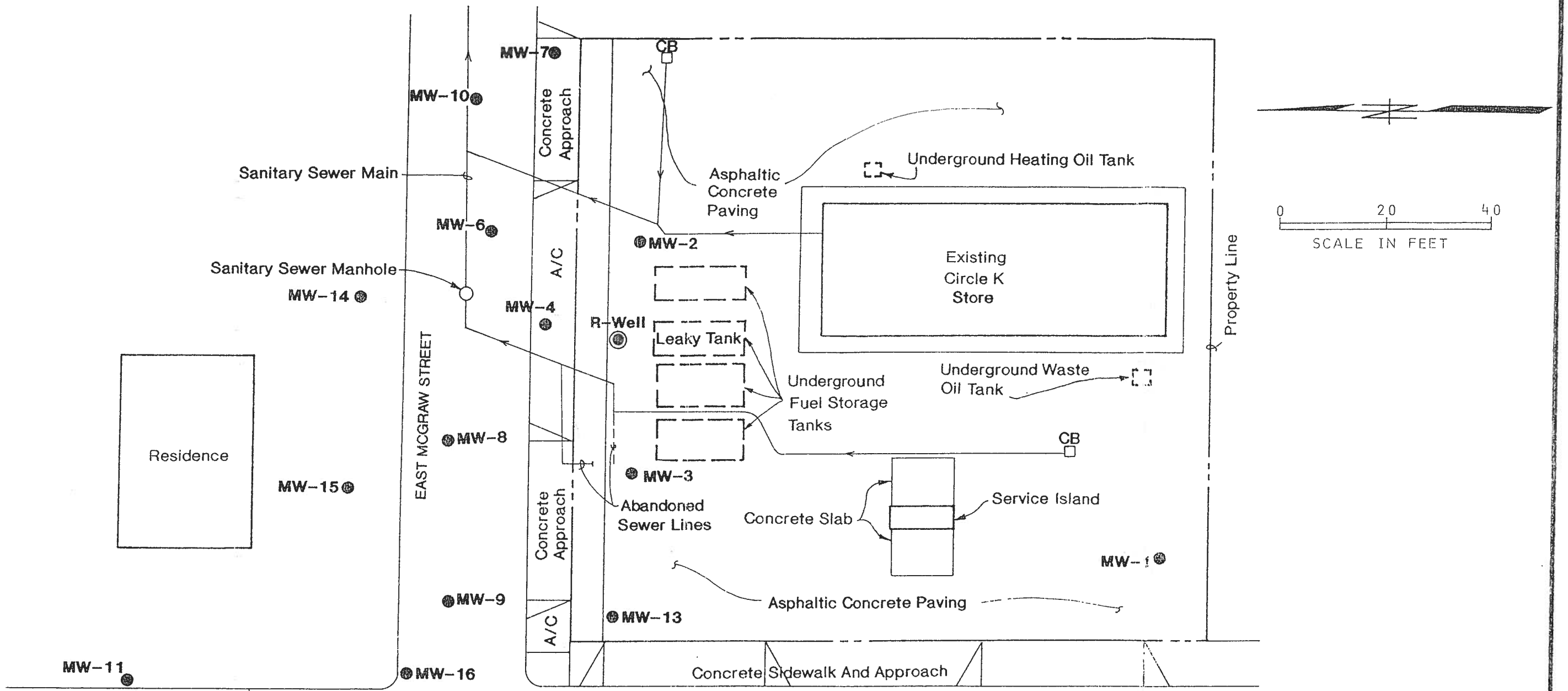
REFERENCE: USGS 7.5' TOPOGRAPHIC QUADRANGLE MAP "SEATTLE NORTH, WASH."

1780·001·804 TEP:KKT 9·19·89

Geo Engineers

VICINITY MAP

FIGURE 1



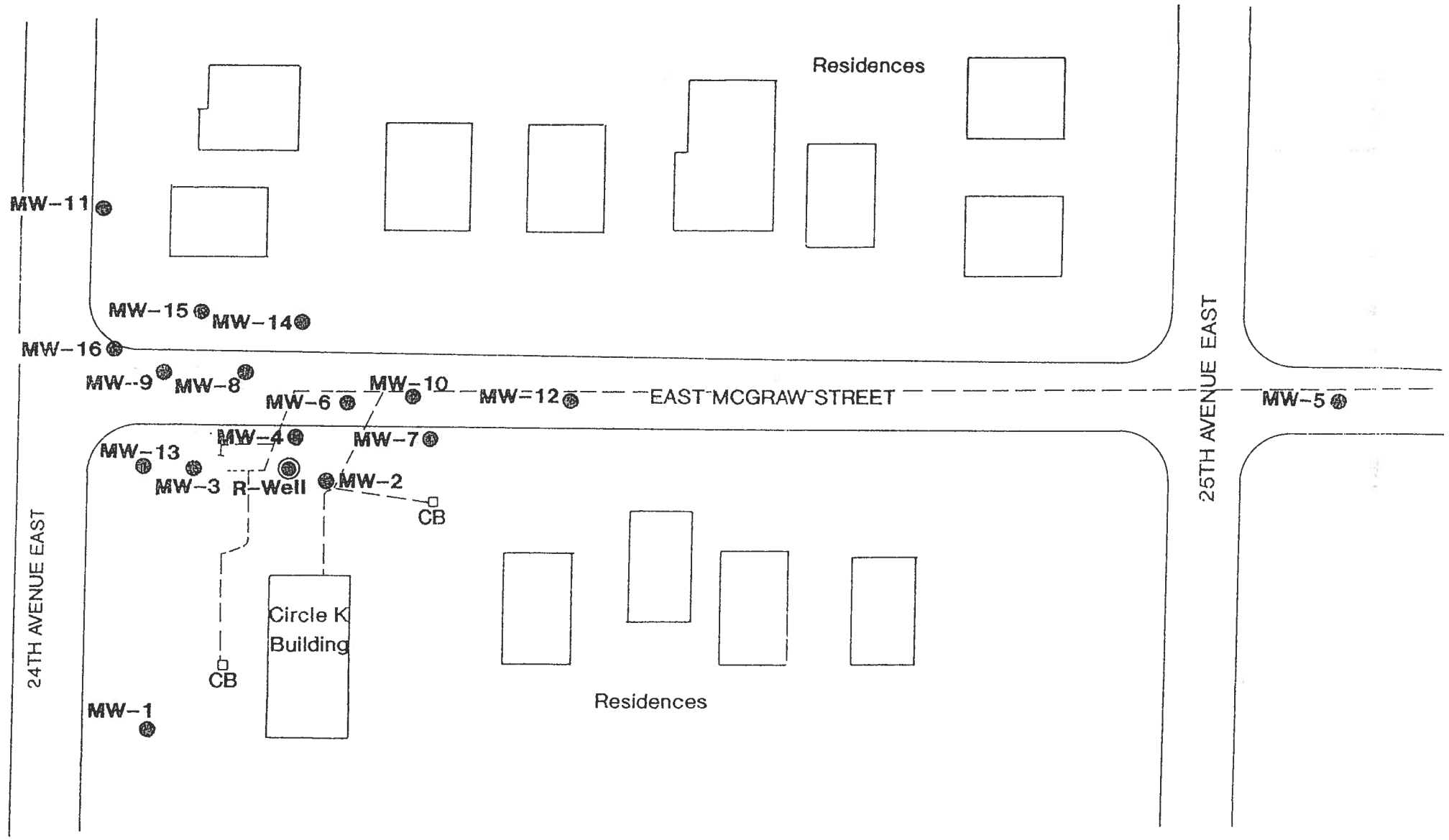
EXPLANATION:

- MW-1 ● — MONITOR WELL LOCATION AND NUMBER.
- R-Well ◉ — RECOVERY WELL LOCATION
- CB □ — CATCH BASIN

Geo Engineers

SITE PLAN

FIGURE 2



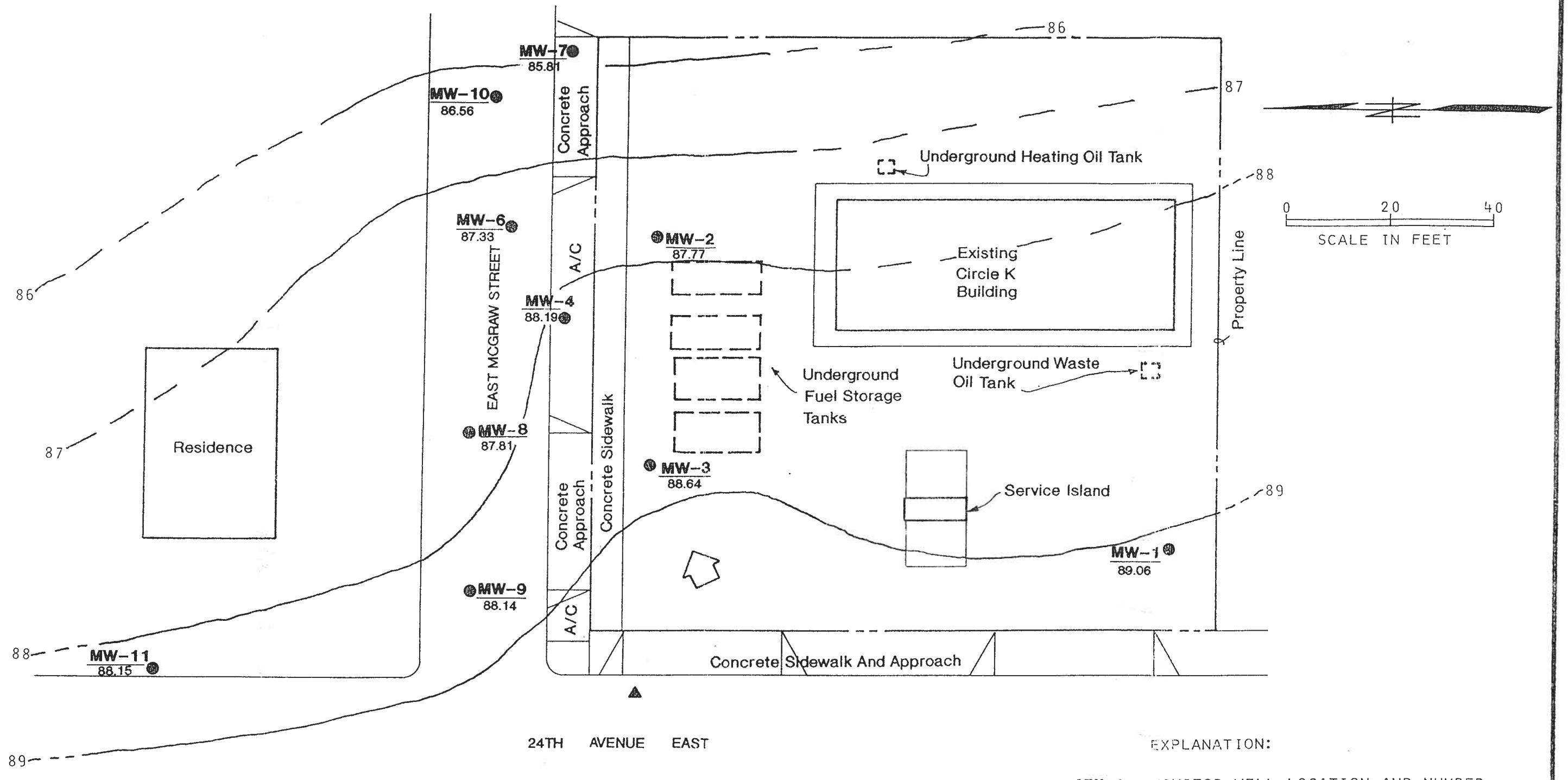
EXPLANATION:

- **MW-1** ⊗ MONITOR WELL LOCATION AND NUMBER
- **R-Well** ⊗ RECOVERY WELL LOCATION
- CB □ CATCH BASIN
- ——— UNDERGROUND SEWER AND DRAIN PIPES

Geo Engineers

MONITOR WELL LOCATION MAP

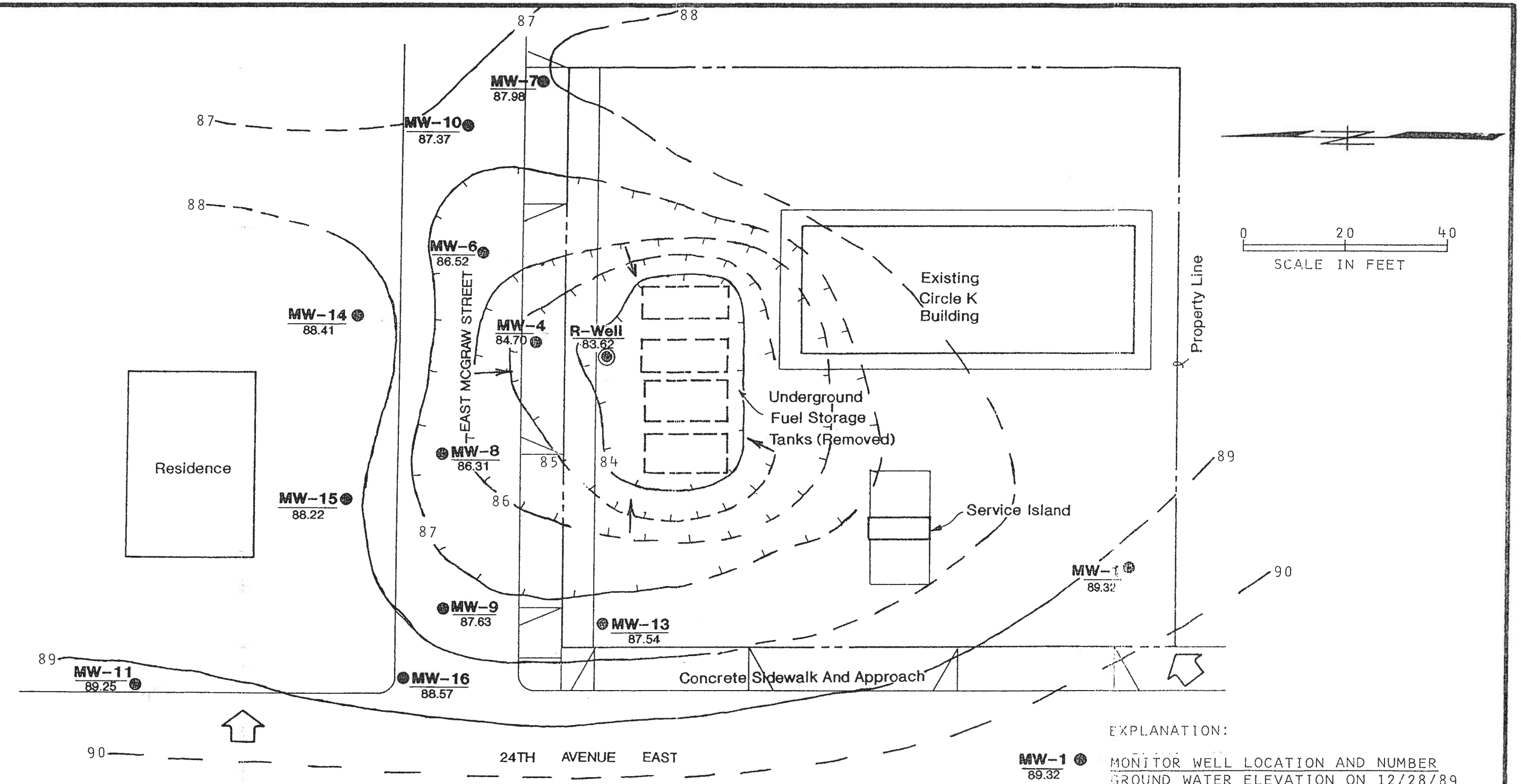
FIGURE 3



Geo Engineers

GROUND WATER ELEVATION CONTOUR MAP
OCTOBER 9, 1989

FIGURE 4



EXPLANATION:

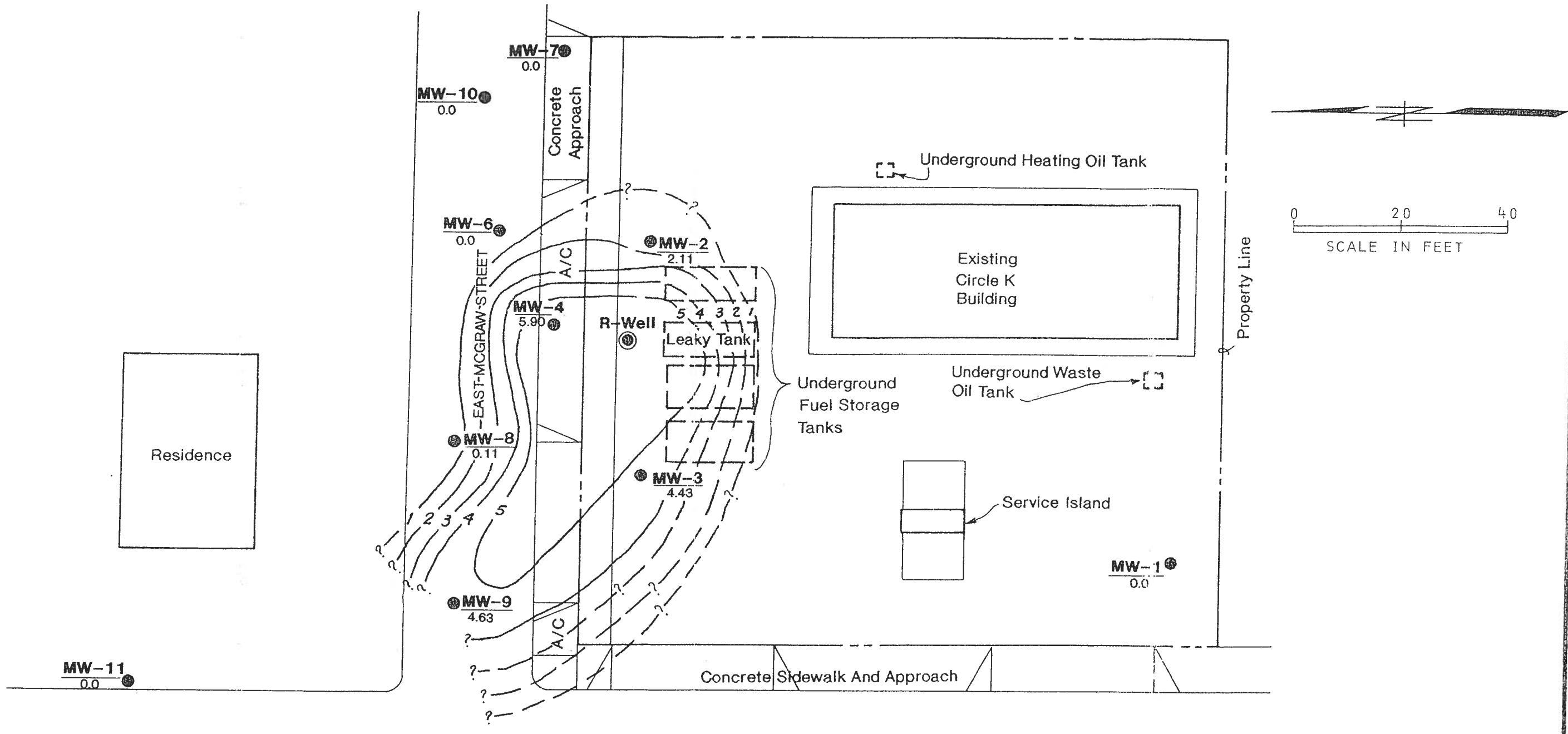
- MW-1 89.32 — MONITOR WELL LOCATION AND NUMBER; GROUND WATER ELEVATION ON 12/28/89
- R-WELL 83.62 — RECOVERY WELL LOCATION; GROUND WATER ELEVATION ON 12/28/89
- GENERAL DIRECTION OF GROUND WATER FLOW
- GROUND WATER FLOW TO THE RECOVERY WELL
- 90 GROUND WATER ELEVATION CONTOUR

NOTE: GROUND WATER ELEVATION OBTAINED APPROXIMATELY THREE WEEKS AFTER START OF GROUND WATER PUMPING FROM THE RECOVERY WELL.

Geo Engineers

GROUND WATER ELEVATION CONTOUR MAP – DECEMBER 28, 1989

FIGURE 5



EXPLANATION:

MW-1 / 0.0 — MONITOR WELL LOCATION AND NUMBER
FREE PRODUCT THICKNESS (FEET) ON 10/9/89

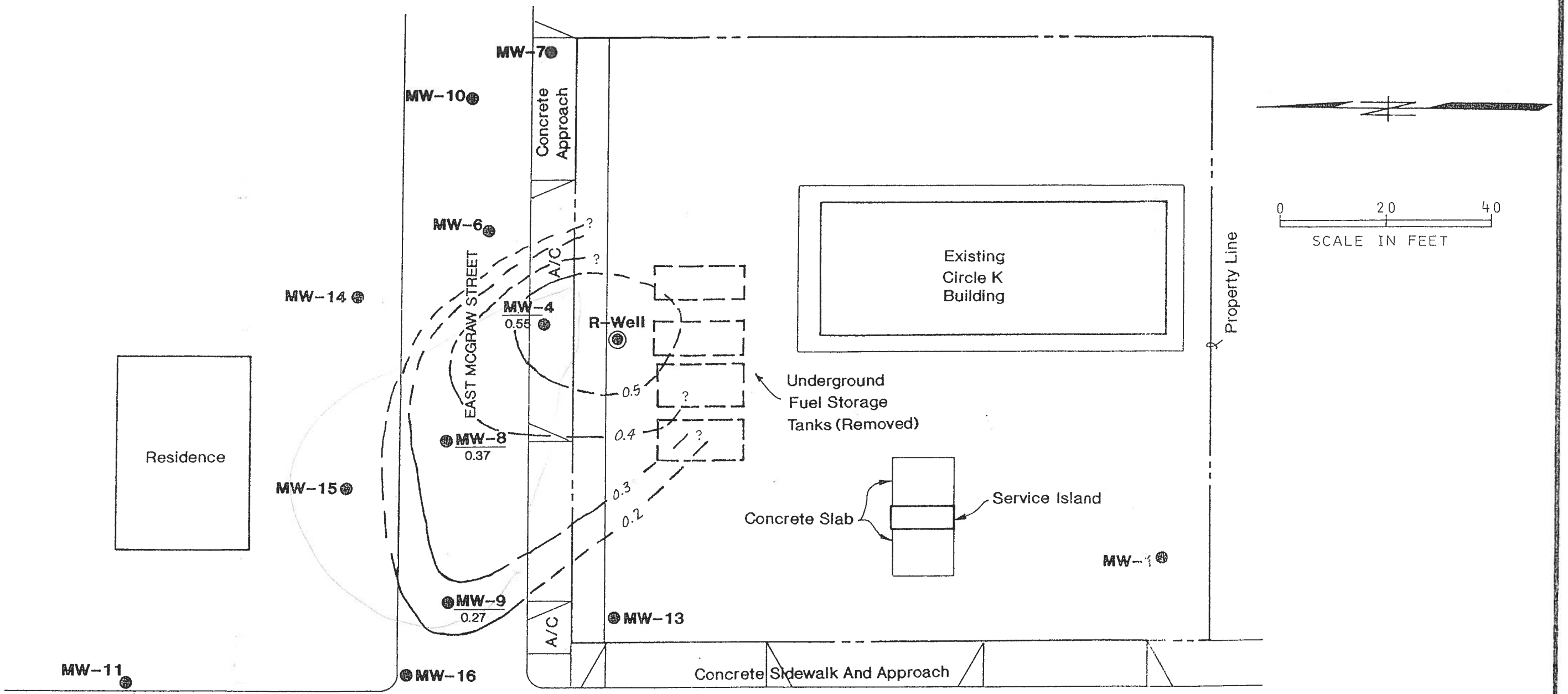
FREE PRODUCT THICKNESS CONTOUR

NOTE: WELL MW-8 CONTAINED SUBSTANTIAL THICKNESSES OF FREE PRODUCT ON LATER MEASUREMENT DATES.

Geo Engineers

FREE PRODUCT THICKNESS CONTOUR MAP
OCTOBER 9, 1989

FIGURE 6



EXPLANATION:

MW-4 / 0.55 — MONITOR WELL LOCATION AND NUMBER / PRODUCT THICKNESS(FEET) ON 12/28/89

—0.4— PRODUCT THICKNESS CONTOUR

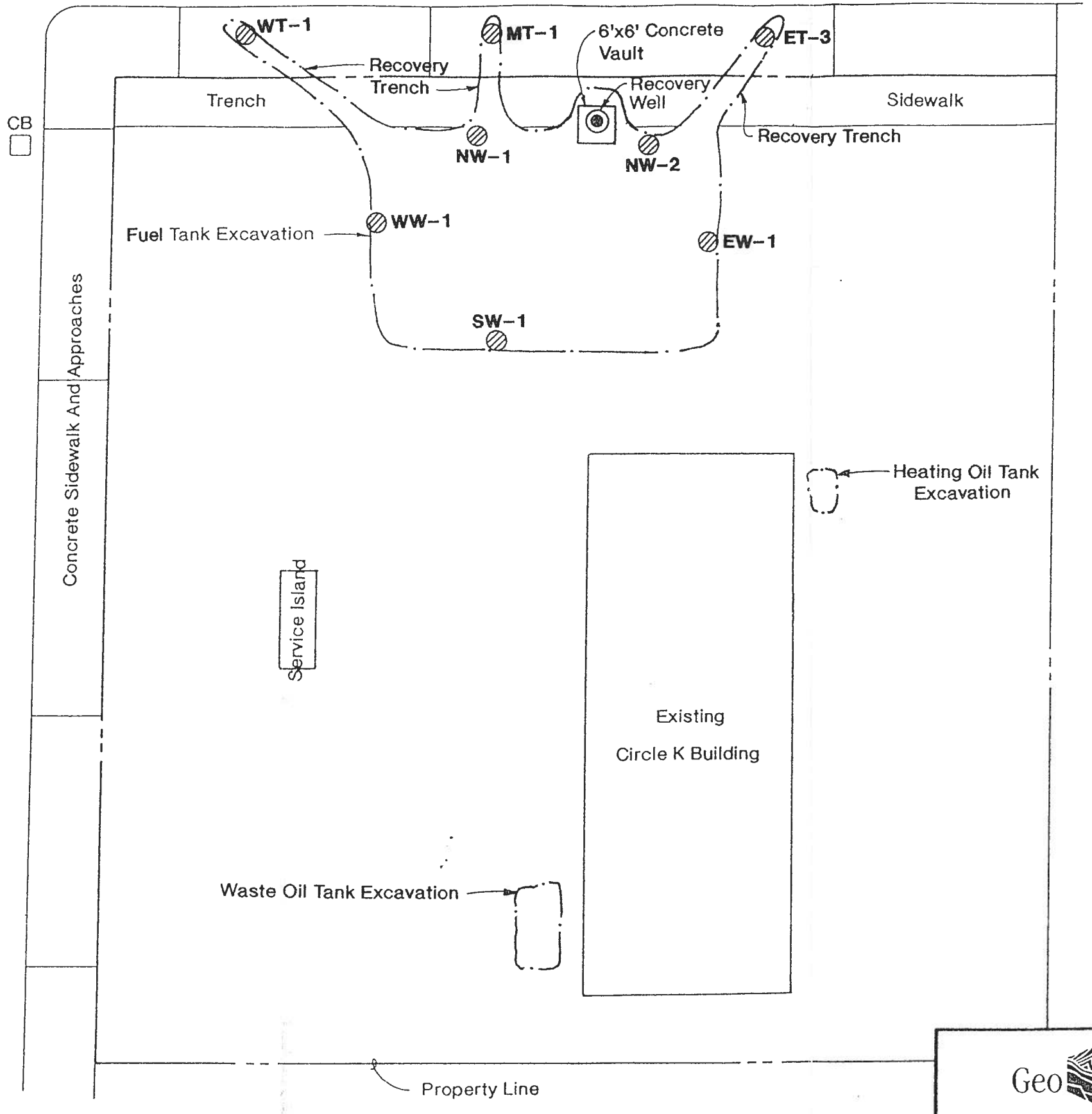
R-WELL — RECOVERY WELL LOCATION

NOTE: PRODUCT THICKNESS DATA OBTAINED APPROXIMATELY THREE WEEKS AFTER START OF GROUND WATER PUMPING FROM THE RECOVERY WELL.

Geo Engineers

FREE PRODUCT THICKNESS CONTOUR MAP – DECEMBER 28, 1989

FIGURE 7



0 15 30

SCALE IN FEET

EXPLANATION:

SW-1 SOIL SAMPLE NUMBER AND LOCATION

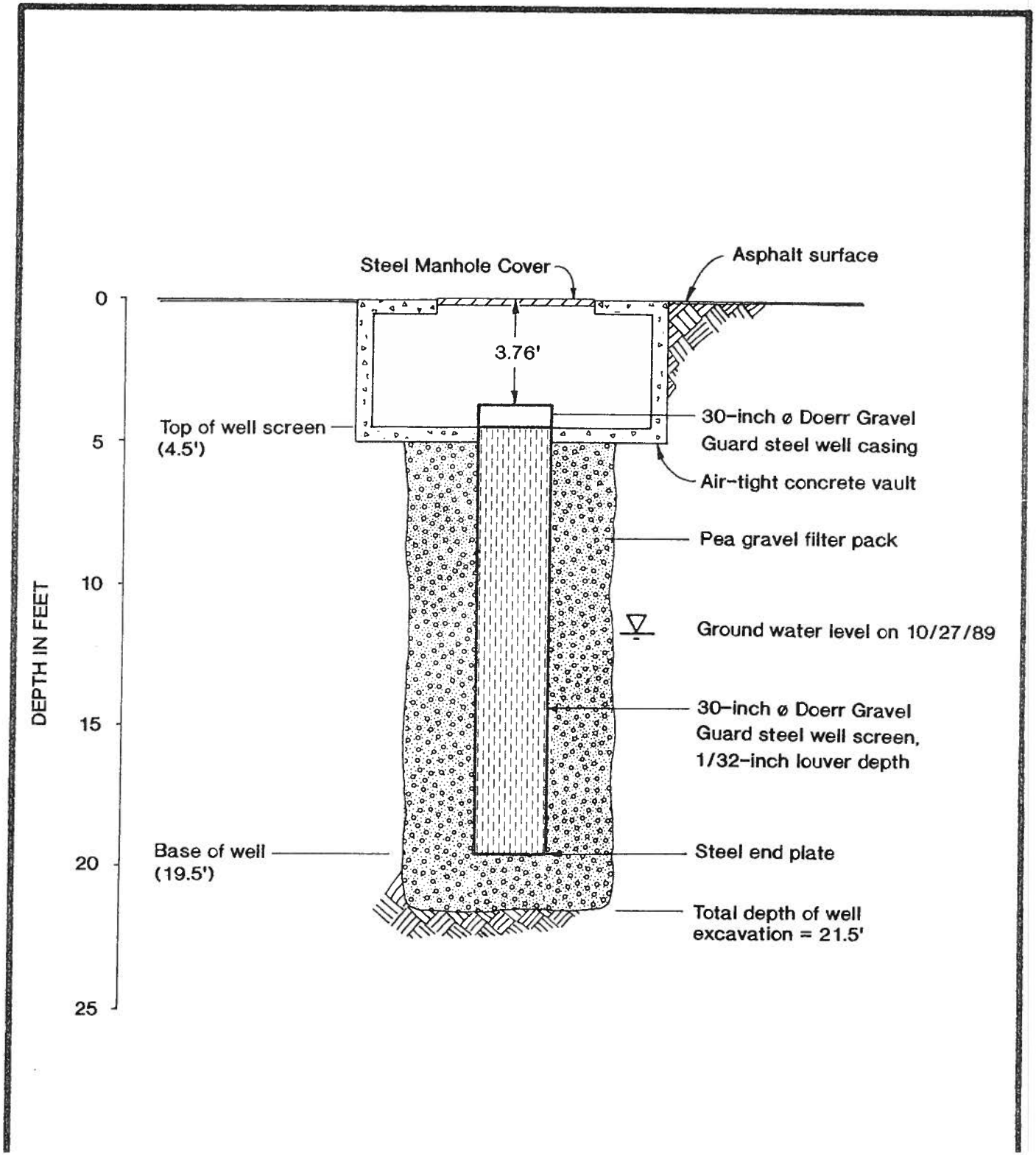
NOTE: SOIL SAMPLE LOCATIONS IN THE HEATING OIL TANK EXCAVATION AND THE WASTE OIL TANK EXCAVATION ARE DESCRIBED IN TABLE 6.

1780-001-804 JGR:BDH 1-16-90

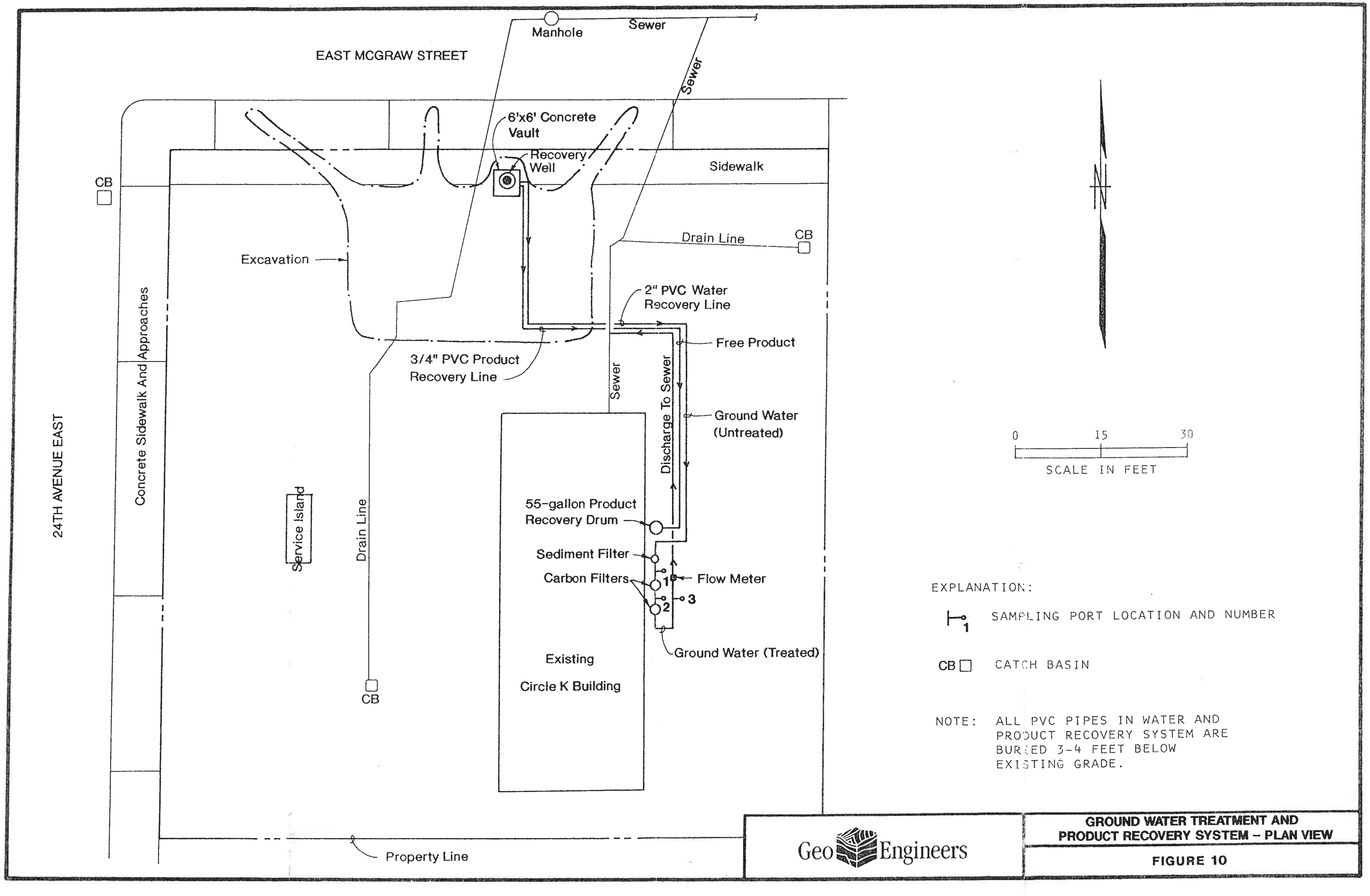
Geo Engineers

MAP OF SOIL AND TANK EXCAVATIONS

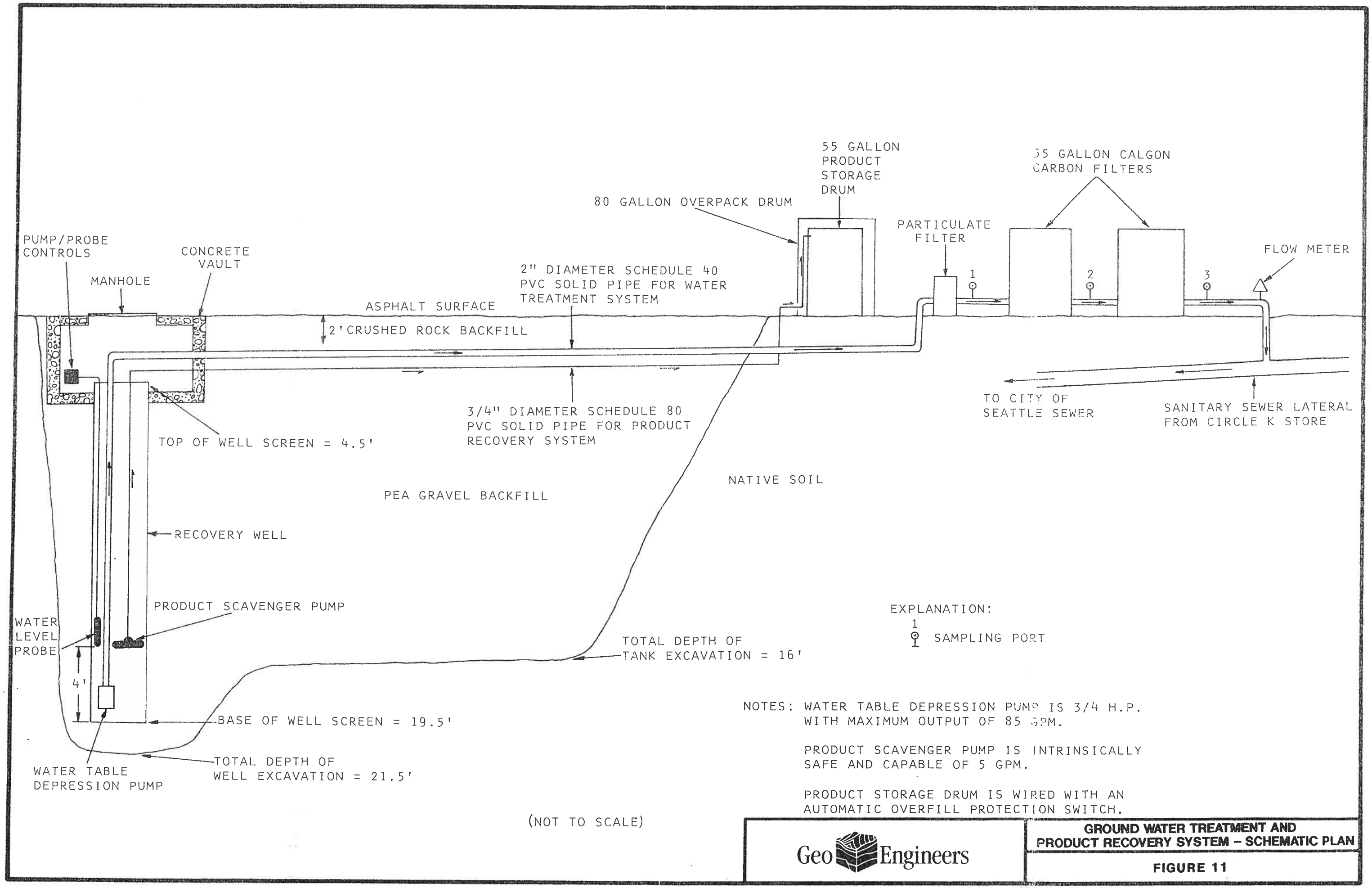
FIGURE 8



OKP:KKT 12-14-89



1780-001-804 JGR:KKT 1/12/90

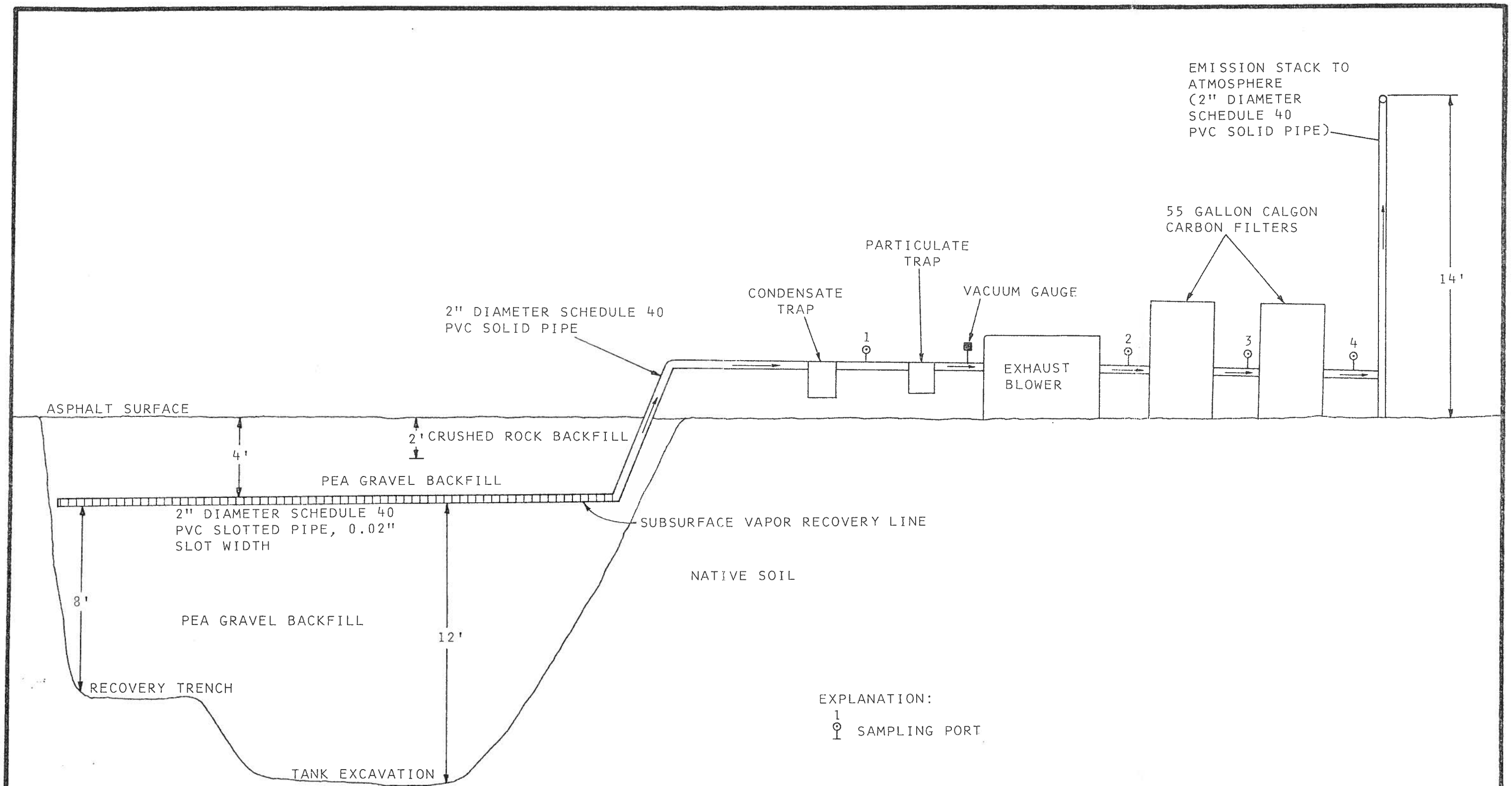


Geo Engineers

GROUND WATER TREATMENT AND PRODUCT RECOVERY SYSTEM – SCHEMATIC PLAN

FIGURE 11

1780-01-B04 JGR: BDH 1-18-90



EXPLANATION:

1
SAMPLING PORT

NOTE: EXHAUST BLOWER SPECIFICATIONS: ORS MODEL #1132006. MAXIMUM VACUUM IS 49" OF WATER. MAXIMUM FLOW IS 98 SCFM. INTRINSICALLY SAFE MOTOR. EQUIPPED WITH VAPOR DILUTION VALVE.

(NOT TO SCALE)

Geo Engineers

SOIL VAPOR EXTRACTION SYSTEM – SCHEMATIC PLAN

FIGURE 13

1780-01-B04 JGR:BDH 1-18-90

APPENDIX A

Field Explorations

GeoEngineers

APPENDIX A

FIELD EXPLORATIONS

DRILLING AND SOIL SAMPLING PROGRAM

Subsurface conditions at the Circle K site were explored by drilling sixteen borings using hollow-stem auger methods. Locations of the borings are indicated in Figure 3. The borings were drilled in three separate phases of our site assessment activities. Wells MW-1 through MW-5 were drilled with equipment owned and operated by Soil Sampling Service, Inc. from September 11, 1989 to September 12, 1989. GeoBoring and Development, Inc. drilled MW-6 through MW-12 from October 2, 1989 to October 4, 1989. Wells MW-13 through MW-16 were completed by GeoBoring and Development, Inc. from December 20, 1989 to December 21, 1989. Boring depths ranged from 19.0 feet to 31.0 feet. The drilling and soil sampling equipment was cleaned with a hot-water pressure washer between each boring.

A hydrogeologist 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 general 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-18.

Soil samples were obtained from the borings using either a Dames & Moore split-barrel sampler (2.4-inch-ID), or a split-spoon sampler (2.5-inch-ID) with 6-inch brass tubes. For MW-1 through MW-13, the sampler was driven 18 inches by a 300-pound weight falling a vertical distance of approximately 30 inches. A 140-pound weight was used to drive the sampler in borings MW-14 through MW-16. 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.

FIELD SCREENING OF SOIL SAMPLES

a basis for selecting soil samples for chemical analysis. The field screening methods employed included: (1) visual examination, (2) sheen testing, and (3) headspace vapor testing using the Bacharach TLV Sniffer calibrated to hexane. The results of headspace and sheen screening are included on the boring logs.

Visual screening consists of inspecting the soil for the presence of stains indicative of residual fuel hydrocarbons. Visual screening is generally more effective in detecting the presence of heavier petroleum hydrocarbons such as motor oil, or when hydrocarbon concentrations are high. Sheen testing and measuring headspace vapors are more sensitive screening methods, and have been effective in detecting contamination at levels less than regulatory cleanup guidelines.

Sheen testing involves immersion of the soil sample in water and observing the water surface for signs of a sheen. Because of its sensitivity, the sheen method is first tested on soils obtained from a portion of the site believed to be clean and unaffected by residual fuel and petroleum hydrocarbons, thereby establishing a site-specific background level of sheen.

Sheens are classified as follows:

No Sheen (NS)	No visible sheen. Note: background samples at the site are classified as NS.
Slight Sheen (SS)	Light colorless sheen, spotty to globular; spread is irregular, not rapid; areas of no sheen remain; film dissipates rapidly.
Moderate Sheen (MS)	Light to heavy film, may have some color or iridescence, globular to stringy; spread is irregular to flowing.
Heavy Sheen (HS)	Heavy colorful film with iridescence

Headspace vapor screening involves placing a soil sample in a plastic sample bag. The sample bag is sealed and shaken slightly to expose the soil to the air trapped in the bag. The probe of a Bacharach TLV Sniffer is inserted into the bag and the instrument measures the concentration of combustible vapors present within the sample bag headspace. The TLV Sniffer records concentrations in parts per million (ppm) and is calibrated to hexane. The TLV Sniffer is designed to measure combustible hydrocarbon vapors at concentrations between 100 and 10,000 ppm. Similar to sheen testing, background vapor levels were established using on-site soils which were not believed to be contaminated.

Field screening results are site specific. The results vary with soil type, soil moisture and organic content, temperature, and type of contaminant(s).

MONITOR WELL CONSTRUCTION

Two-inch-diameter, Schedule 40 polyvinylchloride (PVC) casing was installed in each of the hollow-stem auger borings at the completion of drilling. The lower portion of the PVC casing consists of machine slotted (0.020-inch slot width) well screen, allowing entry of water, free (floating) hydrocarbons, and hydrocarbon vapors into the well casing. Medium sand was placed in the borehole annulus surrounding the well screen. The well casings are protected within flush-grade surface monuments. Monitor well construction details are indicated in Figures A-3 through A-18.

The monitor wells were developed by removing water from the wells with a stainless steel bailer. The elevations of the well casings were measured to the nearest 0.01 foot with an engineers level. An elevation datum of 100 feet was assumed on the steel catch basin grate located at the southeast corner of the 24th Avenue East and East McGraw Street intersection (Figure 4). Elevations referenced to this datum are included on the monitor well logs.

GROUND WATER SAMPLING PROGRAM

teflon bailer after at least three well casing volumes of water were removed from each well. The water samples were transferred to septum vials in the field and kept cool during transport to the testing laboratory.

The bailer was cleaned prior to each sampling attempt with a fresh water rinse, a trisodium phosphate (TSP) wash, and a distilled water rinse.

GROUND WATER ELEVATIONS

The depth to the ground water table relative to the monitor well casing rims was measured from September 1989 through December 1989. The measurements were made using a weighted fiberglass tape and water-finding paste or an electric water level probe. The fiberglass tape and electric probe were cleaned with a TSP wash and a distilled water rinse prior to use in each well. Ground water elevations were calculated by subtracting the water table depth from the casing rim elevations. A correction factor has been applied to the ground water elevations in the wells containing free product. Ground water elevation data are summarized in Table 1.

Free product thicknesses were measured in MW-2 and MW-3 during September and October. Product thicknesses in MW-4, MW-8 and MW-9 were recorded from September through December. The measurements were made with a weighted fiberglass tape and product-finding paste. Product thickness data are presented in Table 4.

HYDROCARBON VAPOR CONCENTRATIONS

Hydrocarbon vapor concentrations were measured in the monitor wells in September 1989 and December 1989. Vapor concentrations were also measured in some of the lateral sewer lines exposed during site remediation activities. A Bacharach TLV Sniffer that is calibrated to hexane was used for the measurements. The lower threshold of significance for the TLV Sniffer in this application is 400 ppm, or 4 percent of the Lower Explosive Limit (LEL) of hexane. Hydrocarbon vapor concentrations measured in the well casings in December 1989 are presented in Table 3.

GROUND WATER AND VAPOR REMEDIATION SYSTEM SAMPLING

Water samples were collected on December 11, 1989 and December 28, 1989

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

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

LABORATORY TESTS:

CA Chemical Analysis

VAPOR CONCENTRATION DATA:

Vapor concentration given in parts per million

SHEEN CLASSIFICATION SYSTEM:

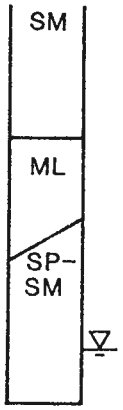
NS No visible sheen

SS Slight sheen

MS Moderate sheen

HS Heavy sheen

SOIL GRAPH:



Soil Group Symbol (See Note 2)

Distinct Contact Between Soil Strata

Gradual Change Between Soil Strata

Water Level

Bottom of Boring

BLOW-COUNT/SAMPLE DATA:

Blows required to drive a split-barrel sampler (2.4-inch I.D.) 12 inches or other indicated distances using 300 pound hammer falling 30 inches.

22 ■ Location of relatively undisturbed sample

12 ⊠ Location of disturbed sample

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

P □ Location of sampling attempt with no recovery

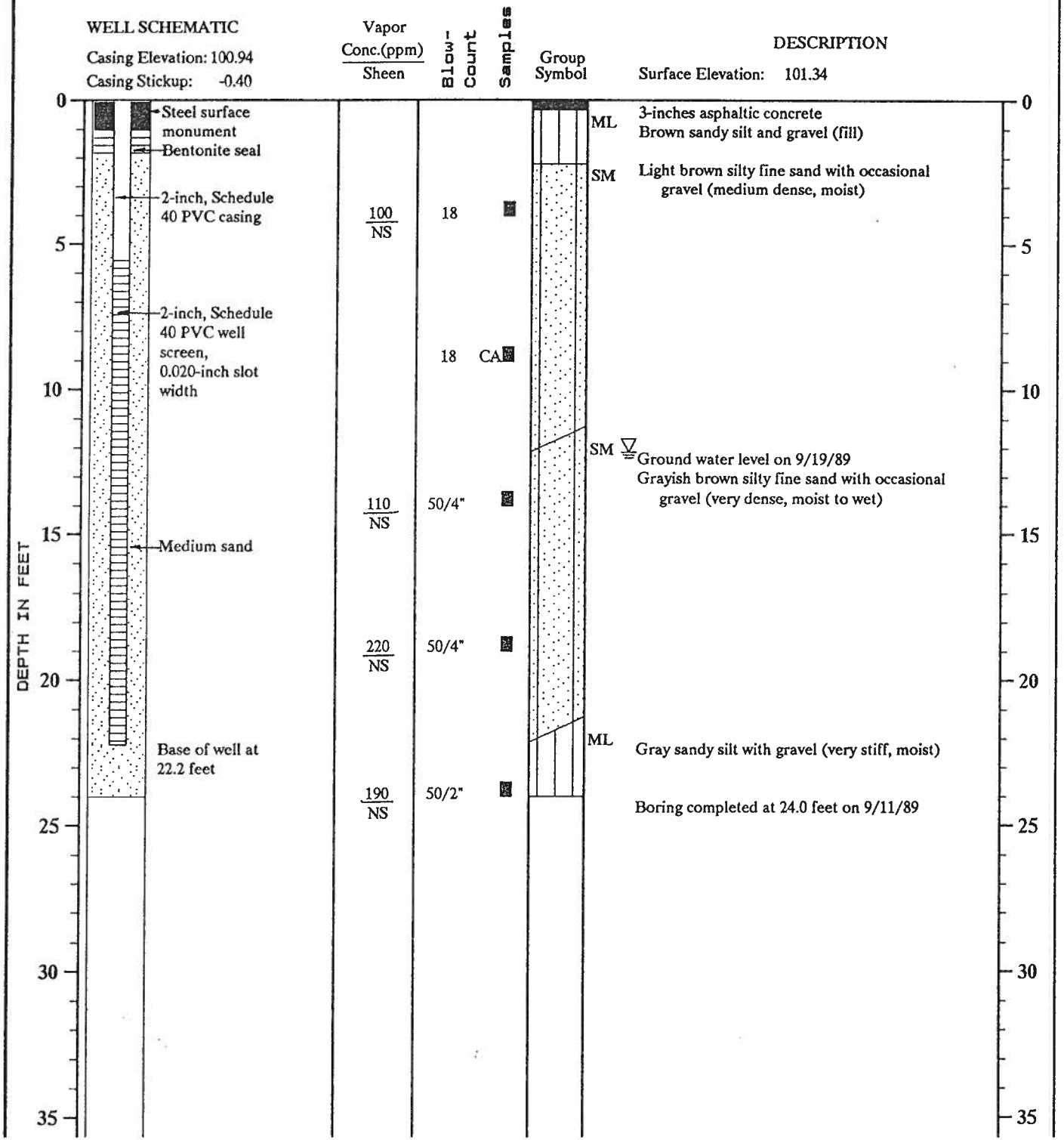
Blows required to drive a split-barrel sampler (1.5-inch I.D.) 12 inches or other indicated distances using 140 pound hammer falling 30 inches.

10 ◪ Location of sample attempt using Standard Penetration Test procedures

NOTES:

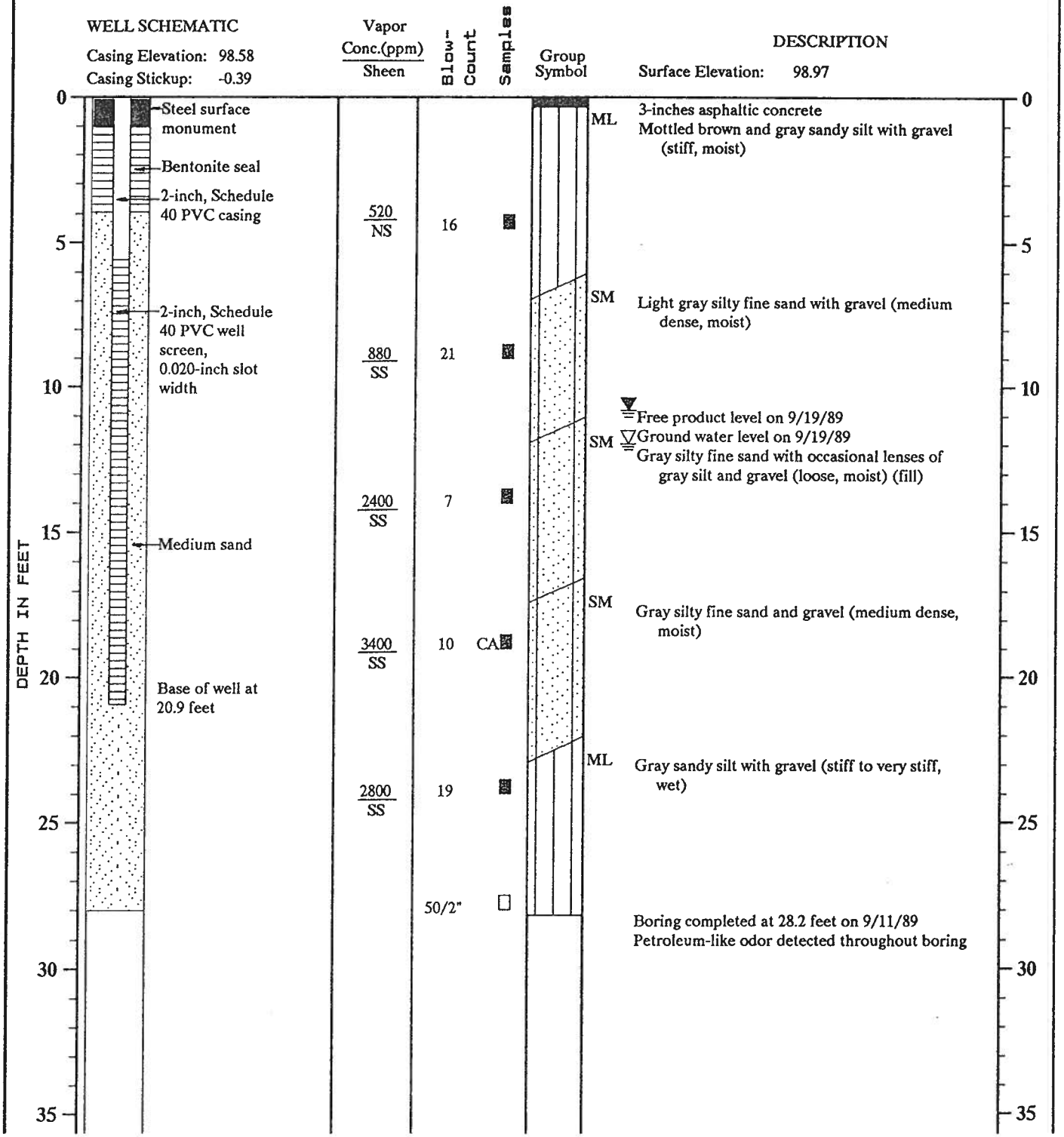
1. Information presented in the attached text and the Key To Boring Log Symbols is required to adequately explain the data on the boring logs.

MONITOR WELL NO. MW-1



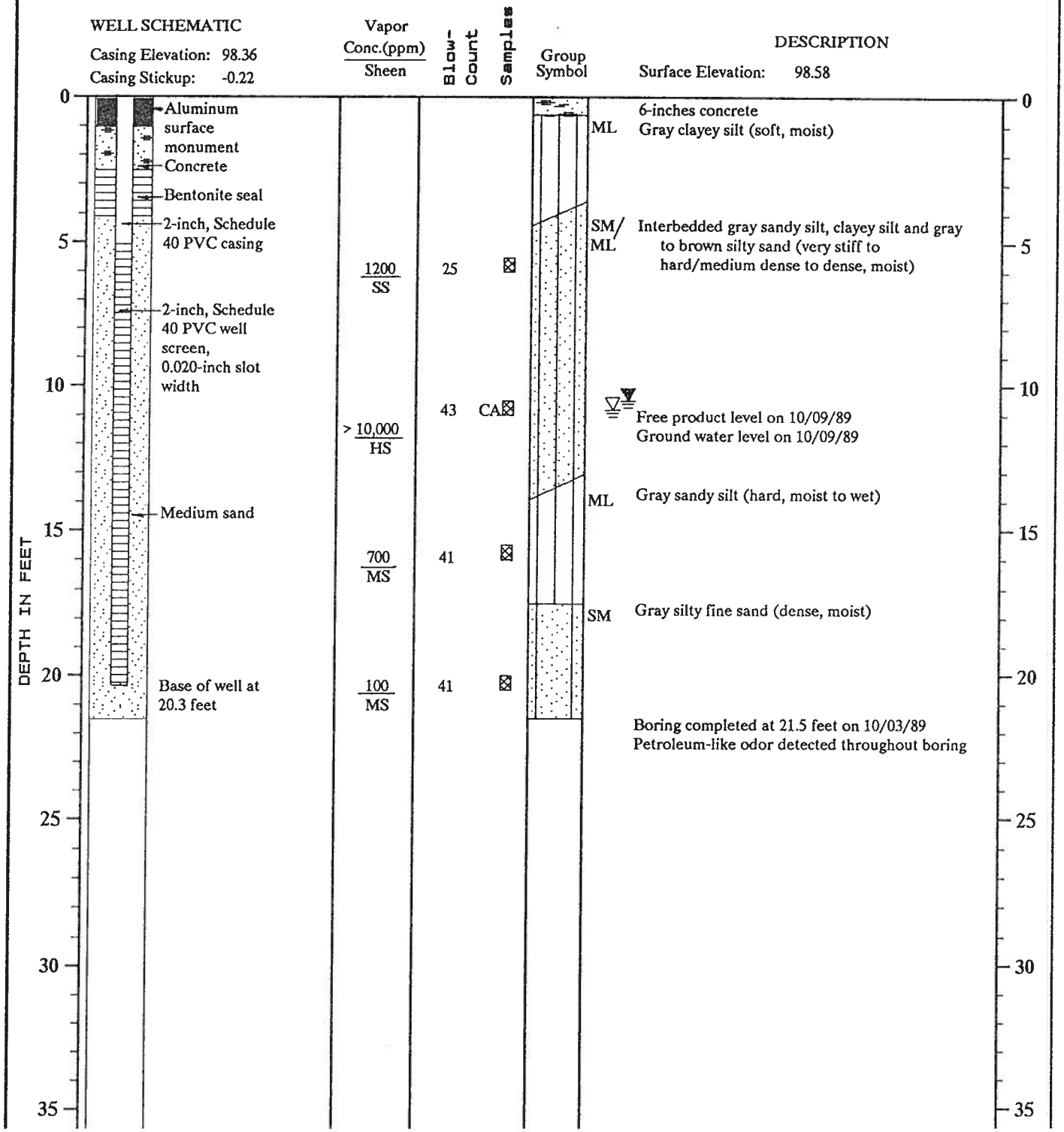
TEP:OKP:CDO 1/9/90

MONITOR WELL NO. MW-2



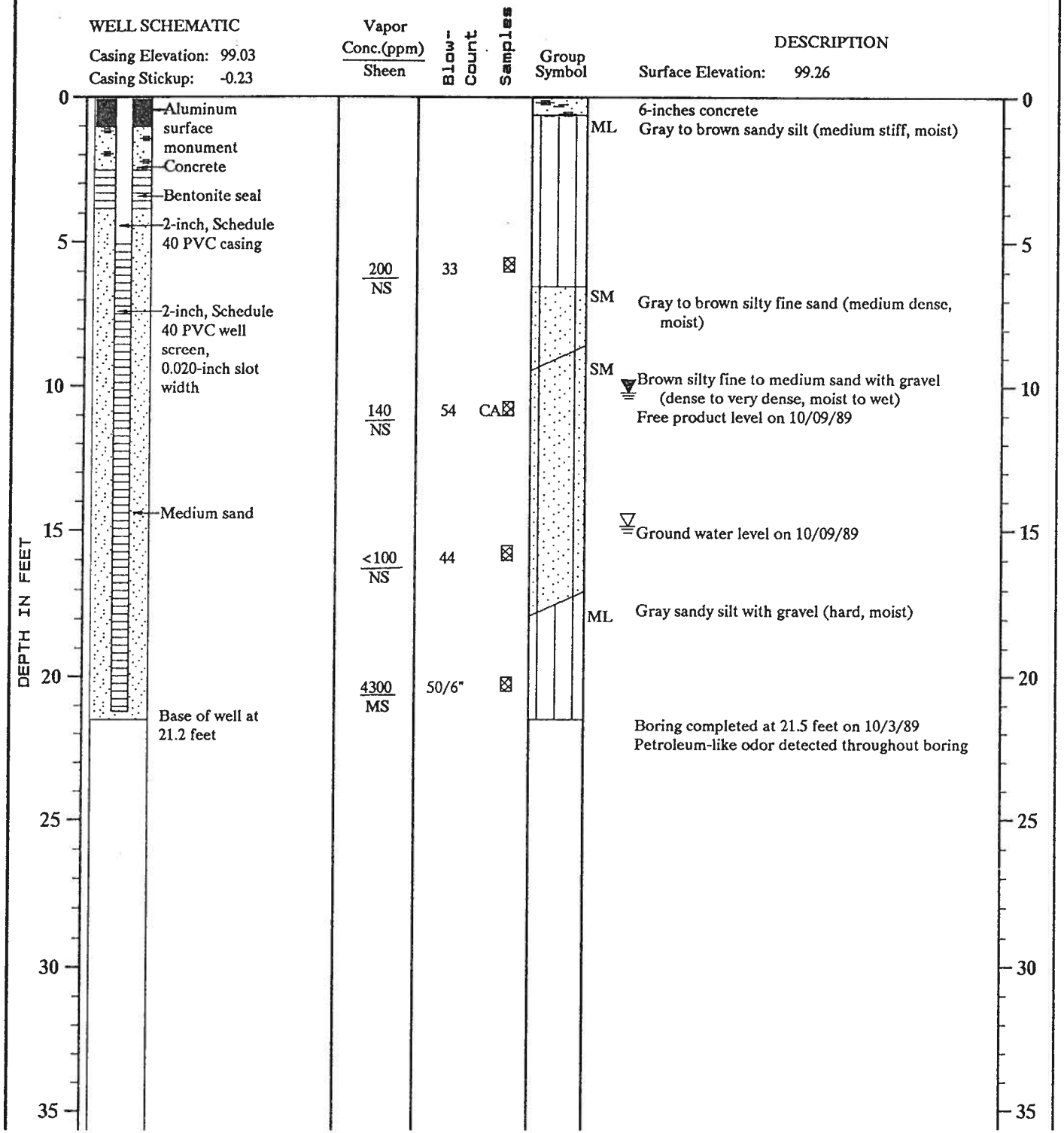
TEP:OKP:CDO 1/9/90

MONITOR WELL NO. MW-8



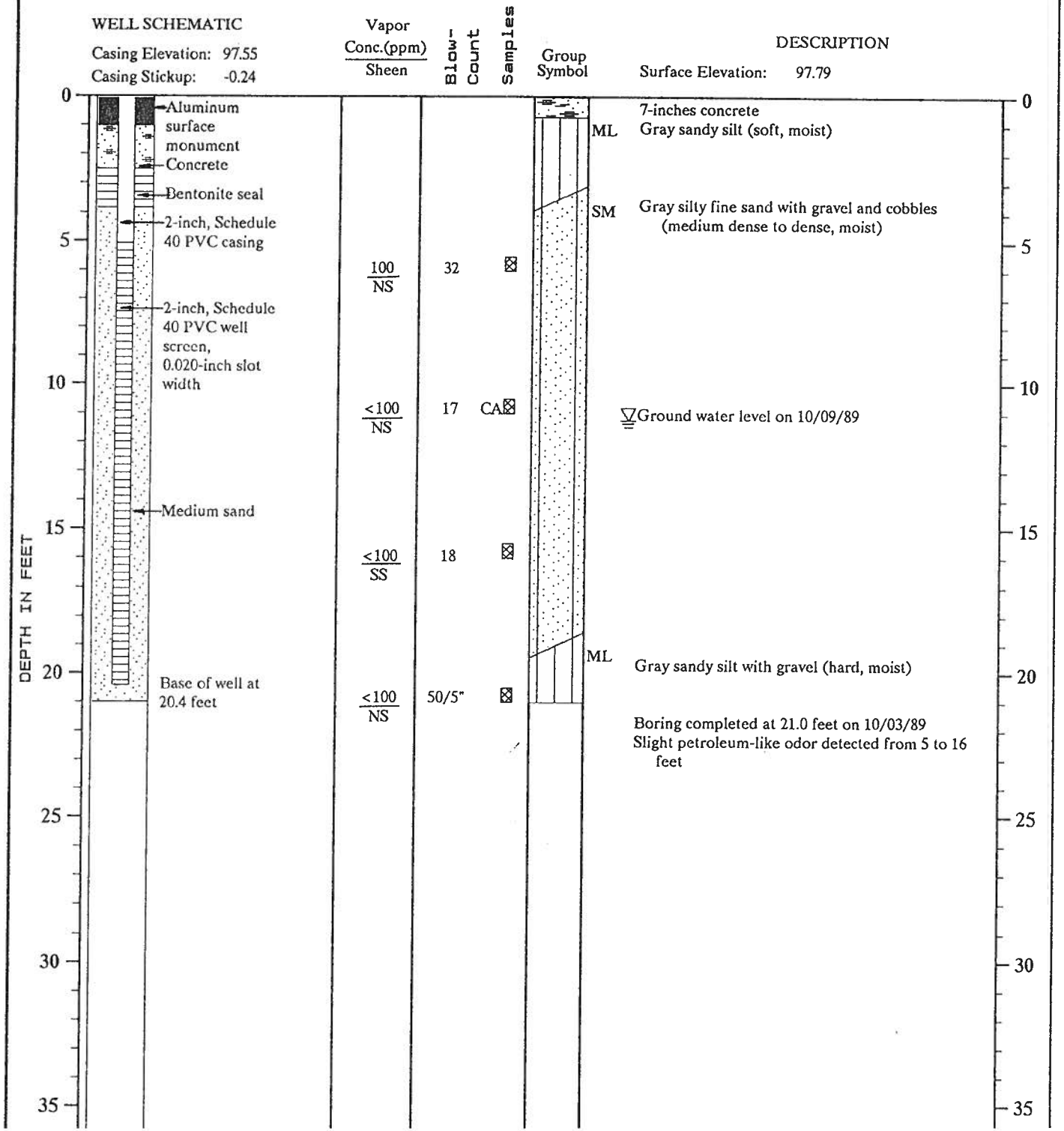
TEP:OKP:CDO 1/10/90

MONITOR WELL NO. MW-9



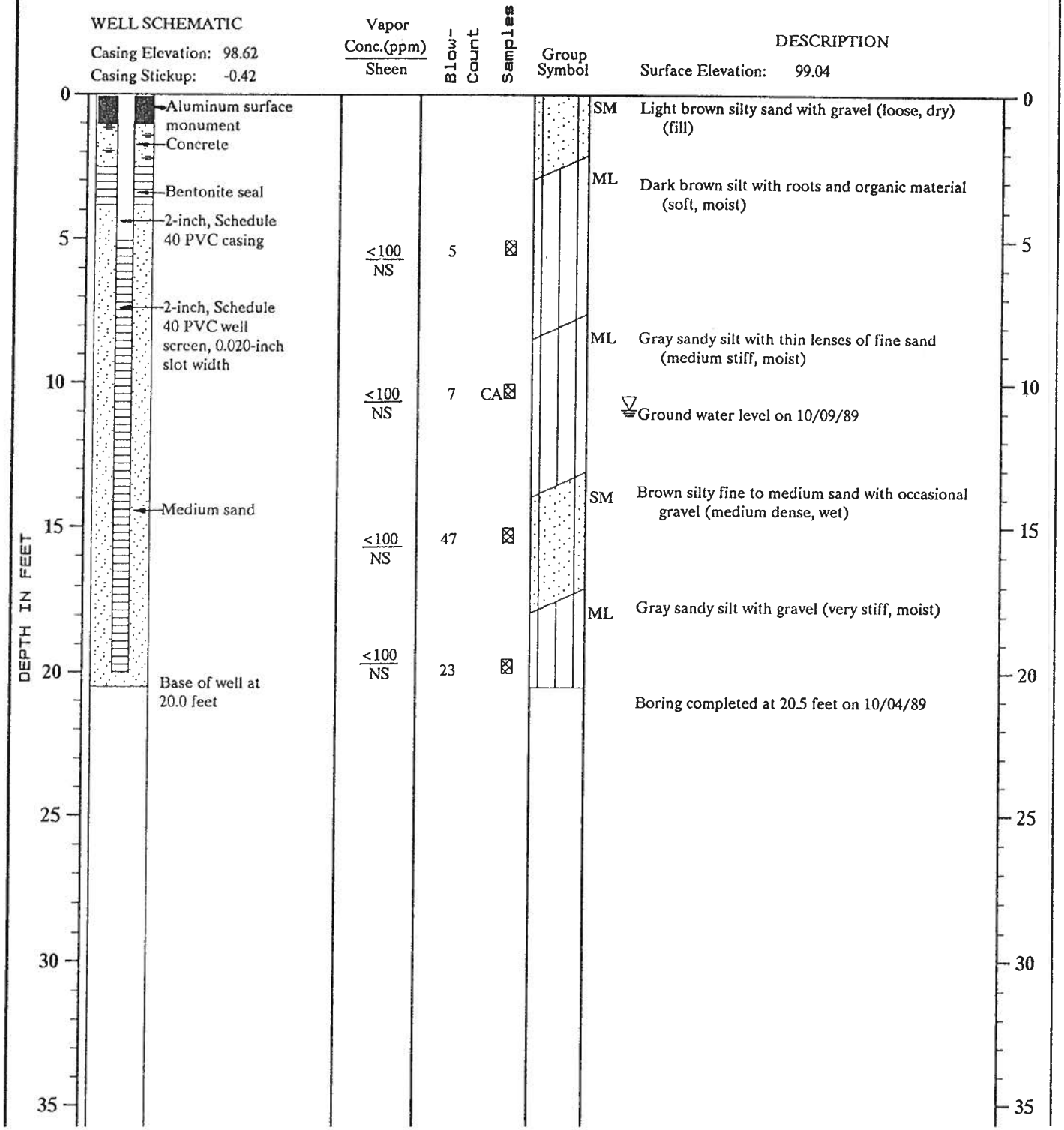
TEP:OKP:CDO 1/10/90

MONITOR WELL NO. MW-10



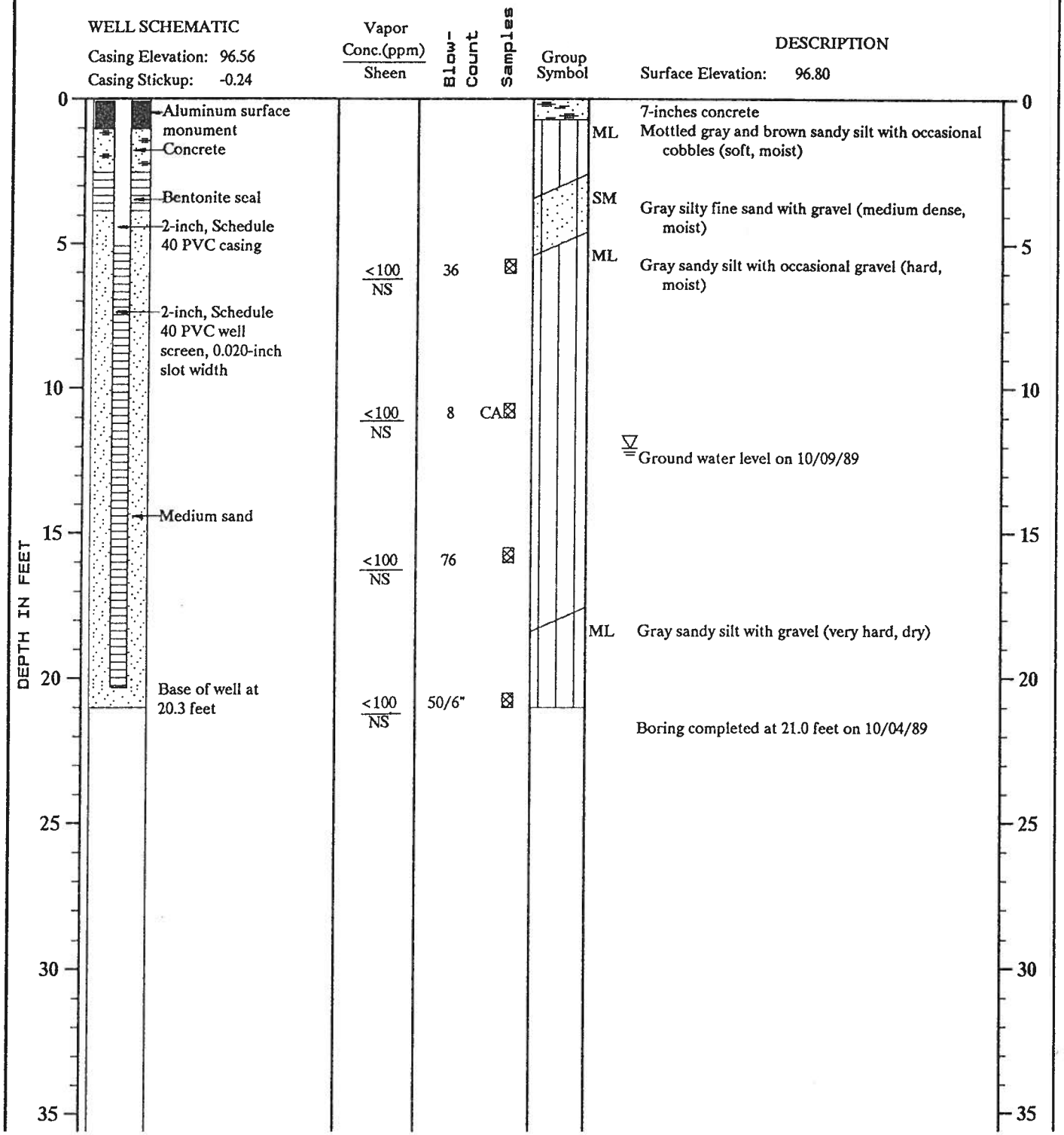
TEP:OKP:CDO 2/8/90

MONITOR WELL NO. MW-11



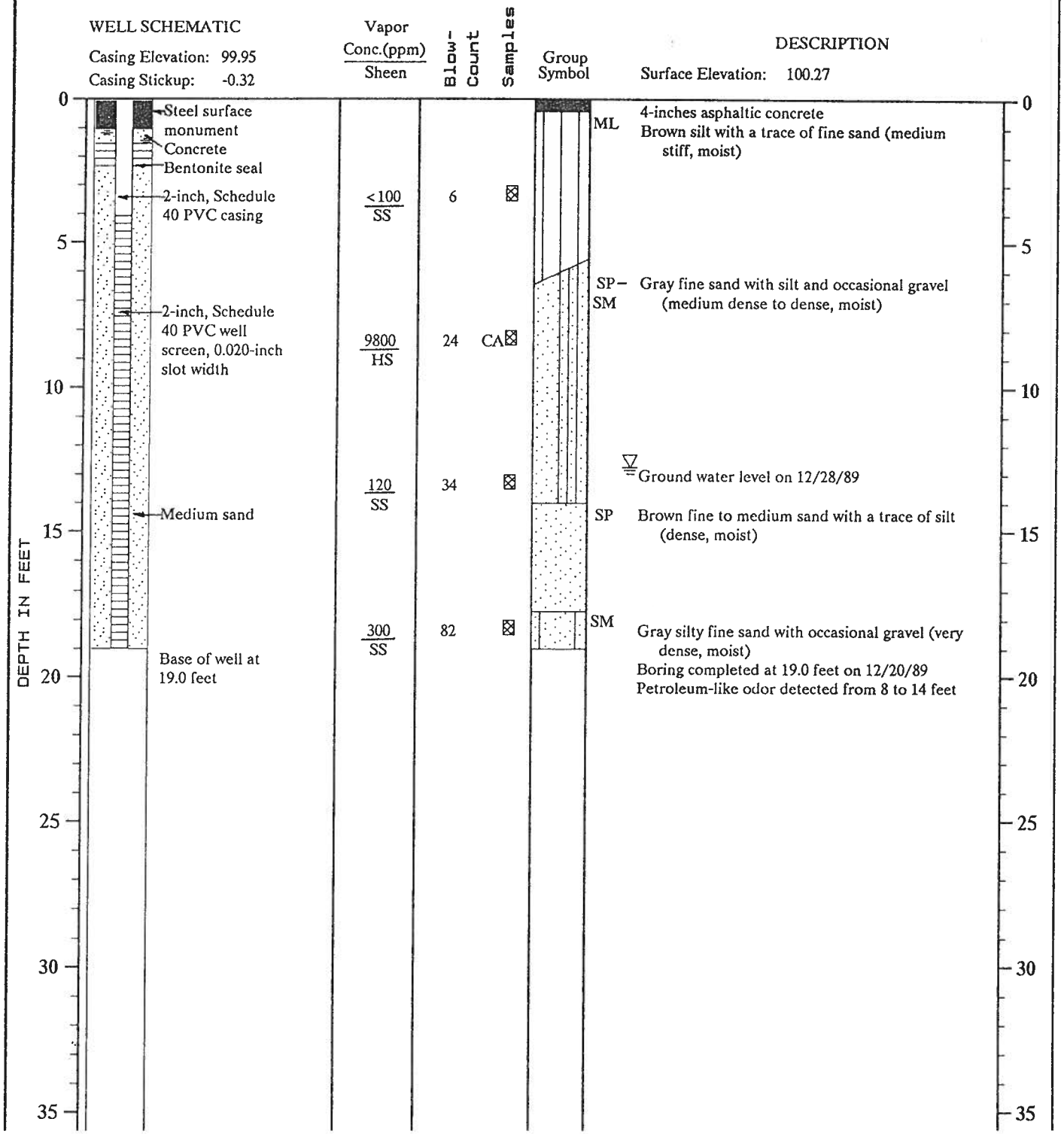
TEP:OKP:CDO 2/8/90

MONITOR WELL NO. MW-12



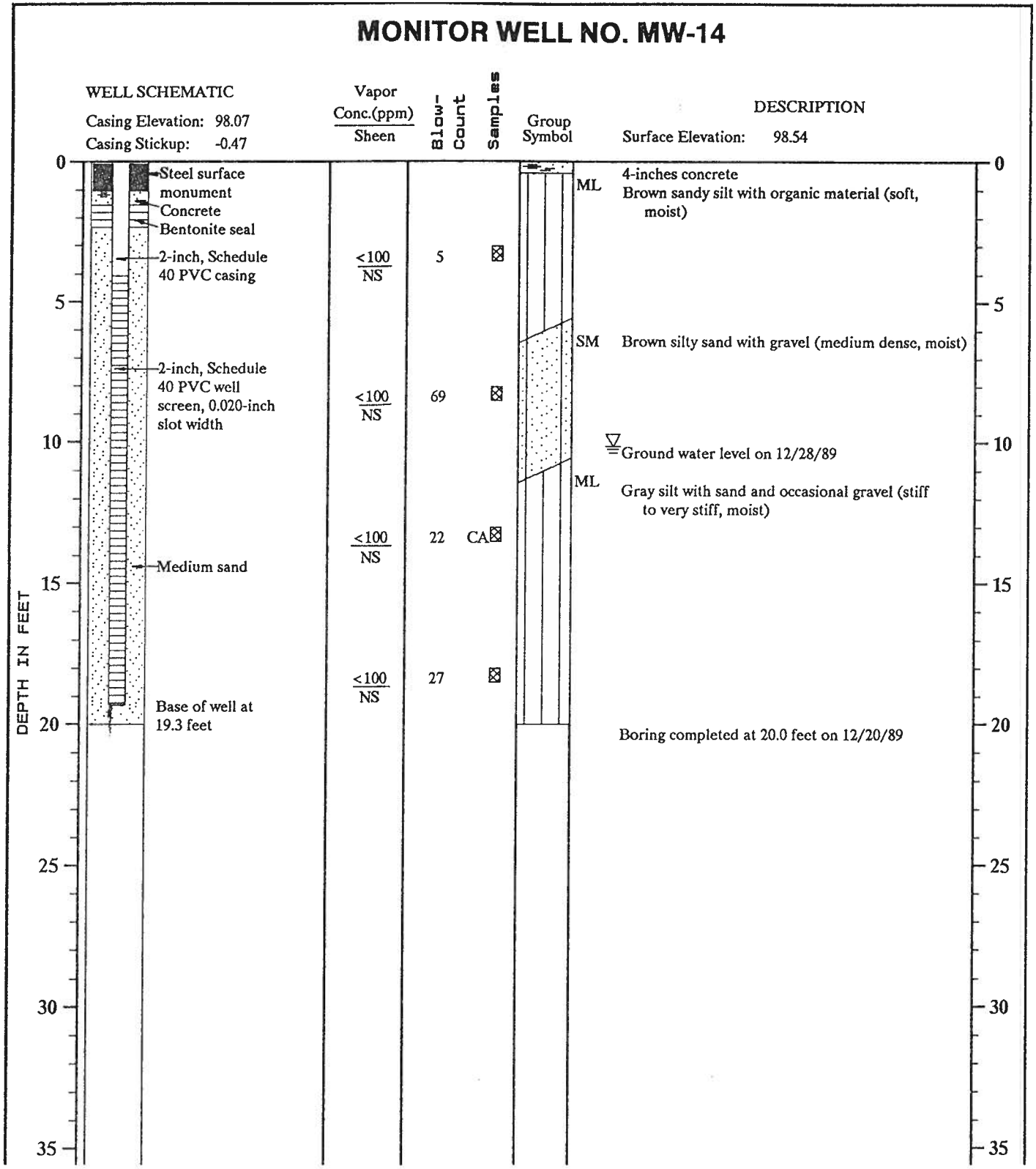
TEP:OKP:CDO 1/9/90

MONITOR WELL NO. MW-13



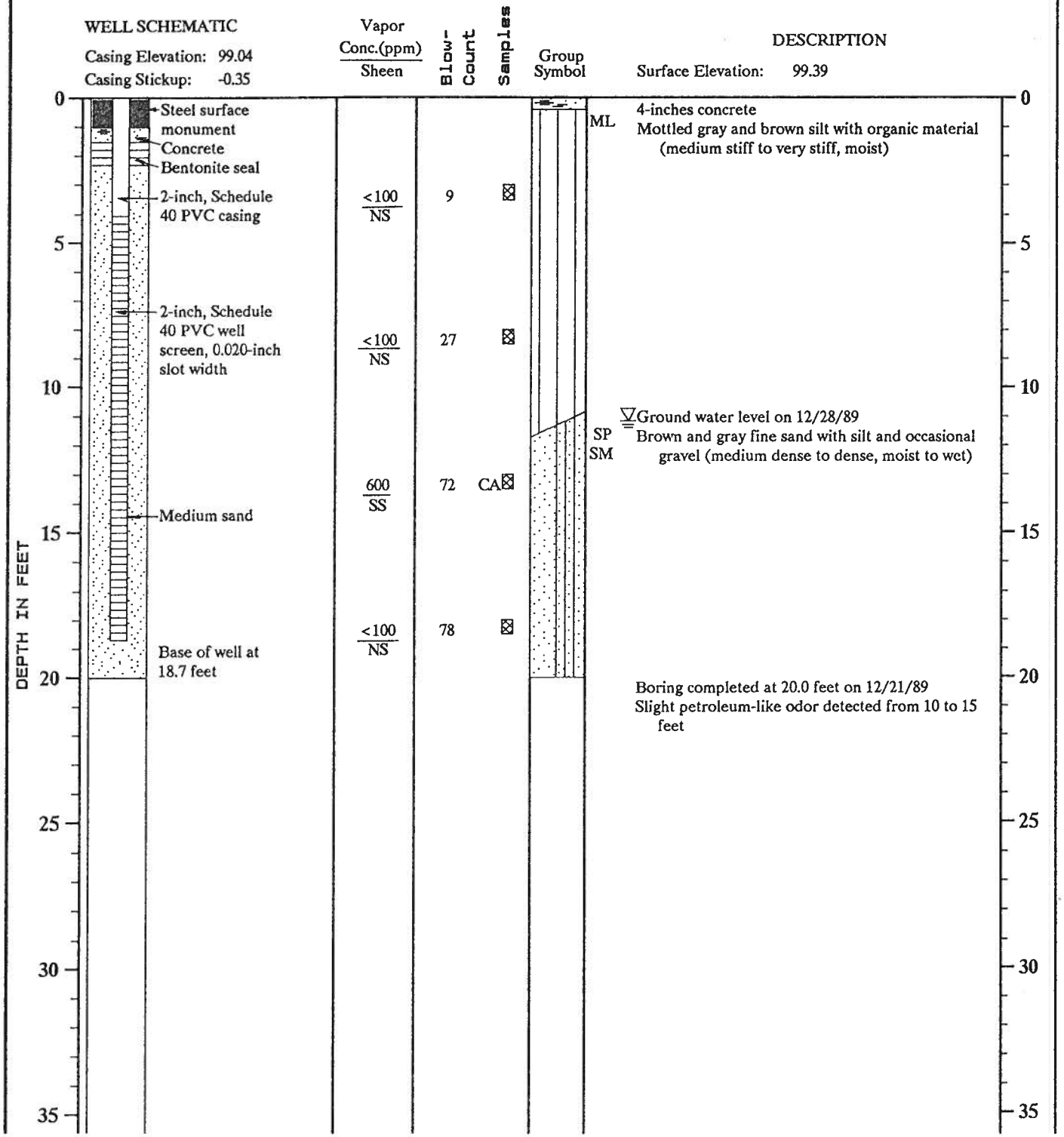
TEP:OKP:CDO 2/8/90

MONITOR WELL NO. MW-14



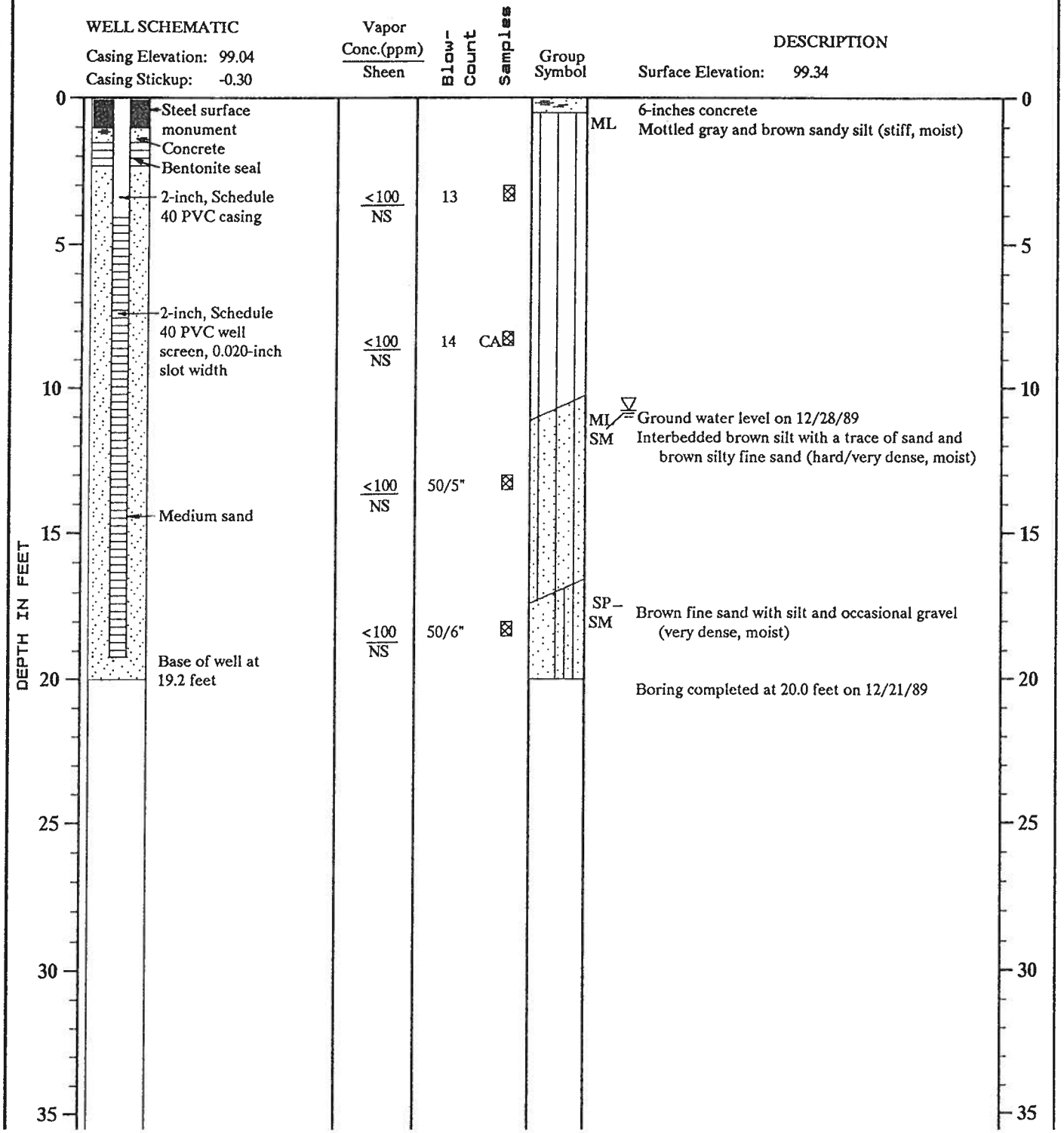
TEP:OKP:CDO 1/10/90

MONITOR WELL NO. MW-15



TEP:OKP:CDO 1/10/90

MONITOR WELL NO. MW-16



TEP:OKP:CDO 1/10/90

APPENDIX B

Chemical Analytical Data, Soil Samples Collected From Monitor Well Borings

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

ATI I.D. # 8909-070

October 2, 1989

GeoEngineers, Inc.
2405 140th Ave. N.E.
Suite 105
Bellevue, WA 98005

Attention : Otto Paris

Project Number : 1780-01-B04

Project Name : Circle K

On September 15, 1989 Analytical Technologies, Inc. received five soil samples and two 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.

Donna M. McKinney
Project Manager

Frederick W. Grothkopp
Technical Manager

ATI #	CLIENT DESCRIPTION	MATRIX	DATE SAMPLED
8909-070-1	MW-1	SOIL	09/11/89
8909-070-2	MW-2	SOIL	09/11/89
8909-070-3	MW-3	SOIL	09/12/89
8909-070-4	MW-4	SOIL	09/12/89
8909-070-5	MW-5	SOIL	09/12/89
8909-070-6	MW-1	WATER	09/13/89
8909-070-7	MW-5	WATER	09/13/89

----- TOTALS -----

MATRIX	# SAMPLES
SOIL	5
WATER	2

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.

Analytical Technologies, Inc.

ATI I.D. # 8909-070

ANALYTICAL SCHEDULE

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1780-01-B04
PROJECT NAME : CIRCLE K

ANALYSIS	TECHNIQUE	REFERENCE/METHOD
BETX	GC/PID	EPA 8020
PURGEABLE AROMATICS	GC/PID	EPA 8020
FUEL HYDROCARBONS	GC/FID	EPA 8015 MODIFIED
PETROLEUM HYDROCARBONS	IR	EPA 418.1
MOISTURE	GRAVIMETRIC	METHOD 7-2.2

[illegible] : REAGENT BLANK
SAMPLE MATRIX : SOIL
EPA METHOD : 8020

DATE ANALYZED : 09/19/89
UNITS : mg/Kg
DILUTION FACTOR : 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	<0.025
CHLOROBENZENE	<0.025
1,3-DICHLOROBENZENE	<0.025
1,2-DICHLOROBENZENE	<0.025
1,4-DICHLOROBENZENE	<0.025
ETHYLBENZENE	<0.025
TOLUENE	<0.025
META & PARA XYLENE	<0.025
ORTHO XYLENE	<0.025

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	96

Analytical Technologies, Inc.

ATI I.D. # 8909-070-1

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 09/11/89
PROJECT #	: 1780-01-B04	DATE RECEIVED	: 09/15/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 09/18/89
CLIENT I.D.	: MW-1	DATE ANALYZED	: 09/19/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8020	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	<0.025
CHLOROBENZENE	<0.025
1,3-DICHLOROBENZENE	<0.025
1,2-DICHLOROBENZENE	<0.025
1,4-DICHLOROBENZENE	<0.025
ETHYLBENZENE	<0.025
TOLUENE	<0.025
META & PARA XYLENE	<0.025
ORTHO XYLENE	<0.025

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	95

SAMPLE ID. : MW 2
SAMPLE MATRIX : SOIL
EPA METHOD : 8020

DATE ANALYZED : 09/19/89
UNITS : mg/Kg
DILUTION FACTOR : 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	<0.025
CHLOROBENZENE	<0.025
1,3-DICHLOROBENZENE	<0.025
1,2-DICHLOROBENZENE	<0.025
1,4-DICHLOROBENZENE	<0.025
ETHYLBENZENE	<0.025
TOLUENE	<0.025
META & PARA XYLENE	<0.025
ORTHO XYLENE	<0.025

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	87

Analytical Technologies, Inc.

ATI I.D. # 8909-070-3

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 09/12/89
PROJECT #	: 1780-01-B04	DATE RECEIVED	: 09/15/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 09/18/89
CLIENT I.D.	: MW-3	DATE ANALYZED	: 09/19/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8020	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	<0.025
CHLOROBENZENE	<0.025
1,3-DICHLOROBENZENE	<0.025
1,2-DICHLOROBENZENE	<0.025
1,4-DICHLOROBENZENE	<0.025
ETHYLBENZENE	0.057
TOLUENE	0.072
META & PARA XYLENE	0.20
ORTHO XYLENE	0.11

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	87

CLIENT I.D. : MW-4
SAMPLE MATRIX : SOIL
EPA METHOD : 8020

DATE ANALYZED : 09/19/89
UNITS : mg/Kg
DILUTION FACTOR : 20

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	<0.50
CHLOROBENZENE	<0.50
1,3-DICHLOROBENZENE	<0.50
1,2-DICHLOROBENZENE	<0.50
1,4-DICHLOROBENZENE	<0.50
ETHYLBENZENE	27
TOLUENE	27
META & PARA XYLENE	110
ORTHO XYLENE	49

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	**

** Due to the necessary dilution of the sample, result was not attainable.

Analytical Technologies, Inc.

ATI I.D. # 8909-070-5

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 09/12/89
PROJECT #	: 1780-01-B04	DATE RECEIVED	: 09/15/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 09/18/89
CLIENT I.D.	: MW-5	DATE ANALYZED	: 09/19/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8020	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	<0.025
CHLOROBENZENE	<0.025
1,3-DICHLOROBENZENE	<0.025
1,2-DICHLOROBENZENE	<0.025
1,4-DICHLOROBENZENE	<0.025
ETHYLBENZENE	<0.025
TOLUENE	<0.025
META & PARA XYLENE	<0.025
ORTHO XYLENE	<0.025

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	91

EPA METHOD : 8020 UNITS : mg/Kg

COMPOUND	SAMPLE RESULT	SPIKE ADDED	SPIKED SAMPLE	% REC	DUP SPIKED SAMPLE	DUP % REC	RPD
BENZENE	<0.025	0.400	0.420	105	0.409	102	3
CHLOROBENZENE	<0.025	0.400	0.430	108	0.404	101	6
TOLUENE	<0.025	0.400	0.435	109	0.414	104	5
META & PARA XYLENE	<0.025	1.10	1.18	107	1.13	103	4

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

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

Analytical Technologies, Inc.

ATI I.D. # 8909-070

FUEL HYDROCARBONS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: N/A
PROJECT #	: 1780-01-B04	DATE RECEIVED	: N/A
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 09/18/89
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 09/18/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 MODIFIED	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	DIESEL

CLIENT I.D. : MW-1
SAMPLE MATRIX : SOIL
EPA METHOD : 8015 MODIFIED

DATE ANALYZED : 09/19/89
UNITS : mg/Kg
DILUTION FACTOR : 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	DIESEL

Analytical Technologies, Inc.

ATI I.D. # 8909-070-2

FUEL HYDROCARBONS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 09/11/89
PROJECT #	: 1780-01-B04	DATE RECEIVED	: 09/15/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 09/18/89
CLIENT I.D.	: MW-2	DATE ANALYZED	: 09/19/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 MODIFIED	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	DIESEL

CLIENT I.D.	: MW-3	DATE ANALYZED	: 09/19/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 MODIFIED	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	9
HYDROCARBON RANGE	C6 - C14
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	DIESEL

Analytical Technologies, Inc.

ATI I.D. # 8909-070-4

FUEL HYDROCARBONS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 09/12/89
PROJECT #	: 1780-01-B04	DATE RECEIVED	: 09/15/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 09/18/89
CLIENT I.D.	: MW-4	DATE ANALYZED	: 09/19/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 MODIFIED	DILUTION FACTOR	: 4

COMPOUND	RESULT
FUEL HYDROCARBONS	1,200
HYDROCARBON RANGE	C6 - C14
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	<20
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	DIESEL

CLIENT I.D.	: MW-5	DATE ANALYZED	: 09/19/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 MODIFIED	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	DIESEL

Analytical Technologies, Inc.

ATI I.D. # 8909-070

FUEL HYDROCARBONS
QUALITY CONTROL DATA

CLIENT	: GEOENGINEERS, INC.	SAMPLE I.D.	: 8909-057-1
PROJECT #	: 1780-01-B04	DATE ANALYZED	: 09/18/89
PROJECT NAME	: CIRCLE K	SAMPLE MATRIX	: SOIL
EPA METHOD	: 8015 MODIFIED	UNITS	: mg/Kg

COMPOUND	SAMPLE RESULT	CONC SPIKED	SPIKED SAMPLE	% REC	DUP SPIKED SAMPLE	DUP % RECOVERY	RPD
FUEL HYDROCARBONS	219	500	616	79	651	86	6

PARAMETER	UNITS	-1	-2	-3	-4	-5
MOISTURE	%	7.8	9.4	6.2	13	9.6

Analytical Technologies, Inc.

ATI I.D. # 8909-070

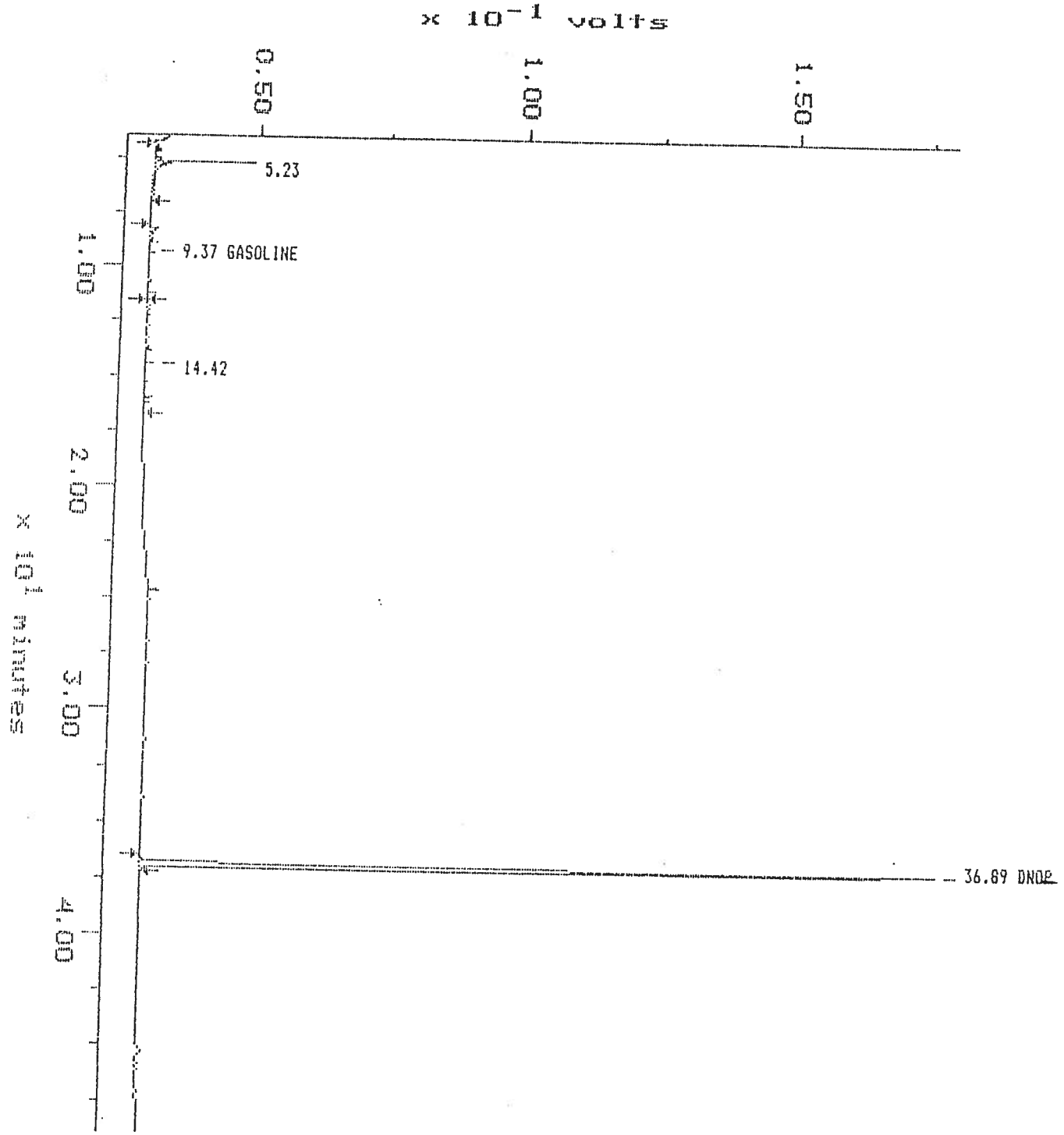
GENERAL CHEMISTRY QUALITY CONTROL

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1780-01-B04
PROJECT NAME : CIRCLE K

SAMPLE MATRIX : SOIL

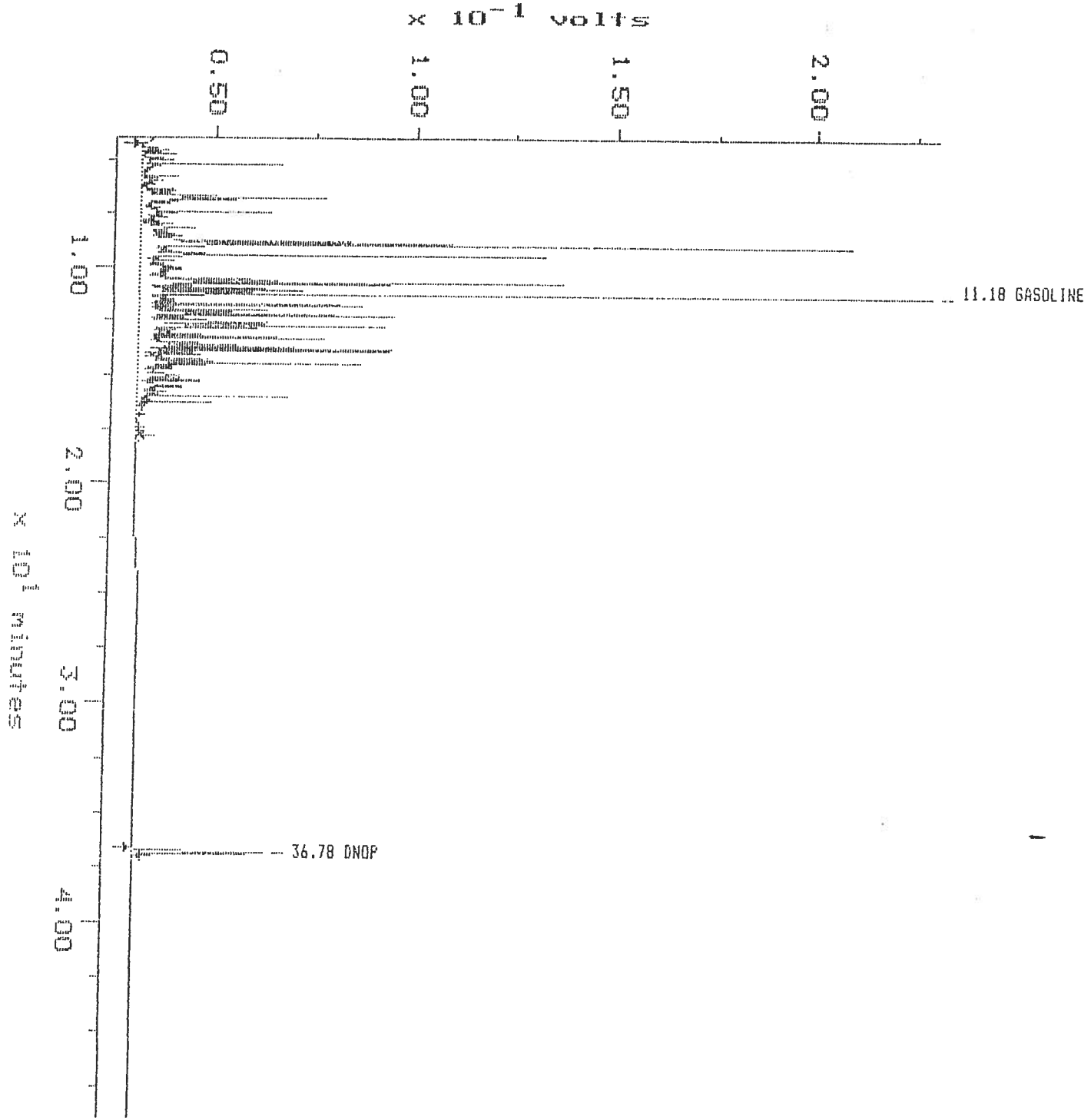
PARAMETER	UNITS	ATI I.D.	SAMPLE RESULT	DUP RESULT	RPD	SPIKED CONC	SPIKE ADDED	% REC
MOISTURE	%	8909-070-1	7.8	8.1	4	N/A	N/A	N/A

Comments: DIESEL AND BTEX PROGRAM FOR DIESEL/BTXE STDS, MS, MSD, FPB, FPBN



Sample: 38707-070-48.23 Channel: FID FRONT-A
Acquired: 19-SEP-89 9:43 Method: C:\MAX\DATA3\FAQBTX18
Dilution: 1 : 4.000
Comments: DIESEL AND BTEX PROGRAM FOR DIESEL/BTXE STDS, MS, MSD, FPB, FPBN

Filename: 9FF01483
Operator: RWM



s, Inc.
inton, WA 98055

Chain of Custody

DATE 9/13/89 PAGE 1 OF 1

Paris
Peers
2 Hall NE Suite 105
WA 98005
SAMPLED BY: TEP

LABORATORY NUMBER: 8909-070

AL INSTRUCTIONS

☐ Return ☐ Pickup (will call)

DATE	TIME	MATRIX	LAB ID
9/11/89	0915	Soil	-1
9/11/89	1220		-2
9/12/89	1400		-3
9/12/89	0900		-4
9/12/89	1115		-5
9/13/89		Water	-6
9/13/89		Water	-7

ANALYSIS REQUEST

	8010 Halogenated Volatiles	8020 Aromatic Volatiles	BETX ONLY	8240 GCMS Volatiles	8270 GCMS BNA	8310 HPLC PNA	8080 Pesticides & PCB's	PCB's ONLY	8140 Phosphate Pesticides	8150 Herbicides	WDOE PAH/HH (WAC 173)	418.1 (TPH)	413.2 Grease & Oil	8015 (Modified)	TOC 9060	TOX 9020	% Moisture	TCLP	Priority Pollutant Metals (13)	EPTOX Metals (8) Total	EP TOX Metals (8) EP EXT							NUMBER OF CONTAINERS
-1		✓												✓								(at 8.5)						1
-2		✓												✓								(at 8.5)						1
-3		✓												✓								(at 8.5)						1
-4		✓												✓								(at 8.5)						1
-5		✓												✓								(at 8.5)						1
-6			✓									✓																3
-7			✓									✓																3

B - 22

304

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS	11
CHAIN OF CUSTODY SEALS Y/N/NA	N
INTACT? Y/N/NA	Y
RECEIVED GOOD COND./COLD	Y

☐ 72 HRS ☐ 1 WK ☒ 2 WKS (Normal)

FOR RUSH DATA ✓

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Terry Parks Time: 1612	Signature: Time:	Signature: Time:
Printed Name: Terry Parks Date: 9/13/89	Printed Name: Date:	Printed Name: Date:
Company: GeoEngineers	Company:	Company:
RECEIVED BY: 1.	**RECEIVED BY: 2.**	**RECEIVED BY: (LAB) 3.**
Signature: Time: 1612	Signature: Time:	Signature: Wayne L. Barkley Time: 5:24
Printed Name: Date: ISRAEL DOMINGUEZ	Printed Name: Date:	Printed Name: DAVID A. BARNEY Date: 9/15
Company: ATI	Company:	Analytical Technologies, Inc.

enix (602)438-1530 • Seattle (206)228-8335 • Pensacola (904)474-1001 DISTRIBUTION: White, Canary - ANALYTICAL TECHNOLOGIES, INC.• Pink - ORIGINATOR

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

ATI I.D. # 8910-045

GeoEngineers

NOV 2 1989

Routing

File

November 1, 1989

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

Attention : Otto Paris

Project Number : 1780-01-B04

Project Name : Circle K

On October 6, 1989 Analytical Technologies, Inc. received one air sample and eight soil 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.

Karen L. Mixon
Project Manager

Frederick W. Grothkopp
Technical Manager

ATI #	CLIENT DESCRIPTION	MATRIX	DATE SAMPLED
8910-045-1	S-1	AIR	10/06/89
8910-045-2	MW-6 @ 10'	SOIL	10/02/89
8910-045-3	MW-6 @ 8'	SOIL	10/02/89
8910-045-4	MW-7 @ 10'	SOIL	10/02/89
8910-045-5	MW-8 @ 10'	SOIL	10/03/89
8910-045-6	MW-9 @ 10'	SOIL	10/03/89
8910-045-7	MW-10 @ 10'	SOIL	10/03/89
8910-045-8	MW-11 @ 11'	SOIL	10/04/89
8910-045-9	MW-12 @ 10'	SOIL	10/04/89

----- TOTALS -----

MATRIX	# SAMPLES
AIR	1
SOIL	8

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.

Analytical Technologies, Inc.

ATI I.D. # 8910-045

ANALYTICAL SCHEDULE

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1780-01-B04
PROJECT NAME : CIRCLE K

ANALYSIS	TECHNIQUE	REFERENCE/METHOD
BETX	GC/PID	EPA 8020 MODIFIED
PURGEABLE AROMATICS	GC/PID	EPA 8020
FUEL HYDROCARBONS	GC/FID	EPA 8015 MODIFIED
MOISTURE	GRAVIMETRIC	METHOD 7-2.2

Analytical Technologies, Inc.

ATI I.D. # 8910-045

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: N/A
PROJECT #	: 1780-01-B04	DATE RECEIVED	: N/A
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 10/09/89
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 10/16/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8020	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	<0.025
CHLOROBENZENE	<0.025
1,2-DICHLOROBENZENE	<0.025
1,3-DICHLOROBENZENE	<0.025
1,4-DICHLOROBENZENE	<0.025
ETHYLBENZENE	<0.025
TOLUENE	<0.025
META & PARA XYLENE	<0.025
ORTHO XYLENE	<0.025

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	80

Analytical Technologies, Inc.

ATI I.D. # 8910-045-2

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 10/02/89
PROJECT #	: 1780-01-B04	DATE RECEIVED	: 10/06/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 10/09/89
CLIENT I.D.	: MW-6 @ 10'	DATE ANALYZED	: 10/16/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8020	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	<0.025
CHLOROBENZENE	<0.025
1,2-DICHLOROBENZENE	<0.025
1,3-DICHLOROBENZENE	<0.025
1,4-DICHLOROBENZENE	<0.025
ETHYLBENZENE	<0.025
TOLUENE	<0.025
META & PARA XYLENE	<0.025
ORTHO XYLENE	<0.025

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	94

PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 10/09/89
CLIENT I.D.	: MW-6 @ 8'	DATE ANALYZED	: 10/13/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8020	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	<0.025
CHLOROBENZENE	<0.025
1,2-DICHLOROBENZENE	<0.025
1,3-DICHLOROBENZENE	<0.025
1,4-DICHLOROBENZENE	<0.025
ETHYLBENZENE	<0.025
TOLUENE	<0.025
META & PARA XYLENE	<0.025
ORTHO XYLENE	<0.025

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	72

Analytical Technologies, Inc.

ATI I.D. # 8910-045-4

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 10/02/89
PROJECT #	: 1780-01-BO4	DATE RECEIVED	: 10/06/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 10/09/89
CLIENT I.D.	: MW-7 @ 10'	DATE ANALYZED	: 10/16/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8020	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	<0.025
CHLOROBENZENE	<0.025
1,2-DICHLOROBENZENE	<0.025
1,3-DICHLOROBENZENE	<0.025
1,4-DICHLOROBENZENE	<0.025
ETHYLBENZENE	0.029
TOLUENE	0.10
META & PARA XYLENE	0.11
ORTHO XYLENE	0.065

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	87

PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 10/09/89
CLIENT I.D.	: MW-8 @ 10'	DATE ANALYZED	: 10/16/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8020	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	<0.025
CHLOROBENZENE	<0.025
1,2-DICHLOROBENZENE	<0.025
1,3-DICHLOROBENZENE	<0.025
1,4-DICHLOROBENZENE	<0.025
ETHYLBENZENE	<0.025
TOLUENE	<0.025
META & PARA XYLENE	<0.025
ORTHO XYLENE	<0.025

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	85

Analytical Technologies, Inc.

ATI I.D. # 8910-045-6

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 10/03/89
PROJECT #	: 1780-01-BO4	DATE RECEIVED	: 10/06/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 10/09/89
CLIENT I.D.	: MW-9 @ 10'	DATE ANALYZED	: 10/16/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8020	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	<0.025
CHLOROBENZENE	<0.025
1,2-DICHLOROBENZENE	<0.025
1,3-DICHLOROBENZENE	<0.025
1,4-DICHLOROBENZENE	<0.025
ETHYLBENZENE	<0.025
TOLUENE	<0.025
META & PARA XYLENE	<0.025
ORTHO XYLENE	<0.025

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	88

PROJECT NAME : CIRCLE K
CLIENT I.D. : MW-10 @ 10'
SAMPLE MATRIX : SOIL
EPA METHOD : 8020

DATE EXTRACTED : 10/09/89
DATE ANALYZED : 10/16/89
UNITS : mg/Kg
DILUTION FACTOR : 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	<0.025
CHLOROBENZENE	<0.025
1,2-DICHLOROBENZENE	<0.025
1,3-DICHLOROBENZENE	<0.025
1,4-DICHLOROBENZENE	<0.025
ETHYLBENZENE	<0.025
TOLUENE	<0.025
META & PARA XYLENE	<0.025
ORTHO XYLENE	<0.025

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	83

Analytical Technologies, Inc.

ATI I.D. # 8910-045-8

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 10/04/89
PROJECT #	: 1780-01-B04	DATE RECEIVED	: 10/06/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 10/09/89
CLIENT I.D.	: MW-11 @ 11'	DATE ANALYZED	: 10/16/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8020	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	<0.025
CHLOROBENZENE	<0.025
1,2-DICHLOROBENZENE	<0.025
1,3-DICHLOROBENZENE	<0.025
1,4-DICHLOROBENZENE	<0.025
ETHYLBENZENE	<0.025
TOLUENE	<0.025
META & PARA XYLENE	<0.025
ORTHO XYLENE	<0.025

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	72

PROJECT NAME : CIRCLE K
CLIENT I.D. : MW-12 @ 10'
SAMPLE MATRIX : SOIL
EPA METHOD : 8020

DATE EXTRACTED : 10/09/89
DATE ANALYZED : 10/16/89
UNITS : mg/Kg
DILUTION FACTOR : 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	<0.025
CHLOROBENZENE	<0.025
1,2-DICHLOROBENZENE	<0.025
1,3-DICHLOROBENZENE	<0.025
1,4-DICHLOROBENZENE	<0.025
ETHYLBENZENE	<0.025
TOLUENE	<0.025
META & PARA XYLENE	<0.025
ORTHO XYLENE	<0.025

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	82

Analytical Technologies, Inc.

ATI I.D. # 8910-045

PURGEABLE AROMATICS
QUALITY CONTROL DATA

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1780-01-BO4
PROJECT NAME : CIRCLE K
EPA METHOD : 8020

SAMPLE I.D. : BLANK 9/27
DATE ANALYZED : 10/11/89
SAMPLE MATRIX : SOIL
UNITS : mg/Kg

COMPOUND	SAMPLE RESULT	SPIKE ADDED	SPIKED SAMPLE	% REC	DUP SPIKED SAMPLE	DUP % REC	RPD
BENZENE	<0.025	0.400	0.334	84	N/A	N/A	N/A
CHLOROBENZENE	<0.025	0.400	0.358	90	N/A	N/A	N/A
TOLUENE	<0.025	0.400	0.294	74	N/A	N/A	N/A
META & PARA XYLENE	<0.025	1.10	0.890	81	N/A	N/A	N/A

PROJECT NAME : CIRCLE K
EPA METHOD : 8020

SAMPLE MATRIX : SOIL
UNITS : mg/Kg

COMPOUND	SAMPLE RESULT	SPIKE ADDED	SPIKED SAMPLE	% REC	DUP SPIKED SAMPLE	DUP % REC	RPD
BENZENE	<0.025	0.400	0.424	106	0.465	116	9
CHLOROBENZENE	<0.025	0.400	0.393	98	0.385	96	2
TOLUENE	<0.025	0.400	0.385	96	0.399	100	4
META & PARA XYLENE	<0.025	1.10	1.11	101	1.15	104	4

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

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

Analytical Technologies, Inc.

ATI I.D. # 8910-045

FUEL HYDROCARBONS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: N/A
PROJECT #	: 1780-01-BO4	DATE RECEIVED	: N/A
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 10/09/89
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 10/10/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 MODIFIED	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	DIESEL

PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 10/09/89
CLIENT I.D.	: MW-6 @ 10'	DATE ANALYZED	: 10/11/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 MODIFIED	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	DIESEL

Analytical Technologies, Inc.

ATI I.D. # 8910-045-3

FUEL HYDROCARBONS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 10/02/89
PROJECT #	: 1780-01-B04	DATE RECEIVED	: 10/06/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 10/09/89
CLIENT I.D.	: MW-6 @ 8'	DATE ANALYZED	: 10/11/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 MODIFIED	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	DIESEL

PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 10/09/89
CLIENT I.D.	: MW-7 @ 10'	DATE ANALYZED	: 10/11/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 MODIFIED	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	DIESEL

Analytical Technologies, Inc.

ATI I.D. # 8910-045-5

FUEL HYDROCARBONS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 10/03/89
PROJECT #	: 1780-01-BO4	DATE RECEIVED	: 10/06/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 10/09/89
CLIENT I.D.	: MW-8 @ 10'	DATE ANALYZED	: 10/11/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 MODIFIED	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	DIESEL

PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 10/09/89
CLIENT I.D.	: MW-9 @ 10'	DATE ANALYZED	: 10/10/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 MODIFIED	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	DIESEL

Analytical Technologies, Inc.

ATI I.D. # 8910-045-7

FUEL HYDROCARBONS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 10/03/89
PROJECT #	: 1780-01-B04	DATE RECEIVED	: 10/06/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 10/09/89
CLIENT I.D.	: MW-10 @ 10'	DATE ANALYZED	: 10/11/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 MODIFIED	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	DIESEL

PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 10/09/89
CLIENT I.D.	: MW-11 @ 11'	DATE ANALYZED	: 10/11/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 MODIFIED	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	DIESEL

Analytical Technologies, Inc.

ATI I.D. # 8910-045-9

FUEL HYDROCARBONS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 10/04/89
PROJECT #	: 1780-01-B04	DATE RECEIVED	: 10/06/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 10/09/89
CLIENT I.D.	: MW-12 @ 10'	DATE ANALYZED	: 10/11/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 MODIFIED	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	DIESEL

PROJECT NAME : CIRCLE K
EPA METHOD : 8015 MODIFIED

SAMPLE MATRIX : SOIL
UNITS : mg/Kg

COMPOUND	SAMPLE RESULT	CONC SPIKED	SPIKED SAMPLE	% REC	DUP SPIKED SAMPLE	DUP % RECOVERY	RPD
FUEL HYDROCARBONS	<5	500	452	90	467	93	3

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

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

Analytical Technologies, Inc.

ATI I.D. # 8910-045

FUEL HYDROCARBONS
QUALITY CONTROL DATA

CLIENT	: GEOENGINEERS, INC.	SAMPLE I.D.	: 8910-031-1
PROJECT #	: 1780-01-B04	DATE ANALYZED	: 10/10/89
PROJECT NAME	: CIRCLE K	SAMPLE MATRIX	: SOIL
EPA METHOD	: 8015 MODIFIED	UNITS	: mg/Kg

COMPOUND	SAMPLE RESULT	CONC SPIKED	SPIKED SAMPLE	% REC	DUP SPIKED SAMPLE	DUP % RECOVERY	RPD
FUEL HYDROCARBONS	6	500	455	91	449	89	1

ATI I.D. #	CLIENT I.D.	% MOISTURE
8910-045-2	MW-6 @ 10'	14
8910-045-3	MW-6 @ 8'	11
8910-045-4	MW-7 @ 10'	10
8910-045-5	MW-8 @ 10'	20
8910-045-6	MW-9 @ 10'	9.4
8910-045-7	MW-10 @ 10'	12
8910-045-8	MW-11 @ 11'	27
8910-045-9	MW-12 @ 10'	12

Analytical Technologies, Inc.

ATI I.D. # 8910-04

GENERAL CHEMISTRY QUALITY CONTROL

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1780-01-B04
PROJECT NAME : CIRCLE K

SAMPLE MATRIX : SOIL

PARAMETER	UNITS	ATI I.D.	SAMPLE RESULT	DUP RESULT	RPD	SPIKED CONC	SPIKE ADDED	% RE
MOISTURE	%	8910-045-6	9.4	9.4	0	N/A	N/A	N/

AnalyticalTechnologies, Inc.
560 Naches Avenue SW, Suite 101 Renton, WA 98055

Chain of Custody

PROJECT MANAGER: Otto Paris
COMPANY: Geo Engineers
ADDRESS: 2405 140th Ave NE
Bellevue, WA 98005
PHONE: 746-5200 SAMPLED BY: Terry Parks

LABORATORY NUMBER: 8910-645

SAMPLE DISPOSAL INSTRUCTIONS

☐ ATI Disposal @ $5.00 each ☐ Return ☐ Pickup (will call)

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	8010 Halogenated Volatiles	8020 Aromatic Volatiles	BETX ONLY	8240 GCMS Volatiles	8270 GCMS BNA	8310 HPLC PNA	8080 Pesticides & PCB's	PCB's ONLY	8140 Phosphate Pesticides	8150 Herbicides	WDOE PAH/HH (WAC 173)	418.1 (TPH)	413.2 Grease & Oil	8015 (Modified)	TOC 9060	TOX 9020	% Moisture	TCLP	Priority Pollutant Metals (12)
S-1	10/6/89	0735	Air	-1			X																
MW-6 @ 10'	10/2/89	1045	Soil	-2		X												X					
MW-6 @ 8'	10/2/89	1080	Soil	-3		X												X					
MW-7 @ 10'	10/2/89	1415	Soil	-4		X												X					
MW 8 @ 10'	10/3/89	0841	Soil	-5		X												X					
MW 9 @ 10'	10/3/89	1023	Soil	-6		X												X					
MW 10 @ 10'	10/3/89	1250	Soil	-7		X												X					
MW 11 @ 11'	10/4/89	1040	Soil	-8		X												X					
MW 12 @ 10'	10/4/89	1225	Soil	-9		X												X					

B-150

PROJECT INFORMATION	
PROJECT NUMBER:	1760-01-B04
PROJECT NAME:	Circle K
PURCHASE ORDER NUMBER:	
VIA:	

SAMPLE RECEIPT	
TOTAL NUMBER OF CONTAINERS	Y
CHAIN OF CUSTODY SEALS Y/N/NA	N
INTACT? Y/N/NA	Y
RECEIVED GOOD COND./COLD	Y

TAT: ☐ 24HR ☐ 48 HRS ☐ 72 HRS ☐ 1 WK ☐ 2 WKS (Normal)

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH DATA

SPECIAL INSTRUCTIONS: Rush on air

RELINQUISHED BY: 1.	RELINQUISHED BY:
Signature: Terry Parks Time: 1551	Signature:
Printed Name: Terry Parks Date: 10/6/89	Printed Name:
Company: Geo Engineers	Company:
RECEIVED BY: 1.	**RECEIVED BY:**
Signature: Dianne Thomas Time: 351	Signature:
Printed Name: DIANNE THOMAS Date: 10/6/89	Printed Name:
Company: ATL	Company:

ATI Labs: San Diego (619)458-9141 • Phoenix (602)438-1530 • Seattle (206)228-8335 • Pensacola (904)474-1001 DISTRIBUTION: White, Canary - ANALYTICAL T

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

ATI I.D. # 8912-075

GeoEngineers

JAN 19 1989

Routing OKP

File

January 18, 1990

GeoEngineers, Inc.
2405 140th Avenue N.E.
Bellevue, WA 98005

Attention : Otto Paris

Project Number : 1780-001-B04

Project Name : Circle K

On December 22, 1989 Analytical Technologies, Inc. received four water samples and five soil 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.

Karen L. Mixon
Project Manager

Frederick W. Grothkopp
Technical Manager

SAMPLE CROSS REFERENCE SHEET

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1780-001-B04
PROJECT NAME : CIRCLE K

ATI #	CLIENT DESCRIPTION	DATE SAMPLED	MATRIX
8912-075-1	MW-14	12/21/89	WATER
8912-075-2	MW-15	12/21/89	WATER
8912-075-3	MW-13	12/21/89	WATER
8912-075-4	MW-16	12/21/89	WATER
8912-075-5	MW-13 @ 8.0'	12/20/89	SOIL
8912-075-6	MW-14 @ 13.0'	12/20/89	SOIL
8912-075-7	MW-15 @ 8.0'	12/21/89	SOIL
8912-075-8	MW-15 @ 13.0'	12/21/89	SOIL
8912-075-9	MW-16 @ 8.0'	12/21/89	SOIL

----- TOTALS -----

MATRIX	# SAMPLES
WATER	4
SOIL	5

ANALYTICAL SCHEDULE

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1780-001-B04
PROJECT NAME : CIRCLE K

ANALYSIS	TECHNIQUE	REFERENCE/METHOD
BETX	GC/PID	EPA 8020
FUEL HYDROCARBONS	GC/FID	EPA 8015 MODIFIED
MOISTURE	GRAVIMETRIC	METHOD 7-2.2

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: N/A
PROJECT #	: 1780-001-B04	DATE RECEIVED	: N/A
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 12/27/89
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 01/04/90
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	<0.025
ETHYLBENZENE	<0.025
TOLUENE	<0.025
TOTAL XYLENES	<0.025

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	93

EPA METHOD : 8020 (BETX)

DILUTION FACTOR : 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	0.46
ETHYLBENZENE	0.22
TOLUENE	1.1
TOTAL XYLENES	1.2

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	100

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 12/20/89
PROJECT #	: 1780-001-B04	DATE RECEIVED	: 12/22/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 12/27/89
CLIENT I.D.	: MW-14 @ 13.0'	DATE ANALYZED	: 01/03/90
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	<0.025
ETHYLBENZENE	<0.025
TOLUENE	<0.025
TOTAL XYLENES	<0.025

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	92

EPA METHOD : 8020 (BETX) DILUTION FACTOR : 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	<0.036
ETHYLBENZENE	<0.036
TOLUENE	<0.036
TOTAL XYLENES	<0.036

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	81

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 12/21/89
PROJECT #	: 1780-001-B04	DATE RECEIVED	: 12/22/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 12/27/89
CLIENT I.D.	: MW-15 @ 13.0'	DATE ANALYZED	: 01/04/90
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	0.51
ETHYLBENZENE	0.090
TOLUENE	0.84
TOTAL XYLENES	0.51

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	85

EPA METHOD : 8020 (BETX) DILUTION FACTOR : 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	<0.025
ETHYLBENZENE	<0.025
TOLUENE	0.063
TOTAL XYLENES	<0.025

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	80

PURGEABLE AROMATICS
QUALITY CONTROL DATA

CLIENT	: GEOENGINEERS, INC.	SAMPLE I.D.	: 8912-066-4
PROJECT #	: 1780-001-B04	DATE EXTRACTED	: 12/22/89
PROJECT NAME	: CIRCLE K	DATE ANALYZED	: 01/02/90
EPA METHOD	: 8020 (BETX)	MATRIX	: SOIL
		UNITS	: mg/Kg

COMPOUND	SAMPLE RESULT	SPIKE ADDED	SPIKED SAMPLE	% REC	DUP SPIKED SAMPLE	DUP % REC	RPD
BENZENE	<0.025	0.400	0.314	78	0.330	82	5
TOLUENE	0.082	0.400	0.310	57	0.333	63	7
TOTAL XYLENES	0.397	0.831	0.691	35*	0.942	69	30*

* Out of limits due to matrix interference.

SAMPLE MATRIX : SOIL
EPA METHOD : 8015 MODIFIED

UNITS : mg/Kg
DILUTION FACTOR : 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	DIESEL

ATI I.D. # 8912-075-5

FUEL HYDROCARBONS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 12/20/89
PROJECT #	: 1780-001-B04	DATE RECEIVED	: 12/22/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 12/28/89
CLIENT I.D.	: MW-13 @ 8.0'	DATE ANALYZED	: 12/30/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 MODIFIED	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	DIESEL

EPA METHOD : 8015 MODIFIED

UNITS : mg/Kg
DILUTION FACTOR : 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	DIESEL

ATI I.D. # 8912-075-7

FUEL HYDROCARBONS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 12/21/89
PROJECT #	: 1780-001-B04	DATE RECEIVED	: 12/22/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 12/28/89
CLIENT I.D.	: MW-15 @ 8.0'	DATE ANALYZED	: 12/30/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 MODIFIED	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	DIESEL

EPA METHOD : 8015 MODIFIED DILUTION FACTOR : 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	DIESEL

FUEL HYDROCARBONS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 12/21/89
PROJECT #	: 1780-001-B04	DATE RECEIVED	: 12/22/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 12/28/89
CLIENT I.D.	: MW-16 @ 8.0'	DATE ANALYZED	: 12/30/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 MODIFIED	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	DIESEL

COMPOUND	SAMPLE RESULT	CONC SPIKED	SPIKED SAMPLE	% REC	DUP SPIKED SAMPLE	DUP % RECOVERY	RPD
FUEL HYDROCARBONS	<5	500	475	95	467	93	2

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

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

GENERAL CHEMISTRY RESULTS

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1780-001-B04
PROJECT NAME : CIRCLE K

SAMPLE MATRIX : SOIL
UNITS : %

ATI I.D. #	CLIENT I.D.	MOISTURE
8912-075-5	MW-13 @ 8.0'	9.9
8912-075-6	MW-14 @ 13.0'	9.6
8912-075-7	MW-15 @ 8.0'	31
8912-075-8	MW-15 @ 13.0'	18
8912-075-9	MW-16 @ 8.0'	28

PARAMETER	UNITS	I.D.	RESULT	RESULT	RPD	CONC	ADDED	REC
MOISTURE	%	8912-082-5	11	13	17	N/A	N/A	N/A
MOISTURE	%	8912-082-9	10	11	10	N/A	N/A	N/A

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

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

es, Inc.
Renton, WA 98055

Chain of Custody

8912-075

DATE 12-21-89 PAGE 1 OF 1

Paris
[illegible]
7th Ave NE, Suite 105
WA 98005
SAMPLED BY: JGR

LABORATORY NUMBER:

OSAL INSTRUCTIONS

☐ Return ☐ Pickup (will call)

ANALYSIS REQUEST

DATE	TIME	MATRIX	LAB ID	8010 Halogenated Volatiles	8020 Aromatic Volatiles	BETX ONLY	8240 GCMS Volatiles	8270 GCMS BNA	8310 HPLC PNA	8080 Pesticides & PCB's	PCB's ONLY	8140 Phosphate Pesticides	8150 Herbicides	WDOE PAH/HH (WAC 173)	418.1 (TPH)	413.2 Grease & Oil	8015 (Modified)	TOC 9060	TOX 9020	% Moisture	TCLP	Priority Pollutant Metals (13)	EPTOX Metals (8) Total	EP TOX Metals (8) EP EXT	NUMBER OF CONTAINERS
12-20-89	0850	Soil	-5			X											X								1
12-20-89	1420	"	-6			X											X								1
12-21-89	0830	"	-7			X											X								1
12-21-89	0845	"	-8			X											X								1
12-21-89	1200	"	-9			X											X								1

	SAMPLE RECEIPT	
-804	TOTAL NUMBER OF CONTAINERS	
	CHAIN OF CUSTODY SEALS Y/N/NA	
	INTACT? Y/N/NA	
	RECEIVED GOOD COND./COLD	

☐ 72 HRS ☐ 1 WK ☒ 2 WKS (Normal)

ED FOR RUSH DATA

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Otto C. Paris Time: 1700	Signature: Time:	Signature: Time:
Printed Name: Otto K. Paris Date: 12-22-89	Printed Name: Date:	Printed Name: Date:
Company: Geo Engineers	Company:	Company:
RECEIVED BY: 1.	**RECEIVED BY: 2.**	**RECEIVED BY: (LAB) 3.**
Signature: Time:	Signature: Time:	Signature: Time: 1350
Printed Name: Date:	Printed Name: Date:	Printed Name: Date: 12/22/89
Company:	Company:	Analytical Technologies, Inc.

Phoenix (602)438-1530 • Seattle (206)228-8335 • Pensacola (904)474-1001 DISTRIBUTION: White, Canary - ANALYTICAL TECHNOLOGIES, INC.• Pink - ORIGINATOR

APPENDIX C

Chemical Analytical Data,

Ground Water Samples Collected From Monitor Wells

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

ATI I.D. # 8909-070

October 2, 1989

GeoEngineers, Inc.
2405 140th Ave. N.E.
Suite 105
Bellevue, WA 98005

Attention : Otto Paris

Project Number : 1780-01-B04

Project Name : Circle K

On September 15, 1989 Analytical Technologies, Inc. received five soil samples and two 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.

Donna M. McKinney
Project Manager

Frederick W. Grothkopp
Technical Manager

Analytical Technologies, Inc.

ATI I.D. # 8909-070

SAMPLE CROSS REFERENCE SHEET

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1780-01-B04
PROJECT NAME : CIRCLE K

ATI #	CLIENT DESCRIPTION	MATRIX	DATE SAMPLED
8909-070-1	MW-1	SOIL	09/11/89
8909-070-2	MW-2	SOIL	09/11/89
8909-070-3	MW-3	SOIL	09/12/89
8909-070-4	MW-4	SOIL	09/12/89
8909-070-5	MW-5	SOIL	09/12/89
8909-070-6	MW-1	WATER	09/13/89
8909-070-7	MW-5	WATER	09/13/89

----- TOTALS -----

MATRIX	# SAMPLES
SOIL	5

Analytical Technologies, Inc.

ATI I.D. # 8909-070

ANALYTICAL SCHEDULE

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1780-01-B04
PROJECT NAME : CIRCLE K

ANALYSIS	TECHNIQUE	REFERENCE/METHOD
BETX	GC/PID	EPA 8020
PURGEABLE AROMATICS	GC/PID	EPA 8020
FUEL HYDROCARBONS	GC/FID	EPA 8015 MODIFIED
PETROLEUM HYDROCARBONS	IR	EPA 418.1
MOISTURE	GRAVIMETRIC	METHOD 7-2.2

Analytical Technologies, Inc.

ATI I.D. # 8909-070

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: N/A
PROJECT #	: 1780-01-B04	DATE RECEIVED	: N/A
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: N/A
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 09/18/89
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUND	RESULT
BENZENE	<0.5
ETHYLBENZENE	<0.5
TOLUENE	<0.5
META & PARA XYLENE	<0.5
ORTHO XYLENE	<0.5

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	92

CLIENT I.D. : MW-1
SAMPLE MATRIX : WATER
EPA METHOD : 8020 (BETX)

DATE ANALYZED : 09/18/89
UNITS : ug/L
DILUTION FACTOR : 1

COMPOUND	RESULT
BENZENE	1.5
ETHYLBENZENE	<0.5
TOLUENE	1.9
META & PARA XYLENE	1.1
ORTHO XYLENE	0.5

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	86

Analytical Technologies, Inc.

ATI I.D. # 8909-070-7

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 09/13/89
PROJECT #	: 1780-01-B04	DATE RECEIVED	: 09/15/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-5	DATE ANALYZED	: 09/18/89
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUND	RESULT
BENZENE	1.1
ETHYLBENZENE	<0.5
TOLUENE	2.5
META & PARA XYLENE	1.7
ORTHO XYLENE	0.9

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	97

EPA METHOD : 8020 (BETX) UNITS : ug/L

COMPOUND	SAMPLE RESULT	SPIKE ADDED	SPIKED SAMPLE	% REC	DUP SPIKED SAMPLE	DUP % REC	RPD
BENZENE	<0.5	8.00	7.39	92	7.32	92	1
TOLUENE	<0.5	8.00	7.29	91	7.04	88	3
META & PARA XYLENE	<0.5	21.9	20.0	91	19.9	91	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. # 8909-070

GENERAL CHEMISTRY RESULTS

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1780-01-B04
PROJECT NAME : CIRCLE K

SAMPLE MATRIX : WATER

PARAMETER	UNITS	-6	-7
PETROLEUM HYDROCARBONS	mg/L	<0.05	<0.05

Analytical Technologies, Inc.

ATI I.D. # 8909-070

GENERAL CHEMISTRY QUALITY CONTROL

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1780-01-B04
PROJECT NAME : CIRCLE K

SAMPLE MATRIX : WATER

PARAMETER	UNITS	ATI I.D.	SAMPLE RESULT	DUP RESULT	RPD	SPIKED CONC	SPIKE ADDED	% REC
PETROLEUM HYDROCARBONS	mg/L	8909-087-5	<0.05	<0.05	0	4.59	10.01	46

es, Inc.
enton, WA 98055

Chain of Custody

DATE 9/13/89 PAGE 1 OF 1

Paris
neers
'D NE Suite 105
WA 98005

SAMPLED BY: TEP

LABORATORY NUMBER: 8909-070

SAL INSTRUCTIONS

☐ Return ☐ Pickup (will call)

DATE	TIME	MATRIX	LAB ID
9/11/89	0915	Soil	-1
9/11/89	1220		-2
9/12/89	1400		-3
9/12/89	0900		-4
9/12/89	1115		-5
9/13/89		Water	-6
9/13/89		Water	-7

ANALYSIS REQUEST

8010 Halogenated Volatiles	8020 Aromatic Volatiles	BETX ONLY	8240 GCMS Volatiles	8270 GCMS BNA	8310 HPLC PNA	8080 Pesticides & PCB's	PCB's ONLY	8140 Phosphate Pesticides	8150 Herbicides	WDOE PAH/HH (WAC 173)	418.1 (TPH)	413.2 Grease & Oil	8015 (Modified)	TOC 9060	TOX 9020	% Moisture	TCLP	Priority Pollutant Metals (13)	EPTOX Metals (8) Total	EP TOX Metals (8) EP EXT							NUMBER OF CONTAINERS
																											1
																											1
																											1
																											1
																											1
		V									V																3
		V									V																3

	SAMPLE RECEIPT	
B04	TOTAL NUMBER OF CONTAINERS	11
	CHAIN OF CUSTODY SEALS Y/N/NA	N
	INTACT? Y/N/NA	Y
	RECEIVED GOOD COND./COLD	Y

☐ 72 HRS ☐ 1 WK ☒ 2 WKS (Normal)

D FOR RUSH DATA ✓

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Terry Parks Time: 1612	Signature: Time:	Signature: Time:
Printed Name: Terry Parks Date: 9/15/89	Printed Name: Date:	Printed Name: Date:
Company: Geo Engineers	Company:	Company:
RECEIVED BY: 1.	**RECEIVED BY: 2.**	**RECEIVED BY: (LAB) 3.**
Signature: Time: 1617	Signature: Time:	Signature: Wayne R. Barker Time: 5:24
Printed Name: BRUCE DOWNHUE Date:	Printed Name: Date:	Printed Name: DAVID L. BARKER Date: 9/15
Company: ATI	Company:	Analytical Technologies, Inc.

hoenix (602)438-1530 • Seattle (206)228-8335 • Pensacola (904)474-1001 DISTRIBUTION: White, Canary - ANALYTICAL TECHNOLOGIES, INC. • Pink - ORIGINATOR

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

ATI I.D. # 8910-063

GeoEngineers

OCT 30 1989

Routing OICP

File

October 26, 1989

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

Attention : Otto Paris

Project Number : 1780-01-4

Project Name : Circle K

On October 10, 1989 Analytical Technologies, Inc. received five 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.

Karen L. Mixon
Project Manager

Frederick W. Grothkopp
Technical Manager

Analytical Technologies, Inc.

ATI I.D. # 8910-063

SAMPLE CROSS REFERENCE SHEET

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1780-01-4
PROJECT NAME : CIRCLE K

ATI #	CLIENT DESCRIPTION	MATRIX	DATE SAMPLED
8910-063-1	MW-12	WATER	10/09/89
8910-063-2	MW-7	WATER	10/09/89
8910-063-3	MW-10	WATER	10/09/89
8910-063-4	MW-6	WATER	10/09/89
8910-063-5	MW-11	WATER	10/09/89

----- TOTALS -----

MATRIX	# SAMPLES

ANALYSIS	TECHNIQUE	REFERENCE/METHOD
BETX	GC/PID	EPA 8020

Analytical Technologies, Inc.

ATI I.D. # 8910-063

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: N/A
PROJECT #	: 1780-01-4	DATE RECEIVED	: N/A
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: N/A
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 10/12/89
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUND	RESULT
BENZENE	<0.5
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	<0.5

SURROGATE PERCENT RECOVERY

1,1,1-TRIFLUOROTOLUENE	98

CLIENT I.D.	: MW-12	DATE ANALYZED	: 10/12/89
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUND	RESULT
BENZENE	<0.5
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	<0.5
SURROGATE PERCENT RECOVERY	
1,1,1-TRIFLUOROTOLUENE	100

Analytical Technologies, Inc.

ATI I.D. # 8910-063-2

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 10/09/89
PROJECT #	: 1780-01-4	DATE RECEIVED	: 10/10/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-7	DATE ANALYZED	: 10/12/89
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUND	RESULT
BENZENE	2.8
ETHYLBENZENE	<0.5
TOLUENE	1.4
TOTAL XYLENES	<0.5

SURROGATE PERCENT RECOVERY

1,1,1-TRIFLUOROTOLUENE	96

PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-10	DATE ANALYZED	: 10/12/89
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUND	RESULT
BENZENE	1.2
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	<0.5
SURROGATE PERCENT RECOVERY	
1,1,1-TRIFLUOROTOLUENE	98

Analytical Technologies, Inc.

ATI I.D. # 8910-063-4

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 10/09/89
PROJECT #	: 1780-01-4	DATE RECEIVED	: 10/10/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-6	DATE ANALYZED	: 10/12/89
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUND	RESULT
BENZENE	250
ETHYLBENZENE	<0.5
TOLUENE	3.2
TOTAL XYLENES	110
SURROGATE PERCENT RECOVERY	
1,1,1-TRIFLUOROTOLUENE	82

PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-11	DATE ANALYZED	: 10/12/89
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUND	RESULT
BENZENE	2.6
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	3.0
SURROGATE PERCENT RECOVERY	
1,1,1-TRIFLUOROTOLUENE	86

Analytical Technologies, Inc.

ATI I.D. # 8910-063

PURGEABLE AROMATICS
QUALITY CONTROL DATA

CLIENT	: GEOENGINEERS, INC.	SAMPLE I.D.	: BLANK SPIKE
PROJECT #	: 1780-01-4	DATE ANALYZED	: 10/12/89
PROJECT NAME	: CIRCLE K	SAMPLE MATRIX	: WATER
EPA METHOD	: 8020 (BETX)	UNITS	: ug/L

COMPOUND	SAMPLE RESULT	SPIKE ADDED	SPIKED SAMPLE	% REC	DUP SPIKED SAMPLE	DUP % REC	RPD
BENZENE	<0.5	25	20	80	20	80	0
TOLUENE	<0.5	25	22	88	25	100	12

Analytical Technologies, Inc.
560 Naches Avenue SW, Suite 101 Renton, WA 98055

Chain of Custody

PROJECT MANAGER: Otto Paris
COMPANY: GeoEngineers Inc
ADDRESS: 2405 - 140th Ave NE
Bellevue, WA 98005
PHONE: 746-5200 SAMPLED BY: TEP

LABORATORY NUMBER: 8910-06

SAMPLE DISPOSAL INSTRUCTIONS
☐ ATI Disposal @ $5.00 each ☐ Return ☐ Pickup (will call)

SAMPLE ID	DATE	TIME	MATRIX	LAB ID
MW-12	10/9/89	1550	Water	-1
MW-7		1610		-2
MW-10		1625		-3
MW-6		1630		-4
MW-11		1645		-5

ANALYSIS REQUEST

8010 Halogenated Volatiles	8020 Aromatic Volatiles	BETX ONLY	8240 GCMS Volatiles	8270 GCMS BNA	8310 HPLC PNA	8080 Pesticides & PCB's	PCB's ONLY	8140 Phosphate Pesticides	8150 Herbicides	WDOE PAH/HH (WAC 173)	418.1 (TPH)	413.2 Grease & Oil	8015 (Modified)	TOC 9060	TOX 9020	% Moisture	TCLP
		X															
		X															
		X															
		X															
		X															

PROJECT INFORMATION	SAMPLE RECEIPT	
PROJECT NUMBER: 1780-01-4	TOTAL NUMBER OF CONTAINERS	10
PROJECT NAME: Circle K	CHAIN OF CUSTODY SEALS Y/N/NA	Y
PURCHASE ORDER NUMBER:	INTACT? Y/N/NA	Y
VIA:	RECEIVED GOOD COND./COLD	Y

TAT: ☐ 24HR ☐ 48 HRS ☐ 72 HRS ☐ 1 WK ☒ 2 WKS (Normal)
PRIOR AUTHORIZATION IS REQUIRED FOR RUSH DATA
SPECIAL INSTRUCTIONS:

RELINQUISHED BY: 1.	RELINQUISHED BY:
Signature: Terry Parks Time: 10:00	Signature:
Printed Name: Terry Parks Date: 10/10	Printed Name:
Company: GeoEngineers	Company:
RECEIVED BY: 1.	**RECEIVED BY:**
Signature: Time:	Signature:
Printed Name: Date:	Printed Name:
Company:	Company:

ATI Labs: San Diego (619)458-9141 • Phoenix (602)438-1530 • Seattle (206)228-8335 • Pensacola (904)474-1001 DISTRIBUTION: White, Canary - ANALYTICAL

C - 21

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

ATI I.D. # 8912-075

GeoEngineers

JAN 19 1989

Routing OKP

File

January 18, 1990

GeoEngineers, Inc.
2405 140th Avenue N.E.
Bellevue, WA 98005

Attention : Otto Paris

Project Number : 1780-001-B04

Project Name : Circle K

On December 22, 1989 Analytical Technologies, Inc. received four water samples and five soil 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.

Karen L. Mixon
Project Manager

Frederick W. Grothkopp
Technical Manager

ATI #	CLIENT DESCRIPTION	DATE SAMPLED	MATRIX
8912-075-1	MW-14	12/21/89	WATER
8912-075-2	MW-15	12/21/89	WATER
8912-075-3	MW-13	12/21/89	WATER
8912-075-4	MW-16	12/21/89	WATER
8912-075-5	MW-13 @ 8.0'	12/20/89	SOIL
8912-075-6	MW-14 @ 13.0'	12/20/89	SOIL
8912-075-7	MW-15 @ 8.0'	12/21/89	SOIL
8912-075-8	MW-15 @ 13.0'	12/21/89	SOIL
8912-075-9	MW-16 @ 8.0'	12/21/89	SOIL

----- TOTALS -----

MATRIX	# SAMPLES
WATER	4
SOIL	5

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.

ANALYTICAL SCHEDULE

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1780-001-B04
PROJECT NAME : CIRCLE K

ANALYSIS	TECHNIQUE	REFERENCE/METHOD
BETX	GC/PID	EPA 8020
FUEL HYDROCARBONS	GC/FID	EPA 8015 MODIFIED
MOISTURE	GRAVIMETRIC	METHOD 7-2.2

SAMPLE MATRIX : WATER
EPA METHOD : 8020 (BETX)

UNITS : ug/L
DILUTION FACTOR : 1

COMPOUND	RESULT
BENZENE	<0.5
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	<0.5

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	88

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 12/21/89
PROJECT #	: 1780-001-B04	DATE RECEIVED	: 12/22/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-14	DATE ANALYZED	: 01/05/90
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUND	RESULT
BENZENE	1.1
ETHYLBENZENE	1.9
TOLUENE	5.7
TOTAL XYLENES	13

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	93

EPA METHOD : 8020 (BETX) DILUTION FACTOR : 500

COMPOUND	RESULT
BENZENE	7,300
ETHYLBENZENE	1,000
TOLUENE	9,000
TOTAL XYLENES	5,800
SURROGATE PERCENT RECOVERY	
BROMOFLUOROBENZENE	93

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 12/21/89
PROJECT #	: 1780-001-B04	DATE RECEIVED	: 12/22/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: N/A
CLIENT I.D.	: MW-13	DATE ANALYZED	: 01/05/90
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 500

COMPOUND	RESULT
BENZENE	13,000
ETHYLBENZENE	1,700
TOLUENE	20,000
TOTAL XYLENES	8,800

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	92

EPA METHOD : 8020 (BETX) DILUTION FACTOR : 1

COMPOUND	RESULT
BENZENE	4.3
ETHYLBENZENE	7.1
TOLUENE	20
TOTAL XYLENES	36

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	91

PURGEABLE AROMATICS
QUALITY CONTROL DATA

CLIENT	: GEOENGINEERS, INC.	SAMPLE I.D.	: 8912-071-4
PROJECT #	: 1780-001-B04	DATE ANALYZED	: 01/04/90
PROJECT NAME	: CIRCLE K	MATRIX	: WATER
EPA METHOD	: 8020 (BETX)	UNITS	: ug/L

COMPOUND	SAMPLE RESULT	SPIKE ADDED	SPIKED SAMPLE	% REC	DUP SPIKED SAMPLE	DUP % REC	RPD
BENZENE	<0.5	8.00	7.20	90	7.55	94	5
TOLUENE	<0.5	8.00	6.74	84	6.76	84	0
TOTAL XYLENES	<0.5	16.6	14.4	87	14.7	89	2

COMPOUND	SAMPLE RESULT	SPIKE ADDED	SPIKED SAMPLE	% REC	DUP SPIKED SAMPLE	DUP % REC	RPD
BENZENE	1.08	8.00	8.07	87	7.95	86	1
TOLUENE	5.70	8.00	12.5	85	12.1	80	3
TOTAL XYLENES	12.6	16.6	27.0	87	25.8	80	5

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

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

s, Inc.
nton, WA 98055

Chain of Custody

8912-075

DATE 12/21 PAGE 1 OF 1

D) Paris
EPCS
Aug 14 F
WA

SAMPLED BY: JGR + TEP

AL INSTRUCTIONS

☐ Return ☐ Pickup (will call)

LABORATORY NUMBER:

ANALYSIS REQUEST

DATE	TIME	MATRIX	LAB ID	8010 Halogenated Volatiles	8020 Aromatic Volatiles	BETX ONLY	8240 GCMS Volatiles	8270 GCMS BNA	8310 HPLC PNA	8080 Pesticides & PCB's	PCB's ONLY	8140 Phosphate Pesticides	8150 Herbicides	WDOE PAH/HH (WAC 173)	418.1 (TPH)	413.2 Grease & Oil	8015 (Modified)	TOC 9060	TOX 9020	% Moisture	TCLP	Priority Pollutant Metals (13)	EPTOX Metals (8) Total	EP TOX Metals (8) EP EXT	NUMBER OF CONTAINERS
12/21/89	1330	WATER	-1			X																			2
12/21/89	1415	"	-2			X																			2
12/21/89	1500	"	-3			X																			2
12/21/89	1530	"	-4			X																			2

	SAMPLE RECEIPT
B04	TOTAL NUMBER OF CONTAINERS
	CHAIN OF CUSTODY SEALS Y/N/NA
	VNA
	OD COND./COLD
	☒ 2 WKS (Normal)

j #
30-001-B04
R Otto
1-17-90

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Otto K. Paris Time: 1200	Signature: Time:	Signature: Time:
Printed Name: Otto K. Paris Date: 12-22-89	Printed Name: Date:	Printed Name: Date:
Company: Geo Engineers	Company:	Company:
RECEIVED BY: 1.	**RECEIVED BY: 2.**	**RECEIVED BY: (LAB) 3.**
Signature: Time:	Signature: Time:	Signature: Time: 1550
Printed Name: Date:	Printed Name: Date:	Printed Name: Keith Stevenson Date: 12/22/89
Company:	Company:	Analytical Technologies, Inc

APPENDIX D

Chemical Analytical Data,

Soil Samples Collected From Excavations and Stockpiles

GeoEngineers

OCT 24 1989

Routing

File

October 17, 1989

Otto Paris, Project Coordinator
GeoEngineers, Inc.
2405-140th Avenue N.E., Suite 105
Bellevue, WA 98005

Dear Otto:

Enclosed are the results of the analyses of the sample submitted on October 12, 1989 from Project 1780-01-B04.

We appreciate this opportunity to be of service to you on this project. If you have any questions regarding this material, or if you just want to discuss any aspect of your projects, please do not hesitate to contact me.

Sincerely,

James K. Farr, Ph.D.

JKF

Enclosures

Date of Report: October 17, 1989
Date Submitted: October 12, 1989
Project: 1780-01-B04

RESULTS OF ANALYSES OF THE ENVIRONMENTAL SAMPLE FOR TOTAL PETROLEUM HYDROCARBONS BY IR (EPA METHOD 418.1)

Sample #		Total Petroleum Hydrocarbons (ppm)
WO-11	Soil	108
Quality Assurance		
Method Blank		<5.0
WO-11 (Duplicate)		121

GEOENGINEERS INC.
2405 - 140th AVE. N.E., SUITE 105
BELLEVUE, WASHINGTON 98005
206-746-5200

CHAIN OF CUSTODY RECORD

TEC

PROJECT LOC. Circle K/Seattle

PROJECT NAME

DATE 10/12/89

GEI FILE NO. 1780-01-804

TIME SAMPLED	DEPTH OF SAMPLE	TYPE OF SAMPLE	FIELD FILTERED	PRESERVATIVE ADDED TO SAMPLE	ANALYSES TO BE CONDUCTED	NO. OF SAMPLE CONTAINERS	COMMENTS
1530	Composite	Soil	No	Iced	418.1 TPH	1	Soil Stockpile

(SIGNATURE) Pam Lees — DATE 10-12-89 — TIME 4:30pm — RECEIVED BY (SIGNATURE) Bob Olmewski — NAME — FIRM Enviros — DATE 10-12-89 — TIME 4:30pm

(SIGNATURE) — DATE — TIME — RECEIVED BY (SIGNATURE) — NAME — FIRM — DATE — TIME

ITS:

Give verbal results to Otto Pan's ASAP

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

ATI I.D. # 8910-098

November 13, 1989

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

Attention : Otto Paris

Project Number : 1780-01-BO4

Project Name : Circle K

On October 13, 1989 Analytical Technologies, Inc. received 11 soil 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.

Donna M. McKinney

Frederick W. Grothkopp

ATI #	CLIENT DESCRIPTION	DATE SAMPLED	MATRIX
8910-098-1	WO-2	10/11/89	SOIL
8910-098-2	WO-6	10/12/89	SOIL
8910-098-3	WO-7	10/12/89	SOIL
8910-098-4	WO-8	10/12/89	SOIL
8910-098-5	WO-9	10/12/89	SOIL
8910-098-6	WO-10	10/12/89	SOIL
8910-098-7	HO-2	10/13/89	SOIL
8910-098-8	HO-3	10/13/89	SOIL
8910-098-9	HO-4	10/13/89	SOIL
8910-098-10	HO-5	10/13/89	SOIL
8910-098-11	HO-6	10/13/89	SOIL

----- TOTALS -----

MATRIX	# SAMPLES
SOIL	11

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.

Analytical Technologies, Inc.

ATI I.D. # 8910-098

ANALYTICAL SCHEDULE

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1780-01-B04
PROJECT NAME : CIRCLE K

ANALYSIS	TECHNIQUE	REFERENCE/METHOD
PETROLEUM HYDROCARBONS	IR	EPA 418.1

ATI I.D. #	CLIENT I.D. #	PETROLEUM HYDROCARBONS
8910-098-1	WO-2	76
8910-098-2	WO-6	2
8910-098-3	WO-7	<1
8910-098-4	WO-8	6
8910-098-5	WO-9	1
8910-098-6	WO-10	<1
8910-098-7	HO-2	8
8910-098-8	HO-3	1
8910-098-9	HO-4	2
8910-098-10	HO-5	110
8910-098-11	HO-6	14

Analytical Technologies, Inc.

ATI I.D. # 8910-098

GENERAL CHEMISTRY QUALITY CONTROL

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1780-01-BO4
PROJECT NAME : CIRCLE K

SAMPLE MATRIX : SOIL

PARAMETER	UNITS	ATI I.D.	SAMPLE RESULT	DUP RESULT	RPD	SPIKED CONC	SPIKE ADDED	% REC
PETROLEUM HYDROCARBONS	mg/Kg	8910-098-9	2	2	0	104	99	103
PETROLEUM HYDROCARBONS	mg/Kg	91038907	170	170	0	260	105	86

,Inc.
ıton,WA 98055

Chain of Custody

DATE 10/13 PAGE 1 OF 1

LABORATORY NUMBER: 8912-098

AMPLED BY: Terry Parks

L INSTRUCTIONS

☐ Return ☐ Pickup (will call)

DATE	TIME	MATRIX	LAB ID	8010 Halogenated Volatiles	8020 Aromatic Volatiles	BETX ONLY	8240 GCMS Volatiles	8270 GCMS BNA	8310 HPLC PNA	8080 Pesticides & PCB's	PCB's ONLY	8140 Phosphate Pesticides	8150 Herbicides	WDOE PAH/HH (WAC 173)	418.1 (TPH)	413.2 Grease & Oil	8015 (Modified)	TOC 9060	TOX 9020	% Moisture	TCLP	Priority Pollutant Metals (13)	EPTOX Metals (8) Total	EP TOX Metals (8) EP EXT		NUMBER OF CONTAINERS
0/11/89	1335	Soil	1												X									@ 8' Bottom		1
0/12/89	1330		2												X									@ 11' S Bottom		1
"	1330		3												X									@ 10' N. Wall		1
"	1335		4												X									@ 9.5' E. Wall		1
"	1335		5												X									@ 10' S wall		1
"	1338		6												X									@ 9.5' W. Wall		1
0/13/89	1310		7												X									@ 6' N wall		1
"	1237		8												X									@ 7' E. Wall		1
"	1313		9												X									@ 6.5' S wall		1
"	1248		10												X									@ 6.5' W. Wall		1
"	1315	↓	11												X									@ 8.5' Bottom		1

ANALYSIS REQUEST

SAMPLE RECEIPT	
TOTAL NUMBER OF CONTAINERS	4
CHAIN OF CUSTODY SEALS Y/N/NA	Y
INTACT? Y/N/NA	Y
RECEIVED GOOD COND./COLD	Y

☐ 72 HRS ☐ 1 WK ☒ 2 WKS (Normal)

FOR RUSH DATA

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Terry Parks Time: 1510	Signature: Time:	Signature: Time:
Printed Name: Terry Parks Date: 10/13	Printed Name: Date:	Printed Name: Date:
Company: Geo Engineers	Company:	Company:
RECEIVED BY: 1.	**RECEIVED BY: 2.**	**RECEIVED BY: (LAB) 3.**
Signature: Time:	Signature: Time:	Signature: E.J. Gelt Time: 1705
Printed Name: Date:	Printed Name: Date:	Printed Name: E.J. Alston Date: 10/13/89
Company:	Company:	Analytical Technologies, Inc.

enix (602)438-1530 • Seattle (206)228-8335 • Pensacola (904)474-1001 DISTRIBUTION: White, Canary - ANALYTICAL TECHNOLOGIES, INC.• Pink - ORIGINATOR

D-9

October 20, 1989

Otto Paris, Project Coordinator
GeoEngineers, Inc.
2405-140th Avenue N.E., Suite 105
Bellevue, WA 98005

Dear Otto:

Enclosed are the results of the analyses of samples submitted on October 18, 1989 from Project 1780-01-B04.

We appreciate this opportunity to be of service to you on this project. If you have any questions regarding this material, or if you just want to discuss any aspect of your projects, please do not hesitate to contact me.

Sincerely,

James K. Farr, Ph.D.

JKF

Enclosures

Date of Report: October 20, 1989
Date Submitted: October 18, 1989
Project: 1780-01-B04

RESULTS OF ANALYSES OF ENVIRONMENTAL SAMPLES FOR BTX AND ETHYLBENZENE USING PURGE AND TRAP (EPA METHOD 602/8020) Results Reported as ng/g (ppb)

Sample #	Dil. Fac.	Benzene	Toluene	Et-Benzene	Xylene m,p	Xylene o
C-1	50	6500b	10,500b	9,500b	11,500b	9,000b
C-2	1	1.8	12	>50	>50	>50
C-2	50	<50	<50	120	320	230
Quality Assurance						
Method Blank		<1.0	<1.0	<1.0	<1.0	<1.0
C-2 (Duplicate)	1	1.6	15	>50	>50	>50
C-2 (Matrix Spike) Spiked @ 20 ppb Percent Recovery	1	89%	79%	a	a	a

a - The amount spiked was insufficient to give meaninful recovery data.

b - Value reported exceeded the calibration range established for the sample.

Sample #	Matrix	Dil. Fac.	TPH (ppm)	RANGE (C7-C30)
C-1	Soil	1	4,400	C7-C12*
Quality Assurance				
Method Blank		1	<1.0	----
C-1 (Duplicate)	Soil	1	4,200	C7-C12*
C-1 (Matrix Spike) Spiked @ 20 ppb Percent Recovery	Soil	1	a	C7-C30

* Gasoline

a - The amount spiked was insufficient to gtive meaningful-recovery data.

enviros

Date of Report: October 20, 1989
Date Submitted: October 18, 1989
Project: 1780-01-B04

RESULTS OF ANALYSES OF ENVIRONMENTAL SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS BY IR (EPA METHOD 418.1)

Sample #	Flash Point
C-1	$<32^{O}F$

Sample #	Total Petroleum Hydrocarbons (ppm)
C-1	2248
C-2	488
Quality Assurance:	
Method Blank	<5.0
C2 (Duplicate)	467

enviros

Date of Report: October 20, 1989
Date Submitted: October 18, 1989
Project: 1780-01-B04

RESULTS OF ANALYSES OF ENVIRONMENTAL SAMPLES FOR PCB AS AROCHLOR 1254 BY GC/ECD

Sample #	PCB (ppm)
C-2	<1.0
Quality Assurance	
Method Blank	<1.0
C-2 (Duplicate)	<1.0

Sample:#	C-2
Matrix:	Soil
Analyte:	
1,1-Dichloroethylene	<1.0
Methylene Chloride	<1.0
t-Dichloroethylene	<1.0
1,1-Dichloroethane	<1.0
Chloroform	<1.0
1,1,1-Trichloroethane	<1.0
Carbon Tetrachloride	<1.0
1,2-Dichloroethane	<1.0
Trichloroethylene	<1.0
Tetrachloroethylene	<1.0
Tetrachloroethane	<1.0

enviros

Date of Report: October 20, 1989
Date Submitted: October 18, 1989
Project: 1780-01-B04

ANALYSIS OF ENVIRONMENTAL SAMPLES
FOR CHLORINATED ORGANIC COMPOUNDS
BY EPA METHOD 601/8010
Results Reported as ng/g (ppb)
Quality Assurance

Sample:#	Method Blank	C-2 Duplicate	C-2 Matrix Spike Spiked @ 10 ppb Percent Recovery
Analyte:			
1,1-Dichloroethylene	<1.0	<1.0	98%
Methylene Chloride	<1.0	<1.0	92%
t-Dichloroethylene	<1.0	<1.0	89%
1,1-Dichloroethane	<1.0	<1.0	87%
Chloroform	<1.0	<1.0	94%
1,1,1-Trichloroethane	<1.0	<1.0	90%
Carbon Tetrachloride	<1.0	<1.0	88%
1,2-Dichloroethane	<1.0	<1.0	87%
Trichloroethylene	<1.0	<1.0	82%
Tetrachloroethylene	<1.0	<1.0	95%
Tetrachloroethane	<1.0	<1.0	78%

Sample #:	C-2
Units:	mg/l
Analyte	
Arsenic	0.25
Barium	1.07
Cadmium	0.140
Chromium	0.005
Lead	1.32
Mercury	0.0001
Selenium	0.05
Silver	0.003

enviros

Date of Report: October 20, 1989
Date Submitted: October 18, 1989
Project: 1780-01-B04

RESULTS OF ANALYSIS OF ENVIRONMENTAL SAMPLES FOR EP-TOX METALS IN ACCORDANCE WITH "TEST METHODS FOR EVALUATING SOLID WASTE" EPA SW-846, 3rd EDITION
Quality Assurance

Sample #:	Method Blank
Units:	mg/l
Analyte	
Arsenic	0.05
Barium	0.001
Cadmium	0.002
Chromium	0.005
Lead	0.03
Mercury	0.0001
Selenium	0.05
Silver	0.003

GeoEngineers

NOV 10 1989

GEOENGINEERS INC.
2405 - 140th AVE. N.E., SUITE 105
BELLEVUE, WASHINGTON 98005
206-746-5200

OKP

File

PROJE

PROJE

GEI F

CHAIN OF CUSTODY RECORD

SAMPLED BY JEP / JGR DATE 10/18/89

SAMPLE No.	DATE SAMPLED	TIME SAMPLED	DEPTH OF SAMPLE	TYPE OF SAMPLE	FIELD FILTERED	PRESERVATIVE ADDED TO SAMPLE	ANALYSES TO BE CONDUCTED	NO. OF SAMPLE CONTAINE
C-1	10/18/89	1230	Stockpiled on surface	Soil	No	No	See (A) below	4
C-2	"	1230	"	"	"	"	See (B) below	3

RELINQUISHED BY (SIGNATURE)
NAME Terry J. Palmer
FIRM GeoEngineers
DATE 10/18/89
TIME 1240
RECEIVED BY (SIGNATURE)
NAME
FIRM JEA/DIROS

RELINQUISHED BY (SIGNATURE)
NAME
FIRM
DATE
TIME
RECEIVED BY (SIGNATURE)
NAME
FIRM

ADDITIONAL COMMENTS:

(A) Analyze using methods BETX (8020), 8015, and flash point.

(B) Analyze using methods 8010, 8020, 8080 (PCB's), 418.1 (TPH), and EP Toxici

Need results by 11:00 AM, 10-19-89, or ASAP. Notify Of

D - 20

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

ATI I.D. # 8910-181

GeoEngineers

DEC 6 1989

Routing
File

December 6, 1989

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

Attention : Otto Paris

Project Number : 1780-01-B4

Project Name : CIRCLE K

On October 31, 1989 Analytical Technologies, Inc. received four soil 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.

Karen L. Mixon
Project Manager

Frederick W. Grothkopp
Technical Manager

Analytical Technologies, Inc.

ATI I.D. # 8910-181

SAMPLE CROSS REFERENCE SHEET

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1780-01-B4
PROJECT NAME : CIRCLE K

ATI #	CLIENT DESCRIPTION	DATE SAMPLED	MATRIX
8910-181-1	NW-2	10/23/89	SOIL
8910-181-2	WT-1	10/26/89	SOIL
8910-181-3	MT-1	10/26/89	SOIL
8910-181-4	ET-3	10/27/89	SOIL

----- TOTALS -----

MATRIX # SAMPLES

ANALYSIS	TECHNIQUE	REFERENCE/METHOD
BETX	GC/PID	EPA 8020
FUEL HYDROCARBONS	GC/FID	EPA 8015 MODIFIED
MOISTURE	GRAVIMETRIC	METHOD 7-2.2

Analytical Technologies, Inc.

ATI I.D. # 8910-181

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: N/A
PROJECT #	: 1780-01-B4	DATE RECEIVED	: N/A
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: N/A
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 11/08/89
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	<0.5
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	<0.5

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	95

PROJECT #	: 1780-01-B4	DATE RECEIVED	: N/A
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: N/A
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 11/09/89
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	<0.5
ETHYLBENZENE	1.9
TOLUENE	1.1
TOTAL XYLENES	<0.5

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	95

NOTE: A water reagent blank was run the day each of the samples was analyzed. An extraction reagent blank was not done for this set of samples. On several of the samples, the result for toluene or ethylbenzene is flagged with a "B" indicating that the analyte was found in the water blank.

Analytical Technologies, Inc.

ATI I.D. # 8910-181-1

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 10/23/89
PROJECT #	: 1780-01-B4	DATE RECEIVED	: 10/31/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 11/07/89
CLIENT I.D.	: NW-2	DATE ANALYZED	: 11/08/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	1.3
ETHYLBENZENE	12
TOLUENE	17
TOTAL XYLENES	57

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	*

* Out of limits due to matrix interference.

PROJECT #	: 1780-01-B4	DATE RECEIVED	: 10/31/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 11/07/89
CLIENT I.D.	: WT-1	DATE ANALYZED	: 11/09/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	0.11
ETHYLBENZENE	0.39
TOLUENE	1.0
TOTAL XYLENES	3.5

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	100

Analytical Technologies, Inc.

ATI I.D. # 8910-181-3

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 10/26/89
PROJECT #	: 1780-01-B4	DATE RECEIVED	: 10/31/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 11/07/89
CLIENT I.D.	: MT-1	DATE ANALYZED	: 11/08/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	<0.025
ETHYLBENZENE	0.074
TOLUENE	0.25
TOTAL XYLENES	0.61

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	140 *

* Out of limits.

PROJECT #	: 1780-01-B4	DATE RECEIVED	: 10/31/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 11/07/89
CLIENT I.D.	: ET-3	DATE ANALYZED	: 11/08/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	0.14
ETHYLBENZENE	<0.025
TOLUENE	0.19
TOTAL XYLENES	0.31

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	120

Analytical Technologies, Inc.

ATI I.D. # 8910-181

PURGEABLE AROMATICS
QUALITY CONTROL DATA

CLIENT	: GEOENGINEERS, INC.	SAMPLE I.D.	: 4619-5
PROJECT #	: 1780-01-B4	DATE ANALYZED	: 11/09/89
PROJECT NAME	: CIRCLE K	UNITS	: mg/Kg
EPA METHOD	: 8020 (BETX)	MATRIX	: SOIL

COMPOUND	SAMPLE RESULT	SPIKE ADDED	SPIKED SAMPLE	% REC	DUP SPIKED SAMPLE	DUP % REC	RPD
BENZENE	<0.025	1.25	1.40	112	1.45	116	4
TOLUENE	<0.025	1.25	1.30	104	1.45	116	11
TOTAL XYLENES	<0.025	3.75	3.70	99	3.90	104	5

PROJECT # : 1780-01-B4
PROJECT NAME : CIRCLE K
EPA METHOD : 8020 (BETX)

DATE ANALYZED : 11/09/89
UNITS : mg/Kg
MATRIX : SOIL

COMPOUND	SAMPLE RESULT	SPIKE ADDED	SPIKED SAMPLE	% REC	DUP SPIKED SAMPLE	DUP % REC	RPD
BENZENE	<0.025	1.25	1.40	112	1.50	120	7
TOLUENE	<0.025	1.25	1.50	120	1.45	116	3
TOTAL XYLENES	<0.025	3.75	4.00	107	4.35	116	8

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

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

Analytical Technologies, Inc.

ATI I.D. # 8910-181

FUEL HYDROCARBONS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: N/A
PROJECT #	: 1780-01-B4	DATE RECEIVED	: N/A
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 11/01/89
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 11/02/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 MODIFIED	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	DIESEL

PROJECT #	: 1780-01-B4	DATE RECEIVED	: 10/31/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 11/01/89
CLIENT I.D.	: NW-2	DATE ANALYZED	: 11/02/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 MODIFIED	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	230
HYDROCARBON RANGE	C6 - C10
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	400
HYDROCARBON RANGE	C12 - C20
HYDROCARBONS QUANTITATED USING	DIESEL

BEST ESTIMATE OF FUEL TYPE - 1 PART GASOLINE : 2 PARTS DIESEL.

Analytical Technologies, Inc.

ATI I.D. # 8910-181-2

FUEL HYDROCARBONS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 10/26/89
PROJECT #	: 1780-01-B4	DATE RECEIVED	: 10/31/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 11/01/89
CLIENT I.D.	: WT-1	DATE ANALYZED	: 11/02/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 MODIFIED	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	59
HYDROCARBON RANGE	C6 - C10
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	150
HYDROCARBON RANGE	C12 - C20
HYDROCARBONS QUANTITATED USING	DIESEL

BEST ESTIMATE OF FUEL TYPE - 1 PART GASOLINE : 2 PARTS DIESEL.

PROJECT #	: 1780-01-B4	DATE RECEIVED	: 10/31/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 11/01/89
CLIENT I.D.	: MT-1	DATE ANALYZED	: 11/02/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 MODIFIED	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	11
HYDROCARBON RANGE	C6 - C10
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	55
HYDROCARBON RANGE	C10 - C16
HYDROCARBONS QUANTITATED USING	DIESEL

BEST ESTIMATE OF FUEL TYPE - 1 PART GASOLINE : 5 PARTS DIESEL.

Analytical Technologies, Inc.

ATI I.D. # 8910-181-4

FUEL HYDROCARBONS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 10/27/89
PROJECT #	: 1780-01-B4	DATE RECEIVED	: 10/31/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 11/01/89
CLIENT I.D.	: ET-3	DATE ANALYZED	: 11/02/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 MODIFIED	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	7
HYDROCARBON RANGE	C10 - C14
HYDROCARBONS QUANTITATED USING	DIESEL

PROJECT NAME : CIRCLE K
EPA METHOD : 8015 MODIFIED

SAMPLE MATRIX : SOIL
UNITS : mg/Kg

COMPOUND	SAMPLE RESULT	CONC SPIKED	SPIKED SAMPLE	% REC	DUP SPIKED SAMPLE	DUP % RECOVERY	RPD
FUEL HYDROCARBONS	10	500	487	95	505	99	4

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

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

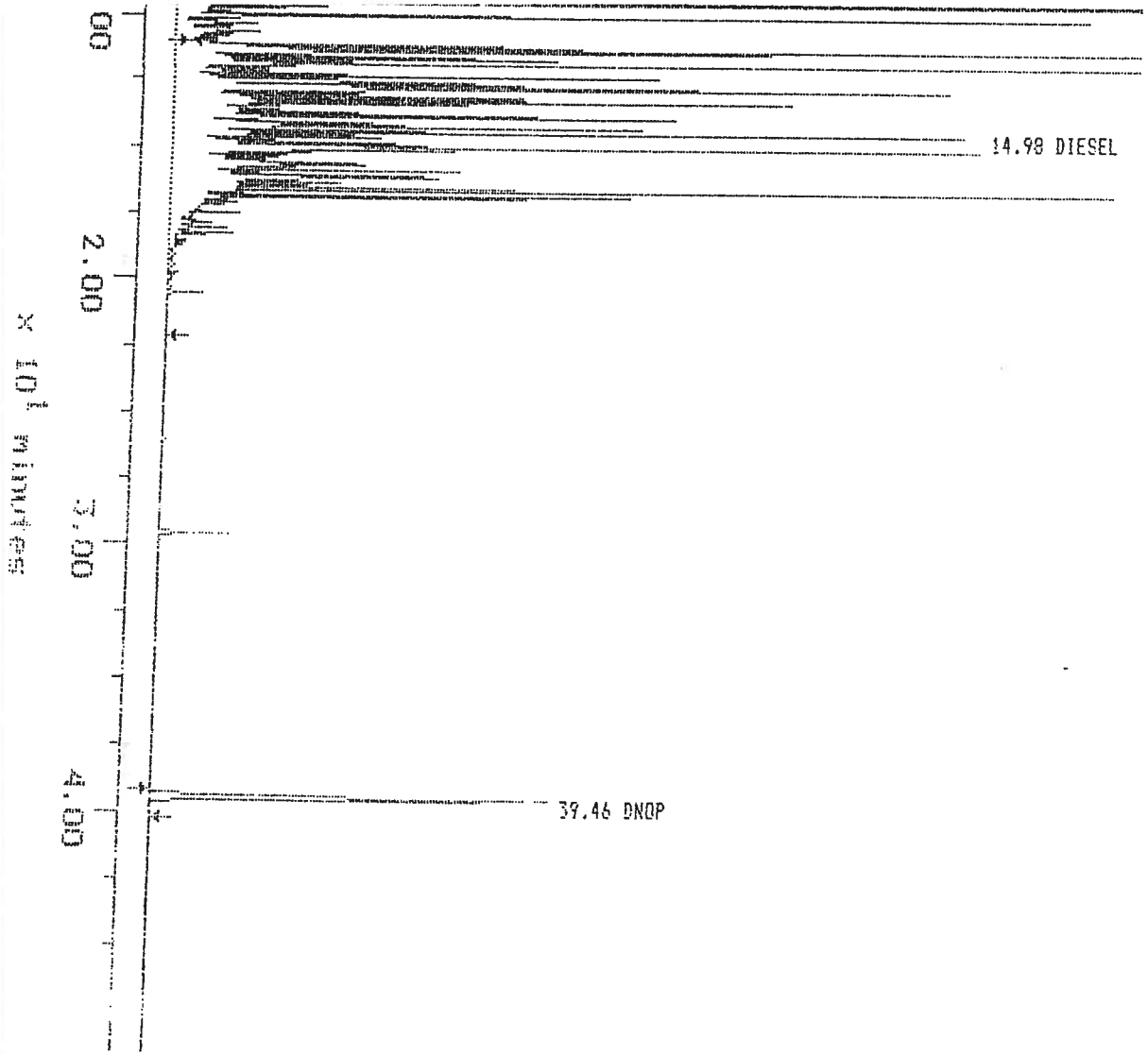
Analytical Technologies, Inc.

ATI I.D. # 8910-181

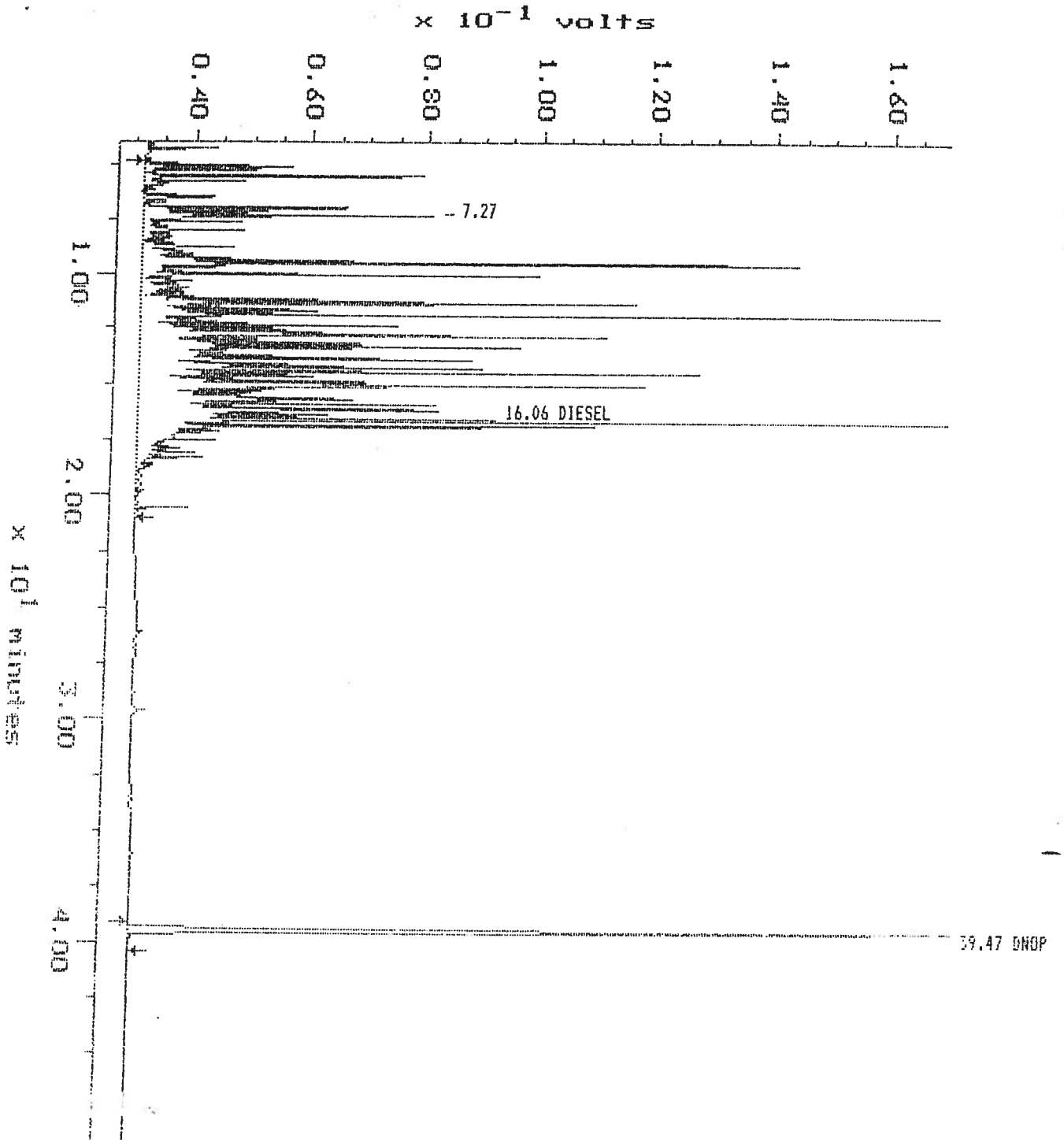
GENERAL CHEMISTRY RESULTS

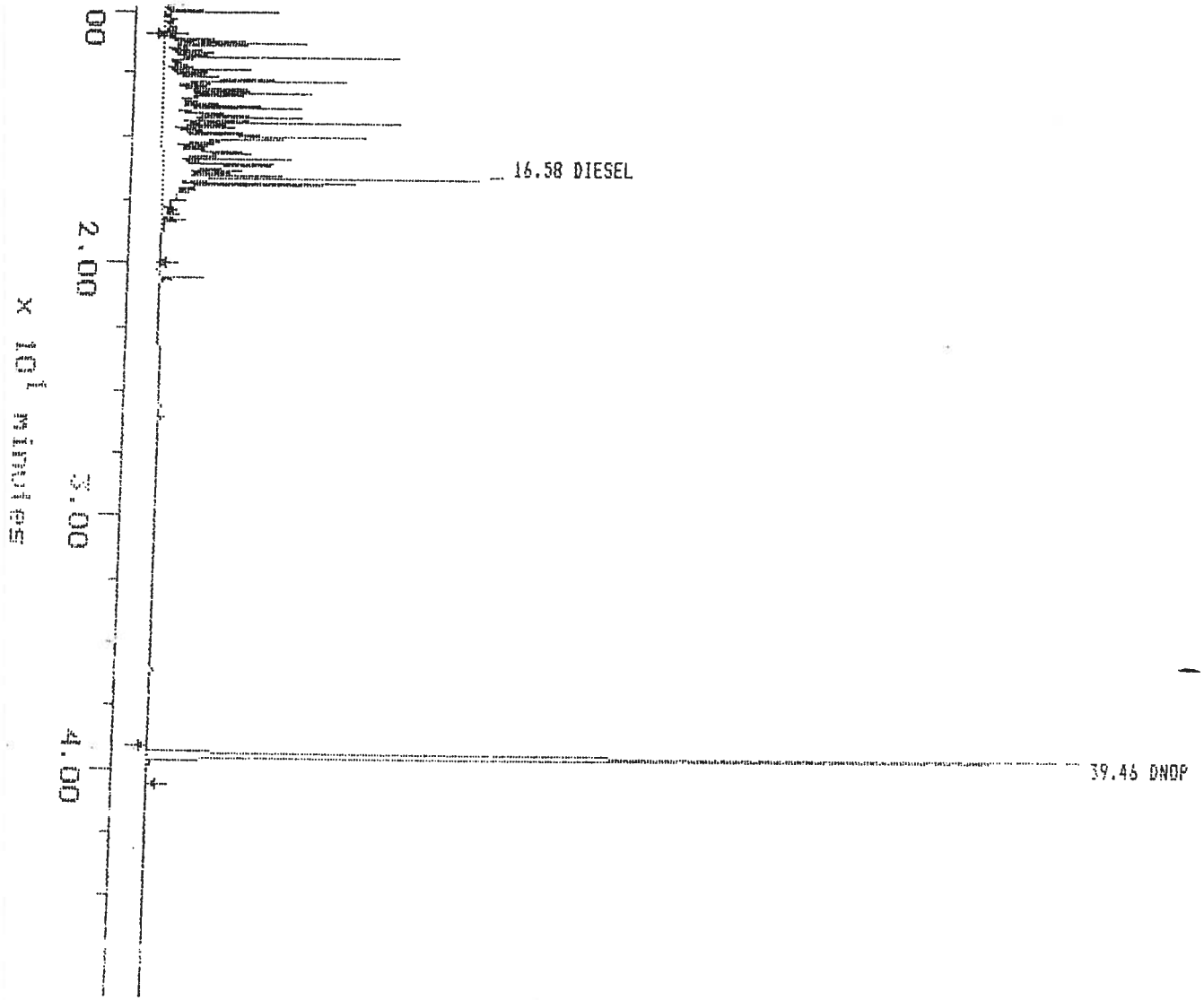
CLIENT : GEOENGINEERS, INC. SAMPLE MATRIX : SOIL
PROJECT # : 1780-01-B4
PROJECT NAME : CIRCLE K

PARAMETER	UNITS	-1	-2	-3	-4
MOISTURE	%	16	8.0	10	7.0

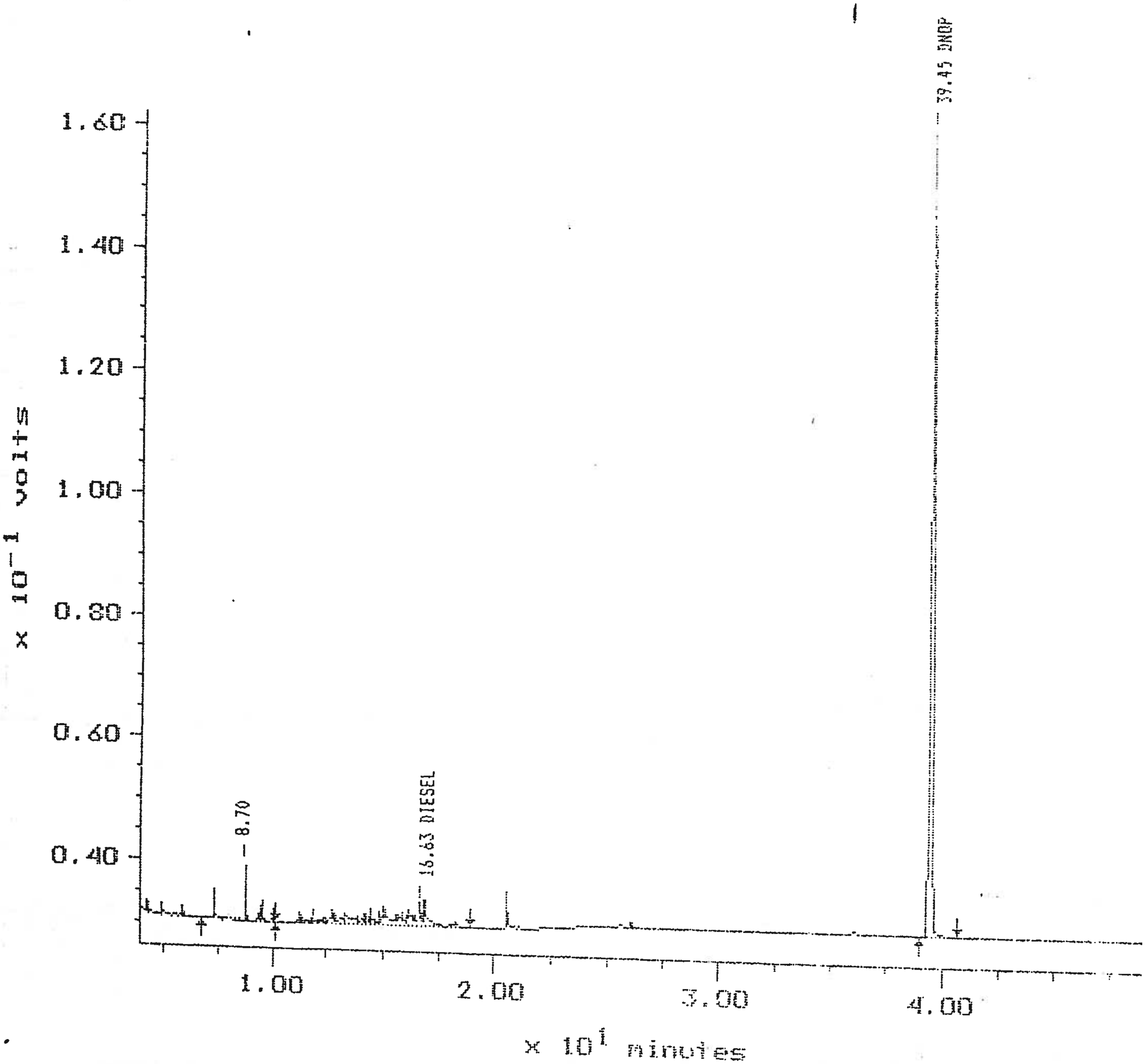

14.98 DIESEL
39.46 DNOP

Sample: S8910-181-2 Channel: FID REAR-A Filename: 9RF02172
Acquired: 02-NOV-89 11:02 Method: C:\MAX\DATA4\RAQBTX29 Operator: RWM
Comments: DIESEL AND BTEX PROGRAM FOR DIESEL/BTXE STDS, MS, MSD, FPB, FPBN




16.58 DIESEL
39.46 DNOP
4.00
3.00
2.00
1.00
0.00
Minutes
X

Sample: S8910-181-4 Channel: FID REAR-A Filename: 9RF02174
Acquired: 02-NOV-89 13:03 Method: C:\MAX\DATA4\RAGBTX29 Operator: RWM
Comments: DIESEL AND BTEX PROGRAM FOR DIESEL/BTXE STDS, MS, MSD, FPB, FPBN



Analytical Technologies, Inc.
560 Naches Avenue SW, Suite 101 Renton, WA 98055

Chain of Custody

PROJECT MANAGER: Otto Paris
COMPANY: GEI
ADDRESS:
PHONE: 746-5200 SAMPLED BY: JER

LABORATORY NUMBER: 8910-181

SAMPLE DISPOSAL INSTRUCTIONS
☐ ATI Disposal @ $5.00 each ☐ Return ☐ Pickup (will call)

SAMPLE ID	DATE	TIME	MATRIX	LAB ID
NW-2	10/23/89		Soil	1
WT-1	10/26			2
MT-1	10/26			3
ET-2	10/27			4

ANALYSIS REQUEST

	8010 Halogenated Volatiles	8020 Aromatic Volatiles	BETX ONLY	8240 GCMS Volatiles	8270 GCMS BNA	8310 HPLC PNA	8080 Pesticides & PCB's	PCB's ONLY	8140 Phosphate Pesticides	8150 Herbicides	WDOE PAH/HH (WAC 173)	418.1 (TPH)	413.2 Grease & Oil	8015 (Modified)	TOC 9060	TOX 9020	% Moisture	TCLP	Priority Pollutant Metals (10)
NW-2			X											X					
WT-1			X											X					
MT-1			X											X					
ET-2			X											X					

PROJECT INFORMATION	
PROJECT NUMBER:	1780-01-R4
PROJECT NAME:	Circle K
PURCHASE ORDER NUMBER:	
VIA:	Taxi

SAMPLE RECEIPT	
TOTAL NUMBER OF CONTAINERS	4
CHAIN OF CUSTODY SEALS Y/N/NA	N
INTACT? Y/N/NA	Y
RECEIVED GOOD COND./COLD	Y

TAT: ☐ 24HR ☐ 48 HRS ☐ 72 HRS ☐ 1 WK ☑ 2 WKS (Normal)

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH DATA

SPECIAL INSTRUCTIONS:
Note: Sample NW-2 was collected on 10/23. Please perform extraction ASAP.

RELINQUISHED BY: 1.	RELINQUISHED BY:
Signature: Jane Roth Time: 1400	Signature:
Printed Name: Jane Roth Date: 10/31/89	Printed Name:
Company: GEI	Company:
RECEIVED BY: 1.	**RECEIVED BY:**
Signature: Time:	Signature:
Printed Name: Date:	Printed Name:
Company:	Company:

ATI Labs: San Diego (619)458-9141 • Phoenix (602)438-1530 • Seattle (206)228-8335 • Pensacola (904)474-1001 DISTRIBUTION: White, Canary - ANALYTICAL

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

ATI I.D. # 8910-142

GeoEngineers

NOV 28 1989

File

November 28, 1989

GeoEngineers, Inc.
2405 140th Ave. NE, Suite 105
Bellevue, WA 98005

Attention : Otto Paris

Project Number : 1780-01-B4

Project Name : Circle K

On October 23, 1989 Analytical Technologies, Inc. received four soil 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.

Karen L. Mixon
Project Manager

FWG/pes

Frederick W. Grothkopp
Technical Manager

Analytical Technologies, Inc.

ATI I.D. # 8910-142

SAMPLE CROSS REFERENCE SHEET

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1780-01-B4
PROJECT NAME : CIRCLE K

ATI #	CLIENT DESCRIPTION	DATE SAMPLED	MATRIX
8910-142-1	EW-1	10/20/89	SOIL
8910-142-2	WW-1	10/20/89	SOIL
8910-142-3	NW-1	10/20/89	SOIL
8910-142-4	SW-1	10/20/89	SOIL

----- TOTALS -----

ANALYSIS	TECHNIQUE	REFERENCE/METHOD
BETX	GC/PID	EPA 8020
FUEL HYDROCARBONS	GC/FID	EPA 8015 MODIFIED
% MOISTURE	GRAVIMETRIC	METHOD 7-2.2

Analytical Technologies, Inc.

ATI I.D. # 8910-142

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: N/A
PROJECT #	: 1780-01-B4	DATE RECEIVED	: N/A
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 10/24/89
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 10/26/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	<0.025
ETHYLBENZENE	<0.025
TOLUENE	<0.025
TOTAL XYLENES	<0.025

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	88

CLIENT I.D. : EW-1
SAMPLE MATRIX : SOIL
EPA METHOD : 8020 (BETX)

DATE ANALYZED : 10/26/89
UNITS : mg/Kg
DILUTION FACTOR : 1

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	<0.025
ETHYLBENZENE	<0.025
TOLUENE	<0.025
TOTAL XYLENES	<0.025

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	97

Analytical Technologies, Inc.

ATI I.D. # 8910-142-2

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 10/20/89
PROJECT #	: 1780-01-B4	DATE RECEIVED	: 10/23/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 10/24/89
CLIENT I.D.	: WW-1	DATE ANALYZED	: 10/26/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 20

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	1.3
ETHYLBENZENE	9.7
TOLUENE	20
TOTAL XYLENES	53

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	**

** Due to the necessary dilution of the sample, result was not attainable.

PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 10/24/89
CLIENT I.D.	: NW-1	DATE ANALYZED	: 10/26/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 100

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	31
ETHYLBENZENE	55
TOLUENE	140
TOTAL XYLENES	300

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	**

** Due to the necessary dilution of the sample, result was not attainable.

Analytical Technologies, Inc.

ATI I.D. # 8910-142-4

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 10/20/89
PROJECT #	: 1780-01-B4	DATE RECEIVED	: 10/23/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 10/24/89
CLIENT I.D.	: SW-1	DATE ANALYZED	: 10/26/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1 & 5

RESULTS BASED ON DRY WEIGHT

COMPOUND	RESULT
BENZENE	1.0
ETHYLBENZENE	1.6
TOLUENE	6.3 *
TOTAL XYLENES	10 *

SURROGATE PERCENT RECOVERY

BROMOFLUOROBENZENE	97

* Dilution factor = 5.

PROJECT NAME : CIRCLE K
EPA METHOD : 8020 (BETX)

UNITS : mg/Kg
MATRIX : SOIL

COMPOUND	SAMPLE RESULT	SPIKE ADDED	SPIKED SAMPLE	% REC	DUP SPIKED SAMPLE	DUP % REC	RPD
BENZENE	<0.025	0.40	0.368	92	0.369	92	0
TOLUENE	<0.025	0.40	0.372	93	0.371	93	0
TOTAL XYLENES	<0.025	1.10	1.18	107	1.19	108	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. # 8910-142

FUEL HYDROCARBONS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: N/A
PROJECT #	: 1780-01-B4	DATE RECEIVED	: N/A
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 10/24/89
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 10/25/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 MODIFIED	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	DIESEL

PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 10/24/89
CLIENT I.D.	: EW-1	DATE ANALYZED	: 10/25/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 MODIFIED	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	DIESEL

Analytical Technologies, Inc.

ATI I.D. # 8910-142-2

FUEL HYDROCARBONS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 10/20/89
PROJECT #	: 1780-01-B4	DATE RECEIVED	: 10/23/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 10/24/89
CLIENT I.D.	: WW-1	DATE ANALYZED	: 10/25/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 MODIFIED	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	270
HYDROCARBON RANGE	C6 - C10
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	600
HYDROCARBON RANGE	C12 - C26
HYDROCARBONS QUANTITATED USING	DIESEL

BEST ESTIMATE OF FUEL TYPE - 1 PART GASOLINE : 2 PARTS DIESEL

PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 10/24/89
CLIENT I.D.	: NW-1	DATE ANALYZED	: 10/25/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 MODIFIED	DILUTION FACTOR	: 5

COMPOUND	RESULT
FUEL HYDROCARBONS	1,700
HYDROCARBON RANGE	C6 - C10
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	4,100
HYDROCARBON RANGE	C12 - C26
HYDROCARBONS QUANTITATED USING	DIESEL

BEST ESTIMATE OF FUEL TYPE - 1 PART GASOLINE : 2 PARTS DIESEL

Analytical Technologies, Inc.

ATI I.D. # 8910-142-4

FUEL HYDROCARBONS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 10/20/89
PROJECT #	: 1780-01-B4	DATE RECEIVED	: 10/23/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: 10/24/89
CLIENT I.D.	: SW-1	DATE ANALYZED	: 10/25/89
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8015 MODIFIED	DILUTION FACTOR	: 1

COMPOUND	RESULT
FUEL HYDROCARBONS	360
HYDROCARBON RANGE	C6 - C14
HYDROCARBONS QUANTITATED USING	GASOLINE
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	-
HYDROCARBONS QUANTITATED USING	DIESEL

EPA METHOD : 8015 MODIFIED UNITS : mg/Kg

COMPOUND	SAMPLE RESULT	CONC SPIKED	SPIKED SAMPLE	% REC	DUP SPIKED SAMPLE	DUP % RECOVERY	RPD
FUEL HYDROCARBONS	<5	500	492	98	464	93	6

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

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

Analytical Technologies, Inc.

ATI I.D. # 8910-142

GENERAL CHEMISTRY RESULTS

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1780-01-B4
PROJECT NAME : CIRCLE K

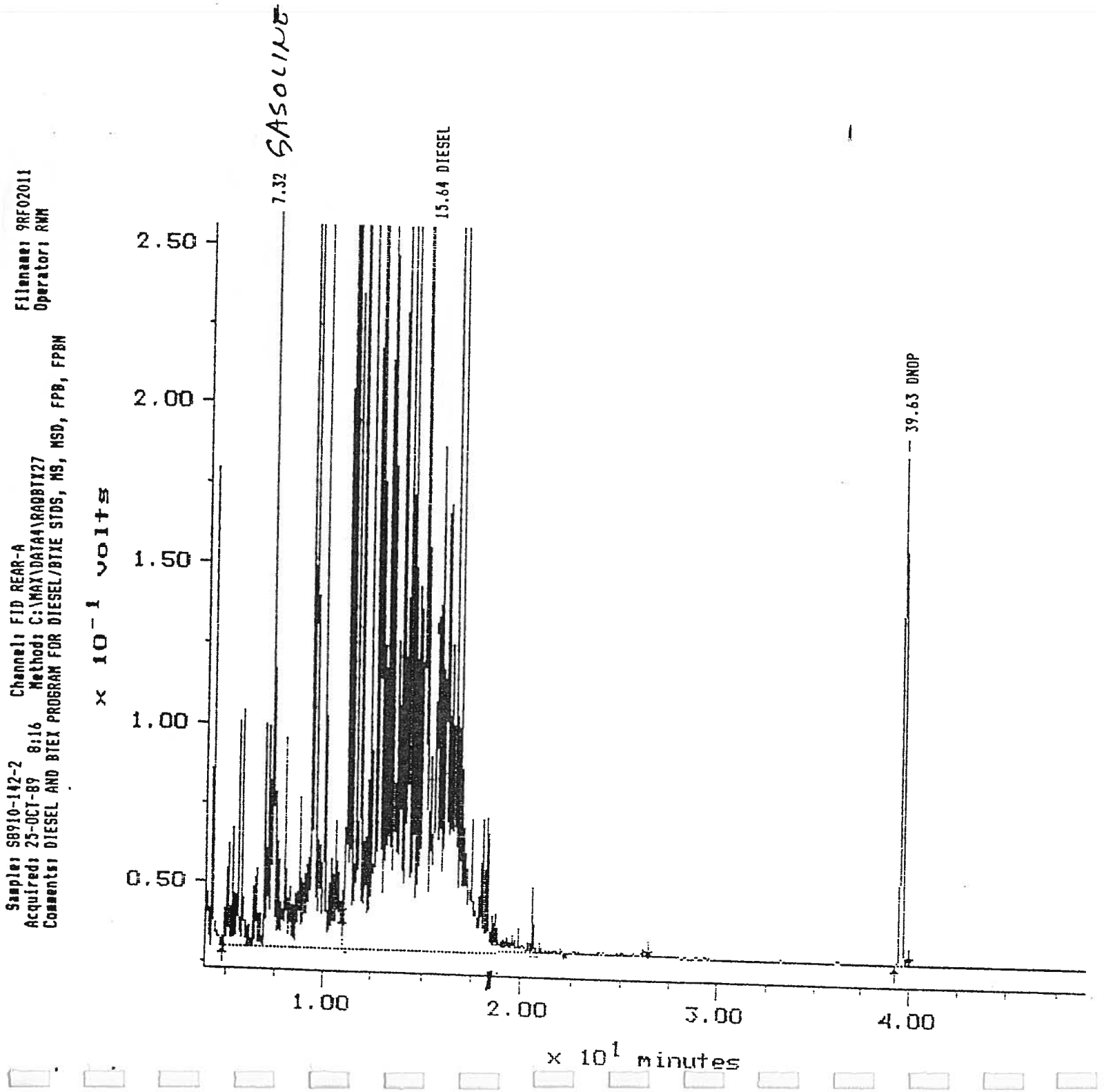
SAMPLE MATRIX : SOIL

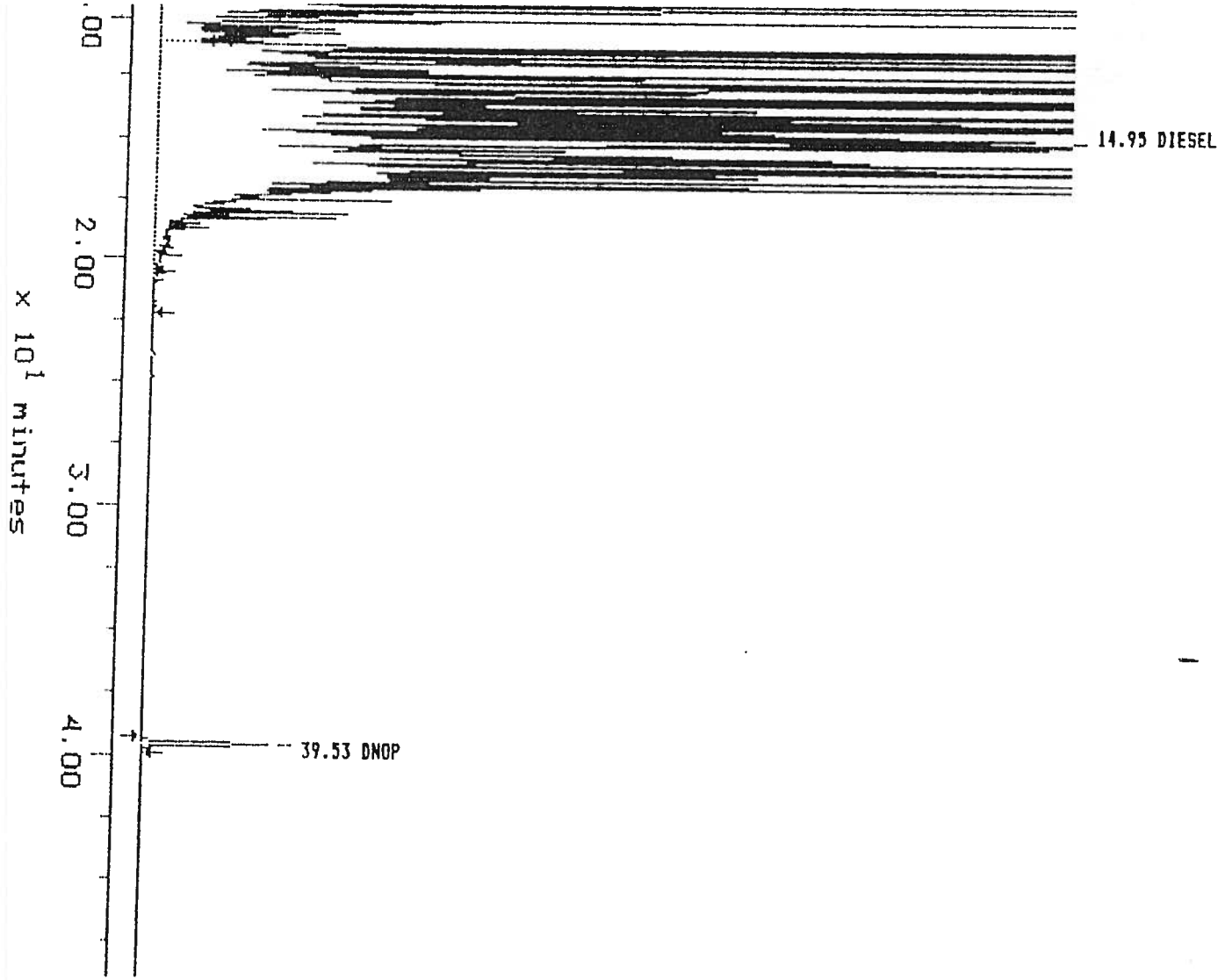
PARAMETER	UNITS	-1	-2	-3	-4
MOISTURE	%	10	11	8.8	30

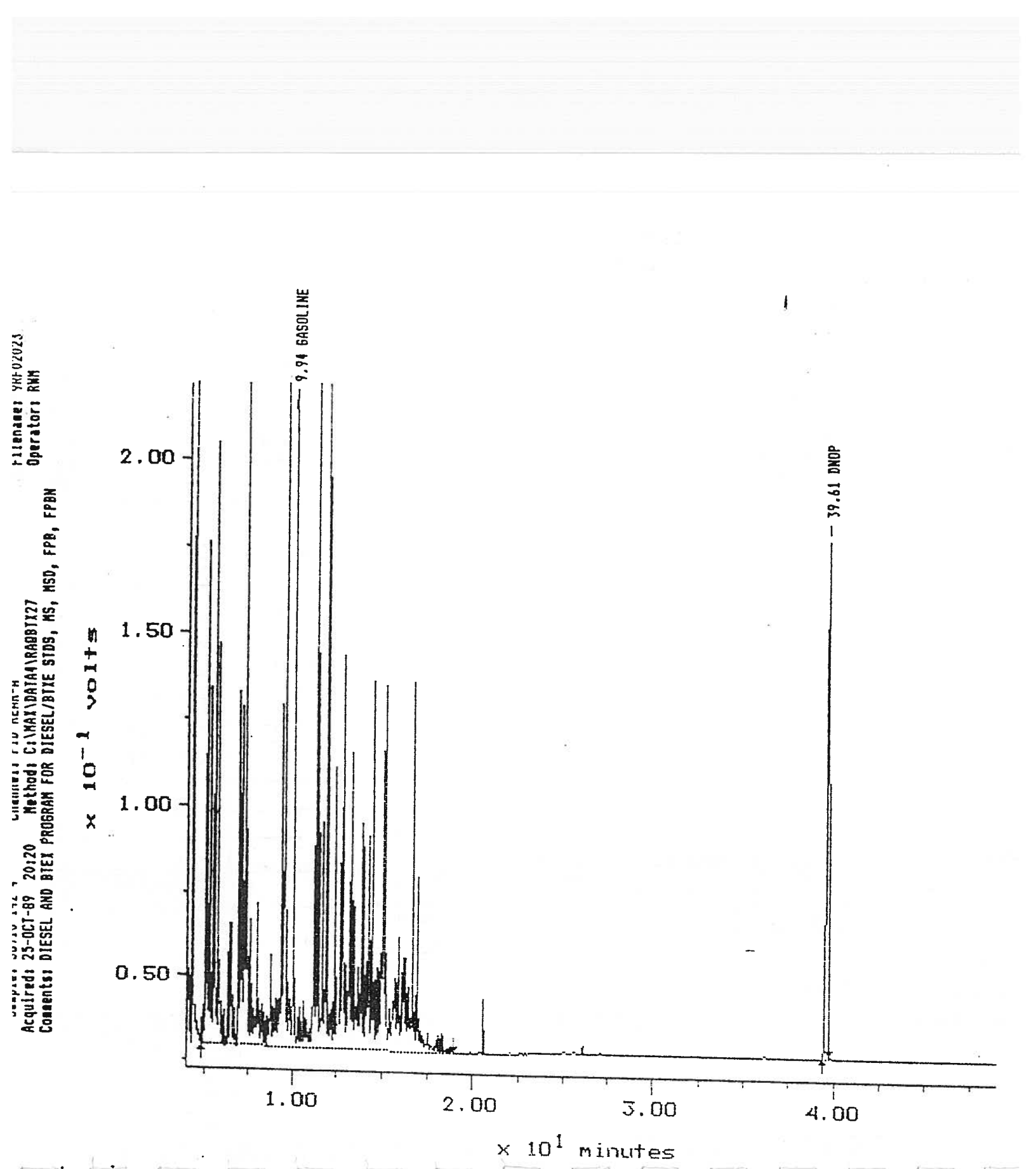
PARAMETER	UNITS	ATI I.D.	SAMPLE RESULT	DUP RESULT	RPD	SPIKED CONC	SPIKE ADDED	% REC
MOISTURE	%	8910-142-1	10	12	18	N/A	N/A	N/A

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

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


Sample: 8910-142-2 Channel: FID REAR-A
Acquired: 25-OCT-89 8:16 Method: C:\MAX\DATA4\RA0BTX27
Comments: DIESEL AND BTEX PROGRAM FOR DIESEL/BTXE STDS, MS, MSD, FPB, FPBM
Filename: 9RF02011
Operator: RNM
7.32 GASOLINE
15.64 DIESEL
39.63 DNOP
2.50
2.00
1.50
1.00
0.50
x 10⁻¹ volts
1.00
2.00
3.00
4.00
x 10¹ minutes


.00
2.00
3.00
4.00
x 10¹ minutes
14.95 DIESEL
39.53 DNOP


Filename: YNF02023
Operator: RNM
Acquired: 25-OCT-89 20:20 Method: C:\MAT\DATA4\RABBIX27
Comment: DIESEL AND BIEX PROGRAM FOR DIESEL/BIXE STDS, MS, MSD, FPD, FPDN
9.94 GASOLINE
39.61 DNOP
2.00
1.50
1.00
0.50
x 10⁻¹ volts
1.00
2.00
3.00
4.00
x 10¹ minutes

Analytical Technologies, Inc.
560 Naches Avenue SW, Suite 101 Renton, WA 98055

Chain of Custody

PROJECT MANAGER: Otto Paris
COMPANY: GEI
ADDRESS:
PHONE: 746-5200 SAMPLED BY: JGR

LABORATORY NUMBER: 8910-142

SAMPLE DISPOSAL INSTRUCTIONS

☐ ATI Disposal @ $5.00 each ☐ Return ☐ Pickup (will call)

SAMPLE ID	DATE	TIME	MATRIX	LAB ID
EW-1	10/20	0915	Soil	1
WW-1	"	0920	"	2
NW-1	"	0930	"	3
SW-1	"	0940	"	4

ANALYSIS REQUEST

8010 Halogenated Volatiles	8020 Aromatic Volatiles	BETX ONLY	8240 GCMS Volatiles	8270 GCMS BNA	8310 HPLC PNA	8080 Pesticides & PCB's	PCB's ONLY	8140 Phosphate Pesticides	8150 Herbicides	WDOE PAH/HH (WAC 173)	418.1 (TPH)	413.2 Grease & Oil	8015 (Modified)	TOC 9060	TOX 9020	% Moisture	TCLP	Priority Pollutant Metals (13)
		X											X					
		X											X					
		X											X					
		X											X					
													X					

PROJECT INFORMATION

PROJECT NUMBER: 1780-01-B4
PROJECT NAME: Circle K
PURCHASE ORDER NUMBER:
VIA:

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS	4
CHAIN OF CUSTODY SEALS Y/N/NA	4
INTACT? Y/N/NA	4
RECEIVED GOOD COND./COLD	4

TAT: ☐ 24HR ☐ 48 HRS ☐ 72 HRS ☐ 1 WK ☑ 2 WKS (Normal)

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH DATA

SPECIAL INSTRUCTIONS:

RELINQUISHED BY: 1.	RELINQUISHED BY:
Signature: Otto K. Paris Time: 0900	Signature:
Printed Name: Otto K. Paris Date: 10/23/89	Printed Name:
Company: GEI	Company:
RECEIVED BY: 1.	**RECEIVED BY:**
Signature: Time:	Signature:
Printed Name: Date:	Printed Name:
Company:	Company:

ATI Labs: San Diego (619)458-9141 • Phoenix (602)438-1530 • Seattle (206)228-8335 • Pensacola (904)474-1001 DISTRIBUTION: White, Canary - ANALYTICAL TE

D - 64

APPENDIX E

Chemical Analytical Data,

Water Quality Samples Collected From the Water Treatment System

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

ATI I.D. # 8912-023

GeoEngineers

JAN 4 1989

Filing OKP

File

January 3, 1990

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

Attention : Otto Paris

Project Number : 1780-01-B4

Project Name : Circle K

On December 11, 1989 Analytical Technologies, Inc. received three 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 C. Silva
Senior Project Manager

Frederick W. Grothkopp
Technical Manager

8912-023-1	PORT 1	12/11/89	WATER
8912-023-2	PORT 2	12/11/89	WATER
8912-023-3	PORT 3	12/11/89	WATER

----- TOTALS -----

MATRIX	# SAMPLES
WATER	3

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.

ANALYTICAL SCHEDULE

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1780-01-B4
PROJECT NAME : CIRCLE K

ANALYSIS	TECHNIQUE	REFERENCE/METHOD
BETX	GC/PID	EPA 8020

EPA METHOD : 8020 (BETX) DILUTION FACTOR : 1

COMPOUND	RESULT
BENZENE	<0.5
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	<0.5

SURROGATE PERCENT RECOVERY

TRIFLUOROTOLUENE	94

ATI I.D. # 8912-023

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: N/A
PROJECT #	: 1780-01-B4	DATE RECEIVED	: N/A
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: N/A
CLIENT I.D.	: REAGENT BLANK	DATE ANALYZED	: 12/20/89
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUND	RESULT
BENZENE	<0.5
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	<0.5

SURROGATE PERCENT RECOVERY

TRIFLUOROTOLUENE	88

EPA METHOD : 8020 (BETX) DILUTION FACTOR : 1000

COMPOUND	RESULT
BENZENE	23,000
ETHYLBENZENE	740
TOLUENE	17,000
TOTAL XYLENES	3,000

SURROGATE PERCENT RECOVERY

TRIFLUOROTOLUENE	85

ATI I.D. # 8912-023-2

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 12/11/89
PROJECT #	: 1780-01-B4	DATE RECEIVED	: 12/11/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: N/A
CLIENT I.D.	: PORT 2	DATE ANALYZED	: 12/20/89
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1000

COMPOUND	RESULT
BENZENE	16,000
ETHYLBENZENE	<500
TOLUENE	800
TOTAL XYLENES	<500

SURROGATE PERCENT RECOVERY

TRIFLUOROTOLUENE	93

EPA METHOD : 8020 (BETX) DILUTION FACTOR : 1

COMPOUND	RESULT
BENZENE	<0.50
ETHYLBENZENE	<0.50
TOLUENE	6.4
TOTAL XYLENES	<0.50

SURROGATE PERCENT RECOVERY

TRIFLUOROTOLUENE	79

ATI I.D. # 8912-023

PURGEABLE AROMATICS
QUALITY CONTROL DATA

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1780-01-B4
PROJECT NAME : CIRCLE K
EPA METHOD : 8020 (BETX)

SAMPLE I.D. : 91201501
DATE ANALYZED : 12/19/89
SAMPLE MATRIX : WATER
UNITS : ug/L

COMPOUND	SAMPLE RESULT	SPIKE ADDED	SPIKED SAMPLE	% REC	DUP SPIKED SAMPLE	DUP % REC	RPD
BENZENE	<0.5	5.00	5.0	100	4.8	96	4
TOLUENE	<0.5	5.00	5.6	112	5.4	108	4

;,Inc.
nton,WA 98055

Chain of Custody 8912-023

DATE 12/11/89 PAGE 1 OF 1

ir

SAMPLED BY: JGR

AL INSTRUCTIONS

☐ Return ☐ Pickup (will call)

LABORATORY NUMBER:

DATE	TIME	MATRIX	LAB ID
12/11		H_2O	1
12/11		↓	2
12/11		↓	3

ANALYSIS REQUEST

8010 Halogenated Volatiles	8020 Aromatic Volatiles	BETX ONLY	8240 GCMS Volatiles	8270 GCMS BNA	8310 HPLC PNA	8080 Pesticides & PCB's	PCB's ONLY	8140 Phosphate Pesticides	8150 Herbicides	WDOE PAH/HH (WAC 173)	418.1 (TPH)	413.2 Grease & Oil	8015 (Modified)	TOC 9060	TOX 9020	% Moisture	TCLP	Priority Pollutant Metals (13)	EPTOX Metals (8) Total	EP TOX Metals (8) EP EXT	NUMBER OF CONTAINERS
		X																			3
		X																			↓
		X																			
		Preserved																			

SAMPLE RECEIPT

TOTAL NUMBER OF CONTAINERS	6
CHAIN OF CUSTODY SEALS Y/N/NA	Y
INTACT? Y/N/NA	Y
RECEIVED GOOD COND./COLD	Y

☐ 72 HRS ☒ 1 WK ☐ 2 WKS (Normal)

FOR RUSH DATA

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: James Ford Time: 1550	Signature: Time:	Signature: Time:
Printed Name: James Roth Date: 12/11	Printed Name: Date:	Printed Name: Date:
Company: GEI	Company:	Company:
RECEIVED BY: 1.	**RECEIVED BY: 2.**	**RECEIVED BY: (LAB) 3.**
Signature: Time:	Signature: Time:	Signature: J. Alston Time: 1640
Printed Name: Date:	Printed Name: Date:	Printed Name: Cindi Alston Date: 12/14
Company:	Company:	Analytical Technologies, Inc.

oenix (602)438-1530 • Seattle (206)228-8335 • Pensacola (904)474-1001

DISTRIBUTION: White, Canary - ANALYTICAL TECHNOLOGIES, INC. • Pink - ORIGINATOR

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

ATI I.D. # 8910-055

GeoEngineers

JAN 15 1989

Routing
File

January 12, 1990

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

Attention : Otto Paris

Project Number : 1780-01-B4

Project Name : Circle K

On December 19, 1989 Analytical Technologies, Inc. received one water sample for analyses. The sample was 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.

Donna M. McKinney

Donna M. McKinney

Frederick W. Grothkopp

Frederick W. Grothkopp

SAMPLE CROSS REFERENCE SHEET

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1780-01-B4
PROJECT NAME : CIRCLE K

ATI #	CLIENT DESCRIPTION	DATE SAMPLED	MATRIX
8910-055-1	CIRCLE K, PORT #3	12/18/89	WATER

----- TOTALS -----

ARSENIC	AA/GF	EPA 7060
CADMIUM	AA/GF	EPA 7131
CHROMIUM	AA/F	EPA 7190
COPPER	AA/F	EPA 7210
LEAD	AA/GF	EPA 7421
MERCURY	AA/COLD VAPOR	EPA 7470
NICKEL	AA/F	EPA 7520
SILVER	AA/F	EPA 7760
ZINC	AA/F	EPA 7950
CYANIDE	COLORIMETRIC	EPA 9012
OIL & GREASE	IR	EPA 413.2
PH	ELECTRODE	EPA 150.1

ATI I.D.# 8912-055

METALS RESULTS

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1780-01-B4
PROJECT NAME : CIRCLE K

MATRIX : WATER
UNITS : mg/L

PARAMETER	-1 CIRCLE K, PORT #3
ARSENIC	0.008
CADMIUM	<0.0003
CHROMIUM	<0.02
COPPER	<0.02
LEAD	<0.005
MERCURY	<0.0005
NICKEL	0.09
SILVER	<0.01
ZINC	0.10

PARAMETER	AFI I.D.	RESULT	RESULT	RPD	SAMPLE	CONC	REC
ARSENIC	8912-077-1	<0.005	<0.005	0	0.053	0.050	106
CADMIUM	8912-039-5	<0.0003	<0.0003	0	0.0018	0.0020	90
CHROMIUM	8912-055-1	<0.02	<0.02	0	1.95	2.00	98
COPPER	8912-059-26	<0.02	<0.02	0	0.49	0.50	98
LEAD	8912-039-11	<0.005	<0.005	0	0.022	0.025	88
MERCURY	8912-055-1	<0.0005	<0.0005	0	0.00253	0.00200	126*
NICKEL	8912-055-1	0.09	0.07	25	0.52	0.50	104
SILVER	8912-055-1	<0.01	<0.01	0	1.02	1.00	102
ZINC	8912-059-26	<0.01	<0.01	0	0.26	0.25	104

* Out of limits due to matrix interference.

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

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

GENERAL CHEMISTRY RESULTS

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1780-01-B4
PROJECT NAME : CIRCLE K

SAMPLE MATRIX : WATER
UNITS : mg/L

ATI I.D.#	CLIENT I.D.	CYANIDE	OIL & GREASE
8910-055-1	CIRCLE K, PORT #3	<0.01	0.31

8910-055-1	CIRCLE K, PORT #3	6.8

ATI I.D. # 8912-055

GENERAL CHEMISTRY QUALITY CONTROL

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1780-01-B4
PROJECT NAME : CIRCLE K

SAMPLE MATRIX : WATER
UNITS : -

PARAMETER	UNITS	ATI I.D.	SAMPLE RESULT	DUP RESULT	RPD	SPIKED CONC	SPIKE ADDED	% REC
CYANIDE	mg/L	8912-055-1	<0.01	<0.01	0	0.54	0.50	108
OIL & GREASE	mg/L	8912-055-1	0.31	0.31	0	2.86	5.03	51
PH	-	8912-055-1	6.8	6.9	1	N/A	N/A	N/A

8912-055

,Inc.
ıton,WA 98055

Chain of Custody

DATE 12/19 PAGE 1 OF 1

-is

AMPLED BY: JGR

L INSTRUCTIONS

☐ Return ☐ Pickup (will call)

LABORATORY NUMBER:

ANALYSIS REQUEST

DATE	TIME	MATRIX	LAB ID	8010 Halogenated Volatiles	8020 Aromatic Volatiles	BETX ONLY	8240 GCMS Volatiles	8270 GCMS BNA	8310 HPLC PNA	8080 Pesticides & PCB's	PCB's ONLY	8140 Phosphate Pesticides	8150 Herbicides	WDOE PAH/HH (WAC 173)	418.1 (TPH)	413.2 Grease & Oil	8015 (Modified)	TOC 9060	TOX 9020	% Moisture	TCLP	Priority Pollutant Metals (13)	EPTOX Metals (8) Total	EP TOX Metals (8) EP EXT	Method 9010 Cyanide	Method 150.1 pH	Methods 7000 Series (4)					NUMBER OF CONTAINERS
12/18		H_2O	-1													X									X	X	X					4

E - 19

SAMPLE RECEIPT	
TOTAL NUMBER OF CONTAINERS	4
CHAIN OF CUSTODY SEALS Y/N/NA	N
INTACT? Y/N/NA	NA
RECEIVED GOOD COND./COLD	Y

☐ 72 HRS ☐ 1 WK ☑ 2 WKS (Normal)

FOR RUSH DATA

1(metals): Please test for Arsenic, ...m, Copper, Lead, Mercury, Nickel,

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: James Roth Time: 1000	Signature: Time:	Signature: Time:
Printed Name: James Roth Date: 12/19/89	Printed Name: Date:	Printed Name: Date:
Company: GEI	Company:	Company:
RECEIVED BY: 1.	**RECEIVED BY: 2.**	**RECEIVED BY: (LAB) 3.**
Signature: Time:	Signature: Time:	Signature: Time: 1155
Printed Name: Date:	Printed Name: Date:	Printed Name: Keith Stevenson Date: 12/19/89
Company:	Company:	Analytical Technologies, Inc.

enix (602)438-1530 • Seattle (206)228-8335 • Pensacola (904)474-1001 DISTRIBUTION: White, Canary - ANALYTICAL TECHNOLOGIES, INC.• Pink - ORIGINATOR

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

ATI I.D. # 8912-085

GeoEngineers

JAN 15 1990

Routing obp

File

January 11, 1990

GeoEngineers, Inc.
2405 140th Ave. N.E.
Suite 105
Bellevue, WA 98005

Attention : Otto Paris

Project Number : 1780-001-4

Project Name : Circle K

On December 28, 1989 Analytical Technologies, Inc. received three 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 C. Silva

Mary C. Silva

Frederick W. Grothkopp

Frederick W. Grothkopp

8912-085-1	PORT 1	12/28/89	WATER
8912-085-2	PORT 2	12/28/89	WATER
8912-085-3	PORT 3	12/28/89	WATER

----- TOTALS -----

MATRIX	# SAMPLES
WATER	3

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.

ANALYTICAL SCHEDULE

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1780-001-4
PROJECT NAME : CIRCLE K

ANALYSIS	TECHNIQUE	REFERENCE/METHOD
BETX	GC/PID	EPA 8020

EPA METHOD : 8020 (BETX) DILUTION FACTOR : 1

COMPOUND	RESULT
BENZENE	<0.5
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	<0.5
SURROGATE PERCENT RECOVERY	
TRIFLUOROTOLUENE	100

ATI I.D. # 8912-085-1

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 12/28/89
PROJECT #	: 1780-001-4	DATE RECEIVED	: 12/28/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: N/A
CLIENT I.D.	: PORT 1	DATE ANALYZED	: 12/30/89
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1000

COMPOUND	RESULT
BENZENE	23,000
ETHYLBENZENE	1,000
TOLUENE	19,000
TOTAL XYLENES	6,000

SURROGATE PERCENT RECOVERY

TRIFLUOROTOLUENE	100

EPA METHOD : 8020 (BETX) DILUTION FACTOR : 1000

COMPOUND	RESULT
BENZENE	36,000
ETHYLBENZENE	<500
TOLUENE	6,000
TOTAL XYLENES	<500
SURROGATE PERCENT RECOVERY	
TRIFLUOROTOLUENE	100

ATI I.D. # 8912-085-3

PURGEABLE AROMATICS ANALYSIS
DATA SUMMARY

CLIENT	: GEOENGINEERS, INC.	DATE SAMPLED	: 12/28/89
PROJECT #	: 1780-001-4	DATE RECEIVED	: 12/28/89
PROJECT NAME	: CIRCLE K	DATE EXTRACTED	: N/A
CLIENT I.D.	: PORT 3	DATE ANALYZED	: 12/29/89
SAMPLE MATRIX	: WATER	UNITS	: ug/L
EPA METHOD	: 8020 (BETX)	DILUTION FACTOR	: 1

COMPOUND	RESULT
BENZENE	14
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	<0.5

SURROGATE PERCENT RECOVERY

TRIFLUOROTOLUENE	96

COMPOUND	SAMPLE RESULT	SPIKE ADDED	SPIKED SAMPLE	% REC	DUP SPIKED SAMPLE	DUP % REC	RPD
BENZENE	<0.5	25	25	100	28	112	12
TOLUENE	<0.5	25	23	92	26	104	12
TOTAL XYLENES	<0.5	75	66	88	71	95	8

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

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

ATI I.D. # 8912-085

PURGEABLE AROMATICS
QUALITY CONTROL DATA

CLIENT : GEOENGINEERS, INC.
PROJECT # : 1780-001-4
PROJECT NAME : CIRCLE K
EPA METHOD : 8020 (BETX)

SAMPLE I.D. : BLANK SPIKE
DATE ANALYZED : 12/29/89
MATRIX : WATER
UNITS : ug/L

COMPOUND	SAMPLE RESULT	SPIKE ADDED	SPIKED SAMPLE	% REC	DUP SPIKED SAMPLE	DUP % REC	RPD
BENZENE	<0.5	25	24	96	23	92	4
TOLUENE	<0.5	25	24	96	23	92	4
TOTAL XYLENES	<0.5	75	75	100	71	95	5

8912085

s, Inc.
nton, WA 98055

Chain of Custody

DATE 12-28-89 PAGE 1 OF 1

Paris
·s
- Ave NE, Suite 105
98005

SAMPLED BY: O. Paris

AL INSTRUCTIONS

☐ Return ☐ Pickup (will call)

LABORATORY NUMBER:

ANALYSIS REQUEST

DATE	TIME	MATRIX	LAB ID	8010 Halogenated Volatiles	8020 Aromatic Volatiles	BETX ONLY Preserved	8240 GCMS Volatiles	8270 GCMS BNA	8310 HPLC PNA	8080 Pesticides & PCB's	PCB's ONLY	8140 Phosphate Pesticides	8150 Herbicides	WDOE PAH/HH (WAC 173)	418.1 (TPH)	413.2 Grease & Oil	8015 (Modified)	TOC 9060	TOX 9020	% Moisture	TCLP	Priority Pollutant Metals (13)	EPTOX Metals (8) Total	EP TOX Metals (8) EP EXT	NUMBER OF CONTAINERS
12-28-89	1300	Water	-1			X																			2
12-28-89	1300	Water	-2			X																			2
12-28-89	1300	Water	-3			X																			2

	SAMPLE RECEIPT	
4	TOTAL NUMBER OF CONTAINERS	
	CHAIN OF CUSTODY SEALS Y/N/NA	
	INTACT? Y/N/NA	
	RECEIVED GOOD COND./COLD	

☐ 72 HRS ☒ 1 WK ☐ 2 WKS (Normal)

FOR RUSH DATA

, Talk to Mary Silva (ATI Seattle)

RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Otto K. Paris Time: 1400	Signature: Time:	Signature: Time:
Printed Name: Otto K. Paris Date: 12/28/89	Printed Name: Date:	Printed Name: Date:
Company: Geo Engineers	Company:	Company:
RECEIVED BY: 1.	**RECEIVED BY: 2.**	**RECEIVED BY: (LAB) 3.**
Signature: Time:	Signature: Time:	Signature: Mary Silva Time: 1440
Printed Name: Date:	Printed Name: Date:	Printed Name: Mary Silva Date: 12/28/89
Company:	Company:	Analytical Technologies, Inc.

enix (602)438-1530 • Seattle (206)228-8335 • Pensacola (904)474-1001 DISTRIBUTION: White, Canary - ANALYTICAL TECHNOLOGIES, INC. • Pink - ORIGINATOR

E-29