Site Characterization Report
for
Site No. 2842

Prepared for

United States Navy
Roosevelt Roads Naval Station

Ceiba, Puerto Rico

Contract No. N62470-95-D-6007
CTO-076

October 1999

Prepared by

CH2MHILL

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List of Acronyms

bls	below land surface
BTEX	Benzene, Toluene, Ethylbenzene, and Total Xylenes
CFR	Code of Federal Regulations
DRO	Diesel Range Organics
ft/day	feet per day
ft/ft	feet per foot
GRO	Gasoline Range Organics
HVC	hydrocarbon vapor content
mg/Kg	milligrams per kilogram
mg/L	milligrams per Liter
msl	mean sea level
MOGAS	Motor Vehicle Gasoline
NAVSTA	U.S. Naval Station
OVA	Organic vapor analyzer
PAH	Polynuclear Aromatic Hydrocarbons
ppm	parts per million
PREQB	Puerto Rico Environmental Quality Board
QA/QC	Quality Assurance/Quality Control
QRA	Qualitative Risk Assessment
RCRA	Resource Conservation and Recovery Act
SC	Site Characterization
SVE	Soil Vapor Extraction
TEG	Transglobal Environmental Chemistry
TPH	Total Petroleum Hydrocarbons
TRPH	Total Recoverable Petroleum Hydrocarbons
USCS	Unified Soil Classification System
UST	Underground Storage Tank
VOC	Volatile Organic Compounds
μg/L	micrograms per Liter

Executive Summary

CH2M HILL conducted a site characterization (SC) for former underground storage tank (UST) Site 2842 at the Roosevelt Roads U.S. Naval Station (NAVSTA Roosevelt Roads), Ceiba, Puerto Rico. Site 2842 is the former location of a 1,500-gallon motor vehicle gasoline (MOGAS) UST used for supplying vehicles at Building 3188. The former UST was located next to a former diesel fuel aboveground storage tank (AST) also used for supplying fuel to vehicles at building 3188. The purpose of the SC was to assess the horizontal and vertical extent of potential effects of fuel leaks from the 1,500-gallon UST on soil and groundwater at Site 2842. The AST at the site was not included in planned activities associated with the UST assessment. The SC investigation consisted of the installation of soil borings and monitoring wells, the collection and analysis of soil and groundwater samples, and aquifer testing.

Twenty-five soil borings and five monitoring wells were installed at Site 2842. Soil and groundwater samples collected from the soil borings and monitoring wells were sent to a laboratory for analysis. The locations of the permanent monitoring wells were based on the laboratory analytical results obtained from the soil and groundwater samples collected from the soil borings. Monitoring well top-of-casing elevation and depth-to-water measurements also were collected to determine the groundwater flow direction at Site 2842. Two slug tests (aquifer tests) were performed to determine the hydraulic conductivity of the surficial aquifer. Results of the slug tests revealed that the soils beneath Site 2842 have a low hydraulic conductivity (ranging from 0.6 feet per day [ft/day] to 13.2 ft/day).

Laboratory analytical data indicates that total petroleum hydrocarbons (TPH) were detected in 8 of 24 soil samples collected, with 7 of these samples above the Puerto Rico Environmental Quality Board (PREQB) TPH target level of 100 micrograms per kilogram (mg/Kg). Concentrations exceeding the target level ranged from 390 to 36,000 mg/Kg. TPH for Diesel Range Organics (DRO) and Gasoline Range Organics (GRO) by Environmental Protection Agency (EPA) Method 8015M was selected as the sample analytical method to assist in differentiating potential impacts from the former gasoline UST and the former diesel fuel AST. All 8 of the impacted soil samples were in the DRO class of petroleum constituents and appear to indicate that subsurface impacts may be related to the former diesel fuel AST at Site 2842.

Separate phase product was encountered in two monitoring wells installed near the former UST, but currently is present in measurable amounts only at the source area well. Bailing efforts have reduced the separate phase thickness to a petroleum sheen at the other location. Groundwater samples were collected from three of the five monitoring wells installed under this program and from one well located at Site 124 which is adjacent to Site 2842. The two monitoring wells that contained separate phase product and petroleum sheens were not sampled during this effort. Dissolved petroleum hydrocarbon constituents were not detected above method detection limits in the groundwater samples collected from the three monitoring wells installed during this investigation, or from the Site 124 well.

The lead concentrations detected in monitoring wells 124-MW6, 2842-MW2, 2842-MW3, and 2842-MW4 were 41 μg/L, 17 μg/L, and 38 μg/L, respectively. The lead detections at the site are slightly above the PREQB target level of 15 μg/L for lead in groundwater.

A qualitative risk assessment (QRA) was conducted to assess potential exposure pathways at the site. Based on the results of the QRA, the residual amounts of petroleum-contaminated soils currently identified at Site 2842 are not a threat to human health and the environment because of a lack of complete exposure pathways.

Based on the information obtained from the field investigation and laboratory analytical data, CH2M HILL recommends that a Monitoring Only Plan be developed at Site 2842 to assess any future potential petroleum impacts at Site 2842. Natural biodegradation processes should reduce the concentrations of dissolved diesel range organics in the groundwater over time. The groundwater should be monitored on a semi-annual basis for TPH and lead. Additionally, monitoring well 2842-MW1 should be bailed on a semi-annual basis to remove free product.

SECTION 1

Introduction

Pursuant to Contract Number N62470-95-D-6007-CTO-076, CH2M HILL was authorized by the United States Navy to conduct a site characterization (SC) investigation of underground storage tank (UST) 2842B (Site 2842) at the United States Naval Station Roosevelt Roads, Ceiba, Puerto Rico. The objective of the SC investigation was to evaluate the degree and extent of potential impacts from petroleum products to the soil and groundwater at Site 2842. This report presents a summary of the work completed, results of the SC field investigation, and remediation recommendations.

1.1 Site Location

Site 2842 is located in the United States Naval Station Roosevelt Roads (NAVSTA Roosevelt Roads), near the town of Ceiba on the eastern end of Puerto Rico (Figure 1-1). The approximate location of the Naval Station is 18° 15′ 00″ latitude and 65° 39′ 30″ longitude. The area of interest for this SC investigation is located in the Camp Moscrip heavy equipment storage yard (see Figure 1-2). A topographic map of the study area, depicting the relief of the site, is presented as Figure 1-3.

1.2 Site Background

According to information provided by the United States Navy, Site 2842 is the former location of one 1,500-gallon single-wall, steel, Motor Vehicle Gasoline (MOGAS) UST. The piping system associated with the UST consisted of single wall steel pipes. The UST was used to supply MOGAS to vehicles at Building 3188 and may have been formerly known as tank number 3126. The installation date of the UST is unknown. Records provided by the United States Navy indicate that the UST passed a tightness test in 1991. A former diesel fuel aboveground storage tank (AST) was located next to the 1,500 gallon UST.

As part of the UST removal activities at Site 2842, soil samples collected and submitted for laboratory analysis detected Total Petroleum Hydrocarbons concentrations ranging from 1600 to 36,000 milligrams per kilogram (mg/Kg). United States Navy personnel indicated that no accidental spills associated with the UST at Site 2842 had been reported at the site.

1.3 Previous Investigations

No previous SC investigations have been conducted at Site 2842. The United States Navy requested that a SC investigation be conducted at Site 2842 to evaluate the degree and extent of potential impacts from petroleum products to the soil and groundwater from the UST at Site 2842.

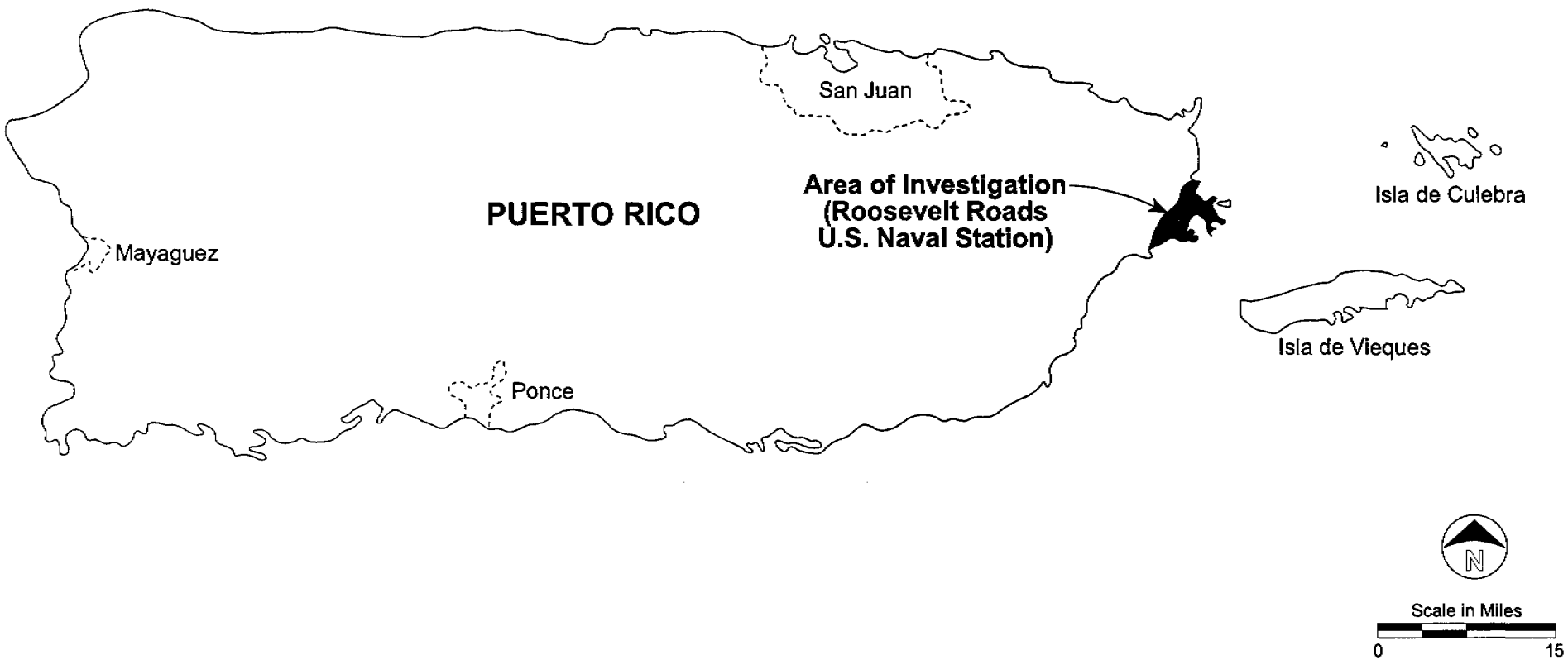

FIGURE 1-1
Site Location Map

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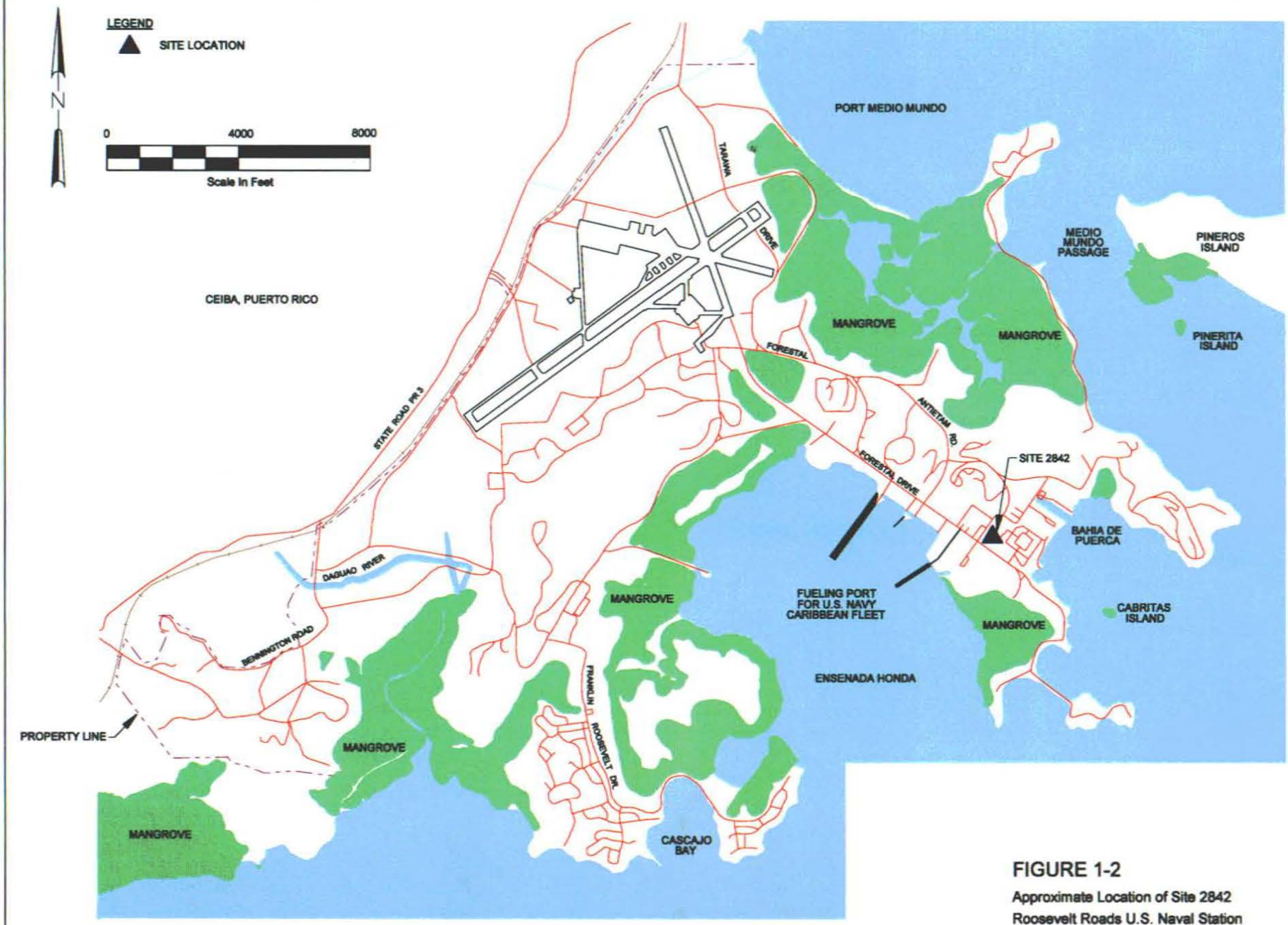

NOTE: DRAWING PREPARED FROM U.S. DEPARTMENT OF THE NAVY, NAVY PUBLIC WORKS DEPARTMENT DRAWING NO. 5424 "STATION MAP", U.S. NAVAL STATION, ROOSEVELT ROADS, PUERTO RICO, 5/15/92.

FIGURE 1-2

Approximate Location of Site 2842
Roosevelt Roads U.S. Naval Station
Ceiba, Puerto Rico

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17-MAR-1999

146801.US.RP 1/99 TPA E031999004TPA

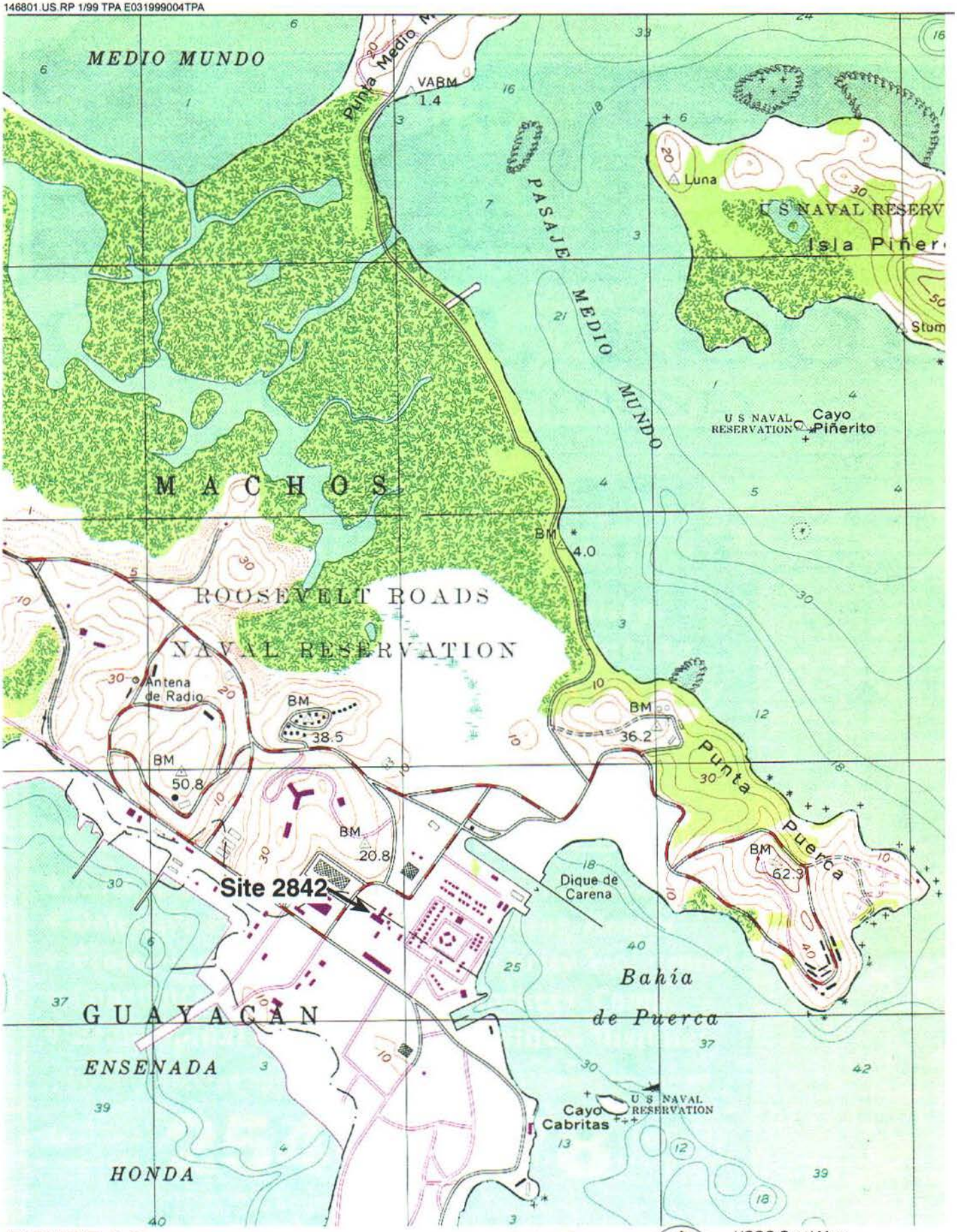

FIGURE 1-3
Site 2842 Topographic Map
Roosevelt Roads U.S. Naval Station
Cieba, Puerto Rico

Scale in Feet
0 1000 2000

N

USGS Quad Map:
Punta Puerca, Puerto Rico - 1982

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1.4 Project Objectives

The main objective of CH2M HILL's SC investigation was to assess the horizontal and vertical extent of potential soil and groundwater contamination from the 1,500-gallon, single-wall, steel UST and associated piping that were removed at Site 2842. The SC investigation consisted of installing soil borings and monitoring wells, and collecting and analyzing soil and groundwater samples.

Twenty-five (25) soil borings and five (5) permanent monitoring wells were installed at Site 2842 to meet the project objectives. Soil and groundwater samples collected from the soil borings and monitoring wells installed during this investigation were submitted to a laboratory for analysis. Three additional soil borings were installed at the site for free phase product gauging purposes. Two in-situ permeability tests were completed to collect data on aquifer characteristics and to support discussions on exposure pathways and risk evaluations in the Qualitative Risk Assessment (QRA) section.

In addition to evaluating the horizontal and vertical extent of potential contamination from the former UST, a QRA was completed to evaluate the potential risks to human health and the environment from the former 1,500 gallon UST at Site 2842.

SECTION 2

Field Investigation

The SC for Site 2842 occurred between July 6 and July 31, 1998 and consisted of the installation of soil borings and monitoring wells, the collection of soil and groundwater samples and aquifer testing. Soil samples were collected at two-foot intervals and were screened in the field with a Model 128 Foxboro organic vapor analyzer (OVA). Groundwater and select soil samples were sent for laboratory analyses. Lithologic data was collected during the installation of monitoring wells and soil borings. Soil boring lithologic logs, monitoring well construction diagrams, and in-situ permeability testing results are included in Appendices A, B, and C, respectively.

2.1 Drilling

This section describes monitoring well and soil boring installation activities. Drilling activities at the site began after utilities were cleared by NAVSTA Roosevelt Roads personnel. Field decontamination, air monitoring, OVA screening, well construction and development procedures are included in Appendix D as summarized in Table 2-1. The standard operating procedures were presented in the Final Work Plan and Health and Safety Plan (CH2M HILL, 1998)

TABLE 2-1
Summary of Appendix D
Site 2842 - Roosevelt Roads Naval Station UST Site Characterization

Appendix D Subsection	Contents
D-1	Utility Location/Dig Permit
D-2	Equipment Decontamination Procedures
D-3	Air Monitoring Procedures
D-4	OVA Field Screening Methodology
D-5	Monitoring Well Construction Procedures
D-6	Monitoring Well Development Procedures

2.1.1 Soil Boring Procedures

To determine and delineate the extent of petroleum-impacted soils, twenty-two (22) soil borings (2842-SB1 through 2842-SB22) were conducted. Soil borings were advanced to 4 feet below land surface (bls) with a post hole digger prior to using the drilling rig. Soil samples were collected continuously in 2-foot intervals to a depth of 8 to 12 feet bls and terminated when water was encountered. The shallow soils encountered at Site 2842 were described in accordance with the Unified Soil Classification System (USCS) and the Munsell soil color chart. Soil boring lithologic logs are presented in Appendix A.

2.1.2 Soil Field Screening and Sampling

Soil samples were collected using stainless steel split spoons until the water table was encountered. The samples were placed in 16-ounce glass jars, covered by a sheet of aluminum foil, and securely capped. Approximately five minutes were allowed to elapse before the head space in the jars were analyzed with the OVA. The methodology used to conduct OVA screening is described in Appendix D-4. The OVA screening results, summarized in Table 2-2, indicate that 53 of the 91 soil samples screened produced detectable vapors. Of those 53 samples, 26 samples had net hydrocarbon vapor content (HVC) concentrations above 100 parts per million (ppm). The net HVC concentrations ranged from non-detect to greater than 1,000 ppm. Methane vapor concentrations also ranged from non-detect to greater than 1,000 ppm. A total of 6 samples had unmeasurable net HVC concentrations because both the total hydrocarbon and methane vapor concentrations were above the upper limit of the OVA.

Selected soil samples were collected for laboratory analysis. The screening process involved a 24-hour turn around time from sample delivery on selected samples to confirm contamination delineation. Soil samples collected from the soil borings were analyzed by Transglobal Environmental Geochemistry (TEG) of Puerto Rico. Since the UST under investigation were used to store gasoline, the selected laboratory analysis included BTEX (Benzene, Toluene, Ethylbenzene, and Total Xylenes) by Environmental Protection Agency (EPA) Method 8020, Total Recoverable Petroleum Hydrocarbons (TRPH) by EPA Method 418.1, and Total Petroleum Hydrocarbons (TPH) by EPA Method 8015M for Gasoline Range Organics (GRO). A former diesel fuel AST existed near the gasoline UST so the TPH EPA Method 8015M for Diesel Range Organics (DRO) was added to the analysis list for the investigation.

EPA Method 418.1 was initially used as the standard site soil contamination screening method until CH2M HILL was informed by the TEG laboratory that, based on experience, TRPH (EPA Method 418.1) has a tendency to give false positives in certain soil types commonly found in Puerto Rico. Once this was known, the standard screening method was changed to EPA Method 8015M for contamination delineation.

In general, one soil sample (4 to 6 foot interval) from each soil boring was selected for laboratory analysis due to the shallow water table which was encountered at 5 feet bls. Section 4 presents laboratory analytical data.

2.1.3 Groundwater Field Screening

At the time of the soil boring installations, the depth to water across Site 2842 was approximately 5 feet bls (Appendix A). At select boreholes, Teflon® tubing was placed in the boring after the water table was encountered and a groundwater sample was collected with a peristaltic pump. This was performed in an effort to delineate the extent of potential groundwater contamination prior to installing the permanent monitoring well network.

TABLE 2-2
Organic Vapor Analysis of Soil
Site 2842 – Roosevelt Roads, U.S. Naval Station, Ceiba, Puerto Rico

Sample Designation	Date Sampled	Sample Depth (ft BLS)	Total Organic Vapors (ppm)	Total Methane Vapors (ppm)	Total Petroleum Hydrocarbon Vapors (ppm)
2842-SB1/MW1	7/6/98	0-2	<1	na	<1
	7/6/98	2-4	300	<1	300
	7/6/98	4-6	>1000	620	<380
	7/6/98	6-8	>1000	>1000	NA
2842-SB2	7/6/98	0-2	<1	na	<1
	7/6/98	2-4	18	<1	18
	7/6/98	4-6	>1000	700	>300
	7/6/98	6-8	>1000	180	>820
2842-SB3	7/7/98	0-2	300	10	290
	7/7/98	2-4	300	4	296
	7/7/98	4-6	>1000	>1000	NA
	7/7/98	6-8	200	95	105
2842-SB4	7/7/98	0-2	<1	na	<1
	7/7/98	2-4	<1	na	<1
	7/7/98	4-6	400	200	200
	7/7/98	6-8	30	20	10
2842-SB5	7/8/98	0-2	<1	na	<1
	7/8/98	2-4	<1	na	<1
	7/8/98	4-6	>1000	>1000	NA
	7/8/98	6-8	>1000	>1000	NA
2842-SB6	7/8/98	0-2	30	<1	30
	7/8/98	2-4	25	<1	25
	7/8/98	4-6	150	40	110
	7/8/98	6-8	>1000	680	>320
2842-SB7	7/8/98	0-2	<1	na	<1
	7/8/98	2-4	<1	na	<1
	7/8/98	4-6	750	400	350
	7/8/98	6-8	250	100	150
2842-SB8	7/8/98	0-2	350	35	315
	7/8/98	2-4	>1000	40	>960
	7/8/98	4-6	15	7	8
	7/8/98	6-8	45	30	15
	7/8/98	8-10	>1000	200	>800
	7/8/98	10-12	700	600	100
2842-SB9	7/9/98	0-2	<1	na	<1
	7/9/98	2-4	15	5	10
	7/9/98	4-6	20	5	15
	7/9/98	6-8	30	10	20
2842-SB10	7/10/98	0-2	10	5	5
	7/10/98	2-4	250	180	70
	7/10/98	4-5	100	100	0
	7/10/98	5-6	>1000	>1000	NA
	7/10/98	6-8	na	na	na (free product)
2842-SB11	7/10/98	0-2	na	na	na
	7/10/98	2-4	100	30	70
	7/10/98	4-6	100	50	50
	7/10/98	6-8	25	10	15

TABLE 2-2 (CONTINUED)
Organic Vapor Analysis of Soil
Site 2842 – Roosevelt Roads, U.S. Naval Station, Ceiba, Puerto Rico

Sample Designation	Date Sampled	Sample Depth (ft BLS)	Total Organic Vapors (ppm)	Total Methane Vapors (ppm)	Total Petroleum Hydrocarbon Vapors (ppm)
2842-SB-12	7/14/98	0-2	<1	na	<1
	7/14/98	2-4	<1	na	<1
	7/14/98	4-6	<1	na	<1
	7/14/98	6-8	50	25	25
2842-SB13	7/15/98	0-2	<1	na	<1
	7/15/98	2-4	<1	na	<1
	7/15/98	4-6	<1	na	<1
	7/15/98	6-8	50	30	20
2842-SB14	7/13/98	0-2	<1	na	<1
	7/13/98	2-4	22	9	13
	7/13/98	4-6	>1000	550	>450
	7/13/98	6-8	100	10	90
2842-SB15	7/15/98	0-2	<1	na	<1
	7/15/98	2-4	<1	na	<1
	7/15/98	4-6	6	<1	6
	7/15/98	6-8	1	<1	1
2842-SB16	7/15/98	0-2	<1	na	<1
	7/15/98	2-4	<1	na	<1
	7/15/98	4-6	100	40	60
	7/15/98	6-8	300	180	120
2842-SB-17	7/16/98	0-2	<1	na	<1
	7/16/98	2-4	<1	na	<1
	7/16/98	4-6	<1	na	<1
	7/16/98	6-8	130	100	30
2842-SB18	7/16/98	0-2	<1	na	<1
	7/16/98	2-4	<1	na	<1
	7/16/98	4-6	>1000	450	>550
	7/16/98	6-8	>1000	250	>750
2842-SB19	7/16/98	0-2	<1	na	<1
	7/16/98	2-4	>1000	>1000	NA
	7/16/98	4-6	>1000	200	>800
	7/16/98	6-8	500	15	485
2842-SB20	7/22/98	0-2	60	<1	60
	7/22/98	2-4	500	10	490
	7/22/98	4-6	200	30	170
	7/22/98	6-8	500	100	400
2842-SB21	7/22/98	0-2	>1000	500	>500
	7/22/98	2-4	200	150	50
	7/22/98	4-6	500	300	200
	7/22/98	6-8	20	15	5
2842-SB22	7/29/98	0-2	<1	na	<1
	7/29/98	2-4	<1	na	<1
	7/29/98	4-6	<1	na	<1
	7/29/98	6-8	20	7.5	12.5

na = Not Analyzed - No sample to analyze or low total organic vapor concentrations
NA = Not Available - Methane and total organic vapor concentrations exceed instrument range
BLS = below land surface
ppm = parts per million

During the Site 2842 soil boring advancement program, three locations (2842-SB1, 2842-SB10 and 2842-SB20) exhibited separate phase product on top of the groundwater table. Two soil borings 2842-SB1 (source area) and 2842-SB10 were converted into permanent monitoring wells for subsequent product thickness monitoring purposes. Three additional soil borings (2842-SB23 through 2842-SB25) were installed at the site in an effort to delineate the limits of free phase product accumulation noted at soil borings 2842-SB1, 2842-SB10, and 2842-SB20. One of these three borings (2842-SB23) exhibited a petroleum sheen on top of the groundwater table that coated the electronic groundwater/oil interface probe, but was not measurable. Soil borings 2842-SB20 and 2842-SB23 were abandoned with cement grout on July 30, 1998.

Groundwater from the soil borings was analyzed for BTEX by EPA Method 8020, TRPH by EPA Method 418.1, and TPH by EPA Method 8015M for DRO and GRO. TPH DRO and GRO, and BTEX concentrations above PREQB target levels were not identified in groundwater samples collected from the 10 selected soil borings. The soil boring groundwater analytical results reported by TEG are summarized in Table 2-3.

Based on the laboratory analytical data and field observations, three soil borings (2842-SB13, 2842-SB16, and 2842-SB11) were determined to be in areas of petroleum contamination below PREQB levels, and were converted to permanent monitoring wells (2842-MW2, 2842-MW3, 2842-MW4, respectively).

TABLE 2-3
Summary of TEG Soil Boring Groundwater Screening Analytical Results
Site 2842 - Roosevelt Roads Naval Station UST Site Characterization

Sample Number	Method 418.1 TRPH (mg/L)	EPA Method 8015M (GRO) TPH (mg/L)	EPA Method 8015M (DRO) TPH (mg/L)	EPA Method 8020 Total BTEX (mg/L)
2842 SB-4	<10	<10	<25	<0.30
2842 SB-8	<10	<10	<25	<0.30
2842 SB-9	<10	<10	<25	<0.30
2842 SB-11	NA	<10 (10)	47 (46)	<0.30
2842 SB-12	16	<10	<25	<0.30
2842 SB-13	15	<10	<25	<0.30
2842 SB-16	10	<10	<25	<0.30
2842 SB-17	<10	<10	<25	<0.30
2842 SB-18	<10	<10	<25	<0.30
2842 SB-21	12	<10	<25	<0.30
PREQB Target Levels	50	50	50	NS

Notes:

PREQB	=	Puerto Rico Environmental Quality Board
TRPH	=	Total Recoverable Petroleum Hydrocarbon
TPH	=	Total Petroleum Hydrocarbon
mg/L	=	Milligrams per Liter
8015M (GRO)	=	EPA Method 8015M Gasoline range organics
Total BTEX	=	Sum of Benzene, Toluene, Ethylbenzene, and Xylenes
8015M (DRO)	=	EPA Method 8015M Diesel range organics
Total BTEX	=	Sum of Benzene, Toluene, Ethylbenzene, and Xylenes
( )	=	Repeat analysis
NA	=	Not analyzed

2.1.4 Monitoring Well Construction

Five 2-inch-diameter monitoring wells (2842-MW1 through 2842-MW5) were installed to define the horizontal extent of potentially impacted groundwater in the vicinity of the former UST and AST. One monitoring well (2842-MW1) was installed to assess the source area groundwater and four monitoring wells were installed to define the horizontal extent of potentially impacted groundwater in the vicinity of the former UST and AST. The wells were installed under the supervision of CH2M HILL personnel.

The well construction materials and equipment were thoroughly decontaminated prior to installation of each well. The development of the wells was accomplished by intermittently surging with a Teflon® bailer and using a peristaltic pump with Teflon® tubing to remove fine-grained sediments. Detailed descriptions of monitoring well construction and development procedures are presented in Appendix D. Table 2-4 summarizes the monitoring well development activities. Monitoring well development logs are included in Appendix E. Table 2-5 summarizes monitoring well completion data. Monitoring well construction diagrams are presented in Appendix B. Monitoring well development logs are included in Appendix E.

TABLE 2-4
Monitoring Well Development Summary
Site 2842 - Roosevelt Roads Naval Station UST Site Characterization

Well	Development Method	Development Completion Date	Approximate Gallons Developed	Number of Well Volumes Developed
2842-MW1	Peristaltic Pump/Bailer	7/27/98	55	42.1
2842-MW2	Peristaltic Pump/Bailer	7/28/98	32	24.5
2842-MW3	Peristaltic Pump/Bailer	7/28/98	86	65.8

TABLE 2-5
Monitoring Well Completion Summary
Site 2842 - Roosevelt Roads Naval Station UST Site Characterization

Well Designation	2842-MW1	2842-MW2	2842-MW3	2842-MW4	2842-MW5
Date Installed	7/7/98	7/21/98	7/21/98	7/21/98	7/21/98
Total Well Depth (ft, BLS)	15	15	15	14	15
Type of Completion	Flush	Flush	Flush	Flush	Flush
Top of Casing Elevation (ft)	110.016	111.053	109.455	109.196	109.442
Casing Type	Schedule 40 PVC	Schedule 40 PVC	Schedule 40 PVC	Schedule 40 PVC	Schedule 40 PVC
Casing Length(s)	2	2	2	2	2
Screen Type	Schedule 40 PVC	Schedule 40 PVC	Schedule 40 PVC	Schedule 40 PVC	Schedule 40 PVC
Screen Slot Size (in)	0.010	0.010	0.010	0.010	0.010
Screen Length	10	10	10	10	10
Screen Interval (ft, BLS)	5-15	5-15	5-15	4-14	5-15

Note: All monitoring wells are 2 inches in diameter
Top-of-casing elevations were referenced to the Roosevelt Roads datum
In = inch
ft = feet
msl = mean sea level
BLS = below land surface

2.2 In-Situ Permeability Testing

On July 31, 1998, in-situ permeability tests were performed in monitoring wells 2842-MW2 and 2842-MW4. The aquifer hydraulic properties beneath Site 2842 were calculated from the data collected during these tests. The in-situ permeability test procedure consisted of the following steps:

- A depth-to-water measurement was taken to determine static conditions in the well.
- A pressure transducer was placed approximately 1 foot off the bottom of the well. The transducer cable was secured in place with the manhole lid to prevent it from shifting during the test.
- The pressure transducer was connected to the data logger.
- The data logger was programmed for the test. This allowed the data logger to convert the pressure transducer readings to feet of water.
- The water level reference on the data logger is entered as the static water level to represent static conditions.
- The data logger started recording and a volume of potable water was introduced into the well.

- Once the water level returned to within approximately 10 percent of static conditions, the test was stopped.

The in-situ permeability tests results were plotted on semi-logarithmic graphs and analyzed using the Bouwer and Rice method (Bouwer and Rice, 1976). The hydraulic conductivity (K) calculated from the tests ranged from 0.6 feet per day (ft/day) to 13.2 ft/day. The raw data, graphs, and calculations pertaining to the in-situ permeability tests are presented in Appendix C.

2.3 Groundwater Elevation Measurements

The top-of-casing elevations of the five monitoring wells installed at Site 2842 were surveyed by a licensed surveyor and referenced to the NAVSTA Roosevelt Roads datum. On July 27, 1998, and July 31, 1998, depth to water measurements were collected from the top of casing (north side) with an electronic water level probe. Table 2-6 presents depth-to-water and monitoring well elevations. The water level measurements obtained on July 27, and July 31, 1998, were used to generate water table elevation contour maps (Figure 2-1 and Figure 2-2). As shown on the water table elevation maps, the groundwater flow appears to be in a north-northeast direction away from the former UST location.

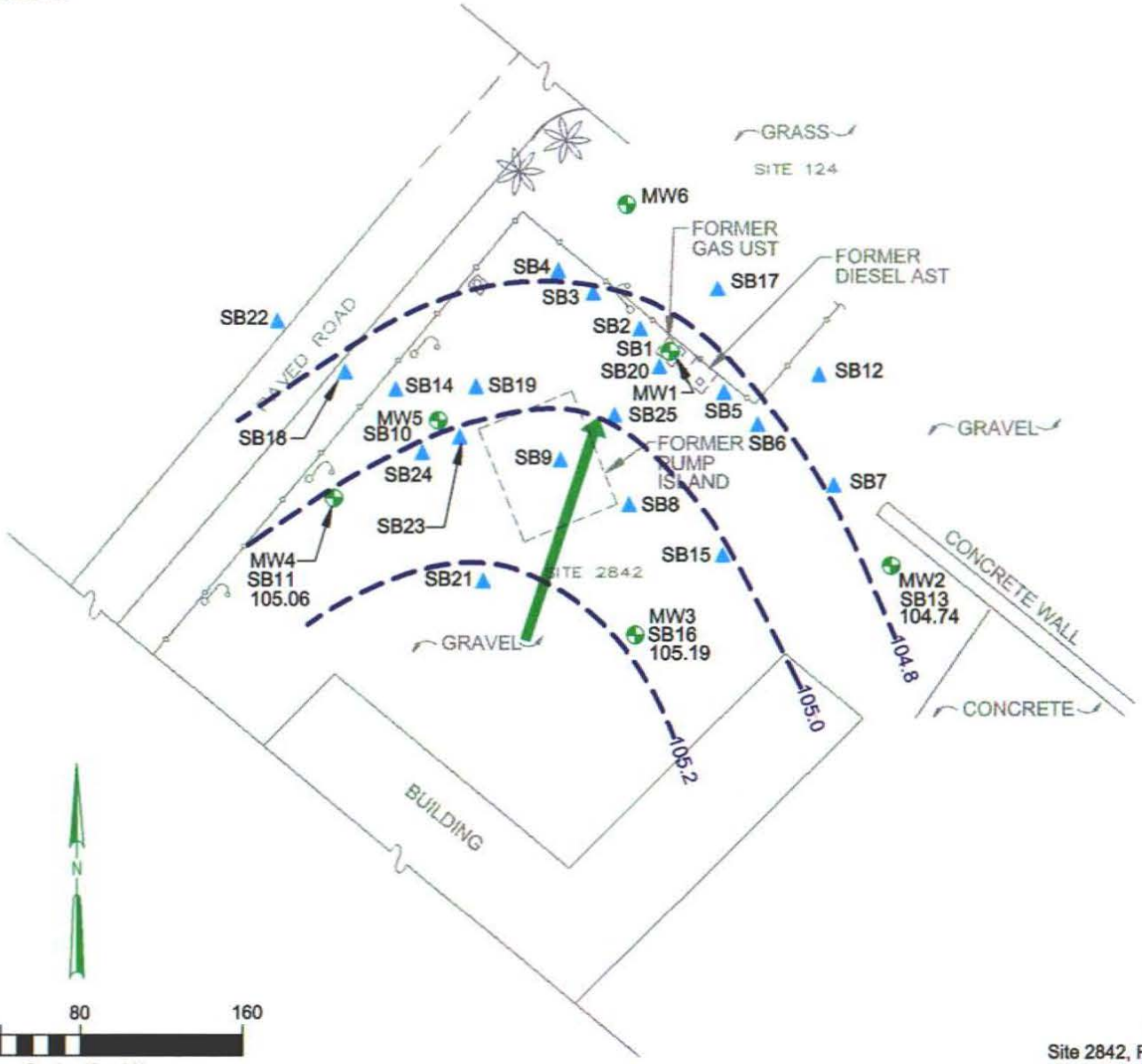
The ground water gradient (I) and flow velocity (V) were calculated from the K obtained from the in-situ permeability tests and water table elevation data. On July 27, the groundwater gradient was 0.0018 feet /foot (ft/ft) while the flow velocity was 0.05 ft/day. On July 31, 1998, the groundwater gradient was 0.0027 feet /foot (ft/ft) while the flow velocity was 0.06 ft/day. The calculations used to determine I and V are presented in Appendix C.

TABLE 2-6
Water Table Elevation Data
Site 2842 - Roosevelt Roads Naval Station UST Site Characterization

Well Designation	Top of Casing Elev. (ft, RRD)	July 27, 1998		July 31, 1998	
		Depth to Water (ft)	Water Level Elevation (ft, RRD)	Depth to Water (ft)	Water Level Elevation (ft, RRD)
2842-MW1	110.016	free product	not taken	free product	not taken
2842-MW2	111.053	6.31	104.743	6.24	104.813
2842-MW3	109.455	4.26	105.195	4.26	105.195
2842-MW4	109.196	4.14	105.056	4.10	105.096
2842-MW5	109.442	free product	not taken	free product	not taken
124-MW6	109.829	not taken	- - -	not taken	- - -

NOTE: Top-of-Casing elevations referenced to msl
RRD: Roosevelt Roads Datum

General Notes:
1) The horizontal control are referred to an arbitrary system.
2) The vertical control are referred to a mean sea level system (by USGS Datum).
3) All distances and elevations are in feet.
4) The survey was performed between September and October of 1996.



Legend

- Monitor Well/Soil Boring
- 105.0 Groundwater Elevation
- Soil Boring
- Groundwater Flow Direction
- Groundwater Elevation Contour

FIGURE 2-1

Groundwater Flow Direction, July 27, 1999

Site 2842, Roosevelt Roads Naval Station, Puerto Rico

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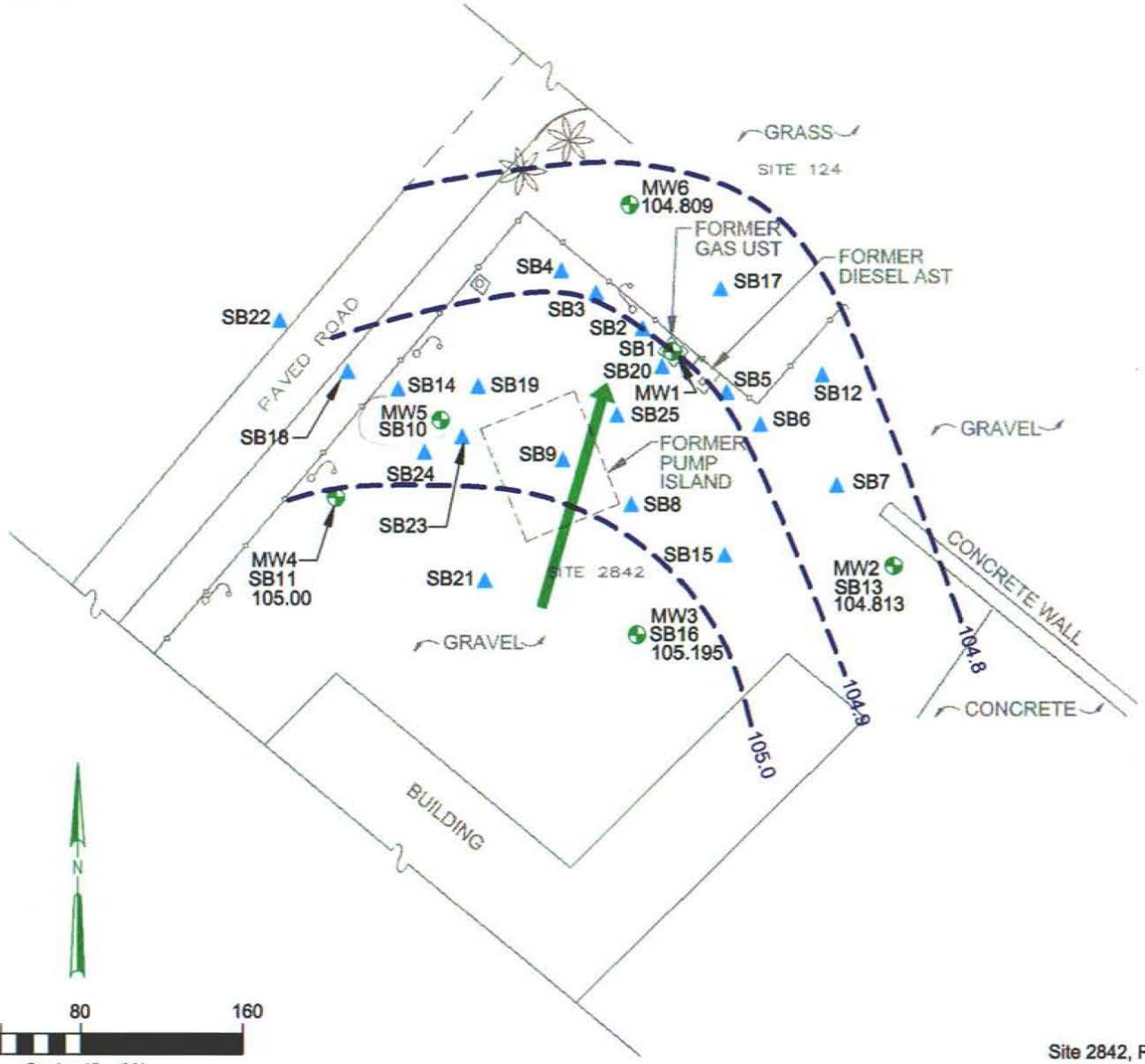
General Notes:
1) The horizontal control are referred to an arbitrary system.
2) The vertical control are referred to a mean sea level system (by USGS Datum).
3) All distances and elevations are in feet.
4) The survey was performed between September and October of 1998.



Legend

- Monitor Well/Soil Boring
- 105.0 Groundwater Elevation
- Soil Boring
- Groundwater Flow Direction
- Groundwater Elevation Contour

FIGURE 2-2

Groundwater Flow Direction, July 31, 1999

Site 2842, Roosevelt Roads Naval Station, Puerto Rico

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2.4 Groundwater Sampling

Separate phase product was purged from monitoring wells 2842-MW1 and 2842-MW5 on August 31, 1998. These two wells were again gauged for separate phase product accumulation on September 2, 1998. Results of this effort show that the free product accumulation in 2842-MW1 was consistent with the previous measurement, and that the 2842-MW5 free product thickness was reduced to a visible sheen (<0.01-foot). Results of the free product measurements performed on July 29, July 30 and September 2, 1998 are summarized in Table 2-7. Figure 2-3 shows the inferred extent of the measured free product at the site.

TABLE 2-7
Free Product Thickness Measurements
Site 2842 - Roosevelt Roads Naval Station UST Site Characterization

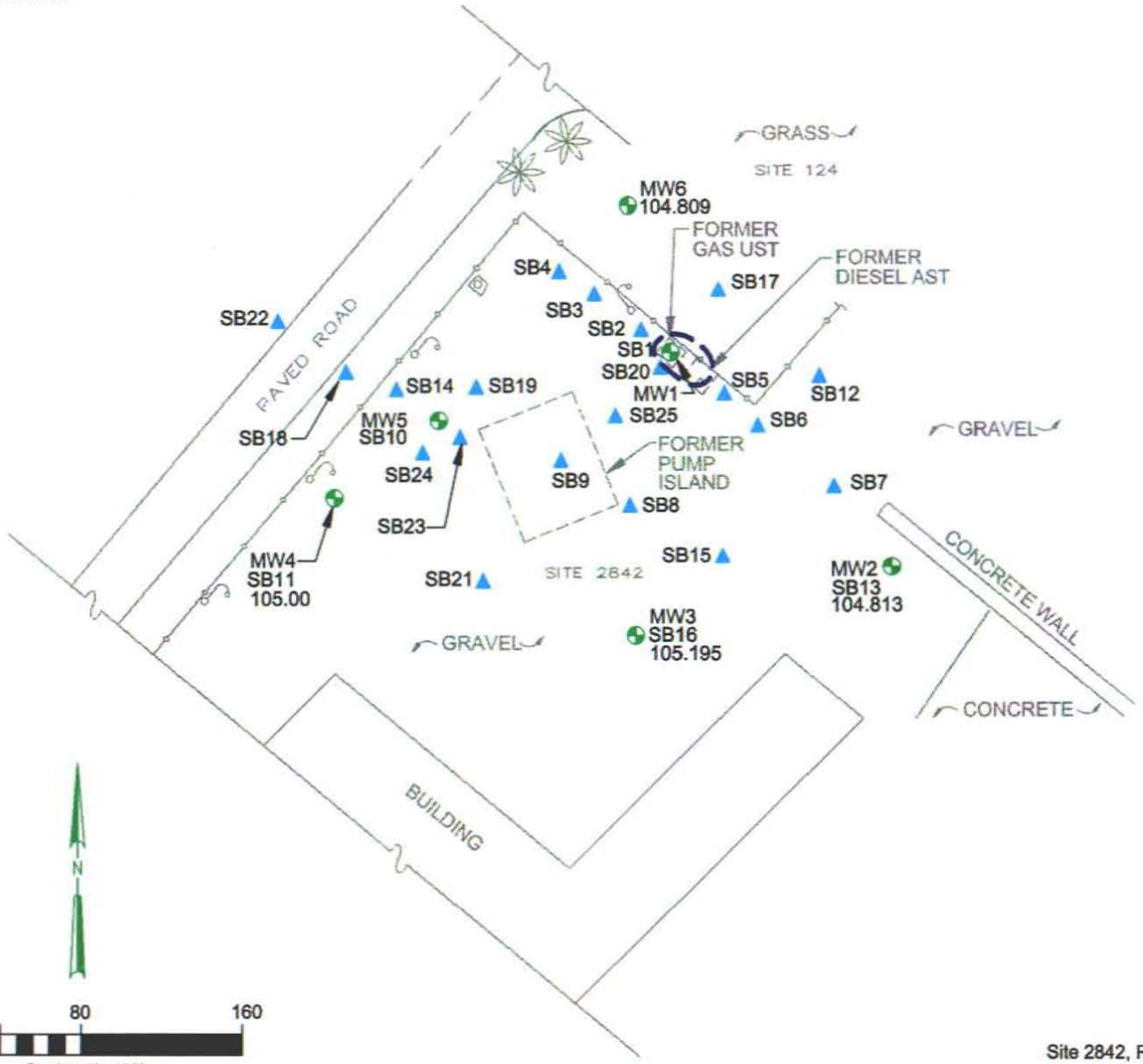
Well or Soil Boring Designation	July 29, 1998 Free Product Thickness (feet)	July 30, 1998 Free Product Thickness (feet)	September 2, 1998* Free Product Thickness (feet)
2842-MW1	0.05	0.06	0.06
2842-MW5	0.07	0.08	<0.01(sheen)
2842-SB20	0.01	0.01	abandoned
2842-SB23	sheen	sheen	abandoned

*Note: The free product was purged from the wells on August 31, 1998.
The wells were allowed to recover for three days prior to re-measuring.

On July 31, 1998, groundwater samples were collected from the three monitoring wells that did not contain separate phase product. The groundwater samples were transported, on ice, to TEG via laboratory courier. The samples were analyzed by the following EPA methods: 8020 (BTEX), 418.1 (TRPH), 8015M (TPH) for GRO and DRO, and 610 (PAH).

Field blanks, equipment blanks, and trip blanks were collected to ensure that contaminants were not introduced to the water samples before, during, or after sample collection. Groundwater sampling procedures and Quality Assurance/Quality Control (QA/QC) guidelines are detailed in Appendix F. Monitoring well purge and sampling forms are included in Appendix G.

General Notes:
1) The horizontal control are referred to an arbitrary system.
2) The vertical control are referred to a mean sea level system (by USGS Datum).
3) All distances and elevations are in feet.
4) The survey was performed between September and October of 1998.



Legend
- Monitor Well/Soil Boring
- Soil Boring
- Free Product

FIGURE 2-3
Extent of Free Product
Site 2842, Roosevelt Roads Naval Station, Puerto Rico

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SECTION 3

Site Geology/Hydrogeology

3.1 Regional Geology

The geology of NAVSTA Roosevelt Roads consists of a sequence of intrusive and extrusive volcanic and volcaniclastic lithologies of lower Cretaceous age (M'Gonile, 1979). Much of the U.S. Naval Base is underlain by the Daguoa Formation, which is characterized by interbedded volcanic breccia, lava, subordinate volcanic sandstone, and crystal tuff (M'Gonile, 1979). The Daguoa Formation has an irregular surface and is encountered at various depths across the NAVSTA Roosevelt Roads (BBL, 1994). The Daguoa formation pinches out in the northern part of the NAVSTA Roosevelt Roads giving way to the Fajardo formation. The Fajardo formation is made up of thin-bedded tuffaceous siltstone and sandstone of lower Cretaceous age (Briggs and Aguilar-Cortez, 1980). The largest hills [approximately 300 feet above mean sea level (msl)] and ridges consist of the Daguoa Formation. The hills are flanked by Quaternary and Holocene fanglomerate and swamp deposits. Quaternary alluvium, slopewash, and fanglomerate deposits compose the broad low-lying areas of NAVSTA Roosevelt Roads (BBL, 1995).

3.1.1 Site Geology

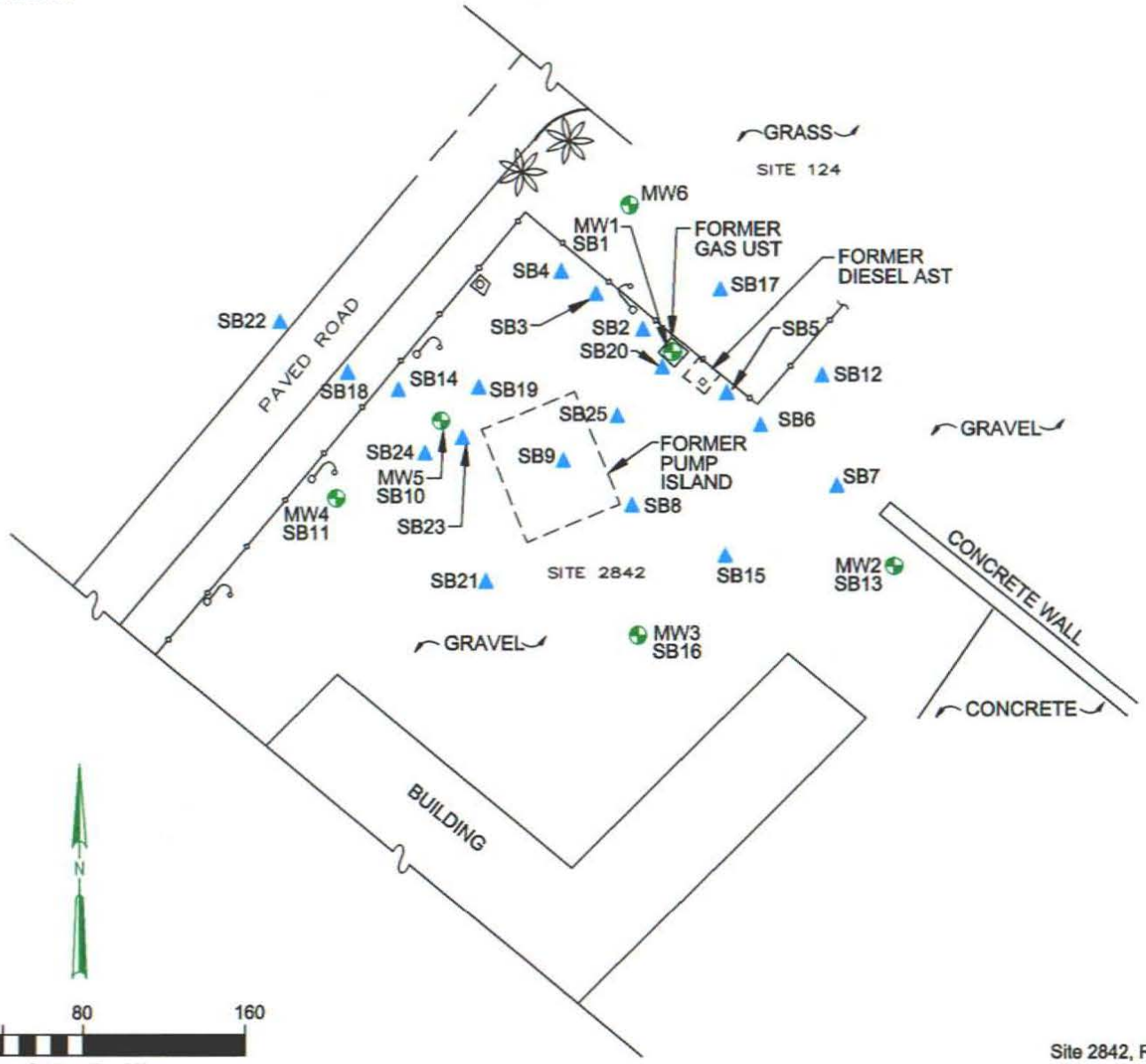
The soil samples collected during the installations of soil borings and monitoring wells were used to describe the site geology. Lithologic descriptions are included within the soil boring logs and monitoring well construction diagrams which are presented as Appendices A and B, respectively.

As seen in Figure 1-3, Site 2842 lies in relatively flat topography (approximately 10 to 20 feet above msl) underlain by the Daguoa Formation. Beneath Site 2842, shell, shelly sand, silty sand and silt from deposition and clay from highly weathered volcanic rock were encountered. The colors of encountered lithologies were primarily brown, white, dark grayish brown, and greenish gray. The colors of the soils were determined using the Munsell soil color system. The unconsolidated shell and sands were light brown and white. The silts and clays were darker in color which are characteristic of the weathering and oxidation or reduction of iron-rich volcanic rock. These sediments generally possess high plasticity when moist and very hard when dry and not easily crumbled under hand pressure. The locations of monitoring wells and soil borings are provided as Figure 3-1. Location of the geologic cross-sections is provided in Figure 3-2 and the geologic cross-sections are presented in Figures 3-3 and 3-4. The cross-sections are based on the lithologies observed during the installation of soil borings and monitoring wells for the SC.

3.2 Site Hydrogeology

Site 2842 is underlain by an unconfined surficial aquifer system, which is composed of shelly sands and plastic clays. Water was encountered at a depth of approximately 5 feet below land surface (bls) at the site.

General Notes:
1) The horizontal control are referred to an arbitrary system.
2) The vertical control are referred to a mean sea level system (by USGS Datum).
3) All distances and elevations are in feet.
4) The survey was performed between September and October of 1998.



Legend
- Monitor Well/Soil Boring
- Soil Boring

FIGURE 3-1
Soil Boring and Monitor Well Locations
Site 2842, Roosevelt Roads Naval Station, Puerto Rico

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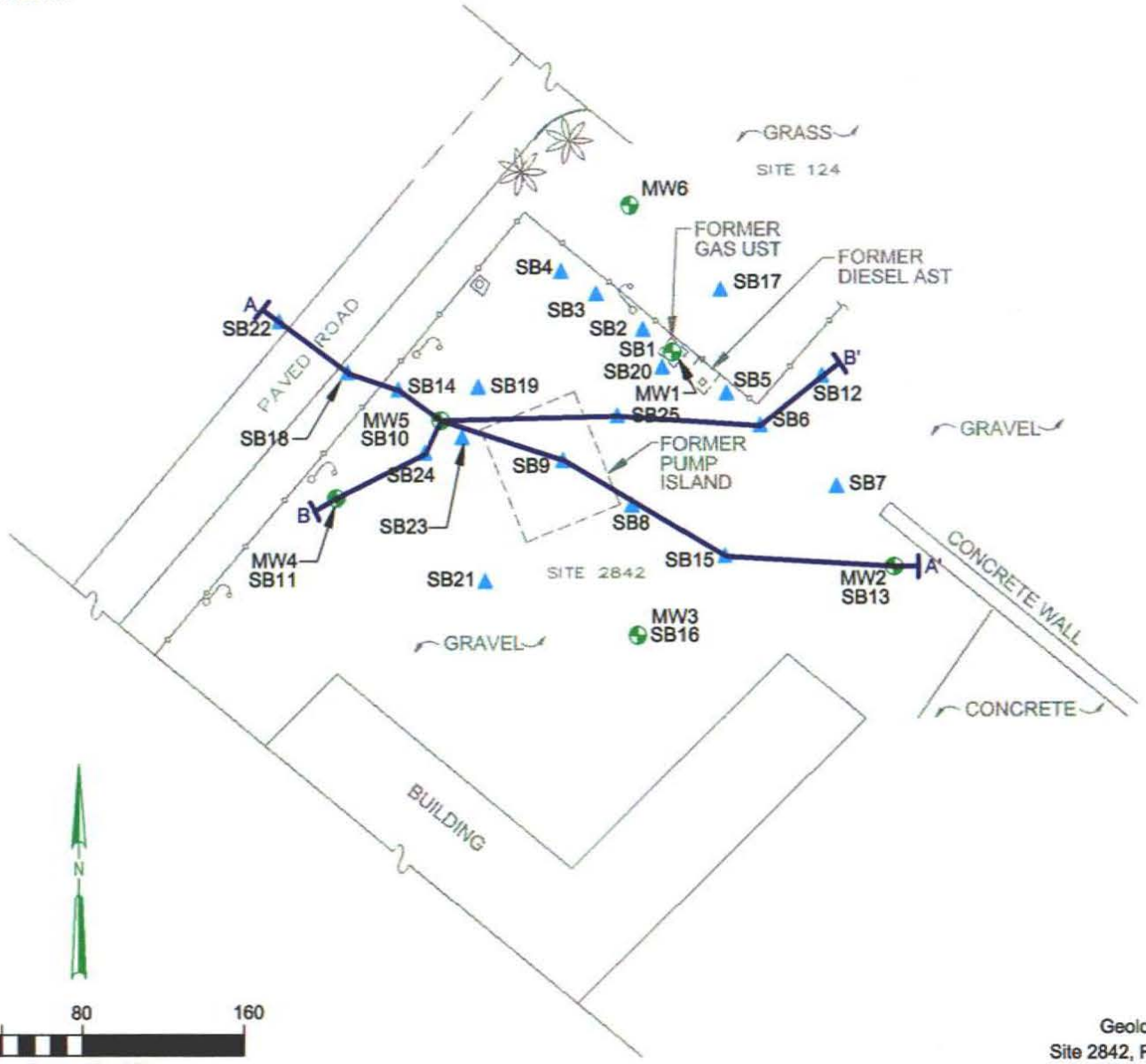
General Notes:
1) The hortzontal control are referred to an arbitrary system.
2) The vertical control are referred to a mean sea level system (by USGS Datum).
3) All distances and elevations are in feet.
4) The survey was performed between September and October of 1998.



Legend
- Monitor Well/Soil Boring
- Soil Boring

FIGURE 3-2
Geologic Cross Sections A-A' and B-B' Locations
Site 2842, Roosevelt Roads Naval Station, Puerto Rico

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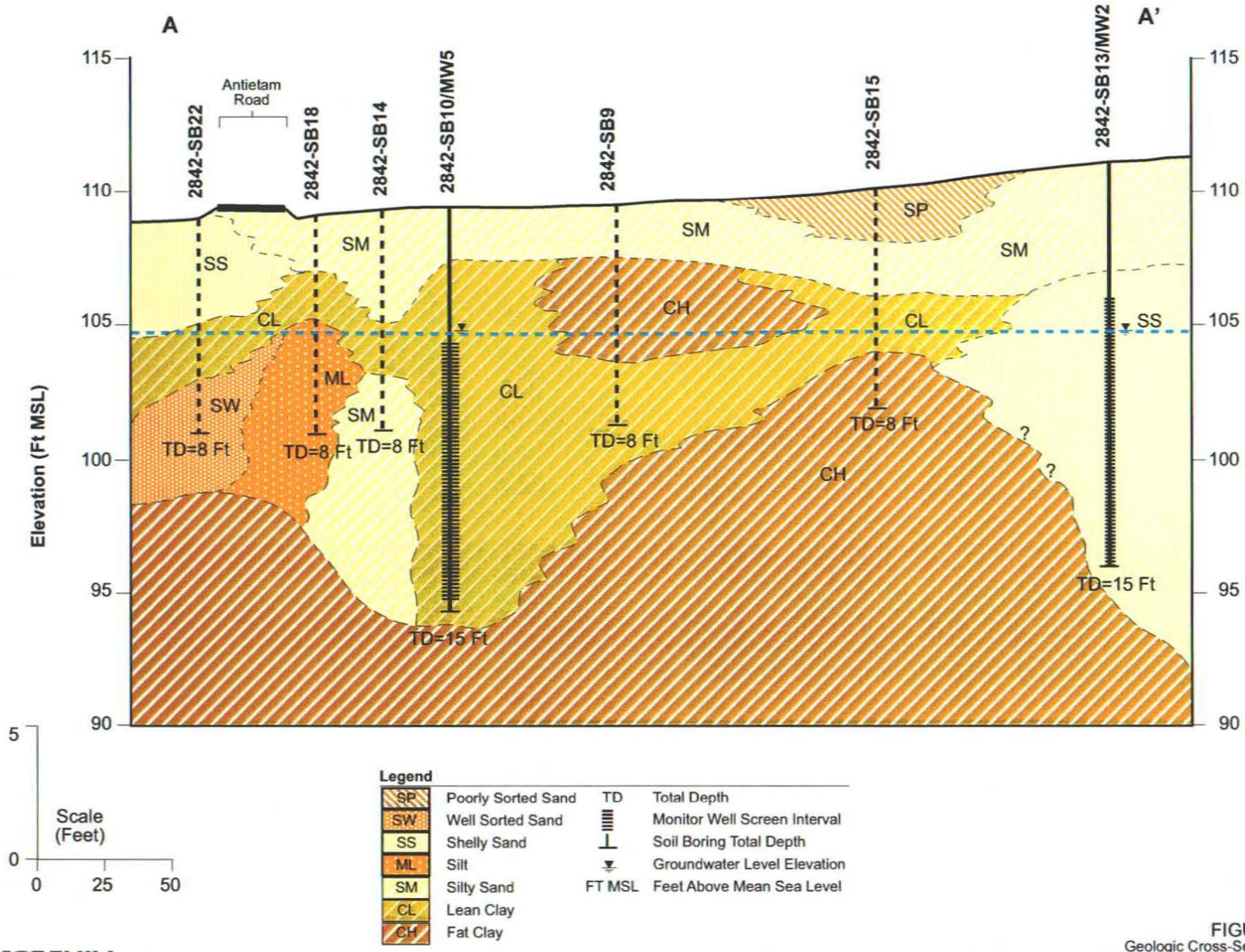

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FIGURE 3-3
Geologic Cross-Section A-A'
Site 2842, Roosevelt Roads Naval Station, Puerto Rico

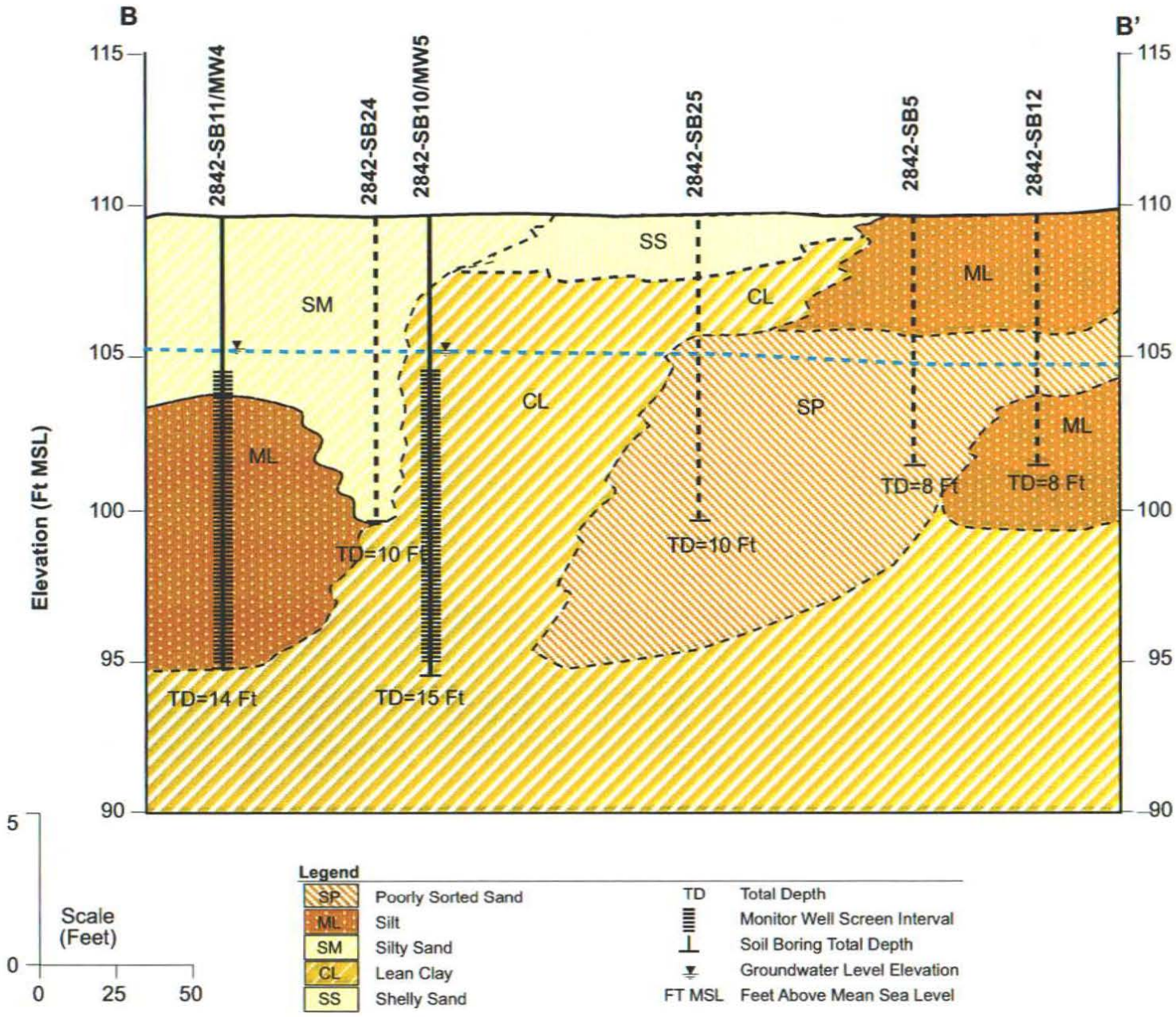

FIGURE 3-4
Geologic Cross-Section B-B'
Site 2842, Roosevelt Roads Naval Station, Puerto Rico

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Groundwater flow at Site 2842 is controlled by elevation differences between adjacent hills and the gentle sloping topography. Groundwater flow at Site 2842 appears to be in a north-northeast direction (see Figures 2-1 and 2-2) away from the former UST and AST. The subsurface materials are highly variable at the site. The shelly sand material is probably fill material which has a higher hydraulic conductivity than the native clayey soils. The in-situ permeability test results reflect this. The hydraulic conductivity in well MW-2, which is screened in shelly sand, is 13.2 ft/day. The hydraulic conductivity in well MW-3, which is screened in mostly silt, is 0.6 ft/day. The minor amounts of free product observed in well MW-1 may be related to the shelly sand fill material. The free product would not be expected to move from the relatively permeable shelly sand to the impermeable clay and silt which surrounds this area. A presentation of the in-situ permeability test results and hydraulic conductivity values are presented in Appendix C.

SECTION 4

Laboratory Analytical Results

4.1 Soil Analytical Results

Analytical results for TPH (DRO and GRO) were used to approximate the maximum horizontal and vertical extent of potentially impacted soil by petroleum hydrocarbons. TPH DRO concentrations above the PREQB target level for UST sites of 100 mg/Kg were identified at seven locations as shown in Table 4-1 and illustrated in Figure 4-1. The seven exceedances ranged from 390 mg/Kg at 2842-SB14 (4-6') to 36,000 mg/Kg at 2842-SB7 (4-6') and were all within the immediate area of the former UST, former AST, and former fuel dispensing islands. The highest positive results were noted within 80 feet of the former AST. Table 4-1 and Figure 4-1 also show that 16 of the 24 soil samples collected by CH2M HILL personnel were below the laboratory method detection limit for TPH DRO and all samples were below the detection limit for TPH GRO. A map depicting the approximate limits of TPH impacted soils is presented in Figure 4-2.

Although PREQB does not have any standards for BTEX in soils, the samples were analyzed to characterize individual constituents. None of the soil samples analyzed for BTEX constituents had any reportable quantities. Complete laboratory analytical results of samples collected by CH2M HILL personnel are presented in Appendix G.

Soil QA/QC analytical results are summarized in Table 4-2.

Soil analytical results were used to determine disposal methods for the drill cuttings. Based on analytical results, drill cuttings from soil borings 2842-SB9, 11, 12, 13, 15, 17, and 22 from Site 2842 were classified as non-hazardous and spread on-site in the vicinity of the former UST. Drill cuttings from soil borings 2842-SB1, 2, 3, 4, 5, 6, 7, 8, 10, 14, 16, 18, 19, 20, and 21 were drummed and disposed of properly after analytical analyses.

4.2 Groundwater Analytical Results

Groundwater laboratory analytical results from monitoring wells at Site 2842 that did not contain free product are summarized in Table 4-3. The summary shows that dissolved concentrations of BTEX, TRPH, TPH (diesel and gasoline range organics), and polynuclear aromatic hydrocarbons (PAHs) were not detected above laboratory method detection limits. PREQB defines groundwater to be contaminated if it contains benzene concentrations above 5 micrograms per liter (ug/L), total BTEX concentrations above 50,000 ug/L, or TPH concentrations above 50,000 ug/L. Lead was detected in the unfiltered groundwater samples collected at all four monitoring wells sampled at the site. The lead concentrations detected in monitoring wells 124-MW6, 2842-MW2, 2842-MW3, and 2842-MW4 were 41 ug/L, 40 ug/L, 17 ug/L, and 38 ug/L respectively. The lead detections at the site are above the PREQB target level of 15 ug/L. Monitoring wells 2842-MW2, 2842-MW3, and 2842-MW4 were resampled for lead on May 18, 1999, using in-line filters. Lead concentrations were again above the PREQB target level of 15 mg/L. Lead concentrations ranged from 230 mg/L to 260 ug/L.

A summary of groundwater analytical results is presented in Table 4-3 and Figure 4-3. Summaries of the QA/QC laboratory analytical results are presented in Table 4-4. The soil, groundwater, and QA/QC laboratory analytical reports are provided in Appendix G.

TABLE 4-1
Summary of TEG Laboratory Soil Analytical Results
Site 2842, Roosevelt Roads, U.S. Naval Station, Ceiba, Puerto Rico

Soil Boring	Date Sampled	TEG Laboratory		
		EPA Method 8015M (GRO) TPH (mg/Kg)	EPA Method 8015M (DRO) TPH (mg/Kg)	EPA Method 8020 Total BTEX (mg/Kg)
2842-SB-1 (4-6')	7/6/98	<10	7,200	<0.30
2842-SB-2 (4-6')	7/6/98	<10	<25	<0.30
2842-SB-3 (4-6')	7/7/98	<10	3,900	<0.30
2842-SB-4 (4-6')	7/7/98	<10	<25	<0.30
2842-SB-5 (4-6')	7/8/98	<10	14,000	<0.30
2842-SB-6 (4-6')	7/8/98	<10	770	<0.30
2842-SB-7 (4-6')	7/8/98	<10	36,000	<0.30
2842-SB-8 (2-4')	7/8/98	<10	4,800	<0.30
2842-SB-8 (4-6')	7/8/98	<10	<25	<0.30
2842-SB-8 (10-12')	7/9/98	<10	<25	<0.30
2842-SB-9 (4-6')	7/9/98	<10	<25	<0.30
2842-SB-10 (4-6')	7/10/98	<10	<25	<0.30
2842-SB-11 (2-4')	7/10/98	<10	<25	<0.30
2842-SB-12 (4-6')	7/14/98	<10	<25	<0.30
2842-SB-13 (4-6')	7/15/98	<10	<25	<0.30
2842-SB-14 (4-6')	7/14/98	<10	390	<0.30
2842-SB-15 (4-6')	7/15/98	<10	<25	<0.30
2842-SB-16 (4-6')	7/15/98	<10	<25	<0.30
2842-SB-17 (4-6')	7/16/98	<10	<25	<0.30
2842-SB-18 (2-4')	7/16/98	<10	<25	<0.30
2842-SB-19 (4-6')	7/20/98	<10	<25	<0.30
2842-SB-20 (4-6')	7/22/98	<10	91	<0.30
2842-SB-21 (2-4')	7/22/98	<10	<25	<0.30
2842-SB-22 (4-6')	7/29/98	<10	<25	<0.30
PREQB UST Target Levels		100	100	NS

Notes:
- PREQB = Puerto Rico Environmental Quality Board
- TPH = Total Petroleum Hydrocarbons
- Total BTEX = Sum of Benzene, Toluene, Ethylbenzene, and Xylene Concentrations
- mg/Kg = Milligrams per Kilogram
- NS = No Standards in Puerto Rico
- UST = Underground Storage Tanks

EPA = Environmental Protection Agency

8015M (GRO) = EPA Method 8015M Gasoline Range Organics

8015M (DRO) = EPA Method 8015M Diesel Range Organics

General Notes:
1) The horizontal control are referred to an arbitrary system.
2) The vertical control are referred to a mean sea level system (by USGS Datum).
3) All distances and elevations are in feet.
4) The survey was performed between September and October of 1998.

EPA Method	Laboratory Detection Limit
BTEX (8020)	0.05 - 0.15 mg/kg
Total Btex	0.30 mg/kg
TPH DRO (8015M)	25.0 mg/kg
TPH GRO (8015M)	10.0 mg/kg

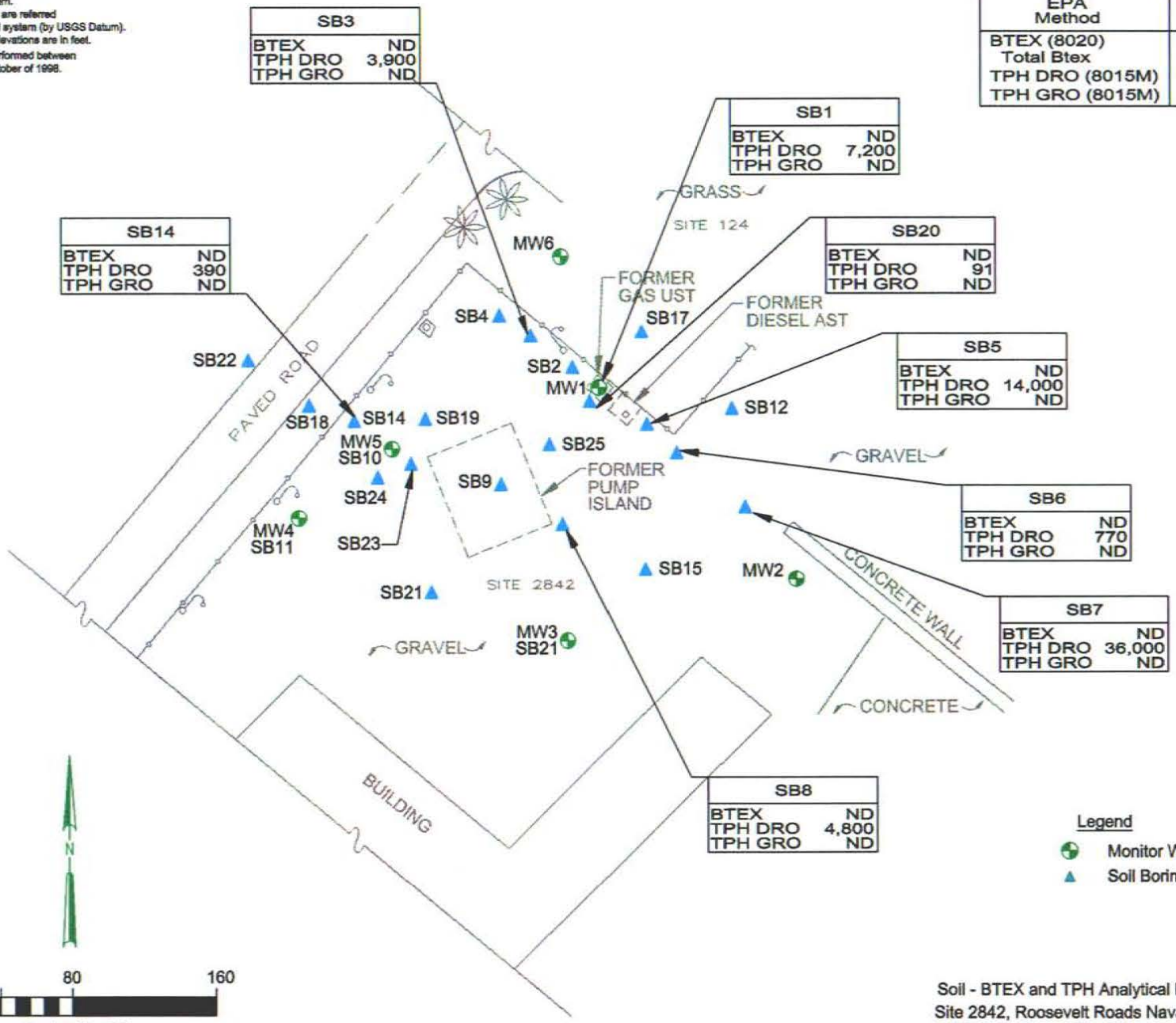

FIGURE 4-1
Soil - BTEX and TPH Analytical Results (Detects Only)
Site 2842, Roosevelt Roads Naval Station, Puerto Rico

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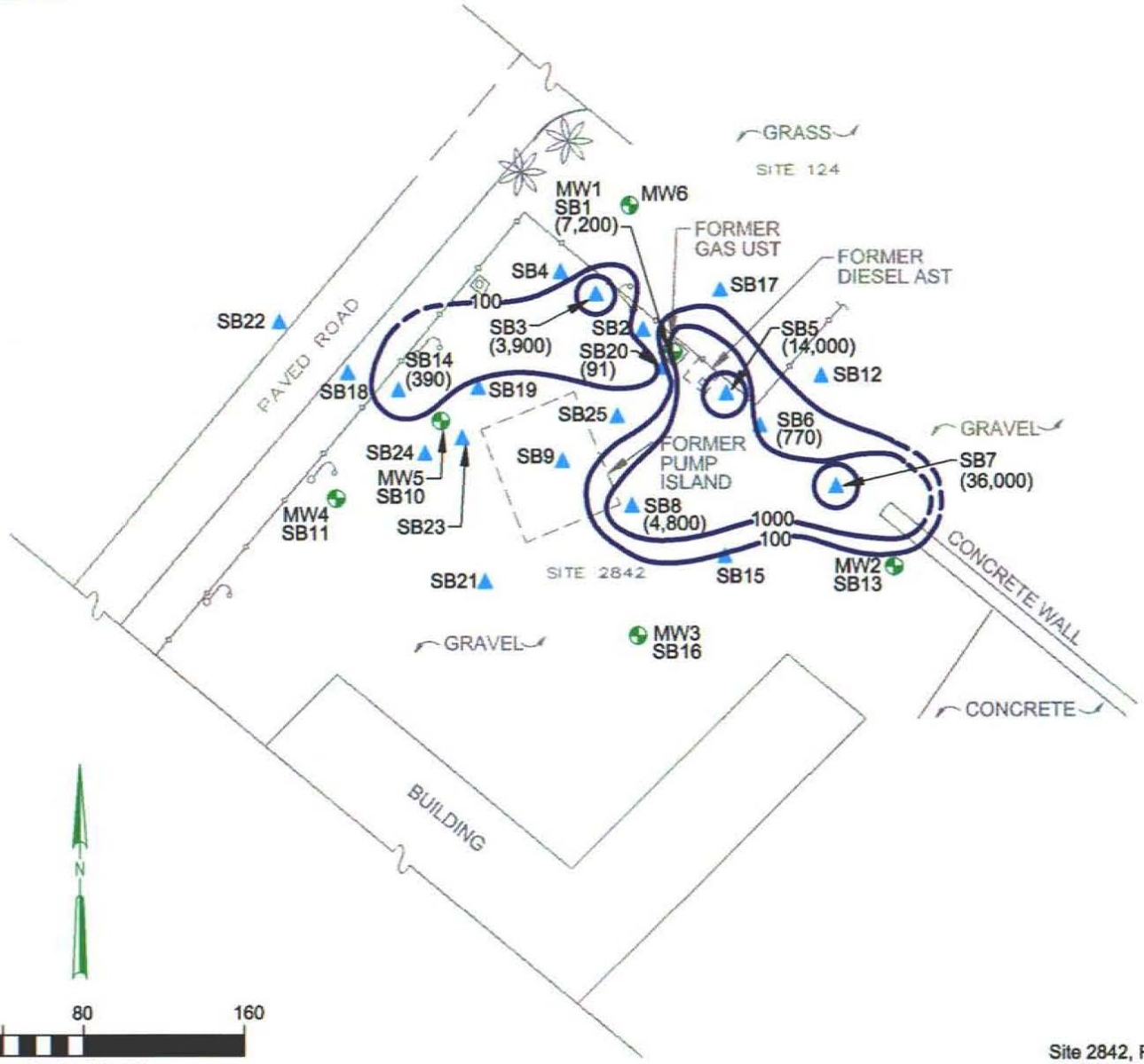
General Notes:
1) The horizontal control are referred to an arbitrary system.
2) The vertical control are referred to a mean sea level system (by USGS Datum).
3) All distances and elevations are in feet.
4) The survey was performed between September and October of 1998.



Legend

- Monitor Well/Soil Boring
- Soil Boring with TPH DRO Concentrations (4,800 in Soils (ppm)
- Contour Lines Depicting Approximate Limits of TPH DRO Impacted Soils
- Inferred Boundary

FIGURE 4-2

Approximate Limits of TPH Impacted Soils
Site 2842, Roosevelt Roads Naval Station, Puerto Rico

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TABLE 4-2
Summary of Soil QA/QC Analytical Results
Site 2842, Roosevelt Roads, U.S. Naval Station, Ceiba, Puerto Rico

Sample Name	Date Sampled	Sample Matrix	EPA Method 8015M (GRO) TPH mg/Kg	EPA Method 8015M (DRO) TPH mg/Kg	EPA Method 8020 BTEX mg/Kg
2842 DUPE1	7/16/98	Soil	<10	<25	<0.30
2842 DUPE2	7/9/98	Soil	<10	<25	<0.30
2842 DUPE3	7/22/98	Soil	<10	<25	<0.30
			mg/L	**mg/L**	**mg/L**
2842-EB-1	7/8/98	Water	<10	<25	<0.30
2842-EB-2	7/9/98	Water	<10	<25	<0.30
2842-EB-3	7/13/98	Water	<10	<25	<0.30
2842-EB-4	7/14/98	Water	<10	<25	<0.30
2842-EB-5	7/15/98	Water	<10	<25	<0.30
2842-EB-6	7/16/98	Water	<10	<25	<0.30
2842-EB-7	7/20/98	Water	<10	<25	<0.30
2842-EB-8	7/22/98	Water	<10	<25	<0.30
2842-EB-9	7/29/98	Water	<10	<25	<0.30
2842 TRIP BLANK	7/22/98	Water	NA	NA	<0.30
2842 TRIP BLANK	7/29/98	Water	<10	<25	<0.30
2842 TRIP BLANK	7/16/98	Water	<10	<25	NA
2842 TRIP BLANK	7/14/98	Water	<10	<25	NA
2842 TRIP BLANK	7/7/98	Water	NA	NA	<0.30
2842 TRIP BLANK	7/8/98	Water	NA	NA	<0.30
2842 TRIP BLANK	7/9/98	Water	NA	NA	<0.30
2842 TRIP BLANK	7/10/98	Water	NA	NA	<0.30

Notes:

TPH = Total Petroleum Hydrocarbon
Total BTEX = Sum of Benzene, Toluene, Ethylbenzene, and Xylenes
mg/Kg = Milligrams per Kilogram
mg/L = Milligrams per Liter
2842 DUPE1 = Duplicate Sample of 2842-SB-1 (4-6')
2842 DUPE2 = Duplicate Sample of 2842-SB-9 (4-6')
2842 DUPE3 = Duplicate Sample of 2842-SB-21 (2-4')
2842-EB-1, 2842-EB-2, 2842-EB-3, 2842-EB-4, 2842-EB-5, 2842-EB-6, 2842-EB-7, 2842-EB-8, and 2842-EB-9 = Equipment blank collected from stainless steel split spoon
EPA = Environmental Protection Agency
8015M (GRO) = EPA Method 8015M Gasoline range organics
8015M (DRO) = EPA Method 8015M Diesel range organics
NA = Not analyzed

TABLE 4-3
Summary of Groundwater Analytical Results
Site 2842, Roosevelt Roads, U.S. Naval Station, Ceiba, Puerto Rico

Parameters	PREQB Target Levels	U.S. EPA MCL	124-MW6	2842-MW-2	2842-MW-3	2842-MW-4
Date Sampled			**7/31/98**	**7/31/98**	**7/31/98**	**7/31/98**
Benzene (µg/L)	5.0	1.0	<5	<5	<5	NA
Toluene (µg/L)	1,000	1,000	<5	<5	<5	NA
Ethylbenzene (µg/L)	700	700	<5	<5	<5	NA
Total Xylenes (µg/L)	10,000	10,000	<15	<15	<15	NA
Total BTEX (µg/L)	50,000	NS	<30	<30	<30	NA
PAH (µg/L)	NS	NS	BDL*	BDL*	BDL*	BDL*
TRPH (µg/L)	50,000	NS	<10,000	<10,000	<10,000	<10,000
TPH GRO (µg/L)	50,000	NS	<10,000	<10,000	<10,000	<10,000
TPH DRO (µg/L)	50,000	NS	<25,000	<25,000	<25,000	<25,000
Lead (unfiltered) (µg/L)	15	15	41	40	17	38

Notes:

µg/L	=	Micrograms per Liter
PREQB	=	Puerto Rico Environmental Quality Board
Total BTEX	=	Sum of Benzene, Toluene, Ethylbenzene, and Xylenes
PAH	=	Polynuclear Aromatic Hydrocarbon (excluding total naphthalenes)
TRPH	=	Total Recoverable Petroleum Hydrocarbon
NS	=	No Standard
NA	=	Not Collected or Analyzed
MCL	=	Maximum Contaminant Level
BDL	=	Below Detection Levels
*	=	All PAH compounds excluding naphthalenes were below their respective detection limits
US EPA	=	United States Environmental Protection Agency

General Notes:
1) The horizontal control are referred to an arbitrary system.
2) The vertical control are referred to a mean sea level system (by USGS Datum).
3) All distances and elevations are in feet.
4) The survey was performed between September and October of 1996.

EPA Method	Laboratory Detection Limit
Benzene	5 ug/L
BTEX (8020)	5 - 15 ug/L
Total Btex	30 ug/L
TRPH (418.1)	10.0 mg/L
TRPH DRO (8015M)	10.0 mg/L
TRPH DRO (8015M)	10.0 mg/L
PAH (610)	0.2 - 0.5 mg/L

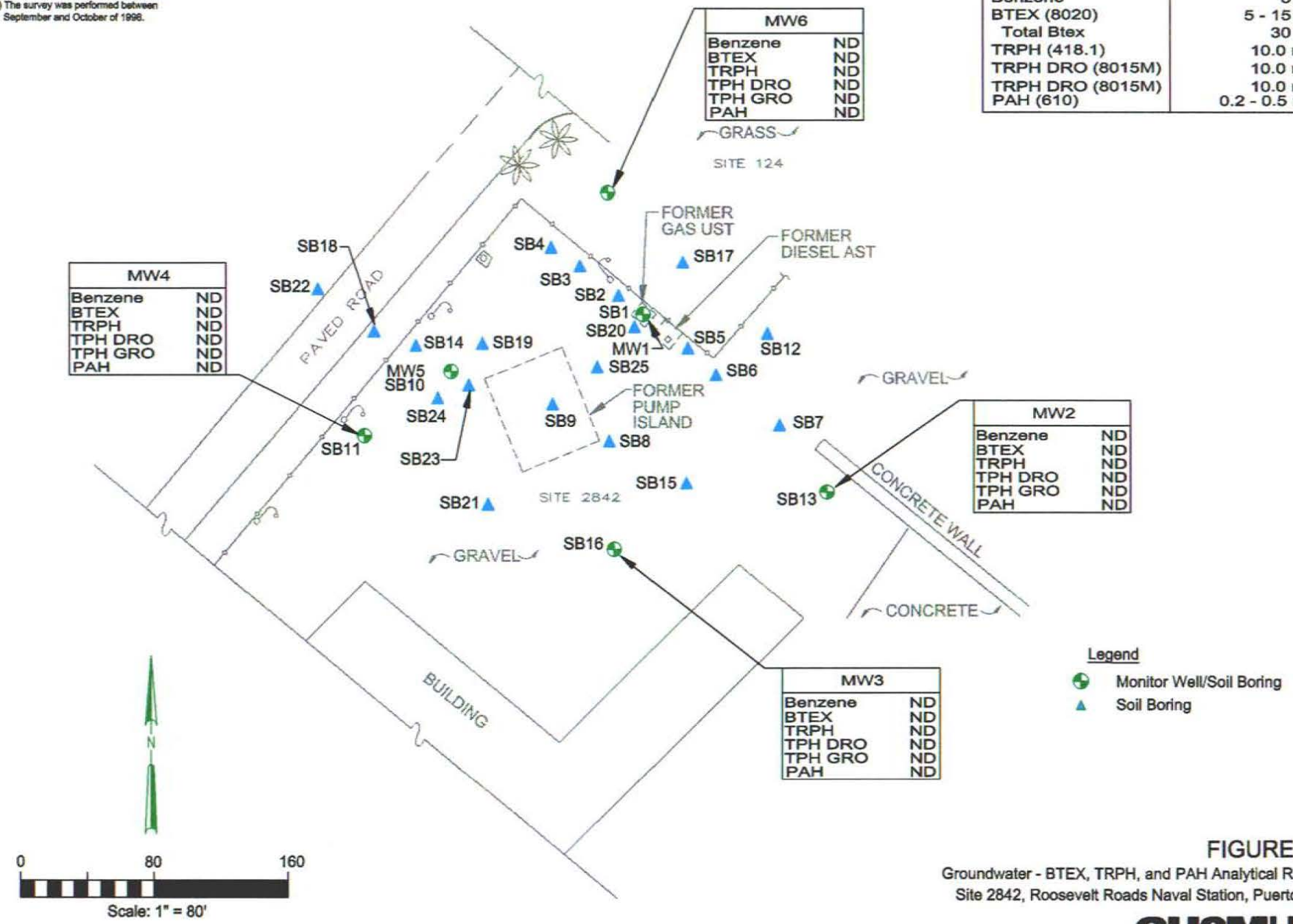

FIGURE 4-3
Groundwater - BTEX, TRPH, and PAH Analytical Results
Site 2842, Roosevelt Roads Naval Station, Puerto Rico

CH2MHILL

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TABLE 4-4
Summary of Groundwater QA/QC Analytical Results
Site 2842, Roosevelt Roads, U.S. Naval Station, Ceiba, Puerto Rico

Parameters	PREQB Levels	U.S. EPA MCL	2842-EB10 (Equipment Blank)	2842-FB1 (Field Blank)	2842 TRIP	2842-DUPE1
Date Sampled			**7/31/98**	**7/31/98**	**7/31/98**	**7/31/98**
Benzene (µg/L)	5.0	1.0	<5	<5	<5	<5
Toluene (µg/L)	1,000	1,000	<5	<5	<5	<5
Ethylbenzene (µg/L)	700	700	<5	<5	<5	<5
Total Xylenes (µg/L)	10,000	10,000	<15	<15	<15	<15
Total BTEX (µg/L)	50,000	NS	<30	<30	<30	<30
PAH (µg/L)	NS	NS	BDL*	BDL*	NA	BDL*
TRPH (µg/L)	50,000	NS	<10,000	<10,000	NA	<10,000
TPH GRO (µg/L)	50,000	NS	<10,000	<10,000	NA	<10,000
TPH DRO (µg/L)	50,000	NS	<25,000	<25,000	NA	<25,000
Lead (unfiltered) (µg/L)	15	15	<0.005	<0.005	NA	8

Notes:

µg/L = Micrograms per Liter
US EPA = United States Environmental Protection Agency
PREQB = Puerto Rico Environmental Quality Board
Total BTEX = Sum of Benzene, Toluene, Ethylbenzene, and Xylenes
PAH = Polynuclear Aromatic Hydrocarbon (excluding total naphthalenes)
TRPH = Total Recoverable Petroleum Hydrocarbon
NS = No Standard
NA = Not Collected or Analyzed
MCL = Maximum Contaminant Level
BDL = Below Detection Levels
* = All PAH compounds excluding naphthalenes were below their respective detection limits
2842-DUPE1 = Duplicate Sample of 2842-MW2
2842-EB10 = Equipment blank collected from Teflon tubing

SECTION 5

Qualitative Risk Assessment

The objective of the QRA is to identify the population that is potentially at risk of exposure to chemicals present in, or released from, soil and groundwater at Site 2842. The QRA presents a discussion of exposure pathways and a qualitative evaluation of the magnitude of the risk.

An exposure pathway is described as the route by which a chemical migrates from the contamination source to a potential receptor. To determine the exposure pathway, the chemical of concern, possible transport media, exposure routes (means by which a chemical comes in contact with a biological receptor), and potential receptors are taken into account. The results of the QRA are used to qualitatively determine the health risk to environmental receptors from the contaminants found at Site 2842.

5.1 Nature and Extent of Release

Based on field and laboratory data obtained from soil and groundwater sampling activities during this SC investigation, CH2M HILL concluded that separate phase product and soils exceeding PREQB TPH target levels for UST sites of 100 mg/Kg were identified at Site 2842. Dissolved petroleum hydrocarbons in groundwater were not identified at concentrations above PREQB target levels in monitoring wells sampled under this SC. Groundwater samples were not collected at locations where separate phase product was identified. Lead was detected at concentrations above the PREQB target level of 15 μg/L in all 4 monitoring wells sampled.

5.2 Chemical of Concern

Petroleum contains a large number of compounds. The specific petroleum-based compounds potentially present in groundwater that represent a potential risk to human health and the environment are volatile organic aromatics (consisting of benzene, toluene, ethylbenzene, and xylene), and naphthalene and lead. Toluene, ethylbenzene, xylenes, and naphthalene are non-carcinogenic compounds; benzene is a known human carcinogen. Exposure to lead can cause adverse heath effects in children. Thus, the qualitative risk assessment focused on the human health impacts of benzene and lead in the groundwater.

5.3 Exposure Assessment

The exposure assessment examines the potential migratory pathways and the biological receptors affected by the chemical of concern. An exposure assessment also estimates both short and long term assessment in terms of doses by exposure routes.

5.3.1 Human Receptors

Site 2842 is the location of a former UST, which was located in back of Building 3188. The UST was used to supply gasoline to vehicles associated with Building 3188, which is inhabited by United States Navy Personnel. The potential of human contact with the compounds is considered minimal because:

- The contamination is found in subsurface soils below 2 feet bls
- The soils consist of silt and clay, minimizing the ability of the soils to spread by wind action
- The area is covered by gravel and concrete
- The area has restricted access (i.e., authorized personnel only)

5.3.2 Environmental Receptors

The potential for migration of the chemicals of concern to environmental receptors is primarily due to groundwater movement off the site. The contaminated soils are near the water table and are overlain by clays, which exhibit high plasticity, resulting in low hydraulic conductivity. These clays may act as a cap, limiting the ability of contaminated soils to spread by wind action and the infiltration of water that could leach contaminants from the soil and carry them to the groundwater system.

Topography at Site 2842 is characterized by a gentle slope to the east. Groundwater flows in a north-northeast direction away from the site. The north-northeasterly direction of the groundwater flow indicates a possible route towards Bahia de Puerca, located to the east of the site. This is the only potential environmental receptor for the chemicals of concern.

5.3.3 Exposure Pathways

Exposure pathways are defined as the routes compounds follow from an original source to potential receptors. The mechanism by which the population can come into contact with the compound is also evaluated and taken into consideration by the exposure pathways. The following four elements are required to complete an exposure pathway:

- A source and mechanism of release for a compound of concern (e.g., storage tank leak)
- A feasible environmental transport route (e.g., dissolved groundwater constituents)
- An exposure point of potential contact with receptors (e.g., potable well)
- An exposure route allowing receptors to come in contact with the compound(s) (e.g., inhalation of vapors and ingestion of groundwater)

If any of these elements are not present, the exposure pathway is considered incomplete. In Site 2842, the first element (a source/mechanism) has been shown to exist. Free product detected in monitoring wells, and the laboratory analytical results indicate that soil and groundwater contamination exists at the site. A discussion of the potential exposure pathways is presented in the following sections.

5.3.4 Groundwater Consumption Pathway

The tropical rain forest (El Yunque) provides the primary source of potable water in eastern Puerto Rico. El Yunque is located approximately 5 miles west of NAVSTA Roosevelt Roads. Based on conversations with U.S. Navy personnel, Puerto Rico Department of Natural Resources personnel, and water supply personnel in the nearby town of Fajardo (located 7

miles northwest of the Naval Station), it was determined that the potable water supply for the Naval Station and the towns of Ceiba and Fajardo originated from El Yunque. The Naval Station has a gravity feed distribution system from the rain forest to the water treatment plant on NAVSTA Roosevelt Roads. Because of the availability of surface water in eastern Puerto Rico, groundwater is not exploited by the U.S. Navy as a source of potable water; therefore, this pathway is incomplete.

5.3.5 Ingestion Pathway

The only potential ingestion pathway of the chemicals of concern is if excavation or drilling activities were conducted at the site. Workers may be exposed through direct contact with the soils during these activities. Thus, a minor possibility of an ingestion pathway exists at Site 2842. Because site access is restricted, however this exposure pathway is incomplete under current site conditions.

5.3.6 Inhalation Pathway

The only potential inhalation pathway of the chemicals of concern is if excavation or drilling activities were conducted at Site 2842. Workers may be exposed through direct contact with the soils during these activities. Thus, a minor possibility of an inhalation pathway exists at Site 2842. Proposed construction activities, however, require the approval of the U.S. Navy Engineering Command prior to conducting any work at Site 2842. Therefore, this exposure pathway is incomplete under current site conditions.

5.3.7 Risk Evaluation

The QRA results indicate that because of the presence of incomplete exposure pathways, the potential for human contact with the compounds of concern is minimal. As described in this section, each viable exposure pathway is incomplete. The missing elements are either a viable exposure point and/or a viable exposure route. In addition, water samples collected from the monitoring wells at Site 2842 indicate that only lead, at relatively low concentrations, is present in the groundwater at Site 2842 above detection limits and levels of concern defined by PREQB. Thus, the chemicals of concern do not present a hazard to personnel who visit, work, or live at Site 2842 or in the surrounding area.

The QRA also indicates that potential impacts to environmental receptors is minimal since dissolved petroleum constituents were not identified in groundwater samples from monitoring wells installed within the study area and lead concentrations were not grossly high. Groundwater quality down-gradient of Site 2842 is also likely to be unaffected by potential releases from the former UST making impacts to potential environmental receptors an unlikely scenario.

SECTION 6

Remediation Assessment

This section presents the corrective action options that could be implemented to remediate the soil, and evaluates the advantages and disadvantages of using a specific method at the site.

6.1 Soil Remediation

Three common methods of soil remediation include soil excavation and disposal, soil vapor extraction (SVE), and bioremediation. The advantages and limitations of each method are discussed in the following sections.

6.1.1 Soil Excavation and Disposal

Excavated soils would be disposed of, offsite in a landfill. Landfilling is the only disposal method for contaminated soil in Puerto Rico because no soil incineration facilities operate on the island. Hydrocarbon-impacted soils can be disposed at a certified landfill as long as the soils do not exhibit the Resource Conservation and Recovery Act (RCRA) hazardous waste characteristics as defined in Title 40 of the Code of Federal Regulations, Part 261 (40 CFR 261). However, since no potential receptors have been identified excavation is not warranted.

6.1.2 Soil Vapor Extraction (SVE)

SVE is an effective means of in-situ soil treatment designed to extract volatile organic compounds (VOCs) from the soil. A typical SVE system consists of one or several extraction wells that are under vacuum. VOCs are removed from the soils by these wells and treated at the land surface by thermal oxidation, catalytic incineration, or carbon adsorption. An SVE system would be ineffective at the site because of the low permeability soils encountered at the site and because the presence of free phase product has been identified at the site. Additionally, no potential receptors have been identified; therefore SVE is not warranted

6.1.3 Bioremediation

Bioremediation is a method of stimulating indigenous subsurface microorganisms by increasing nutrients and adding electron acceptors to biodegrade the chemicals of concern. In-situ bioremediation presents an attractive economical option because no need exists for excavation, transportation, and disposal of soil. Although bioremediation is an appealing alternative, it is also site-specific and requires a number of parameters to be adequate. The subsurface geology at the site appears to lack adequate hydraulic conductivity to allow the effective transport of electron acceptors and nutrients throughout the surficial aquifer. This is because of the existence of silts and clays at the site that induce nutrient sorption on the surficial soil. Therefore, the amount of nutrients available for growth is limited. Thus, enhanced bioremediation would not be an effective method of soil remediation.

6.2 Groundwater Remediation

There are five common methodologies for groundwater remediation (pump and treat with activated carbon, pump and treat with air sparging, pump and treat with air stripper, in-situ air sparging, and bioremediation. Pump and treat technologies are most often used on hydrocarbon impacted sites such as Site 2842 but have not been shown to be effective at removing lead from groundwater. Although effective in treating groundwater, the turbulence created by in-situ air sparging would act to spread the free product plume. Bioremediation would require addition of liquids that may also potentially spread the free product plume.

6.3 Free Product Recovery

Three alternatives for free phase product recovery are available at Site 2842 (passive skimming, hand bailing, and active skimming). The advantages and limitations of each methodology are described in the sections below.

6.3.1 Passive Surface Skimmer

A passive skimmer utilizes either the selective intake or specific gravity method. The selective intake method uses a screen that is impervious water, but allows product to pass through. Specific gravity skimmers utilize a floating device that sinks in free product, but floats on water. Free product can be collected with this method however; the slow capture rate of the free product would limit the effectiveness of this method.

6.3.2 Hand Bailing

Hand bailing is the simplest method of free product recovery in monitoring wells. A bailer is lowered down into the well, allowed to fill with liquid, and then withdrawn from the well. This method is effective for small volumes of free product that allow for periodic removal intervals. The method may be the best option for Site 2842 due to the free product thickness measured at the site.

6.3.3 Active Skimming

Two methods of active skimming are commonly used; continuos belt skimming and adjustable intake skimming. The continuos belt skimmer utilizes a continuous loop of petroleum sorbing material. The petroleum sorbing material moves down into the free product layer, around a pulley, and up to a scraper that removes the petroleum from the belt before it returns to the well. This type of skimmer is most effective with viscous free product layers. The second type of skimmer utilizes an adjustable intake connected to a pump. The intake manifold is positioned in the free product zone and pumps the product to a collection vessel at grade. This method is effective with low viscosity product and has the capacity to collect large volumes.

SECTION 7

Conclusions and Recommendations

7.1 Conclusions

The presence of petroleum hydrocarbons in the soil and groundwater from the former 1,500 gallon UST at Site 2842 was assessed during this site characterization. The former UST was located next to a former diesel fuel AST which was not originally included in assessment activities associated with the UST.

Information obtained during this investigation indicates that petroleum hydrocarbons were detected above PREQB target levels for UST sites in the soils at Site 2842. Since the elevated concentrations of petroleum hydrocarbons were in the DRO class of hydrocarbons, it is likely that subsurface impacts are related to the former AST system located at Site 2842. Separate phase product was detected in three soil borings and two monitoring wells installed at the site. The area of soil contamination appears to be limited to the area immediately surrounding the former UST, AST, and dispensing island.

Dissolved petroleum hydrocarbons above PREQB target levels for UST sites were not detected in groundwater samples collected from four monitoring wells included in the sampling program. Lead, however, was detected above target levels at all four sampling locations.

The measured groundwater flow direction is in a north-northeast pattern away from the former UST and AST locations. Two falling head tests were conducted to assess the aquifer properties at Site 2842; these tests indicated that the soils beneath Site 2842 have low to moderate hydraulic conductivity. The low hydraulic conductivity is attributed to the lithologic composition (silt, clay and saprolite) beneath Site 2842. The hydraulic gradient and groundwater flow velocity, calculated from water table elevation data and falling head tests, indicate a low groundwater flow velocity.

A qualitative risk assessment was conducted to assess various exposure pathways. Based on the lack of complete exposure pathways, it was determined that the groundwater quality and the amount and area of soil exceeding the PREQB TPH target levels of 100 mg/Kg present at the site are not threats to human health or the environment.

7.2 Recommendations

Based on the information obtained from the field investigation and laboratory analytical data, CH2M HILL recommends that a Monitoring Only Plan be implemented to address free product, lead, and soil contamination limits at the Site 2842. Soil excavation is not recommended since exposure would be increased during excavation. In-situ remediation is not recommended due to the low permeability conditions presented by the clays underlying the site. Natural biodegradation processes are expected to reduce the levels of hydrocarbon concentrations in the soils at Site 2842. Further monitoring is required to confirm that natural

biodegradation processes and dilution and dispersion will reduce the concentrations of petroleum and lead in groundwater at the site. Additionally, monitoring well 2842-MW1 should be bailed on a semi-annual basis to remove free product.

SECTION 8

References

Blasland, Bouck & Lee, Inc., 1994.*"Site Characterization-Site 735-Roosevelt Roads Naval Station, Ceiba, Puerto Rico,"* November.

Blasland, Bouck & Lee, Inc., 1995.*"Site Characterization-Site 1995-Roosevelt Roads Naval Station, Ceiba, Puerto Rico,"*.June.

Blasland, Bouck & Lee, Inc., 1998.*"Final Work Plan and Health and Safety Plan for Underground Storage Tank Sites Nos. 210, 382, 730, 860, 1796, 1808, and 2277- Roosevelt Roads Naval Station, Ceiba, Puerto Rico,"*. May.

CH2M HILL, 1998. *"Work Plan and Health and Safety Plan For Underground Storage Tank Sites Nos. 2842, 34, 229, 2016, 2842, 429R, 724, 1817- Roosevelt Roads Naval Station, Ceiba, Puerto Rico"* March.

M'Gongile, J.W., *Geologic Map of Naguabo and Part of the Punta Puerca Quadrangle, Puerto Rico, United States Geological Survey Miscellaneous Investigations Series,* Map I-1099, 1979.

Bouwer and Rice (see page 3-6)

Briggs, Reginald P. & Aguilar-Cortez, Eduardo., *Geologic Map of the Fajardo and Cayo Icacos Quadrangles, Puerto Rico, United States Geological Survey Investigation Series,* Map I-1153, 1980.

Appendix A: Soil Boring Lithologic Logs

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
146801.US.SC	2842-SB1/MW1	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons)
ELEVATION : 110.016 feet above msl DRILLING CONTRACTOR : Western Soils Inc., Mayaguez, Puerto Rico
DRILLING METHOD AND EQUIPMENT USED : 3 1/2-inch ID Hollow Stem Auger Trailer Rig BK51HD, 2" and 3" diameter ss spoons 24" long
WATER LEVELS : 5.35 ft bls; 104.666 ft amsl START : 1230 (7/6/98) END : 1500 (7/6/98) LOGGER : Michael Weatherby

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: HEALTH AND SAFETY MONITORING, SOIL TESTS, AND COMMENTS. OVA (ppm): Breathing Zone	Headspace (total-filter=actual)
	0-2	---	PH	Posthole	Silty Sand (SM), brown 7.5YR5/3, loose, fine shell fragments, dry, rocks.	0	0-0=0
	2-4	---	PH	Posthole	Shelly Sand (SP), white 7.5YR8/1, loose, 40% shell fragments, fine to med qtz, minor rocks, semi-compacted.	0	300-0=300
5	4-6	10	S-1	3-3-4-6 (7)	Shelly Sand (SP), gray 7.5YR6/1, loose, fine to med qtz, 40% shell, zones of v.fine sand w/shell, wet at 5 feet bls.	0	>1000-620=>380
	6-8	10	S-2	2-1-0-4 (1)	Shelly Sand (SP), as above S-1, white 7.5YR8/1.	0	>1000->1000=NC
10	8-15	---	Drill	---	Silt (ML) with shell, white N8/0, minor shell frags, semi-soft, wet.	0	
15					Organic Peat in auger head		
					Total Depth = 15 feet bls Well set to 15 feet bls		
20							
25							

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
146801.US.SC	2842-SB2	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons)
ELEVATION : NA DRILLING CONTRACTOR : Western Soils Inc., Mayaguez, Puerto Rico
DRILLING METHOD AND EQUIPMENT USED : 3 1/2-inch ID Hollow Stem Auger Trailer Rig BK51HD, 2" and 3" diameter ss spoons 24" long
WATER LEVELS : approx. 5 feet bls START : 1500 (7/6/98) END : 0840 (7/7/98) LOGGER : Michael Weatherby

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: HEALTH AND SAFETY MONITORING, SOIL TESTS, AND COMMENTS. OVA (ppm): Breathing Zone	Headspace (total-filter=actual)
	0-2	- - -	PH	Posthole	Silty Sand (SM), brown 7.5YR5/3, loose, fine to course qtz, fine shell fragments, rocks, dry.	0	0-0=0
	2-4	- - -	PH	Posthole	Shelly Sand (SP), white 7.5 YR8/1 to gray 7.5YR6/1, loose, fine to med qtz, 40% shell, minor rocks, compact, dry.	0	18-0=18
5	4-6	12	S-1	17-20-19-10 (39)	Shelly Sand (SP), as above, white 7.5YR8/1.	0	>1000-700=>300
	6-8	20	S-2	4-4-4-4 (8)	Shelly Sand (SP), as above S-1.	0	>1000-180=>820
					Total Depth= 8 feet bls		
10							
15							
20							
25							

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
146801.US.SC	2842-SB3	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons)
ELEVATION : NA DRILLING CONTRACTOR : Western Soils Inc., Mayaguez, Puerto Rico
DRILLING METHOD AND EQUIPMENT USED : 3 1/2-inch ID Hollow Stem Auger Trailer Rig BK51HD. 2" and 3" diameter ss spoons 24" long
WATER LEVELS : approx. 5 feet bls START : 0840 (7/7/98) END : 1115 (7/7/98) LOGGER : Michael Weatherby

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: HEALTH AND SAFETY MONITORING, SOIL TESTS, AND COMMENTS. OVA (ppm):	Breathing Zone	Headspace (total-filter=actual)
	0-2	- - -	PH	Posthole	Silty Sand (SM) with Shell, dark greenish gray 10Y4/1, fine to med qtz, 20% fine shell, small rocks, dry.		0	300-10=290
	2-4	- - -	PH	Posthole	Silty Sand (SM) with Shell, as above.		0	300-4=296
5	4-6	20	S-1	23-18-13-10 (31)	Sandy Shell, white N8/0, coarse shell, fine to med qtz, wet at 5 ft bls.	wet at 5 feet bls	0	>1000->1000=NC
	6-8	24	S-2	4-4-4-4 (8)	12"-Sandy Shell, as above. 12"-Silt (ML), white N8/0, no shell, semi-soft, semi-loose, wet.		0	200-95=105
					Total Depth= 8 feet bls			
10								
15								
20								
25								

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
146801.US.SC	2842-SB4	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons)
ELEVATION : NA DRILLING CONTRACTOR : Western Soils Inc., Mayaguez, Puerto Rico
DRILLING METHOD AND EQUIPMENT USED : 3 1/2-inch ID Hollow Stem Auger Trailer Rig BK51HD, 2" and 3" diameter ss spoons 24" long
WATER LEVELS : approx. 5 feet bls START : 1240 (7/7/98) END : 1410 (7/7/98) LOGGER : Michael Weatherby

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: HEALTH AND SAFETY MONITORING, SOIL TESTS, AND COMMENTS. OVA (ppm):	Breathing Zone	Headspace (total-filter=actual)
	0-2	- - -	PH	Posthole	Silty Sand (SM) with Shell, brown 7.5YR5/3, fine to med qtz, 20% med shell frags, dry.		0	0-0=0
	2-4	- - -	PH	Posthole	Shelly Sand (SP), pinkish white 7.5YR8/2, loose, fine to med qtz, 40% fine to coarse shell frags, dry.		0	0-0=0
5	4-6	20	S-1	6-5-3-4 (8)	Shell, white 7.5YR8/1, loose, fine to coarse, minor sand, wet at 5 feet bls.	wet at 5 feet bls	0	400-200=200
	6-8	24	S-2	(8)	12"-Shell as above. 12"-Silt (ML), white 7.5YR8/1, formable, soft, wet.		0	30-20=10
					Total Depth= 8 feet bls			
10								
15								
20								
25								

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
146801.US.SC	2842-SB5	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons)
ELEVATION : NA DRILLING CONTRACTOR : Western Soils Inc., Mayaguez, Puerto Rico
DRILLING METHOD AND EQUIPMENT USED : 3 1/2-inch ID Hollow Stem Auger Trailer Rig BK51HD, 2" and 3" diameter ss spoons 24" long
WATER LEVELS : approx. 5 feet bls START : 0820 (7/8/98) END : 1015 (7/8/98) LOGGER : Michael Weatherby

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: HEALTH AND SAFETY MONITORING, SOIL TESTS, AND COMMENTS. OVA (ppm):	Breathing Zone	Headspace (total-filter=actual)
	0-2	- - -	PH	Posthole	Shelly Silt (ML), very pale brown 10YR7/3, loose, 40% very fine to coarse, dry.		0	0-0=0
	2-4	- - -	PH	Posthole	Shelly Silt (ML), as above, dry.		0	0-0=0
5	4-6	18	S-1	6-4-11-20 (15)	Sandy Shell, light bluish gray 5PB7/1, loose, coral chunk in spoon tip, abundant rocks, wet at 5 feet bls.	wet at 5 feet bls	0	>1000->1000=NC
	6-8	24	S-2	7-6-5-6 (11)	Sandy Shell, as above.		0	>1000-1000=NC
					Total Depth= 8 feet bls			
10								
15								
20								
25								

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
146801.US.SC	2842-SB6	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons)
ELEVATION : NA DRILLING CONTRACTOR : Western Soils Inc., Mayaguez, Puerto Rico
DRILLING METHOD AND EQUIPMENT USED : 3 1/2-inch ID Hollow Stem Auger Trailer Rig BK51HD, 2" and 3" diameter ss spoons 24" long
WATER LEVELS : approx. 5 feet bls START : 1025 (7/8/98) END : 1150 (7/8/98) LOGGER : Michael Weatherby

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: HEALTH AND SAFETY MONITORING, SOIL TESTS, AND COMMENTS. OVA (ppm): Breathing Zone	Headspace (total-filter=actual)
	0-2	- - -	PH	Posthole	Shelly Sand (SP), dark gray 7.5YR4/1, loose, very fine to coarse shell, fine to med qtz, dry.	0	30-0=30
	2-4	- - -	PH	Posthole	Shelly Sand (SP), as above.	0	25-0=25
5	4-6	12	S-1	5-3-3-3 (6)	Rocks with shell and sand, dark gray 7.5YR4/1, loose, wet at 5 feet bls.	0	150-40=110
	6-8	6	S-2	2-4-3-3 (7)	Shelly Sand (SP), dark gray, 7.5YR4/1, loose, abundant small rocks, wet.	0	>1000-680=>320
					Total Depth= 8 feet bls		
10							
15							
20							
25							

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
146801.US.SC	2842-SB7	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons)
ELEVATION : NA DRILLING CONTRACTOR : Western Soils Inc., Mayaguez, Puerto Rico
DRILLING METHOD AND EQUIPMENT USED : 3 1/2-inch ID Hollow Stem Auger Trailer Rig BK51HD, 2" and 3" diameter ss spoons 24" long
WATER LEVELS : approx. 5 feet bls START : 1330 (7/8/98) END : 1425 (7/8/98) LOGGER : Michael Weatherby

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: HEALTH AND SAFETY MONITORING, SOIL TESTS, AND COMMENTS. OVA (ppm):	Breathing Zone	Headspace (total-filter=actual)
	0-2	- - -	PH	Posthole	Shelly Silt (ML), very pale brown 10YR7/3, loose, 40% v. fine to coarse shell, dry.		0	0-0=0
	2-4	- - -	PH	Posthole	Silt (ML), pink 7.5YR8/3, soft, loose, dry.		0	0-0=0
5	4-6	20	S-1	10-16-15-11 (31)	Sandy Shell, light gray 7.5YR7/1, v. fine to coarse shell, loose, wet at 5 feet bls.	Wet at 5 feet bls	0	750-400=350
	6-8	24	S-2	5-7-6-7 (13)	Sandy Shell as above, S-1, v. fine to med shell.		0	250-100=150
					Total Depth= 8 feet bls			
10								
15								
20								
25								

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
146801.US.SC	2842-SB8	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons)

ELEVATION : NA DRILLING CONTRACTOR : Western Soils Inc., Mayaguez, Puerto Rico

DRILLING METHOD AND EQUIPMENT USED : 3 1/2-inch ID Hollow Stem Auger Trailer Rig BK51HD, 2" and 3" diameter ss spoons 24" long

WATER LEVELS : approx. 11.5 feet bls START : 1505 (7/8/98) END : 0920 (7/9/98) LOGGER : Michael Weatherby

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: HEALTH AND SAFETY MONITORING, SOIL TESTS, AND COMMENTS. OVA (ppm): Breathing Zone	Headspace (total-filter=actual)
	0-2	- - -	PH	Posthole	Shelly Sand (SP), pale yellow 2.5Y7/3, and dark gray 2.5Y4/1, loose, fine to med qtz and shell, rocks, dry.	0	350-35=325
	2-4	- - -	PH	Posthole	Silty Samd (SM) with Shell, dark greenish gray 10Y3/1, semi-loose, rocks, fine qtz and shell, dry.	0	>1000-40=>960
5	4-6	18	S-1	3-2-3-4 (5)	Clay (CH), dark yellowish brown 10YR4/6, v. plastic, semi-stiff to soft, damp.	0	15-7=8
	6-8	6	S-2	2-2-3-2 (5)	Clay (CH), dark gray 10YR4/1, v. plastic, semi-stiff, damp.	0	45-30=15
	8-10	6	S-3	5-4-6-5 (10)	Clay (CH), dark greenish gray 10Y3/1, v. plastic, minor rocks, dry to damp.	0	>1000-200=>800
10	10-12	12	S-4	2-3-3-3 (6)	Clay (CH), dark greenish gray 10Y4/1, v. plastic to stiff, wet at 11.5 feet bls.	0 Wet at 11.5 feet bls	700-600=100
					Total Depth= 12 feet bls		
15							
20							
25							

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
146801.US.SC	2842-SB9	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons)
ELEVATION : NA DRILLING CONTRACTOR : Western Soils Inc., Mayaguez, Puerto Rico
DRILLING METHOD AND EQUIPMENT USED : 3 1/2-inch ID Hollow Stem Auger Trailer Rig BK51HD, 2" and 3" diameter ss spoons 24" long
WATER LEVELS : approx. 5 feet bls START : 0945 (7/9/98) END : 1450 (7/9/98) LOGGER : Michael Weatherby

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: HEALTH AND SAFETY MONITORING, SOIL TESTS, AND COMMENTS. OVA (ppm):	Breathing Zone	Headspace (total-filter=actual)
	0-2	---	PH	Posthole	Silty Sand (SM), black 5Y2.5/2, v. fine to med, loose, some shell, some rocks, dry.		0	0-0=0
	2-4	---	PH	Posthole	Clay (CH), light olive brown 2.5Y5/3, v. plastic, semi-stiff, minor rocks, damp.		0	15-5=10
5	4-6	20	S-1	2-3-4-4 (7)	Clay (CH), dark grayish brown 2.5Y4/2, v. plastic, stiff, rocky zone at 6' bls, wet.	Wet at 5 feet bls	0	20-5=15
	6-8	6	S-2	3-3-9-6 (12)	Clay (CL), dark grayish brown 2.5Y4/2, abundant sand and rocks, semi-loose, wet.		0	30-10=20
					Total Depth= 8 feet bls			
10								
15								
20								
25								

CH2MHILL

PROJECT NUMBER	BORING NUMBER
146801.US.SC	2842-SB10/MW5 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons)
ELEVATION : 109.442 feet above msl DRILLING CONTRACTOR : Western Soils Inc., Mayaguez, Puerto Rico
DRILLING METHOD AND EQUIPMENT USED : 3 1/2-inch ID Hollow Stem Auger Trailer Rig BK51HD, 2" and 3" diameter ss spoons 24" long
WATER LEVELS : 4.58 ft bls; 104.862 ft amsl START : 0730 (7/10/98) END : 0930 (7/10/98) LOGGER : Michael Weatherby

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: HEALTH AND SAFETY MONITORING, SOIL TESTS, AND COMMENTS. OVA (ppm): Breathing Zone	Headspace (total-filter=actual)
	0-2	- - -	PH	Posthole	Silty Sand (SM), black 5Y2.5/2, v.fine to med qtz, loose, minor shell, some rocks, dry.	0	10-5=5
	2-4	- - -	PH	Posthole	Silty Clay (CL), light gray 5Y7/1, soft, no rocks or shell, dry to damp.	0	250-180=70
5	4-6	20	S-1	2-2-3-7 (5)	Clay (CL), greenish gray 10Y5/1, v.plastic, semi-stiff to soft, some rocks, moist. Bottom 4"-Sandy Clay (CL), v.dark gray N3/0, wet.	0 Wet at 5 feet bls	top 100-100=0 >1000->1000=NC
	6-8	6	S-2	3-3-4-3 (7)	Sandy Clay (CL), as above S-1 bottom 4". Rock in spoon tip, wet.	0 spoon is saturated with free product	NT
					Total Depth= 8 feet bls		
10							
15							
20							
25							

CH2MHILL

PROJECT NUMBER	BORING NUMBER
146801.US.SC	2842-SB11/MW4 SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons)
ELEVATION : 109.196 feet above msl DRILLING CONTRACTOR : Western Soils Inc., Mayaguez, Puerto Rico
DRILLING METHOD AND EQUIPMENT USED : 3 1/2-inch ID Hollow Stem Auger Trailer Rig BK51HD, 2" and 3" diameter ss spoons 24" long
WATER LEVELS : 4.10 ft bls; 105.096 ft amsl START : 0930 (7/10/98) END : 1500 (7/13/98) LOGGER : Michael Weatherby

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: HEALTH AND SAFETY MONITORING, SOIL TESTS, AND COMMENTS. OVA (ppm):	Breathing Zone	Headspace (total-filter=actual)
	0-2	- - -	PH	Posthole	Silty Sand (SM), light brownish gray 2.5Y6/2, loose, fine to med qtz, dry.		0	0-0=0
	2-4	- - -	PH	Posthole	Silty Sand (SM), as above, with shell.		0	100-30=70
5	4-6	20	S-1	10-12-9-7 (21)	Silty Sand (SM) with shell, light greenish gray 10Y8/1, fine to med qtz, med shell, wet.	Wet at 5 feet bls slight odor	0	100-50=50
	6-8	20	S-2	2-1-1-2 (2)	Silt (ML), light greenish gray 10Y7/1, soft to compact, very clean, wet.		0	25-10=15
					Total Depth= 8 feet bls			
10								
15								
20								
25								

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
146801.US.SC	2842-SB12	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons)
ELEVATION : NA DRILLING CONTRACTOR : Western Soils Inc., Mayaguez, Puerto Rico
DRILLING METHOD AND EQUIPMENT USED : 3 1/2-inch ID Hollow Stem Auger Trailer Rig BK51HD, 2" and 3" diameter ss spoons 24" long
WATER LEVELS : approx. 7 feet bls START : 1330 (7/14/98) END : 1540 (7/14/98) LOGGER : Michael Weatherby

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: HEALTH AND SAFETY MONITORING, SOIL TESTS, AND COMMENTS. OVA (ppm): Breathing Zone	Headspace (total-filter=actual)
	0-2	- - -	PH	Posthole	Silty Sand (SM), dark grayish brown 10YR4/2, loose, fine to med qtz, minor shell, rocks, dry.	0	0-0=0
	2-4	- - -	PH	Posthole	Silty Sand (SM), very pale brown 10YR7/3, fine to med qtz, fine to coarse shell, loose, dry.	0	0-0=0
5	4-6	20	S-1	20-15-8-4 (23)	Sand (SP) with shell, pale yellow 2.5Y8/2, fine to med qtz, v.coarse shell, loose, dry. Bottom 5" Silt (ML), loose, clean, wet.	0 Wet at 5 feet bls	0-0=0
	6-8	24	S-2	2-0-1-1 (1)	Silty (ML), light greenish gray 10Y7/1, non-plastic, semi-stiff to soft, clean, no rocks, wet.	0	50-25=25
					Total Depth= 8 feet bls		
10							
15							
20							
25							

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
146801.US.SC	2842-SB13/MW2	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons)

ELEVATION : 111.053 feet above msl DRILLING CONTRACTOR : Western Soils Inc., Mayaguez, Puerto Rico

DRILLING METHOD AND EQUIPMENT USED : 3 1/2-inch ID Hollow Stem Auger Trailer Rig BK51HD, 2" and 3" diameter ss spoons 24" long

WATER LEVELS : 6.24 ft bls; 104.813 ft amsl START : 0730 (7/15/98) END : 0915 (7/15/98) LOGGER : Michael Weatherby

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: HEALTH AND SAFETY MONITORING, SOIL TESTS, AND COMMENTS. OVA (ppm):	Breathing Zone	Headspace (total-filter=actual)
	0-2	---	PH	Posthole	Silty Sand (SM), dark grayish brown 10YR4/2, loose, fine to med qtz, rocks, minor shell, dry.		0	0-0=0
	2-4	---	PH	Posthole	Silty Sand (SM), very pale brown 10YR7/3, fine to med qtz, loose, fine to coarse shell, dry.		0	0-0=0
5	4-6	20	S-1	6-8-9-9 (17)	Sandy Shell, very pale brown 10YR7/3, 30% fine to med qtz, fine to coarse shell, wet at 5 feet bls.	Wet at 5.5 feet bls no odor	0	0-0=0
	6-8	20	S-2	3-4-2-1 (6)	Sandy Shell, as above S-1. Bottom 3"-Silt (ML), light greenish gray 10Y7/1, non-plastic, semi-stiff to soft, clean, wet.	no odor	0	50-30=20
					Total Depth= 8 feet bls			
10								
15								
20								
25								

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
146801.US.SC	2842-SB14	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons)

ELEVATION : NA DRILLING CONTRACTOR : Western Soils Inc., Mayaguez, Puerto Rico

DRILLING METHOD AND EQUIPMENT USED : 3 1/2-inch ID Hollow Stem Auger Trailer Rig BK51HD, 2" and 3" diameter ss spoons 24" long

WATER LEVELS : approx. 5 feet bls START : 1500 (7/13/98) END : 1017 (7/14/98) LOGGER : Michael Weatherby

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: HEALTH AND SAFETY MONITORING, SOIL TESTS, AND COMMENTS.	OVA (ppm): Breathing Zone	Headspace (total-filter=actual)
	0-2	---	PH	Posthole	Silty Sand (SM), olive gray 5Y4/2, fine to med qtz, loose, some shell, some rocks, dry.		0	0-0=0
	2-4	---	PH	Posthole	Sandy Silt (SM), light gray 5Y7/1, minor shell, fine qtz, loose, dry.		0	22-9=13
5	4-6	20	S-1	6-5-3-4 (8)	Clay (CL), dark greenish gray 10GY3/1, plastic, minor sand, dry to 5 feet bls, sand in bottom of spoon, wet.	Wet at 5 feet bls	0	>1000-550=>450
	6-8	24	S-2	(8)	Silty Sand (SM), dark greenish gray 10GY3/1, dark yellowish brown 10YR4/4, loose, rocks, med to coarse, qtz, wet.	Trace free product - high odor.	0	100-10=90
					Total Depth= 8 feet bls			
10								
15								
20								
25								

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
146801.US.SC	2842-SB15	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons)
ELEVATION : NA DRILLING CONTRACTOR : Western Soils Inc., Mayaguez, Puerto Rico
DRILLING METHOD AND EQUIPMENT USED : 3 1/2-inch ID Hollow Stem Auger Trailer Rig BK51HD, 2" and 3" diameter ss spoons 24" long
WATER LEVELS : approx. 5 feet bls START : 1010 (7/15/98) END : 1345 (7/15/98) LOGGER : Michael Weatherby

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: HEALTH AND SAFETY MONITORING, SOIL TESTS, AND COMMENTS. OVA (ppm): Breathing Zone	Headspace (total-filter=actual)
	0-2	- - -	PH	Posthole	Shelly Sand (SP), very pale brown 10YR7/3, fine to med qtz and shell, loose, some rocks, dry.	0	0-0=0
	2-4	- - -	PH	Posthole	Silty Sand (SM), very dark grayish brown 10YR3/2, loose, fine to med qtz and shell, dry.	0	0-0=0
5	4-6	20	S-1	6-6-6-16 (12)	Clay (CL), dark greenish gray 5G4/1, semi-plastic to friable, moist at 5 feet bls, 4" high odor zone at 5 feet bls, dark gray.	0 Wet and high odor zone at 5 feet bls	6-0=6
	6-8	18	S-2	4-2-1-2 (3)	Clay (CH), light olive brown 2.5Y5/3, v.plastic, stiff, moist to wet.	0	1-0=1
					Total Depth= 8 feet bls		
10							
15							
20							
25							

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
146801.US.SC	2842-SB16/MW3	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons)

ELEVATION : 109.455 feet above msl DRILLING CONTRACTOR : Western Soils Inc., Mayaguez, Puerto Rico

DRILLING METHOD AND EQUIPMENT USED : 3 1/2-inch ID Hollow Stem Auger Trailer Rig BK51HD, 2" and 3" diameter ss spoons 24" long

WATER LEVELS : 4.26 ft bls; 105.195 ft amsl START : 1405 (7/15/98) END : 1600 (7/15/98) LOGGER : Michael Weatherby

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: HEALTH AND SAFETY MONITORING, SOIL TESTS, AND COMMENTS. OVA (ppm): Breathing Zone	Headspace (total-filter=actual)
	0-2	---	PH	Posthole	Shelly Sand (SP), very pale brown 10YR7/3, fine to med qtz and shell, loose, dry.	0	0-0=0
	2-4	---	PH	Posthole	Silty Sand (SM), very dark grayish brown 10YR3/2, fine to med qtz, loose, dry.	0	0-0=0
5	4-6	18	S-1	11-8-7-9 (15)	Shelly Sand (SP), very pale brown 10YR3/3, fine to med qtz and shell, loose, dry to wet at 5 feet bls.	0	100-40=60
	6-8	20	S-2	5-4-2-1 (6)	Silt (ML), light greenish gray 10Y7/1, nonplastic, semi-stiff to soft, clean-no rocks or shell, wet.	0	300-180=120
					Total Depth= 8 feet bls		
10							
15							
20							
25							

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
146801.US.SC	2842-SB17	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons)
ELEVATION : NA DRILLING CONTRACTOR : Western Soils Inc., Mayaguez, Puerto Rico
DRILLING METHOD AND EQUIPMENT USED : 3 1/2-inch ID Hollow Stem Auger Trailer Rig BK51HD, 2" and 3" diameter ss spoons 24" long
WATER LEVELS : approx. 5 feet bls START : 0730 (7/16/98) END : 1000 (7/16/98) LOGGER : Michael Weatherby

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: HEALTH AND SAFETY MONITORING, SOIL TESTS, AND COMMENTS. OVA (ppm):	Breathing Zone	Headspace (total-filter=actual)
	0-2	- - -	PH	Posthole	Silty Sand (SM), pale brown 10YR6/3, loose, fine qtz and shell, dry.		0	0-0=0
	2-4	- - -	PH	Posthole	Sandy Shell, very pale brown 10YR3/3, fine to med qtz, fine to coarse shell, loose, dry.		0	0-0=0
5	4-6	20	S-1	13-11-10-11 (21)	Sandy Shell, very pale brown 10YR3/3, fine to med qtz, fine to coarse shell, loose, dry to wet at 5 feet bls.	Wet at 5 feet bls	0	0-0=0
	6-8	20	S-2	6-5-4-2 (9)	Silt (ML), light greenish gray 10Y7/1, nonplastic, semi-stiff to soft, clean-no rocks or shell, wet.		0	130-100=30
					Total Depth= 8 feet bls			
10								
15								
20								
25								

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
146801.US.SC	2842-SB18	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons)

ELEVATION : NA DRILLING CONTRACTOR : Western Soils Inc., Mayaguez, Puerto Rico

DRILLING METHOD AND EQUIPMENT USED : 3 1/2-inch ID Hollow Stem Auger Trailer Rig BK51HD, 2" and 3" diameter ss spoons 24" long

WATER LEVELS : approx. 5 feet bls START : 0830 (7/16/98) END : 1600 (7/16/98) LOGGER : Michael Weatherby

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: HEALTH AND SAFETY MONITORING, SOIL TESTS, AND COMMENTS. OVA (ppm):	Breathing Zone	Headspace (total-filter=actual)
	0-2	- - -	PH	Posthole	Silty Sand (SM), very pale brown 10YR3/3, fine to med qtz, fine to coarse shell, loose, dry.		0	0-0=0
	2-4	- - -	PH	Posthole	Clay (CL), light olive brown 2.5Y5/6, rocks and minor shells, semiplastic, dry.		0	0-0=0
5	4-6	20	S-1	2-1-1-2 (2)	Silt (ML), light greenish gray 10Y7/1, nonplastic, semi-stiff to soft, clean-no rocks or shell, wet at 5 feet bls.	Wet at 5 feet bls	0	>1000-450=>550
	6-8	24	S-2	WOR 24"	Silt (ML), as above S-1, wet.		0	>1000-250=>750
					Total Depth= 8 feet bls			
10								
15								
20								
25								

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
146801.US.SC	2842-SB19	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons)

ELEVATION : NA DRILLING CONTRACTOR : Western Soils Inc., Mayaguez, Puerto Rico

DRILLING METHOD AND EQUIPMENT USED : 3 1/2-inch ID Hollow Stem Auger Trailer Rig BK51HD, 2" and 3" diameter ss spoons 24" long

WATER LEVELS : approx. 5 feet bls START : 1315 (7/16/98) END : 1320 (7/20/98) LOGGER : M. Weatherby/R. Morales

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: HEALTH AND SAFETY MONITORING, SOIL TESTS, AND COMMENTS. OVA (ppm):	Breathing Zone	Headspace (total-filter=actual)
	0-2	- - -	PH	Posthole	Silty Sand (SM), pale brown 10YR6/3, fine qtz and shell, loose, dry.		0	0-0=0
	2-4	- - -	PH	Posthole	Clay (CL), light olive brown 2.5Y5/6, rocks and minor shells, semiplastic, moist.		0	>1000->1000=NC
5	4-6	6	S-1	4-6-7-5 (13)	Silty Sand (SM), greenish gray 10GY3/1, very moist.	high odor	0	>1000-200=>800
	6-8	18	S-2	2-10-6-5 (16)	Silt (ML), greenish gray 10GY3/1, wet.	high odor	0	500-15=485
					Total Depth= 8 feet bls			
10								
15								
20								
25								

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
146801.US.SC	2842-SB20	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons)
ELEVATION : NA DRILLING CONTRACTOR : GeoWorks, San Juan, Puerto Rico
DRILLING METHOD AND EQUIPMENT USED : 4 1/4-inch ID Hollow Stem Auger Mobile Drill, 2" and 3" diameter ss spoons 24" long
WATER LEVELS : approx. 5 feet bls START : 1000 (7/22/98) END : 1330 (7/22/98) LOGGER : Cleone Arfstrom

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: HEALTH AND SAFETY MONITORING, SOIL TESTS, AND COMMENTS. OVA (ppm):	Breathing Zone	Headspace (total-filter=actual)
	0-2	- - -	PH	Posthole	Clay (CL) greenish gray 5G3/1, semi-plastic, rock fragments, moist.		0	60-0=60
	2-4	- - -	PH	Posthole	Sandy Clay (CL), greenish gray 10GY4/1, crushed shells, moist.	high odor	0	500-10=490
5	4-6	20	S-1	10-12-10-10 (22)	Sandy Shell, dark gray 10Y4/1, large fragments of coral, loose, poorly sorted qtz, moist.	Wet at 5 feet bls high odor	0	200-30=170
	6-8	12	S-2	4-20-17-8 (37)	Coral, large fragments of coral, wet.	high odor	0	500-100=400
					Total Depth= 8 feet bls			
10								
15								
20								
25								

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
146801.US.SC	2842-SB21	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons)
ELEVATION : NA DRILLING CONTRACTOR : GeoWorks, San Juan, Puerto Rico
DRILLING METHOD AND EQUIPMENT USED : 4 1/4-inch ID Hollow Stem Auger Mobile Drill, 2" and 3" diameter ss spoons 24" long
WATER LEVELS : approx. 5 feet bls START : 1310 (7/22/98) END : 1500 (7/22/98) LOGGER : Cleone Arfstrom

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: HEALTH AND SAFETY MONITORING, SOIL TESTS, AND COMMENTS.	OVA (ppm): Breathing Zone	Headspace (total-filter=actual)
	0-2	- - -	PH	Posthole	Sandy Clay (SC), greenish gray 10GY4/1, loose, moist.		0	>1000-500=>500
	2-4	- - -	PH	Posthole	Clayey Sand (SC), greenish gray 10GY4/1, loose, rock fragments, moist.		0	200-150=50
5	4-6	- - -	S-1	12-10-12-8 (22)	Shelly Sand (SP), white 2.5Y8/1, loose, crushed shell, wet.	Wet at 5 feet bls slight odor	0	500-300=200
	6-8	- - -	S-2	2-1-2-1 (3)	Silty Clay (CL, light gray 2.5Y7/1, semi-plastic, wet, H2S odor.		0	20-15=5
					Total Depth= 8 feet bls			
10								
15								
20								
25								

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
146801.US.SC	2842-SB22	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons)
ELEVATION : NA DRILLING CONTRACTOR : GeoWorks, San Juan, Puerto Rico
DRILLING METHOD AND EQUIPMENT USED : 4 1/4-inch ID Hollow Stem Auger Mobile Drill, 2" and 3" diameter ss spoons 24" long
WATER LEVELS : approx. 5 feet bls START : 1215 (7/29/98) END : 1320 (7/29/98) LOGGER : Cleone Arfstrom

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: HEALTH AND SAFETY MONITORING, SOIL TESTS, AND COMMENTS. OVA (ppm):	Breathing Zone	Headspace (total-filter=actual)
	0-2	- - -	PH	Posthole	Shelly Sand (SP), grayish green (10Y5/1), loose, dry.		0	0-0=0
	2-4	- - -	PH	Posthole	Shelly Sand (SP), dark greenish gray (10Y4/1), loose, slightly moist.		0	0-0=0
5	4-6	20	S-1	1-1-1-2 (2)	Sandy Clay (CL), greenish gray 10Y4/1, loose, semi-plastic, moist to wet.	Wet at 5 feet bls	0	0-0=0
	6-8	15	S-2	1-2-1-1 (3)	Fine Sand (SW), greenish gray 10Y5/1, slightly plastic, wet.		0	20-7.5=12.5
					Total Depth= 8 feet bls			
10								
15								
20								
25								

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
146801.US.SC	2842-SB23	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons)
ELEVATION : NA DRILLING CONTRACTOR : GeoWorks, San Juan, Puerto Rico
DRILLING METHOD AND EQUIPMENT USED : 4 1/4-inch ID Hollow Stem Auger Mobile Drill, 2" and 3" diameter ss spoons 24" long
WATER LEVELS : approx. 5 feet bls START : 0800 (7/29/98) END : 0845 (7/29/98) LOGGER : Cleone Arfstrom

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: HEALTH AND SAFETY MONITORING, SOIL TESTS, AND COMMENTS. OVA (ppm): Breathing Zone	Headspace (total-filter=actual)
	0-2	---	PH	Posthole	Shelly Sand (SP), light gray, loose, slightly moist.	0	NT
						high odor at 2 feet bls	
	2-4	---	PH	Posthole	Shelly Sand (SP) as above.	0	NT
						high odor	
5	4-6	---	Drill	NT	Sand (SW) very light greenish gray 10Y7/1, med qtz, wet.	0	NT
						Wet at 5.5 feet bls minor odor	
	6-8	---	Drill	NT	Silty Sand (SM), greenish gray 10Y5/1, wet.	0	NT
						high odor	
	8-10	---	Drill	NT	Silty Sand (SM), as above.	0	NT
10						high odor	
					Total Depth= 10 feet bls		
15							
20							
25							

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
146801.US.SC	2842-SB24	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons)
ELEVATION : NA DRILLING CONTRACTOR : GeoWorks, San Juan, Puerto Rico
DRILLING METHOD AND EQUIPMENT USED : 4 1/4-inch ID Hollow Stem Auger Mobile Drill, 2" and 3" diameter ss spoons 24" long
WATER LEVELS : approx. 5 feet bls START : 0900 (7/29/98) END : 0945 (7/29/98) LOGGER : Cleone Arfstrom

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: HEALTH AND SAFETY MONITORING, SOIL TESTS, AND COMMENTS. OVA (ppm):	Breathing Zone	Headspace (total-filter=actual)
	0-2	---	PH	Posthole	Silty Sand (SM), dark gray 2.5 Y4/1, friable, slightly moist.	slight odor	0	NT
	2-4	---	PH	Posthole	Silty Sand (SM), light gray 10Y7/1, loose, moist.	slight odor	0	NT
5	4-6	---	Drill	NT	Silty Sand (SM), as above.	slight odor	0	NT
	6-8	---	Drill	NT	Silty Sand (SM), greenish gray 10Y5/1), wet.	medium odor	0	NT
	8-10	---	Drill	NT	Silty Sand (SM) as above.	high odor	0	NT
10					Total Depth= 10 feet bls			
15								
20								
25								

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
146801.US.SC	2842-SB25	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons)

ELEVATION : NA DRILLING CONTRACTOR : GeoWorks, San Juan, Puerto Rico

DRILLING METHOD AND EQUIPMENT USED : 4 1/4-inch ID Hollow Stem Auger Mobile Drill, 2" and 3" diameter ss spoons 24" long

WATER LEVELS : approx. 5 feet bls START : 1015 (7/29/98) END : 1050 (7/29/98) LOGGER : Cleone Arfstrom

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: HEALTH AND SAFETY MONITORING, SOIL TESTS, AND COMMENTS. OVA (ppm):	Breathing Zone	Headspace (total-filter=actual)
	0-2	---	PH	Posthole	Shelly Sand (SP), grayish green 10Y5/2, loose, dry.	medium odor	0	NT
	2-4	---	PH	Posthole	Sandy Clay (CL), greenish gray 10GY4/1), shell frags, moist.	high odor	0	NT
5	4-6	---	Drill	NT	Shelly Sand (SP), light greenish gray 10Y7/1), wet.		0	NT
	6-8	---	Drill	NT	Shelly Sand (SP), as above.		0	NT
	8-10	---	Drill	NT	Shelly Sand (SP), as above.		0	NT
10					Total Depth= 10 feet bls			
15								
20								
25								

Appendix B: Monitoring Well Construction Diagrams

PROJECT NUMBER	WELL NUMBER	
146801.US.SC	2842-MW1	SHEET 1 OF 1

CH2MHILL

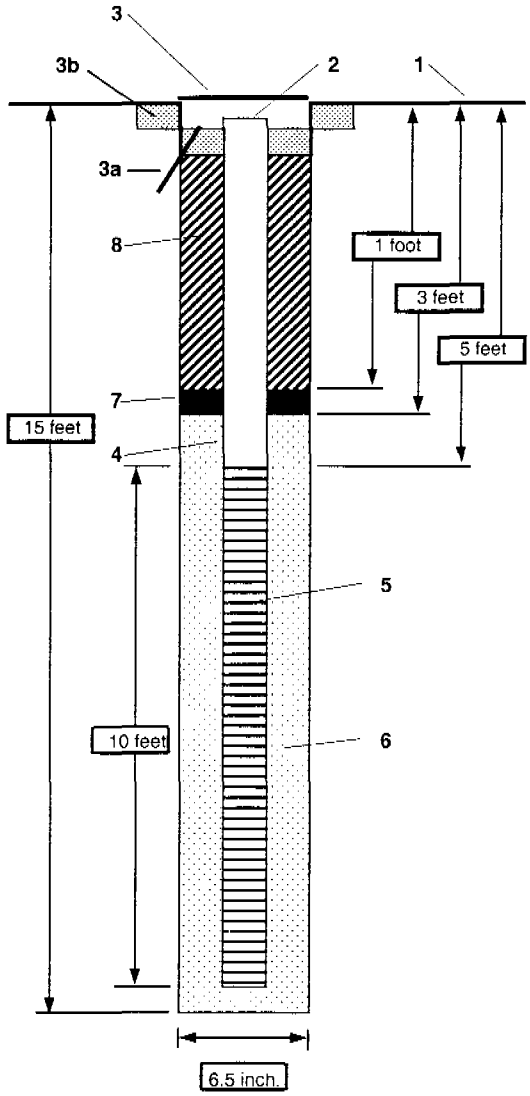
WELL COMPLETION DIAGRAM

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons) - SB1

DRILLING CONTRACTOR : Western Soils Inc., Mayaguez, Puerto Rico

DRILLING METHOD AND EQUIPMENT USED : Post Hole, 3 1/2-inch ID Hollow Stem Auger Trailer Rig BK51HD

WATER LEVELS : 5.35 feet btoc; 104.666 ft amsl START : 1420 (7/7/98) END : 1500 (7/7/98) LOGGER : Michael Weatherby



1- Ground elevation at well	NA
2- Top of casing elevation	110.016 feet above msl
3- Wellhead protection cover	8-inch diameter flush mount steel manhole
a) drain tube?	none
b) concrete pad dimensions	3-feet by 3-feet by 4-inches
4- Dia./type of well casing	2-inch diameter, schedule 40, PVC
5- Type/slot size of screen	2-inch diameter, schedule 40, PVC, 10-slot
6- Type screen filter	beach sand
a) Quantity used	9 - 30 lbs bags
7- Type of seal	Cetco Bentonite pellets
a) Quantity used	1/4 - 5 gallon bucket
8- Grout	
a) Grout mix used	none - concrete from pad
Development method	Intermittently surged with Teflon bailer and pumped with peristaltic pump.
Development time	
Estimated purge volume	Free product in well - not developed

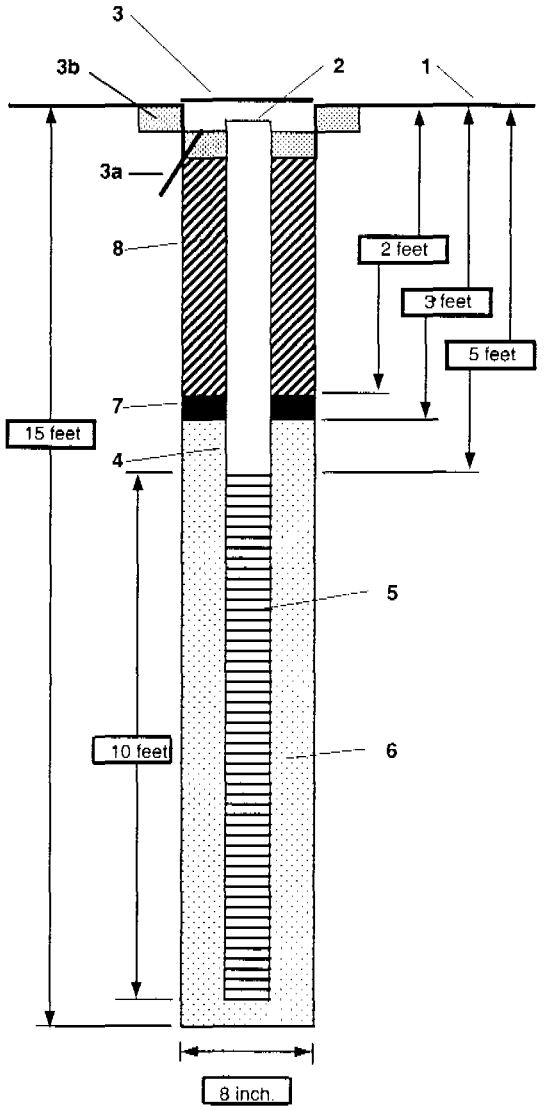
Comments

PROJECT NUMBER	WELL NUMBER	
146801.US.SC	2842-MW2	SHEET 1 OF 1

CH2MHILL

WELL COMPLETION DIAGRAM

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons) - SB13
DRILLING CONTRACTOR : GeoWorks, San Juan, Puerto Rico
DRILLING METHOD AND EQUIPMENT USED : 4 1/4-inch ID Hollow Stem Auger Mobile Drill
WATER LEVELS : 6.24 feet btoc; 104.813 ft amsl START : 1030 (7/21/98) END :1100 (7/21/98) LOGGER : Cleone Arfstrom



1- Ground elevation at well	NA
2- Top of casing elevation	111.053 feet above msl
3- Wellhead protection cover	8-inch diameter flush mount steel manhole
a) drain tube?	none
b) concrete pad dimensions	3-feet by 3-feet by 4-inches
4- Dia./type of well casing	2-inch diameter, schedule 40, PVC
5- Type/slot size of screen	2-inch diameter, schedule 40, PVC, 10-slot
6- Type screen filter	beach sand
a) Quantity used	6 - 30 lbs bags
7- Type of seal	Cetco Bentonite pellets
a) Quantity used	1/4 - 5 gallon bucket
8- Grout	
a) Grout mix used	none - concrete from pad
Development method	Intermittently surged with Teflon bailer and pumped with peristaltic pump.
Development time	
Estimated purge volume	55 gallons

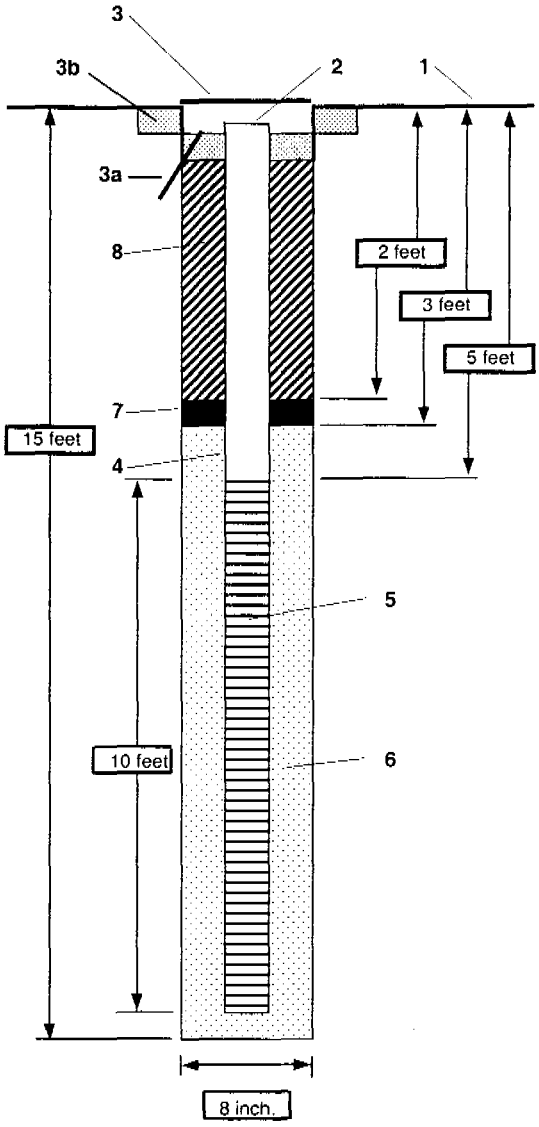
Comments Water is clear and sediment free

PROJECT NUMBER	WELL NUMBER	
146801.US.SC	2842-MW3	SHEET 1 OF 1

CH2MHILL

WELL COMPLETION DIAGRAM

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons) - SB16
DRILLING CONTRACTOR : GeoWorks, San Juan, Puerto Rico
DRILLING METHOD AND EQUIPMENT USED : 4 1/4-inch ID Hollow Stem Auger Mobile Drill
WATER LEVELS : 4.26 feet btoc; 105.195 ft amsl START : 1115 (7/21/98) END :1150 (7/21/98) LOGGER : Cleone Arfstrom



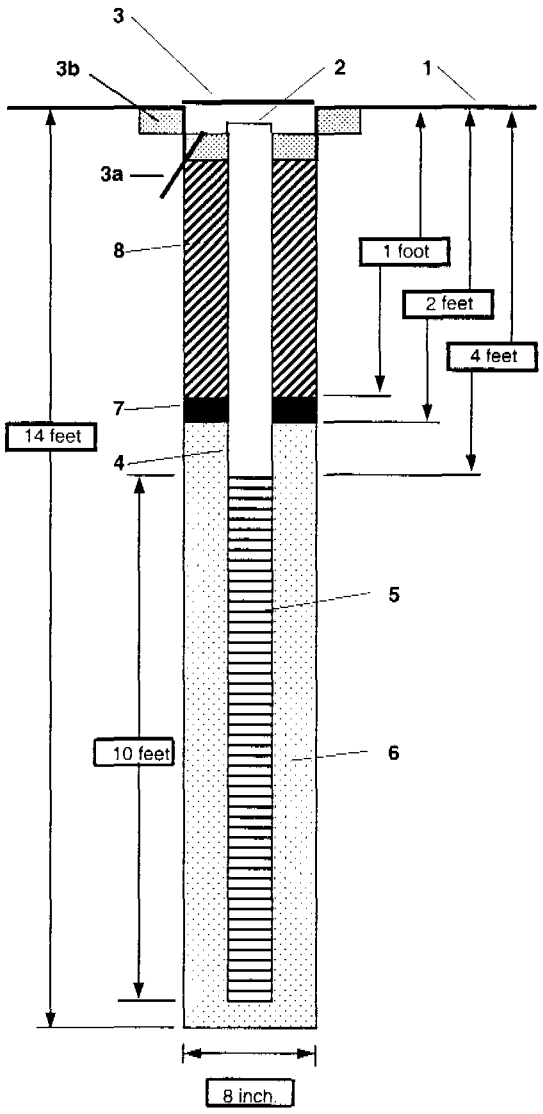
1- Ground elevation at well	NA
2- Top of casing elevation	109.455 feet above msl
3- Wellhead protection cover	8-inch diameter flush mount steel manhole
a) drain tube?	none
b) concrete pad dimensions	3-feet by 3-feet by 4-inches
4- Dia./type of well casing	2-inch diameter, schedule 40, PVC
5- Type/slot size of screen	2-inch diameter, schedule 40, PVC, 10-slot
6- Type screen filter	beach sand
a) Quantity used	10 - 30 lbs bags
7- Type of seal	Cetco Bentonite pellets
a) Quantity used	1/4 - 5 gallon bucket
8- Grout	
a) Grout mix used	none - concrete from pad
Development method	Intermittently surged with Teflon bailer and pumped with peristaltic pump.
Development time	
Estimated purge volume	32 gallons
Comments	Water is clear and sediment free

CH2MHILL

PROJECT NUMBER	WELL NUMBER		
146801.US.SC	2842-MW4	SHEET 1	OF 1

WELL COMPLETION DIAGRAM

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons)
DRILLING CONTRACTOR : GeoWorks, San Juan, Puerto Rico
DRILLING METHOD AND EQUIPMENT USED : 4 1/4-inch ID Hollow Stem Auger Mobile Drill
WATER LEVELS : 4.10 feet btoc; 105.096 ft amsl START : 0930 (7/21/98) END : 1015 (7/21/98 LOGGER : Cleone Arfstrom



1- Ground elevation at well	NA
2- Top of casing elevation	109.196 feet above msl
3- Wellhead protection cover	8-inch diameter flush mount steel manhole
a) drain tube?	none
b) concrete pad dimensions	3-feet by 3-feet by 4-inches
4- Dia./type of well casing	2-inch diameter, schedule 40, PVC
5- Type/slot size of screen	2-inch diameter, schedule 40, PVC, 10-slot
6- Type screen filter	beach sand
a) Quantity used	9 - 30 lbs bags
7- Type of seal	Cetco Bentonite pellets
a) Quantity used	1/4 - 5 gallon bucket
8- Grout	
a) Grout mix used	none - concrete from pad
Development method	Intermittently surged with Teflon bailer and pumped with peristaltic pump.
Development time	
Estimated purge volume	86 gallons

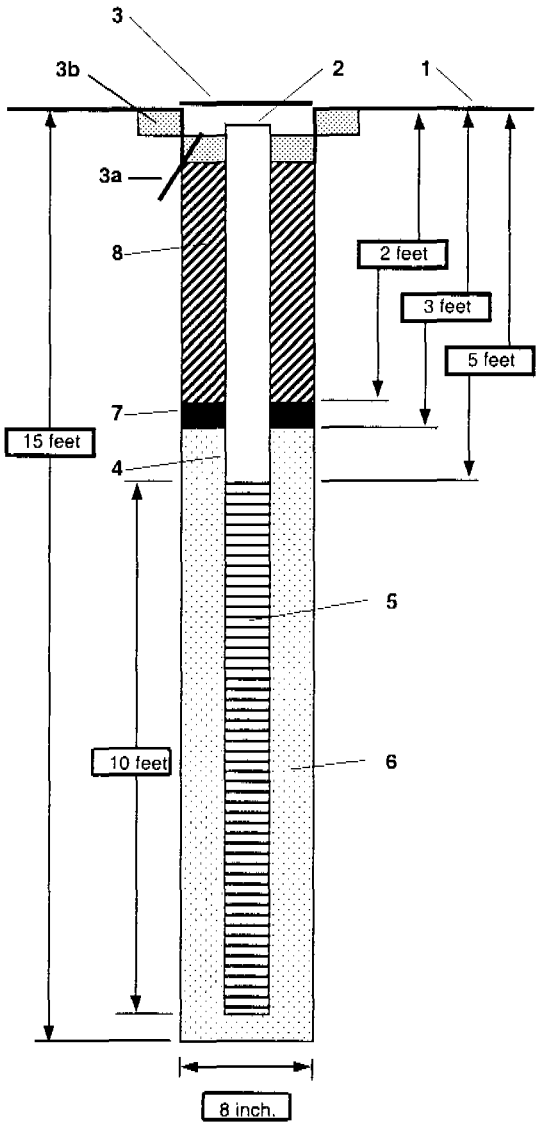
Comments Water is clear and sediment free

PROJECT NUMBER	WELL NUMBER	
146801.US.SC	2842-MW5	SHEET 1 OF 1

CH2MHILL

WELL COMPLETION DIAGRAM

PROJECT : Roosevelt Roads Naval Station UST Site Characterization LOCATION : Facility 2842 - One Gasoline Tank (1,500 gallons)
DRILLING CONTRACTOR : GeoWorks, San Juan, Puerto Rico
DRILLING METHOD AND EQUIPMENT USED : 4 1/4-inch ID Hollow Stem Auger Mobile Drill
WATER LEVELS : 4.58 feet btoc; 104.862 ft amsl START : 0830 (7/21/98) END :0925 (7/21/98) LOGGER : Cleone Arfstrom



1- Ground elevation at well	NA
2- Top of casing elevation	109.442 feet above msl
3- Wellhead protection cover	8-inch diameter flush mount steel manhole
a) drain tube?	none
b) concrete pad dimensions	3-feet by 3-feet by 4-inches
4- Dia./type of well casing	2-inch diameter, schedule 40, PVC
5- Type/slot size of screen	2-inch diameter, schedule 40, PVC, 10-slot
6- Type screen filter	beach sand
a) Quantity used	9 - 30 lbs bags
7- Type of seal	Cetco Bentonite pellets
a) Quantity used	1/4 - 5 gallon bucket
8- Grout	
a) Grout mix used	none - concrete from pad
Development method	Intermittently surged with Teflon bailer and pumped with peristaltic pump.
Development time	
Estimated purge volume	Free product in well - not developed

Comments

Appendix C: In Situ Permeability Test Results

Site 2842 Groundwater Flow Velocity Calculations

Groundwater Gradient (i): $\frac{\bullet h}{\bullet L}$ Groundwater Flow Velocity (V): $\frac{K\,i}{n}$

parameters:
- •h= change in water level between points (feet)
- •L= distance between points (feet)
- K= hydraulic conductivity (Range: MW2=13.2 feet/day, MW4=0.6 feet/day)
- n= porosity of the medium (percent)

July 27, 1998

Gradient (i): $\frac{\bullet h}{\bullet L} = \frac{0.386 \text{ feet}}{213 \text{ feet}} = 0.0018$

Velovity (V): $\frac{K\,i}{n} = \frac{(13.2 \text{ ft/d})(0.0018)}{0.45} = 0.05 \text{ feet/day}$ using MW2 permeability test results (K)

July 31, 1998

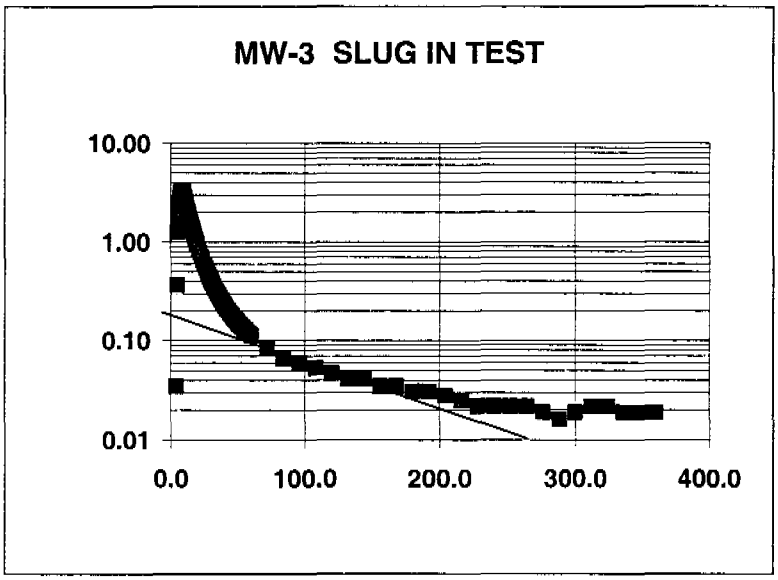
Gradient (i): $\frac{\bullet h}{\bullet L} = \frac{0.4 \text{ feet}}{147 \text{ feet}} = 0.0027$

Velovity (V): $\frac{K\,i}{n} = \frac{(13.2 \text{ ft/d})(0.0027)}{0.45} = 0.06 \text{ feet/day}$ using MW2 permeability test results (K)

CH2MHILL

CH2M HILL SLUG TEST DATA
PROJECT NO: 146801.US.SC
CLIENT: Roosevelt Roads Naval Station, Puerto Rico
TEST DATE: July 31, 1998
WELL NO.: 2842-MW4
COMPILED BY: Michael L. Weatherby
TEST METHOD: Slug In - Water
ANALYSIS METHOD: Bouwer and Rice - Fully Penetrating Well

ELAPSED TIME (sec)	TRANSDUCER READING (ft)	Y(t) (ft)	ELAPSED TIME (sec)	TRANSDUCER READING (ft)	Y(t) (ft)	ELAPSED TIME (sec)	TRANSDUCER READING (ft)	Y(t) (ft)
4.0	4.06	0.04	17.0	2.81	1.28	40.0	3.86	0.23
4.5	3.72	0.37	17.5	2.88	1.22	41.0	3.87	0.22
5.0	2.84	1.25	18.0	2.94	1.16	42.0	3.88	0.21
5.5	2.44	1.65	18.5	3.00	1.10	43.0	3.89	0.20
6.0	2.00	2.09	19.0	3.05	1.04	44.0	3.90	0.19
6.5	1.58	2.52	19.5	3.10	0.99	45.0	3.91	0.19
7.0	1.25	2.84	20.0	3.15	0.94	46.0	3.91	0.18
7.5	0.90	3.20	21.0	3.24	0.86	47.0	3.92	0.17
8.0	0.74	3.36	22.0	3.31	0.78	48.0	3.93	0.17
8.5	0.83	3.27	23.0	3.38	0.71	49.0	3.93	0.16
9.0	0.86	3.23	24.0	3.44	0.65	50.0	3.94	0.15
9.5	0.79	3.30	25.0	3.49	0.60	51.0	3.95	0.15
10.0	1.18	2.91	26.0	3.54	0.55	52.0	3.95	0.15
10.5	1.26	2.84	27.0	3.58	0.51	53.0	3.95	0.14
11.0	1.53	2.56	28.0	3.62	0.48	54.0	3.96	0.14
11.5	1.65	2.44	29.0	3.65	0.44	55.0	3.96	0.13
12.0	1.83	2.26	30.0	3.68	0.41	56.0	3.96	0.13
12.5	1.95	2.14	31.0	3.71	0.39	57.0	3.97	0.12
13.0	2.08	2.01	32.0	3.73	0.36	58.0	3.97	0.12
13.5	2.20	1.90	33.0	3.76	0.34	59.0	3.98	0.12
14.0	2.30	1.79	34.0	3.77	0.32	60.0	3.98	0.11
14.5	2.40	1.69	35.0	3.79	0.30	72.0	4.01	0.09
15.0	2.50	1.60	36.0	3.81	0.29	84.0	4.03	0.07
15.5	2.58	1.51	37.0	3.82	0.27	96.0	4.03	0.06
16.0	2.66	1.43	38.0	3.84	0.26	108.0	4.04	0.05
16.5	2.74	1.36	39.0	3.85	0.24	120.0	4.05	0.05

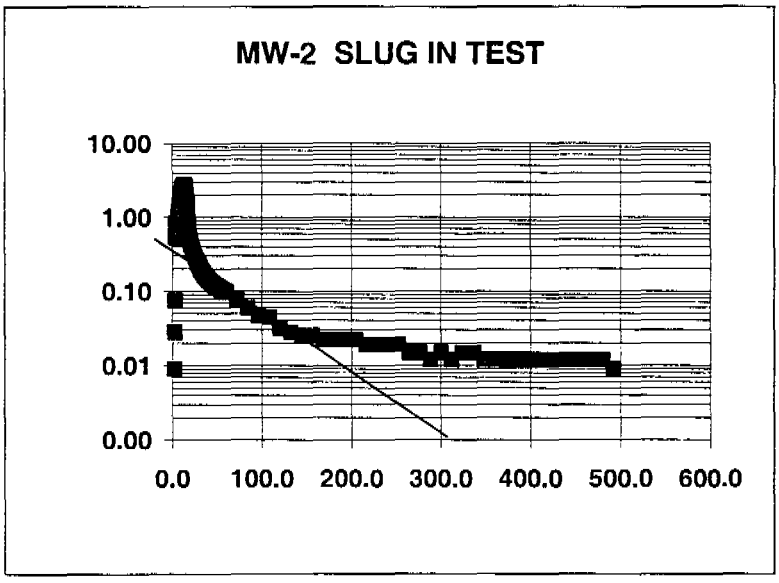


SLUG TEST CALCS. (Bouwer and Rice)	
Well Radius (Rw)=	0.67 ft
Casing Radius (Rc)=	0.0833 ft
Sand pack porosity (n)=	0.2
Adjusted Rc (if Lw<=Le)=	0.0833 ft
Well Depth (Wd)=	15 ft
Depth to Water (Dtw)=	4.1 ft
Confinement Depth(Dtc)=	18 ft
Hsat (Dtc-Dtw)=	13.9 ft
Lw (Wd-Dtw)=	10.9 ft
Le (screen length)=	10 ft
Le/Rw=	15
C=	1.50
ln(Re/Rw)=	2.02
Yo=	0.18 ft
t=	200 sec
Y(t)=	0.025 ft
Hydraulic Cond. (K)=	**0.6 ft/day**

CH2MHILL

CH2M HILL SLUG TEST DATA
PROJECT NO: 146801.US.SC
CLIENT: Roosevelt Roads Naval Station, Puerto Rico
TEST DATE: July 31, 1998
WELL NO.: 2842-MW2
COMPILED BY: Michael L. Weatherby
TEST METHOD: Slug In - Water
ANALYSIS METHOD: Bouwer and Rice - Fully Penetrating Well

ELAPSED TIME (sec)	TRANSDUCER READING (ft)	Y(t) (ft)	ELAPSED TIME (sec)	TRANSDUCER READING (ft)	Y(t) (ft)	ELAPSED TIME (sec)	TRANSDUCER READING (ft)	Y(t) (ft)
0.0	6.24	0.00	13.0	3.45	2.79	32.0	6.04	0.19
0.5	6.24	0.00	13.5	3.52	2.72	33.0	6.05	0.18
1.0	6.24	0.00	14.0	3.64	2.60	34.0	6.06	0.18
1.5	6.24	0.00	14.5	4.00	2.24	35.0	6.07	0.17
2.0	6.23	0.01	15.0	4.19	2.05	36.0	6.07	0.16
2.5	6.21	0.03	15.5	4.49	1.74	37.0	6.08	0.16
3.0	6.16	0.08	16.0	4.76	1.48	38.0	6.09	0.15
3.5	5.69	0.55	16.5	4.69	1.55	39.0	6.09	0.15
4.0	5.40	0.83	17.0	5.16	1.08	40.0	6.09	0.14
4.5	5.70	0.53	17.5	5.37	0.87	41.0	6.10	0.14
5.0	5.60	0.64	18.0	5.49	0.75	42.0	6.10	0.14
5.5	5.46	0.77	18.5	5.59	0.65	43.0	6.10	0.13
6.0	5.33	0.90	19.0	5.68	0.56	44.0	6.11	0.13
6.5	5.19	1.04	19.5	5.73	0.51	45.0	6.11	0.13
7.0	5.04	1.19	20.0	5.76	0.47	46.0	6.11	0.12
7.5	4.89	1.35	21.0	5.80	0.43	47.0	6.12	0.12
8.0	4.76	1.48	22.0	5.84	0.40	48.0	6.12	0.12
8.5	4.59	1.64	23.0	5.88	0.36	49.0	6.12	0.12
9.0	4.45	1.79	24.0	5.91	0.33	50.0	6.12	0.11
9.5	4.12	2.11	25.0	5.94	0.30	51.0	6.12	0.11
10.0	3.97	2.27	26.0	5.96	0.28	52.0	6.13	0.11
10.5	3.78	2.45	27.0	5.98	0.26	53.0	6.13	0.11
11.0	3.63	2.61	28.0	5.99	0.24	54.0	6.13	0.11
11.5	3.62	2.62	29.0	6.01	0.23	55.0	6.13	0.10
12.0	3.49	2.75	30.0	6.02	0.21	56.0	6.13	0.10
12.5	3.51	2.73	31.0	6.03	0.20	57.0	6.14	0.10



SLUG TEST CALCS. (Bouwer and Rice)	
Well Radius (Rw)=	0.67 ft
Casing Radius (Rc)=	0.0833 ft
Sand pack porosity (n)=	0.2
Adjusted Rc (if Lw<=Le)=	0.3088 ft
Well Depth (Wd)=	14.5 ft
Depth to Water (Dtw)=	6.24 ft
Confinement Depth(Dtc)=	25 ft
Hsat (Dtc-Dtw)=	18.76 ft
Lw (Wd-Dtw)=	8.26 ft
Le (screen length)=	10 ft
Le/Rw=	15
C=	1.50
ln(Re/Rw)=	1.86
Yo=	0.22 ft
t=	200 sec
Y(t)=	0.007 ft
Hydraulic Cond. (K)=	**13.2 ft/day**

Appendix D: Drilling Procedures

APPENDIX D-1

Utility Location/Well Permit

The tentative locations of the soil borings and monitoring well locations were presented to Caleb Romero (Facilities Management and Utilities Division, Public Works Department) for the initiation of drilling activities. A utility check in the proposed area of investigation was conducted by Mr. Romero. To avoid damaging any potential underground structures, the first four feet of each soil boring and monitoring well were installed with a post hole digger. In areas of shallow groundwater, a hand auger was used to collect soil samples from two feet to four feet BLS.

4330
NO2C-A411
05/26/98

MEMORANDUM

From: Facilities Management Division, PWD
To: Rick Morales, CH2MHill

Subj.: EXCAVATION PERMIT FOR BORINGS/WELLS AT 1686, 31, 229,2842,2016

Ref.: (a) Memo received 05/26/98

1. Per reference (a), the excavation permit is approved based on the existing utilities information contained on existing filed drawings.

2. As per the accuracy of filed drawings and of previous field visit, no underground utilities were found at the sites of excavation.

3. If any additional information or assistance to perform excavation safely, please contact Mr. Caleb Romero, Utilities Engineer, at telephone extensions 4068/4268.

Caleb Romero

Caleb Romero

DEPARTMENT OF THE NAVY
U.S. NAVAL STATION, ROOSEVELT ROADS
PSC 1008 BOX 3001
FPO AA 34051-0001

5090
Ser N02C-A64/ 03
17 FEB 1998

Department of Natural Resources
Box 5887
Puerta de Tierra, PR 00906

Attention: Ms. Sara Cortez

SUBJECT: PERMIT APPLICATION AND FEE TO INSTALL 45 MONITORING WELLS AT THE U.S. NAVAL STATION, ROOSEVELT ROADS

Enclosed is a permit application and fee to install 45 monitoring wells at the US Naval Station, Roosevelt Roads. These wells will be used to collect water samples for laboratory analysis as required by the Environmental Quality Board regulation for Underground Storage Tanks (USTs). The wells will not be used for any type of groundwater production.

Should you have any questions, please contact Mr. Pedro Ruiz, Pollution Abatement Program Manager, Environmental Engineering Division, at 865-4429.

Sincerely,

D. L. DUREN
Lieutenant Commander, CEC, U.S. Na
Assistant Public Works Department
By direction of the
Commanding Officer

Enclosure: (1)

Estado Libre Asociado de Puerto Rico
DEPARTAMENTO DE RECURSOS NATURALES
San Juan, Puerto Rico

Secretaría Auxiliar de Planificación de Recursos

SOLICITUD PARA PERMISO DE CONSTRUCCION DE POZO

PARA USO DEL DEPARTAMENTO

Número de Solicitud _____ Fecha de Recibo _____

Número de Franquicia _____ Número de Reclamo de Derecho Adquirido _____

1. Solicitante Seguro Social _____

Nombre US Naval Station Roosevelt Roads Teléfono (787)865-4429

Dirección Residencial Public Works Ops Bldg. 31, NAVSTA Roos Rds, Ceiba PR
Calle Núm. Municipio Zona Postal

Urbanización o Barrio Núm. Carr. Km. Hm.

Dirección Postal Commanding Officer Attn. Public Works Officer, Code N07C-A6
PSC 1008 Box 3021 FPO AA 34051-3021
Ruta Rural Núm. Apdo. Municipio Zona Postal

2. Propietario de los terrenos donde se construirá el pozo. De ser igual al solicitante, indique IGUAL.

Nombre SAME Teléfono _____

Dirección Residencial _____
Calle Núm. Municipio Zona Postal

Urbanización o Barrio Núm. Carr. Km. Hm.

Dirección Postal _____
Ruta Rural Núm. Apdo. Municipio Zona Postal

Relación del solicitante con el propietario (arrendatario, usufructuario, otro). _____

3. Pocero. De ser igual al solicitante, indique IGUAL.

Nombre GeoWorks Inc. Teléfono (787)761-0937

Dirección Residencial Pedro Arcilagos H-10 Segunda Seccion Levittown Toa
Calle Núm. Municipio Zona Postal

Baja 00950
Urbanización o Barrio Núm. Carr. Km. Hm.

Dirección Postal _____
Ruta Rural Núm. Apdo. Municipio Zona Postal

4. Localización del Pozo

Municipio Ceiba Barrio _____

Sector 18° 15' 00" Latitude 65° 39' 30" Longitude Finca US Navy Roosevelt Roads

Núm. Carr. _____ Km. _____ Hm. _____

5. Cantidad de Agua a Extraerse (en millones de galones al año (MGA))

(_____)X(_____)X(_____)X(_____)X(60/1,000,000)= _____MGA
razón de extracción (gpm) horas/día días/semana semanas/año

6. Uso de Agua: ( )Doméstico ( )Comercial ( )Agrícola ( )Industrial

Describa brevemente la actividad en que se utilizará el agua.

The wells will be installed for monitoring purposes only. No water will be extracted from them.

7. Tipo de Pozo:

( )abasto (X)observación ( )reserva ( )barreno de prueba

8. Datos del Pozo:

Profundidad anticipada 25 pies Diámetro del barreno 8 pulg.

Diámetro de la camisilla 2 pulg. Tipo de rejilla 0.010

9. Método de Construcción:

( )a mano ( )percusión ( )rotario (X)OTRO Hollow Stem Auger (HSA)

AUTORIZACION

Autorizo al personal del Departamento de Recursos Naturales a entrar en los terrenos de mi propiedad o uso a inspeccionar el lugar donde se construirá el pozo aquí propuesto, así como cualquier otro lugar que pudiere afectarse con las obras en proyecto.

CERTIFICO: Que la información aquí expuesta es correcta, según mi mejor saber y entender.

28 Jan 98
FECHA

Firma del solicitante o su representante autorizado

Pedro J. Ruiz Lebron
Nombre del solicitante o su representante autorizado, en letra de molde

APPENDIX D-2

Equipment Decontamination

The drilling rig and associated equipment was decontaminated before installing each soil boring and monitoring well. Decontamination procedures included removing loose soils from tools and steam cleaning the equipment. Potable water, from an on-site source, and Alconox (non-phosphate soap) were used in addition to steam cleaning. An equipment decontamination pit was temporarily built with short wooden walls and covered with plastic sheeting. The decontamination area was located next to the former gas station at site 520.

Equipment decontamination was conducted in a 20-foot by 20-foot pit that had wooden walls with a minimum height of 6-inches. The pit was covered with plastic sheeting to contain any fluids. Decontamination water contained in the pit evaporated before it could be pumped into 55-gallon drums for disposal.

During the installation of the soil borings, the split-spoon sampling equipment was cleaned between each sampling interval by scrubbing the remaining soil off with a brush in soapy water and rinsing in fresh water. The split-spoon equipment was steam cleaned in the decontamination area after each boring was completed.

APPENDIX D-3

Air Monitoring

During the installation of the soil borings, the breathing zone around the drilling rig was routinely monitored with a Foxboro Model 128 OVA. The soil borings were monitored at ground surface, above the borehole, and at the breathing zone. The breathing levels never exceeded 1 PPM during the field investigation. The soil boring logs, located in Appendix A, provide the health and safety breathing zone monitoring results.

APPENDIX D-4

OVA Field Screening Methodology

The procedure for field screening the soils with an OVA involved the following:

- pint-sized mason jars were half-filled with soil obtained from the split-spoon sampler
- the jar top was covered with aluminum foil and sealed
- the jar was placed in a cool area for five minutes to allow the head space to equilibrate
- the head space was measured with an OVA using an unfiltered and filtered tip.

The samples collected from each interval were had the headspace measured with and without a charcoal filter. The filter allows differentiation between natural organic vapors (e.g., methane) and hydrocarbon vapors. The difference between the two readings is the net hydrocarbon vapor content attributed to non-naturally occurring sources. The OVA field screening results, total and filtered, are provided on the soil boring logs in Appendix A.

The detection range of the OVA is between 1 PPM and 1000 PPM. The lower detection limit of 1 PPM is used to confirm that the OVA flame is ignited and the instrument is working properly. An instrument reading of zero (0) recorded on the soil boring logs indicates 0 PPM over the instrument's lower detection limit of 1 PPM. The maximum OVA range of 1000 PPM is the upper limit of the instrument's analog meter. When a detection is beyond the maximum limit of the meter, the reading is recorded as >1000 PPM.

APPENDIX D-5

Monitoring Well Construction

The monitoring wells were installed using the hollow stem auger method. The filter pack material consisted of silica sand. Following the well casing and screen emplacement, the filter pack material was poured into each borehole annulus to approximately two feet above the top of the screen interval. At sites where a shallow groundwater level existed, the filter pack was placed to a level where a proper seal could be added. To confirm that the filter pack was placed at the proper interval, the depth to sand was continuously measured. A weighted tape measure was used to determine the depth to sand. A bentonite pellet seal was emplaced above the filter pack. Water was added to the bentonite and the pellets were then allowed to hydrate overnight. If needed, the remaining annular space around the well was filled with neat cement to land surface. The monitoring wells were completed with a concrete pad (3-ft x 3-ft x 0.5-ft deep), flush-mounted, bolt down manholes, locking watertight caps, and keyed-alike padlocks. Appendix B contains the construction logs for each of the monitoring wells.

APPENDIX D-6

Monitoring Well Development Procedures

The monitor well development was performed with a peristaltic pump fitted with C-Flex® and Teflon® tubing to pump out the fines entering the well, and a Teflon® bailer was used to surge the well until the water was clear and free of silt. Well development dates and volumes are summarized in Table 3-4.

The development water was contained in 55-gallon drums. Based on laboratory analytical data and the absence of free product, the development water from the site monitor wells was allowed to evaporate on a paved surface.

Appendix E: Monitoring Well Development Logs

CH2MHILL

PROJECT NUMBER	WELL NUMBER	
146801.US.SC	284.2-MW2	SHEET 1 OF 1

WELL DEVELOPMENT LOG

PROJECT: RRNS LOCATION: SITE 284.2
DEVELOPMENT CONTRACTOR: CH2M HILL
DEVELOPMENT METHOD AND EQUIPMENT USED: PERIST PUMP + SURGE
START WATER LEVELS: START: 0950 7/27/98 END: 1350 7/27 LOGGER: MLW

MAXIMUM DRAWDOWN DURING PUMPING:
RANGE AND AVERAGE DISCHARGE RATE:
TOTAL QUANTITY OF WATER DISCHARGED:
DISPOSITION OF DISCHARGE WATER:

Time	Water Volume Discharged (gal)	Water Level (ft BTOC)	Turbidity (NTU)	Temperature (°C)	pH	Conductivity (µmhos/cm)	Remarks (color, odor, sheen, sediment, etc.)
1015	5/						DARK GRAY INITIALLY TO CLEAR
		SURGED					
1030		PUMP	ON				
~~1040~~							
1350	50/55	—	—	—	—	—	CLEAR

Weldev.xls

CH2MHILL

PROJECT NUMBER	WELL NUMBER	
146501.US.SC	284Z - MW 3	SHEET 1 OF 1

WELL DEVELOPMENT LOG

PROJECT: RANS LOCATION: SITE 284Z

DEVELOPMENT CONTRACTOR: CH2M HILL

DEVELOPMENT METHOD AND EQUIPMENT USED:

START WATER LEVELS: START: 1350 7/24 END: 1630 7/24 LOGGER: MLW

MAXIMUM DRAWDOWN DURING PUMPING:

RANGE AND AVERAGE DISCHARGE RATE:

TOTAL QUANTITY OF WATER DISCHARGED:

DISPOSITION OF DISCHARGE WATER: CLEAR, DISCHARGED ON GROUND

Time	Water Volume Discharged (gal)	Water Level (ft BTOC)	Turbidity (NTU)	Temperature (°C)	pH	Conductivity (µmhos/cm)	Remarks (color, odor, sheen, sediment, etc.)
1350	0/0	PUMP	ON				BROWN TURBIDITY
1630	32/32						CLEAR

Weldev.xls

CH2MHILL

PROJECT NUMBER	WELL NUMBER	
146801.05.50	2842 - MW4	SHEET 1 OF 1

WELL DEVELOPMENT LOG

PROJECT: PRNS LOCATION: SITE 2842

DEVELOPMENT CONTRACTOR: CH2M HILL

DEVELOPMENT METHOD AND EQUIPMENT USED:

START WATER LEVELS: START: 7/27 1400 END: 1350 7/28 LOGGER: MCW

MAXIMUM DRAWDOWN DURING PUMPING: —

RANGE AND AVERAGE DISCHARGE RATE: 0.25 gpm

TOTAL QUANTITY OF WATER DISCHARGED: 86 gal

DISPOSITION OF DISCHARGE WATER: GROUND

Time	Water Volume Discharged (gal)	Water Level (ft BTOC)	Turbidity (NTU)	Temperature (°C)	pH	Conductivity (µmhos/cm)	Remarks (color, odor, sheen, sediment, etc.)
1400	0	PUMP	ON				DARK GRAY SEDIMENT
7/27 1645	41.61						CLEAR TO DARK GRAY
7/28 1045	—	PUMP	ON &	SURGING			DARK GRAY TO CLEAR
1345	45/86	—	—	—			CLEAR

Weldev.xls

Appendix F: Groundwater Sampling Procedures

APPENDIX F

Groundwater Sampling Procedures

Sampling Procedures

Before each new monitoring well was sampled, the wells were allowed to stabilize for at least 24 hours after development. Prior to sampling groundwater from the new monitoring wells, depth to water was measured and each well was purged of at least three well volumes or until dry. The purge procedure was performed by using a peristaltic pump and new Teflon® tubing. During purging, multiple water-quality measurements of pH, temperature, and specific conductance were collected. When the purging water-quality measurements stabilized, the well was sampled. To avoid cross-contamination between wells, new Teflon® tubing was used to collect groundwater samples. The complete well sampling logs are presented in this Appendix.

Groundwater samples were delivered to TEG of Puerto Rico in coolers packed with ice via a laboratory courier. The Chain of Custody of the samples was signed by the lab courier to complete sample custody documentation.

QA/QC Procedures

A sample duplicate was collected from one monitoring well at the site. The duplicate sample was analyzed for the same parameters as the regular sample. This duplicate checked the repeatability of the laboratory procedures.

A Field blank was collected at the time that the monitoring well was sampled. The field blank sample was collected by filling the appropriate laboratory containers with distilled water in the area of groundwater collection.

A rinsate blank was collected from the same type of Teflon® tubing that was used to sample the monitoring wells. The sample was collected by pumping distilled water through the tubing and then collecting a volume of water in the appropriate laboratory containers.

A trip blank consisted of analyte free water samples that originated from t he laboratory. The trip lank was taken to the sampling site and then returned to the laboratory with the VOA samples.

Appendix G: Monitoring Well Purge and Sampling Forms

CH2MHILL

PROJECT NUMBER	WELL NUMBER 2842-MW2 SHEET 1 OF 1

MONITOR WELL PURGE AND SAMPLING FIELD SHEET

PROJECT :

FIELD CREW: (leave blank if on previous page)

			CASING DIAMETER		GAL/FT OF CASING	
WELL DEPTH (ft):		14.5				
DEPTH to WATER (ft):	-	6.24	2 in.		0.1632	
WATER COLUMN (ft):	=	8.26	4 in.		0.6528	
GAL/FT of CASING	x	0.1632	6 in.		1.4688	
CASING VOLUME (gal):	=	1.3	8 in.		2.611	
No. of VOLUMES	x		10 in.		4.0797	
PURGE VOLUME (gal):	=		12 in.		5.8748	

METHOD OF PURGING (circle one)

PUMP: SUB. CENT. **PERIST.**	**OTHER:**	**BAILER** : TEFLON, SS ,OTHER:	
TIME ON: 0855		BAILER VOL.. (gal)	.25 / .33
FLOW RATE (gpm): 0.2		REQUIRED PULLS:	
PUMP TIME (min):		VOL. PURGED (gals):	
VOL. PURGED (gals):		OTHER:	

FIELD PARAMETERS	**FIELD MEASUREMENTS** 1st	2nd	3rd	4th	5th	ACCEPTABLE RANGE (±)
TIME	0901	0908	0914			N/A
VOL. (gal)	1.3	2.6	3.9			N/A
pH (s.units)	6.8	6.9	6.8			0.1
TEMP.(C)	31.5	30.8	31.0			10%
COND.(ms/cm)	1100	2000	2000			3%
D.O. %	—	—	—			10%
ORP (mV)	—	—	—			10
TURB. (ntu)	—	—	—			10%

SAMPLE PARAMETERS (**GRAB** OR COMPOSITE) :

FILTERED METALS COLLECTED: Y / **N** 1.0um,0.45um, OTHER:

COMMENTS:

OTHER: PLEASE USE BACK OF SHT.FOR SKETCHING MAPS ,WELL LOCATION NOTES ECT. SEE BACK OF SHEET Y / **N.**

Q.C. SAMPLE TYPE: DUPLICATE , EQUIPMENT BLANK , OTHER :

Q.C. PARAMETERS:

SAMPLE DATE/ TIME: 7/31/98 / @ 0915

SIGNED/SAMPLER: Chrome [illegible]

CH2MHILL

PROJECT NUMBER	WELL NUMBER
	2842-MW3 SHEET 1 OF 1

MONITOR WELL PURGE AND SAMPLING FIELD SHEET

PROJECT :

FIELD CREW: (leave blank if on previous page)

			CASING DIAMETER		GAL/FT OF CASING	
WELL DEPTH (ft):		15.0				
DEPTH to WATER (ft):	-	4.26	2 in.		0.1632	
WATER COLUMN (ft):	=	10.74	4 in.		0.6528	
GAL/FT of CASING	x	0.1632	6 in.		1.4688	
CASING VOLUME (gal):	=	1.75	8 in.		2.611	
No. of VOLUMES	x		10 in.		4.0797	
PURGE VOLUME (gal):	=		12 in.		5.8748	

METHOD OF PURGING (circle one)

PUMP: SUB. CENT. **PERIST.**		**OTHER:**	**BAILER** : TEFLON, SS ,OTHER:	
TIME ON:	0900		BAILER VOL.. (gal)	.25 / .33
FLOW RATE (gpm):	0.20		REQUIRED PULLS:	
PUMP TIME (min):			VOL. PURGED (gals):	
VOL. PURGED (gals):			OTHER:	

FIELD PARAMETERS	**FIELD MEASUREMENTS** 1st	2nd	3rd	4th	5th	ACCEPTABLE RANGE (±)
TIME	0909	0918	0927	0936		N/A
VOL. (gal)	1.75					N/A
pH (s.units)	6.2	6.30	6.8	6.85		0.1
TEMP.(C)	30.3	30.1	31.0	31.0		10%
COND.(ms/cm)	3400	2000	2300	2350		3%
D.O. %	—	—	—			10%
ORP (mV)	—	—	—			10
TURB. (ntu)	—	—	—			10%

SAMPLE PARAMETERS (**GRAB** OR COMPOSITE) :

FILTERED METALS COLLECTED: Y / **N** 1.0um,0.45um, OTHER:

COMMENTS:

OTHER: PLEASE USE BACK OF SHT.FOR SKETCHING MAPS ,WELL LOCATION NOTES ECT. SEE BACK OF SHEET Y / **N.**

Q.C. SAMPLE TYPE: DUPLICATE , EQUIPMENT BLANK , OTHER :

Q.C. PARAMETERS:

SAMPLE DATE/ TIME: 7/31/98 / @ 0936

SIGNED/SAMPLER: Chone Ar

CH2MHILL

PROJECT NUMBER	WELL NUMBER
	2842-MW4 SHEET 1 OF 1

MONITOR WELL
PURGE AND SAMPLING FIELD SHEET

PROJECT :

FIELD CREW: (leave blank if on previous page)

			CASING DIAMETER		GAL/FT OF CASING	
WELL DEPTH (ft):		14.8				
DEPTH to WATER (ft):	-	4.10	2 in.		0.1632	
WATER COLUMN (ft):	=	10.7	4 in.		0.6528	
GAL/FT of CASING	x	0.1632	6 in.		1.4688	
CASING VOLUME (gal):	=	1.75	8 in.		2.611	
No. of VOLUMES	x		10 in.		4.0797	
PURGE VOLUME (gal):	=		12 in.		5.8748	

METHOD OF PURGING (circle one)

PUMP: SUB. CENT. **PERIST.**		**OTHER:**	**BAILER** : TEFLON, SS ,OTHER:	
TIME ON:	1015		BAILER VOL.. (gal)	.25 / .33
FLOW RATE (gpm):	0.20		REQUIRED PULLS:	
PUMP TIME (min):			VOL. PURGED (gals):	
VOL. PURGED (gals):			OTHER:	

FIELD PARAMETERS	**FIELD MEASUREMENTS**					ACCEPTABLE RANGE (±)
	1st	2nd	3rd	4th	5th	
TIME	1024	1033	1042	/		N/A
VOL. (gal)	1.75					N/A
pH (s.units)	6.85	6.8	6.85			0.1
TEMP.(C)	31.0	31.0	31.5			10%
COND.(ms/cm)	3750	4000	4000			3%
D.O. %	—	—	—			10%
ORP (mV)	—	—	—			10
TURB. (ntu)	—	—	—			10%

SAMPLE PARAMETERS (**GRAB** OR COMPOSITE) :

FILTERED METALS COLLECTED: Y / **N** 1.0um,0.45um, OTHER:

COMMENTS:

OTHER: PLEASE USE BACK OF SHT.FOR SKETCHING MAPS ,WELL LOCATION NOTES ECT. SEE BACK OF SHEET Y / **N.**

Q.C. SAMPLE TYPE: DUPLICATE , EQUIPMENT BLANK , OTHER :

Q.C. PARAMETERS:

SAMPLE DATE/ TIME: / @

SIGNED/SAMPLER:

CH2MHILL

PROJECT NUMBER	WELL NUMBER FOR SITE 2842 124 - MW1	SHEET 1 OF 1

MONITOR WELL PURGE AND SAMPLING FIELD SHEET

PROJECT :

FIELD CREW: (leave blank if on previous page)

			CASING DIAMETER		GAL/FT OF CASING	
WELL DEPTH (ft):		14.24				
DEPTH to WATER (ft):	-	5.02	2 in.		0.1632	
WATER COLUMN (ft):	=	9.22	4 in.		0.6528	
GAL/FT of CASING	x	0.1632	6 in.		1.4688	
CASING VOLUME (gal):	=	1.5	8 in.		2.611	
No. of VOLUMES	x		10 in.		4.0797	
PURGE VOLUME (gal):	=		12 in.		5.8748	

METHOD OF PURGING (circle one)

PUMP: SUB. CENT. **PERIST.**	**OTHER:**	**BAILER** : TEFLON, SS ,OTHER:	
TIME ON: 1135		BAILER VOL.. (gal)	.25 / .33
FLOW RATE (gpm): 0.2		REQUIRED PULLS:	
PUMP TIME (min):		VOL. PURGED (gals):	
VOL. PURGED (gals):		OTHER:	

FIELD PARAMETERS	**FIELD MEASUREMENTS** 1st	2nd	3rd	4th	5th	ACCEPTABLE RANGE (±)
TIME	1142	1149	1156			N/A
VOL. (gal)	1.5	3.0	4.5			N/A
pH (s.units)	6.77	6.73	6.70			0.1
TEMP.(C)	30.9	30.0	30.1			10%
COND.(ms/cm)	3800	3900	4000			3%
D.O. %	—	—	—	—		10%
ORP (mV)	—	—	—	—		10
TURB. (ntu)	—	—	—	—		10%

SAMPLE PARAMETERS (**GRAB** OR COMPOSITE): 8020 10/8, LEAD 8015 MIGRO DRO 4 H.

FILTERED METALS COLLECTED: Y / N 1.0um,0.45um, OTHER:

COMMENTS:

OTHER: PLEASE USE BACK OF SHT.FOR SKETCHING MAPS ,WELL LOCATION NOTES ECT. SEE BACK OF SHEET Y / N

Q.C. SAMPLE TYPE: DUPLICATE , EQUIPMENT BLANK , OTHER :

Q.C. PARAMETERS:

SAMPLE DATE/ TIME: 7/31/98 / @ 1200

SIGNED/SAMPLER: N. X. Wenzel

Appendix H: Analytical Results Summary and TEG Laboratory Reports

Site 2842 -Summary of TEG Analytical Results

			SB SOIL							SB WATER							MW WATER								
		DEPTH	8020				418.1	8015M		8020				418.1	8015M		8020				418.1	610	8015M		
Sample Point	Sample Collection Date	(feet)	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl-Benzene (mg/kg)	Total Xylenes (mg/kg)	TRPH (mg/kg)	TPH GRO (mg/kg)	TPH DRO (mg/kg)	Benzene (mg/l)	Toluene (mg/l)	Ethyl-Benzene (mg/l)	Total Xylenes (mg/l)	TRPH (mg/l)	TPH GRO (mg/l)	TPH DRO (mg/l)	Benzene (ug/l)	Toluene (ug/l)	Ethyl-Benzene (ug/l)	Total Xylenes (ug/l)	TRPH (mg/l)	PNA (mg/l)	TPH GRO (mg/l)	TPH DRO (mg/l)	Lead (ug/L)
2842SB1	7/6/98	4-6	<0.05	<0.05	<0.05	<0.15	19000	<10	7200																
2842-SB2	7/6/98	4-6	<0.05	<0.05	<0.05	<0.15	1800	<10	<25																
2842-SB3	7/7/98	4-6	<0.05	<0.05	<0.05	<0.15	4000	<10	3900																
2842-SB4	7/7/98	4-6	<0.05	<0.05	<0.05	<0.15	1500	<10	<25	<0.05	<0.05	<0.05	<0.15	<10	<10	<25									
2842-SB5	7/8/98	4-6	<0.05	<0.05	<0.05	<0.15	39000	<10	14000																
2842-SB6	7/8/98	4-6	<0.05	<0.05	<0.05	<0.15	2900	<10	770																
2842-SB7	7/8/98	4-6	<0.05	<0.05	<0.05	<0.15	44000	<10	36000																
2842-SB8	7/8/98	2-4	<0.05	<0.05	<0.05	<0.15	7,200	<10	4800																
2842-SB8	7/8/98	4-6	<0.05	<0.05	<0.05	<0.15	280	<10	<25																
2842-SB8	7/9/98	10-12	<0.05	<0.05	<0.05	<0.15	100	<10	<25	<0.05	<0.05	<0.05	<0.15	<10	<10	<25									
2842-SB9	7/9/98	4-6	<0.05	<0.05	<0.05	<0.15	80	<10	<25	<0.05	<0.05	<0.05	<0.15	<10	<10	<25									
2842-SB10	7/10/98	4-6	<0.05	<0.05	<0.05	<0.15	260	<10	<25																
2842-SB11	7/10/98	2-4	<0.05	<0.05	<0.05	<0.15	830	<10	<25	<0.05	<0.05	<0.05	<0.15		<10 (<10)	47 (46)									
2842-SB12	7/14/98	4-6	<0.05	<0.05	<0.05	<0.15	220	<10	<25	<0.05	<0.05	<0.05	<0.15	16	<10	<25									
2842-SB13	7/15/98	4-6	<0.05	<0.05	<0.05	<0.15	150	<10	<25	<0.05	<0.05	<0.05	<0.15	15	<10	<25									
2842-SB14	7/14/98	4-6	<0.05	<0.05	<0.05	<0.15	2000	<10	390																
2842-SB15	7/15/98	4-6	<0.05	<0.05	<0.05	<0.15	220	<10	<25																
2842-SB16	7/15/98	4-6	<0.05	<0.05	<0.05	<0.15	220	<10	<25	<0.05	<0.05	<0.05	<0.15	10	<10	<25									
2842-SB17	7/16/98	4-6	<0.05	<0.05	<0.05	<0.15	91	<10	<25	<0.05	<0.05	<0.05	<0.15	<10	<10	<25									
2842-SB18	7/16/98	2-4	<0.05	<0.05	<0.05	<0.15	79	<10	<25	<0.05	<0.05	<0.05	<0.15	<10	<10	<25									
2842-SB19	7/20/98	4-6	<0.05	<0.05	<0.05	<0.15	1200	<10	<25																
2842-SB20	7/22/98	4-6	<0.05	<0.05	<0.05	<0.15	640	<10	91																
2842-SB21	7/22/98	2-4	<0.05	<0.05	<0.05	<0.15	330	<10	<25	<0.05	<0.05	<0.05	<0.15	12	<10	<25									
2842-SB22	7/29/98	4-6	<0.05	<0.05	<0.05	<0.15	230	<10	<25																
2842-DUPE1	7/6/98	- - -	<0.05	<0.05	<0.05	<0.15	19,000	<10	<25																
2842-DUPE2	7/9/98	- - -	<0.05	<0.05	<0.05	<0.15	77	<10	<25																
2842-DUPE3	7/22/98	- - -	<0.05	<0.05	<0.05	<0.15	260	<10	<25																
124-MW6	07/31/98	- - -															<5.0	<5.0	<5.0	<15.0	<10	ND	<10	<25	41
2842-MW2	07/31/98	- - -															<5.0	<5.0	<5.0	<15.0	<10	ND	<10	<25	40
2842-MW3	07/31/98	- - -															<5.0	<5.0	<5.0	<15.0	<10	ND	<10	<25	17
2842-MW4	07/31/98	- - -															<5.0	<5.0	<5.0	<15.0	<10	ND	<10	<25	38
2842-FB1	7/31/98	- - -															<5.0	<5.0	<5.0	<15.0	<10	ND	<10	<25	<0.005
2842-EB1	7/8/98	- - -															<50	<50	<50	<150	<10		<10	<25	
2842-EB2	7/9/98	- - -															<50	<50	<50	<150	<10		<10	<25	
2842-EB3	7/13/98	- - -															<50	<50	<50	<150	<10		<10	<25	
2842-EB4	7/14/98	- - -															<50	<50	<50	<150	<10		<10	<25	
2842-EB5	7/15/98	- - -															<50	<50	<50	<150	<10		<10	<25	
2842-EB6	7/16/98	- - -															<50	<50	<50	<150	<10		<10	<25	
2842-EB7	7/20/98	- - -															<50	<50	<50	<150	<10		<10	<25	
2842-EB8	7/22/98	- - -															<50	<50	<50	<150	<10		<10	<25	
2842-EB9	7/29/98	- - -															<50	<50	<50	<150	<10		<10	<25	
2842-EB10	7/31/98	- - -															<5.0	<5.0	<5.0	<15.0	<10	ND	<10	<25	
2842-TRIP	7/31/98	- - -															<5.0	<5.0	<5.0	<15.0					
2842-DUPE1	7/31/98	- - -															<5.0	<5.0	<5.0	<15.0	<10	ND	<10	<25	<0.005
2842-TRIP	7/22/98	- - -															<50	<50	<50	<150					
2842-TRIP	7/29/98	- - -															<50	<50	<50	<150	<10		<10	<25	
2842-TRIP	7/16/98	- - -																					<10	<25	
2842-TRIP	7/14/98	- - -																					<10	<25	
2842-TRIP	7/7/98	- - -															<50	<50	<50	<150					
2842-TRIP	7/8/98	- - -															<50	<50	<50	<150					
2842-TRIP	7/9/98	- - -															<50	<50	<50	<150					
2842-TRIP	7/10/98	- - -															<50	<50	<50	<150					

Notes -

ND - not detected - below the detection limit
( ) - repeat analysis
2842-DUPE1 (SOIL) - 2842-SB1 (4-6')
2842-DUPE2 (SOIL) - 2842-SB9 (4-6')
2842-DUPE3 (SOIL) - 2842-SB21 (2-4')
2842-FB1 - Field Blank 1
2842-EB1 - Equipment Blank 1 - Stainless Steel Split Spoon
2842-EB2 - Equipment Blank 2 - Stainless Steel Split Spoon
2842-EB3 - Equipment Blank 2 - Stainless Steel Split Spoon
2842-EB4 - Equipment Blank 2 - Stainless Steel Split Spoon
2842-EB5 - Equipment Blank 2 - Stainless Steel Split Spoon
2842-EB6 - Equipment Blank 2 - Stainless Steel Split Spoon
2842-EB7 - Equipment Blank 2 - Stainless Steel Split Spoon
2842-EB8 - Equipment Blank 2 - Stainless Steel Split Spoon
2842-EB9 - Equipment Blank 2 - Stainless Steel Split Spoon
2842-EB10 - Equipment Blank 2 - Teflon Tubing
2842-DUPE1 (WATER) - 2842-MW2
Method detection limits for PNAs varied from 0.2 - 0.5 mg/l
TRPH - Total recoverable petroleum hydrocarbons
TPH DRO - Total petroleum hydrocarbons for diesel range organics
TPH GRO - Total petroleum hydrocarbons for gasoline range organics
PNA - Polunuclear aromatic hydrocarbons

- not collected or analyzed

- table space not used for specific analyses

Site 2842 -Summary of TEG Soil Analytical Results

Sample Point	Sample Collection Date	SB SOIL							
		DEPTH	8020				418.1	8015M	
		(feet)	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl-Benzene (mg/kg)	Total Xylenes (mg/kg)	TRPH (mg/kg)	TPH GRO (mg/kg	TPH DRO (mg/kg
2842SB1	7/6/98	4-6	<0.05	<0.05	<0.05	<0.15	19000	<10	7200
2842-SB2	7/6/98	4-6	<0.05	<0.05	<0.05	<0.15	1800	<10	<25
2842-SB3	7/7/98	4-6	<0.05	<0.05	<0.05	<0.15	4000	<10	3900
2842-SB4	7/7/98	4-6	<0.05	<0.05	<0.05	<0.15	1500	<10	<25
2842-SB5	7/8/98	4-6	<0.05	<0.05	<0.05	<0.15	39000	<10	14000
2842-SB6	7/8/98	4-6	<0.05	<0.05	<0.05	<0.15	2900	<10	770
2842-SB7	7/8/98	4-6	<0.05	<0.05	<0.05	<0.15	44000	<10	36000
2842-SB8	7/8/98	2-4	<0.05	<0.05	<0.05	<0.15	7,200	<10	4800
2842-SB8	7/8/98	4-6	<0.05	<0.05	<0.05	<0.15	280	<10	<25
2842-SB8	7/9/98	10-12	<0.05	<0.05	<0.05	<0.15	100	<10	<25
2842-SB9	7/9/98	4-6	<0.05	<0.05	<0.05	<0.15	80	<10	<25
2842-SB10	7/10/98	4-6	<0.05	<0.05	<0.05	<0.15	260	<10	<25
2842-SB11	7/10/98	2-4	<0.05	<0.05	<0.05	<0.15	830	<10	<25
2842-SB12	7/14/98	4-6	<0.05	<0.05	<0.05	<0.15	220	<10	<25
2842-SB13	7/15/98	4-6	<0.05	<0.05	<0.05	<0.15	150	<10	<25
2842-SB14	7/14/98	4-6	<0.05	<0.05	<0.05	<0.15	2000	<10	390
2842-SB15	7/15/98	4-6	<0.05	<0.05	<0.05	<0.15	220	<10	<25
2842-SB16	7/15/98	4-6	<0.05	<0.05	<0.05	<0.15	220	<10	<25
2842-SB17	7/16/98	4-6	<0.05	<0.05	<0.05	<0.15	91	<10	<25
2842-SB18	7/16/98	2-4	<0.05	<0.05	<0.05	<0.15	79	<10	<25
2842-SB19	7/20/98	4-6	<0.05	<0.05	<0.05	<0.15	1200	<10	<25
2842-SB20	7/22/98	4-6	<0.05	<0.05	<0.05	<0.15	640	<10	91
2842-SB21	7/22/98	2-4	<0.05	<0.05	<0.05	<0.15	330	<10	<25
2842-SB22	7/29/98	4-6	<0.05	<0.05	<0.05	<0.15	230	<10	<25
2842-DUPE1	7/6/98	- - -	<0.05	<0.05	<0.05	<0.15	19,000	<10	<25
2842-DUPE2	7/9/98	- - -	<0.05	<0.05	<0.05	<0.15	77	<10	<25
2842-DUPE3	7/22/98	- - -	<0.05	<0.05	<0.05	<0.15	260	<10	<25

Notes -

2842-DUPE1 (SOIL) - 2842-SB1 (4-6')
2842-DUPE2 (SOIL) - 2842-SB9 (4-6')
2842-DUPE3 (SOIL) - 2842-SB21 (2-4')
TRPH - Total recoverable petroleum hydrocarbons
TPH DRO - Total petroleum hydrocarbons for diesel range organics
TPH GRO - Total petroleum hydrocarbons for gasoline range organics

Site 2842 -Summary of TEG Soil Boring Water Analytical Results

Sample Point	Sample Collection Date	SB WATER						
		8020				418.1	8015M	
		Benzene (mg/l)	Toluene (mg/l)	Ethyl-Benzene (mg/l)	Total Xylenes (mg/l)	TRPH (mg/l)	TPH GRO (mg/l)	TPH DRO (mg/l)
2842-SB4	7/7/98	<0.05	<0.05	<0.05	<0.15	<10	<10	<25
2842-SB8	7/9/98	<0.05	<0.05	<0.05	<0.15	<10	<10	<25
2842-SB9	7/9/98	<0.05	<0.05	<0.05	<0.15	<10	<10	<25
2842-SB11	7/10/98	<0.05	<0.05	<0.05	<0.15		<10 (<10)	47 (46)
2842-SB12	7/14/98	<0.05	<0.05	<0.05	<0.15	16	<10	<25
2842-SB13	7/15/98	<0.05	<0.05	<0.05	<0.15	15	<10	<25
2842-SB16	7/15/98	<0.05	<0.05	<0.05	<0.15	10	<10	<25
2842-SB17	7/16/98	<0.05	<0.05	<0.05	<0.15	<10	<10	<25
2842-SB18	7/16/98	<0.05	<0.05	<0.05	<0.15	<10	<10	<25
2842-SB21	7/22/98	<0.05	<0.05	<0.05	<0.15	12	<10	<25

Notes -

( ) - repeat analysis
TRPH - Total recoverable petroleum hydrocarbons
TPH DRO - Total petroleum hydrocarbons for diesel range organics
TPH GRO - Total petroleum hydrocarbons for gasoline range organics

[ ] - not collected or analyzed

Site 2842 -Summary of TEG Groundwater Analytical Results

Sample Point	Sample Collection Date	MW WATER								
		8020				418.1	610	8015M		
		Benzene (ug/l)	Toluene (ug/l)	Ethyl-Benzene (ug/l)	Total Xylenes (ug/l)	TRPH (mg/l)	PNA (mg/l)	TPH GRO (mg/l)	TPH DRO (mg/l)	Lead (ug/L)
124-MW6	07/31/98	<5.0	<5.0	<5.0	<15.0	<10	ND	<10	<25	41
2842-MW2	07/31/98	<5.0	<5.0	<5.0	<15.0	<10	ND	<10	<25	40
2842-MW3	07/31/98	<5.0	<5.0	<5.0	<15.0	<10	ND	<10	<25	17
2842-MW4	07/31/98	<5.0	<5.0	<5.0	<15.0	<10	ND	<10	<25	38
2842-FB1	7/31/98	<5.0	<5.0	<5.0	<15.0	<10	ND	<10	<25	<0.005
2842-EB1	7/8/98	<50	<50	<50	<150	<10		<10	<25	
2842-EB2	7/9/98	<50	<50	<50	<150	<10		<10	<25	
2842-EB3	7/13/98	<50	<50	<50	<150	<10		<10	<25	
2842-EB4	7/14/98	<50	<50	<50	<150	<10		<10	<25	
2842-EB5	7/15/98	<50	<50	<50	<150	<10		<10	<25	
2842-EB6	7/16/98	<50	<50	<50	<150	<10		<10	<25	
2842-EB7	7/20/98	<50	<50	<50	<150	<10		<10	<25	
2842-EB8	7/22/98	<50	<50	<50	<150	<10		<10	<25	
2842-EB9	7/29/98	<50	<50	<50	<150	<10		<10	<25	
2842-EB10	7/31/98	<5.0	<5.0	<5.0	<15.0	<10	ND	<10	<25	
2842-TRIP	7/31/98	<5.0	<5.0	<5.0	<15.0					
2842-DUPE1	7/31/98	<5.0	<5.0	<5.0	<15.0	<10	ND	<10	<25	<0.005
2842-TRIP	7/22/98	<50	<50	<50	<150					
2842-TRIP	7/29/98	<50	<50	<50	<150	<10		<10	<25	
2842-TRIP	7/16/98							<10	<25	
2842-TRIP	7/14/98							<10	<25	
2842-TRIP	7/7/98	<50	<50	<50	<150					
2842-TRIP	7/8/98	<50	<50	<50	<150					
2842-TRIP	7/9/98	<50	<50	<50	<150					
2842-TRIP	7/10/98	<50	<50	<50	<50					
2842-MW-2	5/18/99									230
2842-MW-3	5/18/99									260
2842-MW-4	5/18/99									260

Notes -

ND - not detected - below the detection limit
2842-FB1 - Field Blank 1
2842-EB1 - Equipment Blank 1 - Stainless Steel Split Spoon
2842-EB2 - Equipment Blank 2 - Stainless Steel Split Spoon
2842-EB3 - Equipment Blank 2 - Stainless Steel Split Spoon
2842-EB4 - Equipment Blank 2 - Stainless Steel Split Spoon
2842-EB5 - Equipment Blank 2 - Stainless Steel Split Spoon
2842-EB6 - Equipment Blank 2 - Stainless Steel Split Spoon
2842-EB7 - Equipment Blank 2 - Stainless Steel Split Spoon
2842-EB8 - Equipment Blank 2 - Stainless Steel Split Spoon
2842-EB9 - Equipment Blank 2 - Stainless Steel Split Spoon
2842-EB10 - Equipment Blank 2 - Teflon Tubing
2842-DUPE1 (WATER) - 2842-MW2
Method detection limits for PNAs varied from 0.2 - 0.5 mg/l
TRPH - Total recoverable petroleum hydrocarbons
TPH DRO - Total petroleum hydrocarbons for diesel range organics
TPH GRO - Total petroleum hydrocarbons for gasoline range organics
PNA - Polunuclear aromatic hydrocarbons

- not collected or analyzed

teg

World Leader In On-Site Sampling and Analysis

December 17, 1998
TEG Project #98I1201CH2

Mr. Marty Clasen
CH2M HILL
4350 W. Cypress Street, Suite 600
Tampa, Florida 33607

SUBJECT: DATA REPORT - CH2M HILL PROJECT NO. 146801.US.SC SITE #2842

Dear Marty,

Please find enclosed the analytical report for the samples collected by CH2M HILL personnel from the above-referenced site and delivered to TEG under the proper chain-of-custody protocol. TEG's Puerto Rico certified-chemist performed the following analyses:

- 7 soil samples analyzed for BTEX by modified EPA test method 8020.
- Laboratory QA/QC analyses for BTEX.

The analytical results are summarized in the attached table. Applicable detection limits, QA/QC data, chromatograms, a chain-of-custody and an invoice are attached.

TEG appreciates the opportunity to provide analytical services for this project. If you have any questions relating to the data or report, please do not hesitate to contact us.

Sincerely,
TEG

Kevin Shelburne

Kevin Shelburne
Principal

Attachments

TEG PUERTO RICO • PMB 627, HC-01 Box 29030, Caguas, PR 00725 • Phone (787) 720-0329 • Fax (787) 789-3858 • Pager 759-1255 Unit 217-4053

teg

QA/QC REPORT - CALIBRATION DATA

TEG Project #98I1201CH2
DAILY CALIBRATION DATE: 12/14/98

CH2M HILL 146801.US.SC
PROJECT NAME: ROOSEVELT ROADS

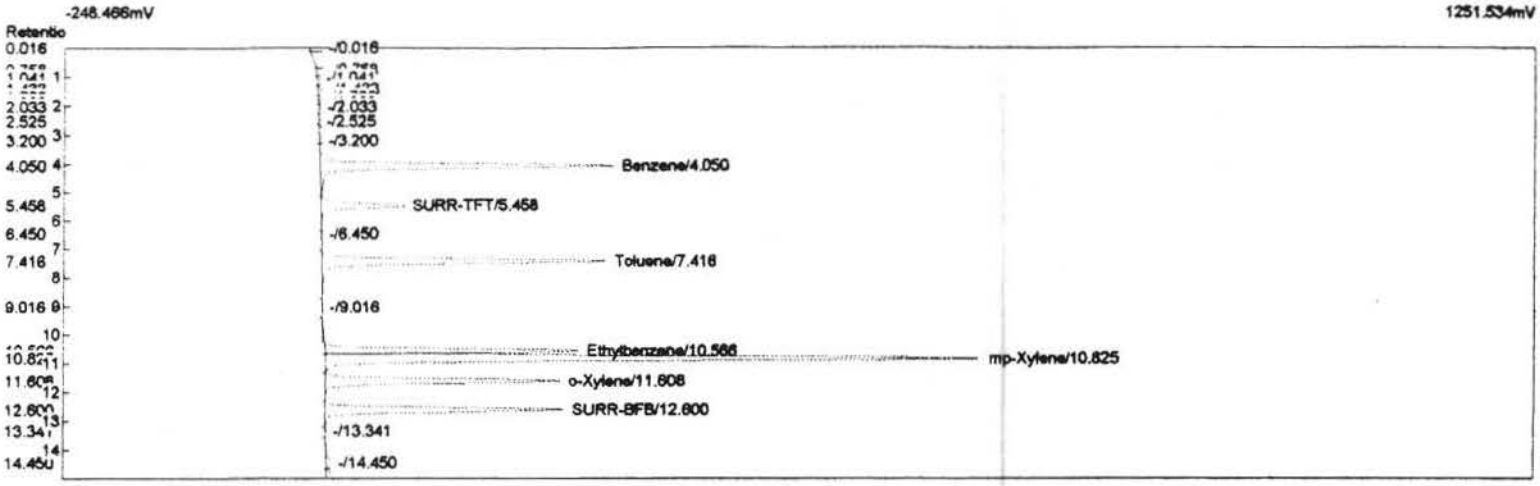
			INITIAL		OPENING			CLOSING		
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	AREA	RF	%DIFF	AREA	RF	%DIFF
BENZENE	PID - GC3	5-100	80	15.0%	3337.59	66.75	16.7%	3585.99	71.72	10.5%
TOLUENE	PID - GC3	5-100	77	14.1%	3225.81	64.52	15.9%	3558.16	71.16	7.2%
ETHYLBENZENE	PID - GC3	5-100	64	14.6%	2614.77	52.30	18.1%	3006.20	60.12	5.8%
m&p-XYLENES	PID - GC3	10-200	80	16.8%	7506.10	75.06	5.7%	8538.48	85.38	7.2%
o-XYLENES	PID - GC3	5-100	65	15.6%	2720.41	54.41	16.3%	3124.46	62.49	3.9%

CALIB RANGE - RANGE OF CALIBRATION CURVE IN ppb
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 20% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 20% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY:JOSÉ MIGUEL PÉREZ
DATA REVIEWED BY: KEVIN SHELBURNE

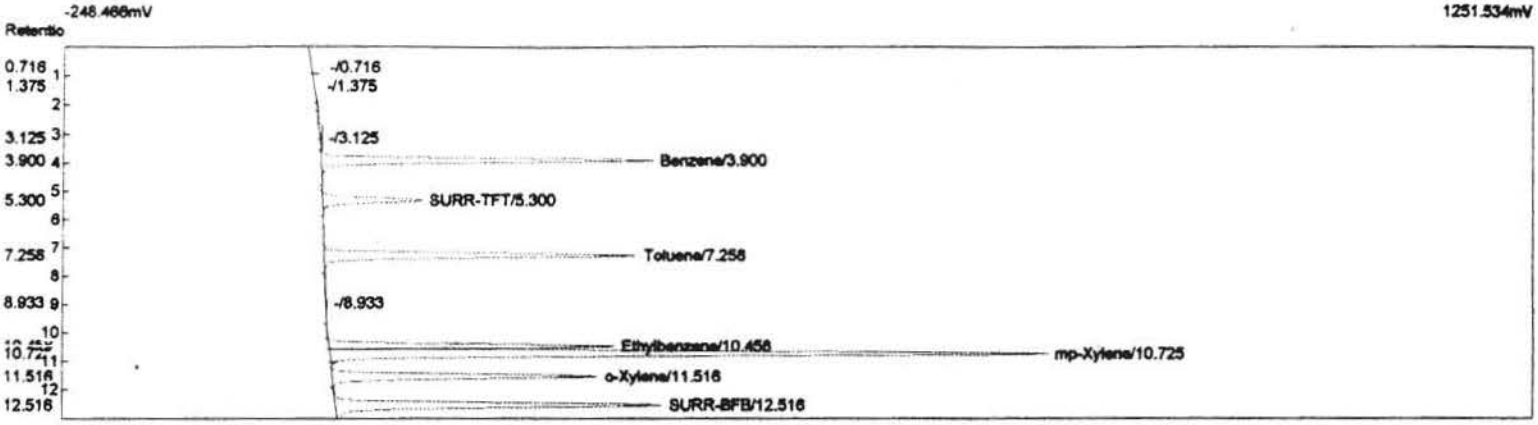
TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

Lab name: TEG Puerto Rico
Analysis date: 12/14/1998 15:39:54
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: 1214p1.CHR ()
Sample: 50 ppb BTEX open
Operator: jmp



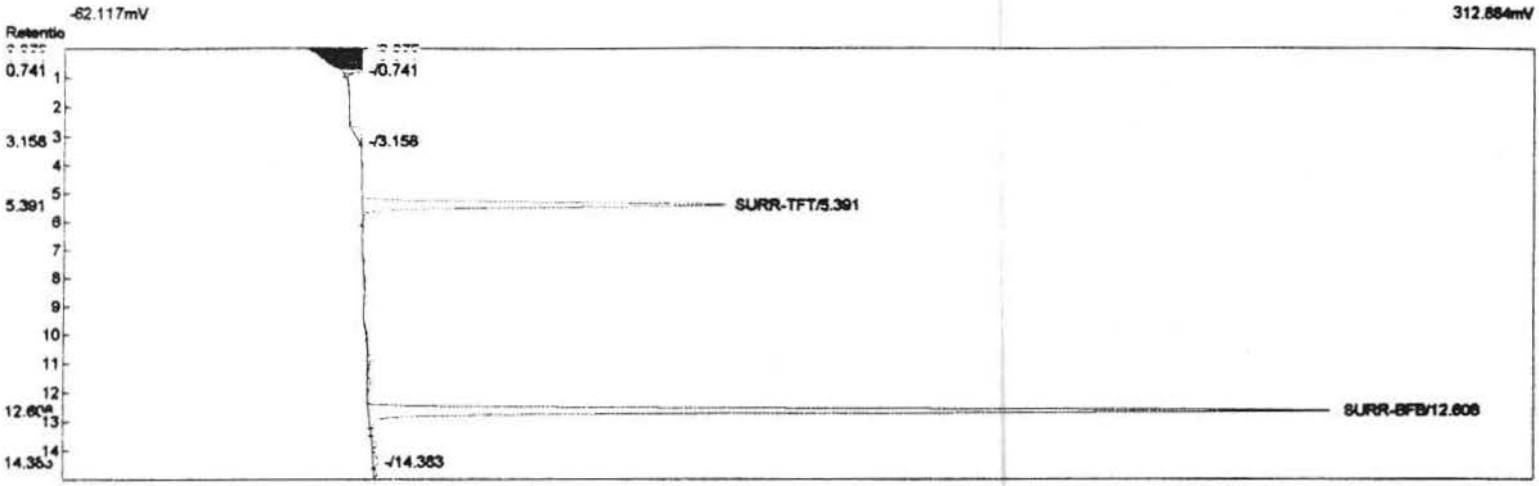
Retention	Component	Number	Area	External	Internal	Units
4.050	Benzene	1	3337.589	41.64	41.6366	ppb
5.458	SURR-TFT	2	1102.360	38.40	38.3964	ppb
7.416	Toluene	3	3225.812	42.41	42.4114	ppb
10.566	Ethylbenzene	4	2614.773	40.96	40.9582	ppb
10.825	mp-Xylene	5	7506.096	94.25	94.2503	ppb
11.608	o-Xylene	6	2720.409	41.83	41.8267	ppb
12.600	SURR-BFB	7	2691.468	43.28	43.2828	ppb
		7	23198.507	342.76	342.7624	

Lab name: TEG Puerto Rico
Analysis date: 12/14/1998 18:50:36
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: 1214p7.CHR ()
Sample: 50 ppb BTEX Closing
Operator: jmp



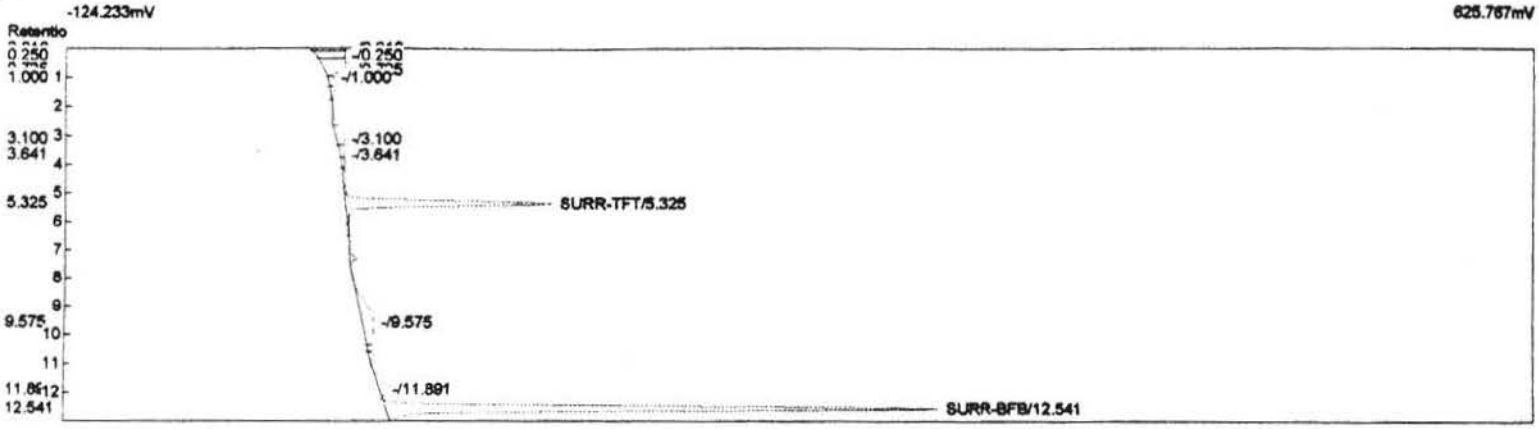
Retention	Component	Number	Area	External	Internal	Units
3.900	Benzene	1	3585.985	44.74	44.7353	ppb
5.300	SURR-TFT	2	1270.368	44.25	44.2483	ppb
7.258	Toluene	3	3558.161	46.78	46.7810	ppb
10.458	Ethylbenzene	4	3006.201	47.09	47.0896	ppb
10.725	mp-Xylene	5	8538.478	107.21	107.2134	ppb
11.516	o-Xylene	6	3124.463	48.04	48.0391	ppb
12.516	SURR-BFB	7	3908.632	62.86	62.8586	ppb
		7	26992.288	400.96	400.9633	

Lab name: TEG Puerto Rico
Analysis date: 12/14/1998 16:04:12
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: 1214p2.CHR ()
Sample: METHOD BLANK
Operator: jmp



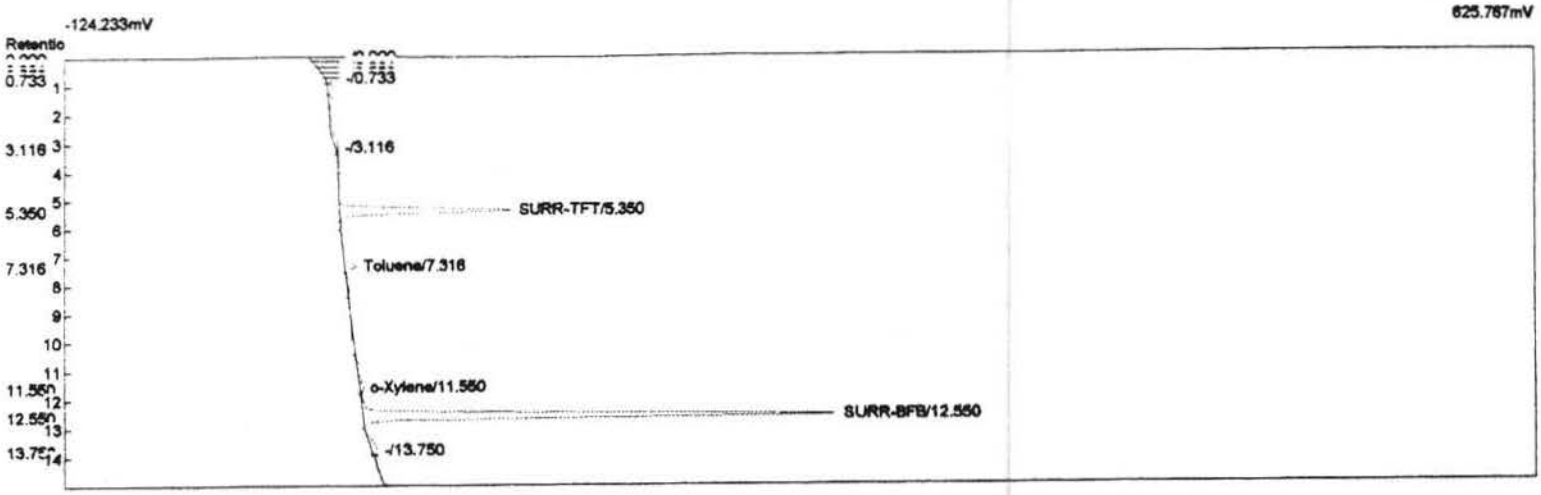
Retention	Component	Number	Area	External	Internal	Units
5.391	SURR-TFT	2	1152.774	40.15	40.1524	ppb
12.608	SURR-BFB	7	2751.300	44.24	44.2450	ppb
		2	3904.075	84.40	84.3973	

Method: EPA 8[illegible]
Lab ID: GC-3
Description: PID, GC-3, P[illegible]
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: 1214p6.CHR ()
Sample: DRUM # 6 2842 /1201CH2
Operator: jmp



Retention	Component	Number	Area	External	Internal	Units
5.325	SURR-TFT	2	1383.722	48.20	48.1965	ppb
12.541	SURR-BFB	7	3294.762	52.98	52.9846	ppb
		2	4678.484	101.18	101.1811	

Lab name: TEG Puerto Rico
Analysis date: 12/14/1998 17:21:53
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: 1214p4.CHR ()
Sample: DRUM #7 2842 /1201CH2
Operator: jmp



Retention	Component	Number	Area	External	Internal	Units
5.350	SURR-TFT	2	1089.092	37.93	37.9343	ppb
7.316	Toluene	3	56.743	0.75	0.7460	ppb
11.550	o-Xylene	6	59.314	0.91	0.9120	ppb
12.550	SURR-BFB	7	2760.501	44.39	44.3929	ppb
		4	3965.651	83.99	83.9852	

teg

QA/QC REPORT - CALIBRATION DATA

TEG Project #98I1201CH2
DAILY CALIBRATION DATE: 12/15/98

CH2M HILL 146801.US.SC
PROJECT NAME: ROOSEVELT ROADS

			INITIAL		OPENING			CLOSING		
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	AREA	RF	%DIFF	AREA	RF	%DIFF
BENZENE	PID - GC3	5-100	80	15.0%	3468.69	69.37	13.5%	7691.68	76.92	4.0%
TOLUENE	PID - GC3	5-100	77	14.1%	3522.28	70.45	8.2%	8071.94	80.72	5.2%
ETHYLBENZENE	PID - GC3	5-100	64	14.6%	2739.63	54.79	14.2%	6979.09	69.79	9.3%
m&p-XYLENES	PID - GC3	10-200	80	16.8%	8419.55	84.20	5.7%	16129.24	80.65	1.3%
o-XYLENES	PID - GC3	5-100	65	15.6%	3081.55	61.63	5.2%	7096.06	70.96	9.1%

CALIB RANGE - RANGE OF CALIBRATION CURVE IN ppb
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 20% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 20% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY:JOSÉ MIGUEL PÉREZ
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

teg

QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I1201CH2 | CH2M HILL: 146801.US.SC
DATE: 12/15/98 | PROJECT NAME: ROOSEVELT ROADS

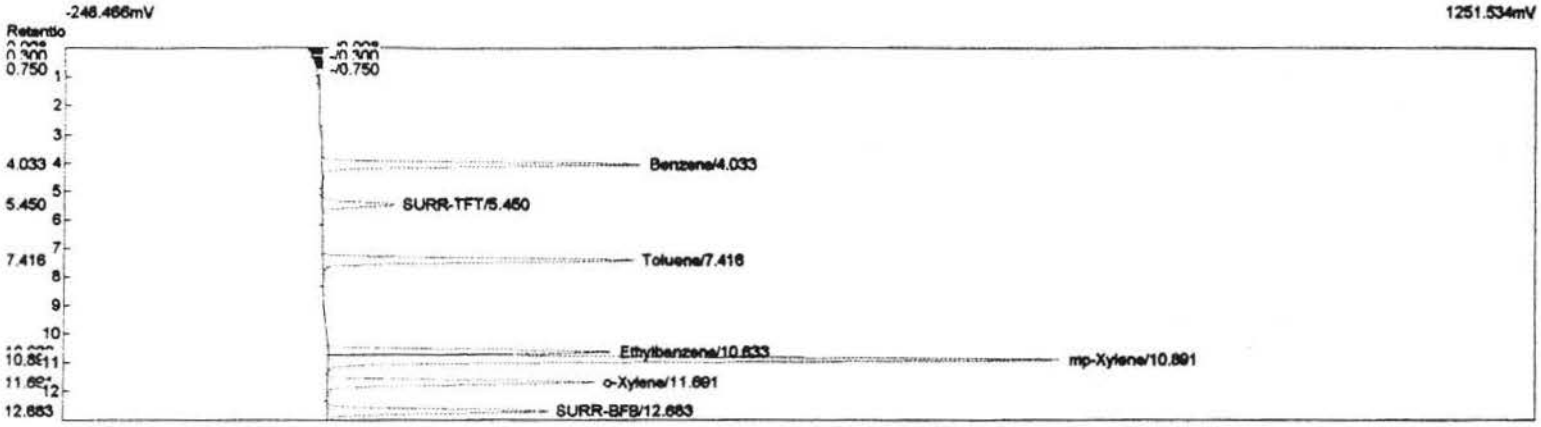
COMPOUND	SPK CONC (ppb)	MS CONC (ppb)	%REC MS	MSD CONC (ppb)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
BENZENE	50.0	47.2	94%	48.1	96%	2%	20%	60% - 135%
TOLUENE	50.0	50.4	101%	49.1	98%	3%	20%	60% - 135%
ETHYLBENZENE	50.0	51.2	102%	49.1	98%	4%	20%	60% - 135%
TOTAL XYLENES	150.0	165.0	110%	161.1	109%	2%	20%	60% - 135%

ppb = PARTS PER BILLION
MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE
% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX
RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY:JOSÉ MIGUEL PÉREZ
DATA REVIEWED BY: KEVIN SHELBURNE

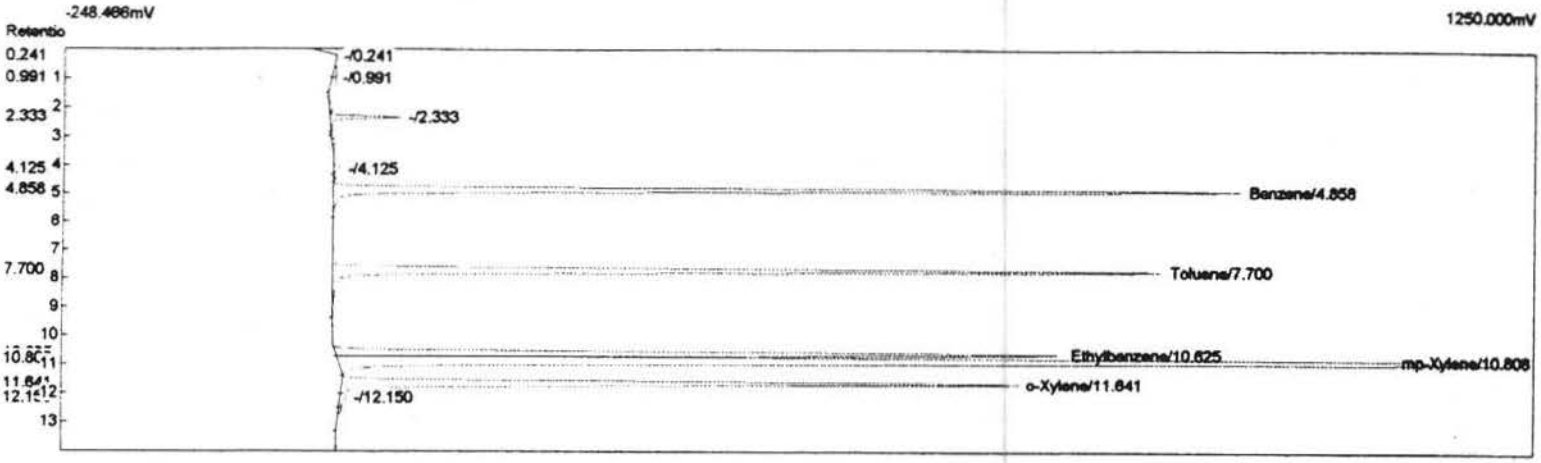
TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

Lab name: TEG Puerto Rico
Analysis date: 12/15/1998 09:02:14
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: 1214p8.CHR ()
Sample: 50 ppb BTEX Opening
Operator: jmp



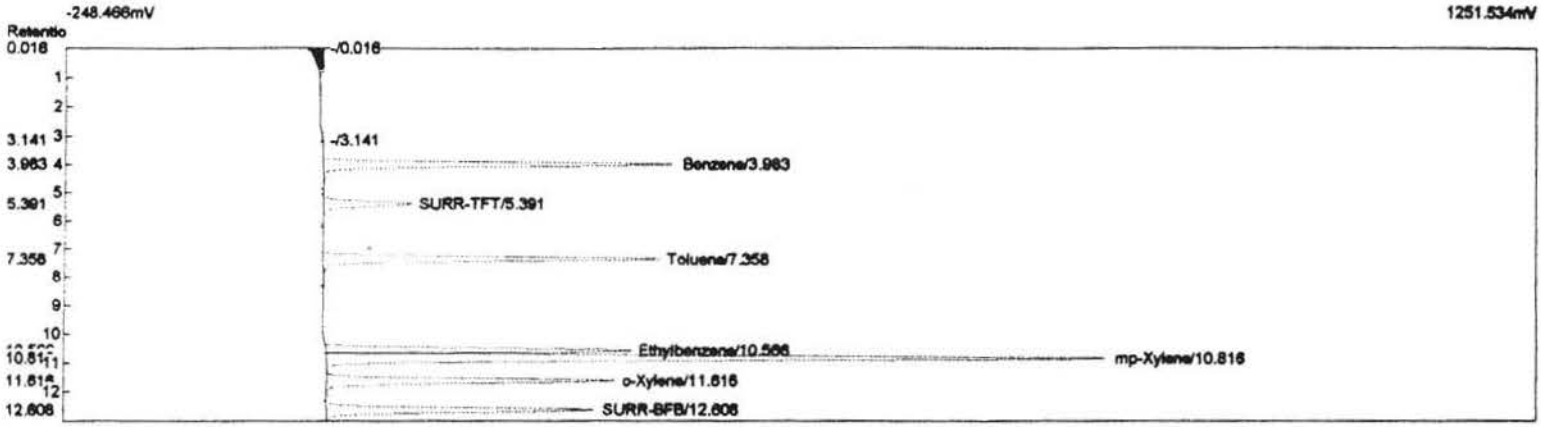
Retention	Component	Number	Area	External	Internal	Units
4.033	Benzene	1	3468.668	43.27	43.2718	ppb
5.450	SURR-TFT	2	920.556	32.06	32.0639	ppb
7.416	Toluene	3	3522.276	46.31	46.3092	ppb
10.633	Ethylbenzene	4	2739.630	42.91	42.9140	ppb
10.891	mp-Xylene	5	8419.550	105.72	105.7201	ppb
11.691	o-Xylene	6	3081.550	47.38	47.3793	ppb
12.683	SURR-BFB	7	2502.626	40.25	40.2459	ppb
		7	24654.856	357.90	357.9043	

Lab name: TEG Puerto Rico
Analysis date: 12/15/1998 17:04:08
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: C:\PEAKW95\1214p24.CHR ()
Sample: 100 ppb close std
Operator: jmp



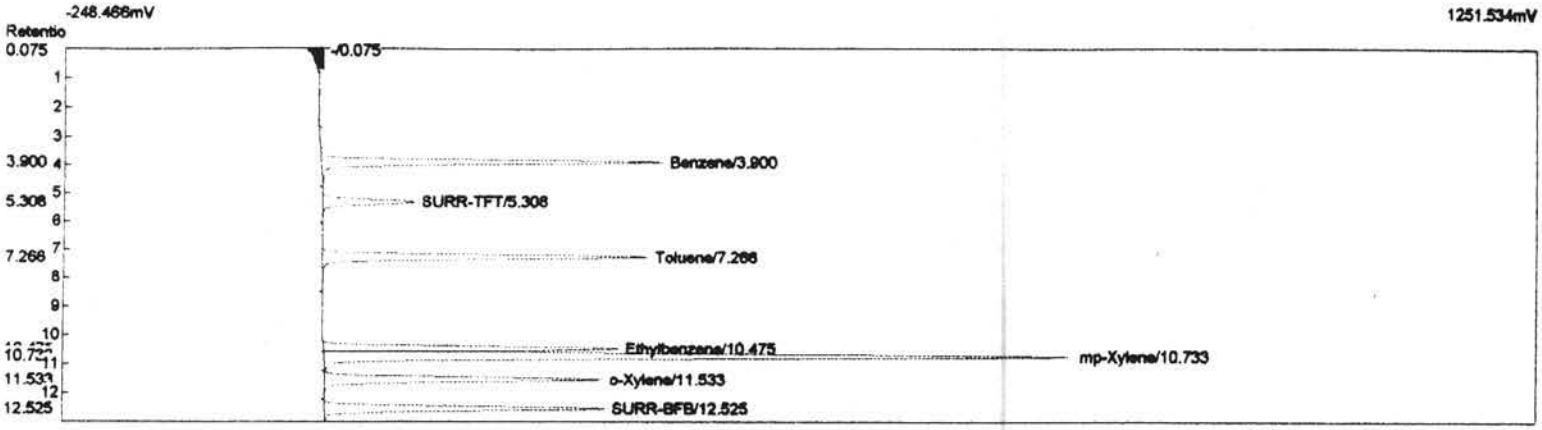
Retention	Component	Number	Area	External	Internal	Units
4.858	Benzene	1	7691.677	95.95	95.9541	ppb
7.700	Toluene	3	8071.943	105.24	105.2405	ppb
10.625	Ethylbenzene	4	6979.093	109.32	109.3216	ppb
10.808	mp-Xylene	5	16129.243	202.53	202.5269	ppb
11.641	o-Xylene	6	7096.056	109.10	109.1030	ppb
		5	45968.013	622.15	622.1460	

Lab name: TEG Puerto Rico
Analysis date: 12/15/1998 09:35:54
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: 1214p9.CHR ()
Sample: Matrix Spike
Operator: jmp



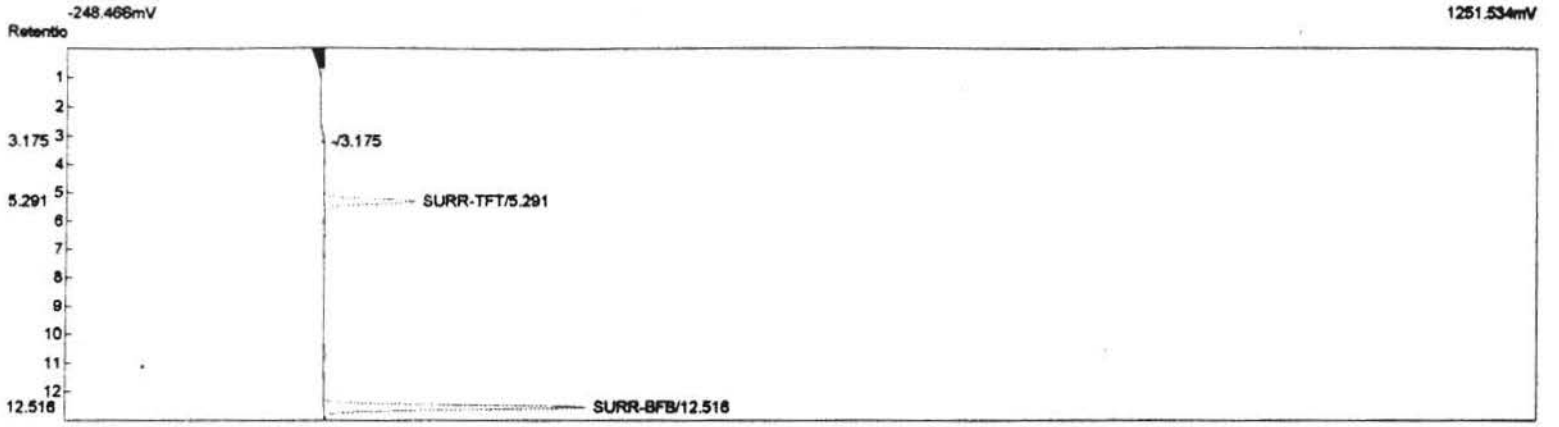
Retention	Component	Number	Area	External	Internal	Units
3.983	Benzene	1	3784.895	47.22	47.2168	ppb
5.391	SURR-TFT	2	1124.844	39.18	39.1795	ppb
7.358	Toluene	3	3834.262	50.41	50.4110	ppb
10.566	Ethylbenzene	4	3268.577	51.20	51.1995	ppb
10.816	mp-Xylene	5	9047.146	113.60	113.6005	ppb
11.616	o-Xylene	6	3342.496	51.39	51.3914	ppb
12.608	SURR-BFB	7	3033.132	48.78	48.7772	ppb
		7	27435.353	401.78	401.7760	

Lab name: TEG [illegible]
Analysis date: 12/15/1998 10:02:35
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: 1214p10.CHR ()
Sample: Matrix Spike Duplicate
Operator: jmp



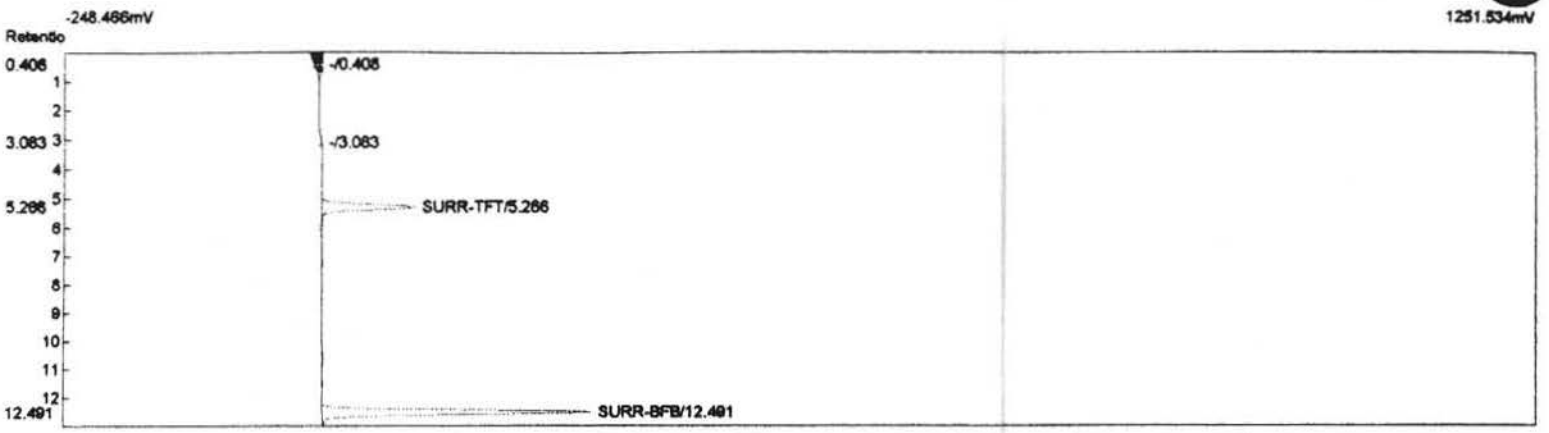
Retention	Component	Number	Area	External	Internal	Units
3.900	Benzene	1	3855.123	48.09	48.0929	ppb
5.308	SURR-TFT	2	1177.424	41.01	41.0109	ppb
7.266	Toluene	3	3733.041	49.08	49.0802	ppb
10.475	Ethylbenzene	4	3134.025	49.09	49.0919	ppb
10.733	mp-Xylene	5	8828.442	110.85	110.8544	ppb
11.533	o-Xylene	6	3266.577	50.22	50.2241	ppb
12.525	SURR-BFB	7	3202.309	51.50	51.4979	ppb
		7	27196.941	399.85	399.8522	

Lab name: TEG Puerto Rico
Analysis date: 12/15/1998 10:50:29
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: 1214p11.CHR ()
Sample: Method Blank
Operator: jmp



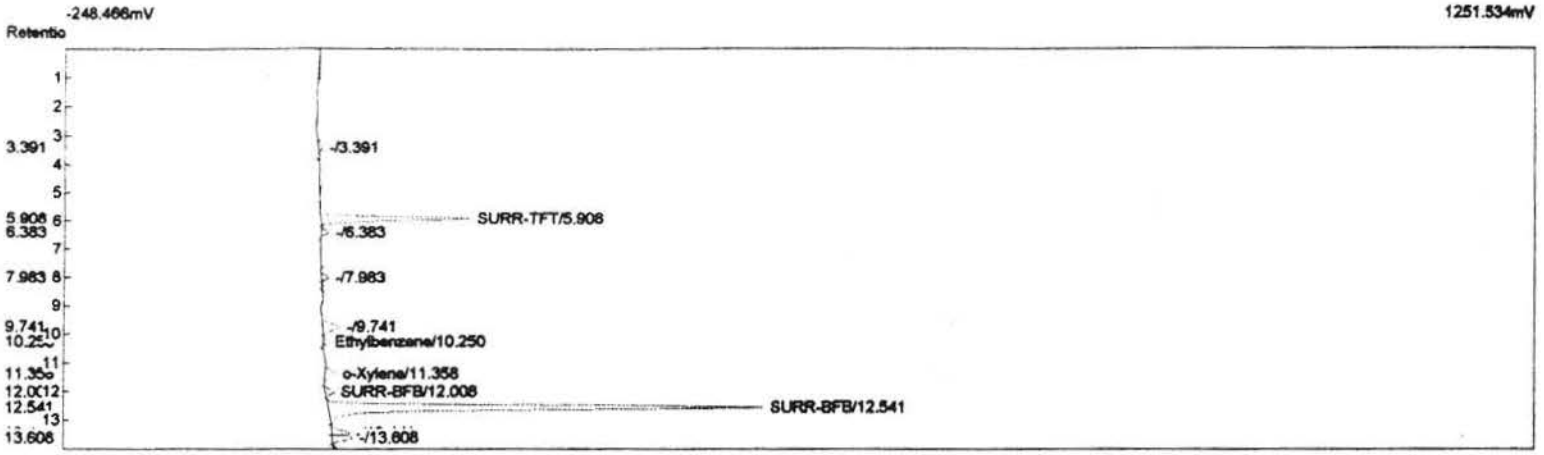
Retention	Component	Number	Area	External	Internal	Units
5.291	SURR-TFT	2	1177.819	41.02	41.0247	ppb
12.516	SURR-BFB	7	3025.230	48.65	48.6502	ppb
		2	4203.049	89.67	89.6749	

Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: 1214p12.CHR ()
Sample: DRUM #1 2842
Operator: jmp



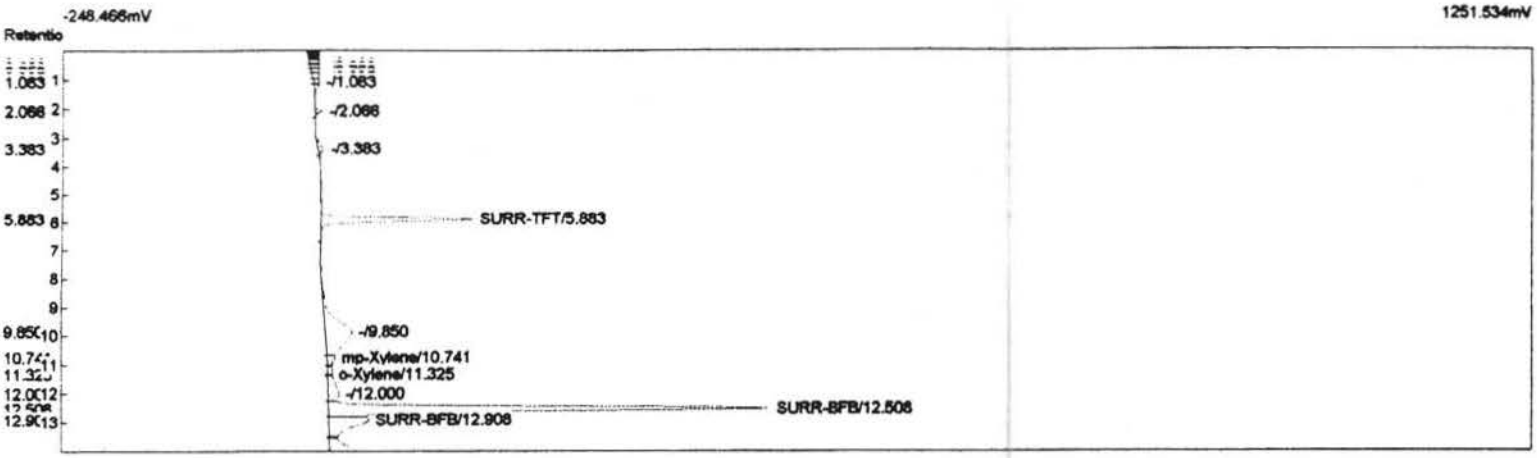
Retention	Component	Number	Area	External	Internal	Units
5.266	SURR-TFT	2	1201.149	41.84	41.8373	ppb
12.491	SURR-BFB	7	3106.272	49.95	49.9534	ppb
		2	4307.421	91.79	91.7908	

Lab name: TEG Puerto Rico
Analysis date: 12/15/1998 15:51:22
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: 1214p18.CHR ()
Sample: DRUM #4 2842
Operator: jmp



Retention	Component	Number	Area	External	Internal	Units
5.908	SURR-TFT	2	1486.144	51.76	51.7640	ppb
10.250	Ethylbenzene	4	56.133	0.88	0.8793	ppb
11.358	o-Xylene	6	185.287	2.85	2.8488	ppb
12.008	SURR-BFB	7	116.762	1.88	1.8777	ppb
12.541	SURR-BFB	7	4847.476	77.95	77.9546	ppb
		5	6691.802	135.32	135.3244	

Lab name: TEG Puerto Rico
Analysis date: 12/15/1998 16:16:04
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: 1214p19.CHR ()
Sample: DRUM #5 2842
Operator: jmp



Retention	Component	Number	Area	External	Internal	Units
5.883	SURR-TFT	2	1552.917	54.09	54.0898	ppb
10.741	mp-Xylene	5	132.395	1.66	1.6624	ppb
11.325	o-Xylene	6	82.473	1.27	1.2680	ppb
12.508	SURR-BFB	7	4933.523	79.34	79.3384	ppb
12.908	SURR-BFB	7	1089.064	17.51	17.5138	ppb
		5	7790.372	153.87	153.8723	

teg

QA/QC REPORT - CALIBRATION DATA

TEG Project #98I1201CH2
DAILY CALIBRATION DATE: 12/16/98

CH2M HILL 146801.US.SC
PROJECT NAME: ROOSEVELT ROADS

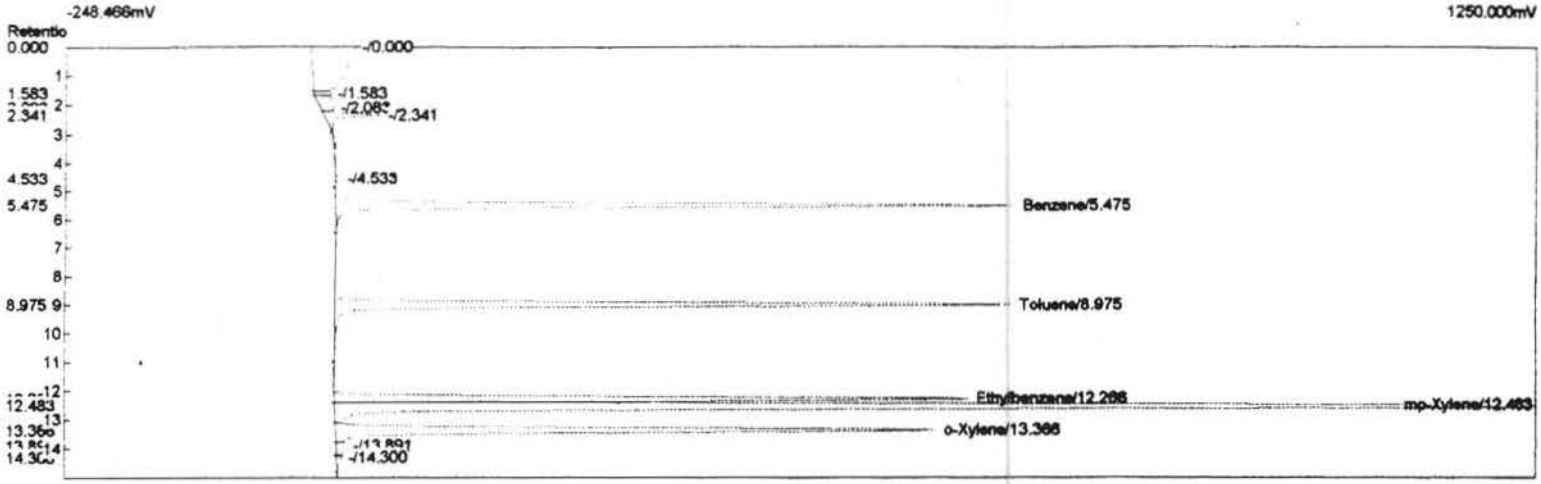
			INITIAL		OPENING			CLOSING		
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	AREA	RF	%DIFF	AREA	RF	%DIFF
BENZENE	PID - GC3	5-100	80	15.0%	6897.35	68.97	14.0%	7161.57	71.62	10.7%
TOLUENE	PID - GC3	5-100	77	14.1%	7326.87	73.27	4.5%	7551.05	75.51	1.6%
ETHYLBENZENE	PID - GC3	5-100	64	14.6%	6477.60	64.78	1.5%	6361.86	63.62	0.3%
m&p-XYLENES	PID - GC3	10-200	80	16.8%	16004.85	80.02	0.5%	16052.89	80.26	0.8%
o-XYLENES	PID - GC3	5-100	65	15.6%	6724.72	67.25	3.4%	6997.68	69.98	7.6%

CALIB RANGE - RANGE OF CALIBRATION CURVE IN ppb
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 20% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 20% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: JOSÉ MIGUEL PÉREZ
DATA REVIEWED BY: KEVIN SHELBURNE

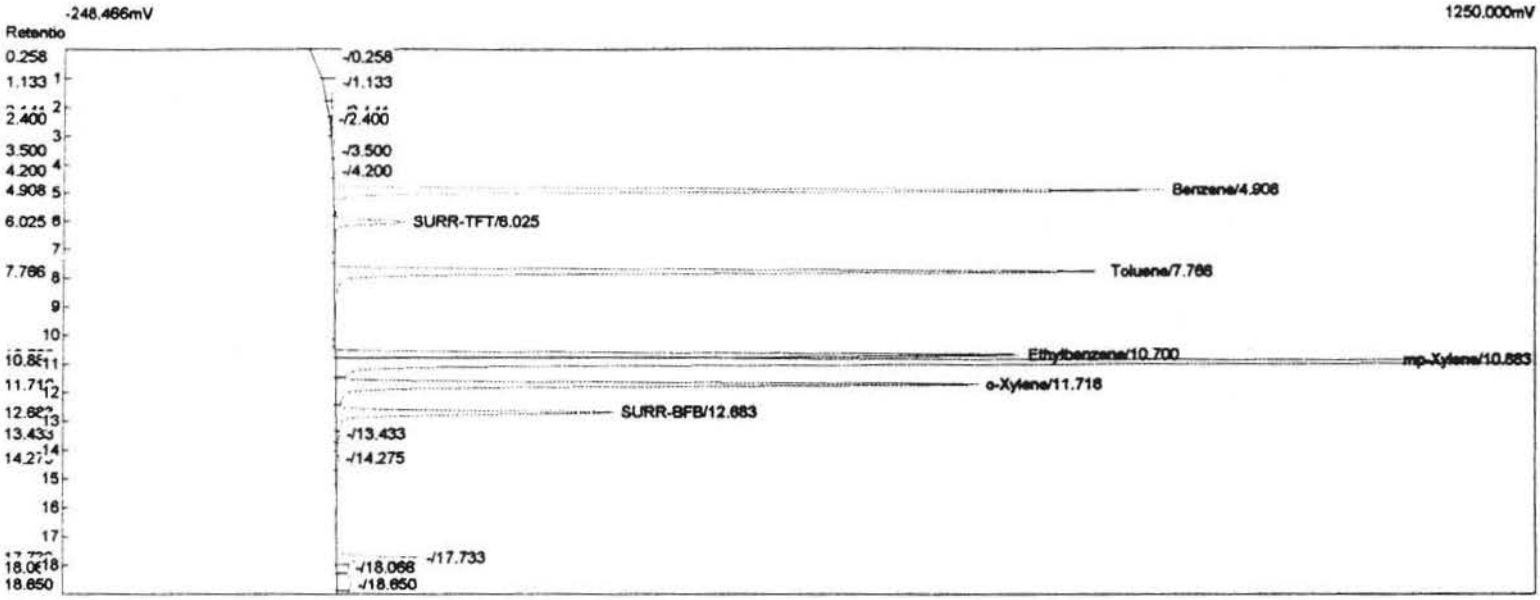
TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

Lab name: TEG Puerto Rico
Analysis date: 12/16/1998 11:39:14
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: C:\PEAKW95\1216p2.CHR ()
Sample: 100 ppb OPEN STD
Operator: MP



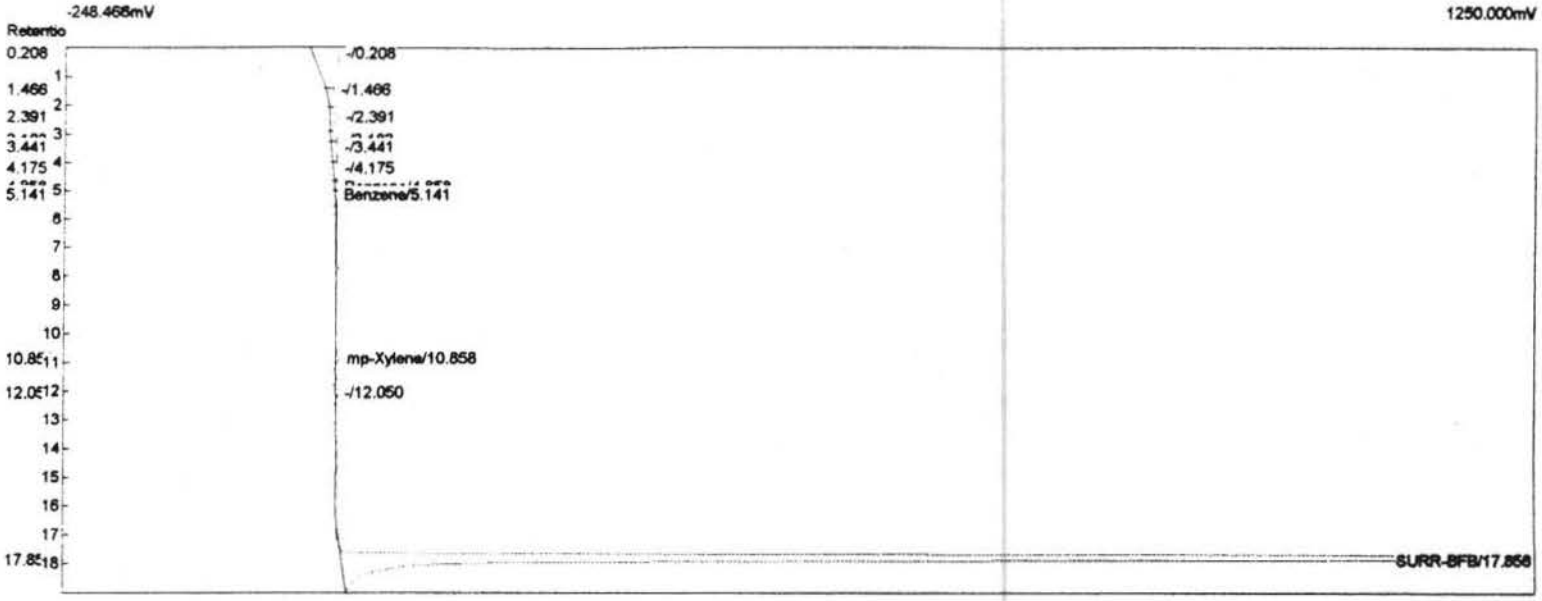
Retention	Component	Number	Area	External	Internal	Units
5.475	Benzene	1	6897.354	86.04	86.0448	ppb
8.975	Toluene	3	7326.869	95.53	95.5263	ppb
12.266	Ethylbenzene	4	6477.602	101.47	101.4662	ppb
12.483	mp-Xylene	5	16004.853	200.96	200.9650	ppb
13.366	o-Xylene	6	6724.722	103.39	103.3936	ppb
		5	43431.399	587.40	587.3960	

Lab name: TEG Puerto Rico
Analysis date: 12/16/1998 16:05:40
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: C:\PEAKW95\1216p9.CHR ()
Sample: 100 ppb BTEX CLOSE STD
Operator: map



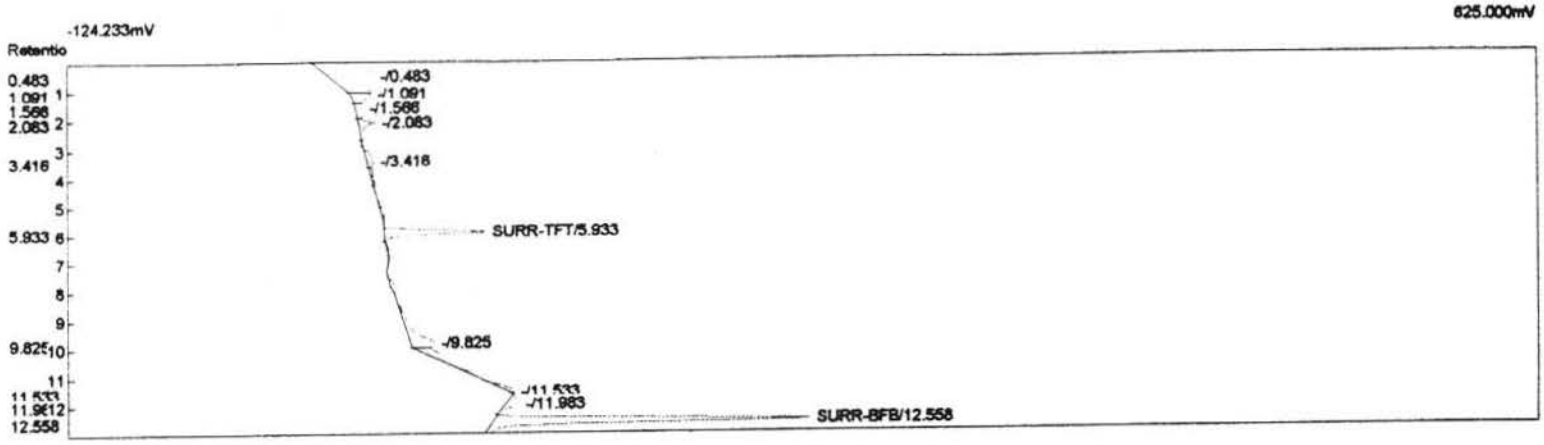
Retention	Component	Number	Area	External	Internal	Units
4.908	Benzene	1	7161.567	89.34	89.3409	ppb
6.025	SURR-TFT	2	794.660	18.45	18.4526	ppb
7.766	Toluene	3	7551.050	98.45	98.4491	ppb
10.700	Ethylbenzene	4	6361.860	99.65	99.6532	ppb
10.883	mp-Xylene	5	16052.892	201.57	201.5682	ppb
11.716	o-Xylene	6	6997.680	107.59	107.5904	ppb
12.683	SURR-BFB	7	3040.486	16.30	16.2985	ppb
		7	47960.194	631.35	631.3529	

Lab name: TEG Puerto Rico
Analysis date: 12/16/1998 12:30:32
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: C:\PEAKW95\1216p3.CHR ()
Sample: method blank
Operator: map



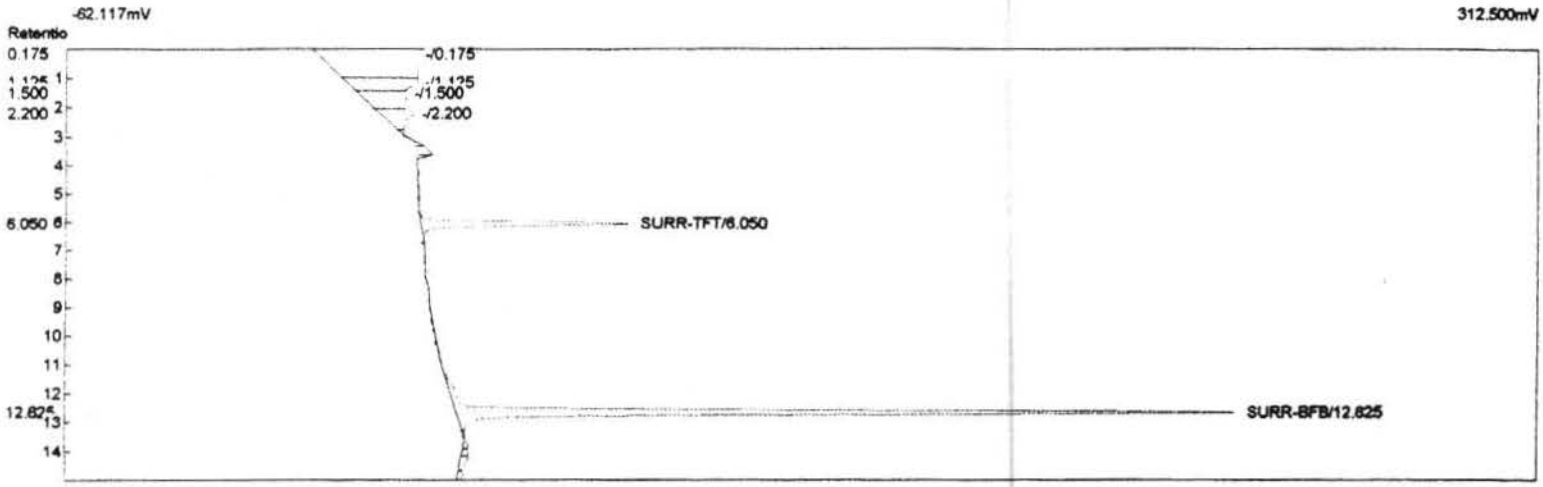
Retention	Component	Number	Area	External	Internal	Units
4.858	Benzene	1	54.422	0.68	0.6789	ppb
5.141	Benzene	1	50.275	0.63	0.6272	ppb
10.858	mp-Xylene	5	56.797	0.71	0.7132	ppb
17.858	SURR-BFB	7	18981.540	101.75	101.7504	ppb
		4	19143.034	103.77	103.7697	

Lab name: TEG Puerto Rico
Analysis date: 12/16/1998 14:47:05
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: C:\PEAKW95\1216p6.CHR ()
Sample: DRUM #2 2842/1201CH2
Operator: map



Retention	Component	Number	Area	External	Internal	Units
5.933	SURR-TFT	2	516.063	11.98	11.9834	ppb
12.558	SURR-BFB	7	1766.882	9.47	9.4714	ppb
		2	2282.945	21.45	21.4547	

Lab name: TEG Puerto Rico
Analysis date: 12/16/1998 15:37:58
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: 1216p8.CHR ()
Sample: DRUM #3 2842/1201CH2
Operator: map



Retention	Component	Number	Area	External	Internal	Units
6.050	SURR-TFT	2	558.786	6.49	6.4877	ppb
12.625	SURR-BFB	7	2200.902	11.80	11.7979	ppb
		2	2759.688	18.29	18.2856	

teg Transglobal Environmental Geochemistry

Chain of Custody Record

PO # _____

000612

Client: CH2M Hill

Address

Phone (407) 342-1602 FAX

Client Project # 146801, US SC Project Manager Marty Clason

Date 12/01/98 Page 2 of 2

TEG Project # 98E120142 Outside Lab. #

Location Roosevelt Roads Site [illegible]

Collector Rick Morales Date of Collection 11/30/98 & 12/1/98

Sample #	Depth	Time	Sample Type	Container Type	VOA 8010	VOA 8020 (BTEX)	VOA 8260	SEMI VOL 8270	TRPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (gas & diesel)	TPH 8015 (oil)	PNA 610/8100	TOTAL LEAD	pH	METALS	RCI	FIELD NOTES / PRESERVATION	Total # of Containers
~~Trip Blk #2~~	—		water	40ml		1													Benzene only Sample — 12/1/98 Low detection limit	1
~~Trip Blk #3~~	—		↓	↓		1													↓	1
Drum #1 7842	—	1035	Soil	2oz		1													7 day TPH or less 12/1/98	1
Drum #2 7842	—	1030	|	|		1													|	1
Drum #3 7842	—	1025	|	|		1													|	1
Drum #4 7842		1020	|	|		1													|	1
Drum #5 7842	—	1015	|	|		1													|	1
Drum #6 7842	—	1010	|	|		1													|	1
Drum #7 7842	—	1000	↓	↓		1													↓	1
1686 - Trip Blk #2	—	—	water	40ml		1														

RELINQUISHED BY (signature)	Date/Time	RECEIVED BY (signature)	Date/Time
Richard Morales	12/1/98	[illegible]	12/01/98 8:30AM
RELINQUISHED BY (signature)	Date/Time	RECEIVED BY (signature)	Date/Time

Total # of containers	19
Chain of Custody seals Y / N / NA	
Seals intact? Y / N / NA	
Received good conditions / cold	

TEMPERATURE 4°C

Sample disposal Instructions: ____ TEG Disposal @ $2.00 each ____ Return to client ____ Pickup

teg

rld Leader In On-Site Sampling and Analysis

August 15, 1998
TEG Project #98I0731CH2-1

Mr. Marty Clasen
CH2M HILL
4350 W. Cypress Street, Suite 600
Tampa, Florida 33607

SUBJECT: DATA REPORT - CH2M HILL PROJECT NO. 146801.US.SC SITE #2842

Dear Marty,

Please find enclosed the analytical report for the samples collected by CH2M HILL personnel from the above-referenced site and delivered to TEG under the proper chain-of-custody protocol. TEG's Puerto Rico certified-chemist performed the following analyses:

- 5 water samples analyzed for TRPH by modified EPA test method 418.1.
- 5 water samples analyzed for TPH-gas/diesel by modified EPA test method 8015.
- 5 water samples analyzed for BTEX by modified EPA test method 8020.
- 5 water samples analyzed for PAHs by modified EPA test method 610.
- 5 water samples analyzed for total lead.
- 1 equipment blank water sample analyzed for BTEX, TRPH, TPH-gas/diesel, PAHs and total lead.
- 1 field blank water sample analyzed for BTEX, TRPH, TPH-gas/diesel, PAHs and total lead.
- 1 trip blank water sample analyzed for BTEX by modified EPA test method 8020.
- Laboratory QA/QC analyses for TPH-gas/diesel, TRPH, PAHs and BTEX.

The analytical results are summarized in the attached table. Applicable detection limits, QA/QC data, chromatograms, a chain-of-custody and an invoice are attached.

TEG appreciates the opportunity to provide analytical services for this project. If you have any questions relating to the data or report, please do not hesitate to contact us.

Sincerely,
TEG

Kevin Shelburne

Kevin Shelburne
Principal

Attachments

TEG-PUERTO RICO • PMB 627, HC-01 Box 29030, Caguas, PR 00725 • Phone (787) 720-0329 • Fax (787) 789-3858 • Pager 759-1255 Unit 217-4053

CARIBBEAN BIORESEARCH, INC.
Environmental & Biological Testing Laboratories

EL RETIRO INDUSTRIAL ZONE

P.O. BOX 325, SAN GERMAN, PUERTO RICO, 00683

TEL.: (787) 892-2650 / 892-2680

FAX: (787) 892-1054

CBI REPORT NO: 66712-08-98

REPORT TO: TEG - PUERTO RICO
PMB 627, HC 01, BOX 29030
CAGUAS, PUERTO RICO 00725

ATTN: MR. KEVIN SHELBURNE

SAMPLE DESCRIPTION: Water Samples of July 31, 1998, 7 Bottles.

TEG Project No.: 98I0731CH2-1

Sample Received: August 3, 1998 **Sample Reported:** August 5, 1998

Total Lead	
Sample Identification	**RESULT (mg/L)**
1) 2842 - MW2	0.040
2) 2842 - MW3	0.017
3) 2842 - MW4	0.038
4) 2842 - MW1	0.041
5) 2842 - EB10	< 0.005
6) 2842 - FBI	< 0.005
7) 2842 - DUPEL	0.008

ESTADO LIBRE ASOCIADO DE PUERTO RICO
Iluminada Santana
LIC. #2108
A 5362
QUIMICO LICENCIADO

QC Data					
Parameter	**Batch Number**	**CBI Sample No.**	**Original Value (mg/L)**	**Duplicate Value (mg/L)**	**Spike % Recovery**
Total Lead (Pb)	080598	66712-4	0.041	0.040	92.5

Notes: (1) Sampling by Client Representative.
(2) Reference: EPA 600 239.2.

Analyzed by: HR

Approved by: Iluminada Santana

Please see reverse side for explanations and other information.

Explanation of Terms:

Detection limits is the smallest amount which can be reported. It is dependent upon many factors such as sample matrix sensitivity of test method, and sensitivity of instrumentation. The detection limit therefore may change from sample to sample.

<	=	less than
>	=	greater than
ND	=	Not Detected
mg/L	=	milligrams/liter (equivalent to ppm for water samples)
µg/L	=	micrograms/liter (equivalent to ppb for water samples)
ppm	=	parts per million, milligrams/kilogram
ppb	=	parts per billion, micrograms/kilogram

Report interpretation:

The results included in this report reflect the findings of this laboratory for the article tested. If the report does not contain a result from a test for which you requested, please contact us.

The non-reporting of a test result in this report does not mean the presence or absence of any substance in the sample. If you have any questions concerning this report, please contact us immediately.

Retention of Samples and Reports:

We retain samples for approximately three (3) weeks after the completion of testing. We retain copies of our reports for five (5) years after completion of testing.

Confidentiality:

Each report will be sent to you on a confidential basis. If you wish us to provide a copy of the report to some other party, please provide us with a written permission and the name and address of the party to whom you wish the report sent.

Liability:

Caribbean Bioresearch Incorporated does not assume responsibility for interpretation of test results. Test results must be interpreted by the customer based on established/accceptance criteria. Any extrapolation of submitted data to other samples is the responsibility of the customer.

CARIBBEAN BIORESEARCH, INC.
Environmental & Biological Testing Laboratories

EL RETIRO INDUSTRIAL ZONE
P.O. BOX 325, SAN GERMAN, PUERTO RICO, 00683
TEL.: (787) 892-2650 / 892-2680

CBI REPORT NO: 73791-05-99

REPORT TO: ENVIRONMENTAL SAMPLING & LABORATORY SERVICES
PMB 627, HC 01, BOX 29030
CAGUAS, PUERTO RICO 00725

ATTN: MR. KEVIN SHELBURNE

TEG Project No.: 99I0514CH2-1+2 **Location:** RRNS Marina

SAMPLE DESCRIPTION: Water samples, eight (8) bottles

Sample Received: May 18, 1999 **Sample Reported:** May 21, 1999

Total Lead		
Sample Identification	Total Lead mg/L (Unfiltered) A	Total Dissolved Lead mg/L (Filtered) B
1) 2842 - MW-2	0.26	0.23
2) 2842 - MW-3	0.22	0.26
3) 2842 - MW-4	0.25	0.26
4) 2842 - EQB IK A	0.22	N/A
5) 2842 - DUPEA	0.27	N/A

ESTADO LIBRE ASOCIADO DE PUERTO RICO
Iluminada Santana
LIC. #2108
A 5810
QUIMICO LICENCIADO

QC Data					
Parameter	Batch Number	CBI Sample No.	Original Value (mg/L)	Duplicate Value (mg/L)	Spike % Recovery
A) Lead (Pb) Unfiltered	051999	73790-7	0.067	0.066	102
B) Lead (Pb) Filtered	051999	73791-3B	0.26	0.26	95

Notes: (1) Sampling by Client Representative.
(2) Reference: EPA 600 Method 239.1 & 2.

Analyzed by: HR

Approved by:

Please see reverse side for explanations and other information.

teg

Leader In On-Site Sampling and Analysis

CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVAL BASE, SITE 2842
CEIBA, P.R.

TEG Project #98I0731CH2-1

TRPH (EPA Method 418.1) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	TRPH (mg/L)
METHOD BLANK	8/14/98	ND
2842/124 - MW1	8/14/98	ND
2842 - MW2	8/14/98	ND
2842 - MW3	8/14/98	ND
2842 - MW4	8/14/98	ND
2842 - DUPE1	8/14/98	ND
2842 - EB10	8/14/98	ND
2842 - FB1	8/14/98	ND
DETECTION LIMIT (mg/L)		10

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT
mg/L = MILLIGRAMS PER LITER
ANALYSES PERFORMED BY: MARCO PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

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CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVAL BASE, SITE 2842
CEIBA, P.R.

TEG Project #98I0731CH2-1

TPH (DOHS Mod. EPA Method 8015) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	TPH-GAS C5-C12 (mg/L)	TPH-DIESEL C13-C24 (mg/L)
METHOD BLANK	8/4/98	ND	ND
2842/124 - MW1	8/4/98	ND	ND
2842 - MW2	8/4/98	ND	ND
2842 - MW3	8/4/98	ND	ND
2842 - MW4	8/4/98	ND	ND
2842 - DUPE1	8/4/98	ND	ND
2842 - EB10	8/4/98	ND	ND
2842 - FB1	8/4/98	ND	ND
DETECTION LIMIT (mg/L)		10	25

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT
CONCENTRATIONS BASED ON DRY WEIGHT

mg/L = MILLIGRAMS PER LITER
ANALYSIS PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

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CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVAL BASE, SITE 2842
CEIBA, P.R.

TEG Project #98I0731CH2-1
ANALYSIS DATE : 8/14/98

PAH (Mod. EPA Method 610) ANALYSES OF WATER

PARAMETER	MDL (mg/L)	2842/124-MW1 (mg/L)	2842-MW2 (mg/L)	2842-MW3 (mg/L)	2842-MW4 (mg/L)	2842-DUPE1 (mg/L)	2842-EB10 (mg/L)	2842-FB1 (mg/L)
ACENAPHTHENE	0.2	ND	ND	ND	ND	ND	ND	ND
ACENAPHTHYLENE	0.2	ND	ND	ND	ND	ND	ND	ND
ANTHRACENE/PHENANTHRENE	0.5	ND	ND	ND	ND	ND	ND	ND
BENZO (a) ANTHRACENE	0.2	ND	ND	ND	ND	ND	ND	ND
BENZO (a) PYRENE	0.2	ND	ND	ND	ND	ND	ND	ND
BENZO (b) FLUORANTHENE	0.2	ND	ND	ND	ND	ND	ND	ND
BENZO (ghi) PERYLENE	0.2	ND	ND	ND	ND	ND	ND	ND
BENZO (k) FLUORANTHENE	0.2	ND	ND	ND	ND	ND	ND	ND
DIBENZO (a,h) ANTHRACENE	0.3	ND	ND	ND	ND	ND	ND	ND
FLUORANTHENE	0.3	ND	ND	ND	ND	ND	ND	ND
FLUORENE	0.3	ND	ND	ND	ND	ND	ND	ND
INDENO (1,2,3-cd) PYRENE	0.3	ND	ND	ND	ND	ND	ND	ND
NAPHTHALENE	0.3	ND	ND	ND	ND	ND	ND	ND
PYRENE	0.3	ND	ND	ND	ND	ND	ND	ND

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT
mg/L = MILLIGRAMS PER LITER
METHOD SURROGATE CO-ELUTES WITH NAPHTHALENE

CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVAL BASE, SITE 2842
CEIBA, P.R.

TEG Project #98I0731CH2-1

BTEX (Mod. EPA Method 8020) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	BENZENE (ug/L)	TOLUENE (ug/L)	ETHYL-BENZENE (ug/L)	TOTAL XYLENES (ug/L)
METHOD BLANK	8/6/98	ND	ND	ND	ND
METHOD BLANK	8/7/98	ND	ND	ND	ND
2842/124 - MW1	8/6/98	ND	ND	ND	ND
2842 - MW2	8/6/98	ND	ND	ND	ND
2842 - MW3	8/7/98	ND	ND	ND	ND
2842 - MW4	8/7/98	ND	ND	ND	ND
2842 - DUPE1	8/7/98	ND	ND	ND	ND
2842 - EB10	8/6/98	ND	ND	ND	ND
2842-TRIP	8/6/98	ND	ND	ND	ND
2842 - FB1	8/6/98	ND	ND	ND	ND
DETECTION LIMIT (ug/L)		5.0	5.0	5.0	15.0

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
ug/L = MICROGRAMS PER LITER
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT

ANALYSES PERFORMED BY:JOSÉ MIGUEL PÉREZ
DATA REVIEWED BY: KEVIN SHELBURNE

Marco A. Pedraza
Laboratory Manager

Kevin Shelburne
Principal

MARCO A. PEDRAZA RUIZ
Licenciado
Químico
Estado Libre Asociado de Puerto Rico
LICENCIA NUM. 3393

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QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0731CH2-1

CH2M HILL 146801.US.SC

DAILY CALIBRATION DATE : 8/14/98

PROJECT NAME: SITE 2842

			INITIAL		OPENING			CLOSING		
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	ABS	RF	%DIFF	ABS	RF	%DIFF
TRPH	IR	10 - 1,000	764.6	15.7%	0.727	687.8	10.0%	0.730	684.9	10.4%

CALIB RANGE - RANGE OF CALIBRATION CURVE IS IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 20% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: MARCO PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

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QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0731CH2-1

CH2M HILL 146801.US.SC
PROJECT NAME: SITE 2842

COMPOUND	SPK CONC (ppm)	MS CONC (ppm)	%REC MS	MSD CONC (ppm)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
TRPH	500	551	110%	552	110%	0%	15%	80% - 120%

ppm = PARTS PER MILLION
MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE
% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX
RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY: JOSE MIGUEL
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

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LABORATORY QA/QC

CH2M HILL, SITE 2842

TEG Project #98I0731CH2-1

BTEX (Mod. EPA Method 8020) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	BENZENE (ug/L)	TOLUENE (ug/L)	ETHYL-BENZENE (ug/L)	TOTAL XYLENES (ug/L)
2842/124-MW1	8/6/98	ND	ND	ND	ND
2842/124-MW1 rep.	8/6/98	ND	ND	ND	ND
DETECTION LIMIT (ug/L)		5.0	5.0	5.0	15

TPH (DOHS Mod. EPA Method 8015) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	TPH-GAS C5-C12 (mg/L)	TPH-DIESEL C13-C24 (mg/L)
2842-DUPE1	8/4/98	ND	ND
2842-DUPE1 rep.	8/4/98	ND	ND
DETECTION LIMIT (mg/L)		10	25

"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT
mg/L = MILLIGRAMS PER LITER
ug/L = MICROGRAMS PER LITER
ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

teg

QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0731CH2-1

CH2M HILL 146801.US.SC
PROJECT NAME: SITE 2842

COMPOUND	SPK CON (ppm)	MS CONC (ppm)	%REC MS	MSD CONC (ppm)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
TPH-GAS	100	102	102%	109	109%	6%	15%	80% - 120%
TPH-DIESEL	1000	864	86%	982	98%	13%	15%	80% - 120%

ppm = PARTS PER MILLION
MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE
% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX
RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

teg

QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0731CH2-1
DAILY CALIBRATION DATE: 8/4/98

CH2M HILL 146801.US.SC
PROJECT NAME: SITE 2842

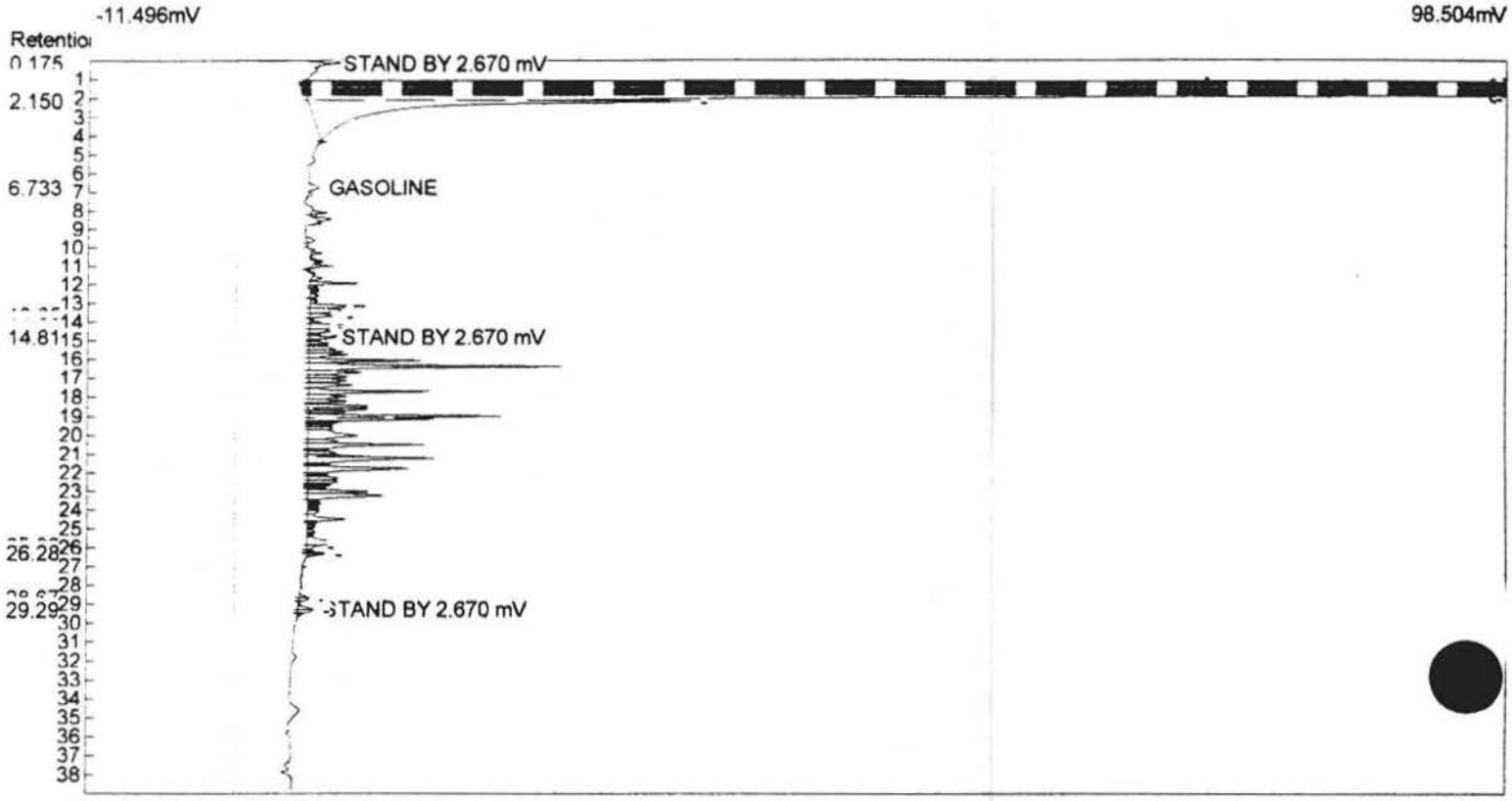
			INITIAL			OPENING			CLOSING	
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	AREA	RF	%DIFF	AREA	RF	%DIFF
TPH GASOLINE	FID #1 (gc1)	10 - 40,000	0.50	9.7%	155.04	0.52	3.4%	150.36	0.50	0.2%
TPH GASOLINE	FID #2 (gc1)	10 - 40,000	0.65	8.1%	190.22	0.63	2.5%	180.14	0.60	7.6%
TPH DIESEL	FID #1 (gc1)	25 - 40,000	0.47	8.8%	1585.36	0.45	3.6%	1208.12	0.40	14.3%
TPH DIESEL	FID #2 (gc1)	25 - 40,000	0.25	5.4%	837.31	0.24	4.3%	713.22	0.24	4.9%

CALIB RANGE - RANGE OF CALIBRATION CURVE IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 15% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

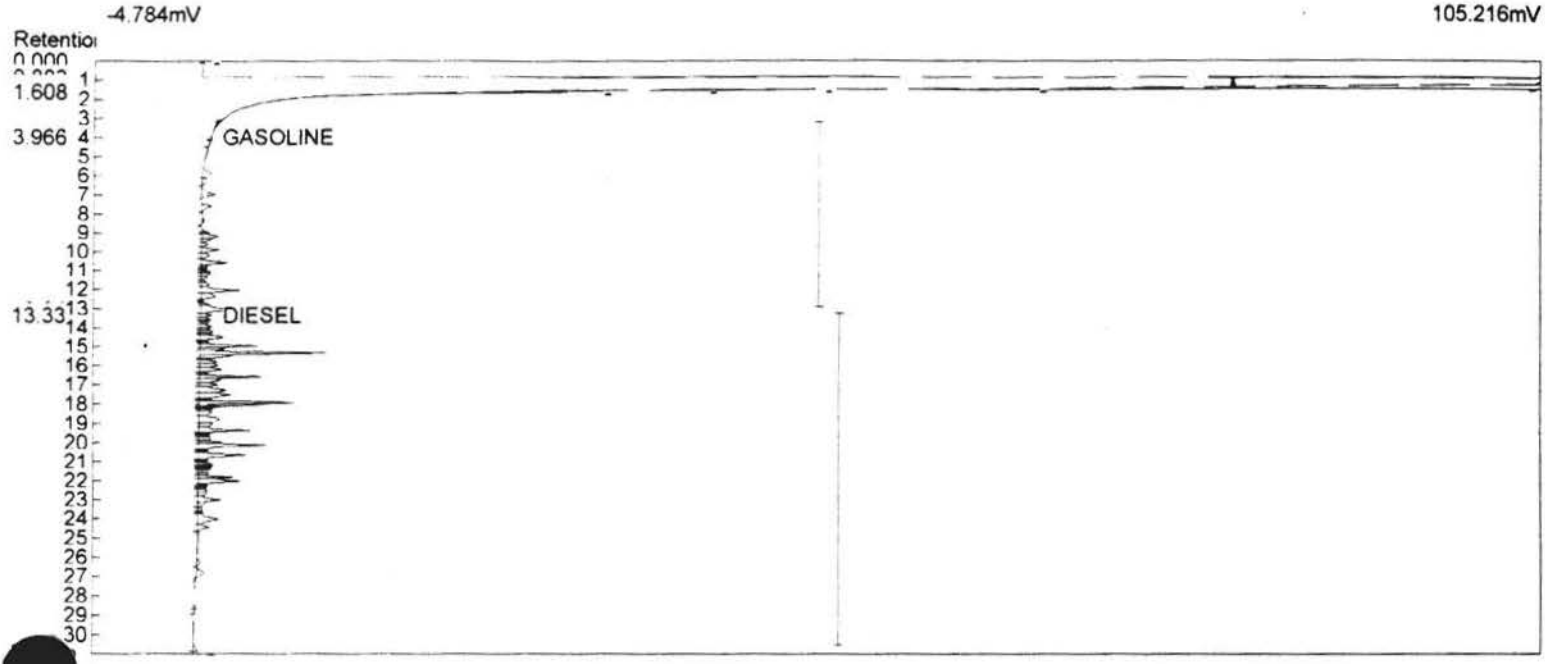
TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

Lab name: TEG Puerto Rico
Analysis date: 08/04/1998 09:40:37
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0804FA1.CHR ()
Sample: 100/1000 ppm G/D Open
Operator: MP



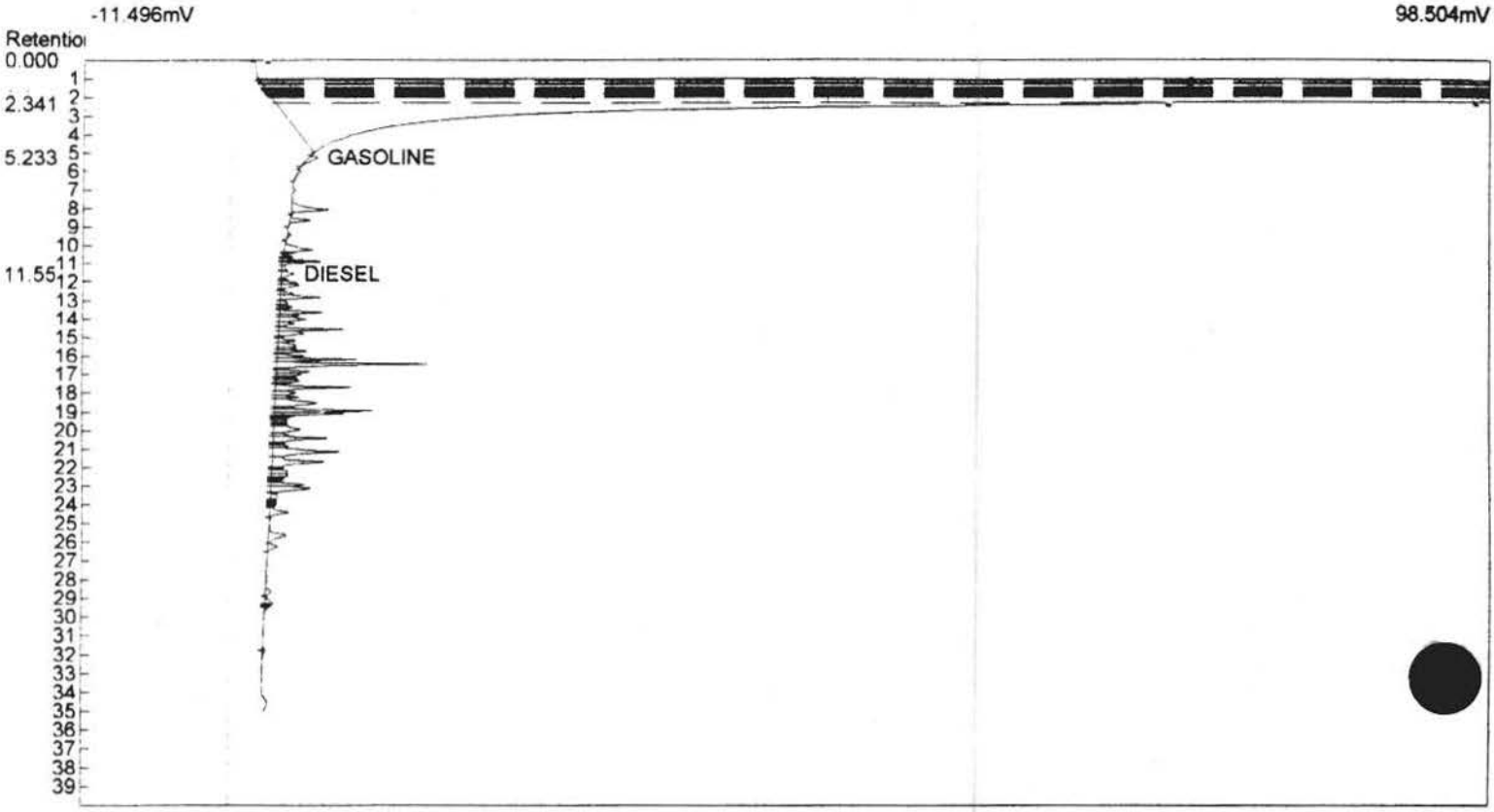
Component	Retention	Area	Internal	Units
GASOLINE	6.733	155.041	103.8803	ppm
DIESEL	14.816	1585.361	1131.5813	PPM
		1740.402	1235.4616	

Lab name: TEG Puerto Rico
Analysis date: 08/04/1998 09:40:37
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0804FB1.CHR ()
Sample: 100/1000 ppm G/D Open
Operator: MP



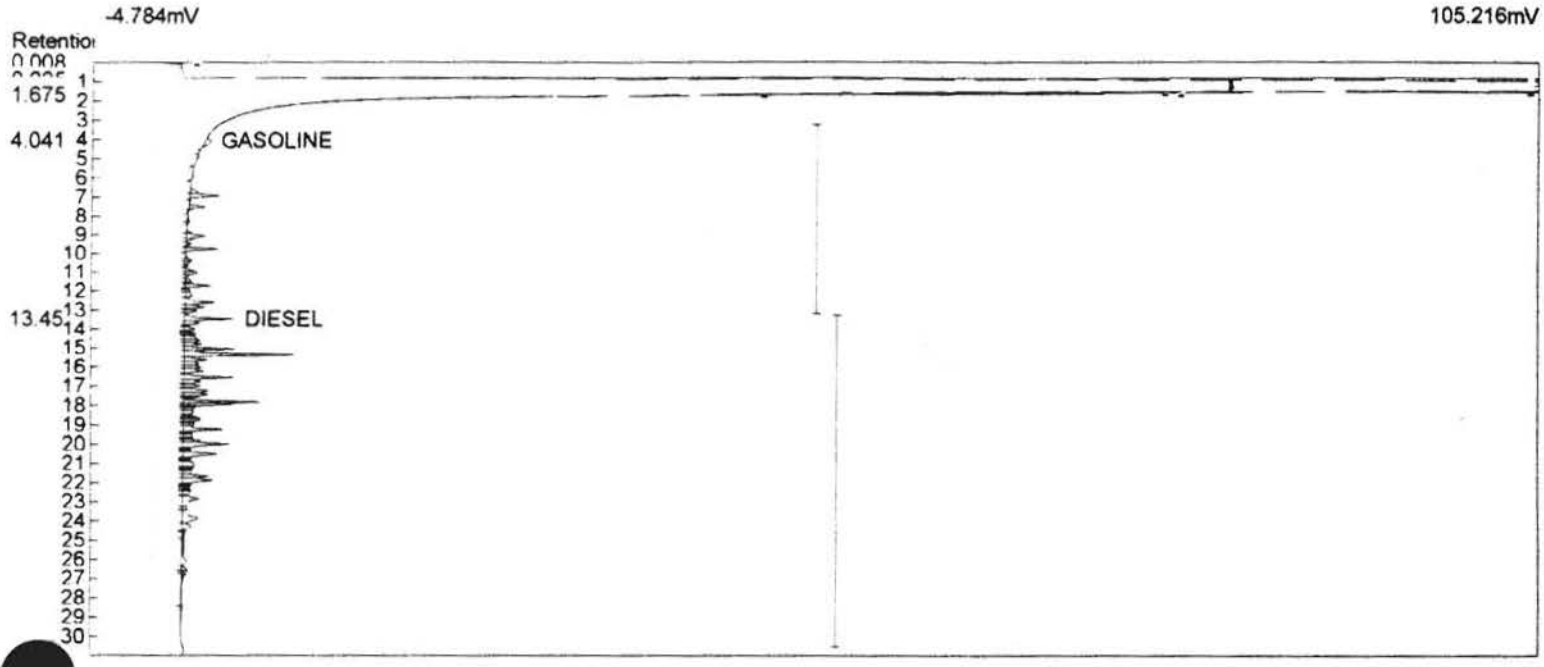
Component	Retention	Area	External	Units
GASOLINE	3.966	190.220	97.00	ppm
DIESEL	13.333	837.307	1128.84	PPM
		1027.527	1225.84	

Lab name: TEG Puerto Rico
Analysis date: 08/04/1998 15:38:55
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0804FA11.CHR ()
Sample: CLOSE STD
Operator: MP



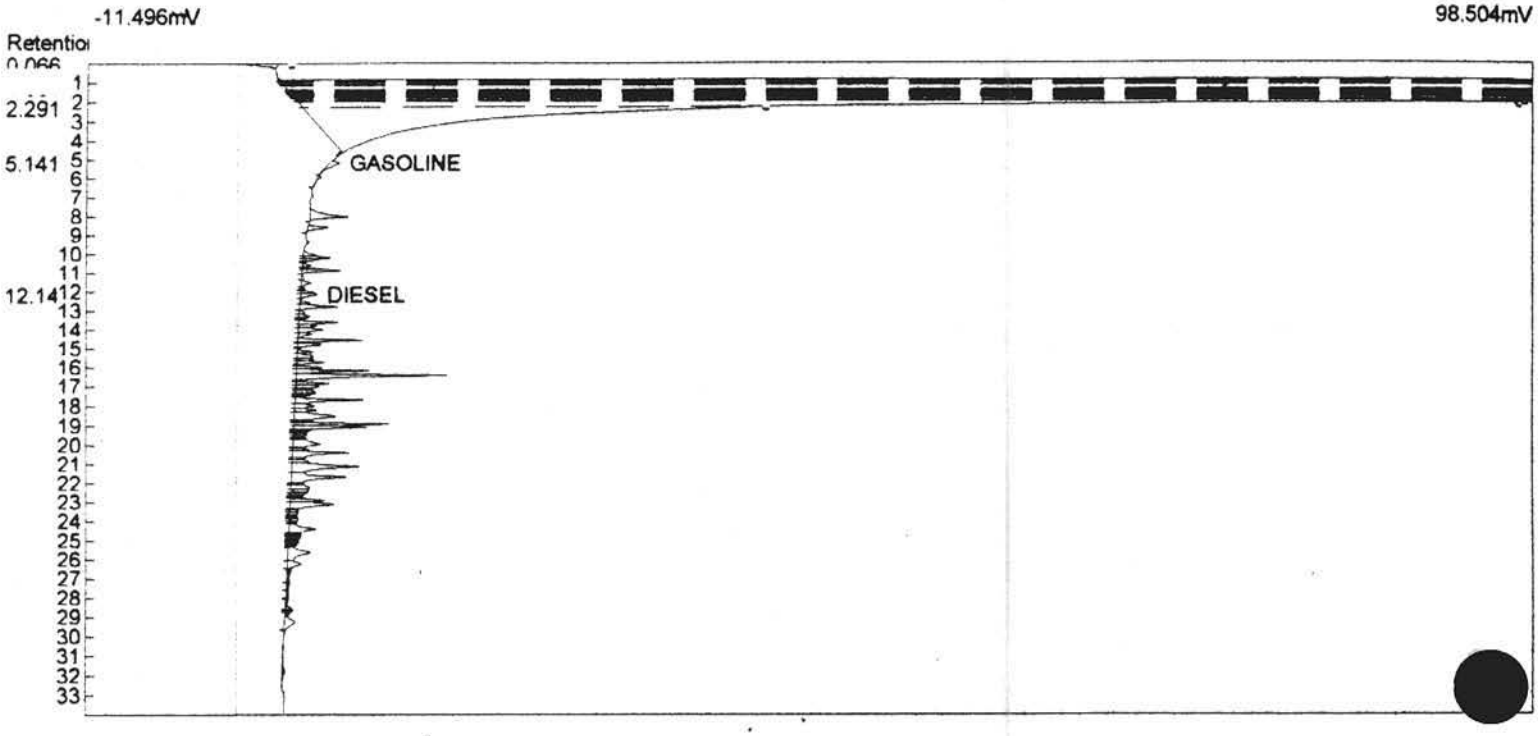
Component	Retention	Area	Internal	Units
GASOLINE	5.233	150.362	100.7452	ppm
DIESEL	11.550	1208.117	862.3160	PPM
		1358.478	963.0612	

Lab name: TEG Puerto Rico
Analysis date: 08/04/1998 15:38:55
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0804FB11.CHR ()
Sample: CLOSE STD
Operator: MP



Component	Retention	Area	External	Units
GASOLINE	4.041	180.139	91.86	ppm
DIESEL	13.450	713.224	961.55	PPM
		893.363	1053.42	

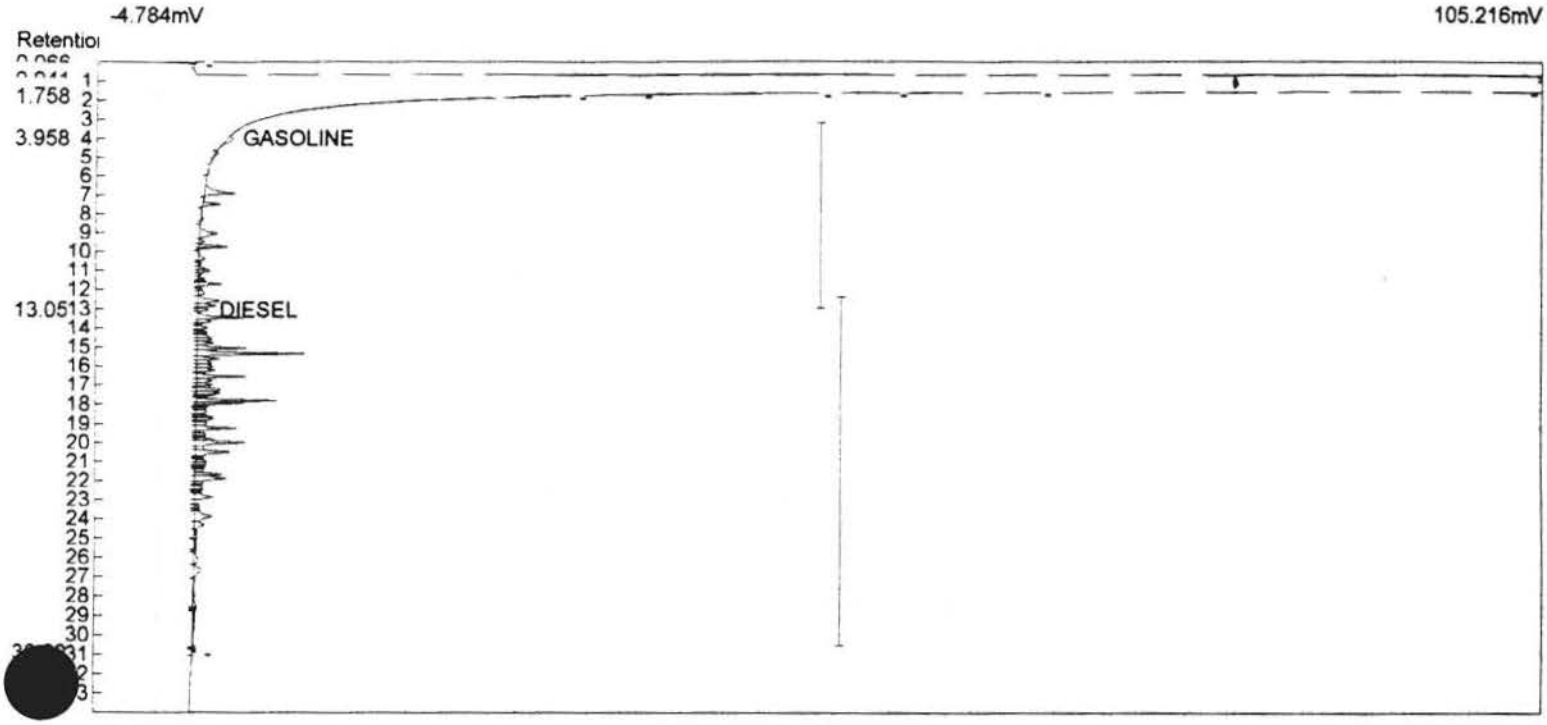
Lab name: TEG Puerto Rico
Analysis date: 08/04/1998 10:27:10
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0804FA2.CHR ()
Sample: Matrix Spike
Operator: MP



Component	Retention	Area	Internal	Units
GASOLINE	5.141	152.749	102.3446	ppm
DIESEL	12.141	1210.979	864.3588	PPM
		1363.727	966.7033	

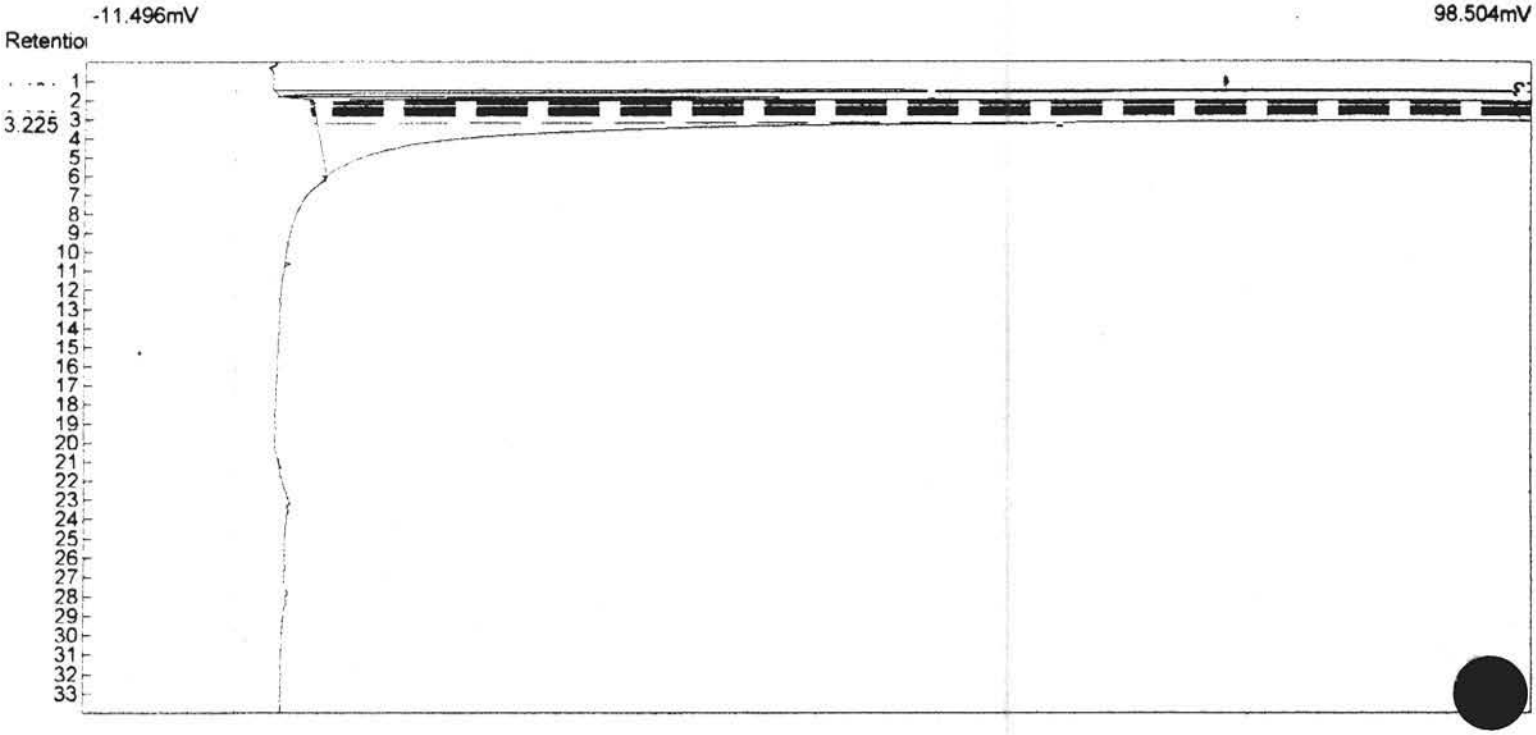
Lab name: TEG Puerto Rico
Analysis date: 08/04/1998 10:27:10
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0804FB2.CHR ()
Sample: ~~100/1000 ppm G/D Open~~ Matrix Spike Duplicate
Operator: MP

MS 8/4/98



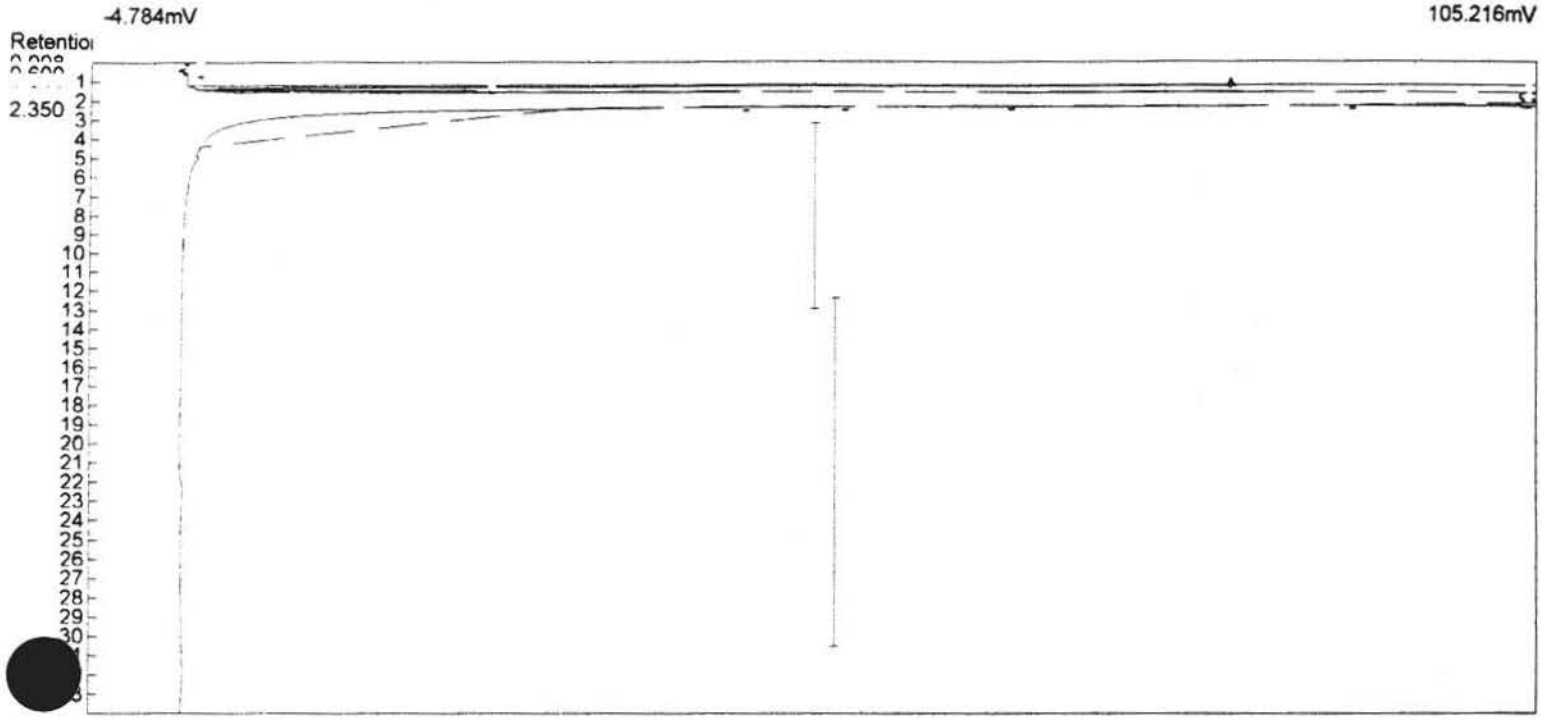
Component	Retention	Area	External	Units
GASOLINE	3.958	171.407	108.93	ppm
DIESEL	13.050	728.308	981.89	PPM
		899.715	1090.82	

Lab name: TEG Puerto Rico
Analysis date: 08/04/1998 11:06:37
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0804FA3.CHR ()
Sample: Method blank
Operator: MP



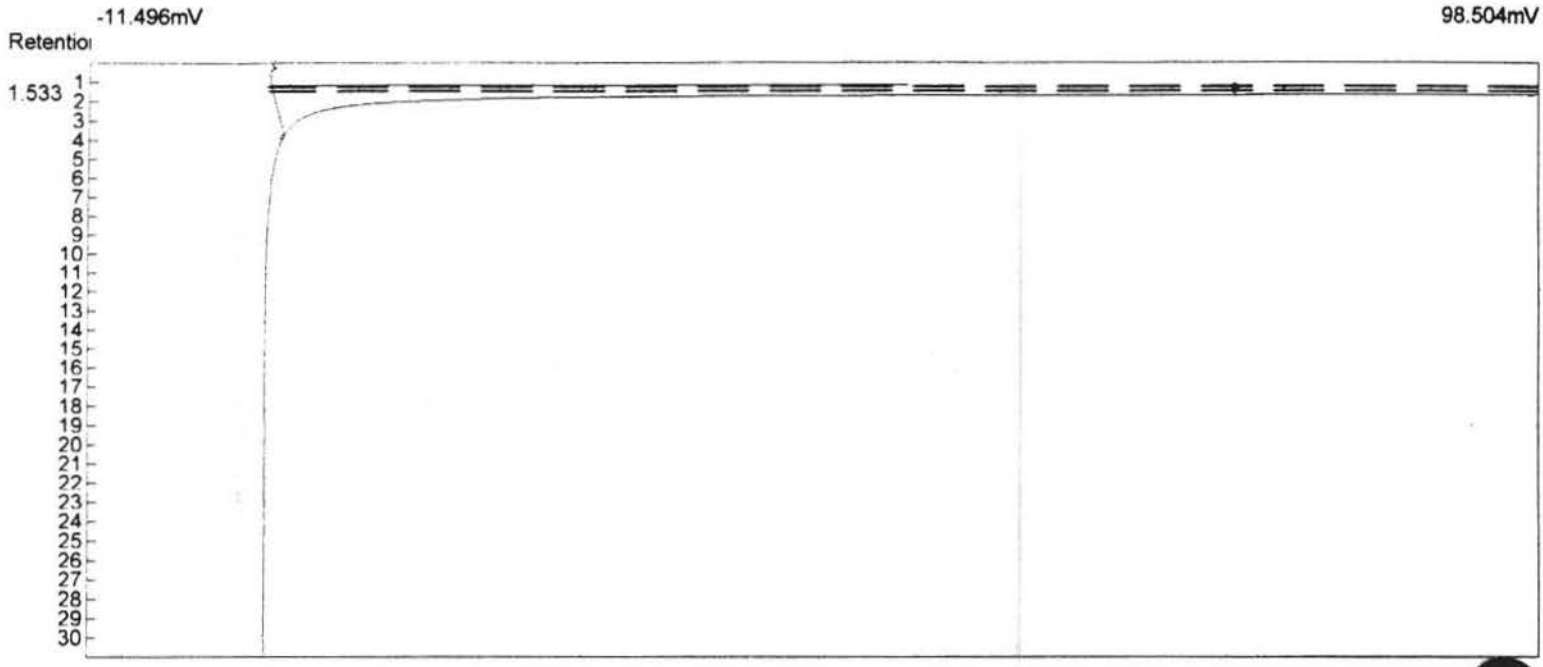
Component	Retention	Area	Internal	Units
		0.000	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 08/04/1998 11:06:37
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0804FB3.CHR ()
Sample: Method blank
Operator: MP



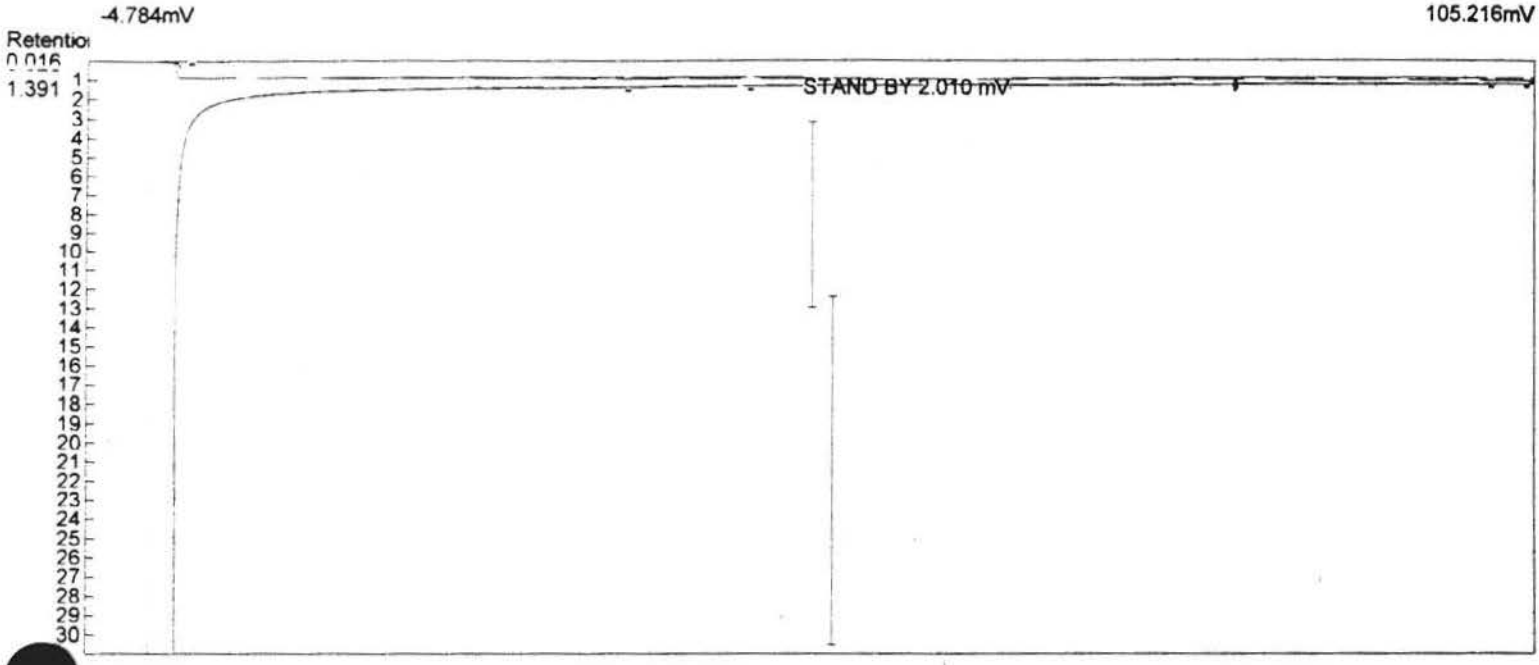
Component	Retention	Area	External	Units
		0.000	0.00	

Lab name: TEG Puerto Rico
Analysis date: 08/04/1998 13:03:05
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0804FA7.CHR ()
Sample: 2842-EB-10/0731CH2-1
Operator: MP



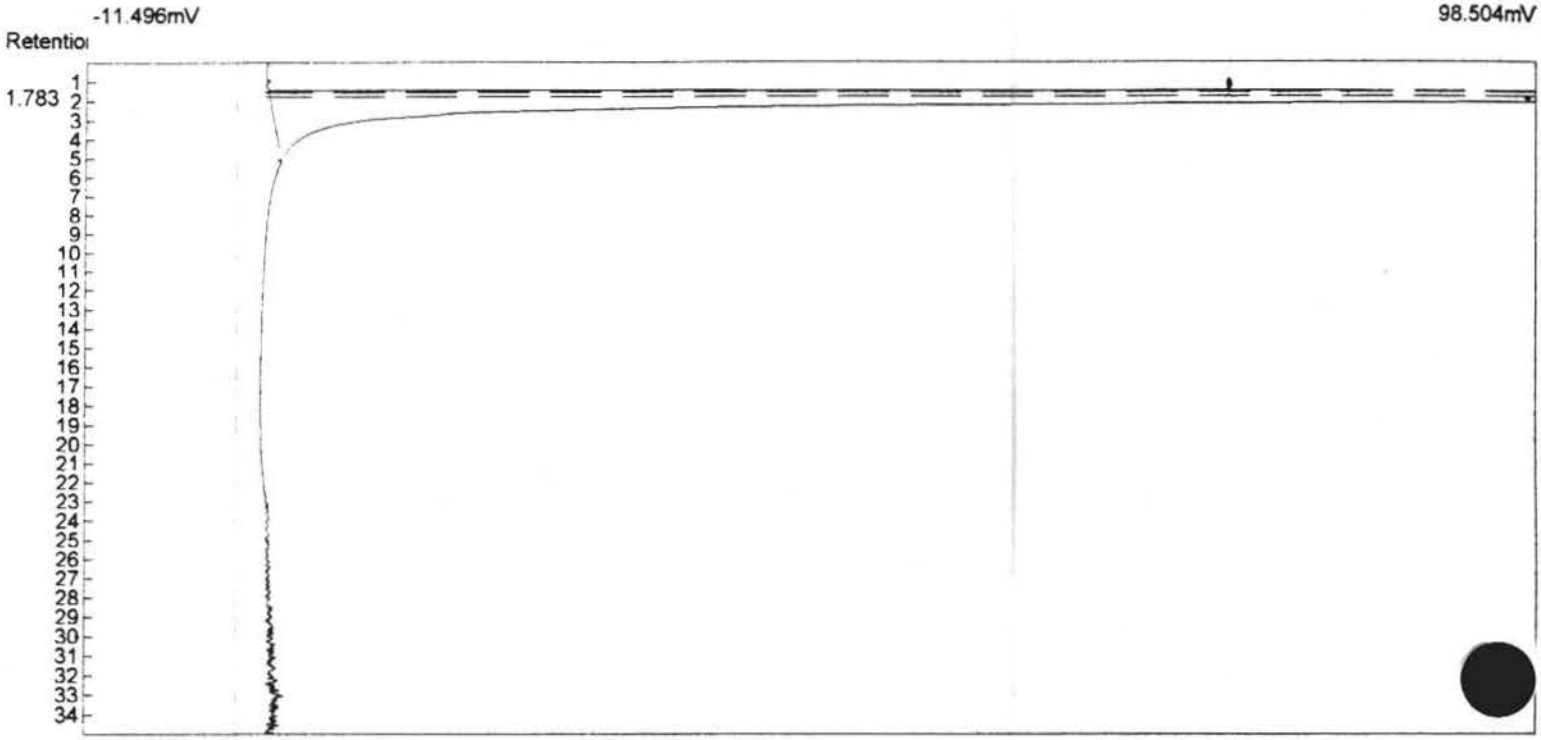
Component	Retention	Area	Internal	Units
		0.000	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 08/04/1998 13:03:05
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0804FB7.CHR ()
Sample: 2842-FB-1/0731CH2-1
Operator: MP



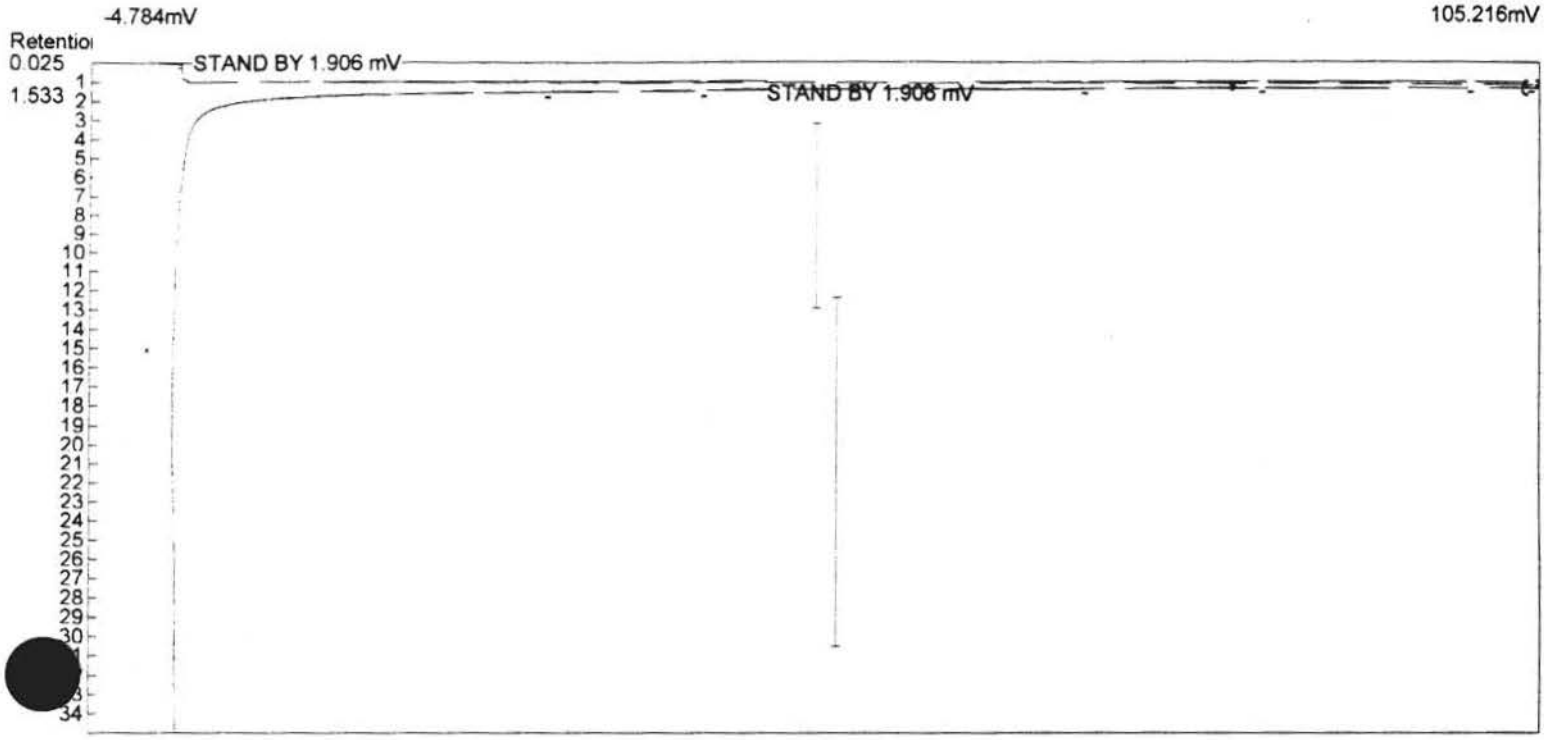
mponent	Retention	Area	External	Units
		0.000	0.00	

Lab name: TEG Puerto Rico
Analysis date: 08/04/1998 14:08:29
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0804FA9.CHR ()
Sample: 2842-MW-1/0731CH2-1
Operator: MP



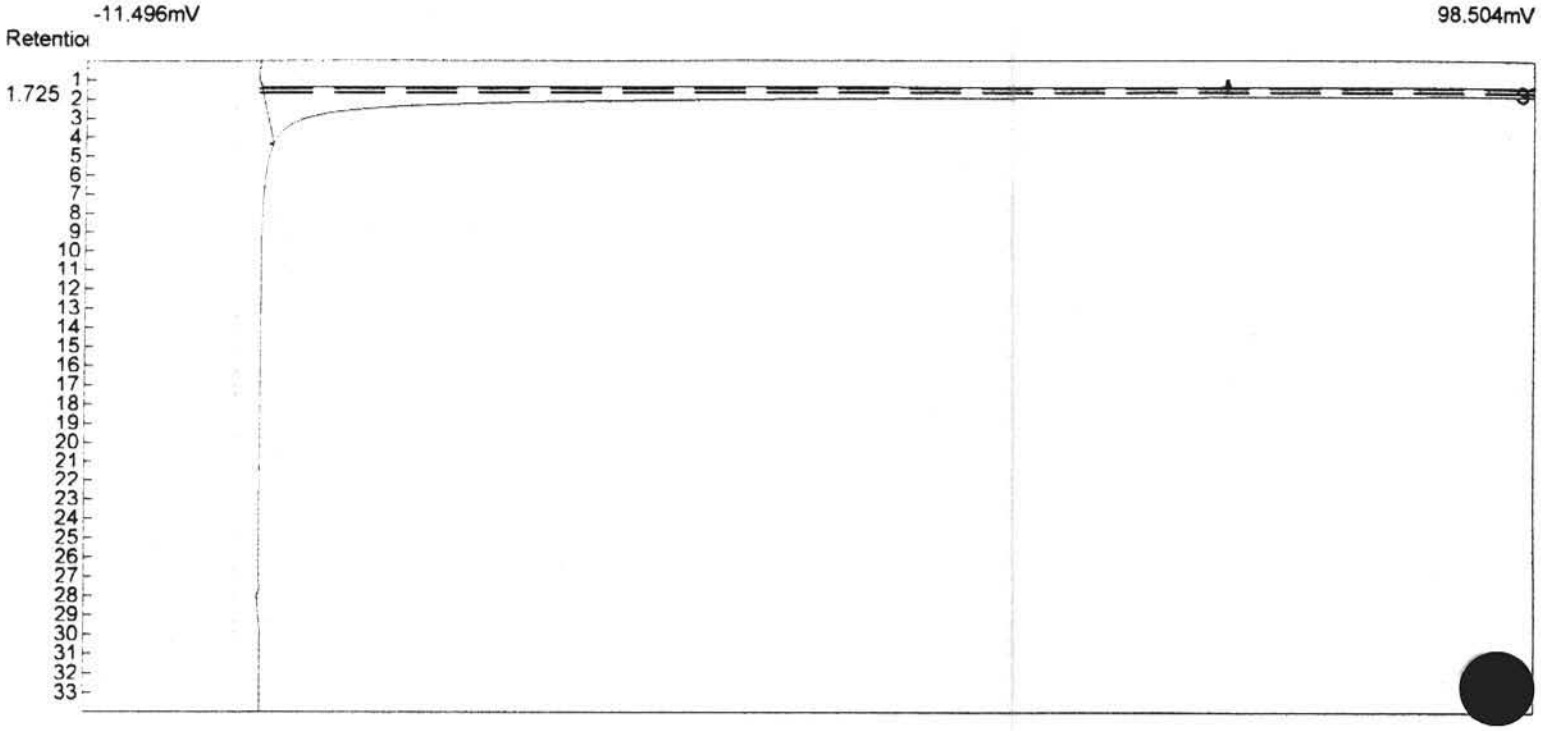
Component	Retention	Area	Internal	Units
		0.000	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 08/04/1998 14:08:29
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: C:\PEAKWIN\0804FB9.CHR ()
Sample: 2842-MW-2/0731CH2-1
Operator: MP



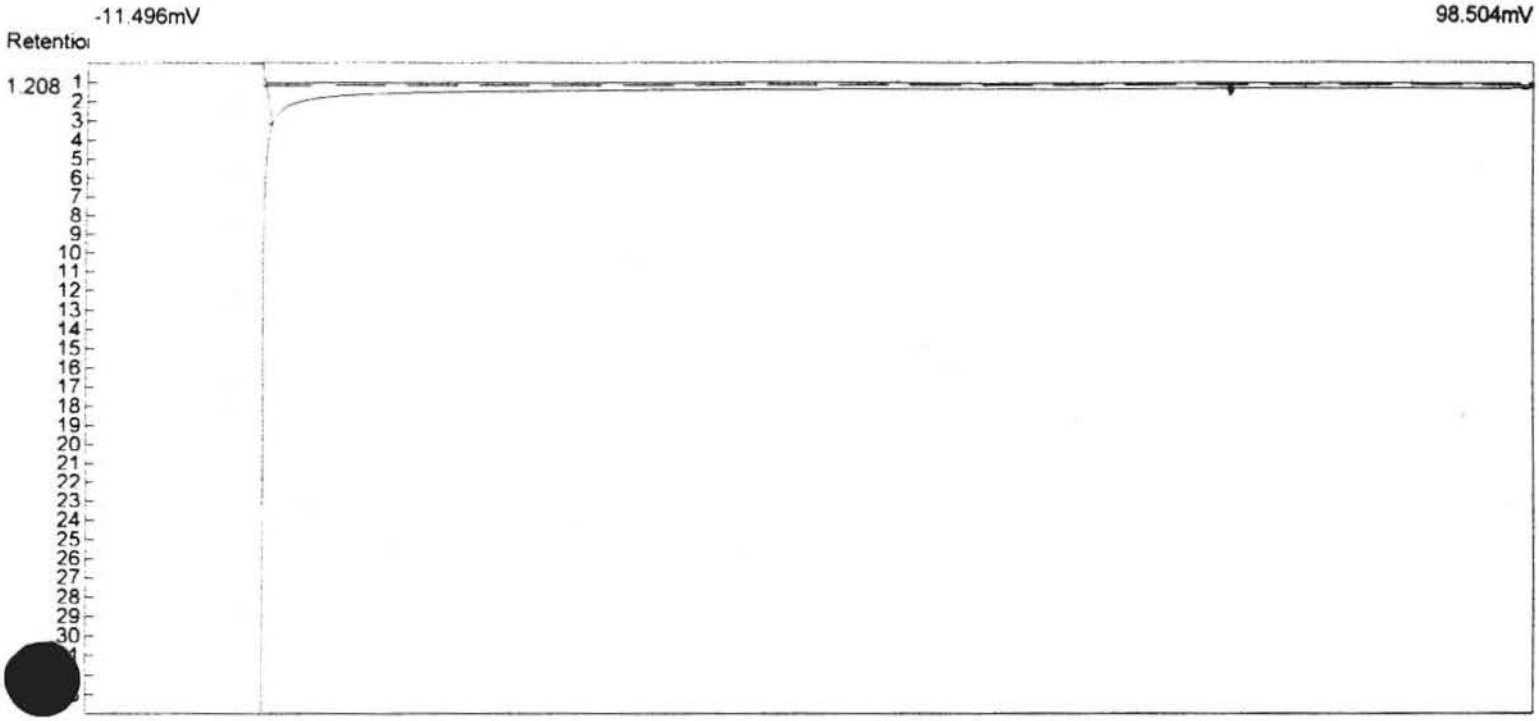
Component	Retention	Area	External	Units
		0.000	0.00	

Lab name: TEG Puerto Rico
Analysis date: 08/04/1998 14:55:37
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0804FA10.CHR ()
Sample: 2842-MW-3/0731CH2-1
Operator: MP



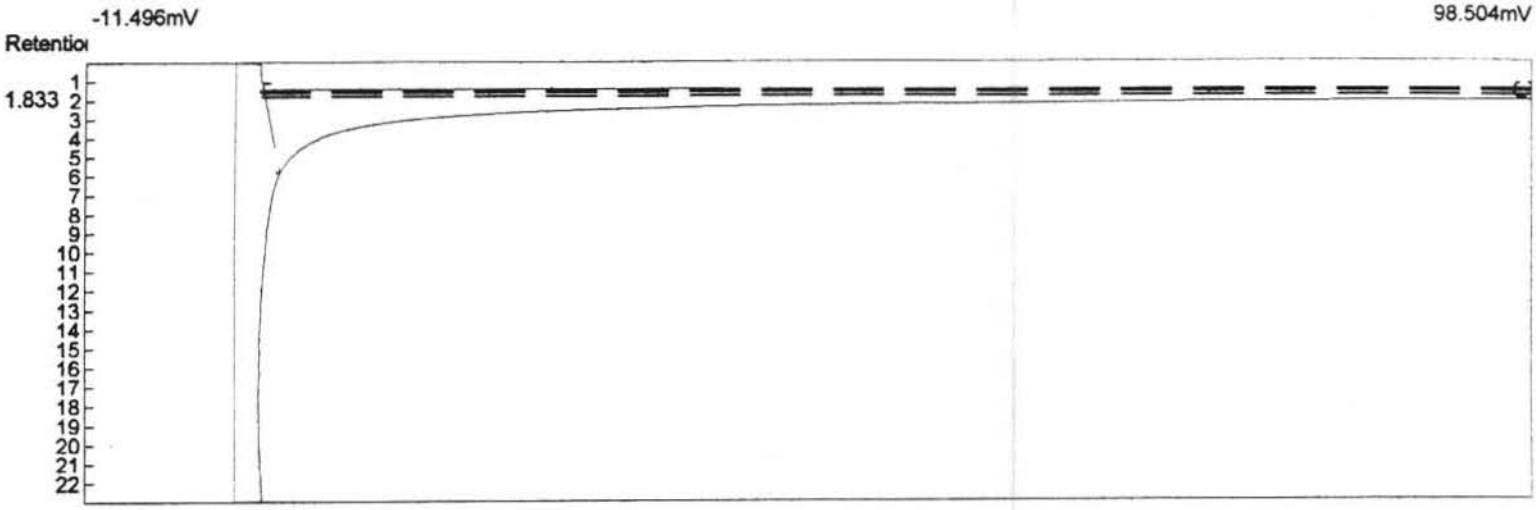
Component	Retention	Area	Internal	Units
		0.000	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 08/04/1998 14:55:37
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0804FB10.CHR ()
Sample: 2842-MW-4/0731CH2-1
Operator: MP



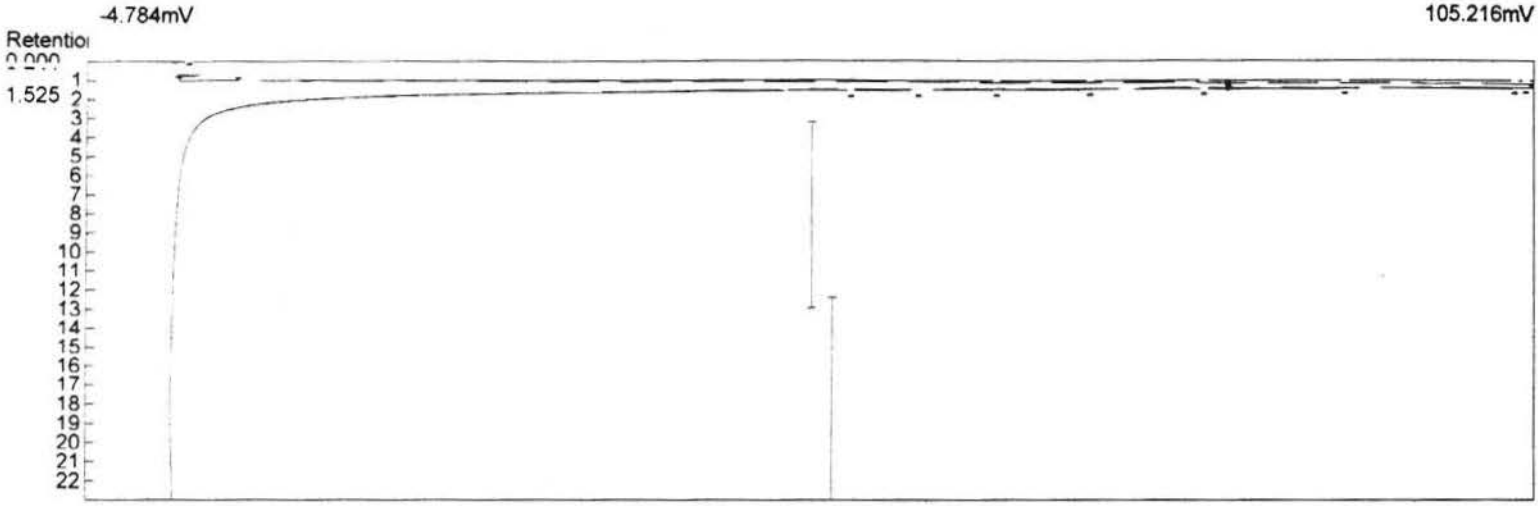
Component	Retention	Area	Internal	Units
		0.000	0.0000	

Analysis date: 08/04/1998 13:36:00
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0804FA8.CHR ()
Sample: 2842-DUPE1/0731CH2-1
Operator: MP



Component	Retention	Area	Internal	Units
		0.000	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 08/04/1998 13:36:00
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: C:\PEAKWIN\0804FB8.CHR ()
Sample: 2842-DUPE1/0731CH2-1R
Operator: MP



Component	Retention	Area	External	Units
		0.000	0.00	

teg

QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0731CH2-1
DAILY CALIBRATION DATE : 8/14/98

CH2M HILL
PROJECT NAME: SITE 2842

		INITIAL		OPENING			CLOSING		
COMPOUND	DETECTOR	RF	%RSD	AREA	RF	%DIFF	AREA	RF	%DIFF
NAPHTHALENE	FID #1 (gc4)	2.46	15.9%	267.73	2.68	8.8%	255.23	2.55	3.8%
ACENAPHTHENE	FID #1 (gc4)	6.90	6.4%	470.83	7.85	13.7%	445.15	7.42	7.5%
ACENAPHTHYLENE	FID #1 (gc4)	6.84	4.5%	231.65	7.72	12.9%	219.53	7.32	7.0%
FLUORENE	FID #1 (gc4)	6.43	4.4%	42.44	7.07	10.0%	40.48	6.75	4.9%
ANTHRACENE/PHENANTHRENE	FID #1 (gc4)	5.21	2.1%	35.13	5.85	12.4%	34.96	5.83	11.8%
FLUORANTHENE	FID #1 (gc4)	5.09	3.2%	35.06	5.84	14.8%	33.93	5.66	11.1%
PYRENE	FID #1 (gc4)	5.03	6.7%	17.00	5.67	12.7%	16.84	5.61	11.6%
BENZO (a) ANTHRACENE	FID #1 (gc4)	4.30	4.9%	25.99	4.33	0.7%	29.41	4.90	14.0%
BENZO (b/K) FLUORANTHENE	FID #1 (gc4)	9.13	1.1%	49.70	8.28	9.3%	52.71	8.78	3.8%
BENZO (a) PYRENE	FID #1 (gc4)	3.23	5.9%	10.74	3.58	10.9%	10.48	3.49	8.1%
INDENO (1,2,3-cd) PYRENE/DB(ah)ANTRACENE	FID #1 (gc4)	4.86	8.5%	40.71	4.52	6.9%	40.19	4.47	8.1%
BENZO (ghi) PERYLENE	FID #1 (gc4)	3.87	12.0%	22.71	3.79	2.2%	22.69	3.78	2.3%
NAPHTHALENE	FID #2 (gc4)	2.72	19.2%	247.94	2.48	8.8%	267.98	2.68	1.5%
ACENAPHTHENE	FID #2 (gc4)	6.70	9.8%	438.92	7.32	9.2%	455.35	7.59	13.3%
ACENAPHTHYLENE	FID #2 (gc4)	6.62	8.6%	215.99	7.20	8.8%	224.32	7.48	13.0%
FLUORENE	FID #2 (gc4)	6.40	12.2%	40.22	6.70	4.7%	40.81	6.80	6.3%
ANTHRACENE/PHENANTHRENE	FID #2 (gc4)	5.23	5.7%	34.79	5.80	10.9%	30.20	5.03	3.8%
FLUORANTHENE	FID #2 (gc4)	4.92	5.5%	32.05	5.34	8.6%	30.28	5.05	2.6%
PYRENE	FID #2 (gc4)	4.94	6.5%	14.45	4.82	2.5%	14.99	5.00	1.2%
BENZO (a) ANTHRACENE	FID #2 (gc4)	4.15	1.7%	25.13	4.19	0.9%	23.75	3.96	4.6%
BENZO (b/K) FLUORANTHENE	FID #2 (gc4)	5.51	4.5%	48.60	5.40	2.0%	35.40	5.90	7.1%
BENZO (a) PYRENE	FID #2 (gc4)	3.28	7.8%	10.77	3.59	9.4%	9.28	3.09	5.7%
INDENO (1,2,3-cd) PYRENE/DB(ah)ANTRACENE	FID #2 (gc4)	4.95	9.2%	37.94	4.22	14.8%	42.26	4.70	5.1%
BENZO (ghi) PERYLENE	FID #2 (gc4)	3.77	9.7%	24.82	4.14	9.7%	23.00	3.83	1.7%

CALIB RANGE - RANGE OF CALIBRATION CURVE IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 20% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (809) 720-0373 FAX 789-3858

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QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0731CH2-1

CH2M HILL

DATE : 8/14/98

PROJECT NAME: SITE 2842

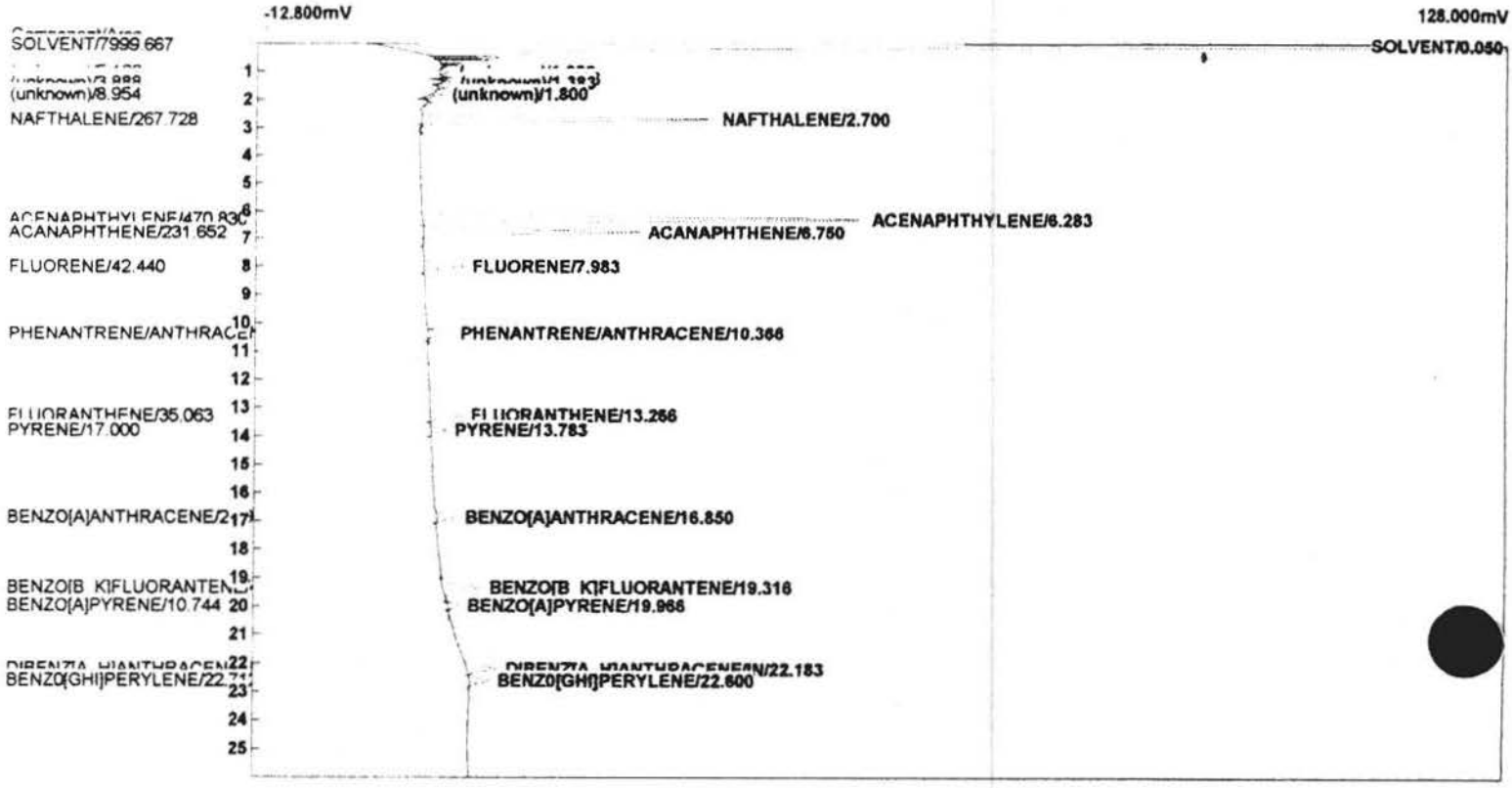
COMPOUND	SPK CONC (ppm)	MS CONC (ppm)	%REC MS	MSD CONC (ppm)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
ACENAPHTHENE	40	41	103%	38	95%	8%	15%	80% - 135%
ACENAPHTHYLENE	80	83	104%	77	96%	8%	15%	80% - 135%
FLUORENE	8.0	8.0	100%	7.3	92%	9%	15%	80% - 135%
ANTHRACENE/PHENANTHRENE	8.0	8.6	107%	7.9	98%	9%	15%	80% - 135%
FLUORANTHENE	8.0	8.0	100%	8.0	100%	0%	15%	80% - 135%
PYRENE	4.0	4.1	102%	3.8	96%	6%	15%	80% - 135%
BENZO (a) ANTHRACENE	8.0	8.3	103%	8.4	105%	2%	15%	80% - 135%
BENZO (a) PYRENE	4.0	4.6	114%	4.4	109%	4%	15%	80% - 135%
INDENO (1,2,3-cd) PYRENE/DB(ah)ANTRACENE	8.0	8.6	107%	8.8	110%	3%	15%	80% - 135%
BENZO (ghi) PERYLENE	8.0	7.0	88%	7.1	88%	1%	15%	80% - 135%

ppm = PARTS PER MILLION
SPK CONC - CONCENTRATION SPIKED INTO MATRIX
MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE
% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX
RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

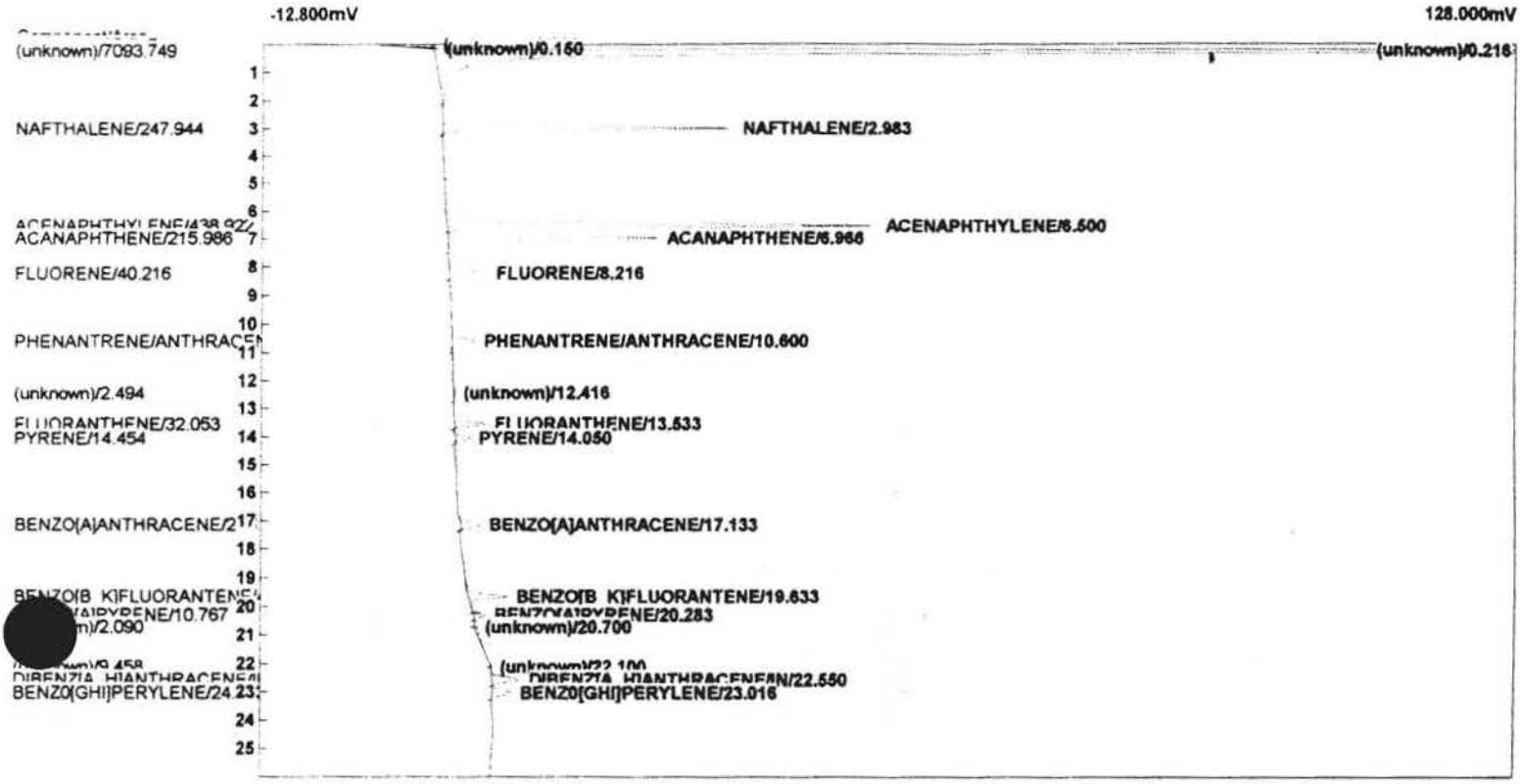
TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (809) 720-0329 FAX 789-3858

Lab name: TEG PUERTO RICO MOBILE
Analysis date: 08/14/1998 10:13:49
Method: EPA 8100
Lab ID: GC-4
Description: CHANNEL 3 - FID 1
Column: XTI-5 30M,ID.53mm,1.5um
Carrier: HELIUM 1 kg/cm3
Data file: 0814AF1.chr ()
Sample: PAH OPEN STD
Operator: PEDRAZA



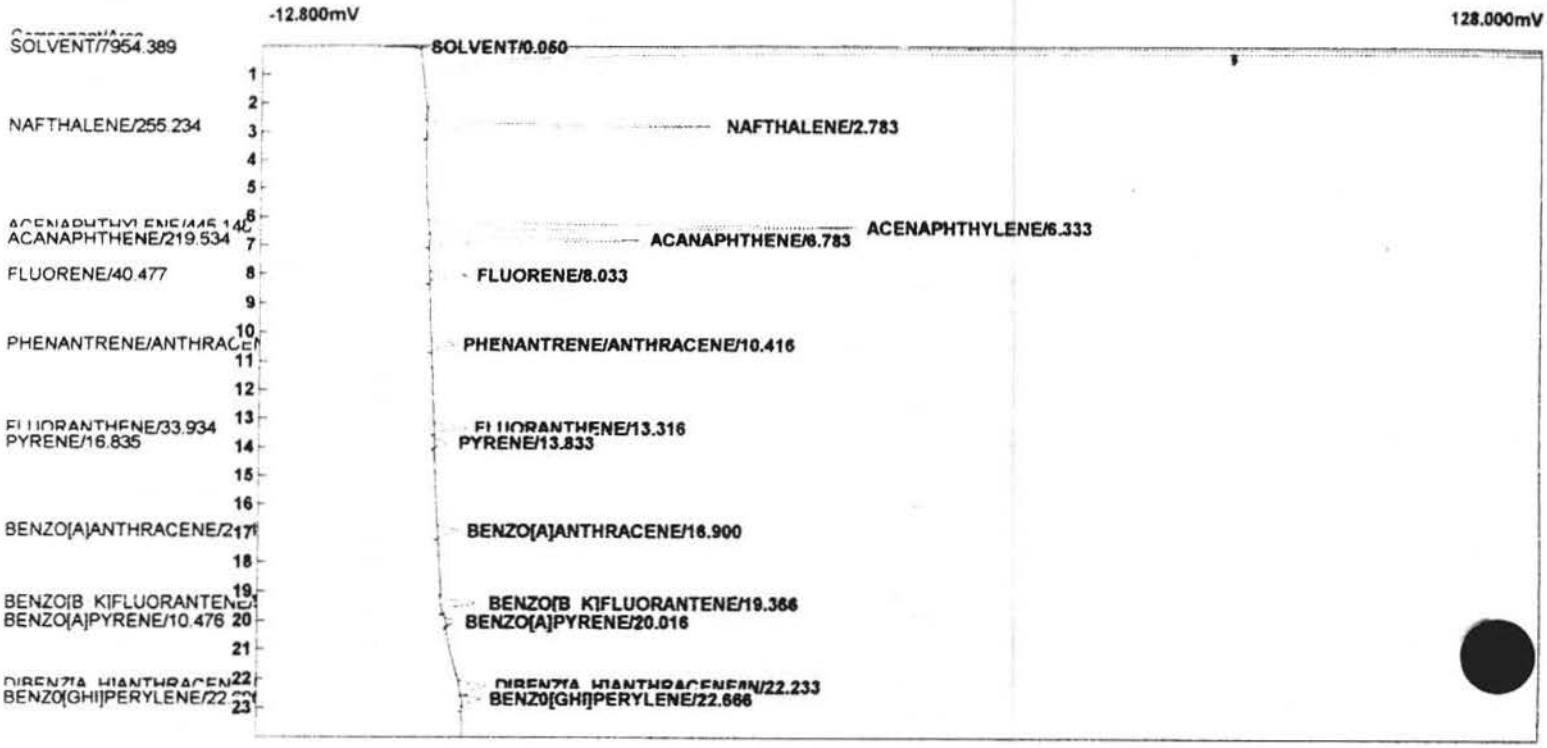
Component	Retention	Area	External	Internal	Units
SOLVENT	0.050	7999.667	0.00	0.0000	%
NAFTHALENE	2.700	267.728	108.39	108.3919	ppm
ACENAPHTHYLENE	6.283	470.830	68.24	68.2362	ppm
ACANAPHTHENE	6.750	231.652	33.87	33.8673	ppm
FLUORENE	7.983	42.440	6.60	6.6003	ppm
PHENANTRENE/ANTHRACENE	10.366	35.128	6.74	6.7424	ppm
FLUORANTHENE	13.266	35.063	6.70	6.7042	ppm
PYRENE	13.783	17.000	3.38	3.3797	ppm
BENZO[A]ANTHRACENE	16.850	25.986	6.04	6.0433	ppm
BENZO[B_K]FLUORANTENE	19.316	49.703	5.44	5.4439	ppm
BENZO[A]PYRENE	19.966	10.744	3.33	3.3262	ppm
DIBENZ[A_H]ANTHRACENE/I	22.183	40.708	8.38	8.3761	ppm
BENZO[GHI]PERYLENE	22.600	22.712	5.87	5.8687	ppm
		9249.361	262.98	262.9802	

Lab name: TEG PUERTO RICO MOBILE
Analysis date: 08/14/1998 10:13:49
Method: EPA 8100
Lab ID: GC-4
Description: CHANNEL 4 - FID 2
Column: XTI-5 30M,ID.53mm,1.5um
Carrier: HELIUM 1 kg/cm3
Data file: 0814BF1.CHR ()
Sample: PAH OPEN STD
Operator: PEDRAZA



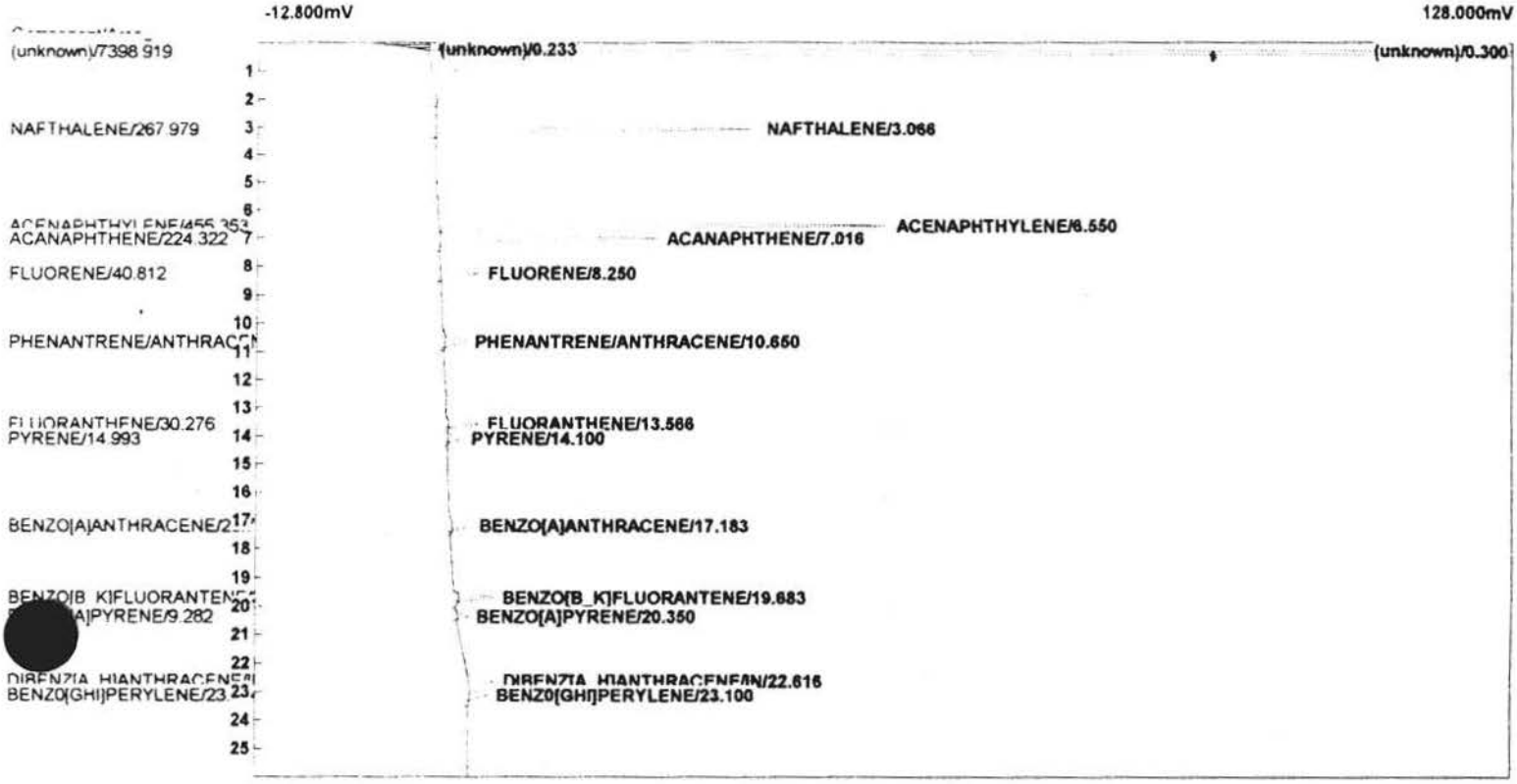
Component	Number	Retention	Area	External	Internal	Units
NAFTHALENE	1	2.983	247.944	91.16	91.1559	ppm
ACENAPHTHYLENE	3	6.500	438.922	65.51	65.5107	ppm
ACANAPHTHENE	4	6.966	215.986	32.63	32.6263	ppm
FLUORENE	5	8.216	40.216	6.28	6.2838	ppm
PHENANTRENE/ANTHRACENE	6	10.600	34.786	6.65	6.6512	ppm
FLUORANTHENE	8	13.533	32.053	6.51	6.5148	ppm
PYRENE	9	14.050	14.454	2.93	2.9259	ppm
BENZO[A]ANTHRACENE	10	17.133	25.134	6.06	6.0564	ppm
BENZO[B_K]FLUORANTENE	12	19.633	48.602	8.82	8.8207	ppm
BENZO[A]PYRENE	13	20.283	10.767	3.28	3.2826	ppm
DIBENZ[A_H]ANTHRACENE/IN	14	22.550	37.940	7.66	7.6646	ppm
BENZO[GHI]PERYLENE	15	23.016	24.823	6.58	6.5844	ppm
	12		1171.627	244.08	244.0773	

Lab name: TEG PUERTO RICO MOBILE
Analysis date: 08/14/1998 16:38:06
Method: EPA 8100
Lab ID: GC-4
Description: CHANNEL 3 - FID 1
Column: XTI-5 30M,ID.53mm,1.5um
Carrier: HELIUM 1 kg/cm3
Data file: 0814Af8.CHR ()
Sample: PAH CLOSE STD
Operator: PEDRAZA



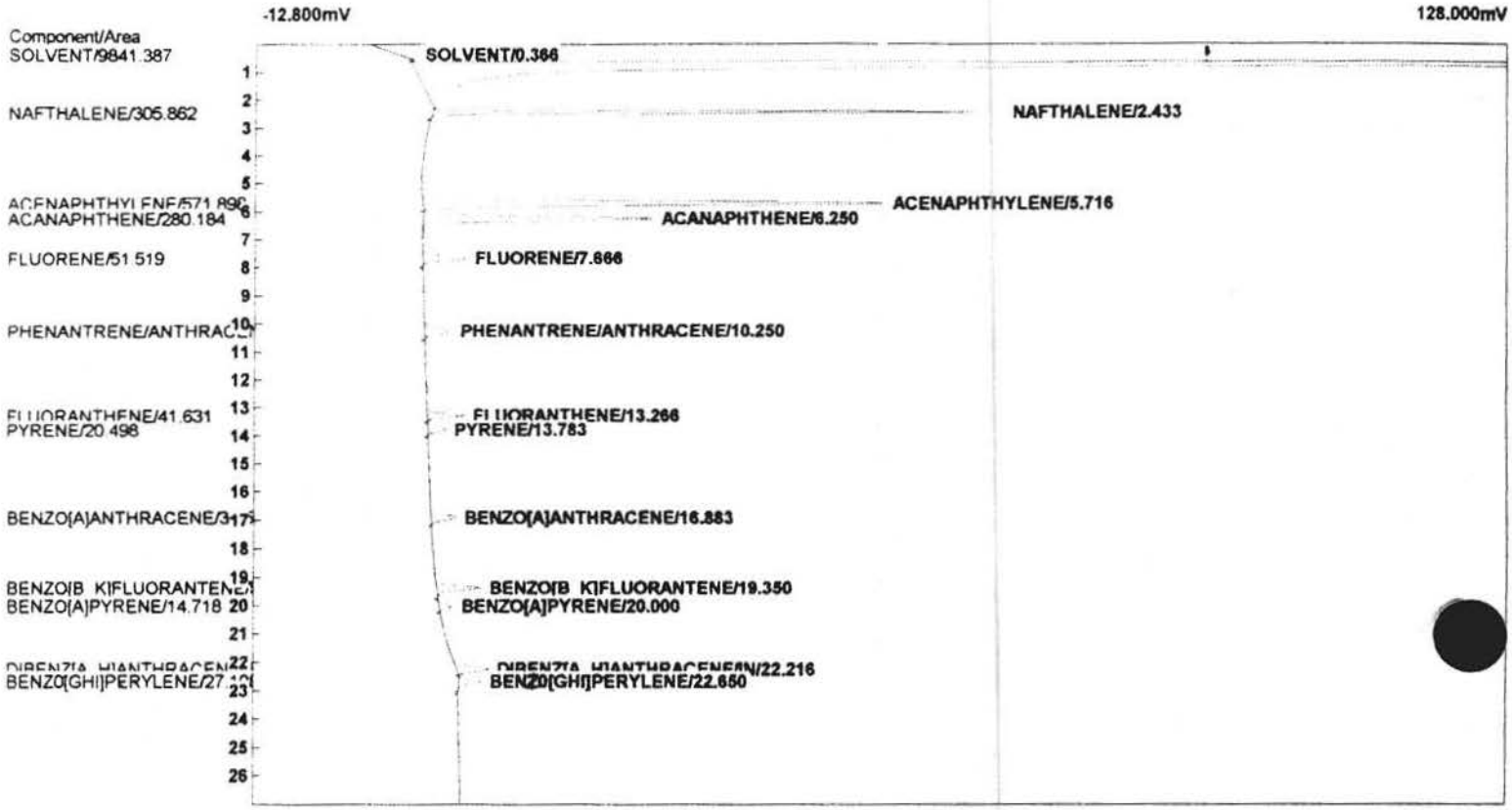
Component	Number	Retention	Area	External	Internal	Units
SOLVENT	1	0.050	7954.389	0.00	0.0000	%
NAFTHALENE	1	2.783	255.234	103.33	103.3336	ppm
ACENAPHTHYLENE	3	6.333	445.148	64.51	64.5142	ppm
ACANAPHTHENE	4	6.783	219.534	32.10	32.0956	ppm
FLUORENE	5	8.033	40.477	6.30	6.2950	ppm
PHENANTRENE/ANTHRACENE	6	10.416	34.956	6.71	6.7094	ppm
FLUORANTHENE	8	13.316	33.934	6.49	6.4883	ppm
PYRENE	9	13.833	16.835	3.35	3.3469	ppm
BENZO[A]ANTHRACENE	10	16.900	29.412	6.84	6.8400	ppm
BENZO[B_K]FLUORANTENE	12	19.366	52.705	5.77	5.7727	ppm
BENZO[A]PYRENE	13	20.016	10.476	3.24	3.2433	ppm
DIBENZ[A_H]ANTHRACENE/IN	14	22.233	40.193	8.27	8.2702	ppm
BENZO[GHI]PERYLENE	15	22.666	22.686	5.86	5.8620	ppm
	13		9155.979	252.77	252.7714	

Lab name: TEG PUERTO RICO MOBILE
Analysis date: 08/14/1998 16:38:06
Method: EPA 8100
Lab ID: GC-4
Description: CHANNEL 4 - FID 2
Column: XTI-5 30M,ID.53mm,1.5um
Carrier: HELIUM 1 kg/cm3
Data file: C:\PEAKW95\0814BF8.CHR ()
Sample: PAH CLOSE STD
Operator: PEDRAZA



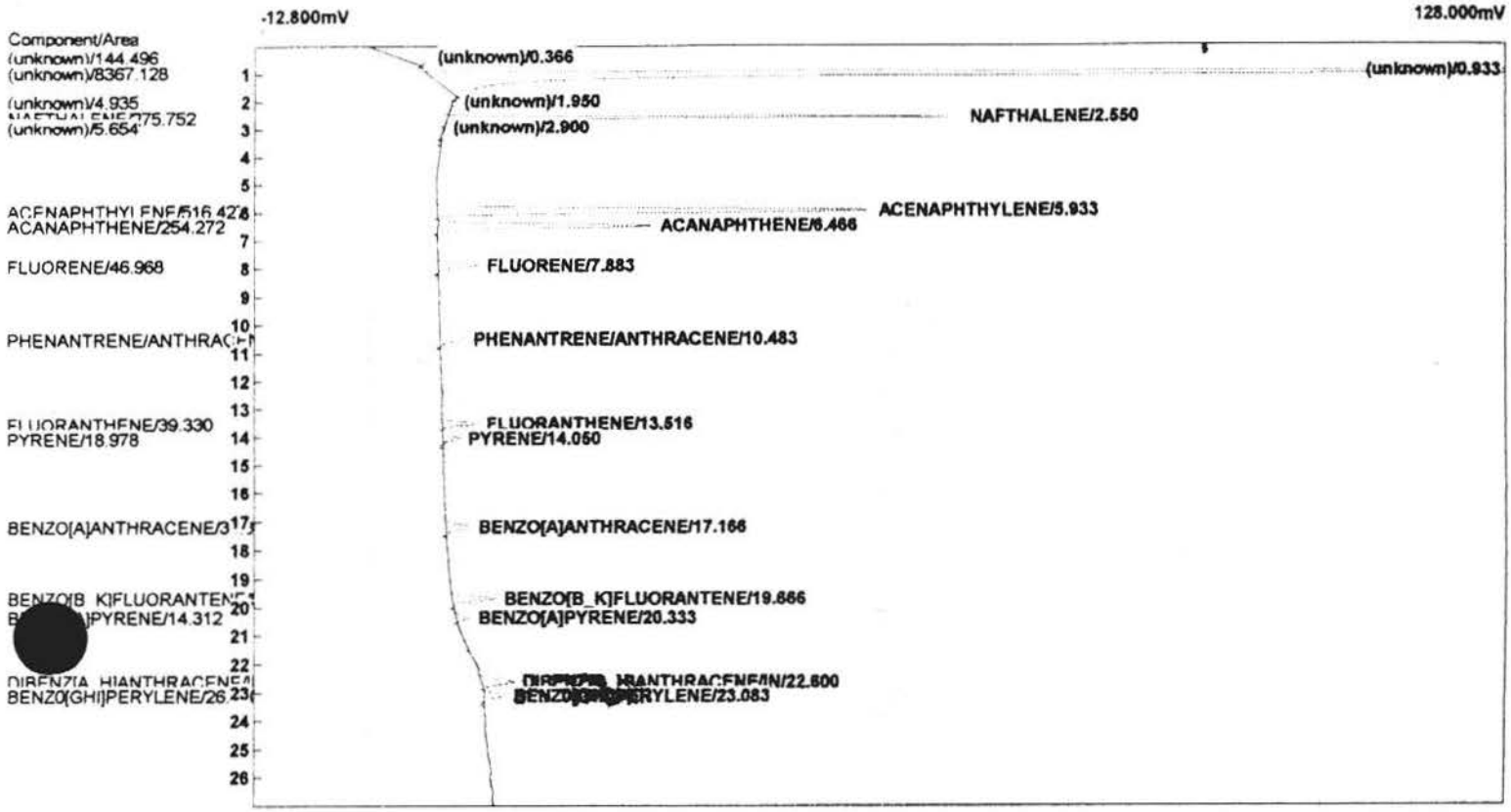
Component	Number	Retention	Area	External	Internal	Units
NAFTHALENE	1	3.066	267.979	98.52	98.5217	ppm
ACENAPHTHYLENE	3	6.550	455.353	67.96	67.9631	ppm
ACANAPHTHENE	4	7.016	224.322	33.89	33.8855	ppm
FLUORENE	5	8.250	40.812	6.38	6.3769	ppm
PHENANTRENE/ANTHRACENE	6	10.650	30.201	5.77	5.7746	ppm
FLUORANTHENE	8	13.566	30.276	6.15	6.1537	ppm
PYRENE	9	14.100	14.993	3.04	3.0350	ppm
BENZO[A]ANTHRACENE	10	17.183	23.754	5.72	5.7239	ppm
BENZO[B_K]FLUORANTENE	12	19.683	35.395	6.42	6.4238	ppm
BENZO[A]PYRENE	13	20.350	9.282	2.83	2.8299	ppm
DIBENZ[A_H]ANTHRACENE/IN	14	22.616	42.259	8.54	8.5372	ppm
BENZO[GHI]PERYLENE	15	23.100	23.004	6.10	6.1019	ppm
	12		1197.630	251.33	251.3270	

Lab name: TEG PUERTO RICO MOBILE
Analysis date: 08/14/1998 15:38:42
Method: EPA 8100
Lab ID: GC-4
Description: CHANNEL 3 - FID 1
Column: XTI-5 30M,ID.53mm,1.5um
Carrier: HELIUM 1 kg/cm3
Data file: 0814Af7.CHR ()
Sample: matrix spike
Operator: PEDRAZA



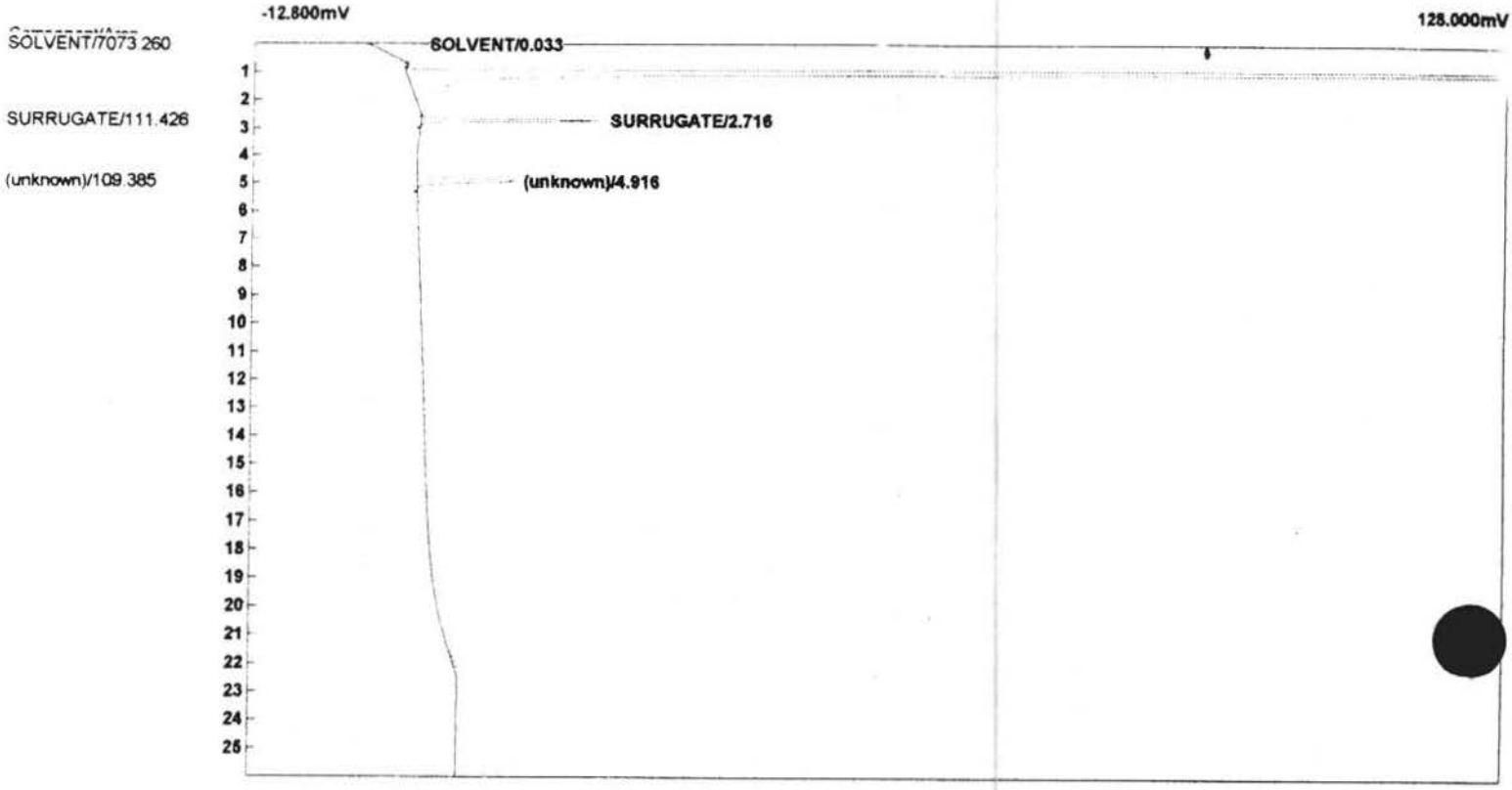
Component	Number	Retention	Area	External	Internal	Units
SOLVENT	1	0.366	9841.387	0.00	0.0000	%
NAFTHALENE	1	2.433	305.862	123.83	123.8308	ppm
ACENAPHTHYLENE	3	5.716	571.898	82.88	82.8838	ppm
ACANAPHTHENE	4	6.250	280.184	40.96	40.9626	ppm
FLUORENE	5	7.666	51.519	8.01	8.0123	ppm
PHENANTRENE/ANTHRACENE	6	10.250	44.766	8.59	8.5923	ppm
FLUORANTHENE	8	13.266	41.631	7.96	7.9600	ppm
PYRENE	9	13.783	20.498	4.08	4.0751	ppm
BENZO[A]ANTHRACENE	10	16.883	35.560	8.27	8.2698	ppm
BENZO[B_K]FLUORANTENE	12	19.350	53.044	5.81	5.8099	ppm
BENZO[A]PYRENE	13	20.000	14.718	4.56	4.5567	ppm
DIBENZ[A_H]ANTHRACENE/IN	14	22.216	41.734	8.59	8.5872	ppm
BENZO[GHI]PERYLENE	15	22.650	27.108	7.00	7.0047	ppm
	13		11329.909	310.55	310.5451	

Lab name: TEG PUERTO RICO MOBILE
Analysis date: 08/14/1998 15:38:42
Method: EPA 8100
Lab ID: GC-4
Description: CHANNEL 4 - FID 2
Column: XTI-5 30M,ID.53mm,1.5um
Carrier: HELIUM 1 kg/cm3
Data file: C:\PEAKW95\0814BF7.CHR ()
Sample: matrix spike duplicate
Operator: PEDRAZA



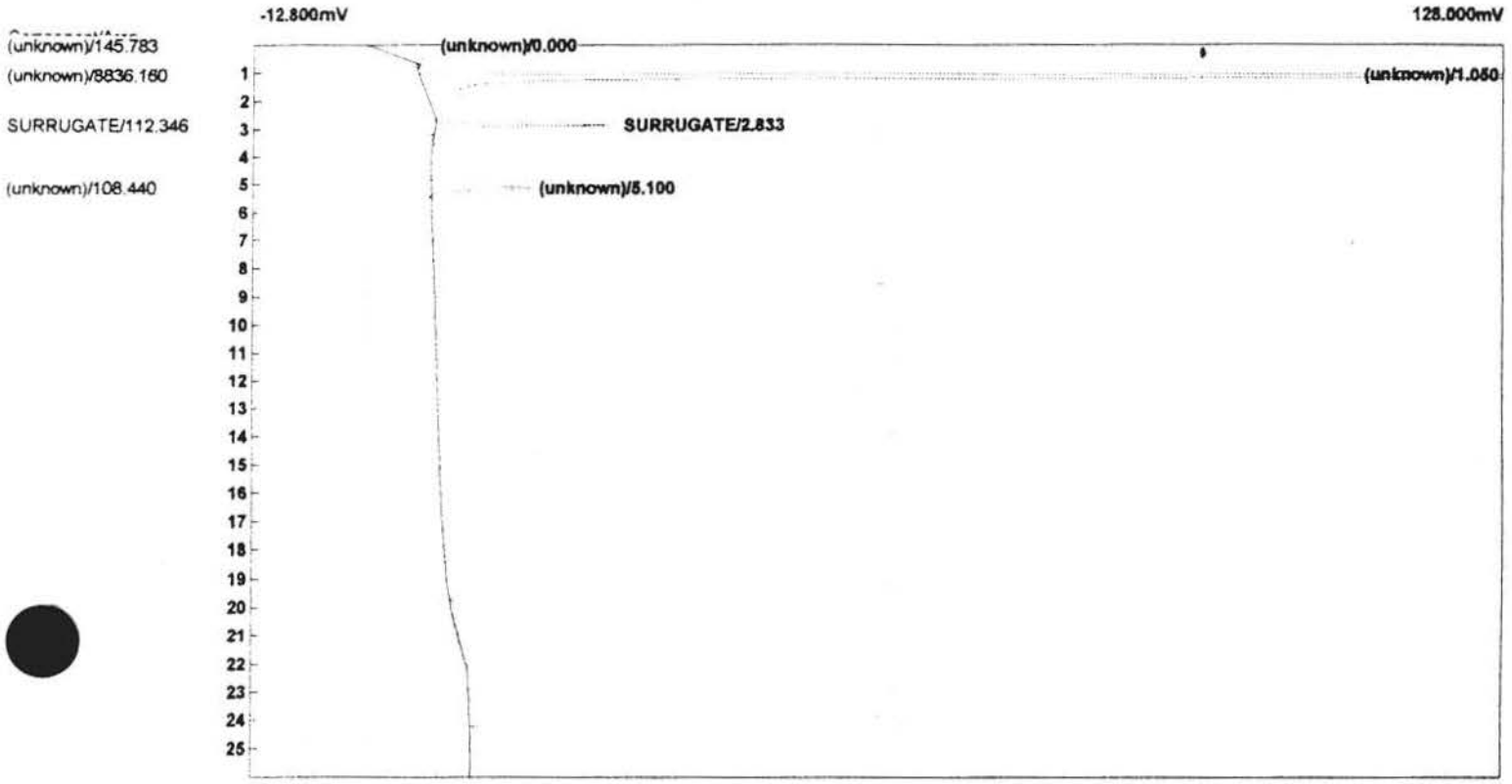
Component	Number	Retention	Area	External	Internal	Units
NAFTHALENE	1	2.550	275.752	101.38	101.3794	ppm
ACENAPHTHYLENE	3	5.933	516.427	77.08	77.0787	ppm
ACANAPHTHENE	4	6.466	254.272	38.41	38.4097	ppm
FLUORENE	5	7.883	46.968	7.34	7.3388	ppm
PHENANTRENE/ANTHRACENE	6	10.483	41.054	7.85	7.8497	ppm
FLUORANTHENE	8	13.516	39.330	7.99	7.9939	ppm
PYRENE	9	14.050	18.978	3.84	3.8417	ppm
BENZO[A]ANTHRACENE	10	17.166	34.858	8.40	8.3995	ppm
BENZO[B_K]FLUORANTENE	12	19.666	51.784	9.40	9.3982	ppm
BENZO[A]PYRENE	13	20.333	14.312	4.36	4.3634	ppm
DIBENZ[A_H]ANTHRACENE/IN	14	22.600	43.662	8.82	8.8206	ppm
BENZO[GHI]PERYLENE	15	23.083	26.580	7.05	7.0504	ppm
	12		1363.977	281.92	281.9239	

Lab name: TEG PUERTO RICO MOBILE
Analysis date: 08/14/1998 12:20:46
Method: EPA 8100
Lab ID: GC-4
Description: CHANNEL 3 - FID 1
Column: XTI-5 30M,ID.53mm,1.5um
Carrier: HELIUM 1 kg/cm3
Data file: 0814AF2.chr ()
Sample: METHOD BLANK
Operator: PEDRAZA



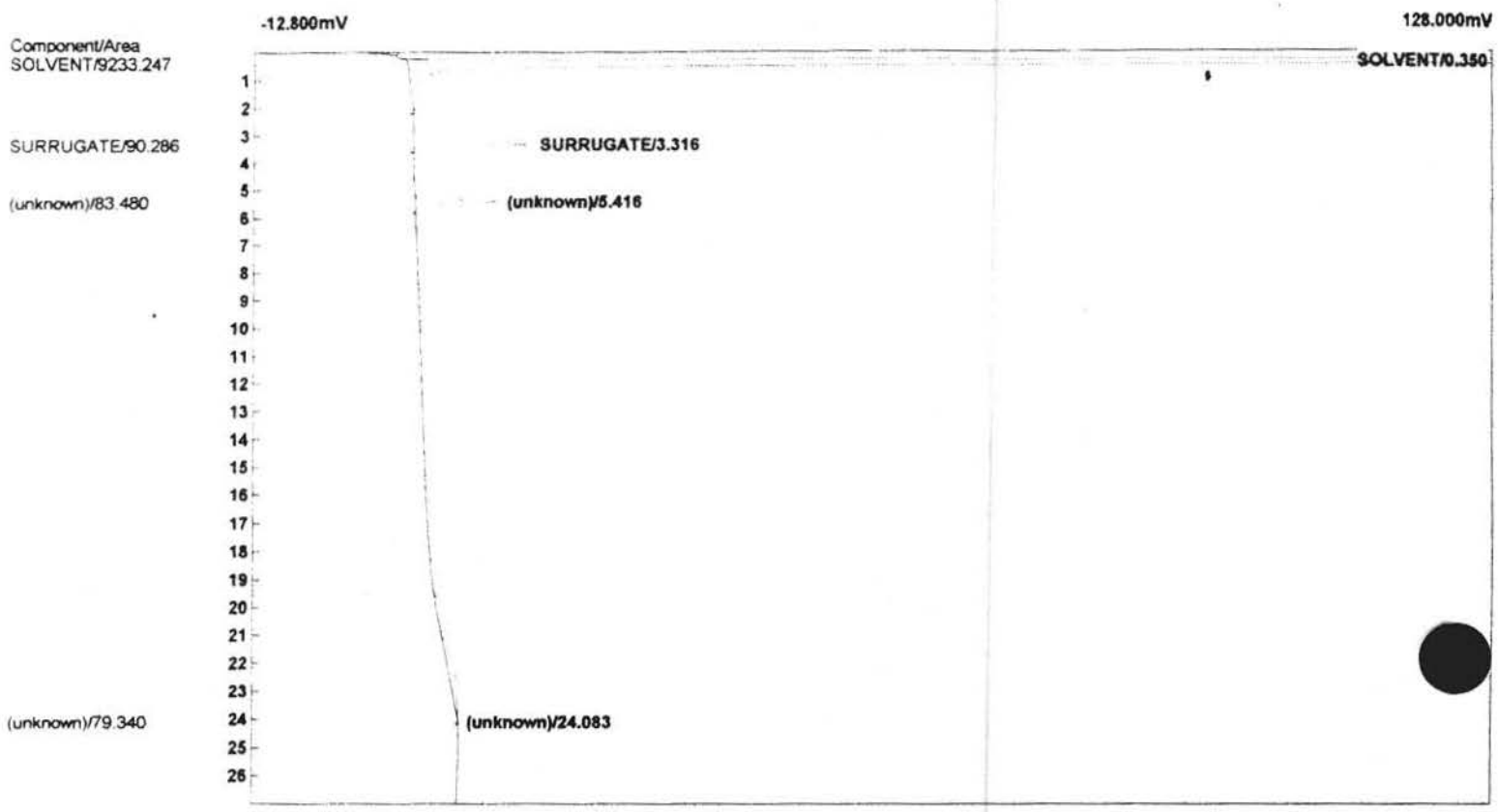
Component	Retention	Area	External	Internal	Units
SOLVENT	0.033	7073.260	0.00	0.0000	%
SURRUGATE	2.716	111.426	11.67	11.6676	ppm
		7184.686	11.67	11.6676	

Lab name: TEG PUERTO RICO MOBILE
Analysis date: 08/14/1998 12:20:46
Method: EPA 8100
Lab ID: GC-4
Description: CHANNEL 4 - FID 2
Column: XTI-5 30M,ID.53mm,1.5um
Carrier: HELIUM 1 kg/cm3
Data file: 0814BF2.CHR ()
Sample: METHOD BLANK
Operator: PEDRAZA



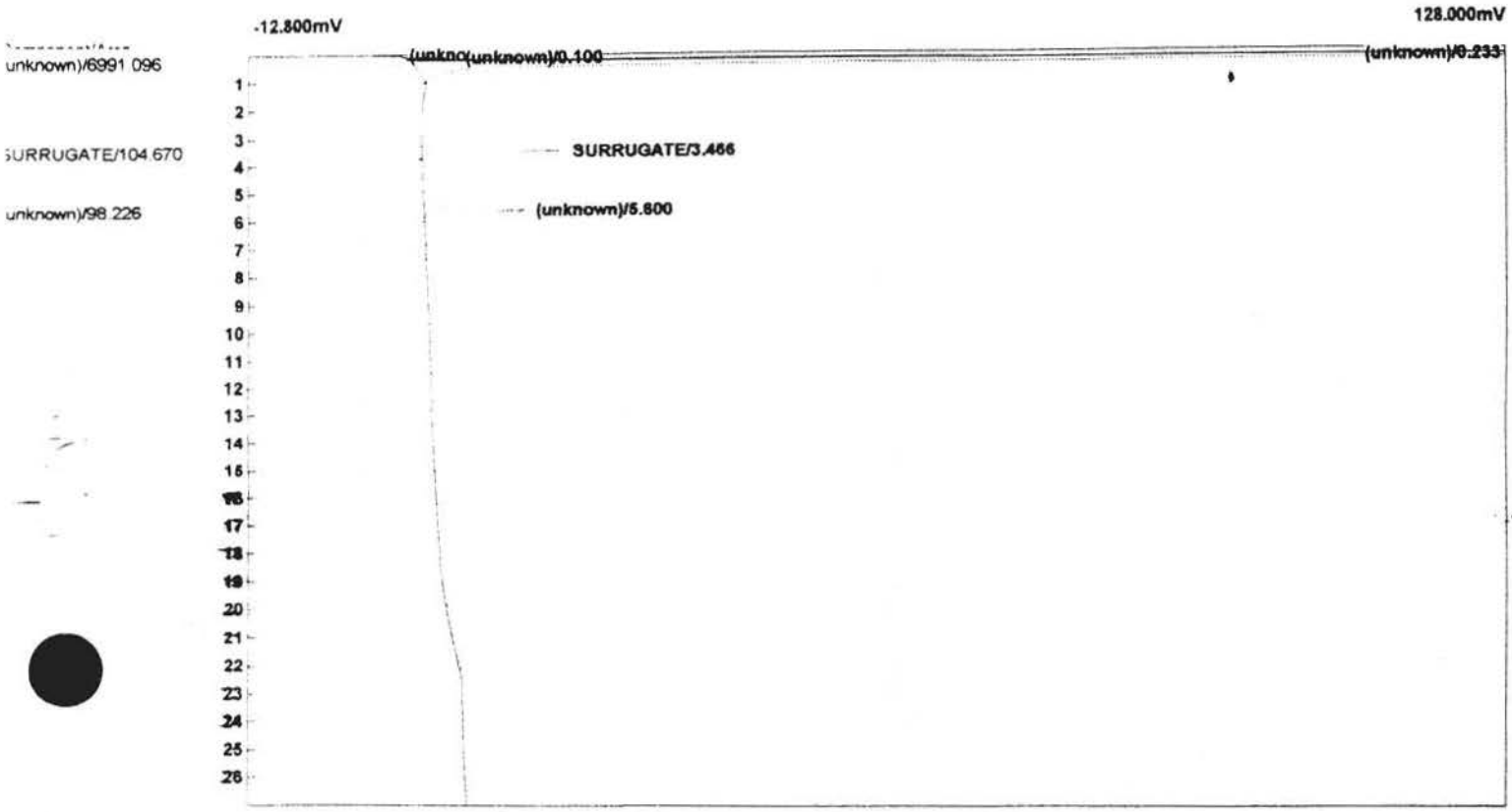
Component	Retention	Area	External	Internal	Units
SURRUGATE	2.833	112.346	11.19	11.1898	ppm
		112.346	11.19	11.1898	

Lab name: TEG PUERTO RICO MOBILE
Analysis date: 08/14/1998 12:58:35
Method: EPA 8100
Lab ID: GC-4
Description: CHANNEL 3 - FID 1
Column: XTI-5 30M,ID.53mm,1.5um
Carrier: HELIUM 1 kg/cm3
Data file: 0814AF3.CHR ()
Sample: 2842-FB-1/0731CH2-1
Operator: PEDRAZA



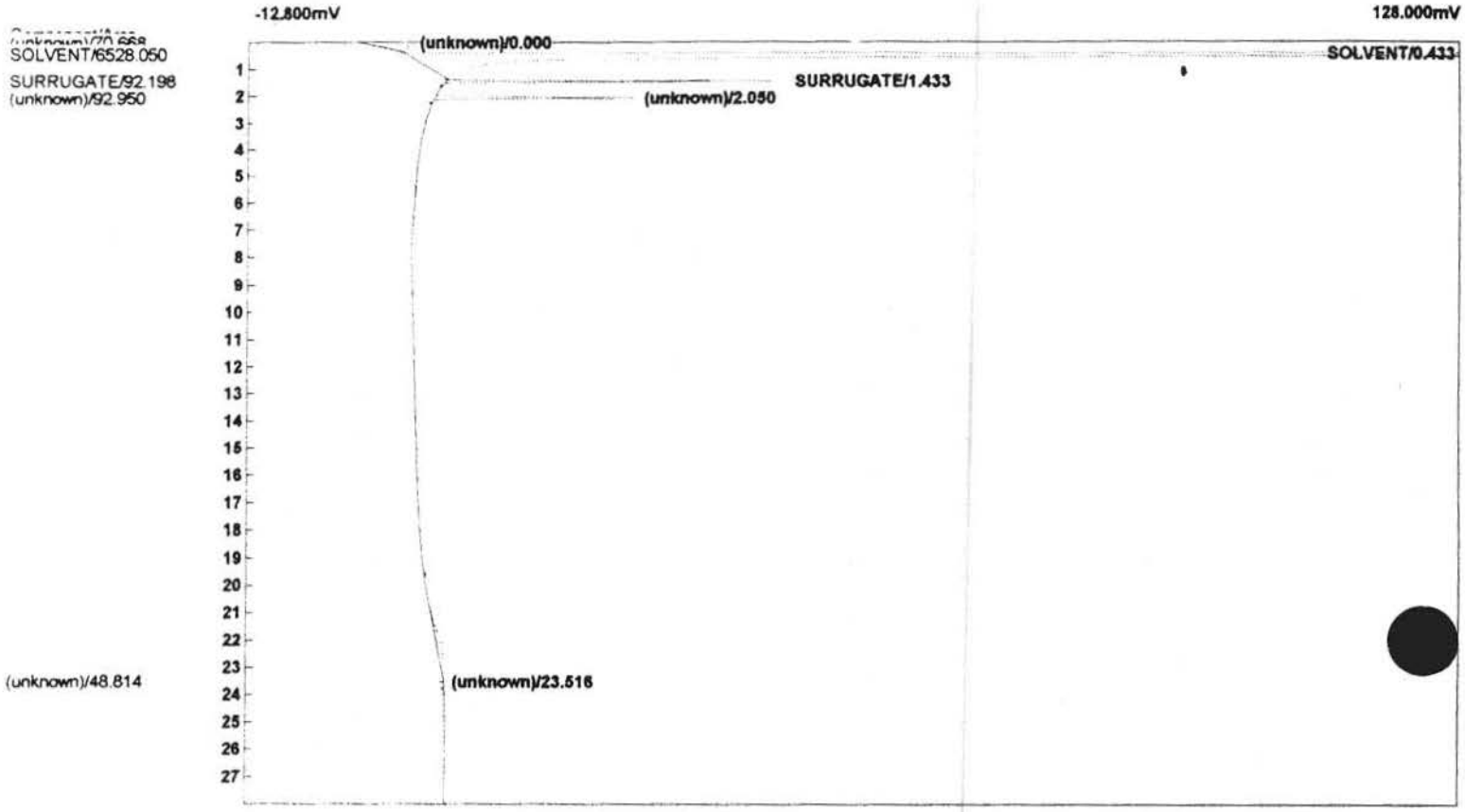
Component	Number	Retention	Area	External	Internal	Units
SOLVENT	1	0.350	9233.247	0.00	0.0000	%
SURRUGATE	2	3.316	90.286	9.45	9.4540	ppm
	2		9323.533	9.45	9.4540	

Lab name: TEG PUERTO RICO MOBILE
Analysis date: 08/14/1998 12:58:35
Method: EPA 8100
Lab ID: GC-4
Description: CHANNEL 4 - FID 2
Column: XTI-5 30M,ID.53mm,1.5um
Carrier: HELIUM 1 kg/cm3
Data file: C:\PEAKW95\0814BF3.CHR ()
Sample: 2842-EB-10/0731CH2-1
Operator: PEDRAZA



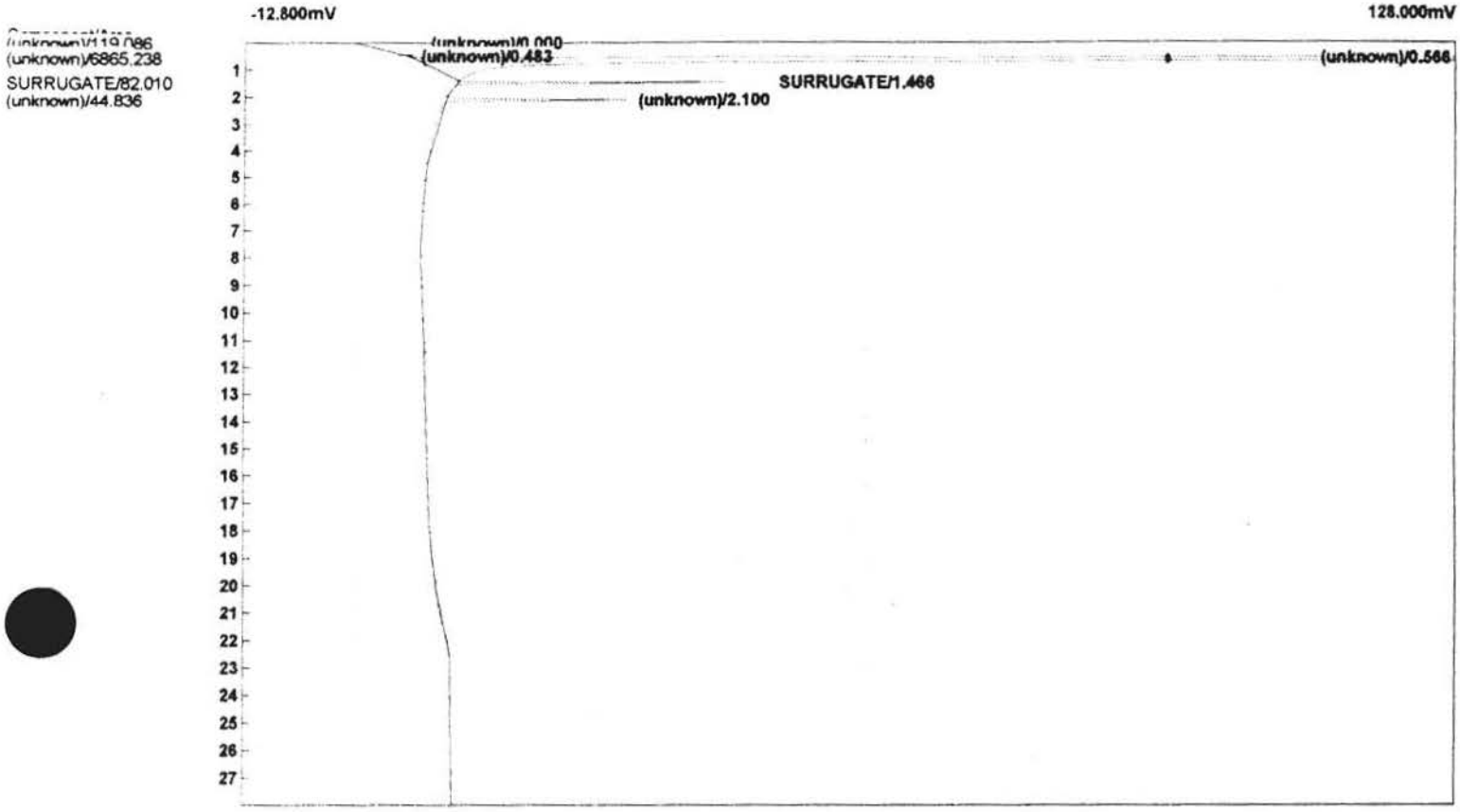
Component	Number	Retention	Area	External	Internal	Units
SURRUGATE	2	3.466	104.670	10.43	10.4253	ppm
	1		104.670	10.43	10.4253	

Lab name: TEG PUERTO RICO MOBILE
Analysis date: 08/14/1998 13:31:22
Method: EPA 8100
Lab ID: GC-4
Description: CHANNEL 3 - FID 1
Column: XTI-5 30M,ID.53mm,1.5um
Carrier: HELIUM 1 kg/cm3
Data file: 0814AF4.CHR ()
Sample: 2842-MW-1/0731CH2-1
Operator: PEDRAZA



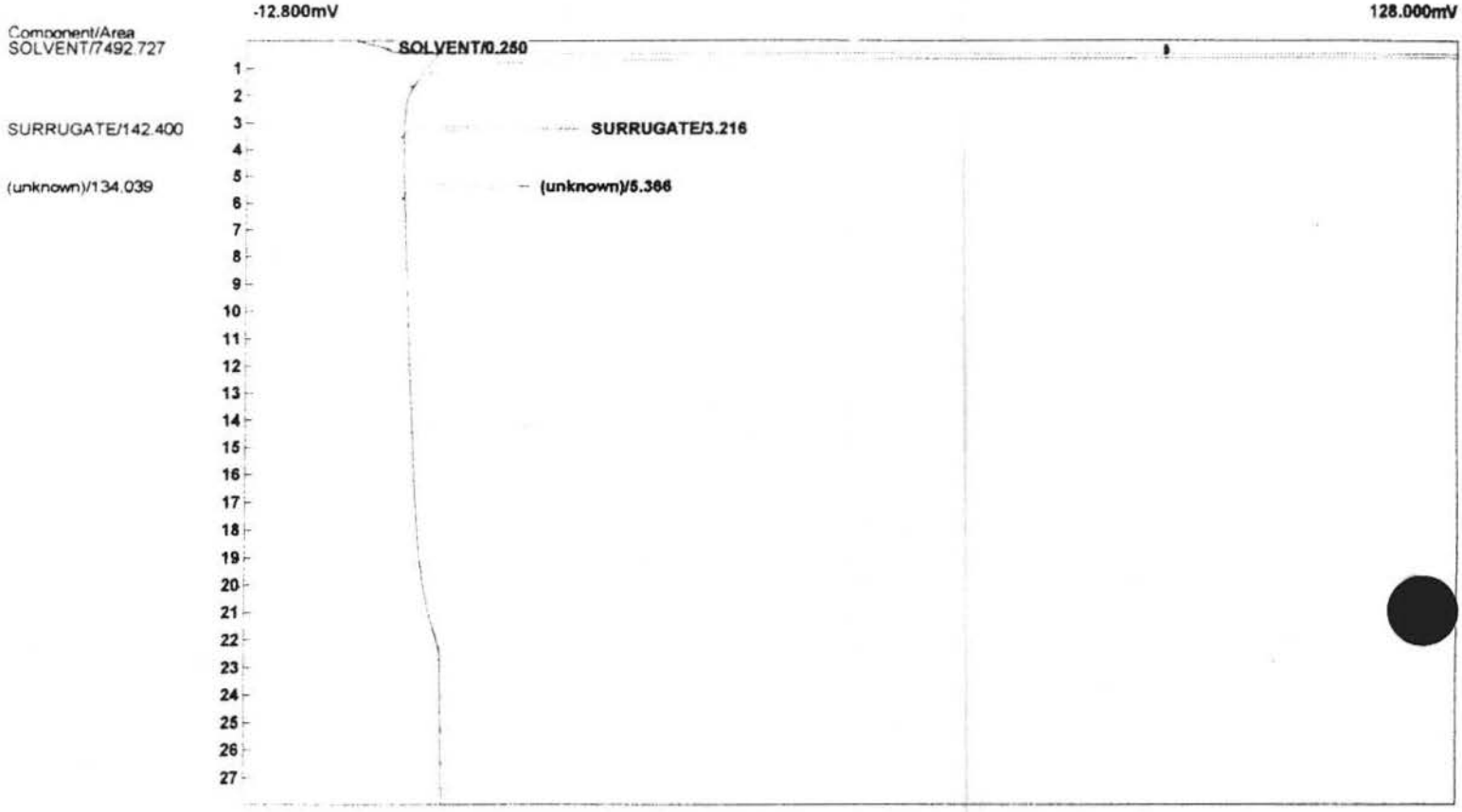
Component	Number	Retention	Area	External	Internal	Units
SOLVENT	1	0.433	6528.050	0.00	0.0000	%
SURRUGATE	2	1.433	92.198	9.65	9.6542	ppm
	2		6620.248	9.65	9.6542	

Lab name: TEG PUERTO RICO MOBILE
Analysis date: 08/14/1998 13:31:22
Method: EPA 8100
Lab ID: GC-4
Description: CHANNEL 4 - FID 2
Column: XTI-5 30M,ID.53mm,1.5um
Carrier: HELIUM 1 kg/cm3
Data file: C:\PEAKW95\0814BF4.CHR ()
Sample: 2842-MW-2/0731CH2-1
Operator: PEDRAZA



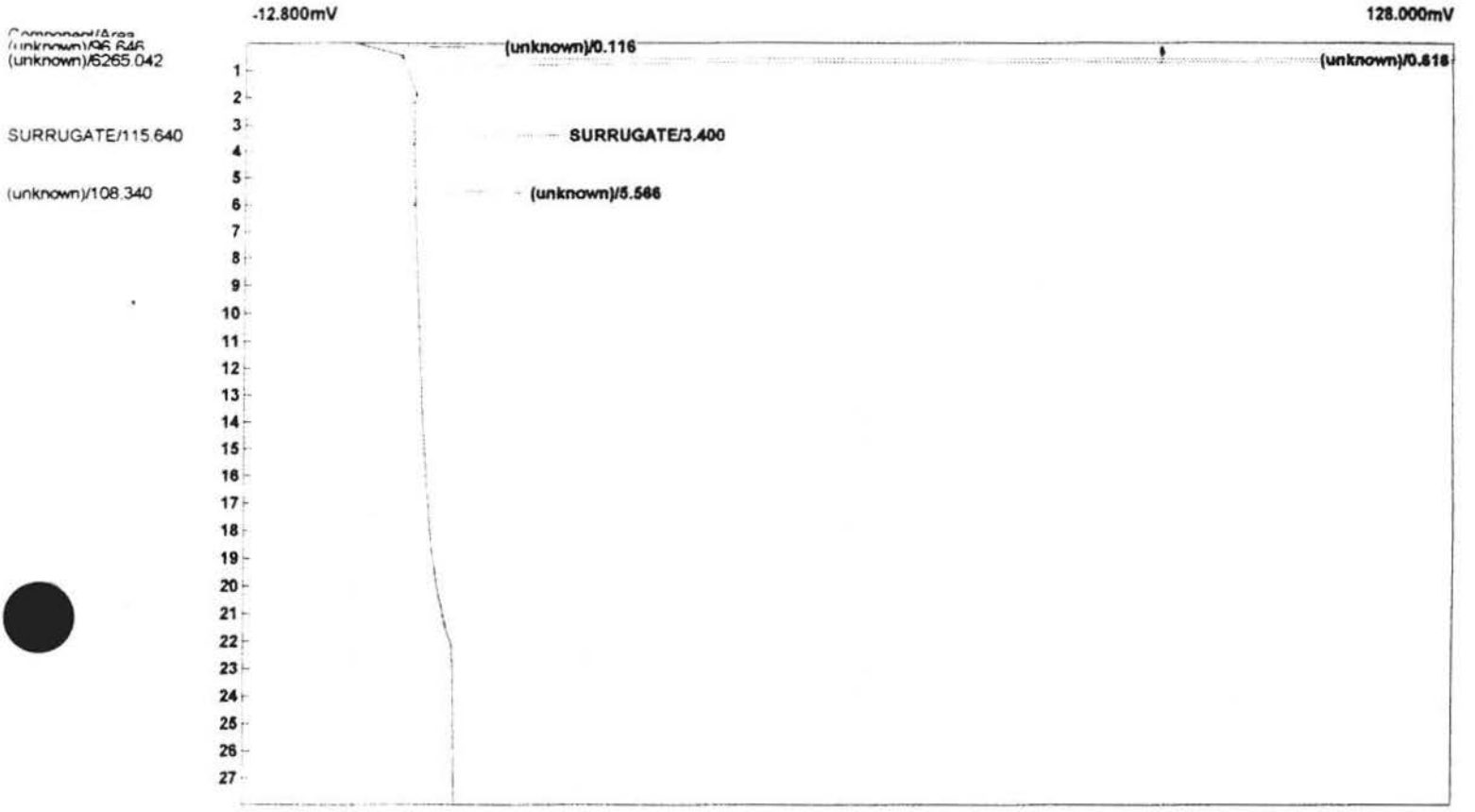
Component	Number	Retention	Area	External	Internal	Units
SURRUGATE	2	1.466	82.010	8.17	8.1683	ppm
	1		82.010	8.17	8.1683	

Lab name: TEG PUERTO RICO MOBILE
Analysis date: 08/14/1998 14:07:50
Method: EPA 8100
Lab ID: GC-4
Description: CHANNEL 3 - FID 1
Column: XTI-5 30M,ID.53mm,1.5um
Carrier: HELIUM 1 kg/cm3
Data file: 0814Af5.CHR ()
Sample: 2842-MW-3/0731CH2-1
Operator: PEDRAZA



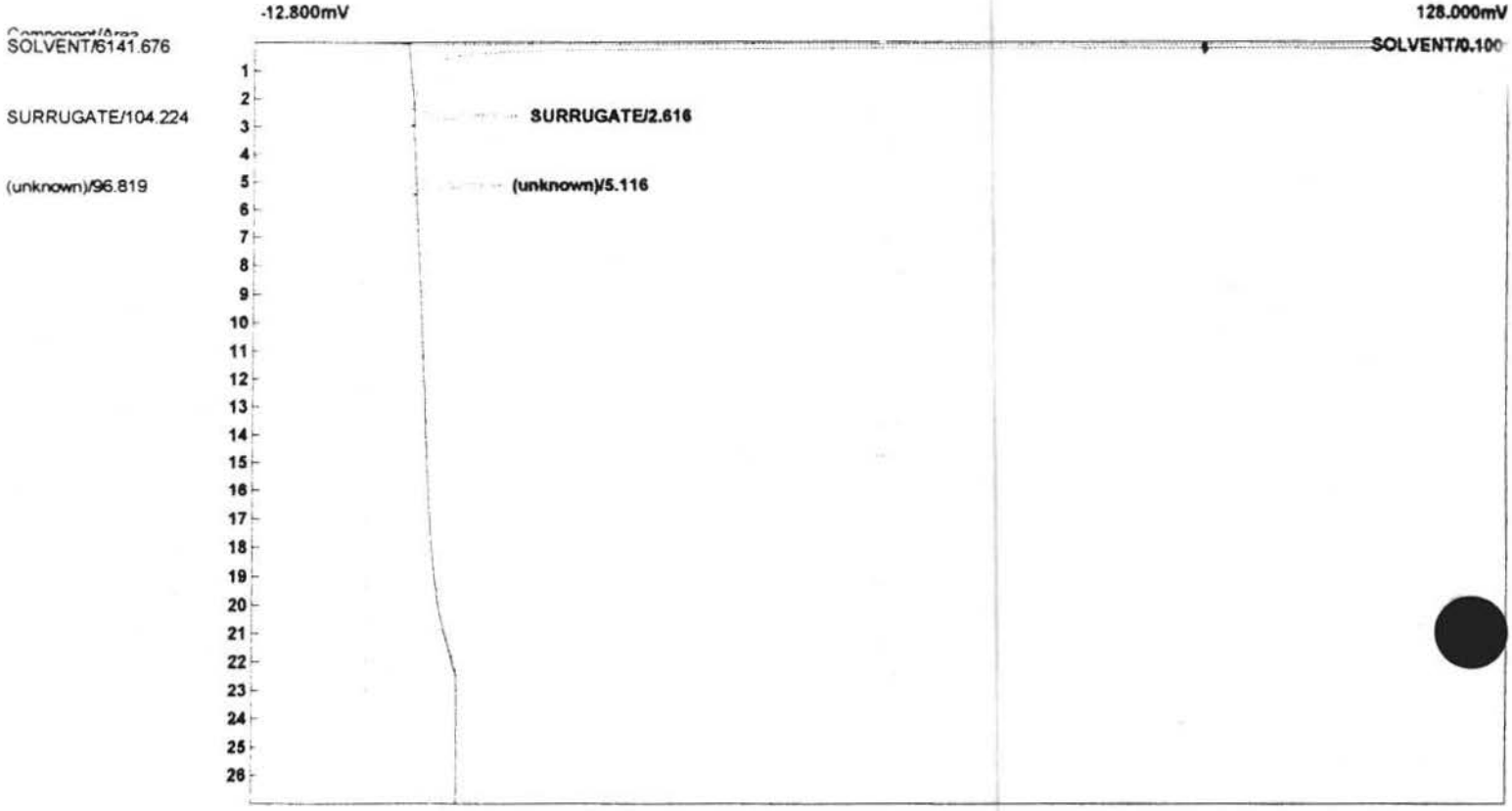
Component	Number	Retention	Area	External	Internal	Units
SOLVENT	1	0.250	7492.727	0.00	0.0000	%
SURRUGATE	2	3.216	142.400	14.91	14.9110	ppm
	2		7635.127	14.91	14.9110	

Lab name: TEG PUERTO RICO MOBILE
Analysis date: 08/14/1998 14:07:50
Method: EPA 8100
Lab ID: GC-4
Description: CHANNEL 4 - FID 2
Column: XTI-5 30M,ID.53mm,1.5um
Carrier: HELIUM 1 kg/cm3
Data file: C:\PEAKW95\0814BF5.CHR ()
Sample: 2842-MW-4/0731CH2-1
Operator: PEDRAZA



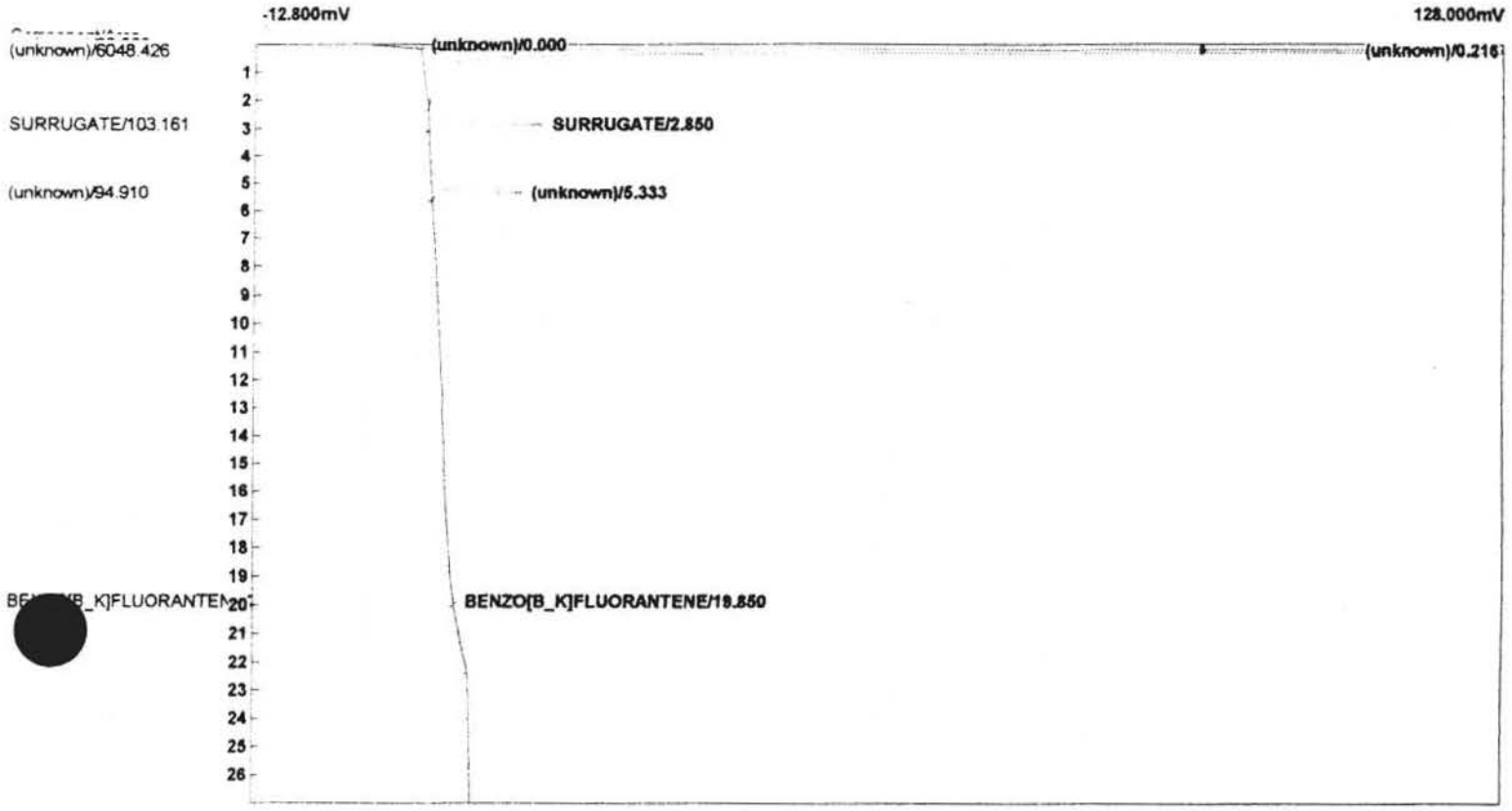
Component	Number	Retention	Area	External	Internal	Units
SURRUGATE	2	3.400	115.640	11.52	11.5179	ppm
	1		115.640	11.52	11.5179	

Lab name: TEG PUERTO RICO MOBILE
Analysis date: 08/14/1998 15:08:07
Method: EPA 8100
Lab ID: GC-4
Description: CHANNEL 3 - FID 1
Column: XTI-5 30M,ID.53mm,1.5um
Carrier: HELIUM 1 kg/cm3
Data file: 0814Af6.CHR ()
Sample: 2842-MW-4/0731CH2-1rep
Operator: PEDRAZA



Component	Number	Retention	Area	External	Internal	Units
SOLVENT	1	0.100	6141.676	0.00	0.0000	%
SURRUGATE	2	2.616	104.224	10.91	10.9135	ppm
	2		6245.900	10.91	10.9135	

Lab name: TEG PUERTO RICO MOBILE
Analysis date: 08/14/1998 15:08:07
Method: EPA 8100
Lab ID: GC-4
Description: CHANNEL 4 - FID 2
Column: XTI-5 30M,ID.53mm,1.5um
Carrier: HELIUM 1 kg/cm3
Data file: C:\PEAKW95\0814BF6.CHR ()
Sample: 2842-DUPE1/0731CH2-1
Operator: PEDRAZA



Component	Number	Retention	Area	External	Internal	Units
SURRUGATE	2	2.850	103.161	10.28	10.2750	ppm
BENZO[B_K]FLUORANTENE	12	19.850	~~3.754~~	~~0.68~~	~~0.6813~~	~~ppm~~
	2		106.915	10.96	10.9563	

NA
Fase pura

teg

QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0731CH2-1
DAILY CALIBRATION DATE: 8/6/98

CH2M HILL 146801.US.SC
PROJECT NAME: SITE 2842

			INITIAL		OPENING			CLOSING		
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	AREA	RF	%DIFF	AREA	RF	%DIFF
BENZENE	PID - GC3	5-100	171	15.0%	4272.87	170.91	0.1%	3332.18	166.61	2.6%
TOLUENE	PID - GC3	5-100	170	14.1%	4195.65	167.83	1.0%	3281.42	164.07	3.3%
ETHYLBENZENE	PID - GC3	5-100	139	14.6%	3471.45	138.86	0.1%	3169.50	158.47	14.3%
m&p-XYLENES	PID - GC3	10-200	159	16.8%	9475.94	189.52	19.4%	7306.26	182.66	15.1%
o-XYLENES	PID - GC3	5-100	146	15.6%	3456.78	138.27	5.1%	2749.18	137.46	5.6%

DAILY CALIBRATION DATE: 8/7/98

			INITIAL		OPENING			CLOSING		
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	AREA	RF	%DIFF	AREA	RF	%DIFF
BENZENE	PID - GC3	5-100	171	15.0%	3199.23	159.96	6.5%	7834.09	156.68	8.4%
TOLUENE	PID - GC3	5-100	170	14.1%	3072.73	153.64	9.4%	7693.49	153.87	9.3%
ETHYLBENZENE	PID - GC3	5-100	139	14.6%	2468.50	123.43	11.0%	6689.06	133.78	3.5%
m&p-XYLENES	PID - GC3	10-200	159	16.8%	7293.02	182.33	14.9%	15671.14	156.71	1.3%
o-XYLENES	PID - GC3	5-100	146	15.6%	2590.92	129.55	11.1%	6561.79	131.24	9.9%

CALIB RANGE - RANGE OF CALIBRATION CURVE IN ppb
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 30% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 20% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: JOSÉ MIGUEL PÉREZ
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 730-0329 FAX 789-3858

teg

QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0731CH2-1
DATE: 8/6/98

CH2M HILL: 146801.US.SC
PROJECT NAME: SITE 2842

COMPOUND	SPK CONC (ppb)	MS CONC (ppb)	%REC MS	MSD CONC (ppb)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
BENZENE	25.0	25.7	103%	21.2	85%	19%	20%	60% - 135%
TOLUENE	25.0	27.2	109%	22.3	89%	20%	20%	60% - 135%
ETHYLBENZENE	25.0	28.1	112%	23.0	92%	20%	20%	60% - 135%
TOTAL XYLENES	75.0	94.6	126%	77.7	106%	20%	20%	60% - 135%

DATE: 8/7/98

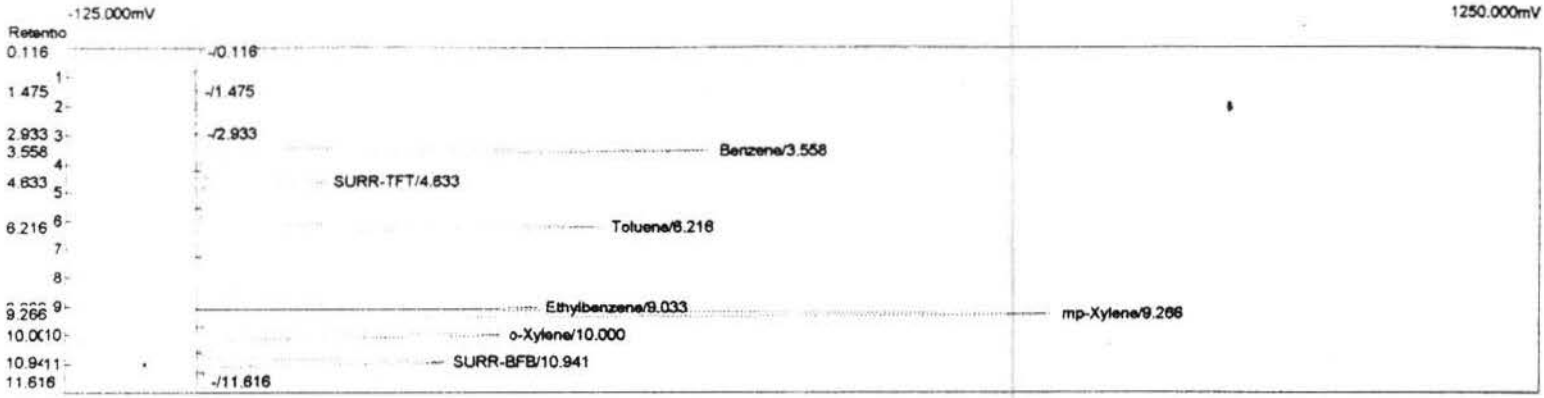
COMPOUND	SPK CONC (ppb)	MS CONC (ppb)	%REC MS	MSD CONC (ppb)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
BENZENE	20.0	18.9	94%	16.3	82%	14%	20%	60% - 135%
TOLUENE	20.0	20.1	101%	17.9	89%	12%	20%	60% - 135%
ETHYLBENZENE	20.0	19.2	96%	17.2	86%	11%	20%	60% - 135%
TOTAL XYLENES	60.0	72.2	120%	63.6	108%	13%	20%	60% - 135%

ppb = PARTS PER BILLION
MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE
% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX
RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY:JOSÉ MIGUEL PÉREZ
DATA REVIEWED BY: KEVIN SHELBURNE

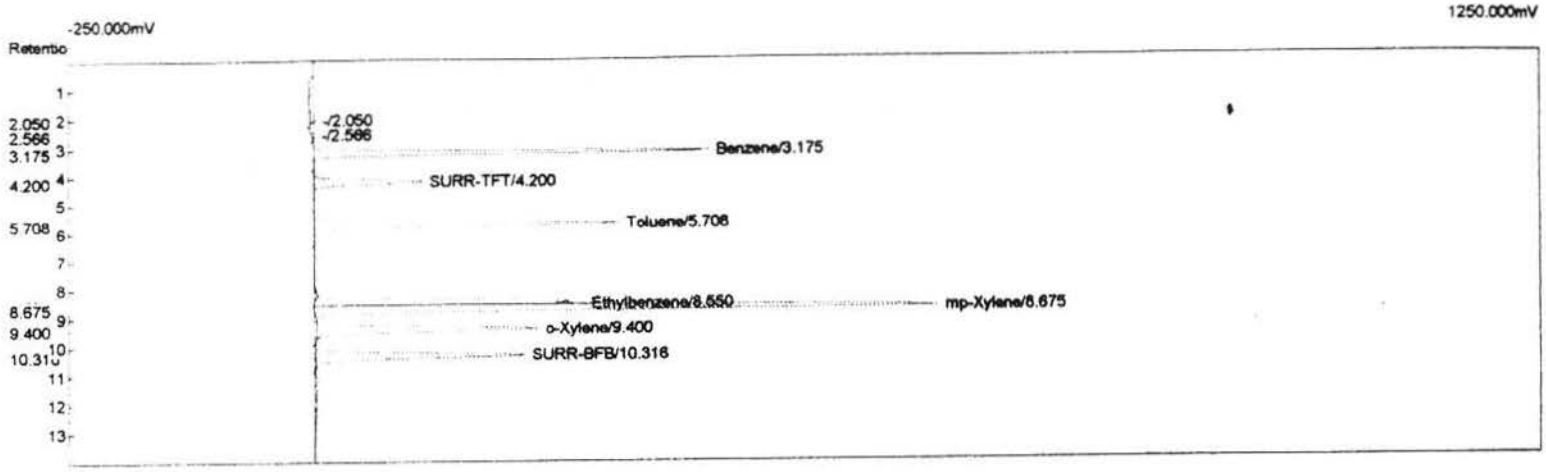
TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

Lab name: TEG Puerto Rico
Analysis date: 08/06/1998 10:48:53
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: C:\PEAKW95\0806p1.CHR ()
Sample: Opening
Operator: MAP



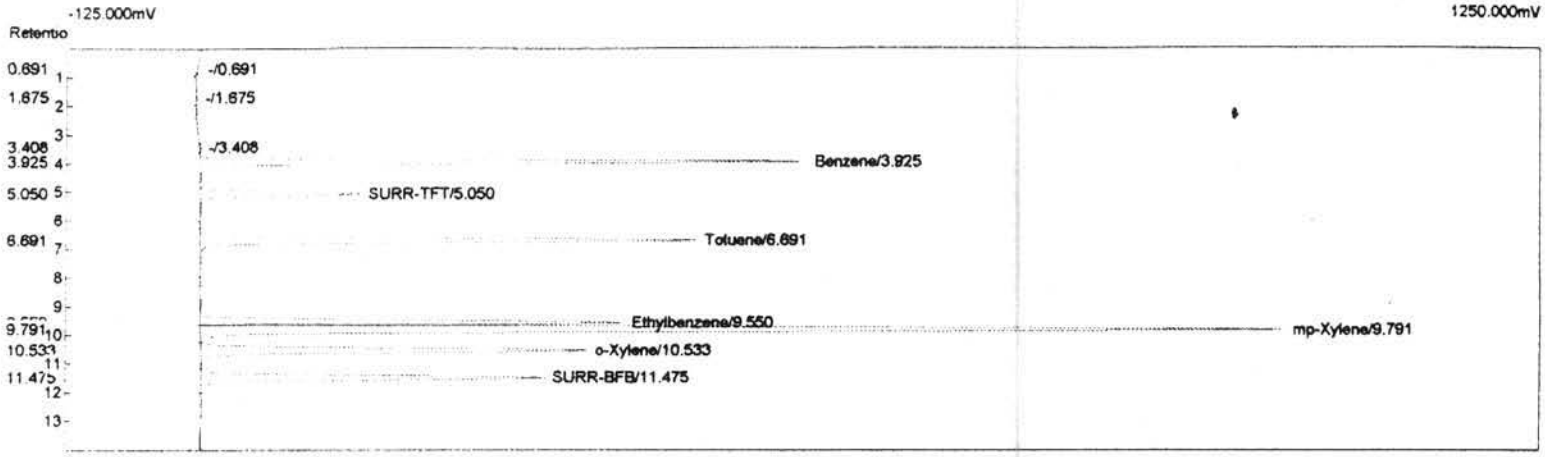
Retention	Component	Number	Area	External	Internal	Units
3.558	Benzene	1	4272.868	23.23	23.2347	ppb
4.633	SURR-TFT	2	1527.179	17.73	17.7311	ppb
6.216	Toluene	3	4195.654	24.74	24.7385	ppb
9.033	Ethylbenzene	4	3471.445	25.03	25.0284	ppb
9.266	mp-Xylene	5	9475.938	59.69	59.6928	ppb
10.000	o-Xylene	6	3456.777	23.73	23.7318	ppb
10.941	SURR-BFB	7	2794.528	14.98	14.9800	ppb
		7	29194.389	189.14	189.1375	

Lab name: TEG Puerto Rico
Analysis date: 08/06/1998 16:51:51
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: 0806p12.CHR ()
Sample: 20 ppb BTEX Closing Std
Operator: MAP



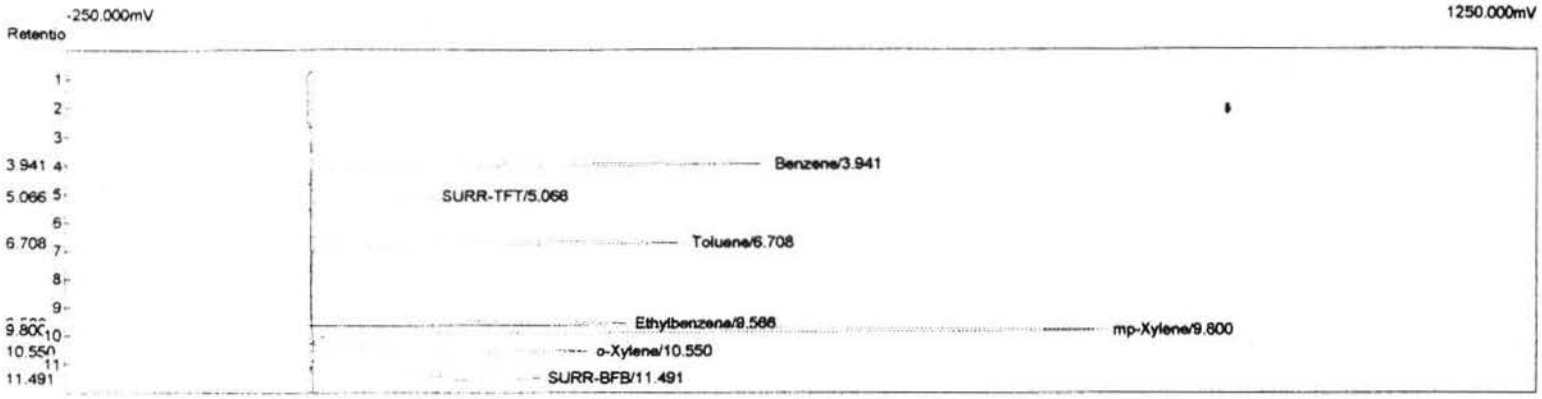
Retention	Component	Number	Area	External	Internal	Units
3.175	Benzene	1	3332.179	18.12	18.1195	ppb
4.200	SURR-TFT	2	1180.132	13.70	13.7018	ppb
5.708	Toluene	3	3281.421	19.35	19.3480	ppb
8.550	Ethylbenzene	4	3169.495	22.85	22.8514	ppb
8.675	mp-Xylene	5	7306.258	46.03	46.0251	ppb
9.400	o-Xylene	6	2749.175	18.87	18.8739	ppb
[illegible]16	SURR-BFB	7	2577.322	13.82	13.8157	ppb
		7	23595.982	152.74	152.7355	

Lab name: TEG Puerto Rico
Analysis date: 08/06/1998 11:51:49
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: 0806p2.CHR ()
Sample: Matrix Spike
Operator: MAP



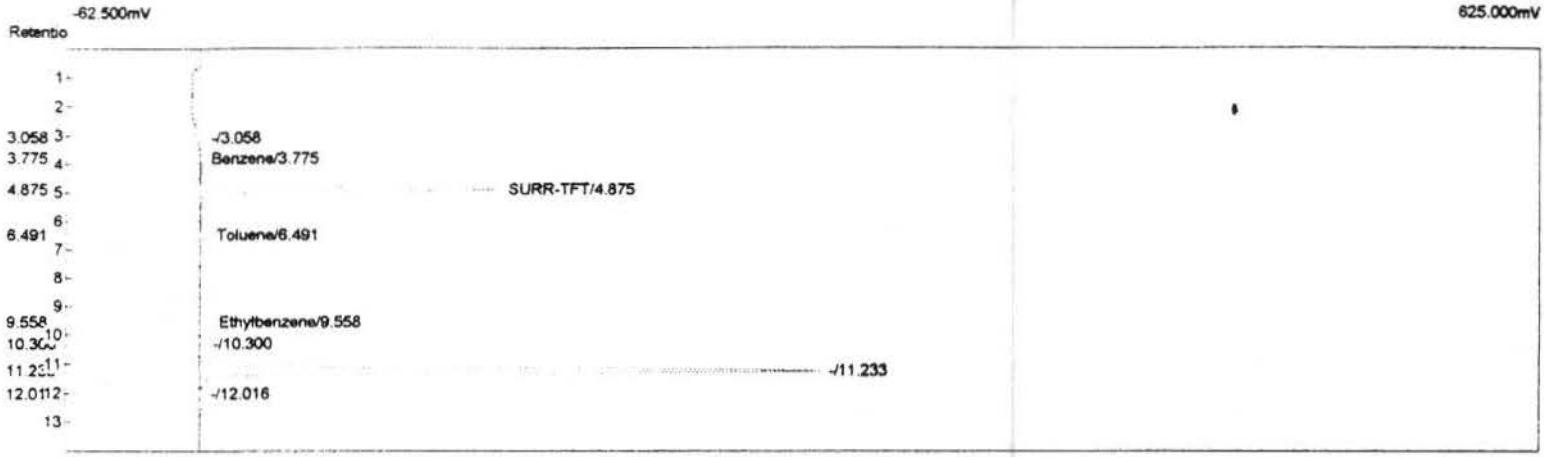
Retention	Component	Number	Area	External	Internal	Units
3.925	Benzene	1	4734.715	25.75	25.7461	ppb
5.050	SURR-TFT	2	1565.571	18.18	18.1768	ppb
6.691	Toluene	3	4607.282	27.17	27.1656	ppb
9.550	Ethylbenzene	4	3894.135	28.08	28.0760	ppb
9.791	mp-Xylene	5	11171.827	66.86	66.8571	ppb
10.533	o-Xylene	6	4039.982	27.74	27.7357	ppb
11.475	SURR-BFB	7	3546.041	19.01	19.0085	ppb
		7	33559.552	212.77	212.7659	

Lab name: TEG Puerto Rico
Analysis date: 08/06/1998 12:30:22
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: 0806p3.CHR ()
Sample: Matrix Spike Duplicate
Operator: MAP



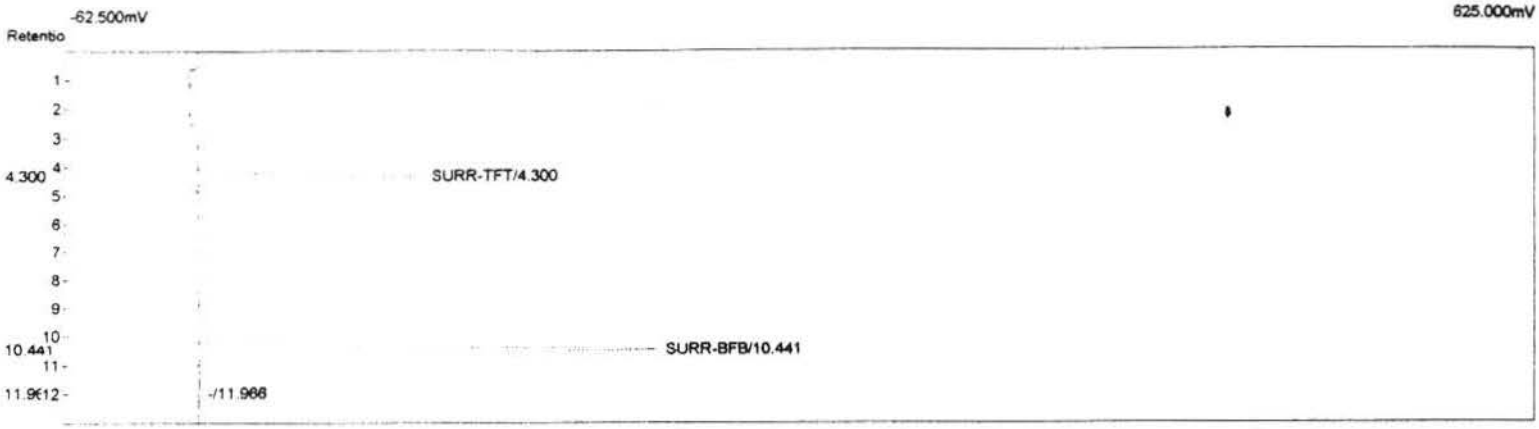
Retention	Component	Number	Area	External	Internal	Units
3.941	Benzene	1	3903.825	21.23	21.2280	ppb
5.066	SURR-TFT	2	1305.891	15.16	15.1619	ppb
6.708	Toluene	3	3785.294	22.32	22.3190	ppb
9.566	Ethylbenzene	4	3192.461	23.02	23.0170	ppb
9.800	mp-Xylene	5	8938.308	56.31	56.3061	ppb
10.550	o-Xylene	6	3111.495	21.36	21.3614	ppb
11.491	SURR-BFB	7	2563.783	13.74	13.7431	ppb
		7	26801.058	173.14	173.1364	

Lab name: TEG Puerto Rico
Analysis date: 08/06/1998 12:58:20
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: C:\PEAKW95\0806p4.CHR ()
Sample: blank
Operator: MAP



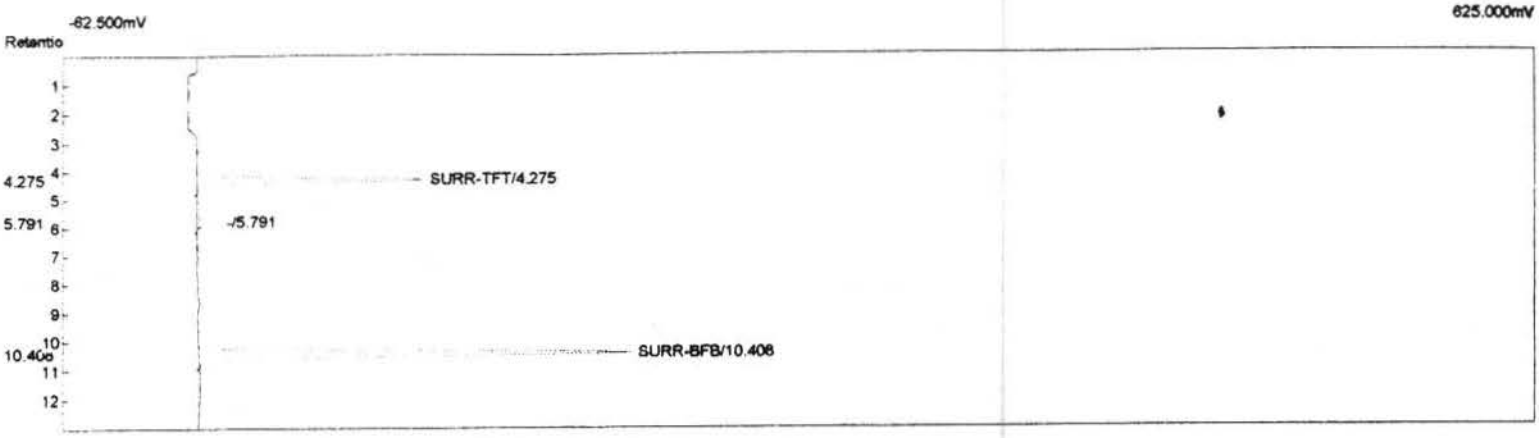
Retention	Component	Number	Area	External	Internal	Units
3.775	Benzene	1	27.893	0.15	0.1517	ppb
4.875	SURR-TFT	2	1475.798	17.13	17.1345	ppb
6.491	Toluene	3	89.966	0.53	0.5305	ppb
9.558	Ethylbenzene	4	137.529	0.99	0.9916	ppb
		4	1731.186	18.81	18.8082	

Lab name: TEG Puerto Rico
Analysis date: 08/06/1998 13:23:04
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
ata file: C:\PEAKW95\0806p5.CHR ()
Sample: method blank
Operator: MAP



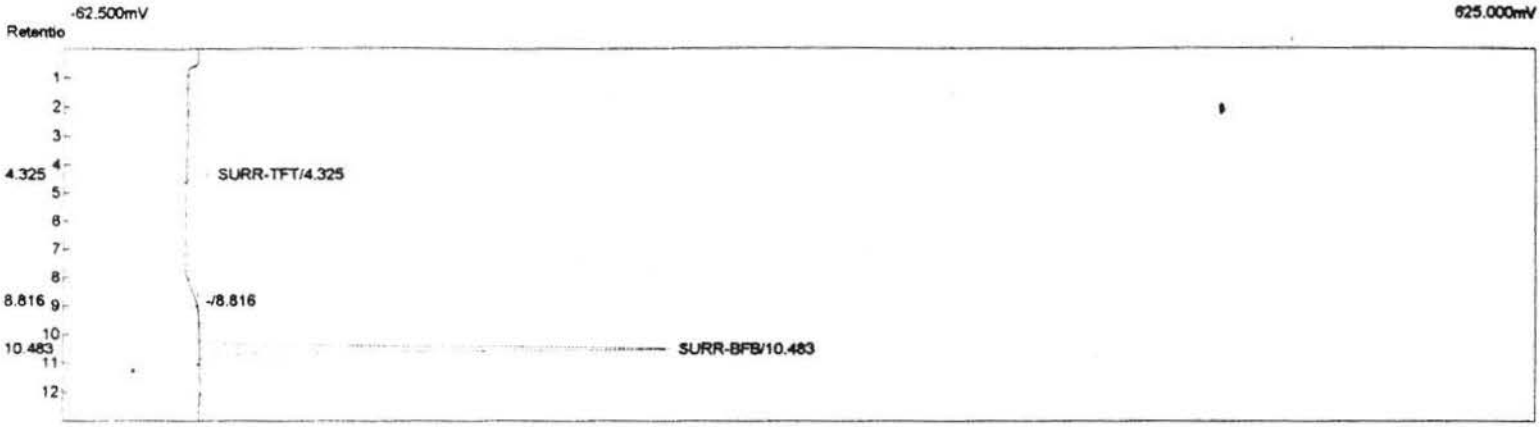
Retention	Component	Number	Area	External	Internal	Units
4.300	SURR-TFT	2	1120.020	13.00	13.0038	ppb
10.441	SURR-BFB	7	2508.689	13.45	13.4478	ppb
		2	3628.709	26.45	26.4516	

Lab name: TEG Puerto Rico
Analysis date: 08/06/1998 14:01:05
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: C:\PEAKW95\0806p6.CHR ()
Sample: 2842-TRIP/0731CH2-1
Operator: MAP



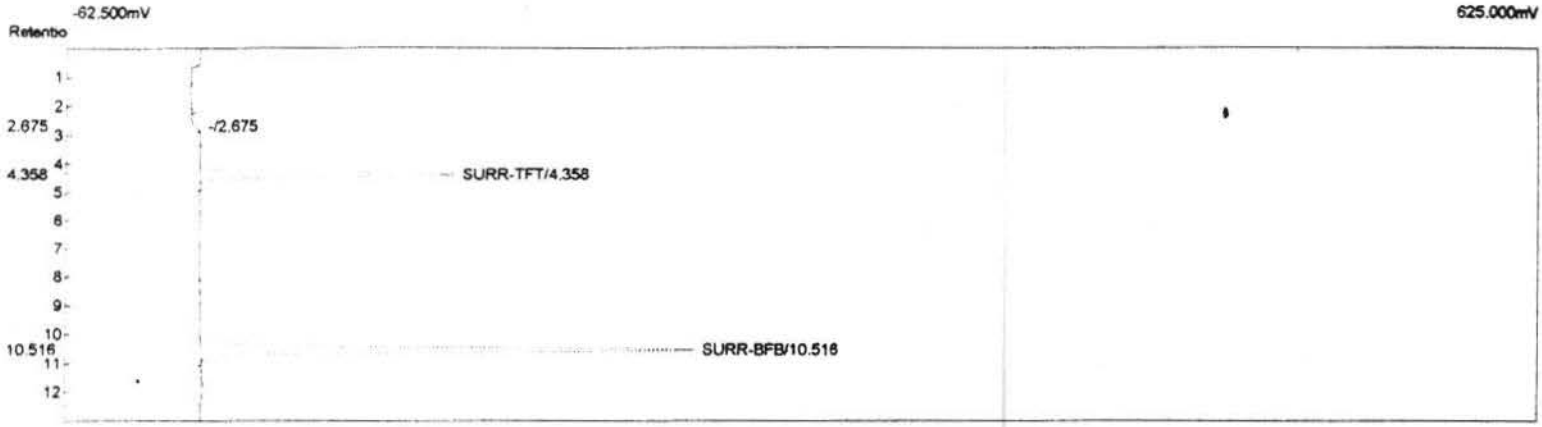
Retention	Component	Number	Area	External	Internal	Units
4.275	SURR-TFT	2	1125.295	13.07	13.0651	ppb
10.408	SURR-BFB	7	2413.303	12.94	12.9365	ppb
		2	3538.598	26.00	26.0016	

Lab name: TEG Puerto Rico
Analysis date: 08/06/1998 14:25:55
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: C:\PEAKW95\0806p7.CHR ()
Sample: 2842-EB10/0731CH2-1
Operator: MAP



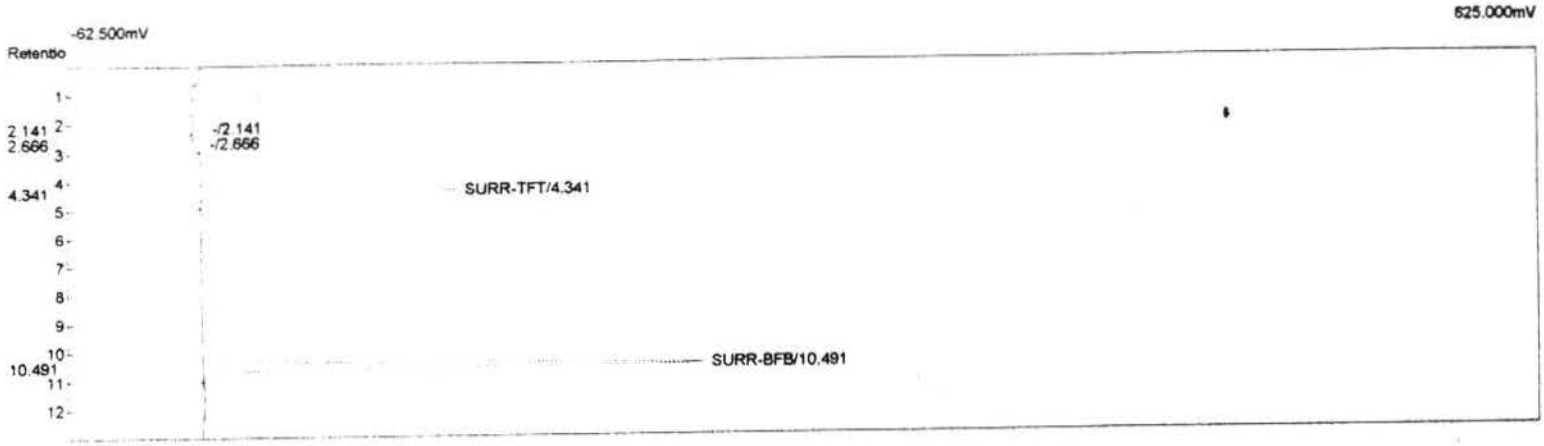
Retention	Component	Number	Area	External	Internal	Units
4.325	SURR-TFT	2	117.676	1.37	1.3663	ppb
10.483	SURR-BFB	7	2659.979	14.26	14.2588	ppb
		2	2777.655	15.63	15.6251	

Lab name: TEG Puerto Rico
Analysis date: 08/06/1998 14:56:19
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: C:\PEAKW95\0806p8.CHR ()
Sample: 2842-FB1/0731CH2-1
Operator: MAP



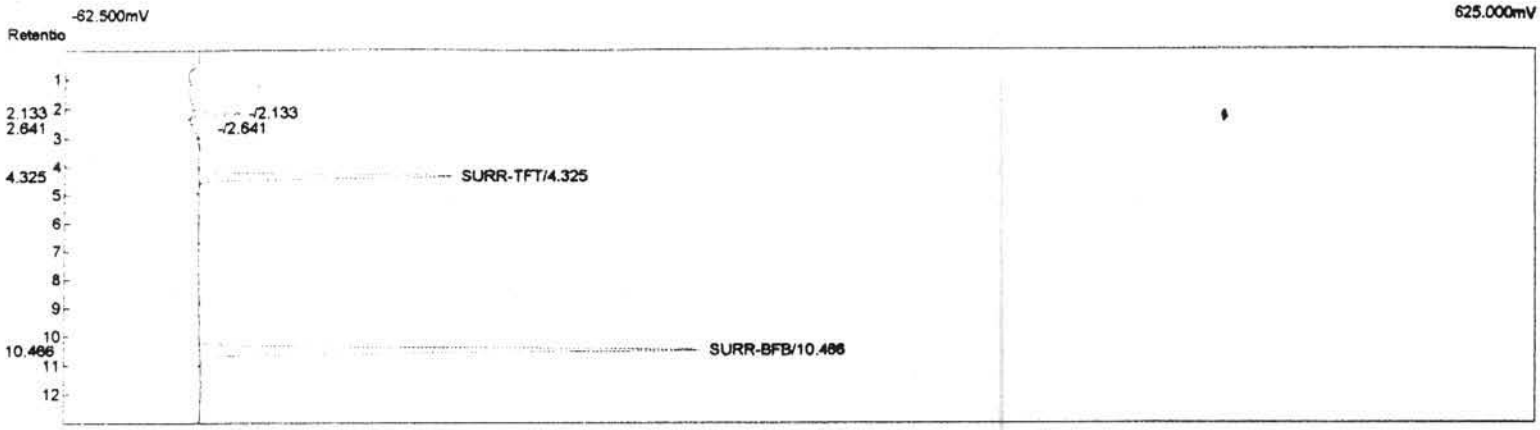
Retention	Component	Number	Area	External	Internal	Units
4.358	SURR-TFT	2	1264.409	14.68	14.6802	ppb
10.516	SURR-BFB	7	2716.412	14.56	14.5613	ppb
		2	3980.822	29.24	29.2416	

Lab name: TEG Puerto Rico
Analysis date: 08/06/1998 15:27:04
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: C:\PEAKW95\0806p9.CHR ()
Sample: 2842/124-mw1/0731CH2-1
Operator: MAP



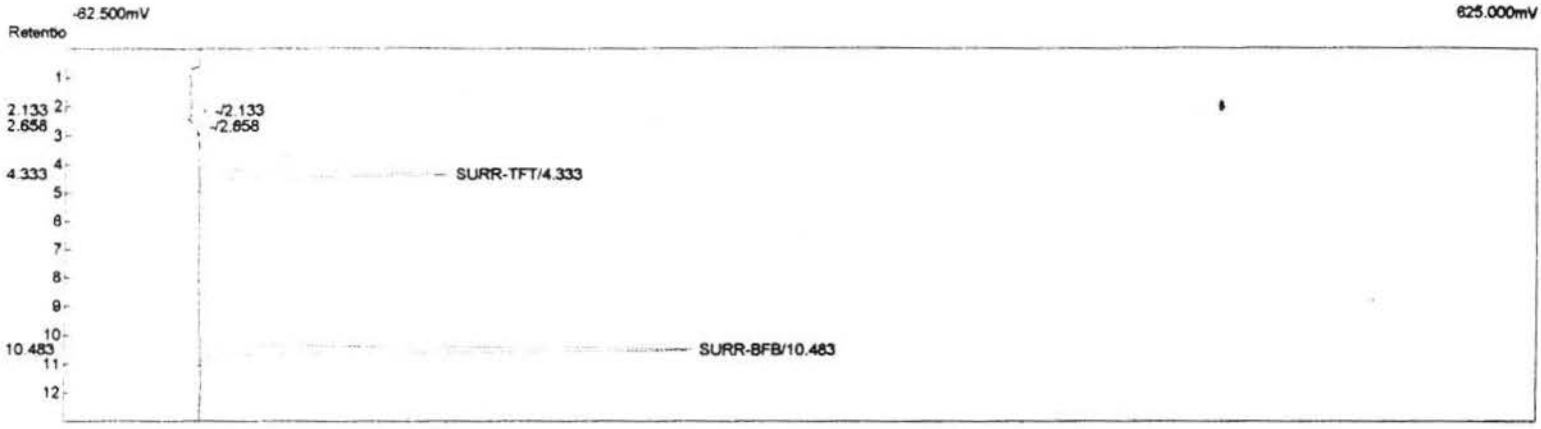
Retention	Component	Number	Area	External	Internal	Units
4.341	SURR-TFT	2	1265.925	14.70	14.6978	ppb
10.491	SURR-BFB	7	2756.566	14.78	14.7766	ppb
		2	4022.491	29.47	29.4744	

Lab name: TEG Puerto Rico
Analysis date: 08/06/1998 16:23:28
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: C:\PEAKW95\0806p11.CHR ()
Sample: 2842/124-mw1/0731ch2 rp
Operator: MAP



Retention	Component	Number	Area	External	Internal	Units
4.325	SURR-TFT	2	1262.817	14.66	14.6618	ppb
10.466	SURR-BFB	7	2768.542	14.84	14.8408	ppb
		2	4031.359	29.50	29.5025	

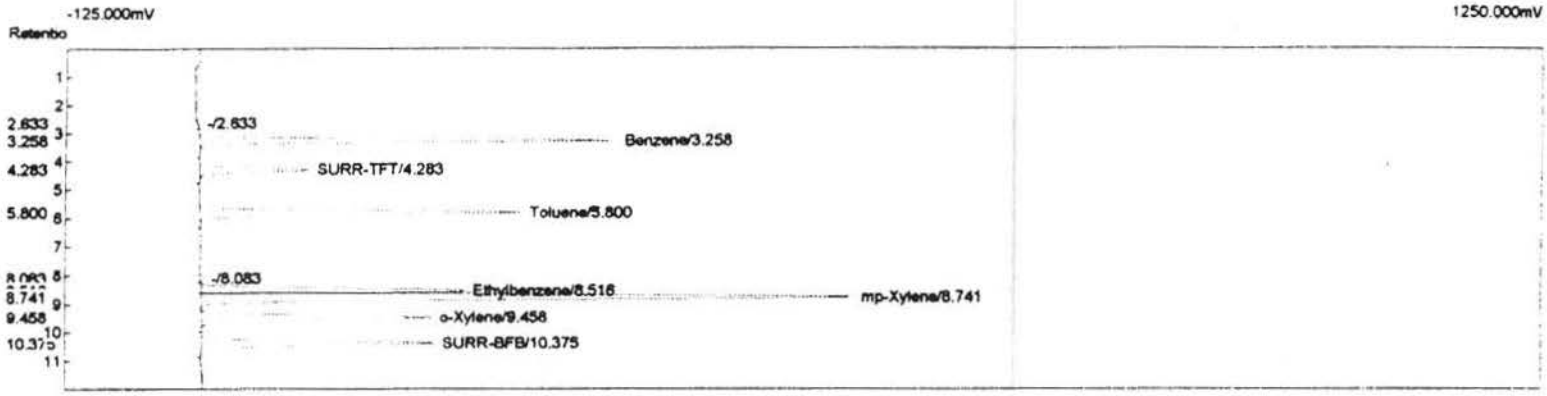
Lab name: TEG Puerto Rico
Analysis date: 08/06/1998 15:53:15
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: C:\PEAKW95\0806p10.CHR ()
Sample: 2842-MW2/0731CH2-1
Operator: MAP



Retention	Component	Number	Area	External	Internal	Units
4.333	SURR-TFT	2	1232.902	14.31	14.3144	ppb
10.483	SURR-BFB	7	2737.010	14.67	14.6717	ppb
		2	3969.912	28.99	28.9862	

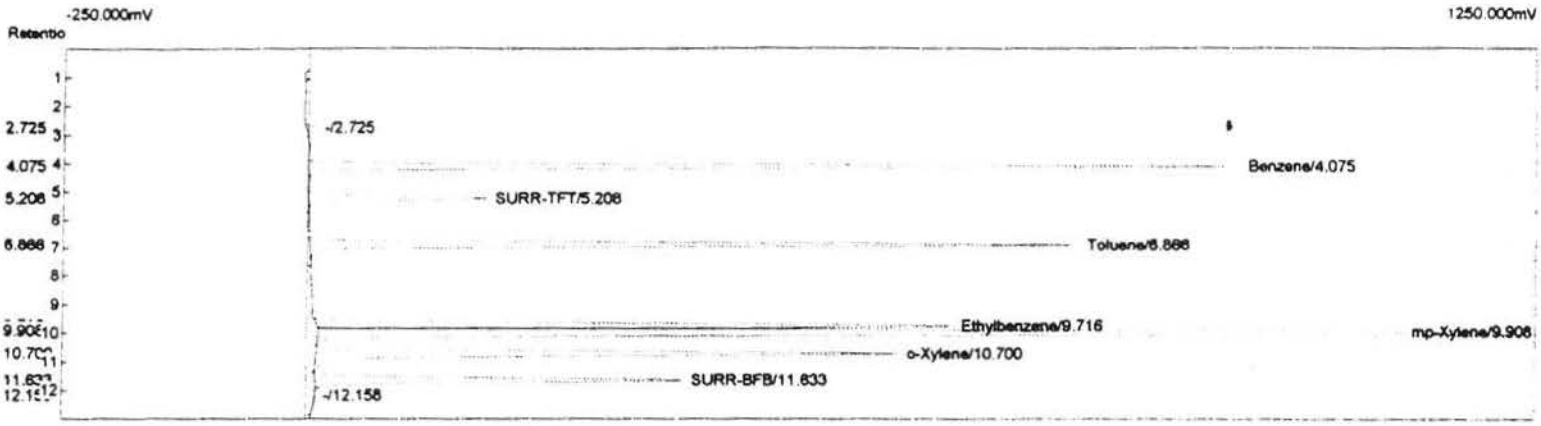
Lab name: TEG Puerto Rico
Analysis date: 08/07/1998 10:28:09
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T

Lab name: TEG Puerto Rico
Analysis date: 08/07/1998 09:58:04
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: C:\PEAKW95\0807p2.CHR ()
Sample: Opening
Operator: MAP



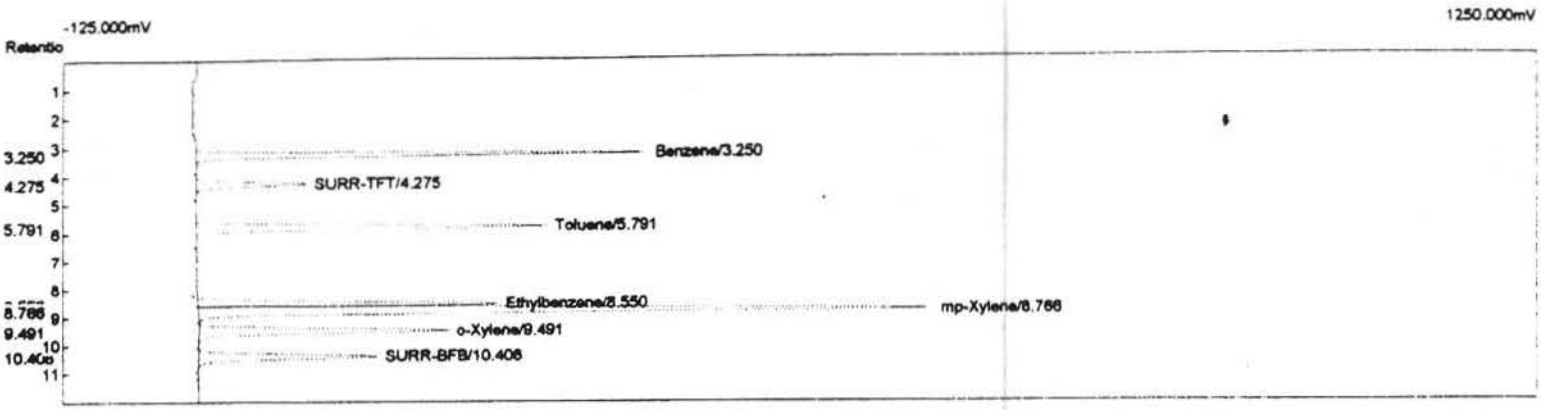
Retention	Component	Number	Area	External	Internal	Units
3.258	Benzene	1	3199.229	17.40	17.3966	ppb
4.283	SURR-TFT	2	1093.699	12.70	12.6982	ppb
5.800	Toluene	3	3072.733	18.12	18.1175	ppb
8.516	Ethylbenzene	4	2468.502	17.80	17.7974	ppb
8.741	mp-Xylene	5	7293.017	45.94	45.9417	ppb
9.458	o-Xylene	6	2590.919	17.79	17.7874	ppb
10.375	SURR-BFB	7	2591.830	13.89	13.8935	ppb
		7	22309.930	143.63	143.6324	

Lab name: TEG Puerto Rico
Analysis date: 08/07/1998 16:57:05
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: C:\PEAKW95\0807p15.CHR ()
Sample: 50 ppb CLOSE STD
Operator: MAP



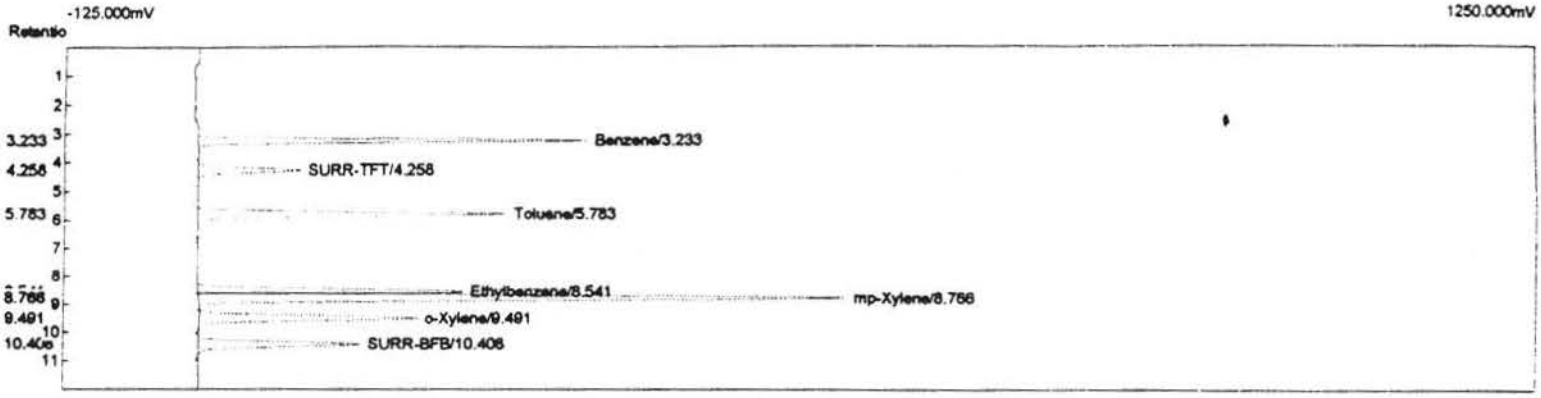
Retention	Component	Number	Area	External	Internal	Units
4.075	Benzene	1	7834.086	42.60	42.5997	ppb
5.208	SURR-TFT	2	1871.642	21.73	21.7304	ppb
6.866	Toluene	3	7693.485	45.36	45.3625	ppb
9.716	Ethylbenzene	4	6689.059	48.23	48.2268	ppb
9.908	mp-Xylene	5	15671.137	98.72	98.7189	ppb
10.700	o-Xylene	6	6561.789	45.05	45.0487	ppb
11.633	SURR-BFB	7	4005.093	21.47	21.4693	ppb
		7	50326.292	323.16	323.1584	

Lab name: TEG Puerto Rico
Analysis date: 08/07/1998 10:28:09
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: C:\PEAKW95\0807p3.CHR ()
Sample: Matrix Spike
Operator: MAP



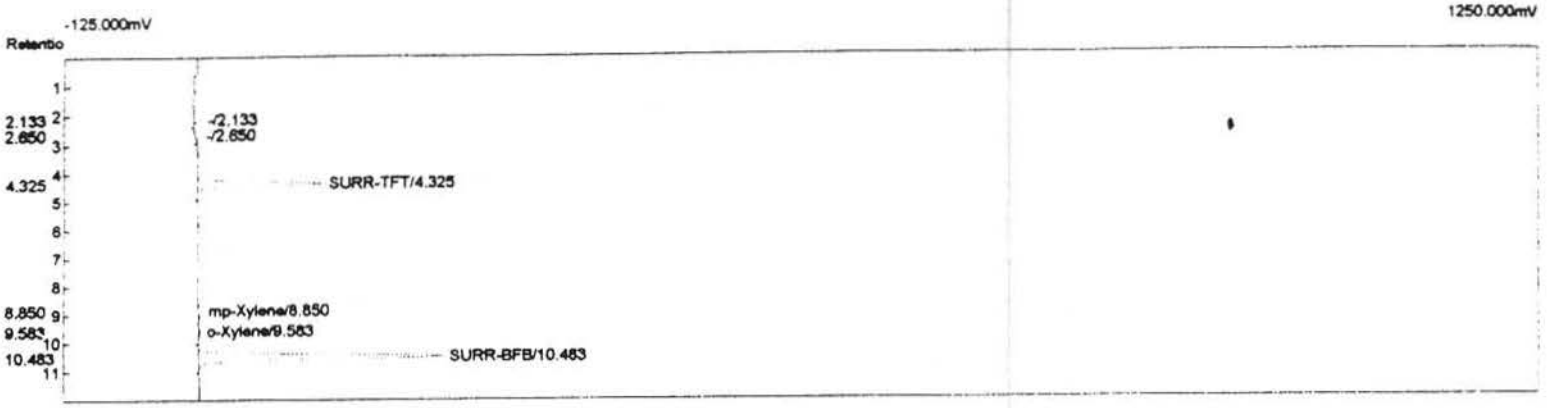
Retention	Component	Number	Area	External	Internal	Units
3.250	Benzene	1	3472.854	18.88	18.8845	ppb
4.275	SURR-TFT	2	1080.781	12.55	12.5483	ppb
5.791	Toluene	3	3412.917	20.12	20.1233	ppb
8.550	Ethylbenzene	4	2663.089	19.20	19.2004	ppb
8.766	mp-Xylene	5	8406.796	52.96	52.9579	ppb
9.491	o-Xylene	6	2798.966	19.22	19.2157	ppb
10.408	SURR-BFB	7	1997.458	10.71	10.7074	ppb
		7	23832.861	153.64	153.6374	

Lab name: TEG Puerto Rico
Analysis date: 08/07/1998 10:57:20
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: C:\PEAKW95\0807p4.CHR ()
Sample: Matrix Spike Duplicate
Operator: MAP



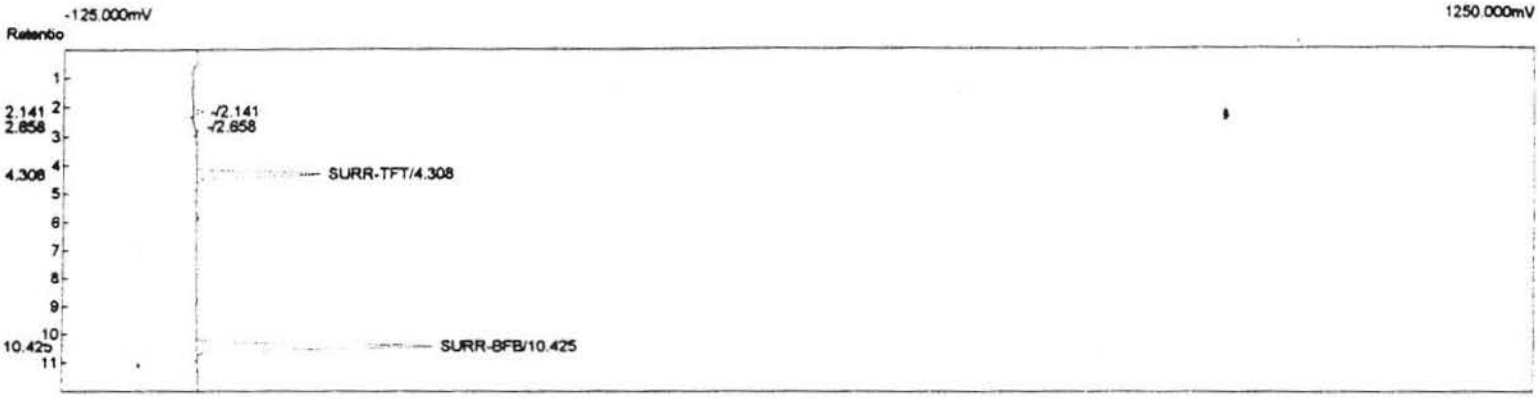
Retention	Component	Number	Area	External	Internal	Units
3.233	Benzene	1	3005.476	16.34	16.3430	ppb
4.258	SURR-TFT	2	1024.337	11.89	11.8929	ppb
5.783	Toluene	3	3035.588	17.90	17.8985	ppb
8.541	Ethylbenzene	4	2391.883	17.25	17.2450	ppb
8.766	mp-Xylene	5	7422.297	46.76	46.7561	ppb
9.491	o-Xylene	6	2456.396	16.86	16.8639	ppb
10.408	SURR-BFB	7	1823.087	9.77	9.7726	ppb
		7	21159.065	136.77	136.7721	

Lab name: TEG Puerto Rico
Analysis date: 08/07/1998 11:29:40
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: C:\PEAKW95\0807p5.CHR ()
Sample: blank
Operator: MAP



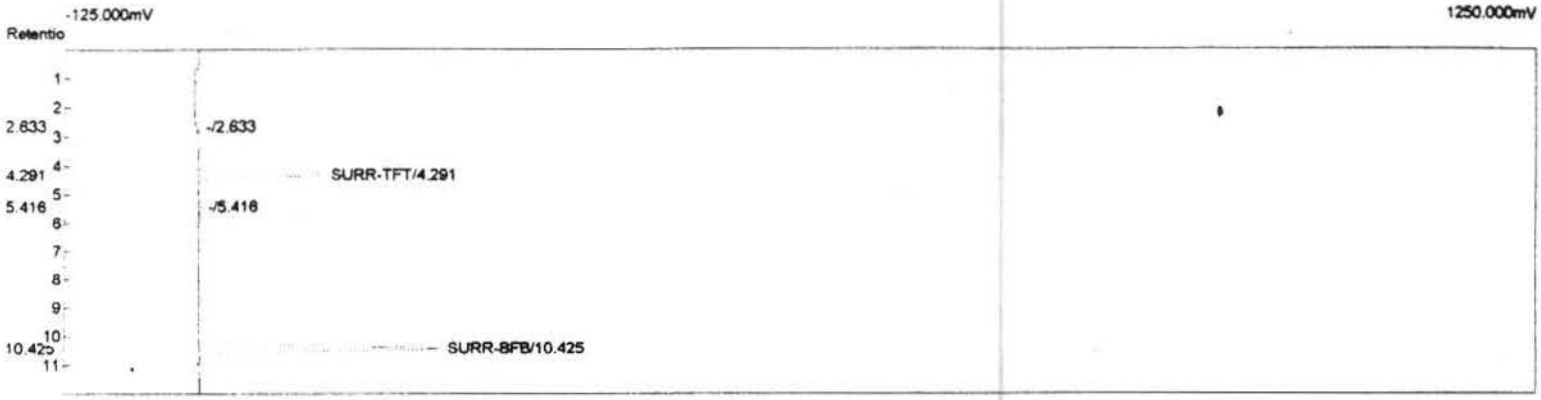
Retention	Component	Number	Area	External	Internal	Units
4.325	SURR-TFT	2	1220.978	14.18	14.1760	ppb
8.850	mp-Xylene	5	82.134	0.52	0.5174	ppb
9.583	o-Xylene	6	32.450	0.22	0.2228	ppb
10.483	SURR-BFB	7	2712.838	14.54	14.5421	ppb
		4	4048.400	29.46	29.4583	

Lab name: TEG Puerto Rico
Analysis date: 08/07/1998 12:04:48
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
ata file: C:\PEAKW95\0807p6.CHR ()
Sample: method blank
Operator: MAP



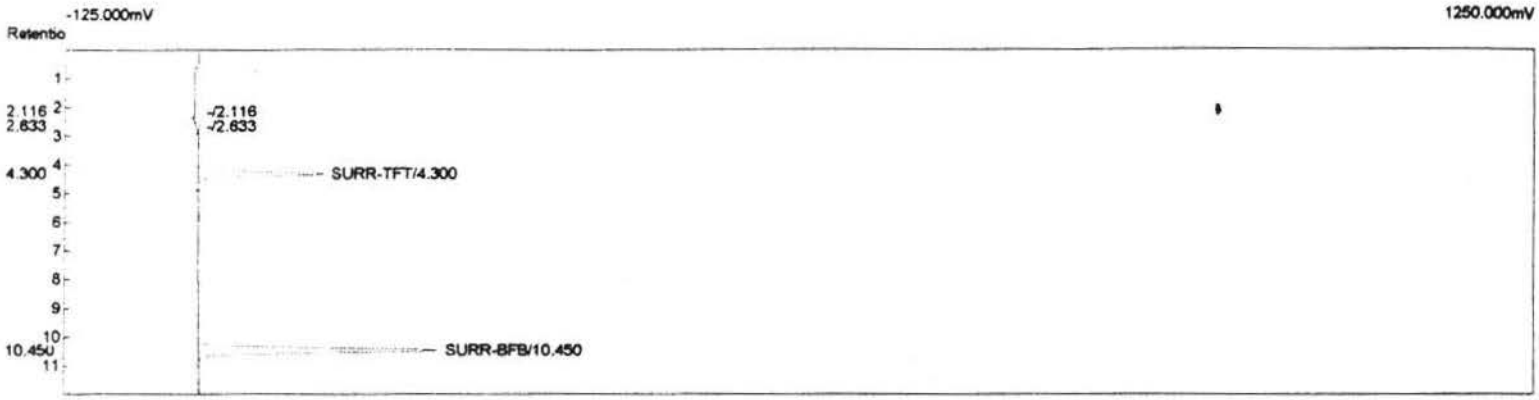
Retention	Component	Number	Area	External	Internal	Units
4.308	SURR-TFT	2	1219.563	14.16	14.1596	ppb
10.425	SURR-BFB	7	2624.437	14.07	14.0683	ppb
		2	3844.000	28.23	28.2278	

Lab name: TEG Puerto Rico
Analysis date: 08/07/1998 12:31:12
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: C:\PEAKW95\0807p7.CHR ()
Sample: 2842-MW3/0731CH2-1
Operator: MAP



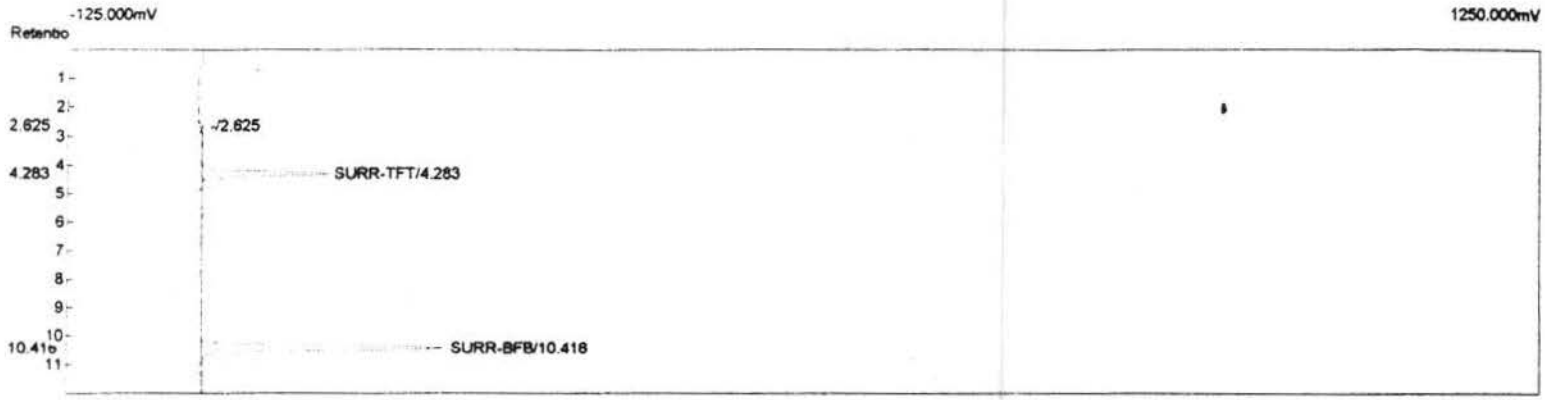
Retention	Component	Number	Area	External	Internal	Units
4.291	SURR-TFT	2	1242.346	14.42	14.4241	ppb
10.425	SURR-BFB	7	2698.779	14.47	14.4668	ppb
		2	3941.125	28.89	28.8909	

Lab name: TEG Puerto Rico
Analysis date: 08/07/1998 12:59:05
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: C:\PEAKW95\0807p8.CHR ()
Sample: 2842-MW4/0731CH2-1
Operator: MAP



Retention	Component	Number	Area	External	Internal	Units
4.300	SURR-TFT	2	1245.702	14.46	14.4630	ppb
10.450	SURR-BFB	7	2648.312	14.20	14.1963	ppb
		2	3894.014	28.66	28.6593	

Lab name: TEG Puerto Rico
Analysis date: 08/07/1998 13:54:02
Method: EPA 8021 Mod.
Lab ID: GC-3
Description: PID, GC-3, P&T
Column: RTX-5 (30x.53x5)
Carrier: N2, 15mL/min
Data file: C:\PEAKW95\0807p9.CHR ()
Sample: 2842-DUPE1/0731CH2-1
Operator: MAP



Retention	Component	Number	Area	External	Internal	Units
4.283	SURR-TFT	2	1241.642	14.42	14.4159	ppb
10.416	SURR-BFB	7	2688.999	14.41	14.4144	ppb
		2	3930.641	28.83	28.8303	

teg transglobal Environmental Geochemistry

Chain of Custody Record

PO # _____

Client: CHAM HILL

Address

Phone (787) 888-8713 FAX

Client Project # 146801.US.SC Project Manager MARTY CLASEN/TPA

Date 7/31/98 Page 1 of 1

TEG Project # 98I0731CH2-1 Outside Lab.#

Location Site 2842

Collector MIKE WEATHERBY Date of Collection 7/31/98

Sample #	Depth	Time	Sample Type	Container Type	VOA 8010	VOA 8020 (BTEX)	VOA 8260	SEMI VOL 8270	TRPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (gas & diesel)	TPH 8015 (oil)	PNA 610/8100	TOTAL LEAD	pH	METALS	RCI							FIELD NOTES / PRESERVATION	Total # of Containers
2842-MW2	–	0915	WATER	GLASS		1			1			1		1	1										STD TAT	5
2842-MW3	–	0936	↓	↓		1			1			1		1	1										↓	5
2842-MW4	–	1045	↓	↓		1			1			1		1	1										↓	5
2842/824-MW1	–	1200	↓	↓		1			1			1		1	1										↓	5
2842-EB10	–	1130	↓	↓		1			1			1		1	1										↓	5
2842-FB1	–	1140	↓	↓		1			1			1		1	1										↓	5
2842-DUPE1	—	—	↓	↓		1			1			1		1	1										↓	5
2842-TRIP	–	–	↓	↓		1			**			**													↓	1

RELINQUISHED BY (signature)	Date/Time	RECEIVED BY (signature)	Date/Time
Michael R. Weatherby	7/31/98 5:20	K. Shelburne	7/31/98 5:29
RELINQUISHED BY (signature)	Date/Time	RECEIVED BY (signature)	Date/Time

Total # of containers	36	TEMPERATURE
Chain of Custody seals Y / N / (NA)	NA	4 °C
Seals intact? Y / N / (NA)	NA	ice bath
Received good conditions / cold	YES	

Sample disposal Instructions: ____ TEG Disposal @ $2.00 each ____ Return to client ____ Pickup

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World Leader In On-Site Sampling and Analysis

July 31, 1998
TEG Project #98I0729CH2-1

Mr. Marty Clasen
CH2M HILL
4350 W. Cypress Street, Suite 600
Tampa, Florida 33607

SUBJECT: DATA REPORT - CH2M HILL PROJECT NO. 146801.US.SC SITE #2842

Dear Marty,

Please find enclosed the analytical report for the samples collected by CH2M HILL personnel from the above-referenced site and delivered to TEG under the proper chain-of-custody protocol. TEG's Puerto Rico certified-chemist performed the following analyses:

- 1 soil sample analyzed for TRPH by modified EPA test method 418.1.
- 1 soil sample analyzed for TPH-gas/diesel by modified EPA test method 8015.
- 1 soil sample analyzed for BTEX by modified EPA test method 8020.
- 1 equipment blank water samples analyzed for BTEX, TRPH and TPH-gas/diesel.
- 1 trip blank water sample analyzed for BTEX, TRPH and TPH-gas/diesel.
- Laboratory QA/QC analyses for TPH-gas/diesel, TRPH and BTEX.

The analytical results are summarized in the attached table. Applicable detection limits, QA/QC data, chromatograms, a chain-of-custody and an invoice are attached.

TEG appreciates the opportunity to provide analytical services for this project. If you have any questions relating to the data or report, please do not hesitate to contact us.

Sincerely,
TEG

Kevin Shelburne
Principal

Attachments

TEG-PUERTO RICO • PMB 627, HC-01 Box 29030, Caguas, PR 00725 • Phone (787) 720-0329 • Fax (787) 789-3858 • Pager 759-1255 Unit 217-4053

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World Leader In On-Site Sampling and Analysis

CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVY BASE, SITE 2842
CEIBA, P. R.

TEG Project #98I0729CH2-1

TRPH (EPA Method 418.1) ANALYSES OF SOIL

SAMPLE NUMBER	DATE ANALYZED	TRPH (mg/kg)
METHOD BLANK	7/30/98	ND
2842-SB22 @ 4'-6'	7/30/98	230
DETECTION LIMIT (mg/kg)		10

TRPH (EPA Method 418.1) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	TRPH (mg/L)
METHOD BLANK	7/30/98	ND
2842-TRIP	7/30/98	ND
2842-EB9	7/30/98	ND
DETECTION LIMIT (mg/L)		10

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT
mg/L = MILLIGRAMS PER LITER
mg/kg = MILLIGRAMS PER KILOGRAM
ANALYSES PERFORMED BY: MARCO PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

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CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVY BASE, SITE 2842
CEIBA, P. R.

TEG Project #98I0729CH2-1

TPH (DOHS Mod. EPA Method 8015) ANALYSES OF SOIL

SAMPLE NUMBER	DATE ANALYZED	TPH-GAS C5-C12 (mg/kg)	TPH-DIESEL C13-C24 (mg/kg)
METHOD BLANK	7/30/98	ND	ND
2842-SB22 @ 4'-6'	7/30/98	ND	ND
DETECTION LIMIT (mg/kg)		10	25

TPH (DOHS Mod. EPA Method 8015) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	TPH-GAS C5-C12 (mg/L)	TPH-DIESEL C13-C24 (mg/L)
METHOD BLANK	7/30/98	ND	ND
2842-TRIP	7/30/98	ND	ND
2842-EB9	7/30/98	ND	ND
DETECTION LIMIT (mg/L)		10	25

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT
CONCENTRATIONS BASED ON DRY WEIGHT

mg/kg = MILLIGRAMS PER KILOGRAM
mg/L = MILLIGRAMS PER LITER
ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

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CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVY BASE, SITE 2842
CEIBA, P. R.

TEG Project #98I0729CH2-1

BTEX (Mod. EPA Method 8020) ANALYSES OF SOIL

SAMPLE NUMBER	DATE ANALYZED	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL-BENZENE (mg/kg)	TOTAL XYLENES (mg/kg)
METHOD BLANK	7/30/98	ND	ND	ND	ND
2842-SB22 @ 4'-6'	7/30/98	ND	ND	ND	ND
DETECTION LIMIT (mg/kg)		0.05	0.05	0.05	0.15

BTEX (Mod. EPA Method 8020) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL-BENZENE (mg/L)	TOTAL XYLENES (mg/L)
METHOD BLANK	7/30/98	ND	ND	ND	ND
2842-TRIP	7/30/98	ND	ND	ND	ND
2842-EB9	7/30/98	ND	ND	ND	ND
DETECTION LIMIT (mg/L)		0.05	0.05	0.05	0.15

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
mg/kg = MILLIGRAMS PER KILOGRAM
mg/L = MILLIGRAMS PER LITER
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT

ANALYSES PERFORMED BY: MARCO PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE
CONCENTRATIONS BASED ON DRY WEIGHT

Marco A. Pedraza
Laboratory Manager

Kevin Shelburne
Principal

MARCO A. PEDRAZA RUIZ
Químico Licenciado
Estado Libre Asociado de Puerto Rico
526097
LICENCIA NUM. 1193

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QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0729CH2-1

CH2M HILL

DAILY CALIBRATION DATE : 7/30/98

PROJECT NAME: SITE 2842

			INITIAL		OPENING			CLOSING		
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	ABS	RF	%DIFF	ABS	RF	%DIFF
TRPH	IR	10 - 1,000	764.6	15.7%	0.662	755.3	1.2%	0.664	753.0	1.5%

CALIB RANGE - RANGE OF CALIBRATION CURVE IS IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 20% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: MARCO PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

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QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0729CH2-1 CH2M HILL

DATE : 7/30/98 PROJECT NAME: SITE 2842

COMPOUND	SPK CONC (ppm)	MS CONC (ppm)	%REC MS	MSD CONC (ppm)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
TRPH	500	505	101%	506	101%	0%	15%	80% - 120%

ppm = PARTS PER MILLION

MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE

% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX

RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY: MARCO PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

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QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0729CH2-1

CH2M HILL
PROJECT NAME: SITE 2842

COMPOUND	SPK CON (ppm)	MS CONC (ppm)	%REC MS	MSD CONC (ppm)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
TPH-GAS	100	114	114%	114	114%	1%	15%	80% - 120%
TPH-DIESEL	1000	1064	106%	1149	115%	8%	15%	80% - 120%

ppm = PARTS PER MILLION
MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE
% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX
RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY:MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

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QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0729CH2-1
DAILY CALIBRATION DATE: 7/30/98

CH2M HILL
PROJECT NAME: SITE 2842

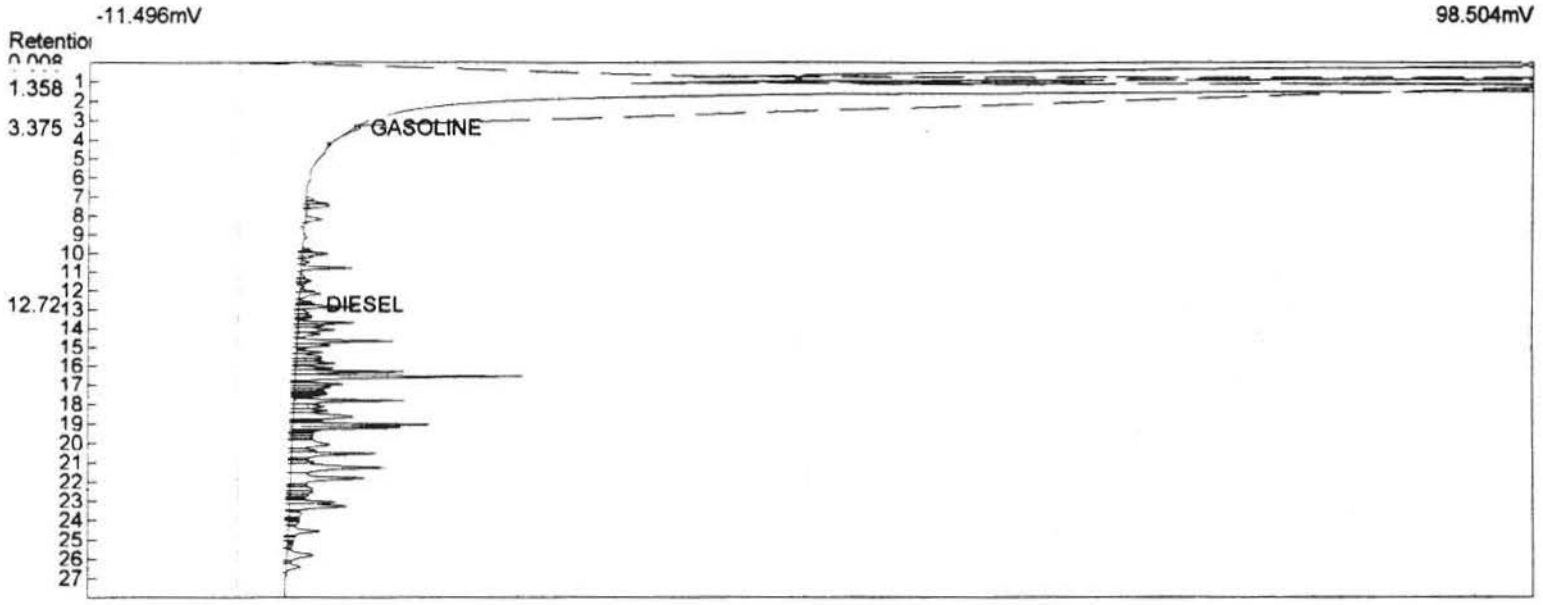
			INITIAL		OPENING			CLOSING		
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	AREA	RF	%DIFF	AREA	RF	%DIFF
TPH GASOLINE	FID #1 (gc1)	10 - 40,000	0.50	9.7%	161.79	0.54	8.5%	132.51	0.44	11.1%
TPH GASOLINE	FID #2 (gc1)	10 - 40,000	0.65	8.1%	198.64	0.66	1.4%	198.02	0.66	1.1%
TPH DIESEL	FID #1 (gc1)	25 - 40,000	0.47	8.8%	1573.66	0.52	12.3%	1381.65	0.46	1.4%
TPH DIESEL	FID #2 (gc1)	25 - 40,000	0.25	5.4%	763.57	0.25	3.0%	833.83	0.28	12.5%

CALIB RANGE - RANGE OF CALIBRATION CURVE IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 15% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

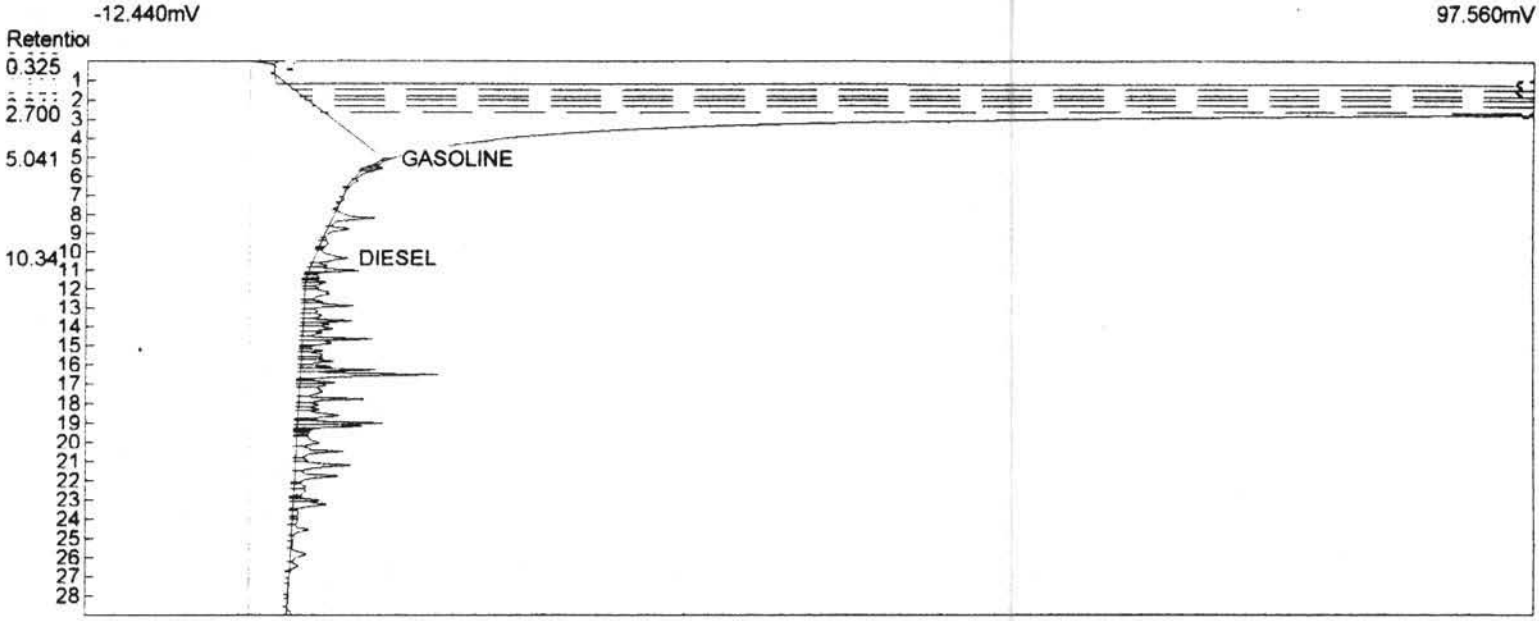
TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

Lab name: TEG Puerto Rico
Analysis date: 07/30/1998 11:43:32
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0730FA3.CHR ()
Sample: 100/1000ppmG/D Opening
Operator: JMP



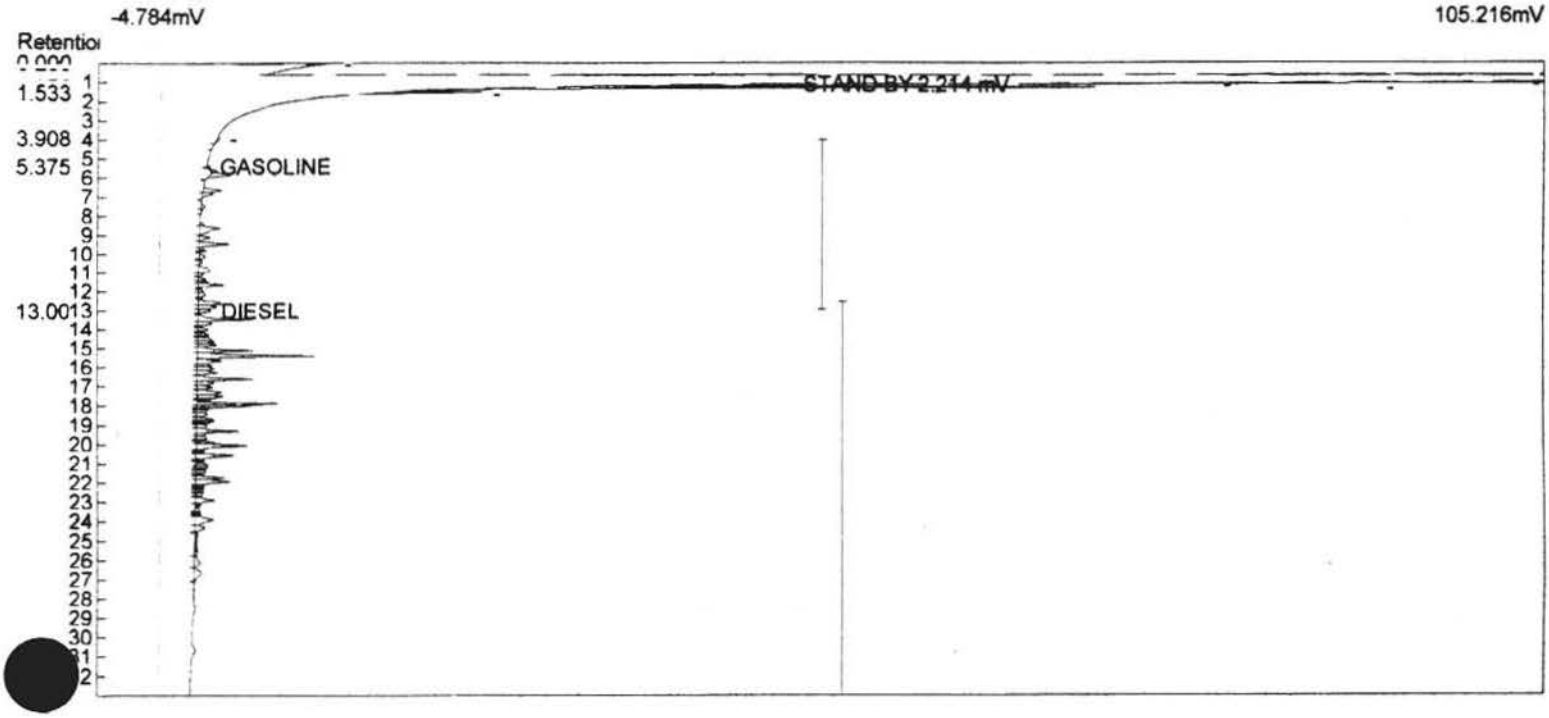
Component	Retention	Area	Internal	Units
OLINE	3.375	161.791	108.4034	ppm
DIESEL	12.725	1573.666	1123.2336	PPM
		1735.457	1231.6370	

Lab name: TEG Puerto Rico
Analysis date: 07/30/1998 17:14:54
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0707FA1.CHR ()
Sample: close std
Operator: MP



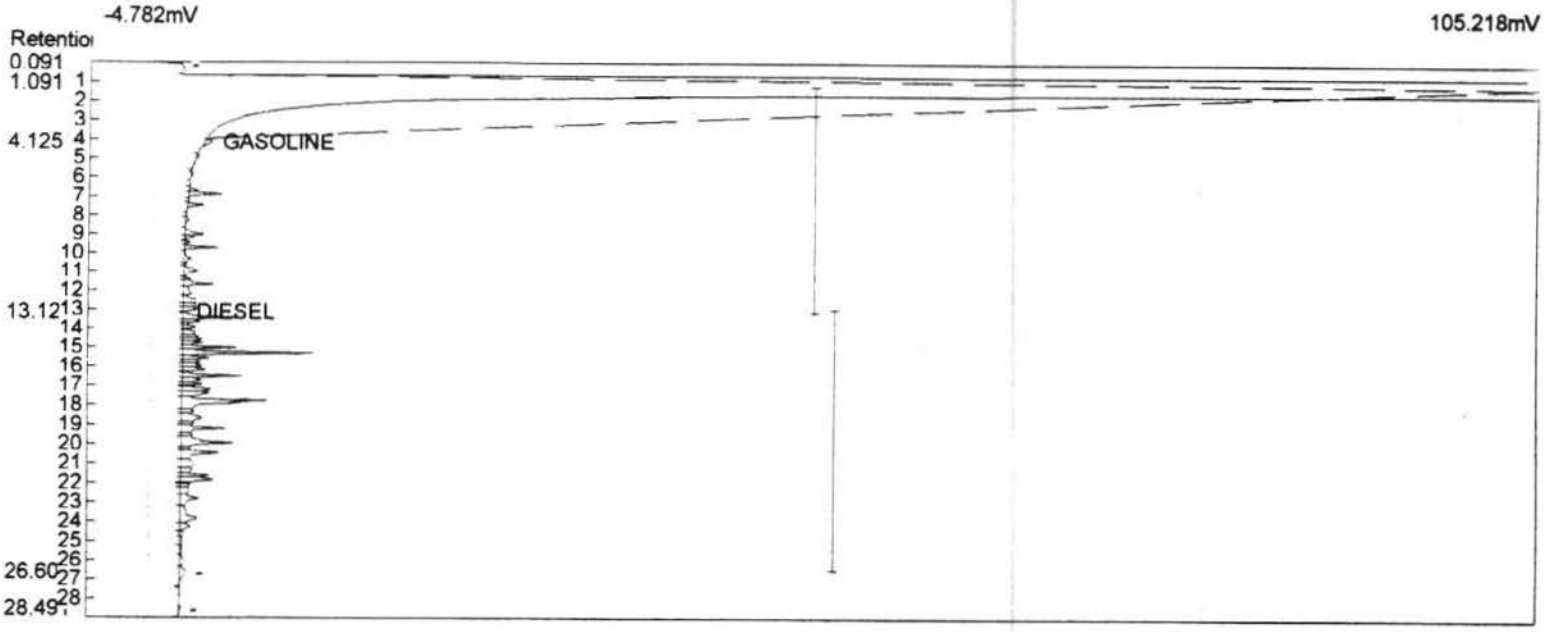
Component	Retention	Area	Internal	Units
GASOLINE	5.041	132.505	88.7807	ppm
DIESEL	10.341	1381.651	986.1793	PPM
		1514.156	1074.9600	

Lab name: TEG Puerto Rico
Analysis date: 07/30/1998 11:43:32
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0730FB3.CHR ()
Sample: 100/1000ppmG/D Opening
Operator: JMP



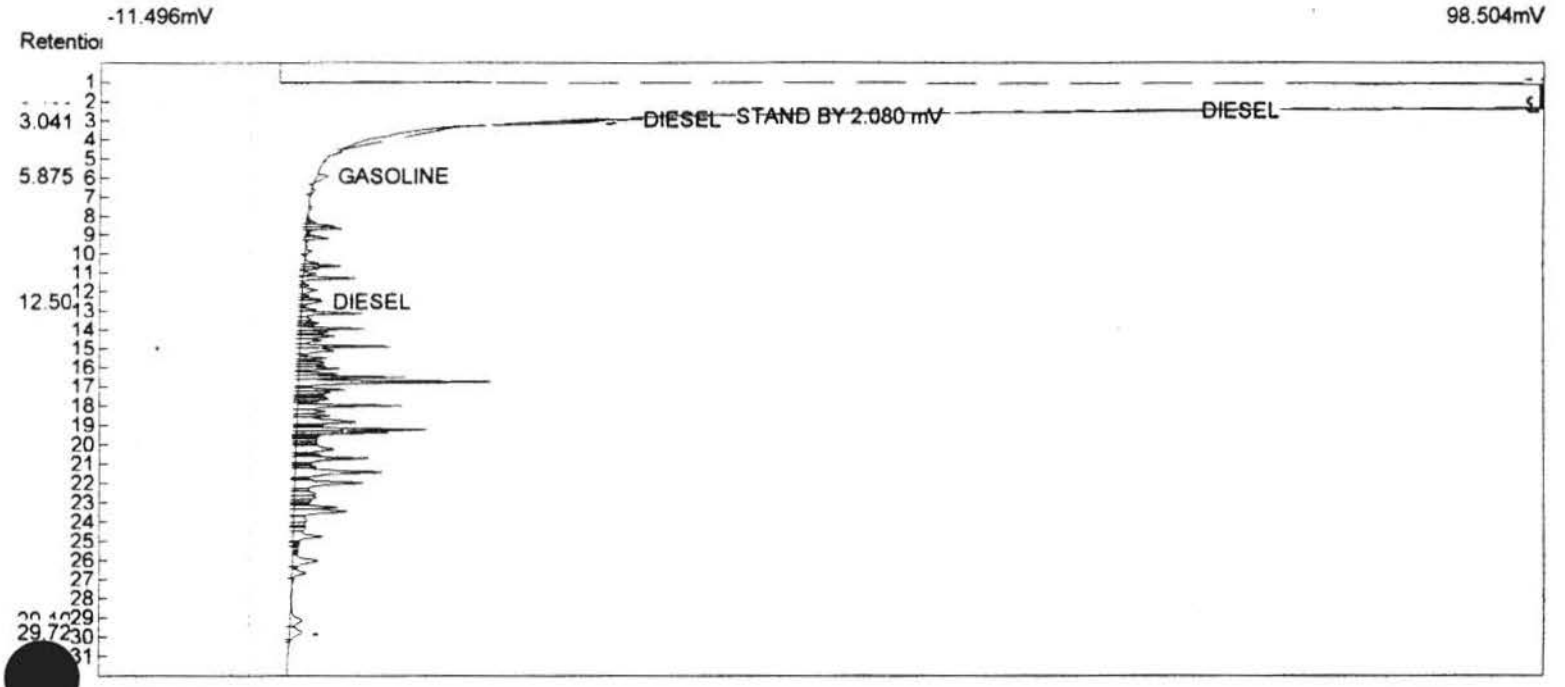
Component	Retention	Area	External	Units
GASOLINE	5.375	198.643	101.30	ppm
DIESEL	13.008	763.573	1029.43	PPM
		962.216	1130.73	

Lab name: TEG Puerto Rico
Analysis date: 07/30/1998 17:14:54
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0730FB11.CHR ()
Sample: close std
Operator: MP



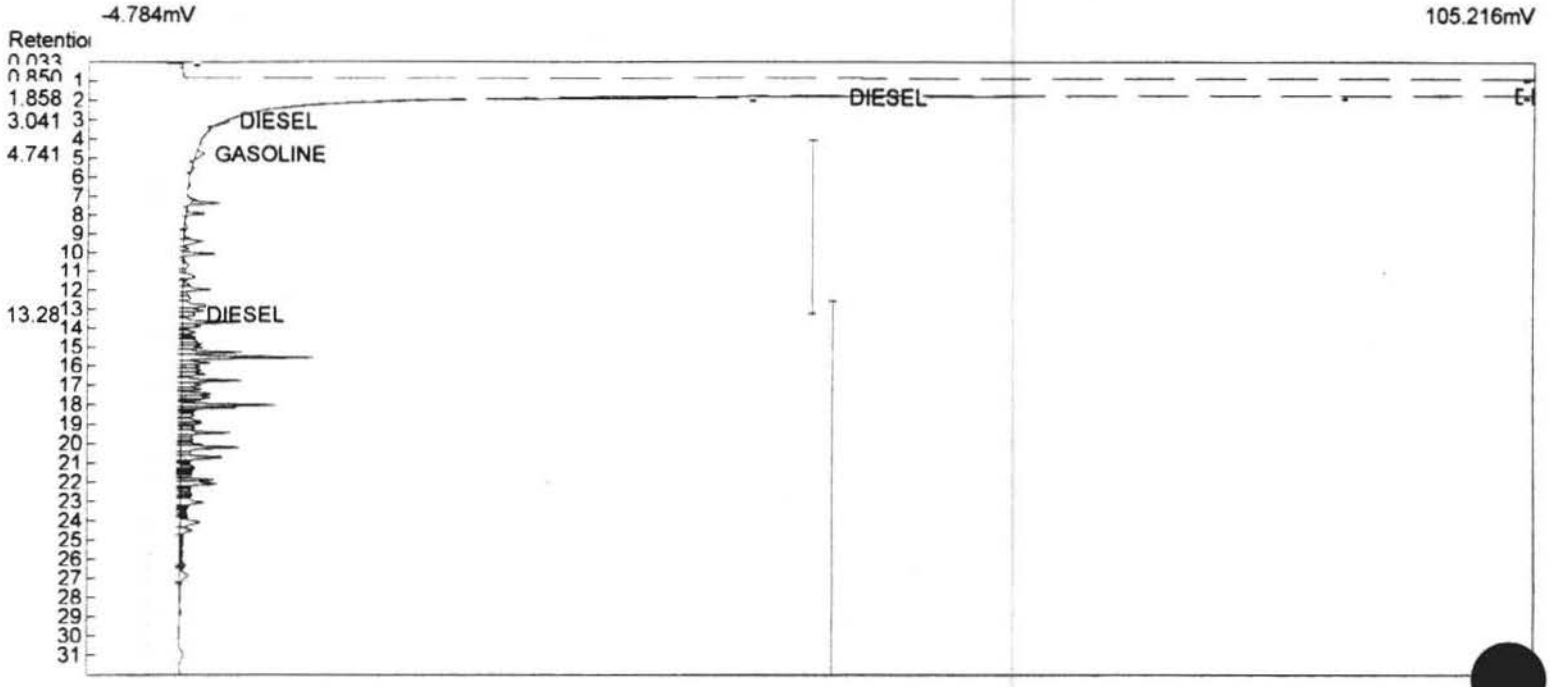
Component	Retention	Area	External	Units
GASOLINE	4.125	198.017	100.07	ppm
DIESEL	13.125	833.829	1124.15	PPM
		1031.845	1224.22	

Lab name: TEG Puerto Rico
Analysis date: 07/30/1998 12:23:29
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0730FA4.CHR ()
Sample: matrix spike
Operator: MP



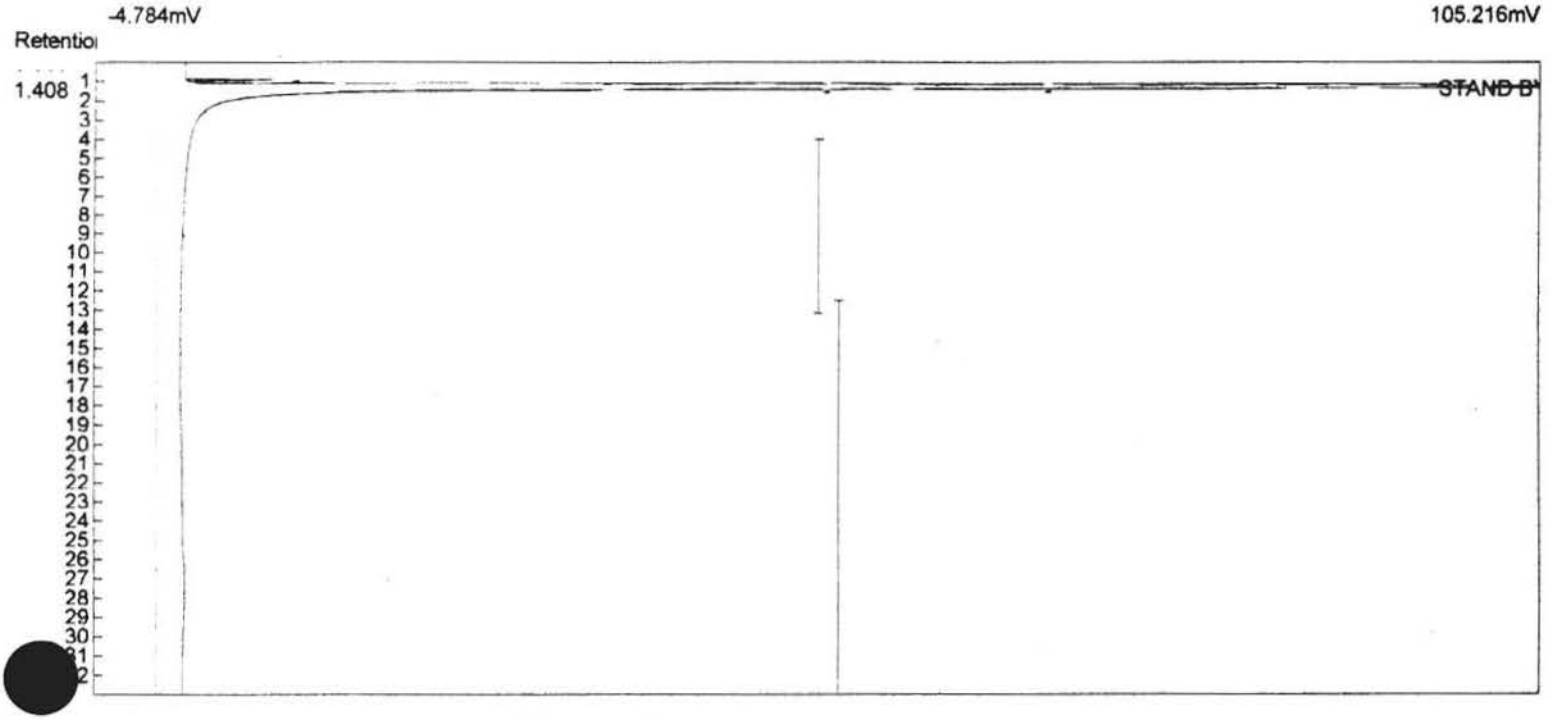
Component	Retention	Area	Internal	Units
GASOLINE	5.875	169.688	113.6940	ppm
DIESEL	12.508	1490.695	1064.0117	PPM
		1660.383	1177.7057	

Lab name: TEG Puerto Rico
Analysis date: 07/30/1998 12:23:29
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0730FB4.CHR ()
Sample: matrix spike duplicate
Operator: MP



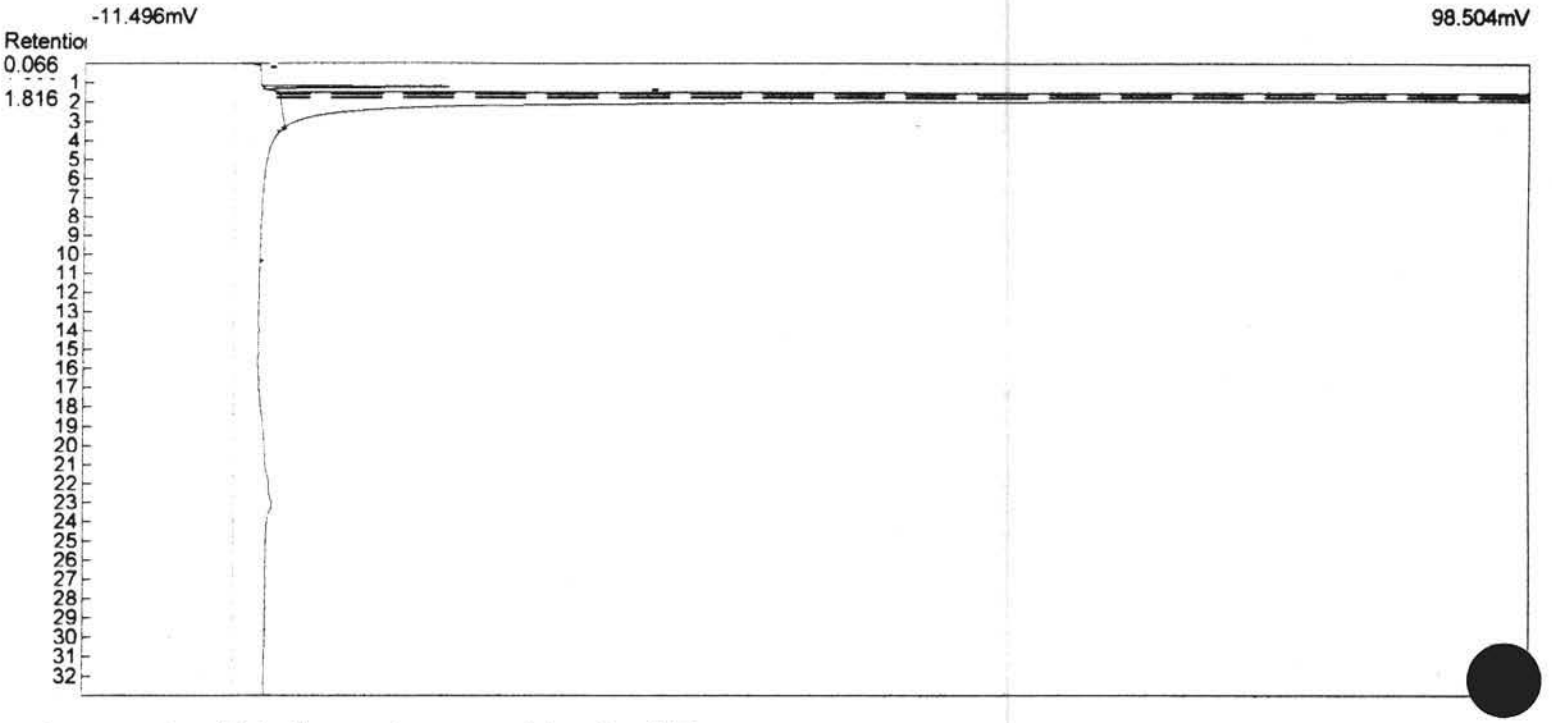
Component	Retention	Area	External	Units
GASOLINE	4.741	179.977	114.38	ppm
DIESEL	13.283	851.990	1148.63	PPM
		1031.967	1263.02	

Lab name: TEG Puerto Rico
Analysis date: 07/30/1998 13:22:57
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0730FB5.CHR ()
Sample: method blank
Operator: MP



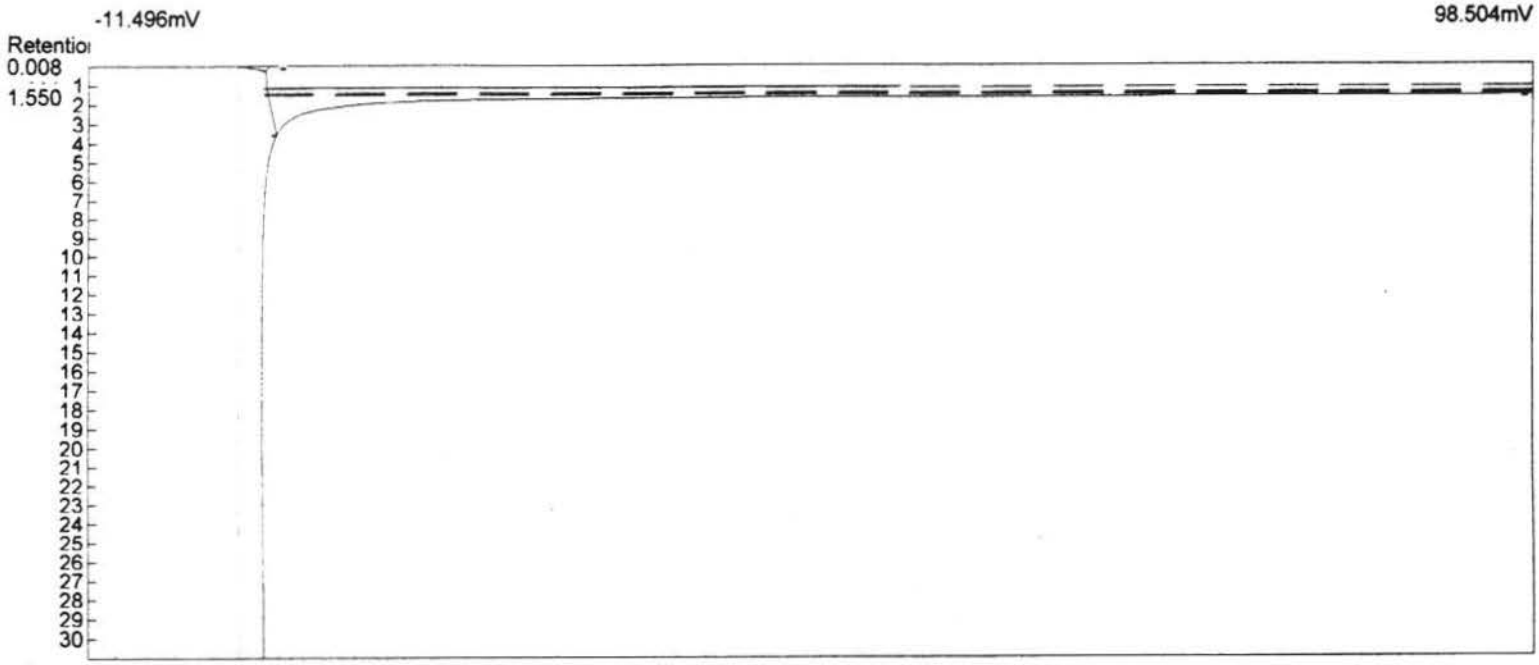
Component	Retention	Area	External	Units
		0.000	0.00	

Lab name: TEG Puerto Rico
Analysis date: 07/30/1998 13:22:57
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0730FA5.CHR ()
Sample: method blank
Operator: MP



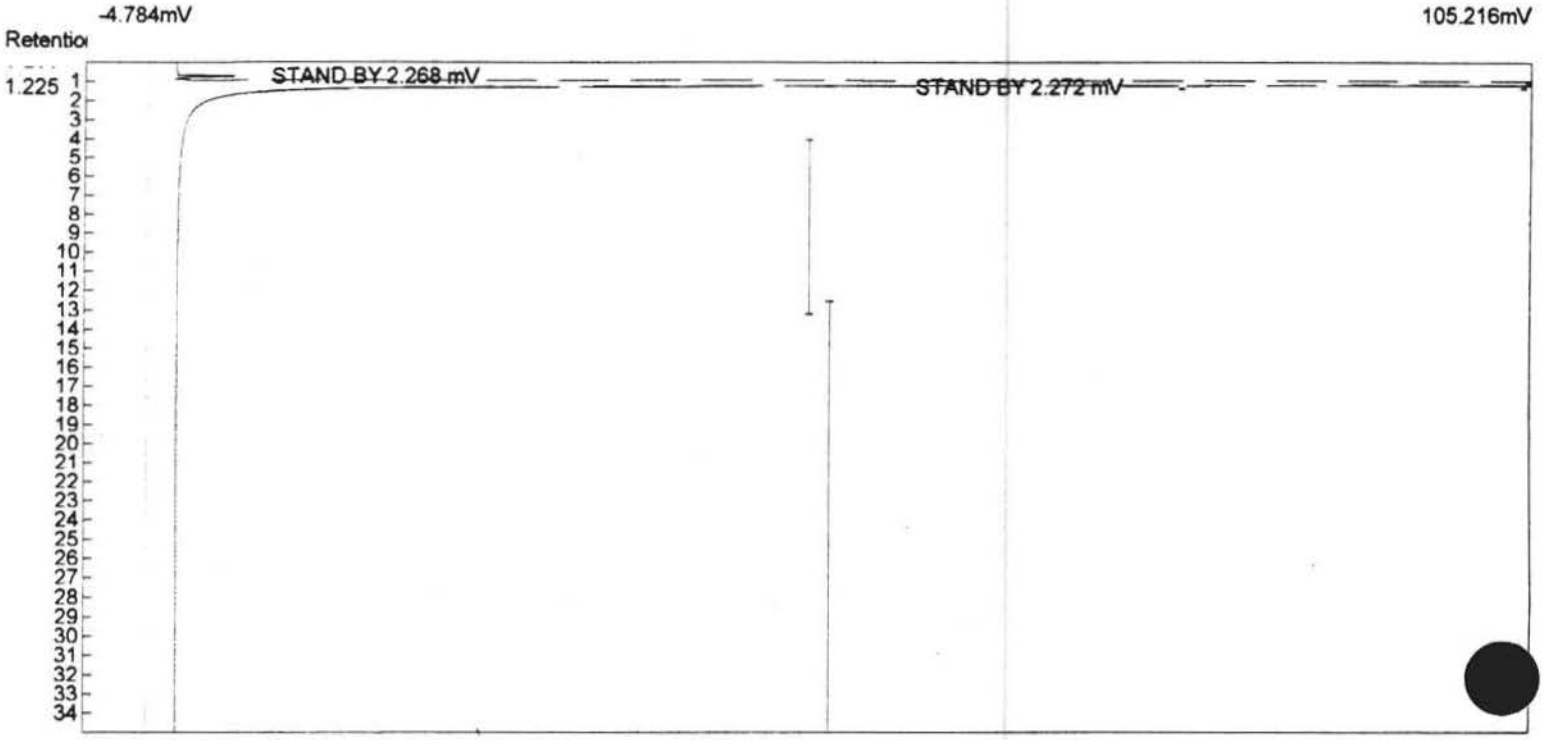
Component	Retention	Area	Internal	Units
		0.000	0.0000	

Analysis date: 07/30/1998 13:58:29
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0730FA6.CHR ()
Sample: 2842eb9/0729ch2-1
Operator: MP



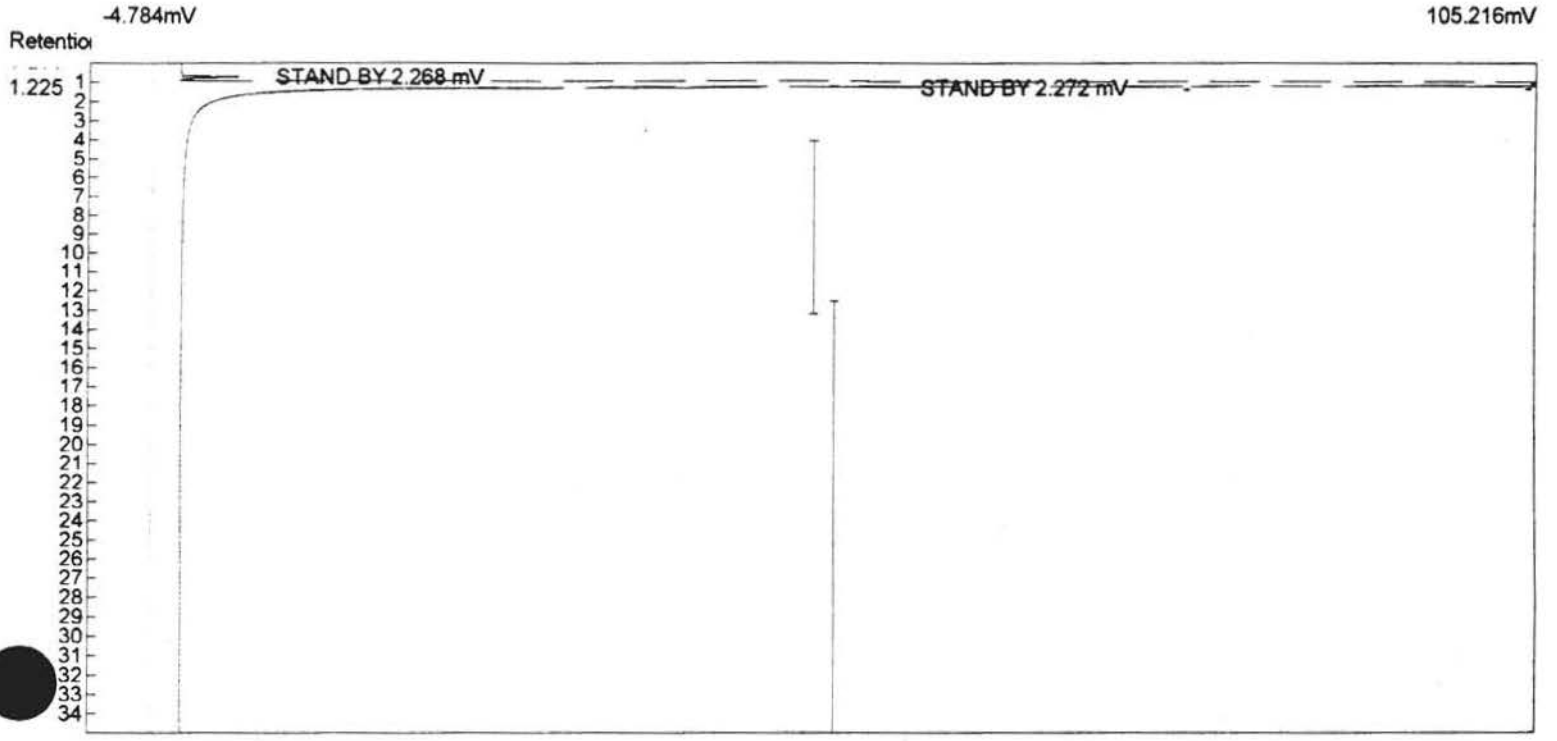
omponent	Retention	Area	Internal	Units
		0.000	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/30/1998 14:31:17
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0730FB7.CHR ()
Sample: 2842sb22/0729ch2-1
Operator: MP



Component	Retention	Area	External	Units
		0.000	0.00	

Lab name: TEG Puerto Rico
Analysis date: 07/30/1998 14:31:17
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0730FB7.CHR ()
Sample: 2842sb22/0729ch2-1
Operator: MP



Component	Retention	Area	External	Units
		0.000	0.00	

teg

QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0729CH2-1
DATE: 7/30/98

CH2M HILL
PROJECT NAME: SITE 2842

COMPOUND	SPK CONC (ppm)	MS CONC (ppm)	%REC MS	MSD CONC (ppm)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
BENZENE	5.0	4.90	98%	5.45	109%	11%	15%	76% - 120%
TOLUENE	5.0	5.19	104%	5.78	116%	11%	15%	75% - 120%
ETHYLBENZENE	5.0	5.83	117%	6.19	124%	6%	15%	65% - 125%
TOTAL XYLENES	15.0	16.5	110%	17.7	120%	7%	15%	72% - 120%

ppm = PARTS PER MILLION
MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE
% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX
RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY:MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

teg

QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0729CH2-1
DAILY CALIBRATION DATE: 7/30/98

CH2M HILL
PROJECT NAME: SITE 2842

			INITIAL		OPENING			CLOSING		
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	AREA	RF	%DIFF	AREA	RF	%DIFF
BENZENE	PID #1	0.100 - 10.000	4.44	6.7%	87.15	4.36	1.9%	82.56	4.13	7.0%
TOLUENE	PID #1	0.100 - 10.000	4.73	9.4%	103.61	5.18	9.5%	100.07	5.00	5.8%
ETHYLBENZENE	PID #1	0.100 - 10.000	4.30	10.0%	95.69	4.78	11.3%	91.65	4.58	6.6%
m&p-XYLENES	PID #1	0.100 - 10.000	5.67	3.5%	260.53	6.51	14.9%	258.18	6.45	13.8%
o-XYLENES	PID #1	0.100 - 10.000	4.97	5.5%	107.61	5.38	8.3%	106.67	5.33	7.3%
BENZENE	PID #2	0.100 - 10.000	4.26	8.6%	86.01	4.30	1.0%	84.79	4.24	0.5%
TOLUENE	PID #2	0.100 - 10.000	4.73	10.2%	100.36	5.02	6.1%	102.48	5.12	8.3%
ETHYLBENZENE	PID #2	0.100 - 10.000	3.70	12.2%	83.97	4.20	13.5%	84.80	4.24	14.6%
m&p-XYLENES	PID #2	0.100 - 10.000	5.39	9.1%	242.34	6.06	12.4%	247.04	6.18	14.6%
o-XYLENES	PID #2	0.100 - 10.000	4.77	11.8%	102.29	5.11	7.2%	105.45	5.27	10.5%

CALIB RANGE - RANGE OF CALIBRATION CURVE IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 20% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY:MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

teg

LABORATORY QA/QC

CH2M HILL, SITE 2842

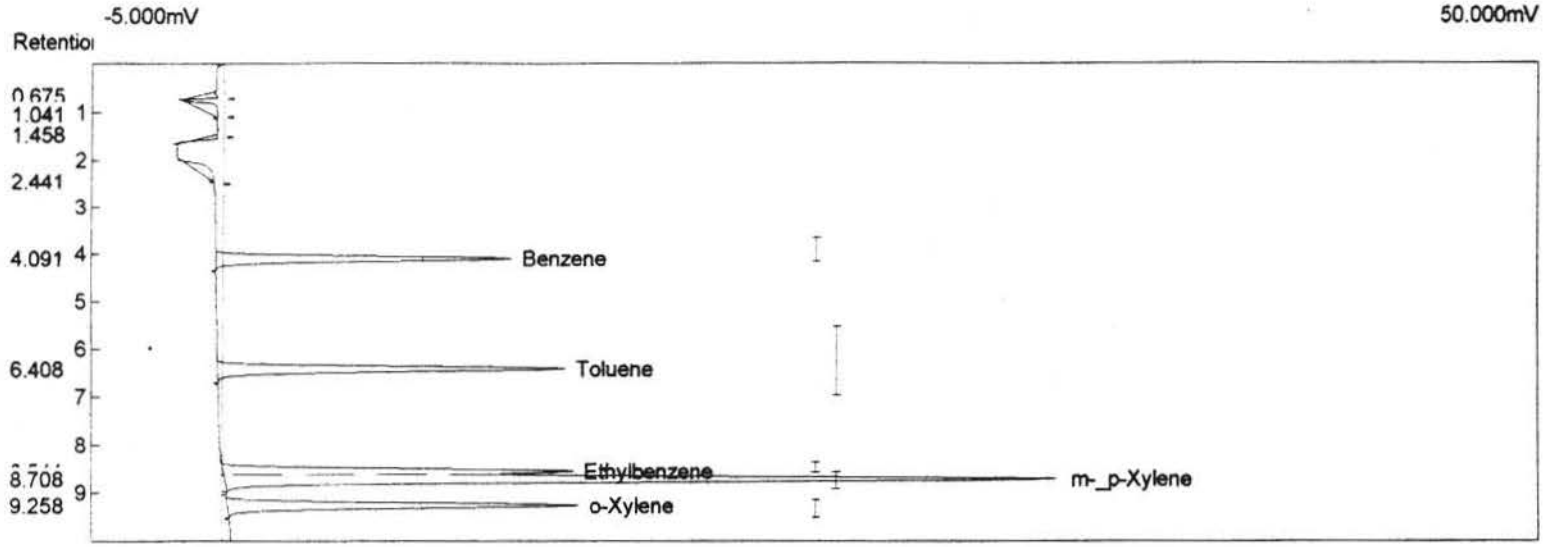
TEG Project #98I0729CH2-1

BTEX (Mod. EPA Method 8020) ANALYSES OF SOIL

SAMPLE NUMBER	DATE ANALYZED	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL-BENZENE (mg/kg)	TOTAL XYLENES (mg/kg)
2842-SB22 @ 4'-6'	7/30/98	ND	ND	ND	ND
2842-SB22 @ 4'-6' rep.	7/30/98	ND	ND	ND	ND
DETECTION LIMIT (mg/kg)		0.05	0.05	0.05	0.15

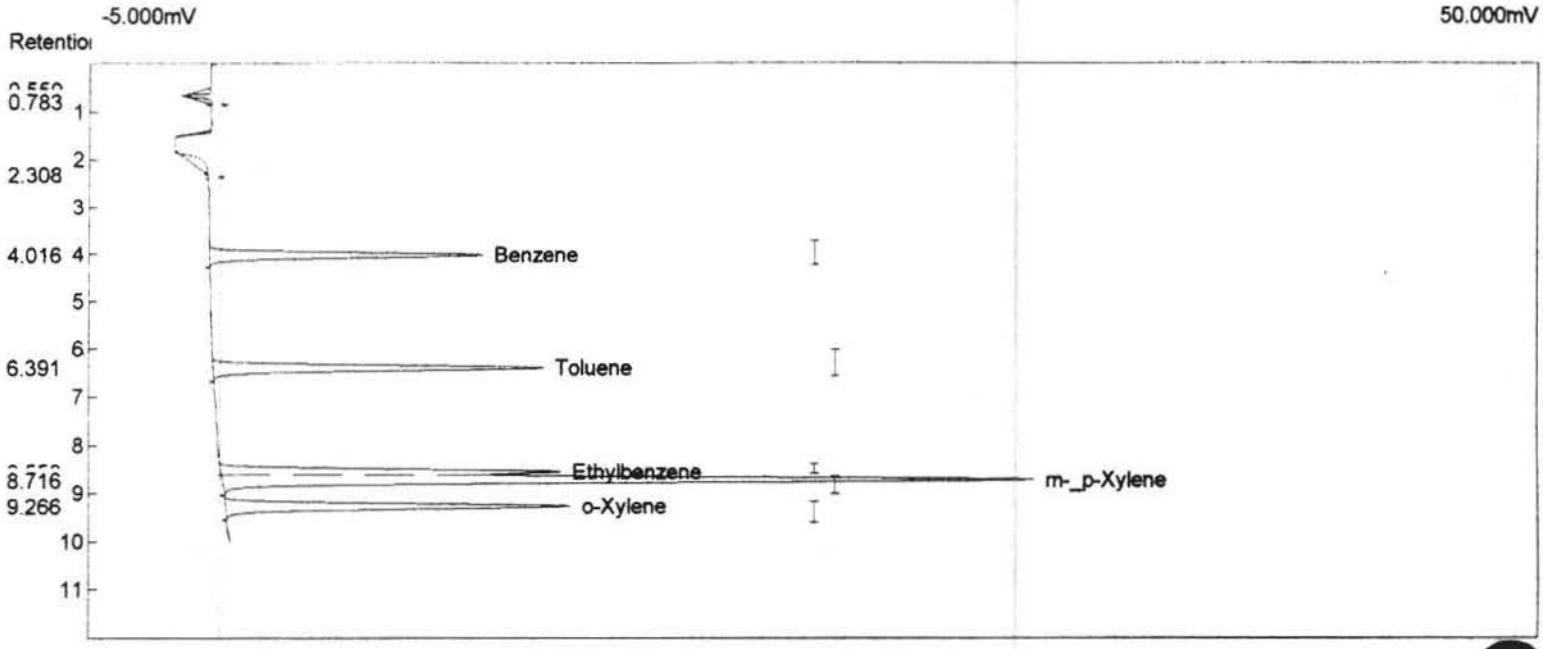
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT
mg/kg = MILLIGRAMS PER KILOGRAM
CONCENTRATIONS BASED ON DRY WEIGHT
ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

Lab name: TEG Puerto Rico
Analysis date: 07/30/1998 12:22:45
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0730PA3.CHR ()
Sample: 5 ppm BTEX open
Operator: MP



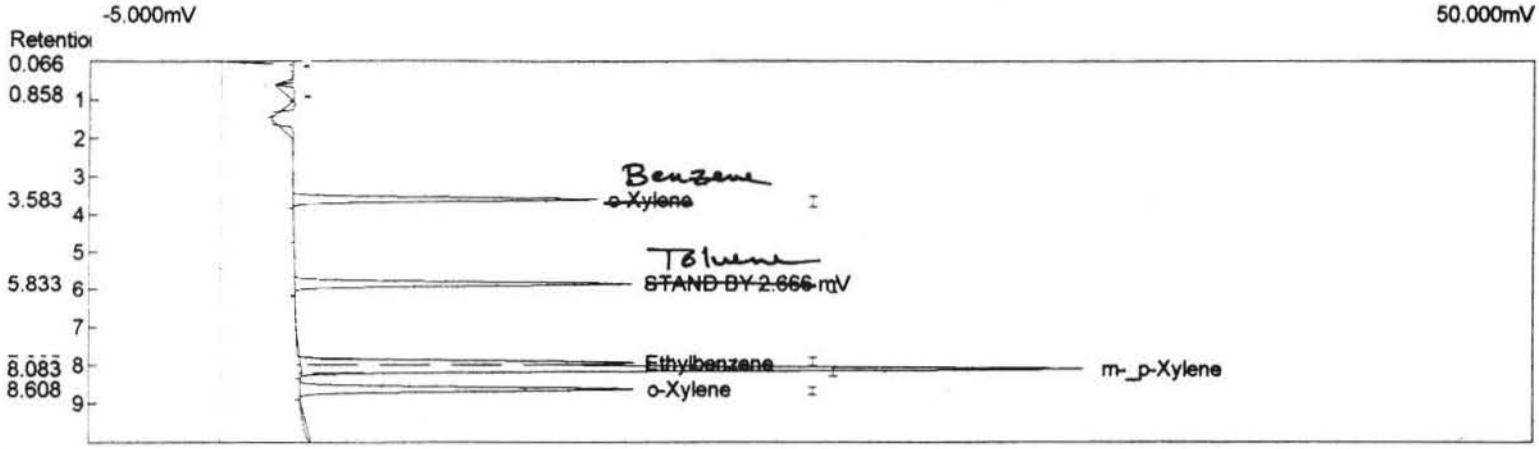
Component	Retention	Area	External	Internal	Units
Benzene	4.091	87.152	4.91	4.9072	ppm
Toluene	6.408	103.606	5.48	5.4760	ppm
Ethylbenzene	8.541	95.690	5.56	5.5634	ppm
m-_p-Xylene	8.708	260.531	11.49	11.4873	ppm
o-Xylene	9.258	107.610	5.41	5.4130	ppm
		654.589	32.85	32.8468	

Lab name: TEG Puerto Rico
Analysis date: 07/30/1998 16:35:10
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0730PA10.CHR ()
Sample: CLOSE
Operator: MP



Component	Retention	Area	External	Internal	Units
Benzene	4.016	82.555	4.65	4.6484	ppm
Toluene	6.391	100.070	5.29	5.2891	ppm
Ethylbenzene	8.550	91.650	5.33	5.3285	ppm
m-_p-Xylene	8.716	258.177	11.38	11.3835	ppm
o-Xylene	9.266	106.665	5.37	5.3655	ppm
		639.118	32.01	32.0150	

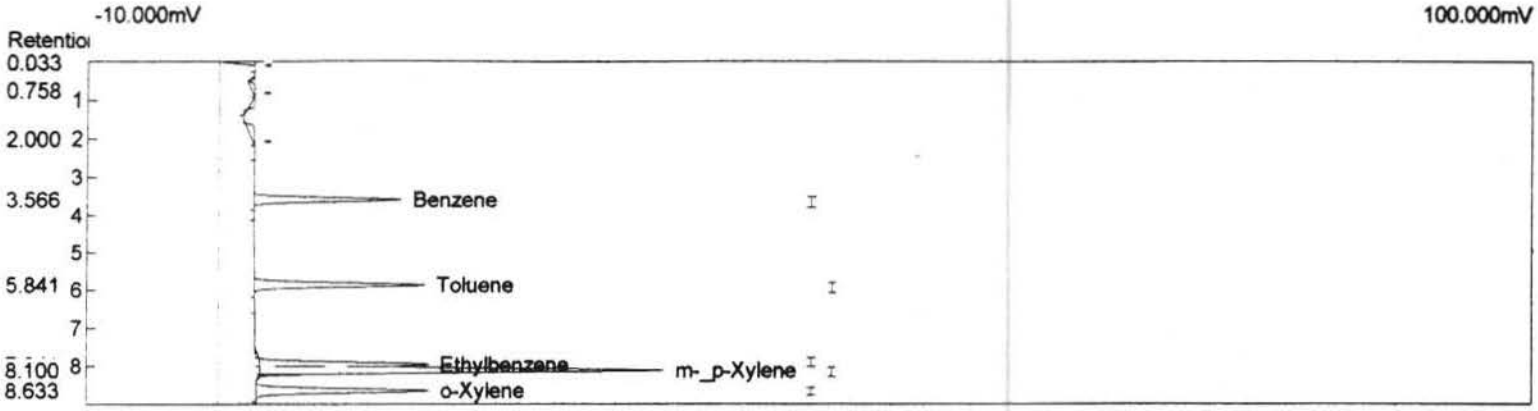
Lab name: TEG Puerto Rico
Analysis date: 07/30/1998 11:44:11
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0730PB1.CHR ()
Sample: 5 ppm BTEX open
Operator: MP



Component	Retention	Area	External	Internal	Units
Benzene	3.583	86.014	5.05	5.0478	ppm
Toluene	5.833	100.362	5.30	5.3045	ppm
Ethylbenzene	7.925	83.974	5.67	5.6739	ppm
m-_p-Xylene	8.083	242.337	11.24	11.2401	ppm
o-Xylene	8.608	102.293	5.36	5.3613	ppm
		614.979	32.63	32.6276	

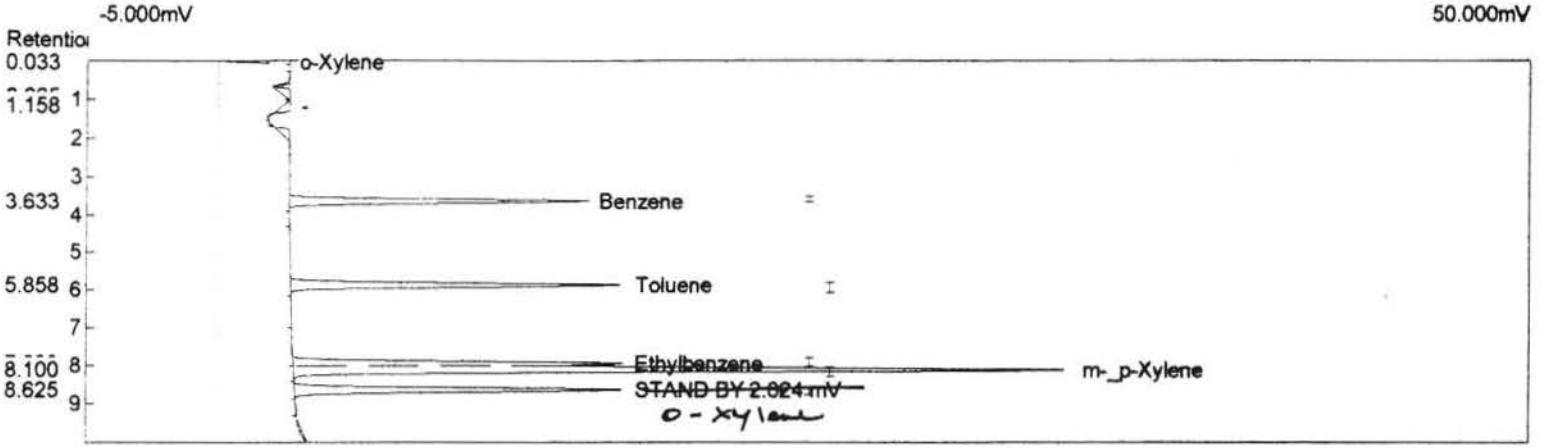
KA

Lab name: TEG Puerto Rico
Analysis date: 07/30/1998 16:56:37
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0730PB11.CHR ()
Sample: CLOSE
Operator: MP



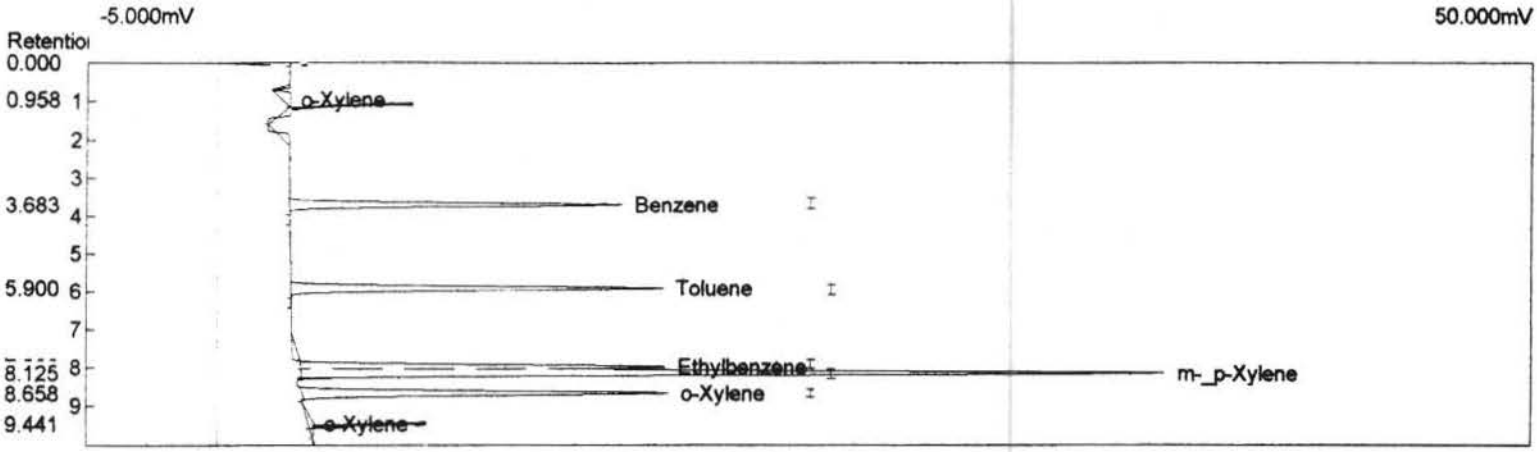
Component	Retention	Area	External	Internal	Units
Benzene	3.566	84.794	4.98	4.9762	ppm
Toluene	5.841	102.484	5.42	5.4167	ppm
Ethylbenzene	7.941	84.796	5.73	5.7295	ppm
m-_p-Xylene	8.100	247.036	11.46	11.4581	ppm
o-Xylene	8.633	105.447	5.53	5.5266	ppm
		624.558	33.11	33.1070	

Lab name: TEG Puerto Rico
Analysis date: 07/30/1998 11:58:13
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0730PB2.CHR ()
Sample: matrix spike
Operator: MP



Component	Retention	Area	External	Internal	Units
Benzene	3.633	83.493	4.90	4.8998	ppm
Toluene	5.858	98.174	5.19	5.1889	ppm
Ethylbenzene	7.933	86.271	5.83	5.8291	ppm
m-_p-Xylene	8.100	243.093	11.28	11.2752	ppm
o-Xylene	8.625	99.984	5.24	5.2403	ppm
		611.015	32.43	32.4333	

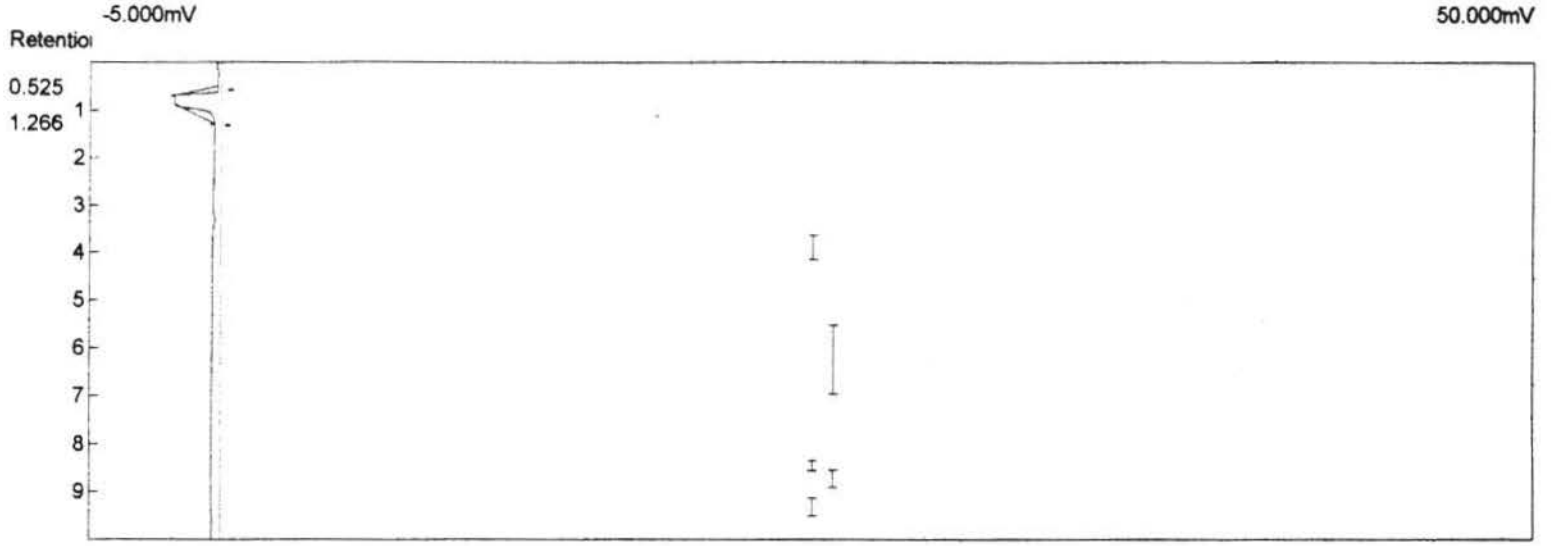
Lab name: TEG Puerto Rico
Analysis date: 07/30/1998 12:22:45
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0730PB3.CHR ()
Sample: matrix spike duplicate
Operator: MP



Component	Retention	Area	External	Internal	Units
Benzene	3.683	92.795	5.45	5.4457	ppm
Toluene	5.900	109.290	5.78	5.7765	ppm
Ethylbenzene	7.966	95.430	6.19	6.1900	ppm
m-_p-Xylene	8.125	263.363	11.97	11.9710	ppm
o-Xylene	8.658	109.856	5.76	5.7577	ppm
		670.734	35.14	35.1409	

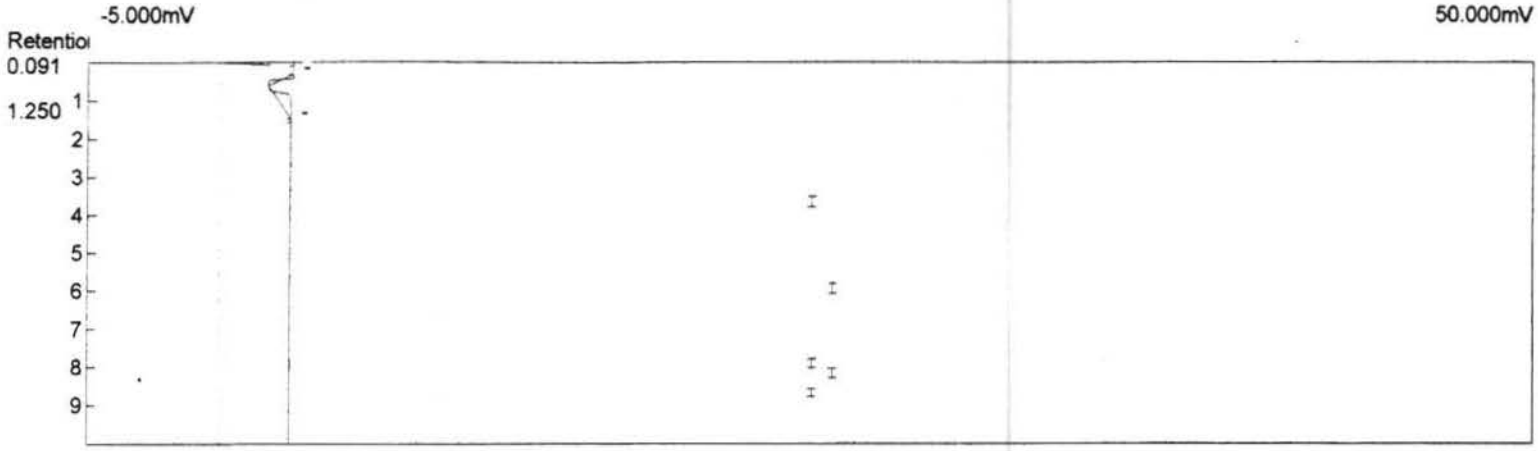
KB

Lab name: TEG Puerto Rico
Analysis date: 07/30/1998 12:38:25
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0730PA4.CHR ()
Sample: method blank
Operator: MP



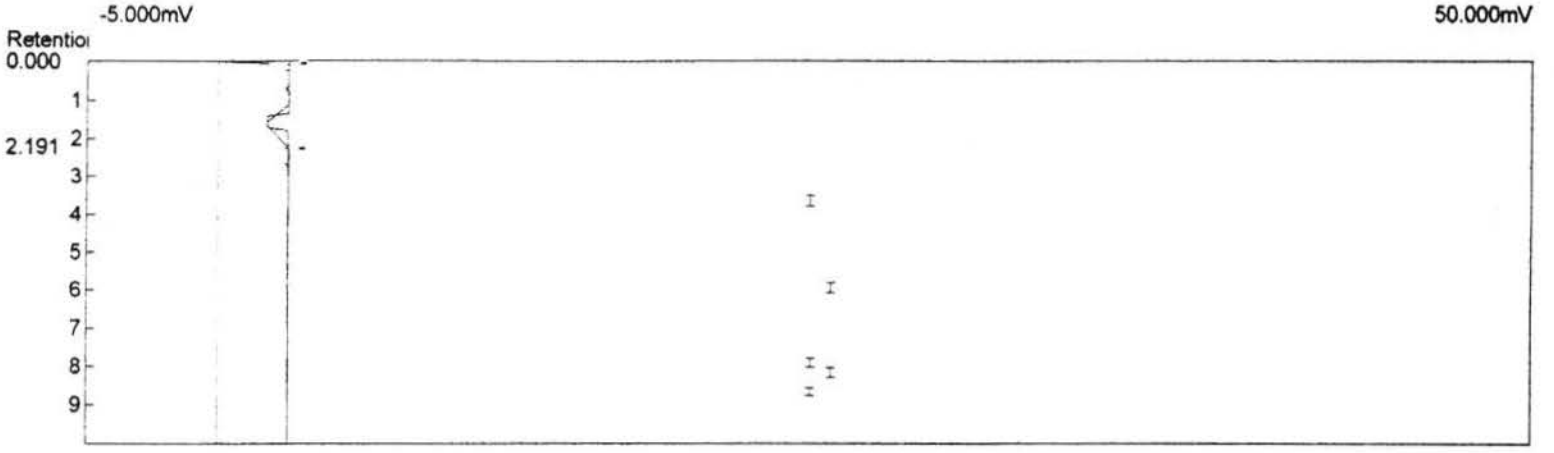
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/30/1998 12:38:25
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0730PB4.CHR ()
Sample: method blank
Operator: MP



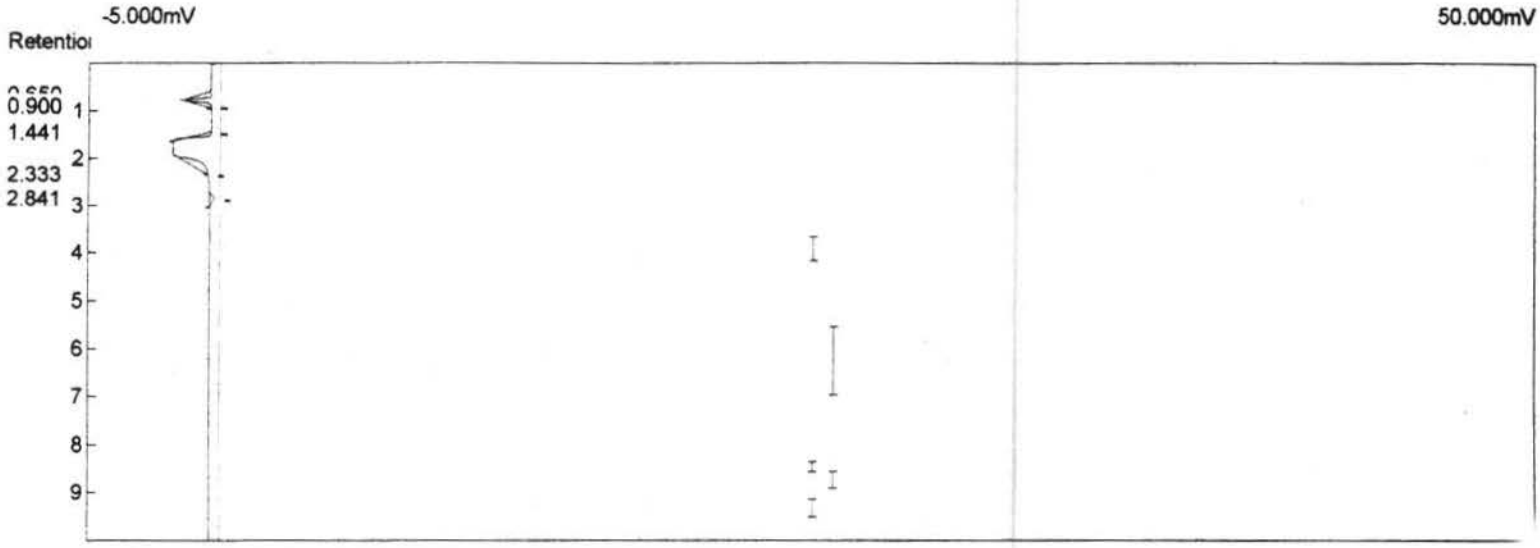
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/30/1998 12:50:42
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0730PB5.CHR ()
Sample: trip blank/0729ch2-1
Operator: MP



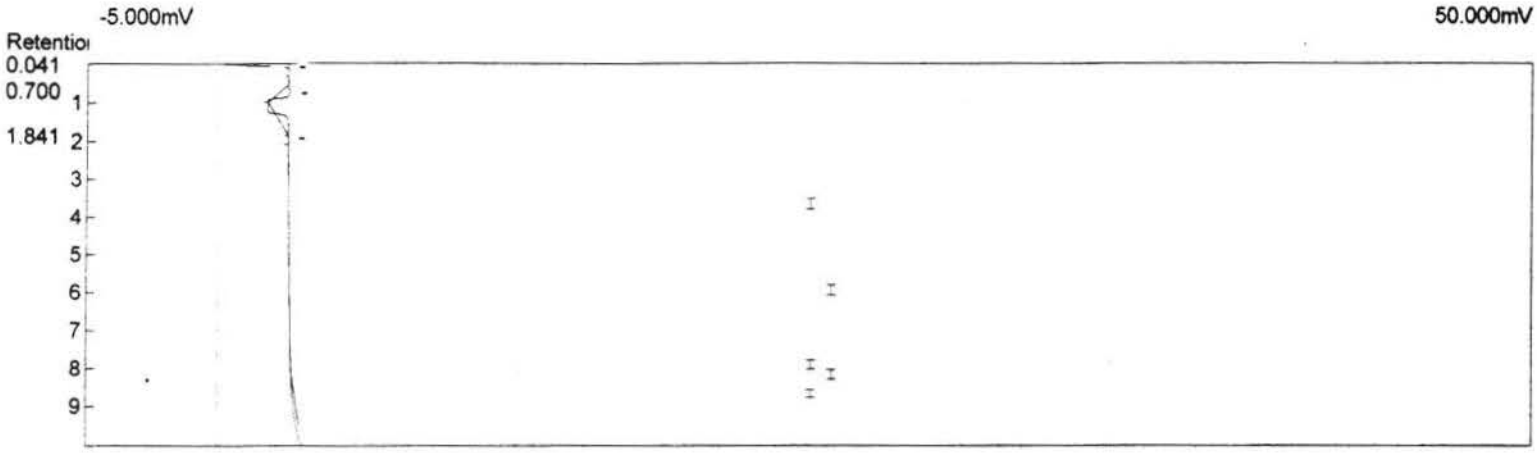
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/30/1998 12:50:42
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0730PA5.CHR ()
Sample: 2842-eb9/0729ch2-1
Operator: MP



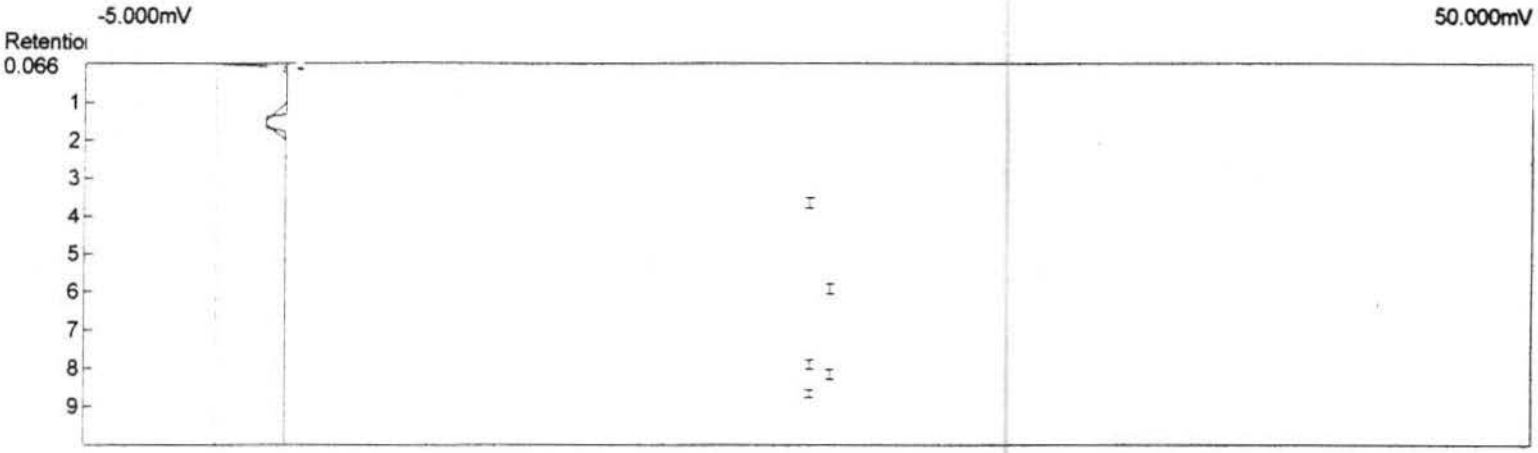
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/30/1998 13:17:41
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0730PB6.CHR ()
Sample: 2842-sb-22/0729ch2-1
Operator: MP



Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/30/1998 13:58:57
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0730PB7.CHR ()
Sample: 2842-SB22/0729CH2-1 rep
Operator: MP



Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

teg Transglobal Environmental Geochemistry

Chain of Custody Record

PO # _____

Client: CH2M HILL RRNS

Address

Phone (787) 888-8713 FAX

Client Project # 146801.US.SC Project Manager MARTY CLASEN/TPA

Date 7/29/98 Page 1 of 1

TEG Project # TEI0729CH2-1 Outside Lab.#

Location Roosevelt Roads

Collector MIKE WEATHERBY Date of Collection 7/29/98

Sample #	Depth	Time	Sample Type	Container Type	VOA 8010	VOA 8020 (BTEX)	VOA 8260	SEMI VOL 8270	TRPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (gas & diesel)	TPH 8015 (oil)	PNA 610/8100	TOTAL LEAD	pH	METALS	RCI							FIELD NOTES / PRESERVATION	Total # of Containers
2842-SB22	4-6	1330	SOIL	2 oz		1			1			1													24 TAT 8015M ONLY	3
2842-TRIP	—	—	WATER	40 ML		X			X			X														1
~~—~~	~~—~~																									
~~—~~	~~—~~																									
2842-EB9	—	1430	WATER	40 ML		1			1			1														3
																										7

RELINQUISHED BY (signature)	Date/Time	RECEIVED BY (signature)	Date/Time
Michael R. Weatherby	7/29/98	[illegible]	7/29/98 5:35 pm
RELINQUISHED BY (signature)	Date/Time	RECEIVED BY (signature)	Date/Time

		TEMPERATURE
Total # of containers	7	
Chain of Custody seals Y / N / NA	NA	
Seals intact? Y / N / NA	NA	
Received good conditions / cold	Y	4°C

Sample disposal Instructions: _____ TEG Disposal @ $2.00 each _____ Return to client _____ Pickup

teg

World Leader In On-Site Sampling and Analysis

July 27, 1998
TEG Project #98I0722CH2

Mr. Marty Clasen
CH2M HILL
4350 W. Cypress Street, Suite 600
Tampa, Florida 33607

SUBJECT: DATA REPORT - CH2M HILL PROJECT NO. 146801.US.SC SITE #2842

Dear Marty,

Please find enclosed the analytical report for the samples collected by CH2M HILL personnel from the above-referenced site and delivered to TEG under the proper chain-of-custody protocol. TEG's Puerto Rico certified-chemist performed the following analyses:

- 4 soil samples analyzed for TRPH by modified EPA test method 418.1.
- 1 water sample analyzed for TRPH by modified EPA test method 418.1.
- 4 soil samples analyzed for TPH-gas/diesel by modified EPA test method 8015.
- 1 water sample analyzed for TPH-gas/diesel by modified EPA test method 8015.
- 4 soil samples analyzed for BTEX by modified EPA test method 8020.
- 1 water sample analyzed for BTEX by modified EPA test method 8020.
- 2 equipment blank water samples analyzed for BTEX, TRPH and TPH-gas/diesel.
- 1 trip blank water sample analyzed for BTEX by modified EPA test method 8020.
- Laboratory QA/QC analyses for TPH-gas/diesel, TRPH and BTEX.

The analytical results are summarized in the attached table. Applicable detection limits, QA/QC data, chromatograms, a chain-of-custody and an invoice are attached.

TEG appreciates the opportunity to provide analytical services for this project. If you have any questions relating to the data or report, please do not hesitate to contact us.

Sincerely,
TEG

Kevin Shelburne

Kevin Shelburne
Principal

Attachments

The World Leader In On-Site Sampling and Analysis

CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVY BASE, SITE 2842
CEIBA, P. R.

TEG Project #98I0722CH2

TRPH (EPA Method 418.1) ANALYSES OF SOIL

SAMPLE NUMBER	DATE ANALYZED	TRPH (mg/Kg)
METHOD BLANK	7/23/98	ND
2842-SB19 @ 4'-6'	7/23/98	**1,200**
2842-SB20 @ 4'-6'	7/23/98	**640**
2842-SB21 @ 2'-4'	7/23/98	**330**
2842-DUPE3	7/23/98	**260**
DETECTION LIMIT (mg/Kg)		10

TRPH (EPA Method 418.1) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	TRPH (mg/L)
METHOD BLANK	7/23/98	ND
2842-SB21	7/23/98	12
2842-EB7	7/23/98	ND
2842-EB8	7/23/98	ND
DETECTION LIMIT (mg/L)		10

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT
mg/L = MILLIGRAMS PER LITER
mg/Kg = MILLIGRAMS PER KILOGRAM
CONCENTRATIONS BASED ON DRY WEIGHT
ANALYSES PERFORMED BY: MARCO PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TEG-PUERTO RICO • PMB 627, HC-01 Box 29030, Caguas, PR 00725 • Phone (787) 720-0329 • Fax (787) 789-3858 • Pager 759-1255 Unit 217-4053

CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVY BASE, SITE 2842
CEIBA, P. R.

TEG Project #98I0722CH2

TPH (DOHS Mod. EPA Method 8015) ANALYSES OF SOIL

SAMPLE NUMBER	DATE ANALYZED	TPH-GAS C5-C12 (mg/kg)	TPH-DIESEL C13-C24 (mg/kg)
METHOD BLANK	7/23/98	ND	ND
2842-SB19 @ 4'-6'	7/23/98	ND	ND
2842-SB20 @ 4'-6'	7/23/98	ND	91
2842-SB21 @ 2'-4'	7/23/98	ND	ND
2842-DUPE3	7/23/98	ND	ND
DETECTION LIMIT (mg/kg)		10	25

TPH (DOHS Mod. EPA Method 8015) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	TPH-GAS C5-C12 (mg/L)	TPH-DIESEL C13-C24 (mg/L)
METHOD BLANK	7/23/98	ND	ND
2842-SB21	7/23/98	ND	ND
2842-EB7	7/23/98	ND	ND
2842-EB8	7/23/98	ND	ND
DETECTION LIMIT (mg/L)		10	25

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT
CONCENTRATIONS BASED ON DRY WEIGHT

mg/kg = MILLIGRAMS PER KILOGRAM
mg/L = MILLIGRAMS PER LITER
ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

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CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVY BASE, SITE 2842
CEIBA, P. R.

TEG Project #98I0722CH2

BTEX (Mod. EPA Method 8020) ANALYSES OF SOIL

SAMPLE NUMBER	DATE ANALYZED	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL-BENZENE (mg/kg)	TOTAL XYLENES (mg/kg)
METHOD BLANK	7/23/98	ND	ND	ND	ND
2842-SB19 @ 4'-6'	7/23/98	ND	ND	ND	ND
2842-SB20 @ 4'-6'	7/23/98	ND	ND	ND	ND
2842-SB21 @ 2'-4'	7/23/98	ND	ND	ND	ND
2842-DUPE3	7/23/98	ND	ND	ND	ND
DETECTION LIMIT (mg/kg)		0.05	0.05	0.05	0.15

BTEX (Mod. EPA Method 8020) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL-BENZENE (mg/L)	TOTAL XYLENES (mg/L)
METHOD BLANK	7/23/98	ND	ND	ND	ND
2842-SB21	7/23/98	ND	ND	ND	ND
2842-EB7	7/23/98	ND	ND	ND	ND
2842-EB8	7/23/98	ND	ND	ND	ND
TRIP BLANK	7/23/98	ND	ND	ND	ND
DETECTION LIMIT (mg/L)		0.05	0.05	0.05	0.15

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
mg/kg = MILLIGRAMS PER KILOGRAM
mg/L = MILLIGRAMS PER LITER
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE
CONCENTRATIONS BASED ON DRY WEIGHT

Marco A. Pedraza
Laboratory Manager

Kevin Shelburne
Principal

A 526057

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QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0722CH2

DAILY CALIBRATION DATE : 7/23/98

CH2M HILL

PROJECT NAME: SITE 2842

			INITIAL		OPENING			CLOSING		
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	ABS	RF	%DIFF	ABS	RF	%DIFF
TRPH	IR	10 - 1,000	764.6	15.7%	0.702	712.3	6.8%	0.709	705.2	7.8%

CALIB RANGE - RANGE OF CALIBRATION CURVE IS IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 20% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: MARCO PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
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QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0722CH2
DATE : 7/23/98

CH2M HILL
PROJECT NAME: SITE 2842

COMPOUND	SPK CONC (ppm)	MS CONC (ppm)	%REC MS	MSD CONC (ppm)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
TRPH	500	543	109%	547	109%	1%	15%	80% - 120%

ppm = PARTS PER MILLION
MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE
% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX
RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY: MARCO PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
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LABORATORY QA/QC

CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVY BASE, SITE 2842
CEIBA, P. R.

TEG Project #98I0722CH2

BTEX (Mod. EPA Method 8020) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL-BENZENE (mg/L)	TOTAL XYLENES (mg/L)
METHOD BLANK	7/23/98	ND	ND	ND	ND
2842-SB21	7/23/98	ND	ND	ND	ND
2842-SB21 rep.	7/23/98	ND	ND	ND	ND
DETECTION LIMIT (mg/L)		0.05	0.05	0.05	0.15

TPH (DOHS Mod. EPA Method 8015) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	TPH-GAS C5-C12 (mg/L)	TPH-DIESEL C13-C24 (mg/L)
METHOD BLANK	7/23/98	ND	ND
2842-SB21	7/23/98	ND	ND
2842-SB21 rep.	7/23/98	ND	ND
DETECTION LIMIT (mg/L)		10	25

mg/L = MILLIGRAMS PER LITER
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT
ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE
CONCENTRATIONS BASED ON DRY WEIGHT

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QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0722CH2
DAILY CALIBRATION DATE: 7/23/98

CH2M HILL
PROJECT NAME: SITE 2842

			INITIAL			OPENING			CLOSING	
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	AREA	RF	%DIFF	AREA	RF	%DIFF
TPH GASOLINE	FID #1 (gc1)	10 - 40,000	0.50	9.7%	153.58	0.51	3.0%	160.75	0.54	7.8%
TPH GASOLINE	FID #2 (gc1)	10 - 40,000	0.65	8.1%	207.85	0.69	6.1%	173.36	0.58	11.5%
TPH DIESEL	FID #1 (gc1)	25 - 40,000	0.47	8.8%	1571.28	0.52	12.2%	723.49	0.48	3.3%
TPH DIESEL	FID #2 (gc1)	25 - 40,000	0.25	5.4%	758.84	0.25	2.4%	418.28	0.28	12.9%

CALIB RANGE - RANGE OF CALIBRATION CURVE IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 15% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
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QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0722CH2

CH2M HILL
PROJECT NAME: SITE 2842

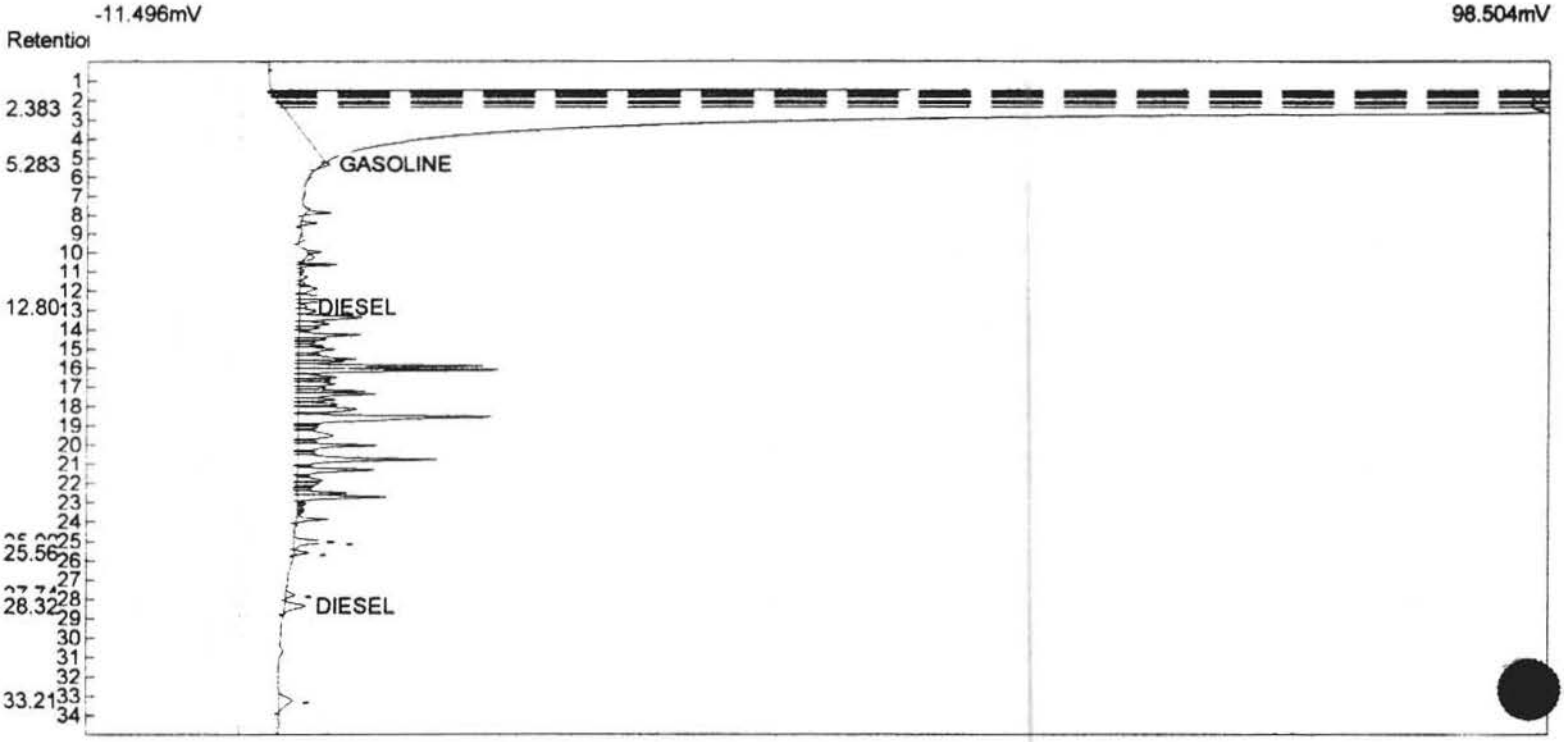
COMPOUND	SPK CON (ppm)	MS CONC (ppm)	%REC MS	MSD CONC (ppm)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
TPH-GAS	100	84	84%	86	86%	2%	15%	80% - 120%
TPH-DIESEL	500	534	107%	552	110%	3%	15%	80% - 120%

ppm = PARTS PER MILLION
MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE
% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX
RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

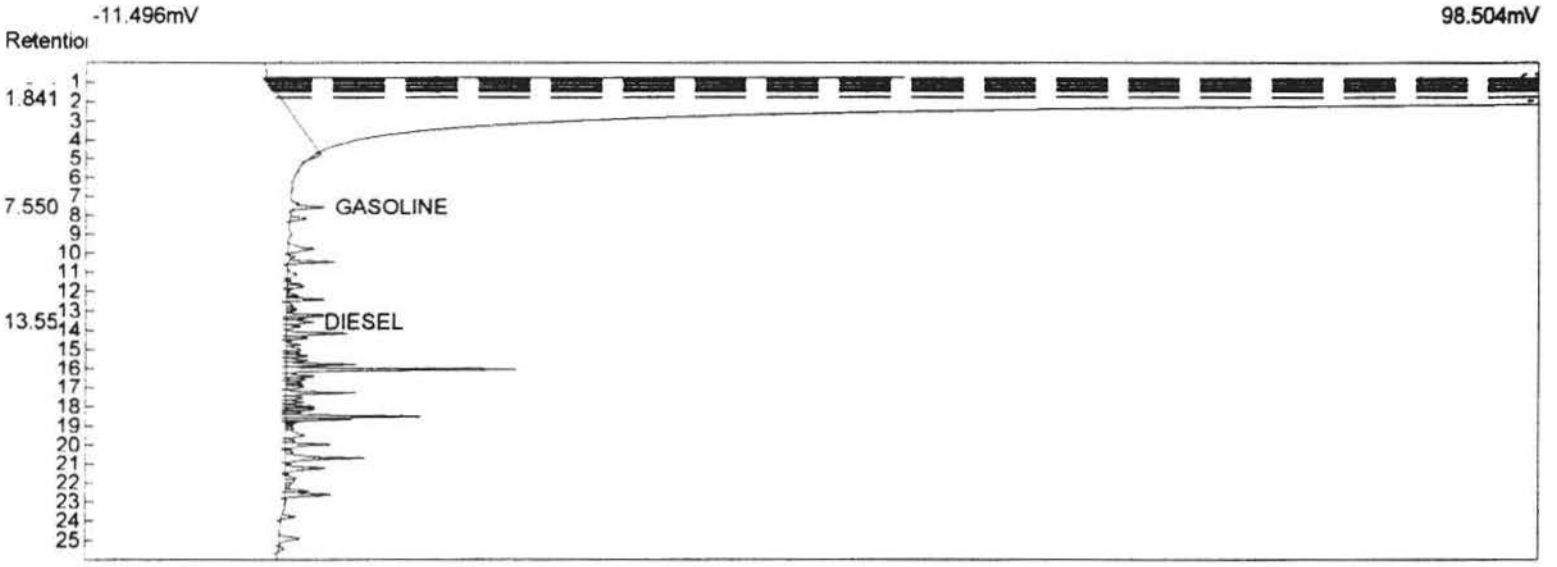
TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 11:20:10
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0723FA1.CHR ()
Sample: 100/1000 ppm G/D Open
Operator: JMP



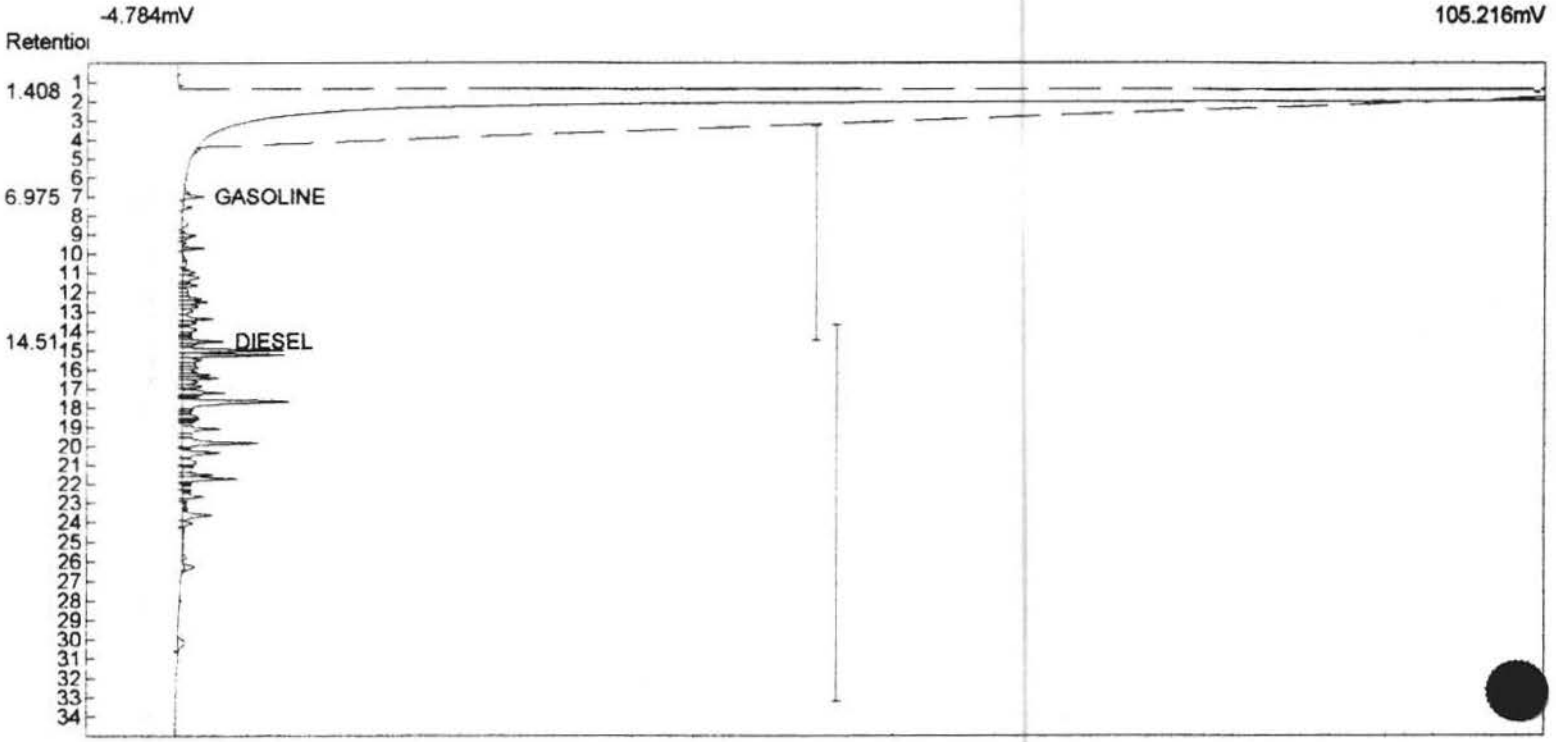
Component	Retention	Area	Internal	Units
GASOLINE	5.283	153.580	102.9017	ppm
DIESEL	12.800	1571.282	1121.5318	PPM
		1724.862	1224.4335	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 19:41:12
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0723FA8.CHR ()
Sample: CLOSE STD
Operator: JMP



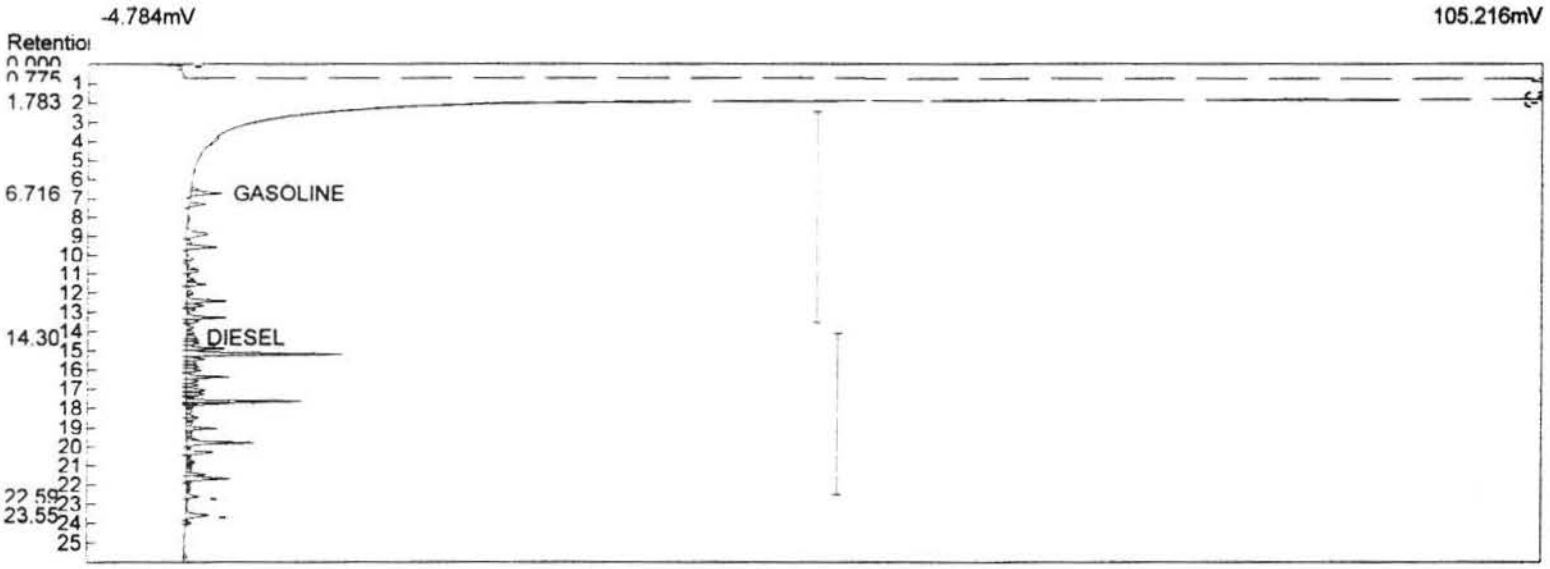
Component	Retention	Area	Internal	Units
GASOLINE	7.550	160.749	107.7054	ppm
DIESEL	13.558	723.485	516.4008	PPM
		884.234	624.1062	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 11:20:10
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0723FB1.CHR ()
Sample: 100/1000 ppm G/D Open
Operator: JMP



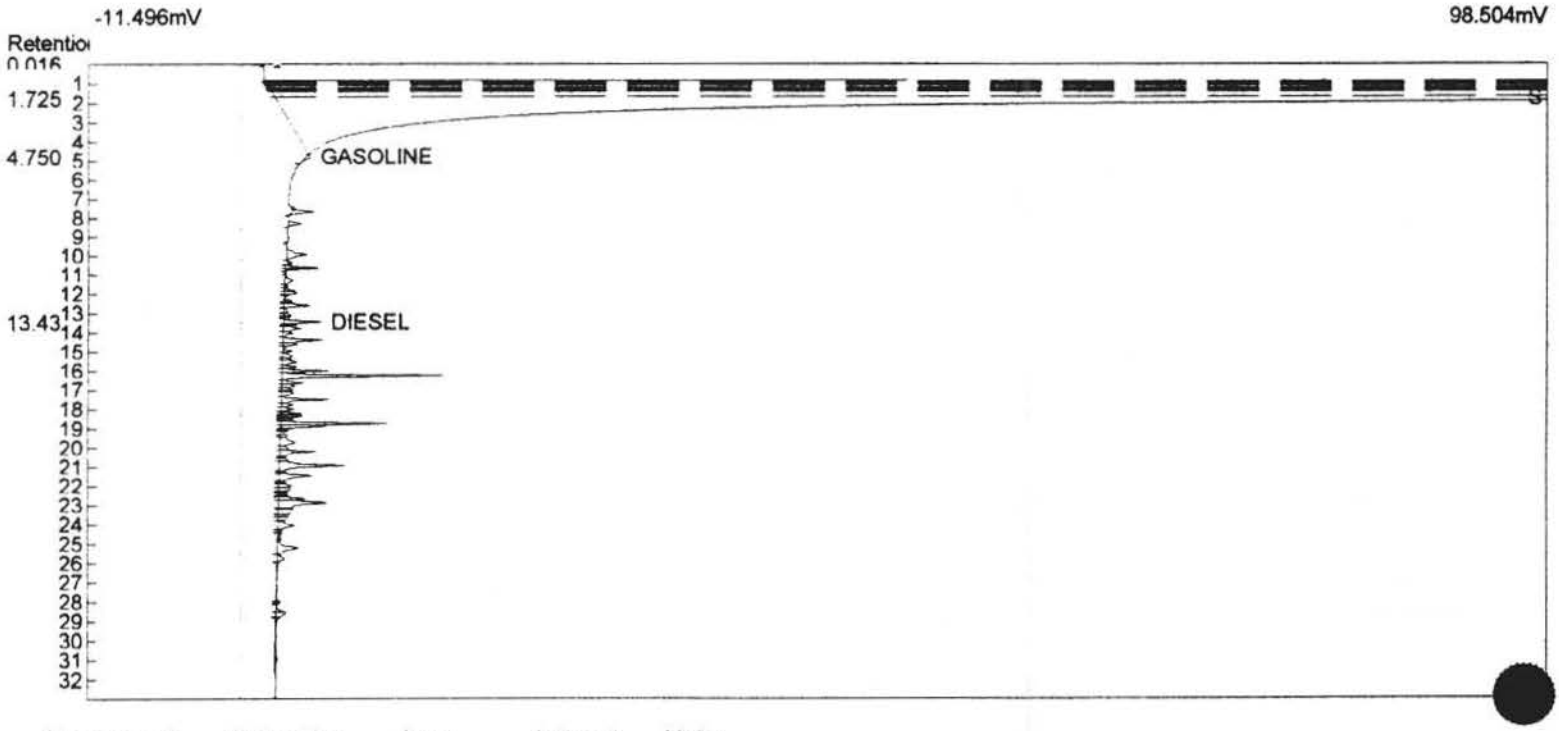
Component	Retention	Area	External	Units
GASOLINE	6.975	207.845	108.22	ppm
DIESEL	14.516	758.837	1023.05	PPM
		966.682	1131.27	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 19:41:12
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0723FB8.CHR ()
Sample: CLOSE STD
Operator: JMP



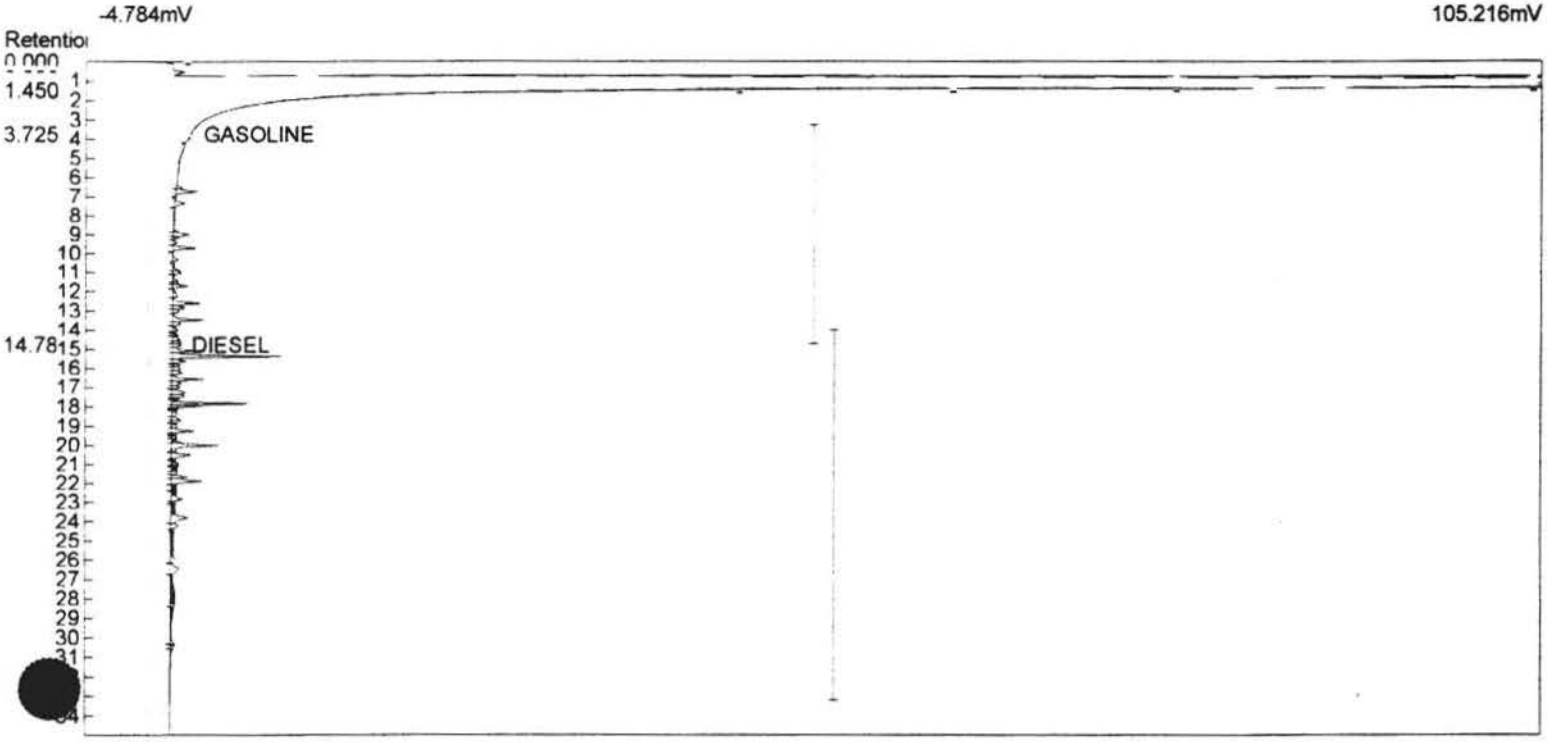
Component	Retention	Area	External	Units
GASOLINE	6.716	173.358	90.26	ppm
DIESEL	14.308	418.279	563.91	PPM
		591.636	654.18	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 12:06:29
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0723FA2.CHR ()
Sample: 1~~00/1000 ppm G/D Open~~ Matrix Spike
Operator: JMP



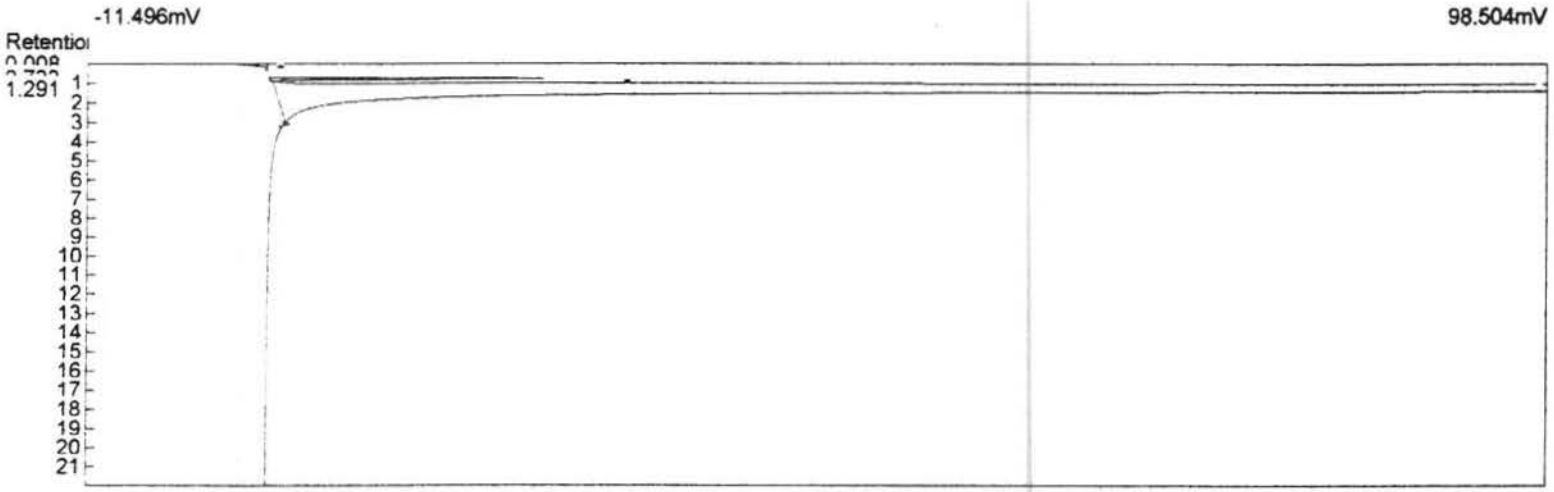
Component	Retention	Area	Internal	Units
GASOLINE	4.750	125.363	83.9957	ppm
DIESEL	13.433	748.304	534.1156	PPM
		873.667	618.1114	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 12:06:29
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0723FB2.CHR ()
Sample: Matri Spike Duplicate
Operator: JMP



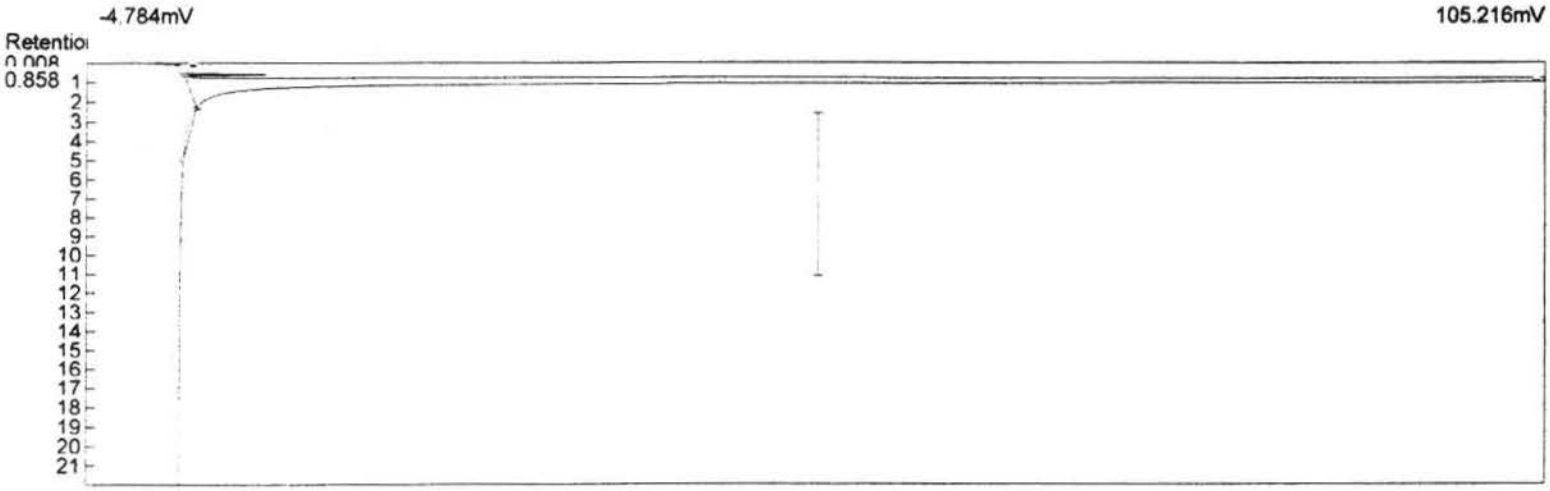
Component	Retention	Area	External	Units
GASOLINE	3.725	165.683	86.27	ppm
DIESEL	14.783	409.536	552.13	PPM
		575.219	638.39	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 14:11:22
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0723FA3.CHR ()
Sample: METHOD BLANK
Operator: JMP



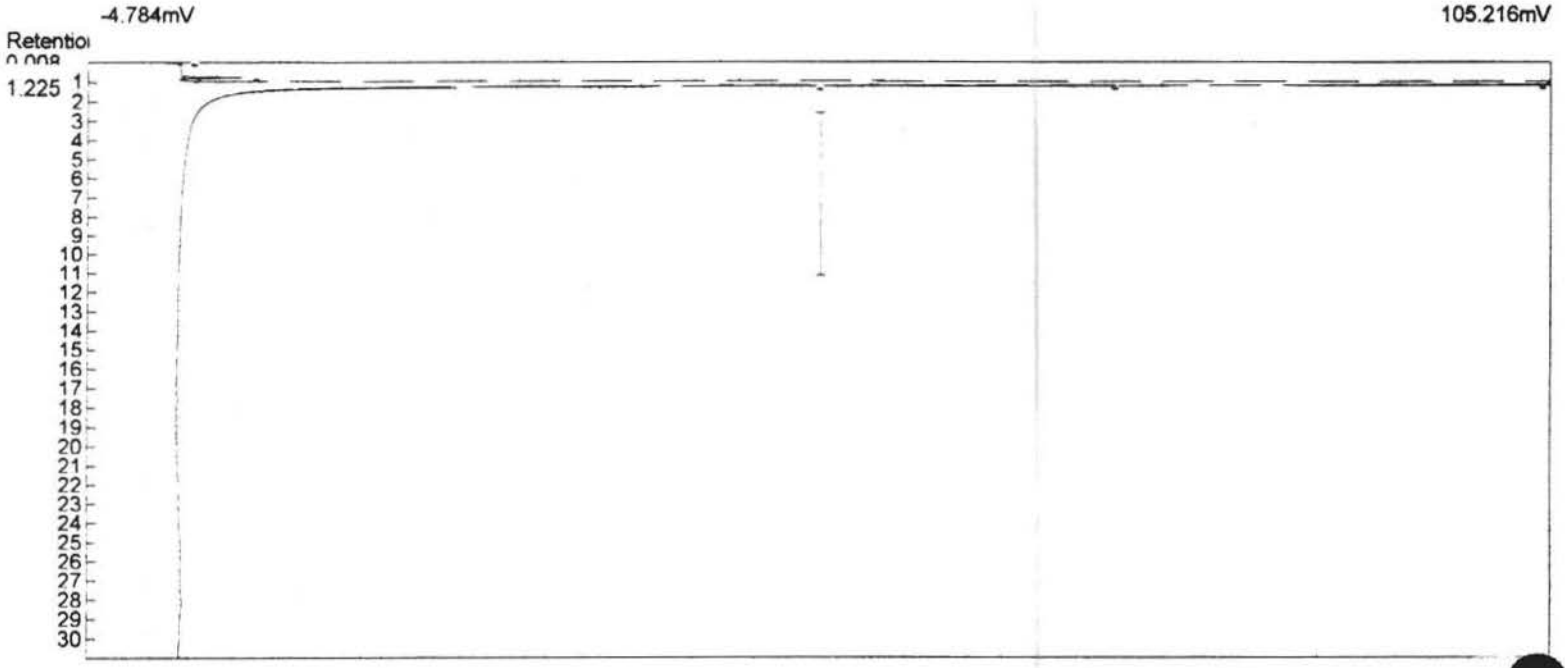
Component	Retention	Area	Internal	Units
		0.000	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 14:11:22
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0723FB3.CHR ()
Sample: METHOD BLANK
Operator: JMP



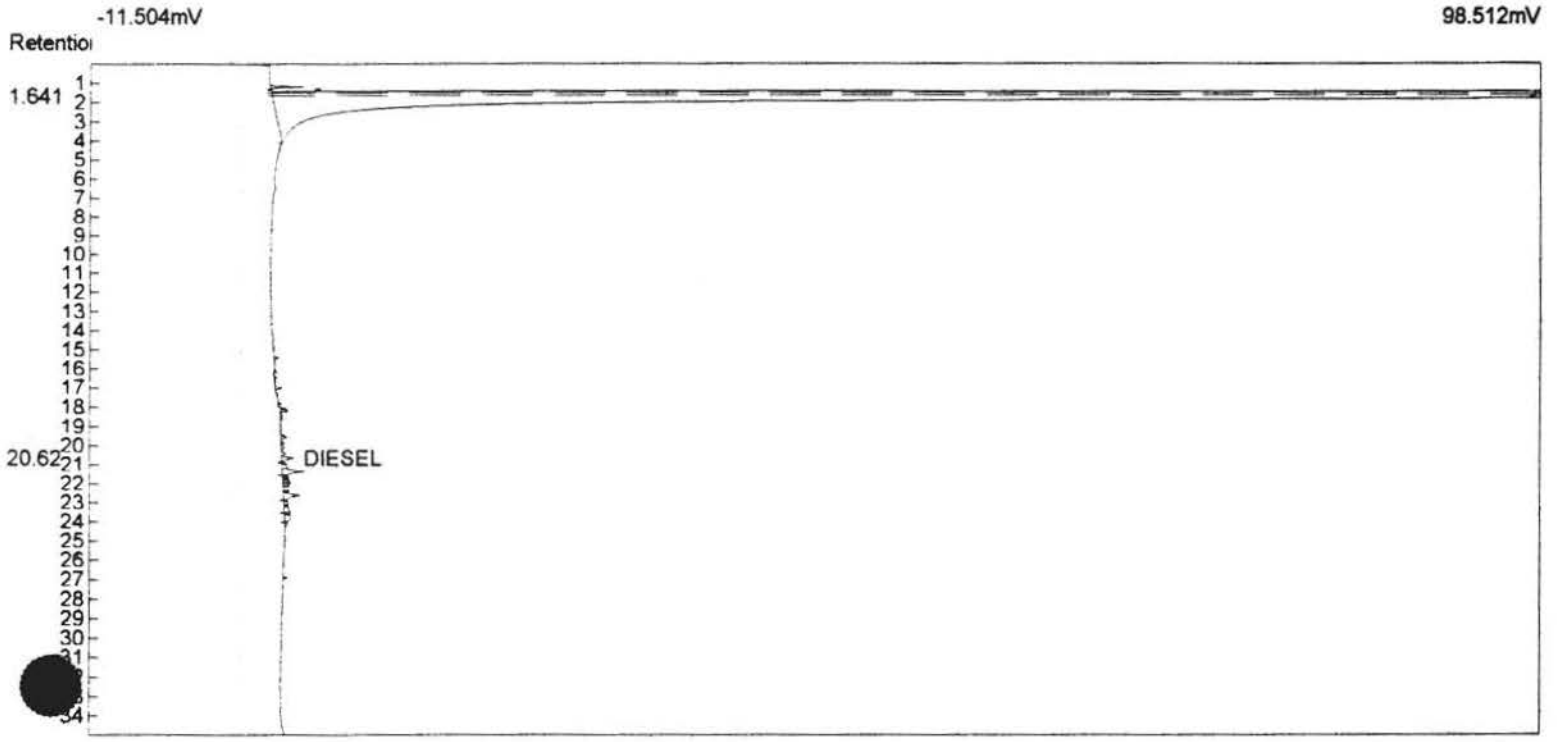
Component	Retention	Area	External	Units
		0.000	0.00	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 14:56:32
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0723FB4.CHR ()
Sample: 2842-SB19/0723CH2
Operator: JMP



Component	Retention	Area	External	Units
		0.000	0.00	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 14:56:32
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0723FA4.CHR ()
Sample: 2842-SB20@4'6'/0723CH2
Operator: JMP



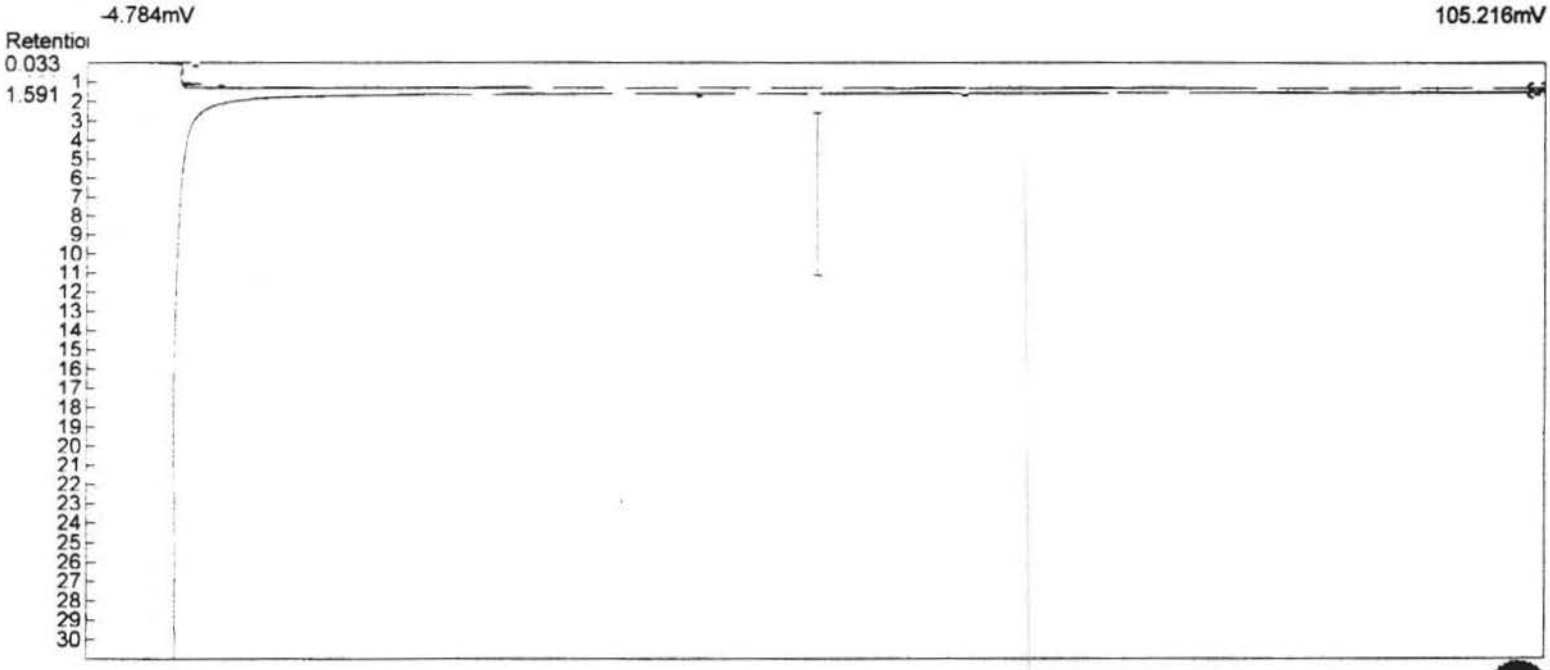
Component	Retention	Area	Internal	Units
DIESEL	20.625	54.425	38.8469	PPM

D.F. % Solid

54.425 38.8469 X 2 = 78 ÷ 0.85 = 91 ppm

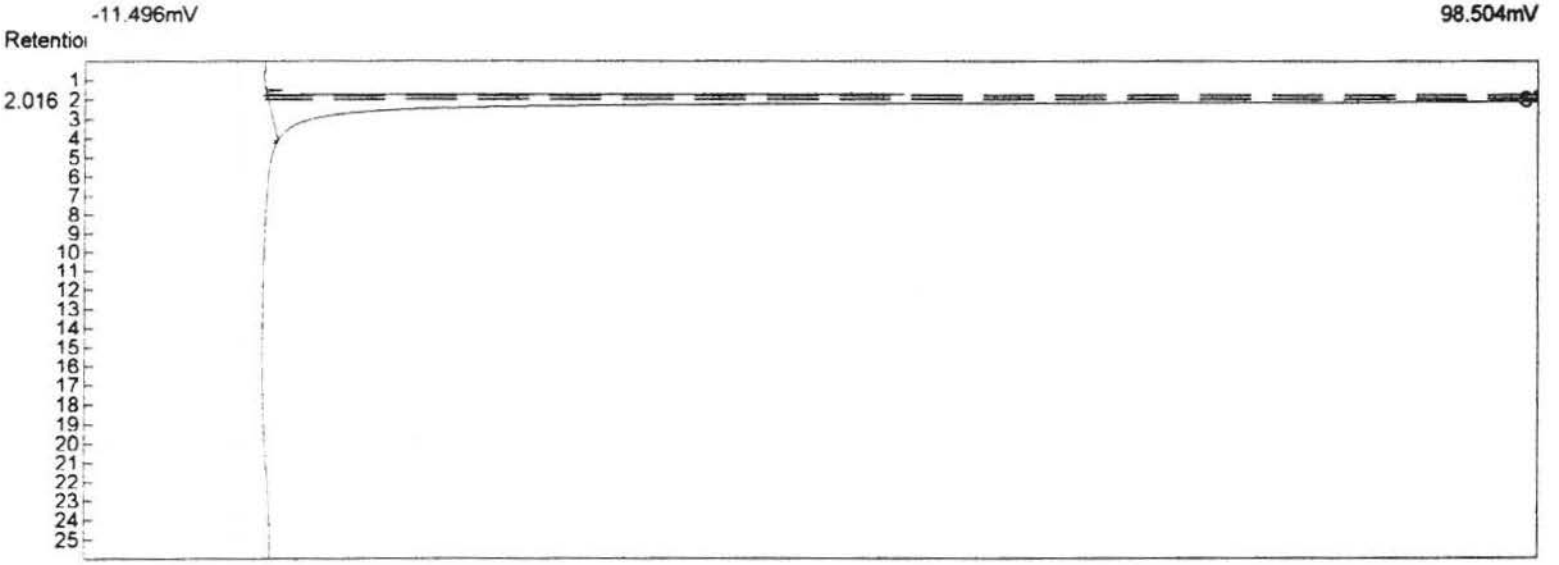
KS

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 15:40:26
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0723FB5.CHR ()
Sample: 2842-SB21/0723CH2
Operator: JMP



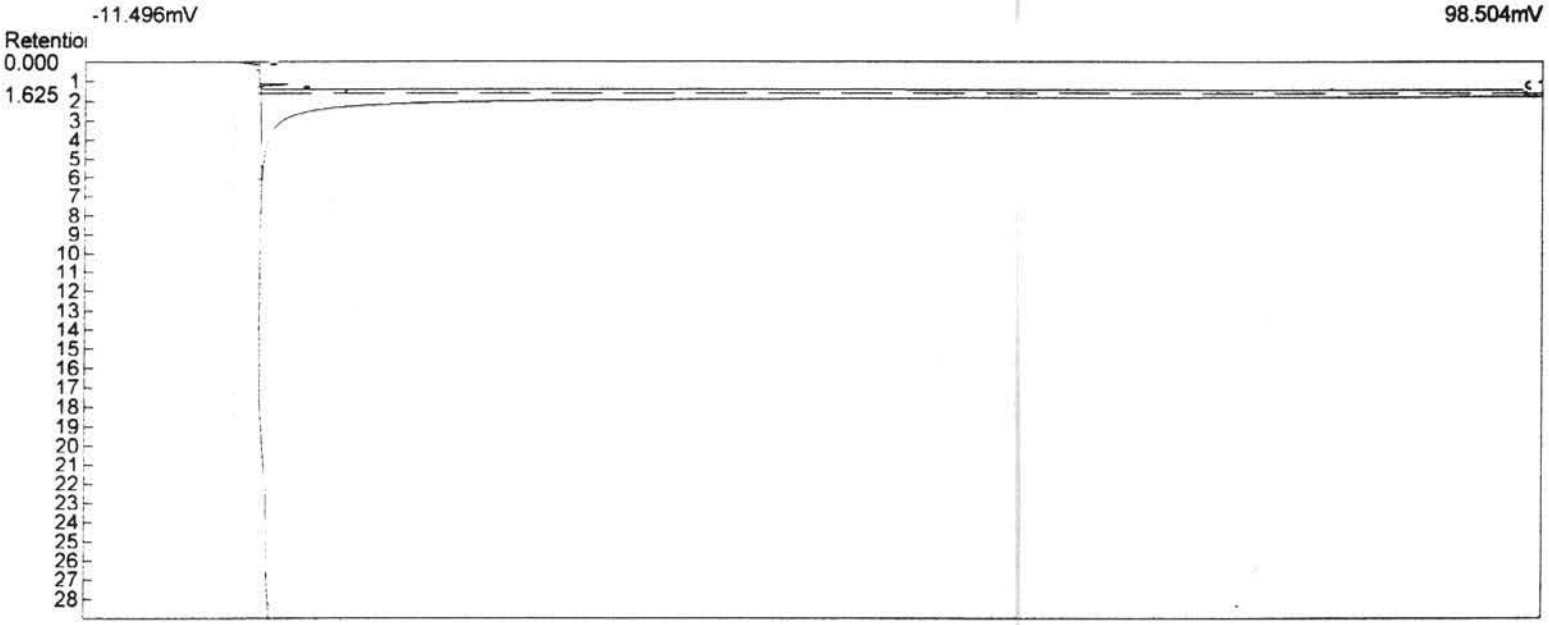
Component	Retention	Area	External	Units
		0.000	0.00	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 15:40:26
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0723FA5.CHR ()
Sample: 2842-DUPE/0723CH2
Operator: JMP gks



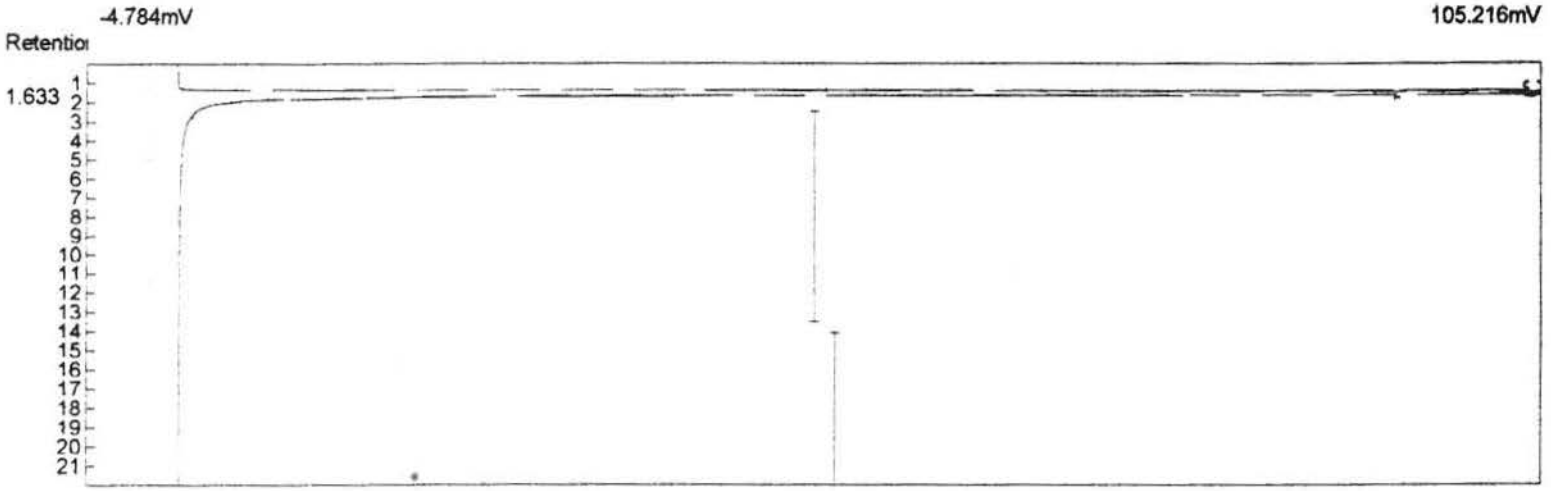
Component	Retention	Area	Internal	Units
		0.000	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 16:28:32
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0723FA6.CHR ()
Sample: 2842-SB21W/0723CH2
Operator: JMP



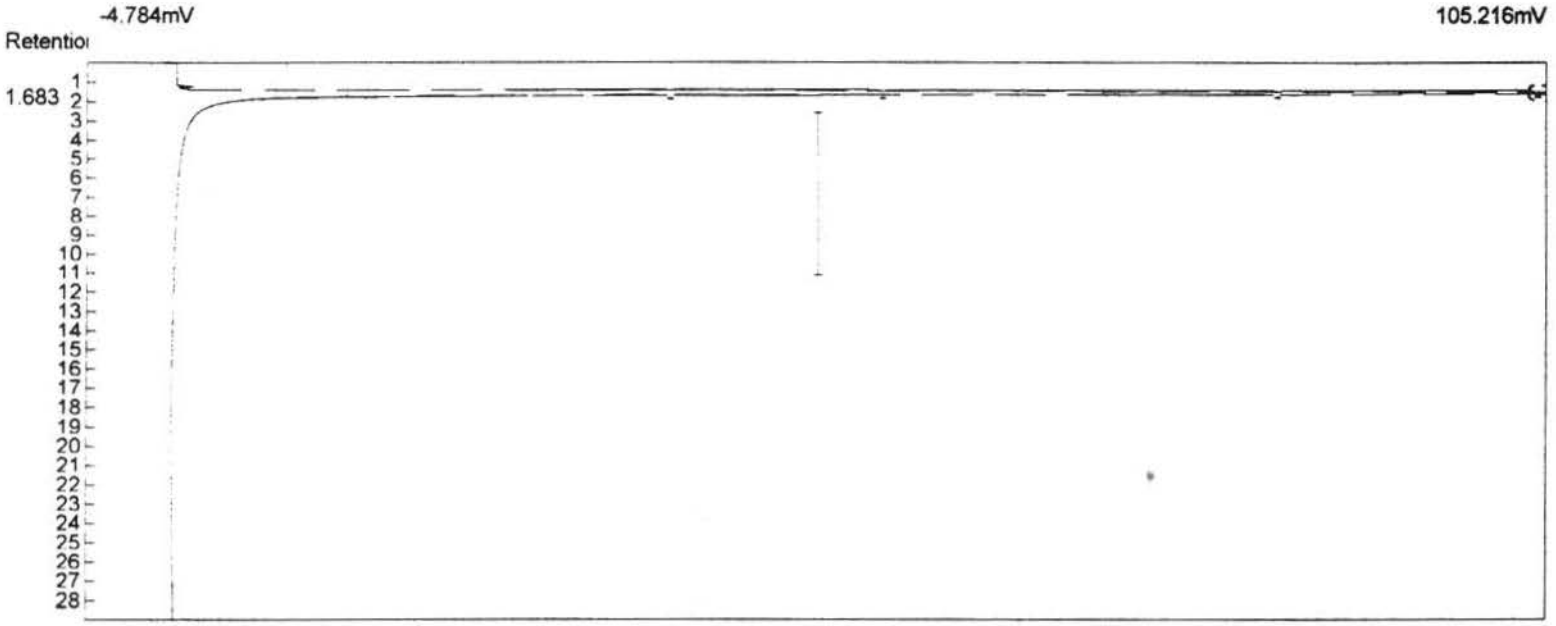
Component	Retention	Area	Internal	Units
		0.000	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 17:21:47
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0723FB7.CHR ()
Sample: 2842-SB21 W/0723CH2R
Operator: MAP



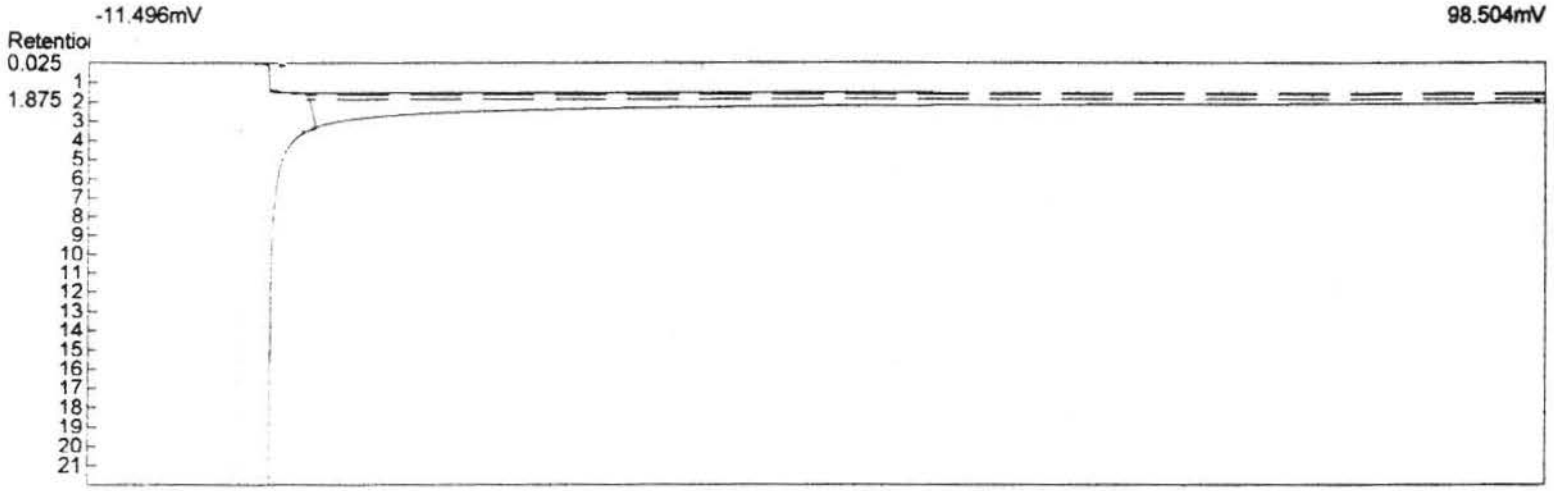
Component	Retention	Area	External	Units
		0.000	0.00	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 16:28:32
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0723FB6.CHR ()
Sample: 2842-EB7/0723CH2
Operator: JMP



Component	Retention	Area	External	Units
		0.000	0.00	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 17:21:47
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0723FA7.CHR ()
Sample: 2842-EB8/0723CH2
Operator: MAP



Component	Retention	Area	Internal	Units
		0.000	0.0000	

teg

QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0722CH2
DAILY CALIBRATION DATE: 7/23/98

CH2M HILL
PROJECT NAME: SITE 2842

			INITIAL		OPENING			CLOSING		
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	AREA	RF	%DIFF	AREA	RF	%DIFF
BENZENE	PID #1	0.100 - 10.000	4.44	6.7%	75.81	3.79	14.6%	89.32	4.47	0.6%
TOLUENE	PID #1	0.100 - 10.000	4.73	9.4%	81.89	4.09	13.4%	97.69	4.88	3.3%
ETHYLBENZENE	PID #1	0.100 - 10.000	4.30	10.0%	74.57	3.73	13.3%	87.14	4.36	1.3%
m&p-XYLENES	PID #1	0.100 - 10.000	5.67	3.5%	202.89	5.07	10.5%	243.81	6.10	7.5%
o-XYLENES	PID #1	0.100 - 10.000	4.97	5.5%	85.11	4.26	14.4%	99.87	4.99	0.5%
BENZENE	PID #2	0.100 - 10.000	4.26	8.6%	74.55	3.73	12.5%	81.87	4.09	3.9%
TOLUENE	PID #2	0.100 - 10.000	4.73	10.2%	81.47	4.07	13.9%	89.67	4.48	5.2%
ETHYLBENZENE	PID #2	0.100 - 10.000	3.70	12.2%	72.35	3.62	2.2%	75.95	3.80	2.6%
m&p-XYLENES	PID #2	0.100 - 10.000	5.39	9.1%	195.92	4.90	9.1%	217.14	5.43	0.7%
o-XYLENES	PID #2	0.100 - 10.000	4.77	11.8%	82.27	4.11	13.8%	89.82	4.49	5.8%

CALIB RANGE - RANGE OF CALIBRATION CURVE IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 20% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY:MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

teg

QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0722CH2
DATE: 7/23/98

CH2M HILL
PROJECT NAME: SITE 2842

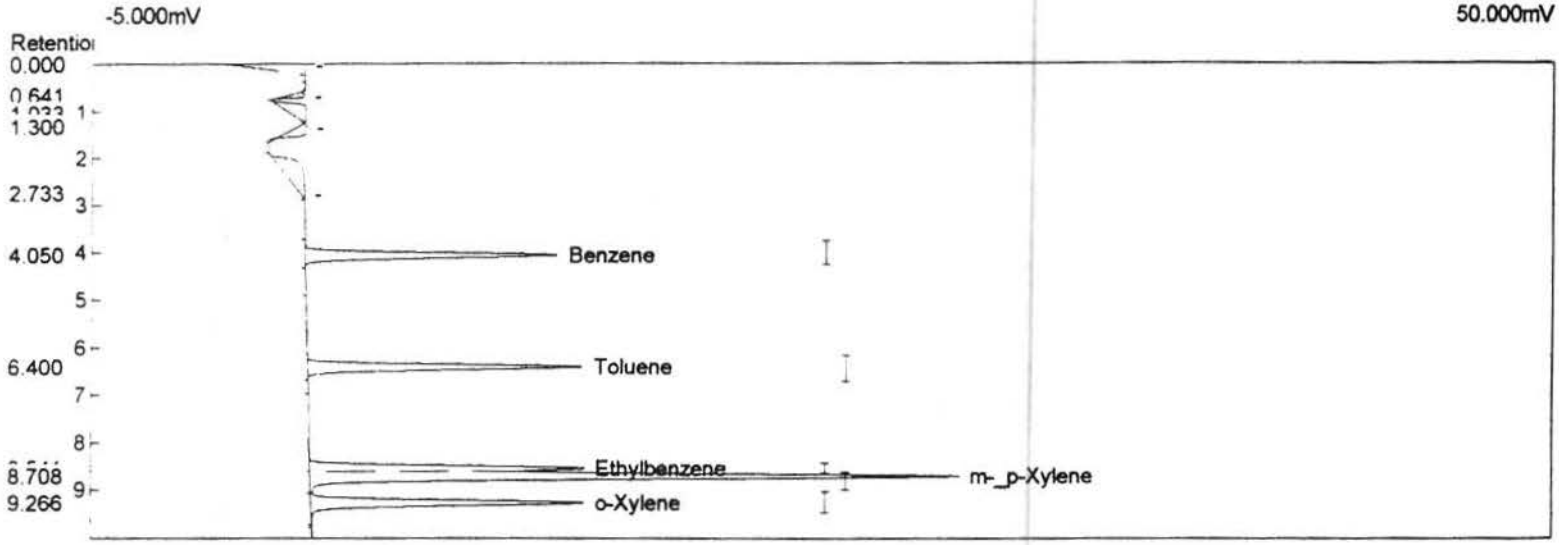
COMPOUND	SPK CONC (ppm)	MS CONC (ppm)	%REC MS	MSD CONC (ppm)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
BENZENE	5.0	5.88	118%	5.50	110%	7%	15%	76% - 120%
TOLUENE	5.0	6.06	121%	5.39	108%	12%	15%	75% - 122%
ETHYLBENZENE	5.0	6.03	121%	5.95	119%	1%	15%	65% - 125%
TOTAL XYLENES	15.0	17.2	114%	16.7	113%	3%	15%	72% - 120%

ppm = PARTS PER MILLION
MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE
% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX
RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY:MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

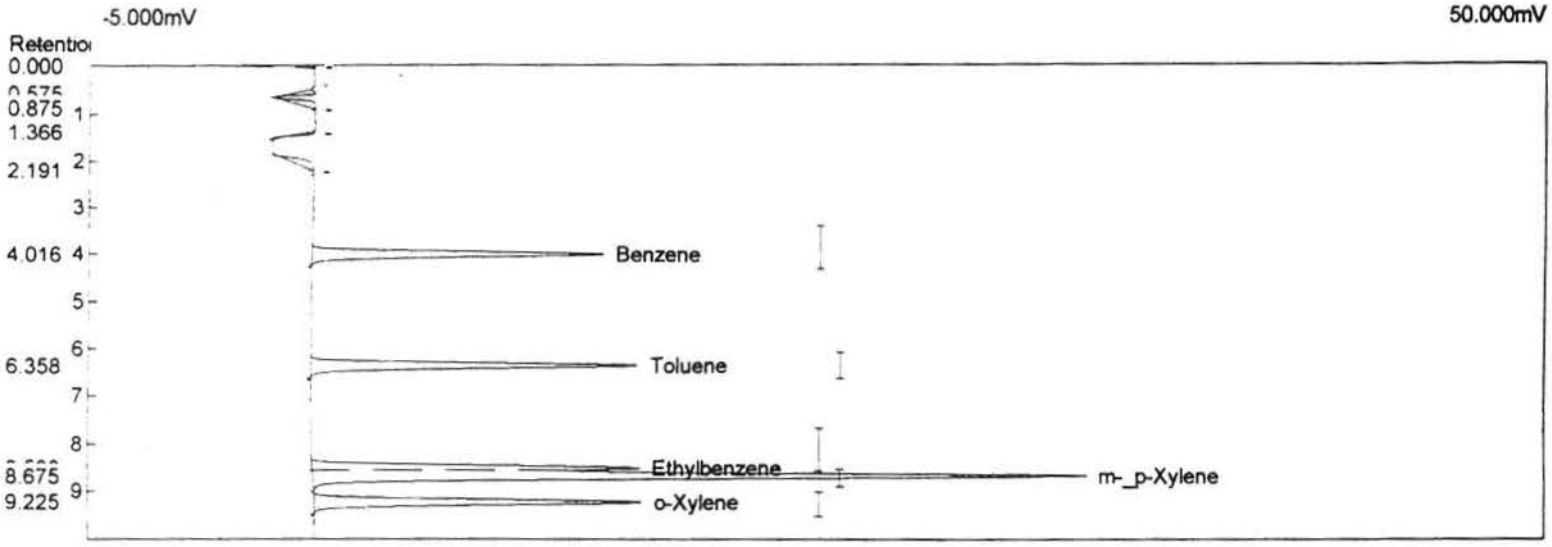
TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 09:23:51
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0723PA1.CHR ()
Sample: 5 ppm BTEX OPEN
Operator: JMP



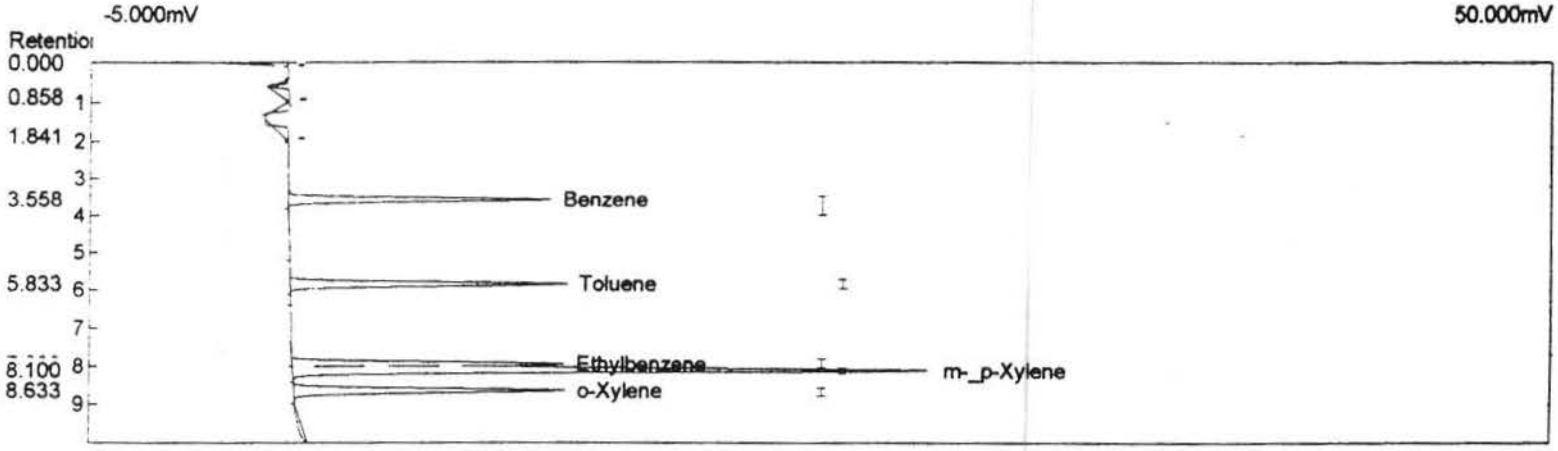
Component	Retention	Area	External	Internal	Units
Benzene	4.050	75.805	4.27	4.2683	ppm
Toluene	6.400	81.888	4.33	4.3281	ppm
Ethylbenzene	8.541	74.567	4.34	4.3353	ppm
m-_p-Xylene	8.708	202.887	8.95	8.9456	ppm
o-Xylene	9.266	85.110	4.28	4.2812	ppm
		520.257	26.16	26.1585	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 20:07:48
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: C:\PEAKWIN\0722PA25.CHR ()
Sample: ~~matrix spike~~ CLOSE STD
Operator: MAP



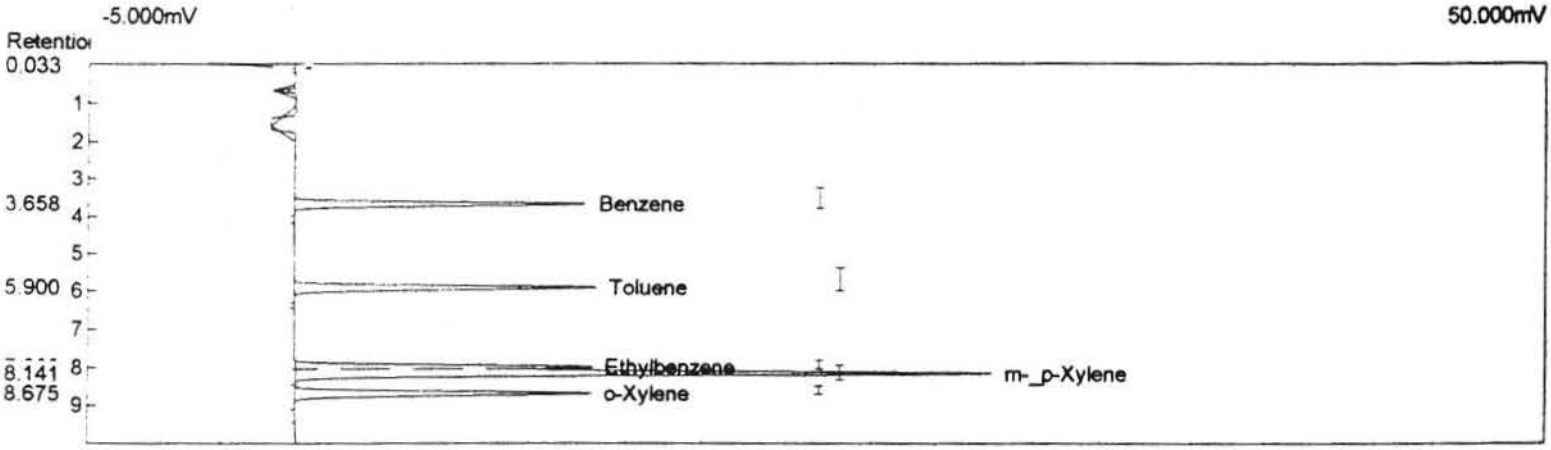
Component	Retention	Area	External	Internal	Units
[illegible]ene	4.016	89.320	5.03	5.0293	ppm
[illegible]ene	6.358	97.686	5.16	5.1631	ppm
Ethylbenzene	8.508	87.144	5.07	5.0665	ppm
m-_p-Xylene	8.675	243.810	10.75	10.7500	ppm
o-Xylene	9.225	99.874	5.02	5.0238	ppm
		617.833	31.03	31.0327	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 09:39:40
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 07523PB1.CHR ()
Sample: 5 ppm BTEX OPEN STD
Operator: JMP



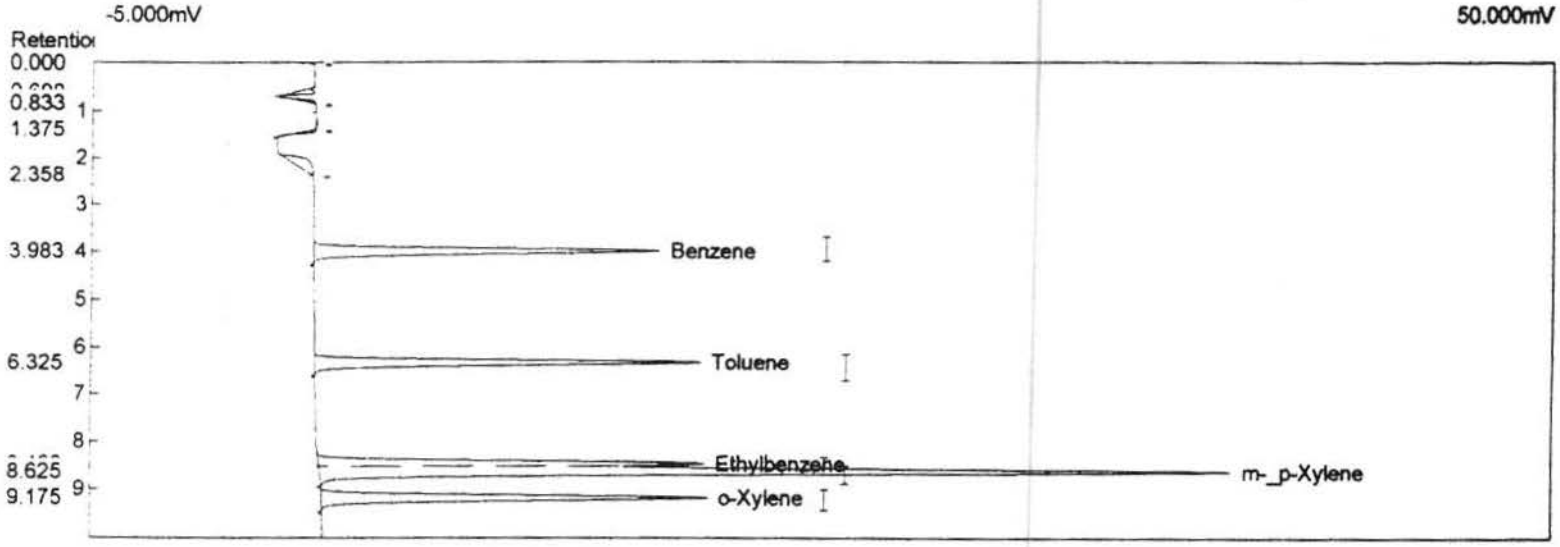
Component	Retention	Area	External	Internal	Units
Benzene	3.558	74.553	4.38	4.3752	ppm
Toluene	5.833	81.474	4.31	4.3062	ppm
Ethylbenzene	7.933	72.346	4.89	4.8882	ppm
m-_p-Xylene	8.100	195.915	9.09	9.0870	ppm
o-Xylene	8.633	82.268	4.31	4.3117	ppm
		506.556	26.97	26.9683	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 20:07:48
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: C:\PEAKWIN\0723PB16.CHR ()
Sample: close
Operator: MAP



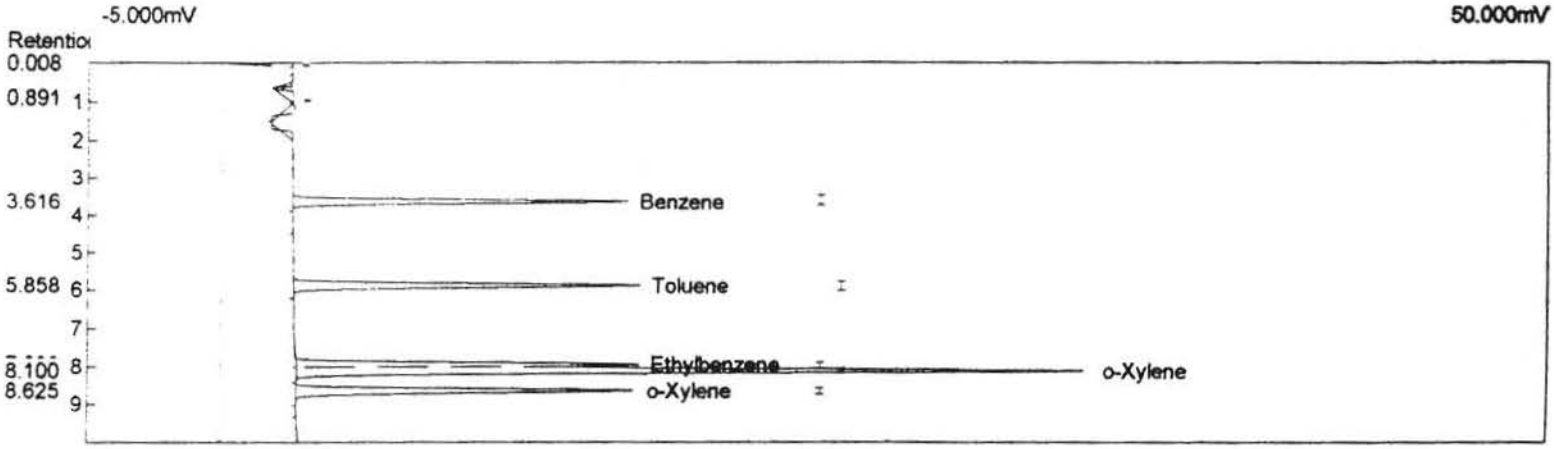
Component	Retention	Area	External	Internal	Units
Benzene	3.658	81.866	4.80	4.8043	ppm
Toluene	5.900	89.671	4.74	4.7395	ppm
Ethylbenzene	7.983	75.948	5.13	5.1316	ppm
m-_p-Xylene	8.141	217.135	10.07	10.0712	ppm
o-Xylene	8.675	89.824	4.71	4.7078	ppm
		554.443	29.45	29.4544	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 19:43:11
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0722PA24.CHR ()
Sample: matrix spike
Operator: MAP



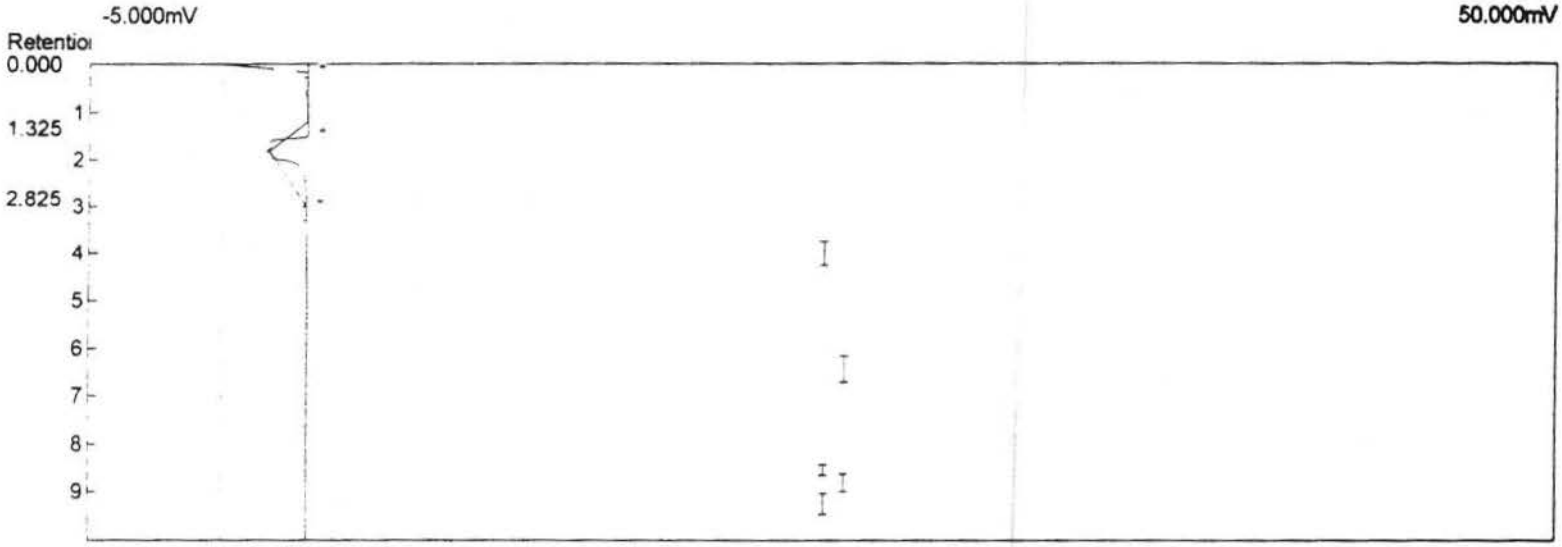
Component	Retention	Area	External	Internal	Units
Benzene	3.983	104.504	5.88	5.8842	ppm
Toluene	6.325	114.663	6.06	6.0604	ppm
Ethylbenzene	8.466	103.695	6.03	6.0288	ppm
m-_p-Xylene	8.625	283.788	11.26	11.2614	ppm
o-Xylene	9.175	117.186	5.89	5.8946	ppm
		723.835	35.13	35.1295	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 19:43:11
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0723PB15.CHR ()
Sample: Matrix Spike duplicate
Operator: MAP



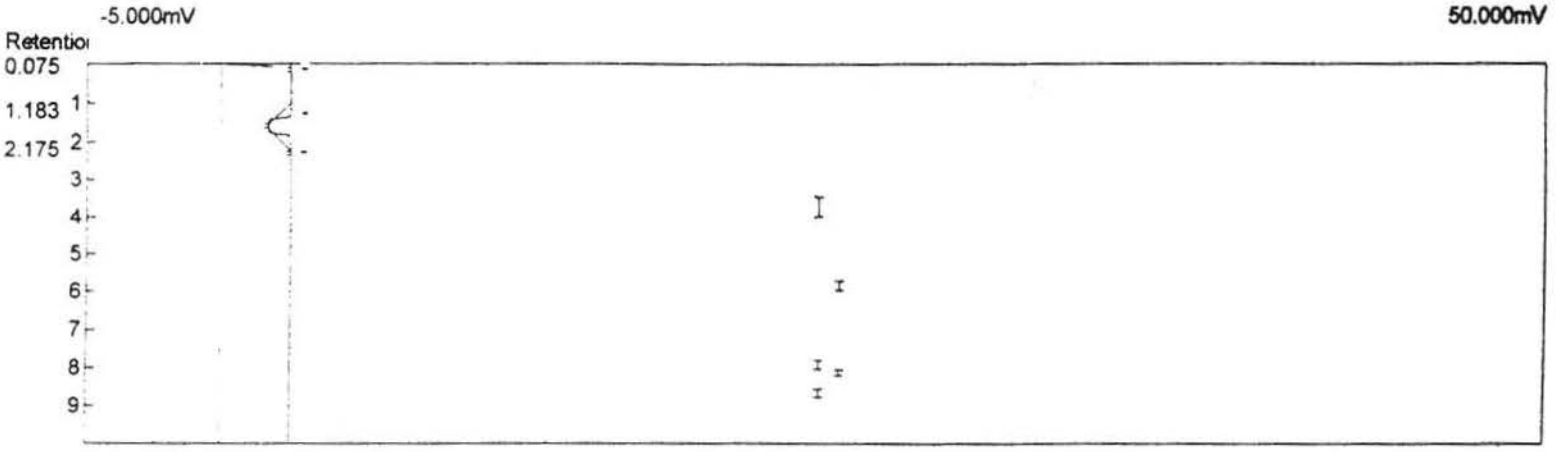
Component	Retention	Area	External	Internal	Units
Benzene	3.616	93.779	5.50	5.5035	ppm
Toluene	5.858	101.994	5.39	5.3908	ppm
Ethylbenzene	7.933	88.081	5.95	5.9514	ppm
m-_p-Xylene	8.100	244.883	11.36	11.3582	ppm
o-Xylene	8.625	102.099	5.35	5.3511	ppm
		630.836	33.55	33.5550	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 11:23:34
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0723PA2.CHR ()
Sample: 5 ~~ppm BTEX OPEN~~ METHOD BLANK
Operator: JMP



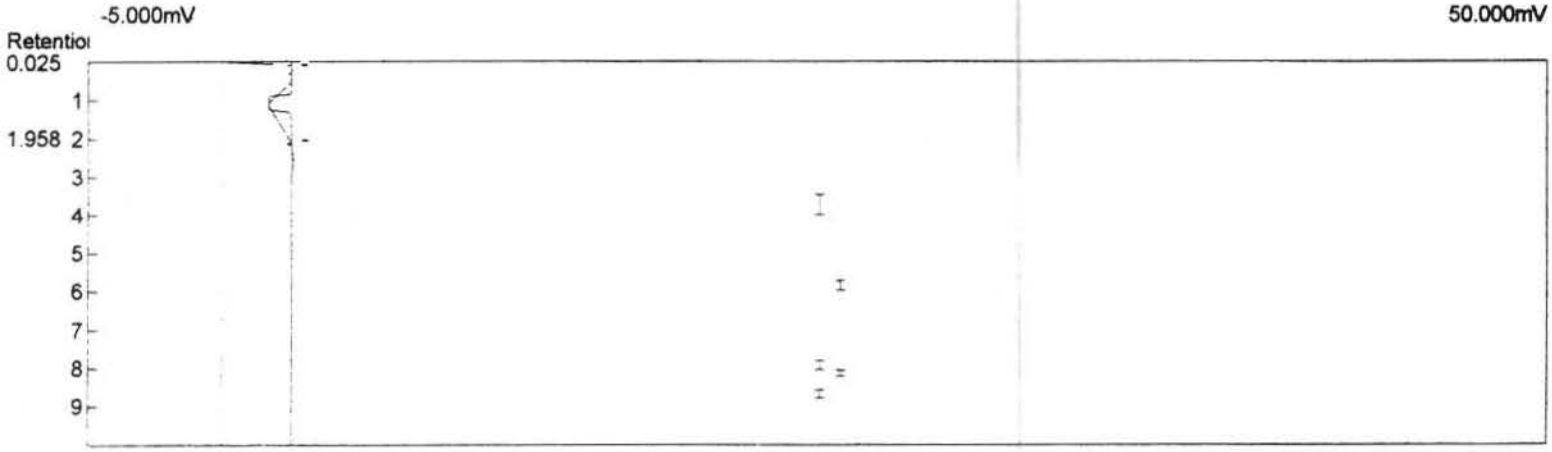
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 11:23:34
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: C:\PEAKWIN\0723PB2.CHR ()
Sample: METHOD BLANK
Operator: JMP



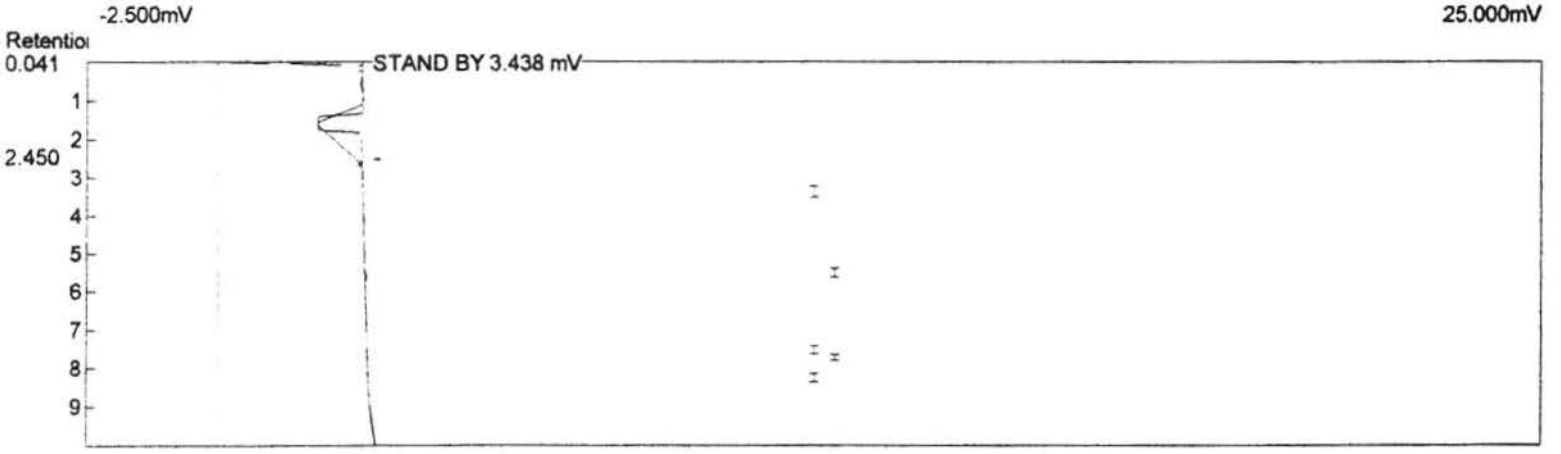
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 11:34:59
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0723PB3.CHR ()
Sample: 2842-EB-7/0723CH2
Operator: JMP



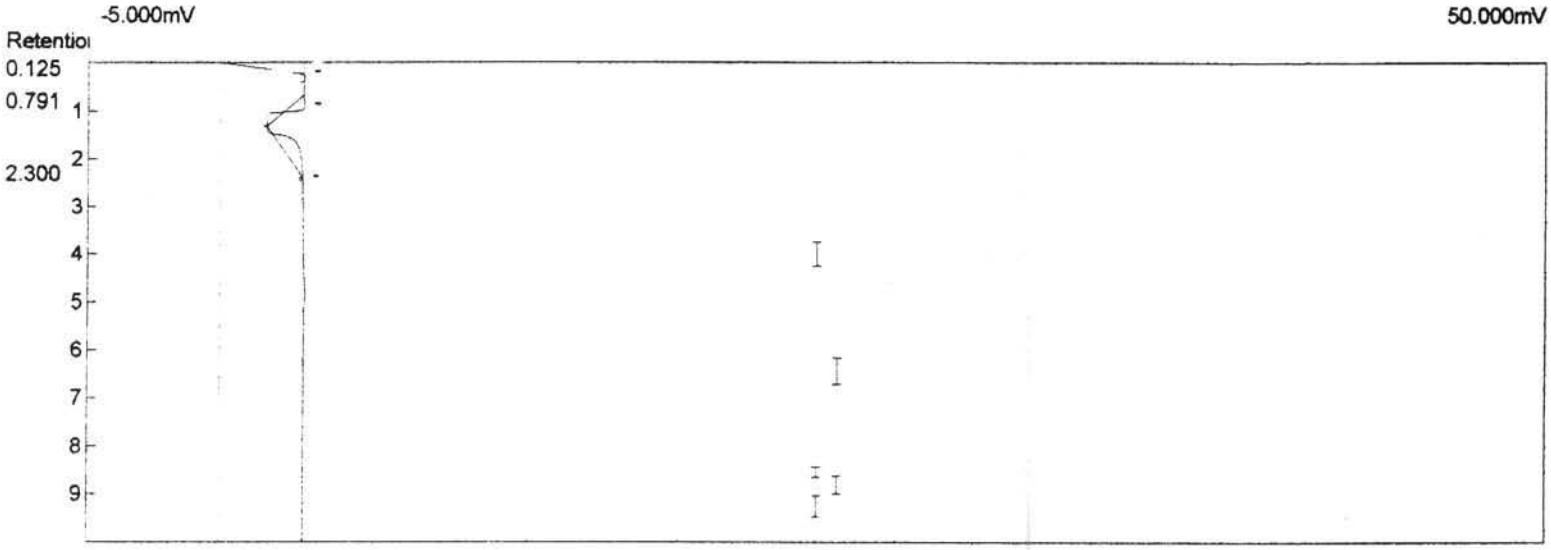
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 14:14:15
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: C:\PEAKWIN\0723PB6.CHR ()
Sample: 2842-EB8/0723CH2
Operator: JMP



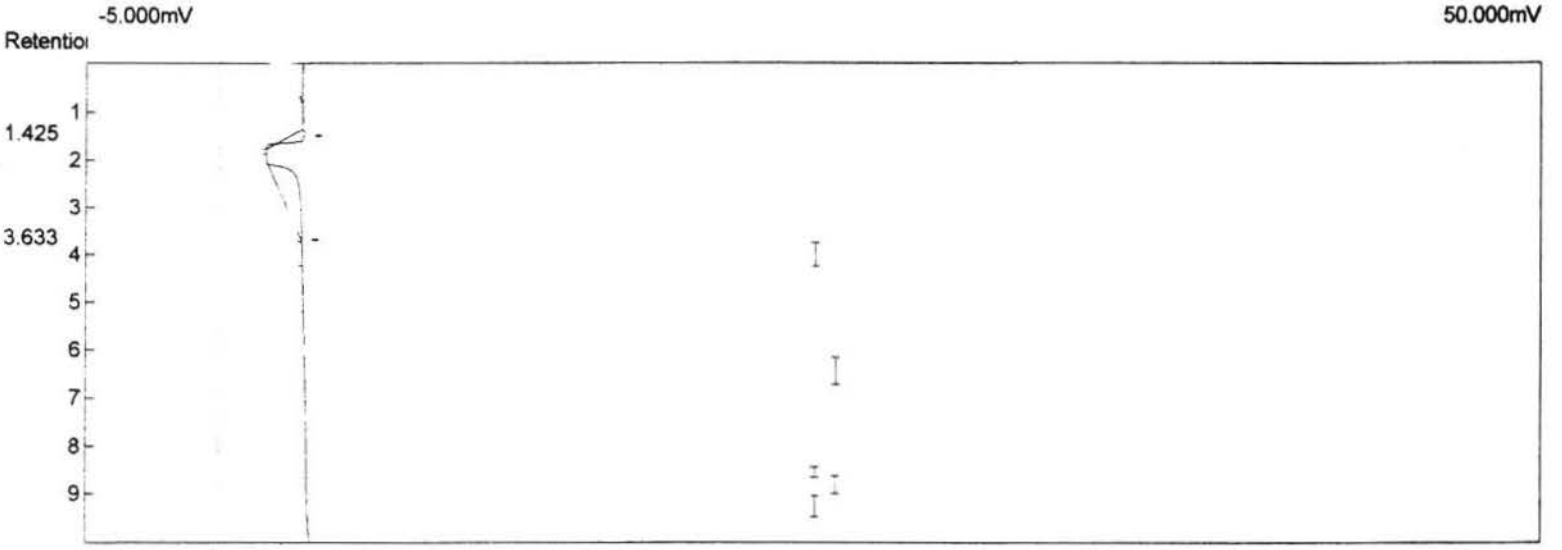
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 11:34:59
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0723PA3.CHR ()
Sample: TRIP BLANK/0723CH2
Operator: JMP



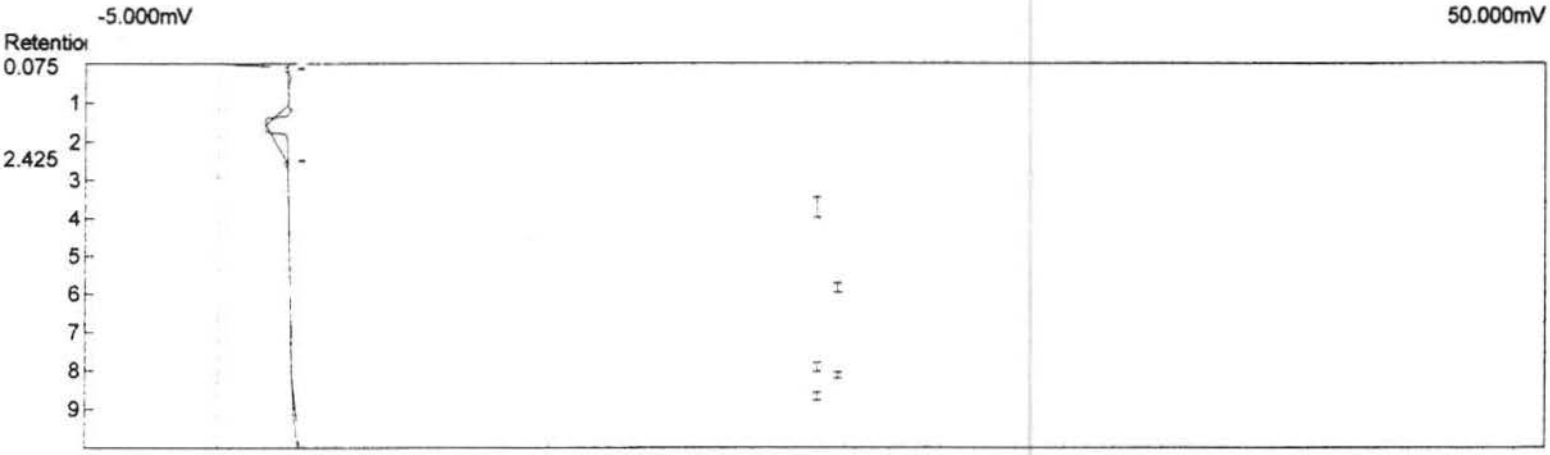
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 11:57:34
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: C:\PEAKWIN\0723PA4.CHR ()
Sample: 2842-SB19/0723CH2
Operator: JMP



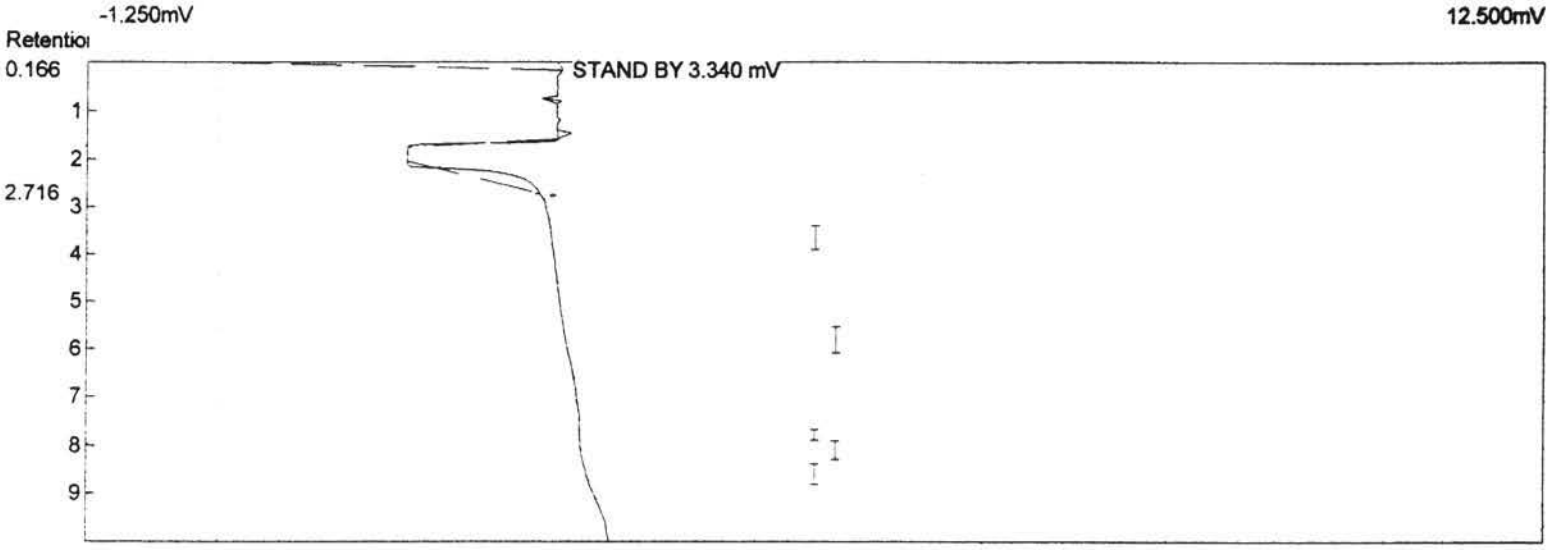
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 11:57:34
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0723PB4.CHR ()
Sample: 2842-SB20/0723CH2
Operator: JMP



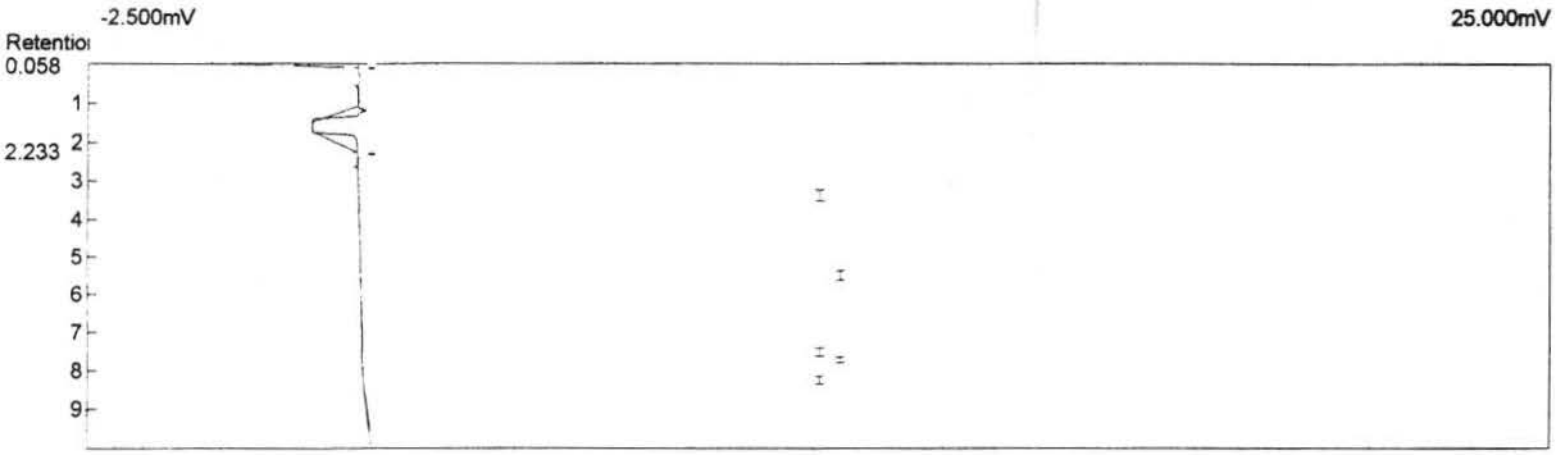
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 12:55:19
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0723PA5.CHR ()
Sample: 2842-sb 21/0723CH2
Operator: JMP



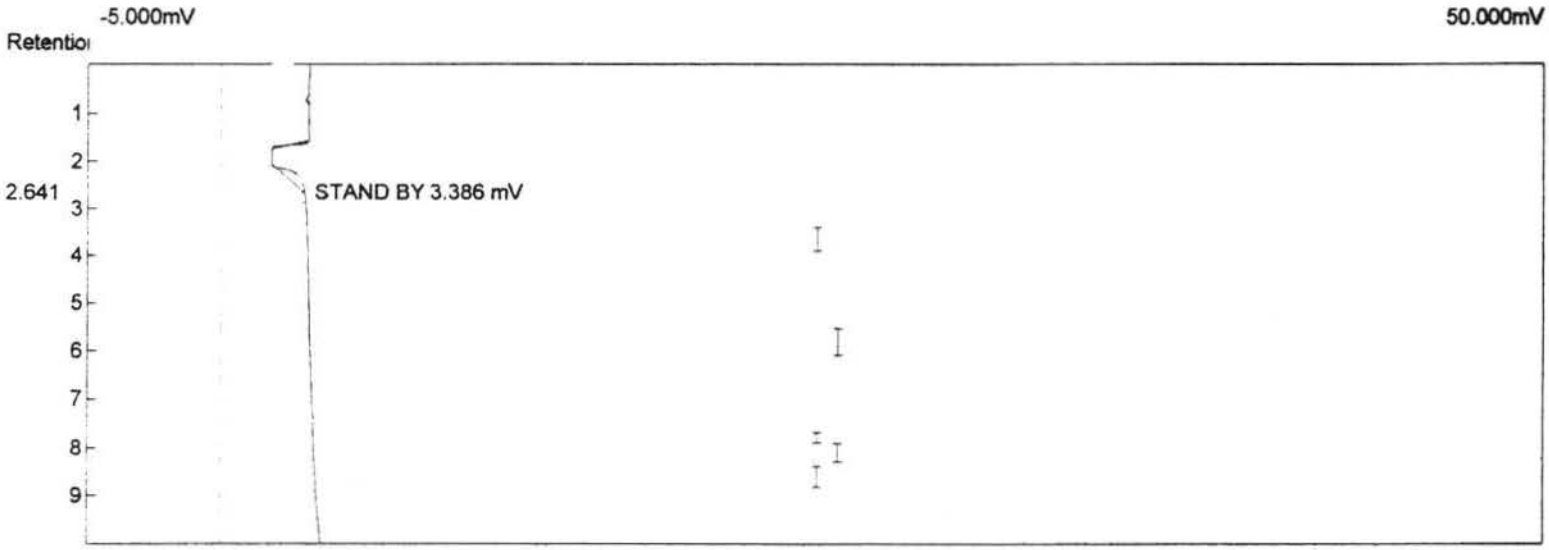
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 12:55:19
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0723PB5.CHR ()
Sample: 2842-dupe/0723CH2
Operator: JMP



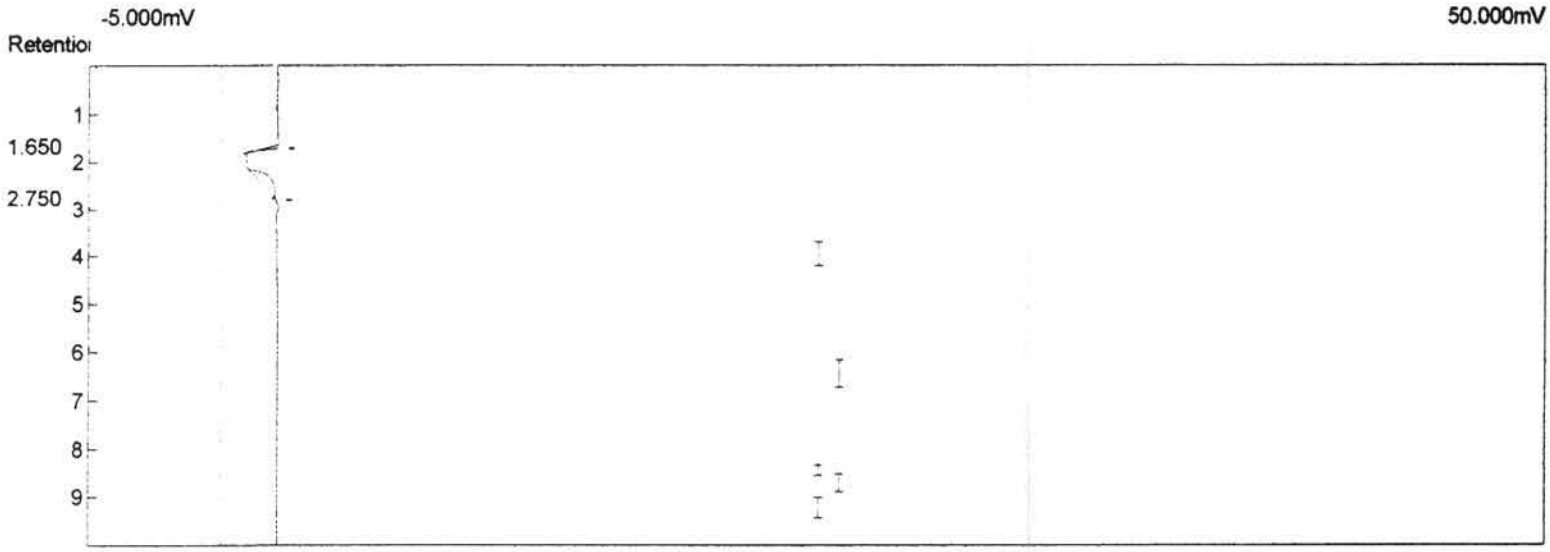
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 14:14:15
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0723PA6.CHR ()
Sample: 2842-sb 21 w/0723CH2
Operator: JMP



Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/23/1998 17:22:18
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: C:\PEAKWIN\0722PA22.CHR ()
Sample: SB-21 water/0722CH2 rep
Operator: MAP



Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

teg Transglobal Environmental Geochemistry

Chain of Custody Record

PO # _____

Client: CH2M Hill

Address _____

Phone (787) 888-8713 FAX _____

Client Project # _____ Project Manager Marty Clusen / TPA

Date 7/22/98 Page 1 of 1

TEG Project # 981 0722 CHR Outside Lab.# _____

Location Roosevelt Roads

Collector Rich Morales Date of Collection 7/20/98 & 7/22/98

Sample #	Depth	Time	Sample Type	Container Type	VOA 8010	VOA 8020 (BTEX)	VOA 8260	SEMI VOL 8270	TRPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (gas & diesel)	TPH 8015 (oil)	PNA 610/8100	TOTAL LEAD	pH	METALS	RCI							FIELD NOTES / PRESERVATION	Total # of Containers
2842-EB7	—	1445	Water	40ml		1			1			1													STD TAT	3
2842-SB19	4-6'	1430	Soil	2oz		1			1			1													24 HR TAT 8015M	3
2842-SB 20	4-6'	1240	Soil	2oz		1			1			1														3
2842-SB 21	~~4-6'~~ 2-4'	~~1430~~ 1330	Soil	2oz		1			1			1														3
2842-DUPE3	—	—	Soil	2oz		1			1			1														3
2842-EB8	—	1000	Water	40ml		1			1			1													STD TAT	3
2842-TRIP	—	—	Water	40ml		1																			" "	1
2842-SB21	—	1440	Water	40ml		1			1			1													24 HR TAT All	
																										19
																										+ 3
																										22

RELINQUISHED BY (signature) Date/Time: Richard Morales 07/22/98 1800

RECEIVED BY (signature) Date/Time: Franklin [illegible] 7/22/98 6:00 pm

RELINQUISHED BY (signature) Date/Time

RECEIVED BY (signature) Date/Time

Total # of containers	22
Chain of Custody seals Y / N / NA	NA
Seals intact? Y / N / NA	NA
Received good conditions / cold	Yes

TEMPERATURE: 4 c°

Sample disposal Instructions: ____ TEG Disposal @ $2.00 each ____ Return to client ____ Pickup

teg

World Leader In On-Site Sampling and Analysis

July 24, 1998
TEG Project #98I0715CH2

Mr. Marty Clasen
CH2M HILL
4350 W. Cypress Street, Suite 600
Tampa, Florida 33607

SUBJECT: DATA REPORT - CH2M HILL PROJECT NO. 146801.US.SC SITE #2842

Dear Marty,

Please find enclosed the analytical report for the samples collected by CH2M HILL personnel from the above-referenced site and delivered to TEG under the proper chain-of-custody protocol. TEG's Puerto Rico certified-chemist performed the following analyses:

- 5 soil samples analyzed for TRPH by modified EPA test method 418.1.
- 3 water samples analyzed for TRPH by modified EPA test method 418.1.
- 5 soil samples analyzed for TPH-gas/diesel by modified EPA test method 8015.
- 3 water samples analyzed for TPH-gas/diesel by modified EPA test method 8015.
- 5 soil samples analyzed for BTEX by modified EPA test method 8020.
- 3 water samples analyzed for BTEX by modified EPA test method 8020.
- 3 equipment blank water samples analyzed for BTEX, TRPH and TPH-gas/diesel.
- 1 trip blank water sample analyzed for TPH-gas/diesel by modified EPA test method 8015.
- Laboratory QA/QC analyses for TPH-gas/diesel, TRPH and BTEX.

The analytical results are summarized in the attached table. Applicable detection limits, QA/QC data, chromatograms, a chain-of-custody and an invoice are attached.

TEG appreciates the opportunity to provide analytical services for this project. If you have any questions relating to the data or report, please do not hesitate to contact us.

Sincerely,
TEG

Kevin Shelburne

Kevin Shelburne
Principal

Attachments

The World Leader in On-Site Sampling and Analysis

CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVY BASE, SITE 2842
CEIBA, P. R.

TEG Project #98I0715CH2

TRPH (EPA Method 418.1) ANALYSES OF SOIL

SAMPLE NUMBER	DATE ANALYZED	TRPH (mg/kg)
METHOD BLANK	7/23/98	ND
2842-SB12 @ 4'-6'	7/23/98	**220**
2842-SB13 @ 4'-6'	7/23/98	**150**
2842-SB14 @ 4'-6'	7/23/98	**2,000**
2842-SB15 @ 4'-6'	7/23/98	**220**
2842-SB16 @ 4'-6'	7/23/98	**220**
DETECTION LIMIT (mg/kg)		10

TRPH (EPA Method 418.1) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	TRPH (mg/L)
METHOD BLANK	7/15/98	ND
METHOD BLANK	7/23/98	ND
2842-EB3	7/23/98	ND
2842-EB4	7/23/98	ND
2842-EB5	7/23/98	ND
2842-SB12	7/15/98	16
2842-SB13	7/15/98	15
2842-SB16	7/15/98	10
DETECTION LIMIT (mg/L)		10

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT
ANALYSES PERFORMED BY: MARCO PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

mg/L = MILLIGRAMS PER LITER
mg/kg = MILLIGRAMS PER KILOGRAM

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CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVY BASE, SITE 2842
CEIBA, P. R.

TEG Project #98I0715CH2

TPH (DOHS Mod. EPA Method 8015) ANALYSES OF SOIL

SAMPLE NUMBER	DATE ANALYZED	TPH-GAS C5-C12 (mg/kg)	TPH-DIESEL C13-C24 (mg/kg)
METHOD BLANK	7/16/98	ND	ND
2842-SB12 @ 4'-6'	7/16/98	ND	ND
2842-SB13 @ 4'-6'	7/16/98	ND	ND
2842-SB14 @ 4'-6'	7/16/98	ND	**390**
2842-SB15 @ 4'-6'	7/16/98	ND	ND
2842-SB16 @ 4'-6'	7/16/98	ND	ND
DETECTION LIMIT (mg/kg)		10	25

TPH (DOHS Mod. EPA Method 8015) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	TPH-GAS C5-C12 (mg/L)	TPH-DIESEL C13-C24 (mg/L)
METHOD BLANK	7/16/98	ND	ND
2842-SB12	7/16/98	ND	ND
2842-SB13	7/16/98	ND	ND
2842-SB16	7/16/98	ND	ND
TRIP BLANK	7/16/98	ND	ND
2842-EB3	7/16/98	ND	ND
2842-EB4	7/16/98	ND	ND
2842-EB5	7/16/98	ND	ND
DETECTION LIMIT (mg/L)		10	25

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT
CONCENTRATIONS BASED ON DRY WEIGHT

mg/kg = MILLIGRAMS PER KILOGRAM
mg/L = MILLIGRAMS PER LITER
ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

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CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVY BASE, SITE 2842
CEIBA, P. R.

TEG Project #98I0715CH2

BTEX (Mod. EPA Method 8020) ANALYSES OF SOIL

SAMPLE NUMBER	DATE ANALYZED	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL-BENZENE (mg/kg)	TOTAL XYLENES (mg/kg)
METHOD BLANK	7/16/98	ND	ND	ND	ND
2842-SB12 @ 4'-6'	7/16/98	ND	ND	ND	ND
2842-SB13 @ 4'-6'	7/16/98	ND	ND	ND	ND
2842-SB14 @ 4'-6'	7/16/98	ND	ND	ND	ND
2842-SB15 @ 4'-6'	7/16/98	ND	ND	ND	ND
2842-SB16 @ 4'-6'	7/16/98	ND	ND	ND	ND
DETECTION LIMIT (mg/kg)		0.05	0.05	0.05	0.15

BTEX (Mod. EPA Method 8020) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL-BENZENE (mg/L)	TOTAL XYLENES (mg/L)
METHOD BLANK	7/16/98	ND	ND	ND	ND
2842-SB12	7/16/98	ND	ND	ND	ND
2842-SB13	7/16/98	ND	ND	ND	ND
2842-SB16	7/16/98	ND	ND	ND	ND
2842-EB3	7/16/98	ND	ND	ND	ND
2842-EB4	7/16/98	ND	ND	ND	ND
2842-EB5	7/16/98	ND	ND	ND	ND
DETECTION LIMIT (mg/L)		0.05	0.05	0.05	0.15

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
mg/kg = MILLIGRAMS PER KILOGRAM
mg/L = MILLIGRAMS PER LITER
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT

ANALYSES PERFORMED BY: MARCO PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE
CONCENTRATIONS BASED ON DRY WEIGHT

Marco A. Pedraza
Laboratory Manager

Kevin Shelburne
Principal

MARCO A. PEDRAZA SUTA
Químico Licenciado
Colegio Ciencias Químicas de Puerto Rico
A 526058
LICENCIA NUM.

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QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0715CH2

CH2M HILL

DAILY CALIBRATION DATE : 7/15/1998

PROJECT NAME: SITE 2842

			INITIAL		OPENING			CLOSING		
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	ABS	RF	%DIFF	ABS	RF	%DIFF
TRPH	IR	10 - 1,000	764.6	15.7%	0.710	704.2	7.9%	0.710	704.2	7.9%
DAILY CALIBRATION DATE : 7/23/98										
TRPH	IR	10 - 1,000	764.6	15.7%	0.702	712.3	6.8%	0.709	705.2	7.8%

CALIB RANGE - RANGE OF CALIBRATION CURVE IS IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 20% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: MARCO PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
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QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0715CH2
DATE : 7/23/98

CH2M HILL
PROJECT NAME: SITE 2842

COMPOUND	SPK CONC (ppm)	MS CONC (ppm)	%REC MS	MSD CONC (ppm)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
TRPH	500	543	109%	547	109%	1%	15%	80% - 120%

ppm = PARTS PER MILLION
MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE
% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX
RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY: JOSE MIGUEL
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
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QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0715CH2
DAILY CALIBRATION DATE: 7/16/1998

CH2M HILL
PROJECT NAME: SITE 2842

			INITIAL			OPENING			CLOSING	
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	AREA	RF	%DIFF	AREA	RF	%DIFF
TPH GASOLINE	FID #1 (gc1)	10 - 40,000	0.50	9.7%	130.10	0.43	12.7%	140.65	0.47	5.7%
TPH GASOLINE	FID #2 (gc1)	10 - 40,000	0.65	8.1%	209.85	0.70	7.1%	177.88	0.59	9.2%
TPH DIESEL	FID #1 (gc1)	25 - 40,000	0.47	8.8%	1562.46	0.52	11.5%	782.99	0.52	11.8%
TPH DIESEL	FID #2 (gc1)	25 - 40,000	0.25	5.4%	730.88	0.24	1.4%	389.62	0.26	5.2%

CALIB RANGE - RANGE OF CALIBRATION CURVE IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 15% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

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QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0715CH2

CH2M HILL
PROJECT NAME: SITE 2842

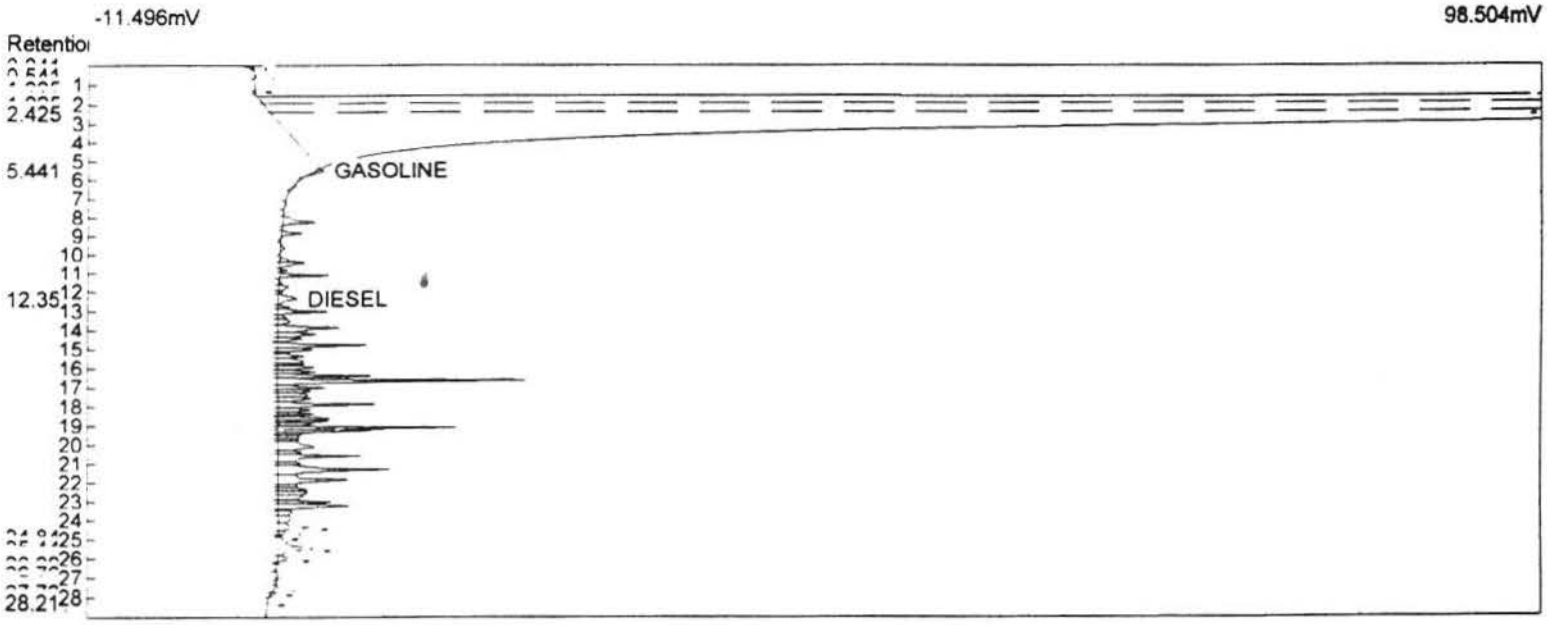
COMPOUND	SPK CON (ppm)	MS CONC (ppm)	%REC MS	MSD CONC (ppm)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
TPH-GAS	100	103	103%	99	99%	4%	15%	80% - 120%
TPH-DIESEL	1000	1154	115%	1169	117%	1%	15%	80% - 120%

ppm = PARTS PER MILLION
MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE
% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX
RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY:MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

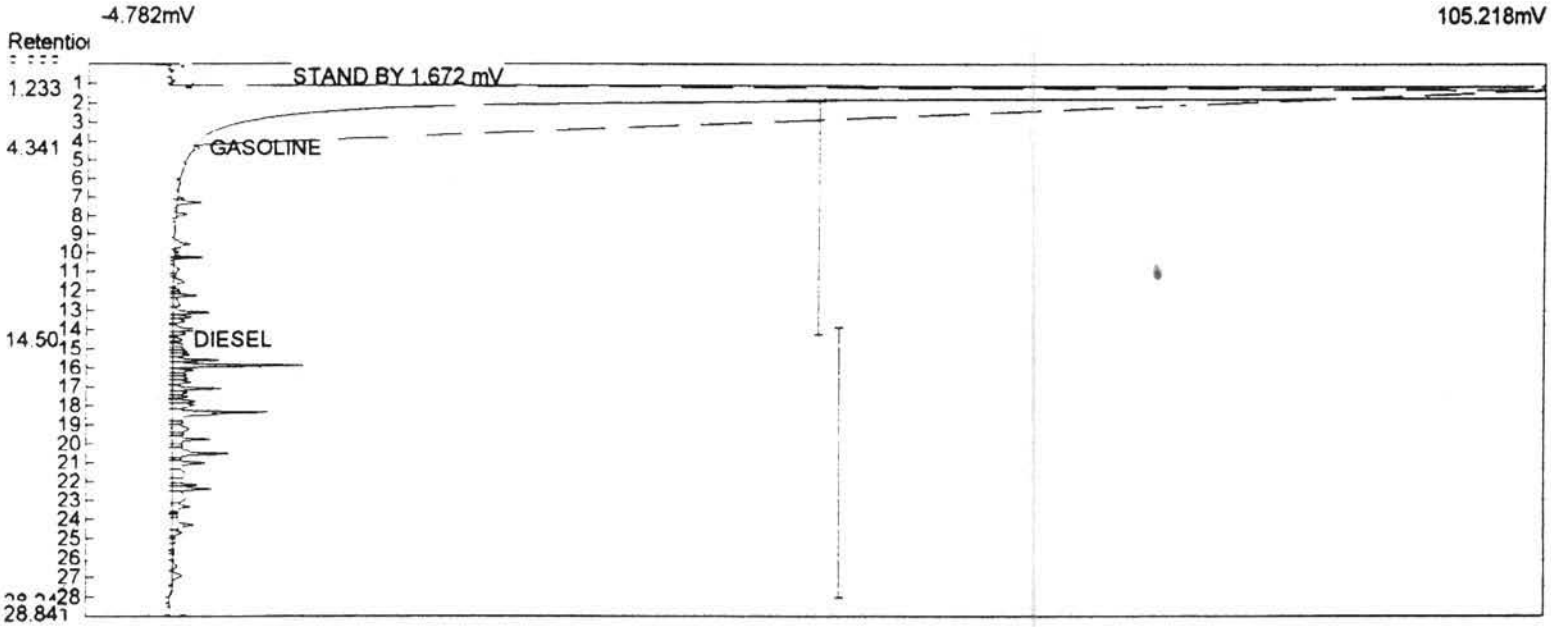
TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 10:52:17
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0716FA1.CHR ()
Sample: 100/1000 ppm G/D Open
Operator: JMP



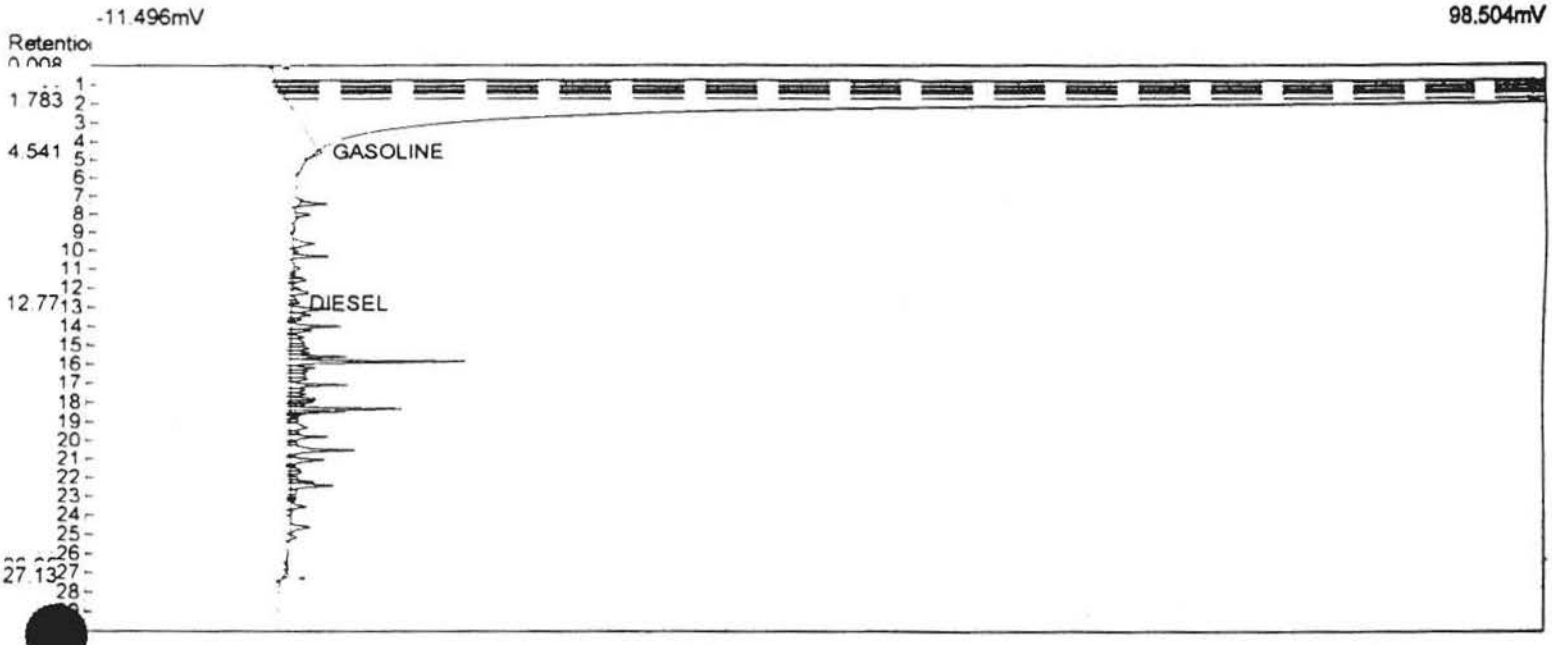
mponent	Retention	Area	Internal	Units
GASOLINE	5.441	130.102	87.1711	ppm
DIESEL	12.350	1562.464	1115.2381	PPM
		1692.566	1202.4093	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 10:52:17
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0716FB1.CHR ()
Sample: 100/500 G/D Std ~~Close~~ OPEN
Operator: JMP



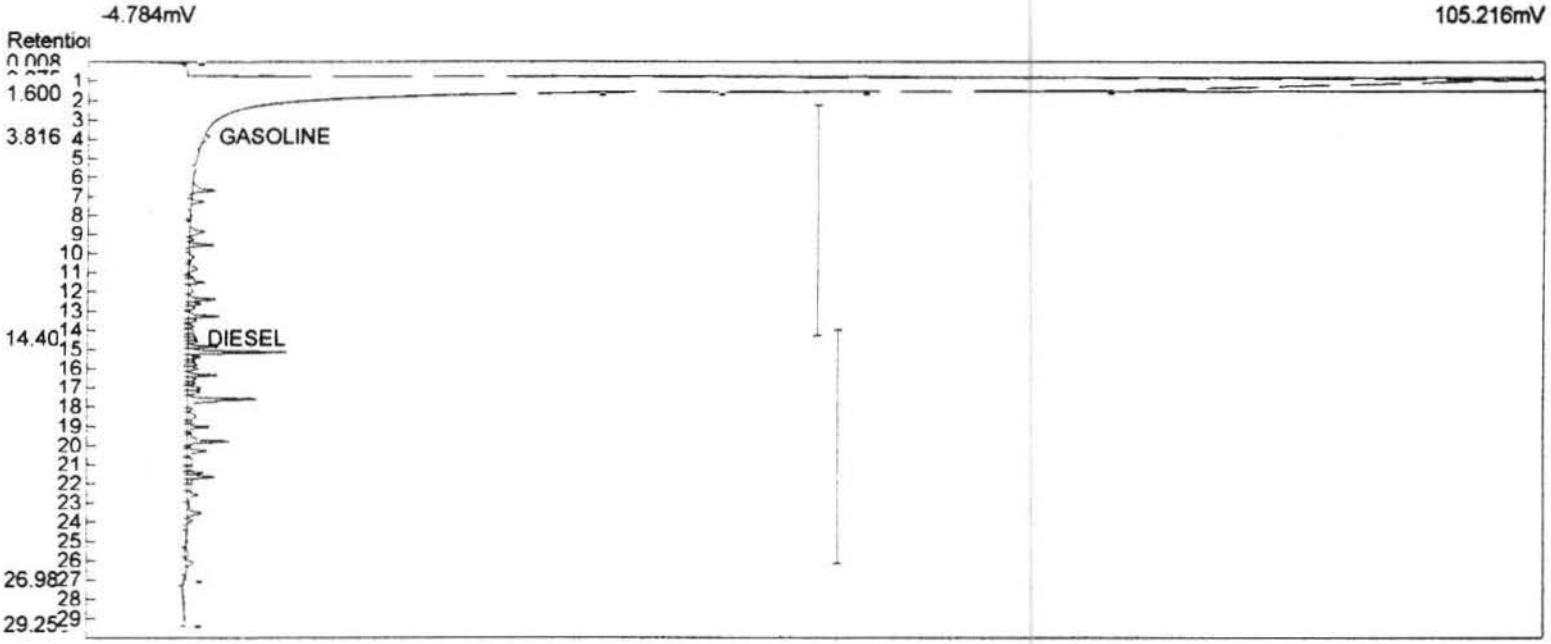
Component	Retention	Area	External	Units
GASOLINE	4.341	209.851	109.26	ppm
DIESEL	14.508	730.877	985.35	PPM
		940.728	1094.62	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 18:16:39
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: C:\PEAKWIN\0716FA13.CHR ()
Sample: CLOSE
Operator: map



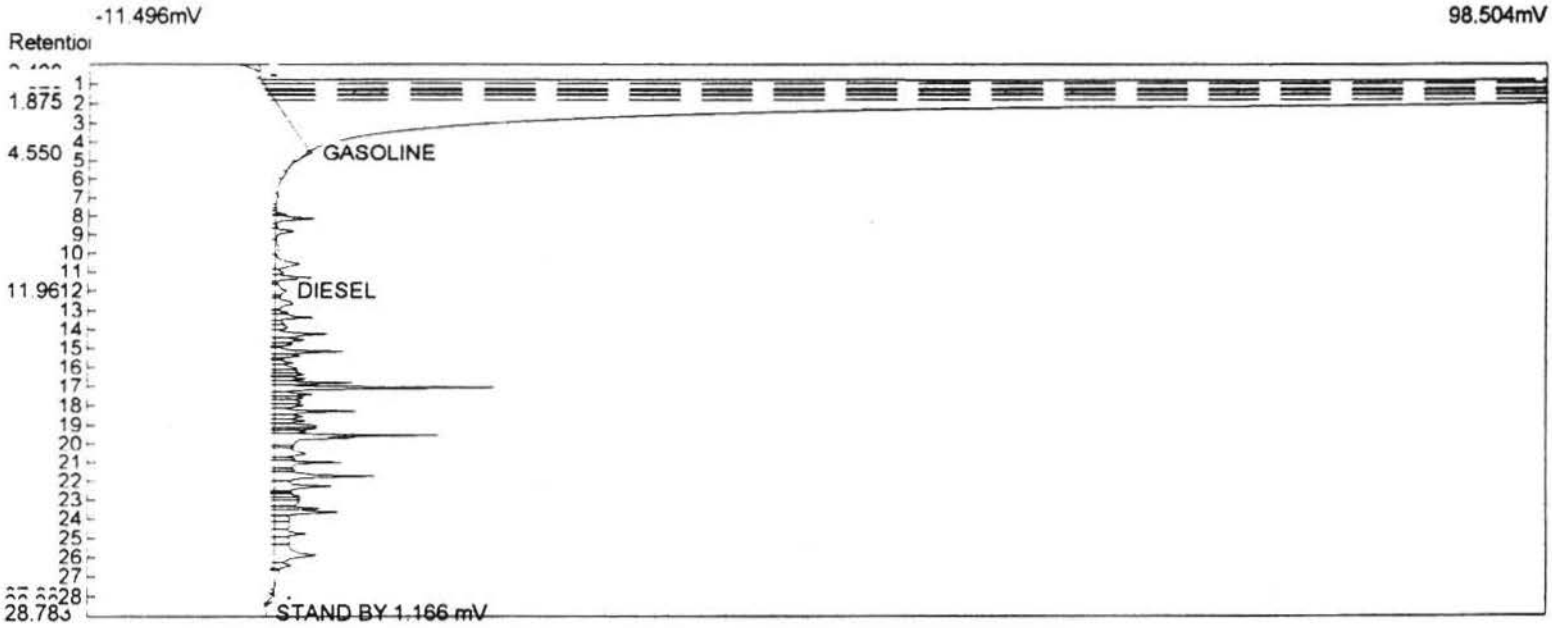
Component	Retention	Area	Internal	Units
GASOLINE	4.541	140.651	94.2388	ppm
DIESEL	12.775	782.990	558.8741	PPM
		923.641	653.1130	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 18:16:39
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0716FB13.CHR ()
Sample: CLOSE
Operator: map



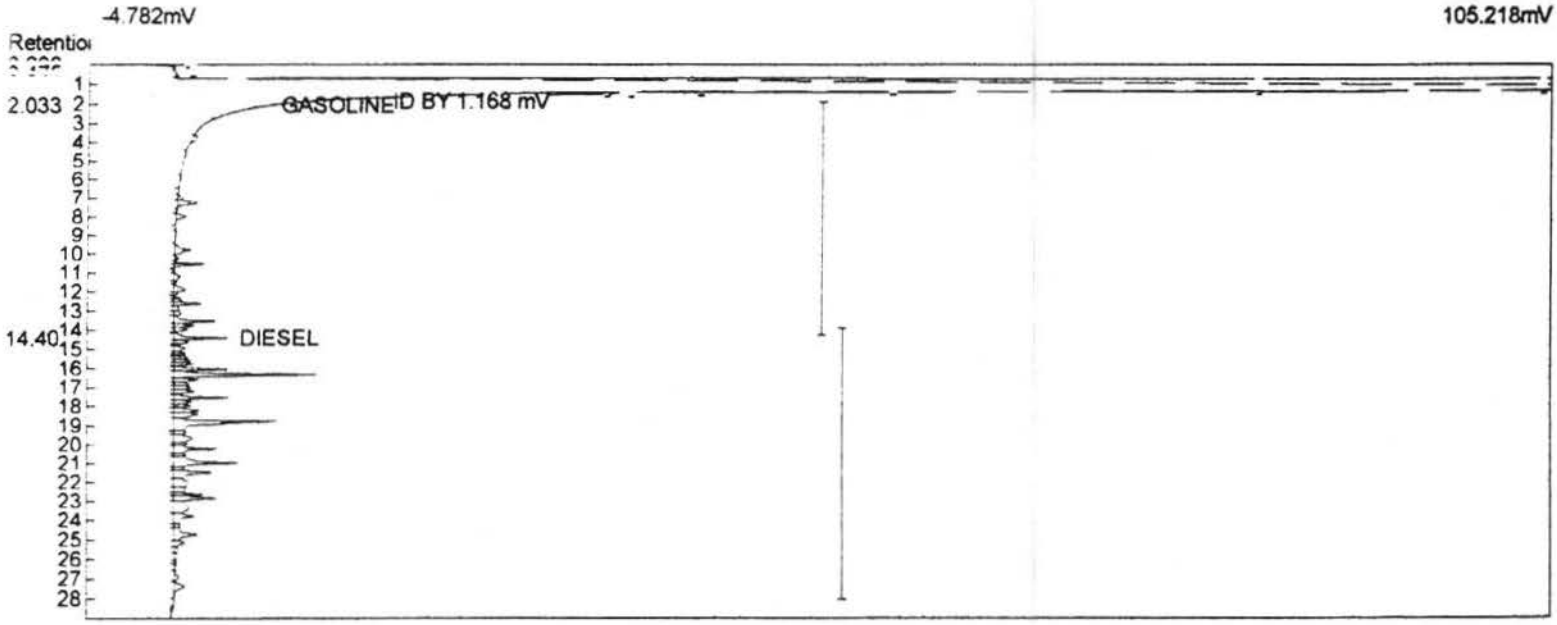
Component	Retention	Area	External	Units
GASOLINE	3.816	177.880	92.62	ppm
DIESEL	14.408	389.619	525.28	PPM
		567.499	617.89	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 11:26:39
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0716FA2.CHR ()
Sample: matrix spike
Operator: map



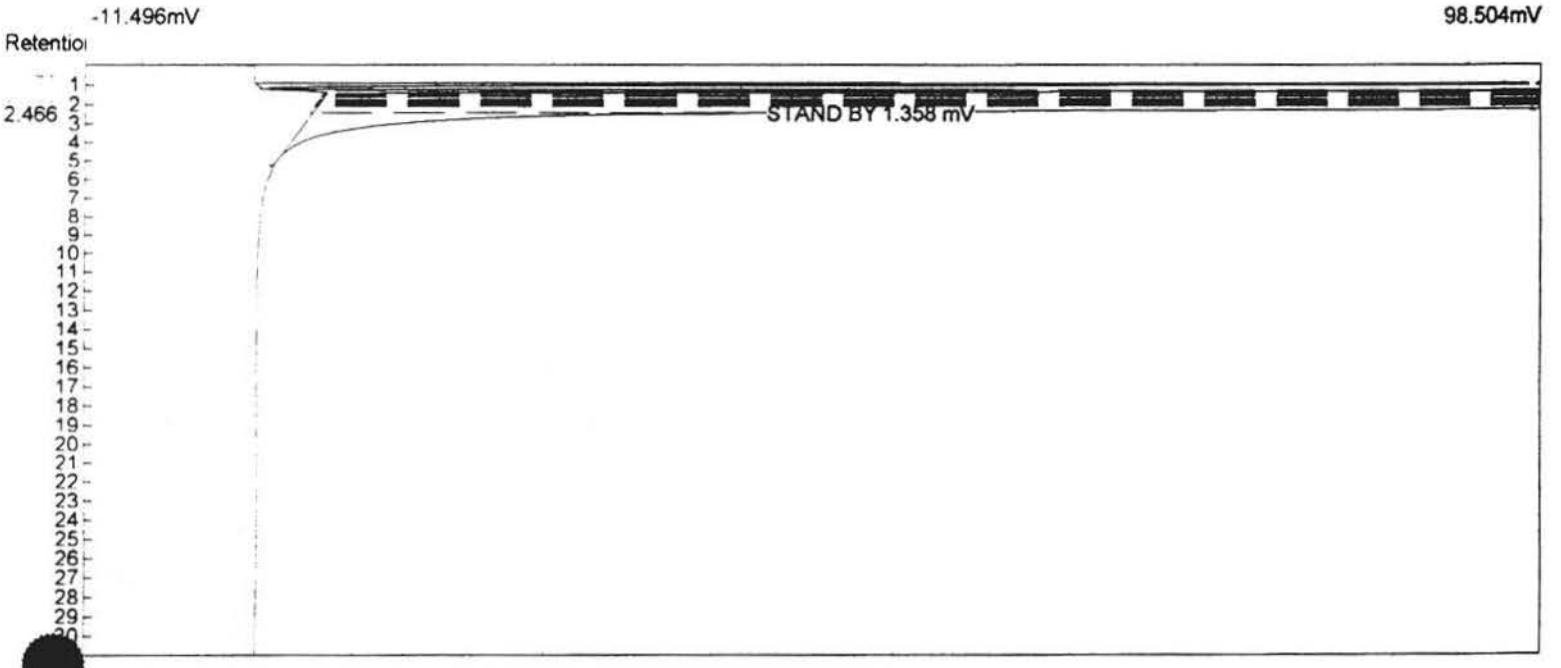
Component	Retention	Area	Internal	Units
GASOLINE	4.550	153.393	102.7767	ppm
DIESEL	11.966	1617.040	1154.1922	PPM
		1770.433	1256.9690	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 11:26:39
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0716FB2.CHR ()
Sample: matrix spike duplicate
Operator: map



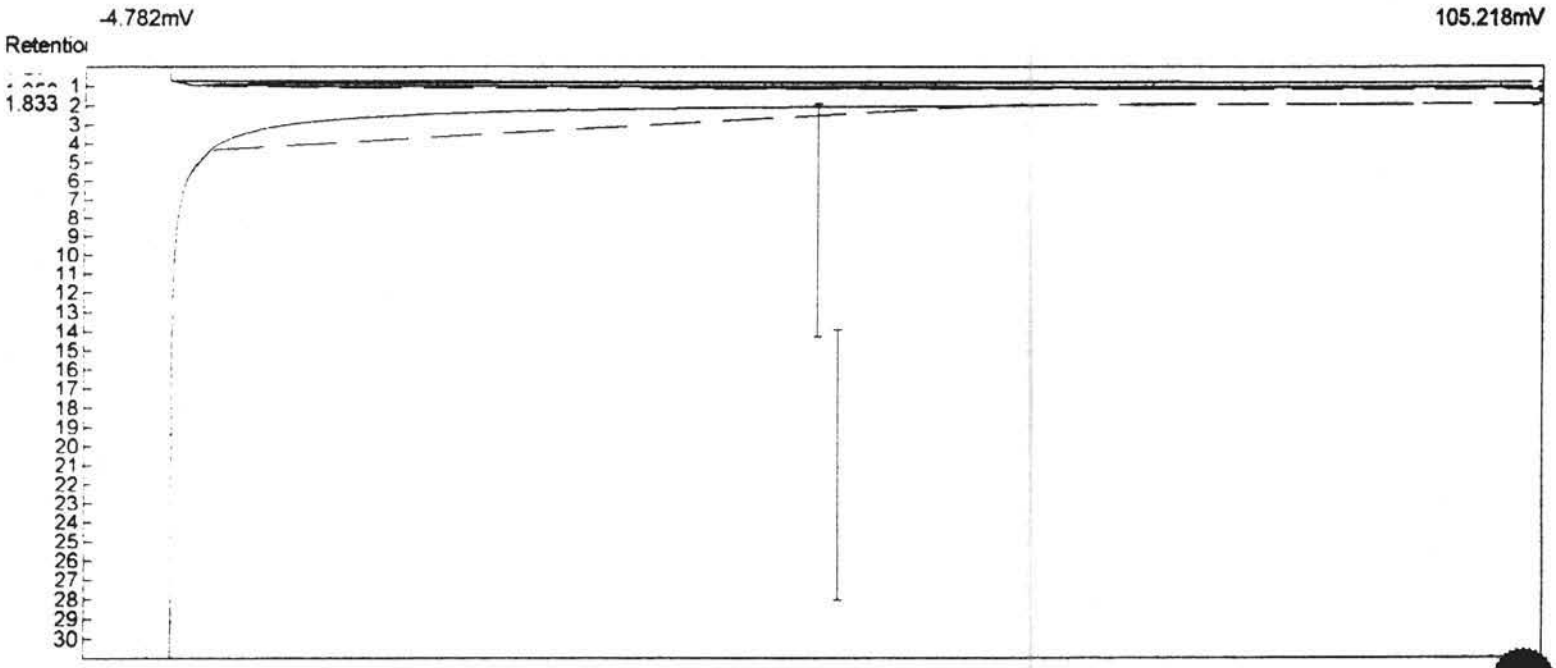
Component	Retention	Area	External	Units
GASOLINE	2.033	189.348	98.59	ppm
DIESEL	14.400	867.251	1169.21	PPM
		1056.599	1267.80	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 12:04:22
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0716FA3.CHR ()
Sample: METHOD BLANK
Operator: map



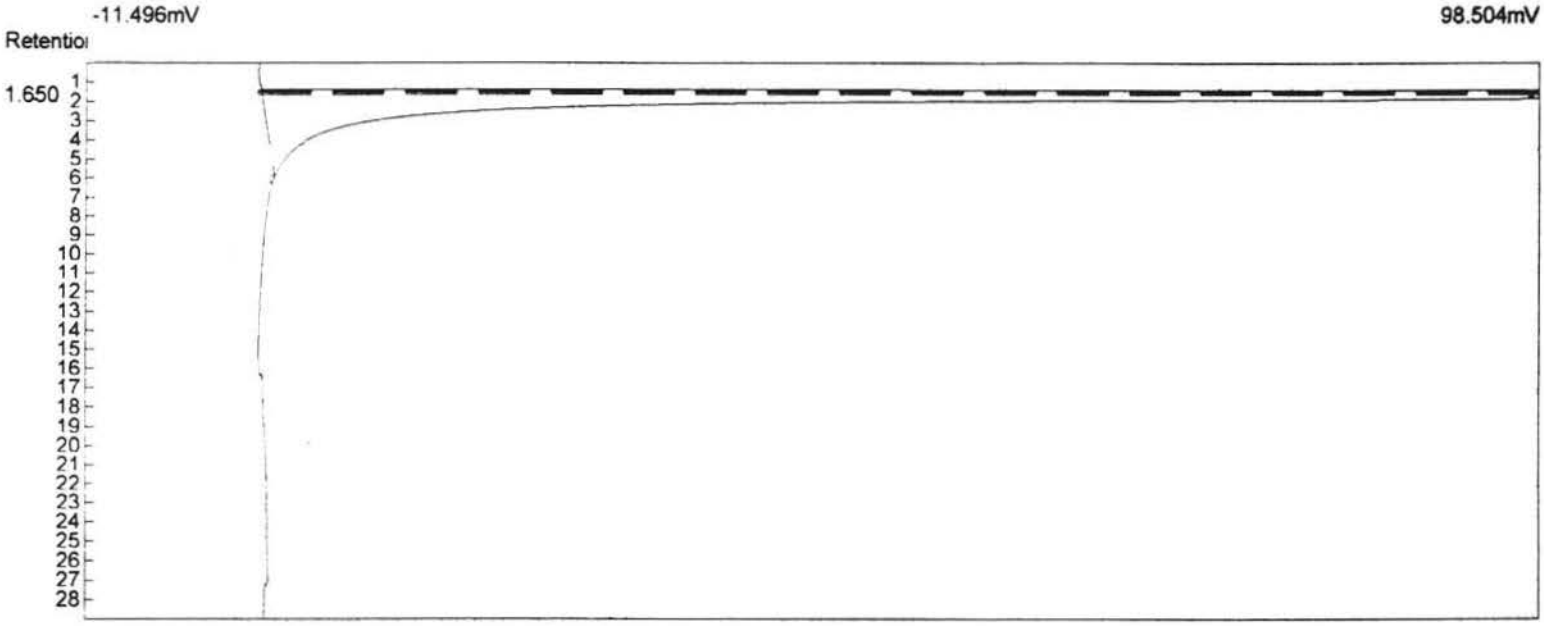
Component	Retention	Area	Internal	Units
		0.000	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 12:04:22
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0716FB3.CHR ()
Sample: METHOD BLANK
Operator: map



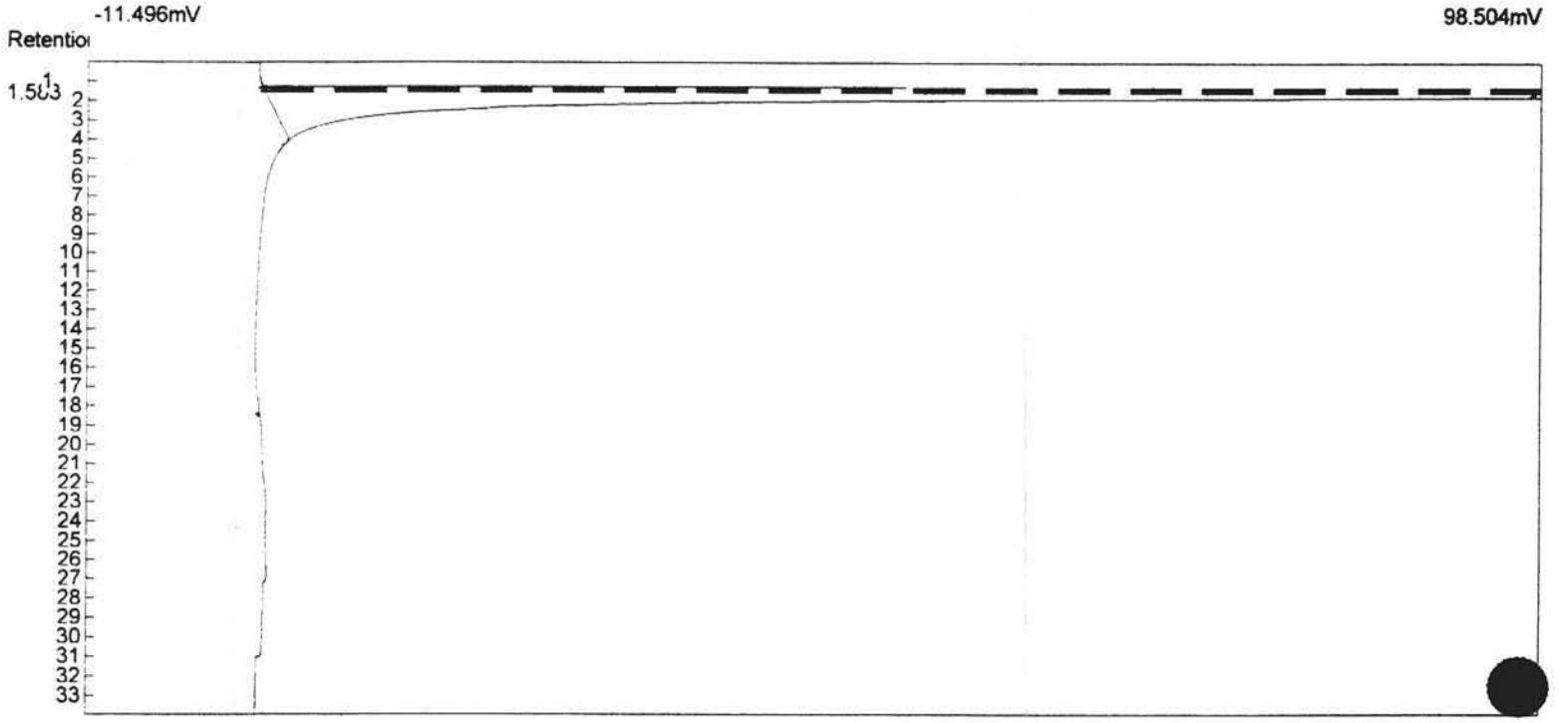
Component	Retention	Area	External	Units
		0.000	0.00	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 15:26:00
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0716FA8.CHR ()
Sample: 2842SB12@4-6/0716CH2
Operator: map



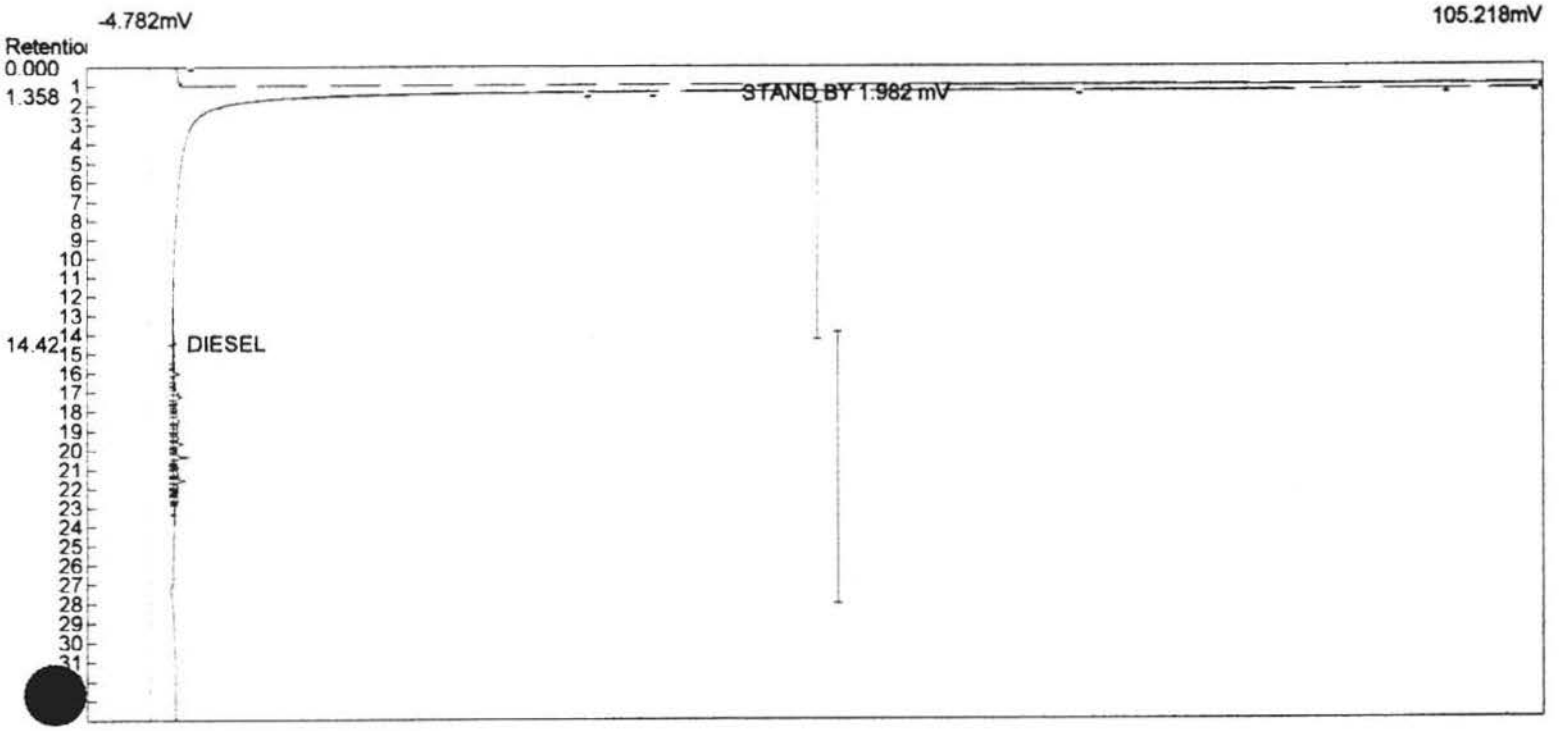
Component	Retention	Area	Internal	Units
		0.000	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 15:58:17
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0716FA9.CHR ()
Sample: 2842SB13@4-6/0716CH2
Operator: map



Component	Retention	Area	Internal	Units
		0.000	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 15:58:17
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0716FB9.CHR ()
Sample: 2842SB14@4-6/0716CH2
Operator: map

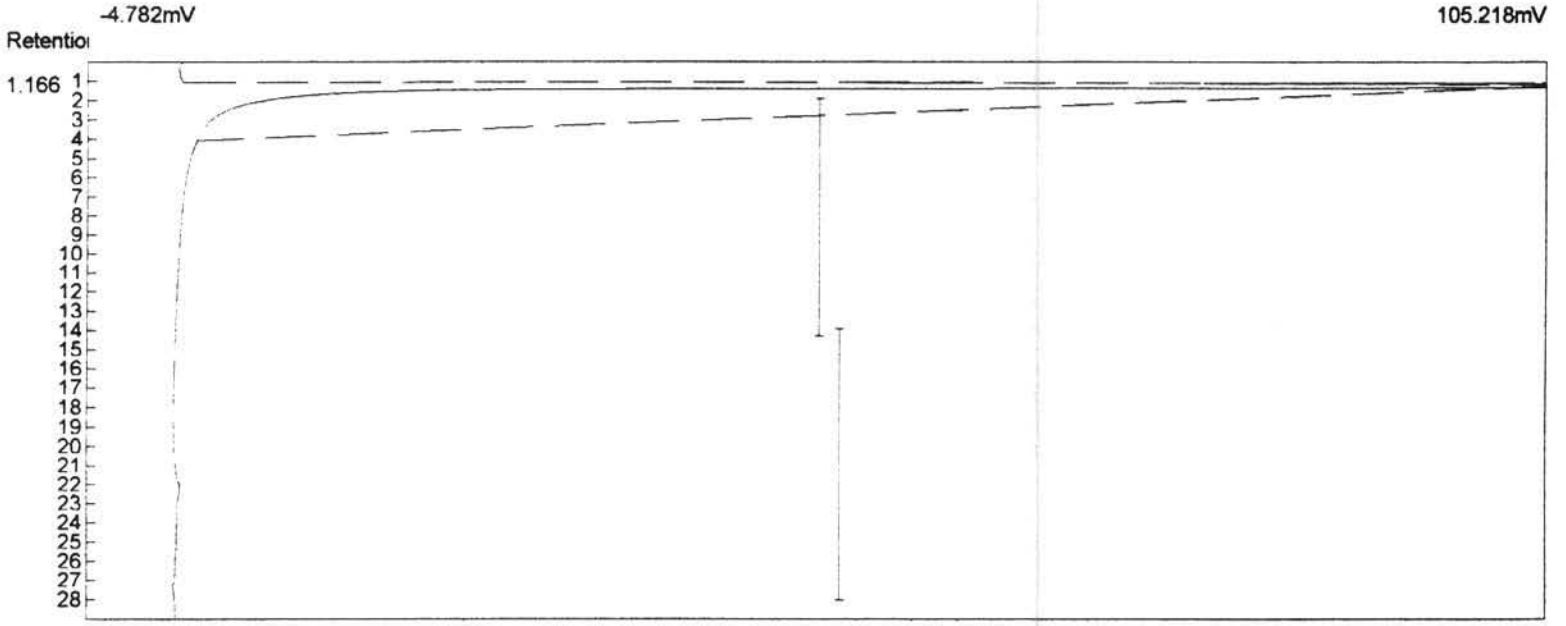


Component	Retention	Area	External	Units
DIESEL	14.425	123.118	165.98	PPM
		123.118	165.98	

D.F. % Solids
x 2 ÷ 0.85 = 390 ppm

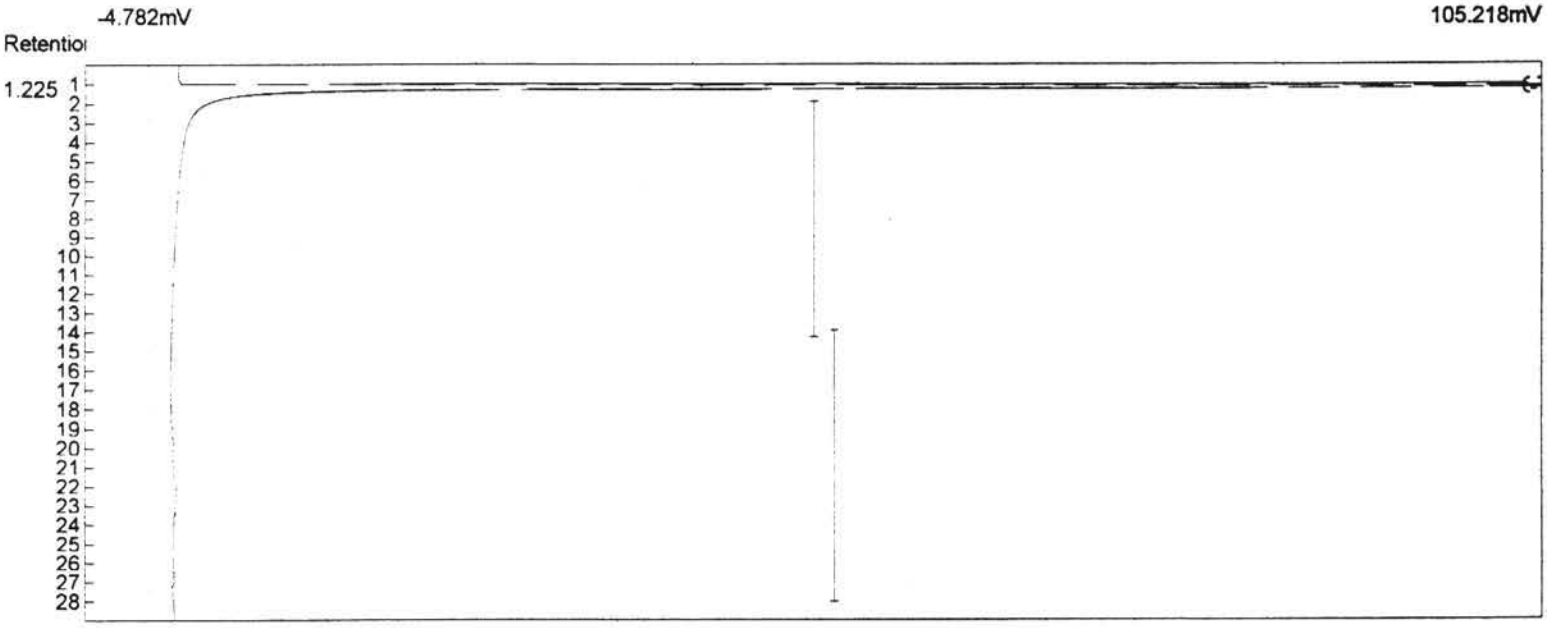
KS

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 15:26:00
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0716FB8.CHR ()
Sample: 2842SB15@4-6/0716CH2
Operator: map



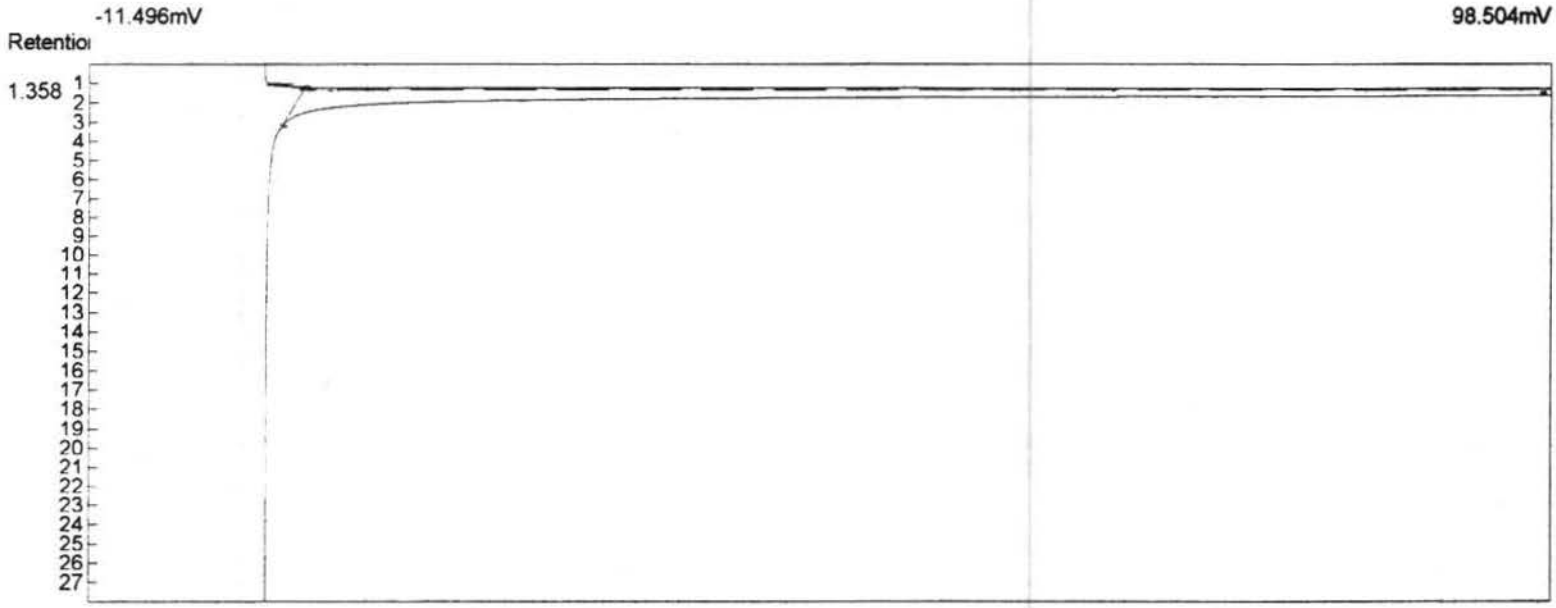
Component	Retention	Area	External	Units
		0.000	0.00	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 14:47:26
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0716FB7.CHR ()
Sample: 2842SB16@4-6/0716CH2
Operator: map



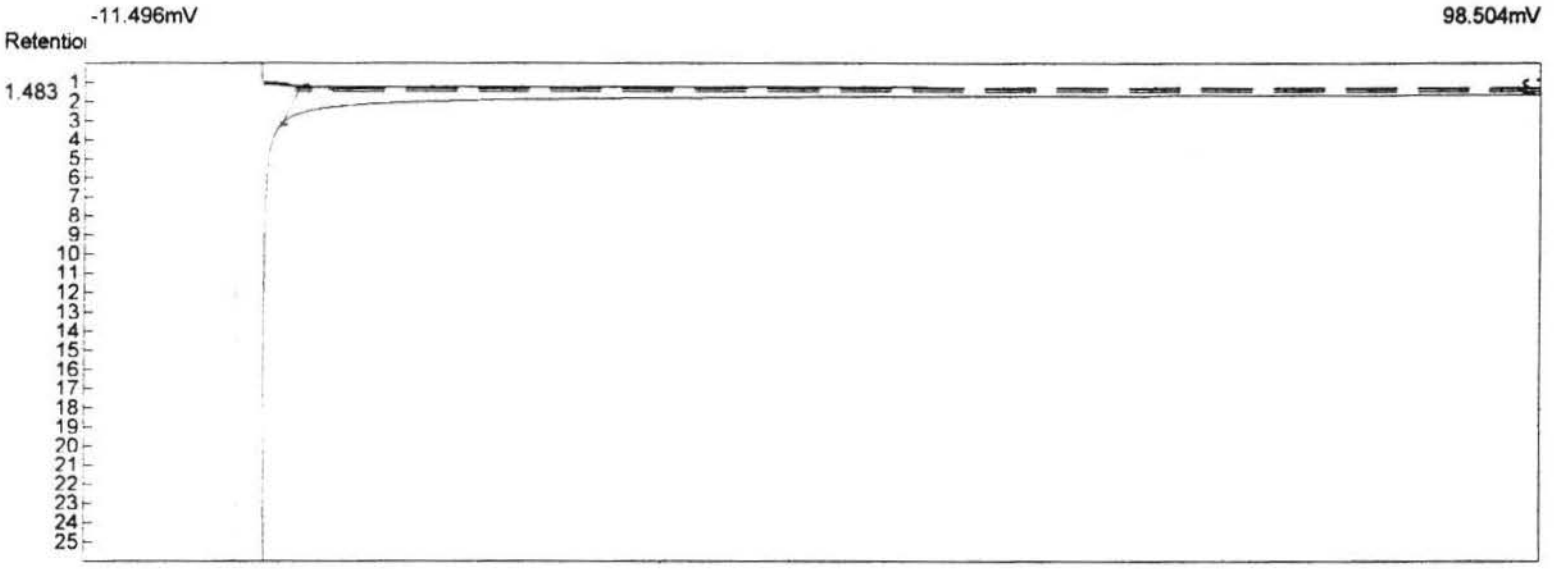
Component	Retention	Area	External	Units
		0.000	0.00	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 17:11:04
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: C:\PEAKWIN\0716FA11.CHR ()
Sample: TRIP BLANK
Operator: map



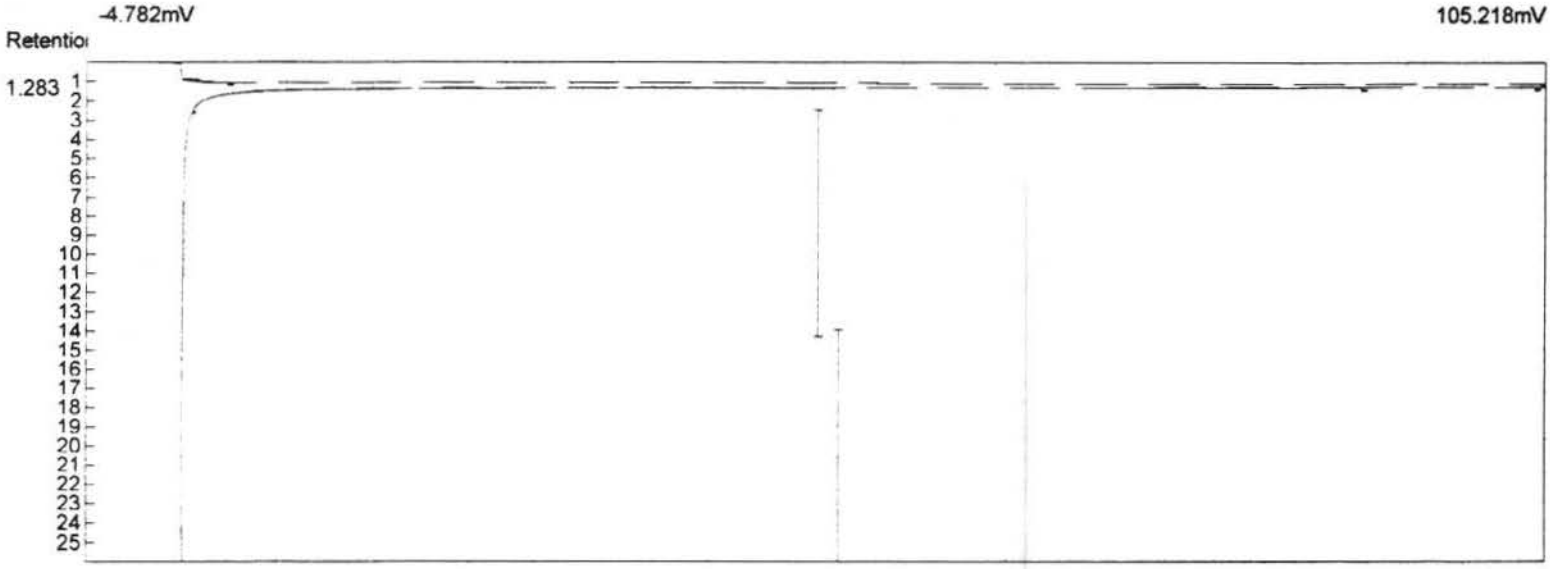
Component	Retention	Area	Internal	Units
		0.000	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 17:41:43
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: C:\PEAKWIN\0716FA12.CHR ()
Sample: 2842-EB3/0715CH2
Operator: map



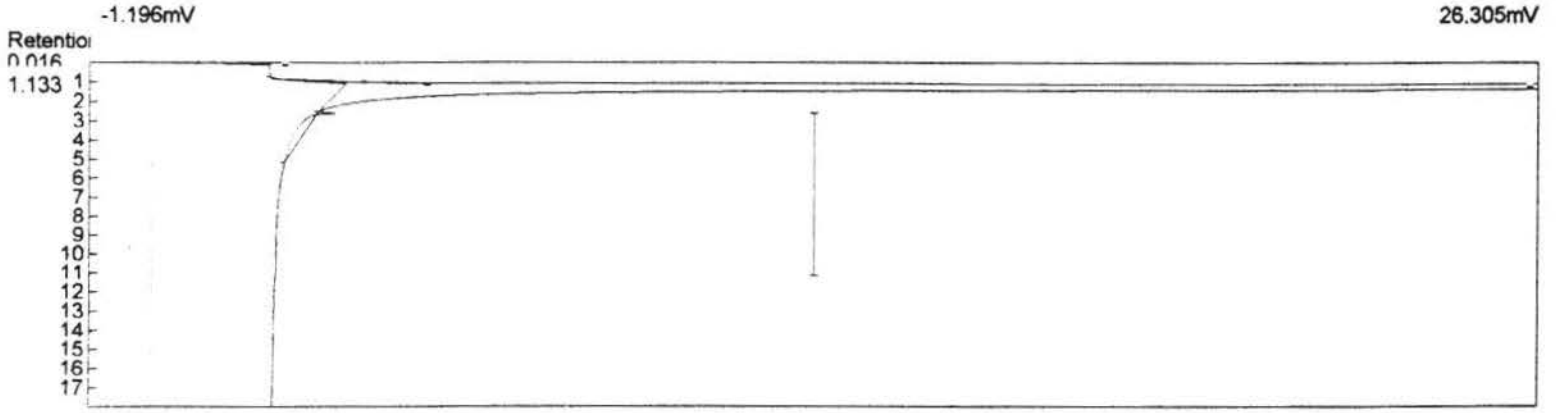
Component	Retention	Area	Internal	Units
		0.000	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 17:41:43
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: C:\PEAKWIN\0716FB12.CHR ()
Sample: 2842-EB4/0715CH2
Operator: map



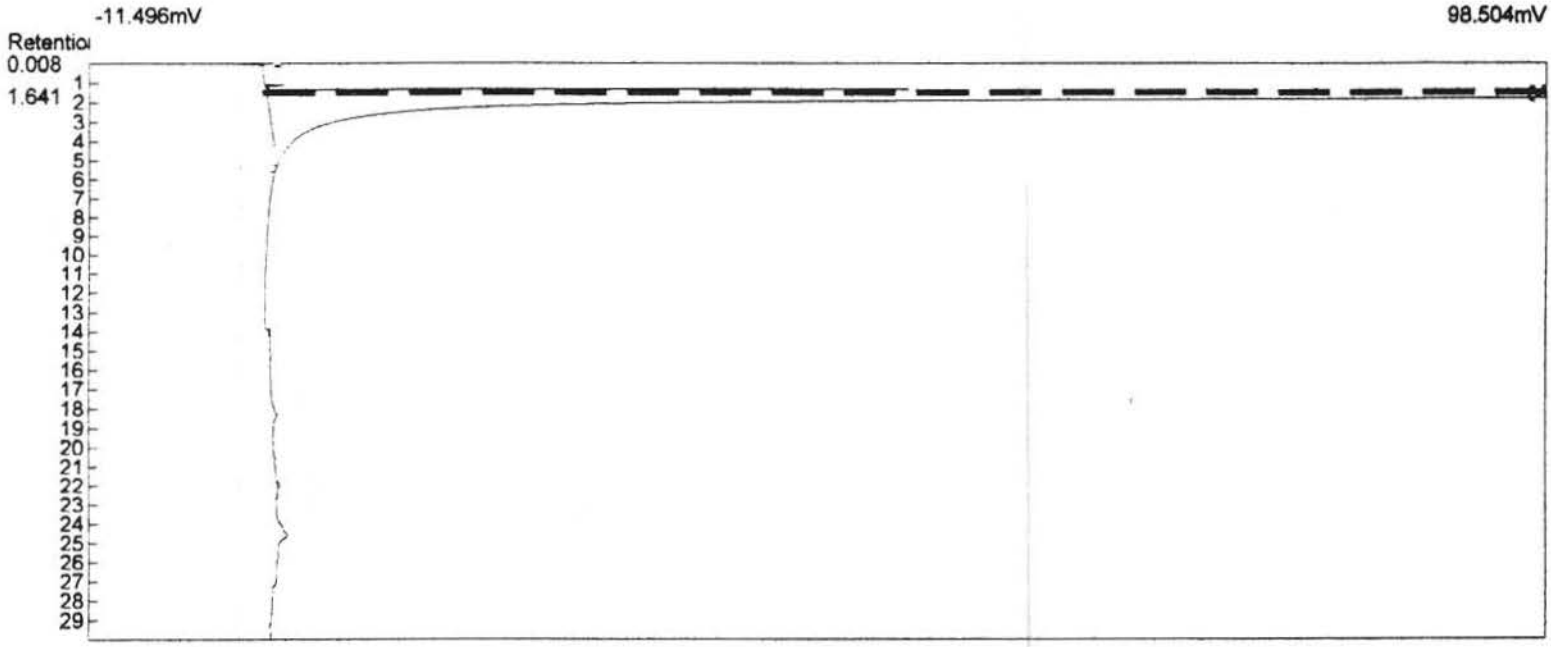
Component	Retention	Area	External	Units
		0.000	0.00	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 17:11:04
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0716FB11.CHR ()
Sample: 2842-EB5/0715CH2
Operator: map



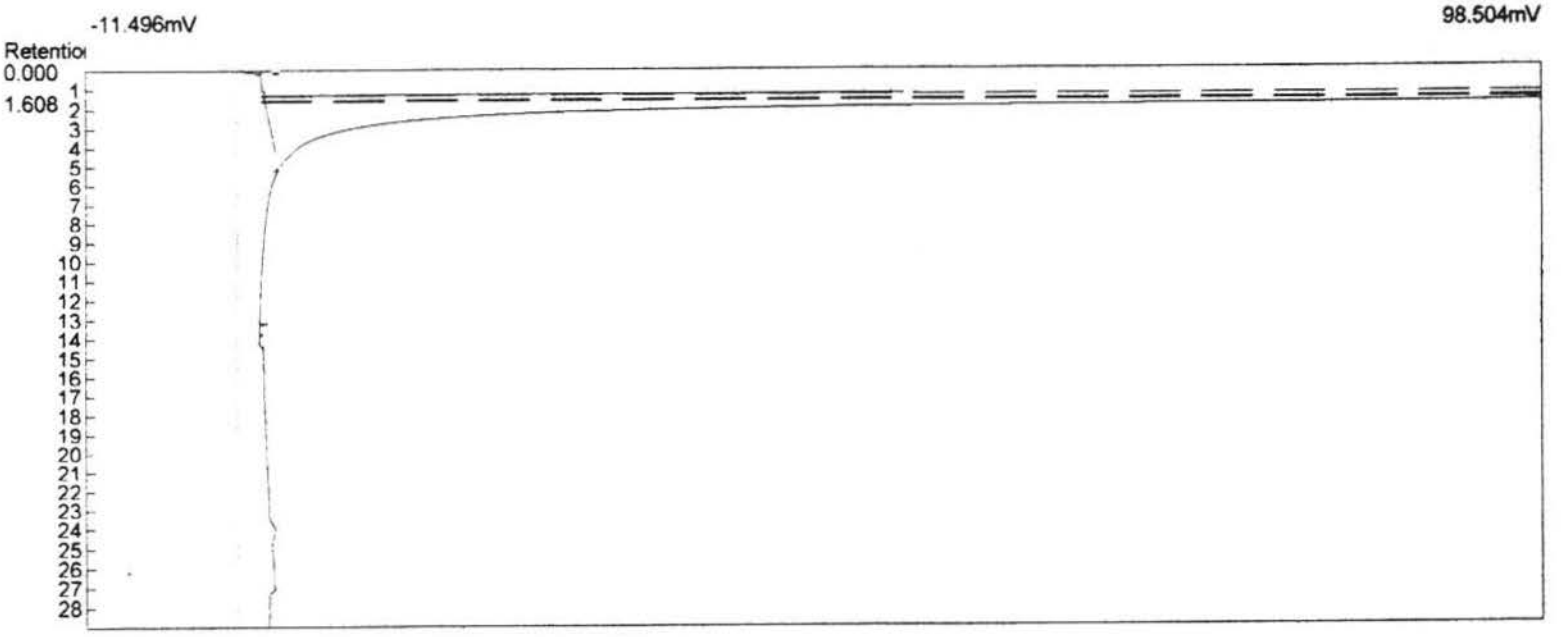
Component	Retention	Area	External	Units
		0.000	0.00	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 14:15:00
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0716FA6.CHR ()
Sample: 2842-SB12WATER/0716C
Operator: map



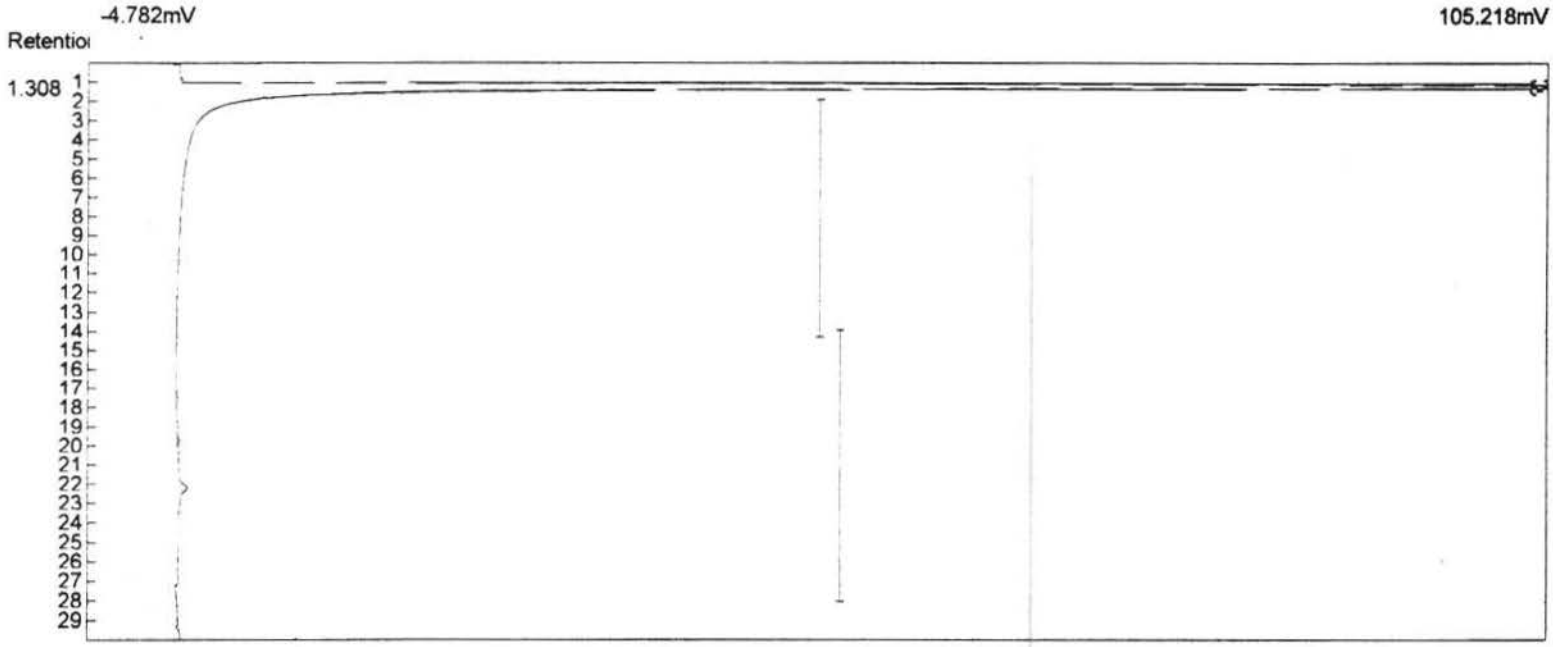
Component	Retention	Area	Internal	Units
		0.000	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 14:47:26
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0716FA7.CHR ()
Sample: 2842-SB13WATER/0716C
Operator: map



Component	Retention	Area	Internal	Units
		0.000	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 14:15:00
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0716FB6.CHR ()
Sample: 2842-SB16WATER/0716C
Operator: map



Component	Retention	Area	External	Units
		0.000	0.00	

teg

QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0715CH2
DAILY CALIBRATION DATE: 7/16/1998

CH2M HILL
PROJECT NAME: SITE 2842

			INITIAL		OPENING			CLOSING		
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	AREA	RF	%DIFF	AREA	RF	%DIFF
BENZENE	PID #1	0.100 - 10.000	26	7.1%	29.60	29.60	12.4%	28.95	28.95	10.0%
TOLUENE	PID #1	0.100 - 10.000	27	4.9%	30.67	30.67	14.1%	30.86	30.86	14.8%
ETHYLBENZENE	PID #1	0.100 - 10.000	23	9.0%	26.42	26.42	14.9%	26.24	26.24	14.1%
m&p-XYLENES	PID #1	0.100 - 10.000	33	9.9%	70.63	35.32	5.7%	74.56	37.28	11.6%
o-XYLENES	PID #1	0.100 - 10.000	27	8.9%	28.92	28.92	6.3%	29.91	29.91	9.9%
BENZENE	PID #2	0.100 - 10.000	31	7.3%	27.84	27.84	10.2%	33.35	33.35	7.6%
TOLUENE	PID #2	0.100 - 10.000	32	8.4%	31.54	31.54	1.4%	35.86	35.86	12.0%
ETHYLBENZENE	PID #2	0.100 - 10.000	26	5.2%	29.66	29.66	14.1%	29.26	29.26	12.5%
m&p-XYLENES	PID #2	0.100 - 10.000	37	3.8%	86.31	43.16	16.6%	82.49	41.25	11.5%
o-XYLENES	PID #2	0.100 - 10.000	31	2.6%	34.22	34.22	10.4%	34.57	34.57	11.5%

CALIB RANGE - RANGE OF CALIBRATION CURVE IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 20% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY:MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

teg

QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0715CH2
DATE: 7/16/1998

CH2M HILL
PROJECT NAME: SITE 2842

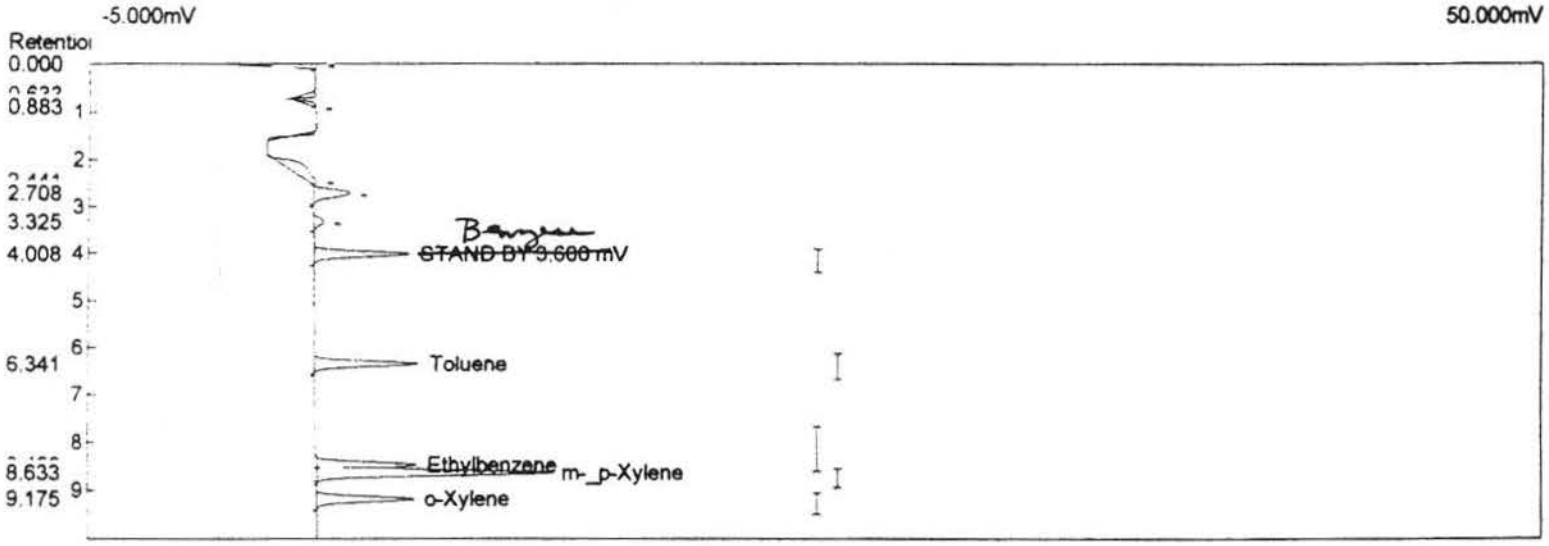
COMPOUND	SPK CONC (ppm)	MS CONC (ppm)	%REC MS	MSD CONC (ppm)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
BENZENE	1.0	0.88	88%	0.87	87%	1%	15%	76% - 120%
TOLUENE	1.0	1.00	100%	0.92	92%	8%	15%	75% - 120%
ETHYLBENZENE	1.0	1.12	112%	1.00	100%	11%	15%	65% - 125%
TOTAL XYLENES	3.0	3.2	107%	3.3	113%	4%	15%	72% - 120%

ppm = PARTS PER MILLION
MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE
% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX
RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY:MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

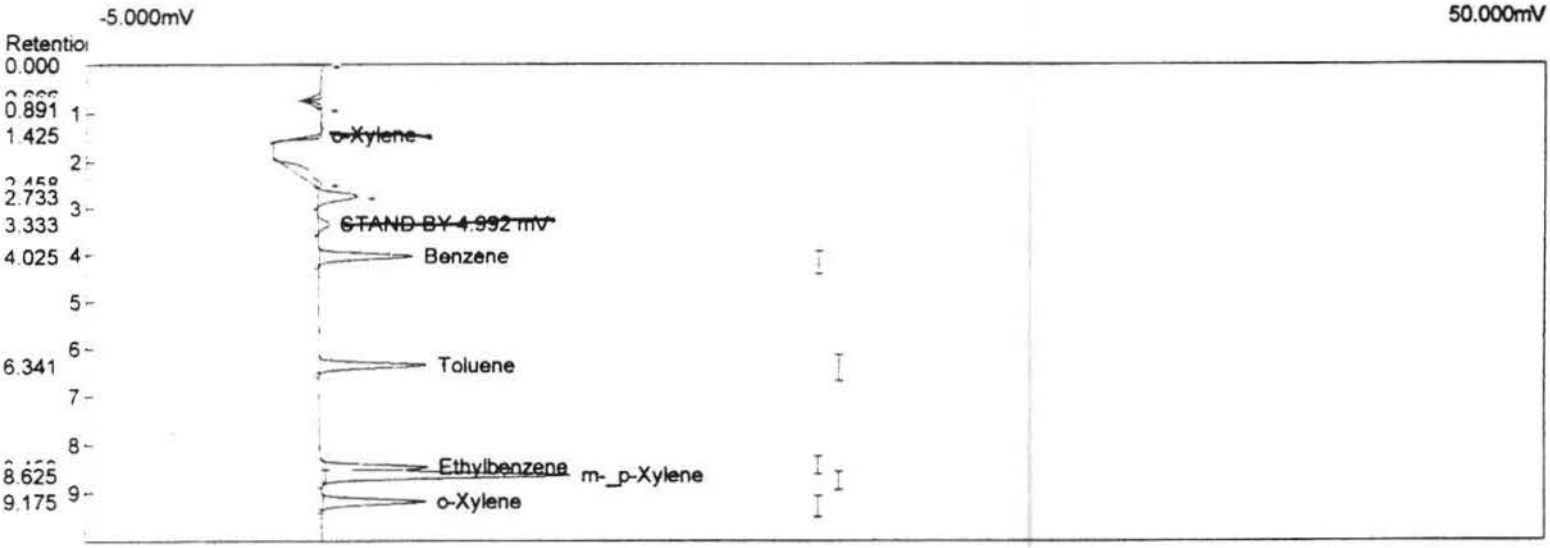
Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 10:59:15
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0716PA1.CHR ()
Sample: 1 ppm BTEX open
Operator: JMP



Component	Retention	Area	External	Internal	Units
Benzene	4.008	29.596	1.14	1.1383	ppm
Toluene	6.341	30.669	1.14	1.1404	ppm
Ethylbenzene	8.466	26.418	1.15	1.1486	ppm
m-_p-Xylene	8.633	70.632	2.14	2.1404	ppm
o-Xylene	9.175	28.923	1.07	1.0712	ppm
		186.238	6.64	6.6390	

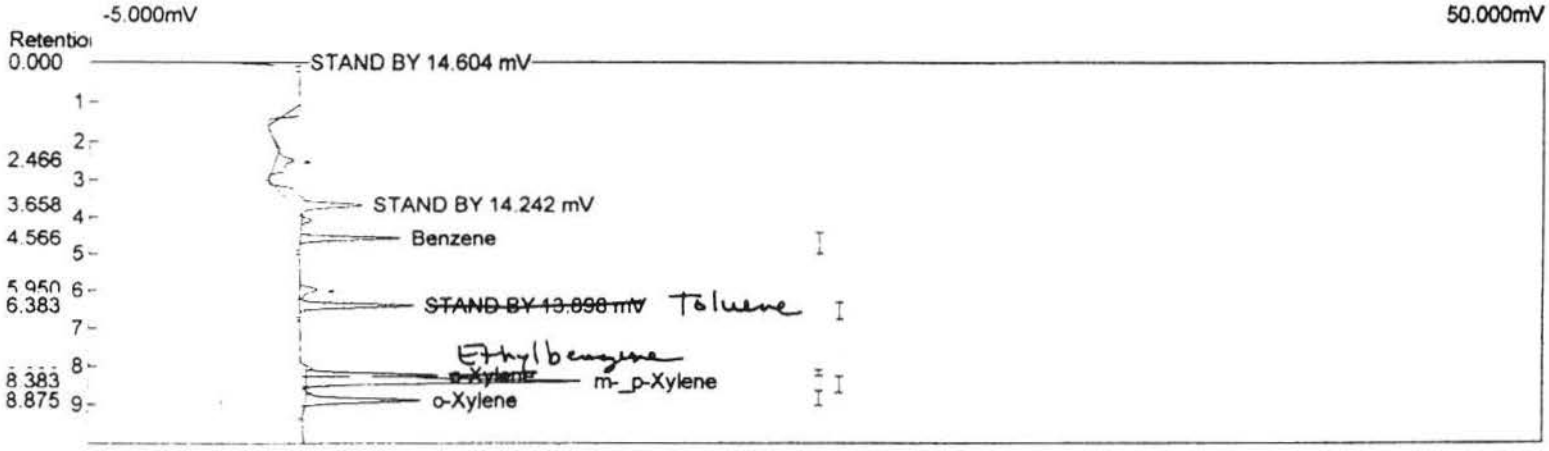
KA

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 17:32:27
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0716PA18.CHR ()
Sample: CLOSE STD
Operator: MAP



Component	Retention	Area	External	Internal	Units
Benzene	4.025	28.950	1.11	1.1135	ppm
Toluene	6.341	30.860	1.15	1.1476	ppm
Ethylbenzene	8.458	26.243	1.14	1.1410	ppm
m-_p-Xylene	8.625	74.555	2.26	2.2592	ppm
o-Xylene	9.175	29.910	1.11	1.1078	ppm
		190.518	6.77	6.7690	

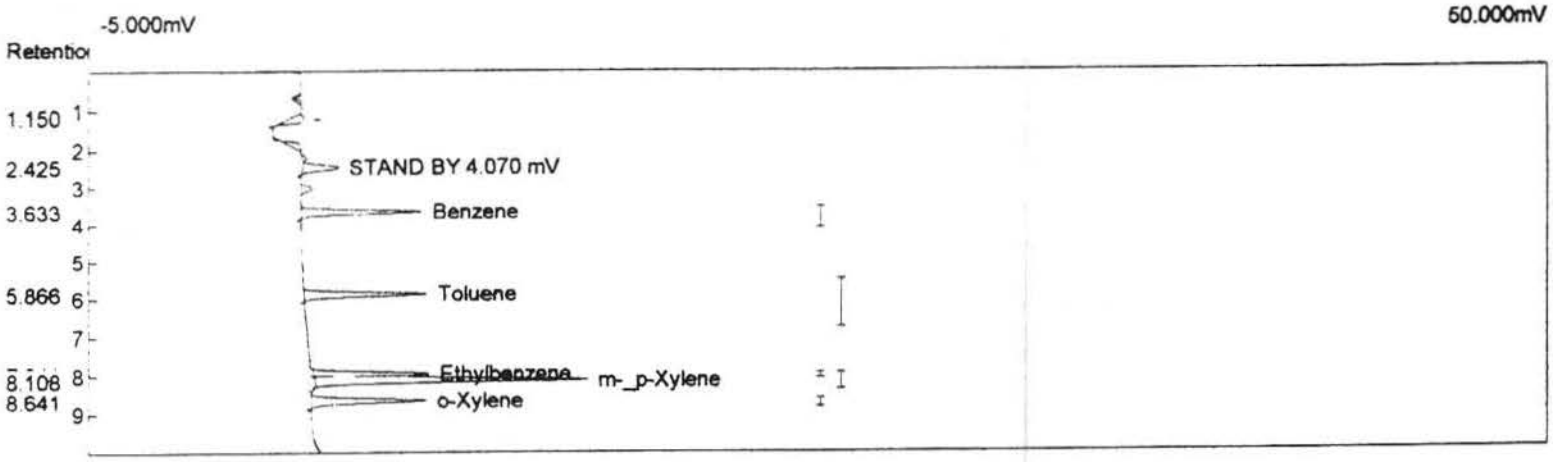
Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 10:59:15
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0716PB1.CHR ()
Sample: 1 ppm BTEX open
Operator: JMP



Component	Retention	Area	External	Internal	Units
Benzene	4.566	27.840	0.90	0.9022	ppm
Toluene	6.383	31.538	1.00	0.9970	ppm
Ethylbenzene	8.233	29.655	1.15	1.1494	ppm
m-_p-Xylene	8.383	86.313	2.28	2.2785	ppm
o-Xylene	8.875	34.217	1.11	1.1128	ppm
		209.564	6.44	6.4399	

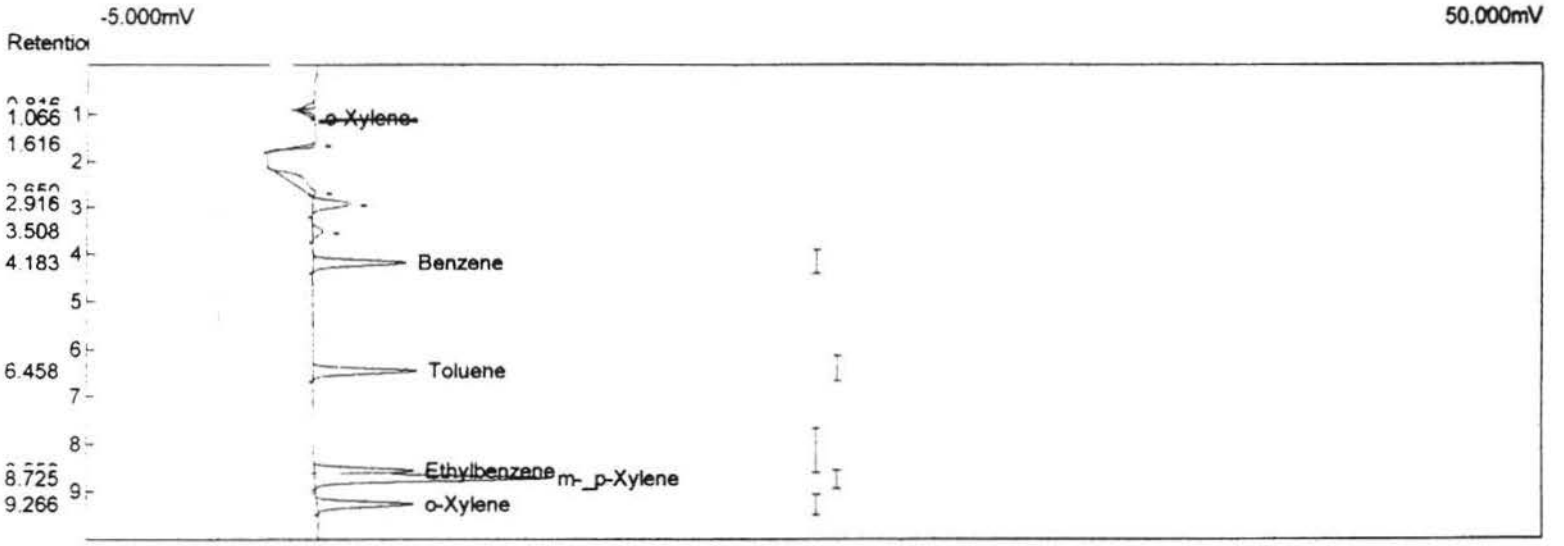
KJL

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 17:32:27
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0716PB18.CHR ()
Sample: CLOSE STD
Operator: MAP



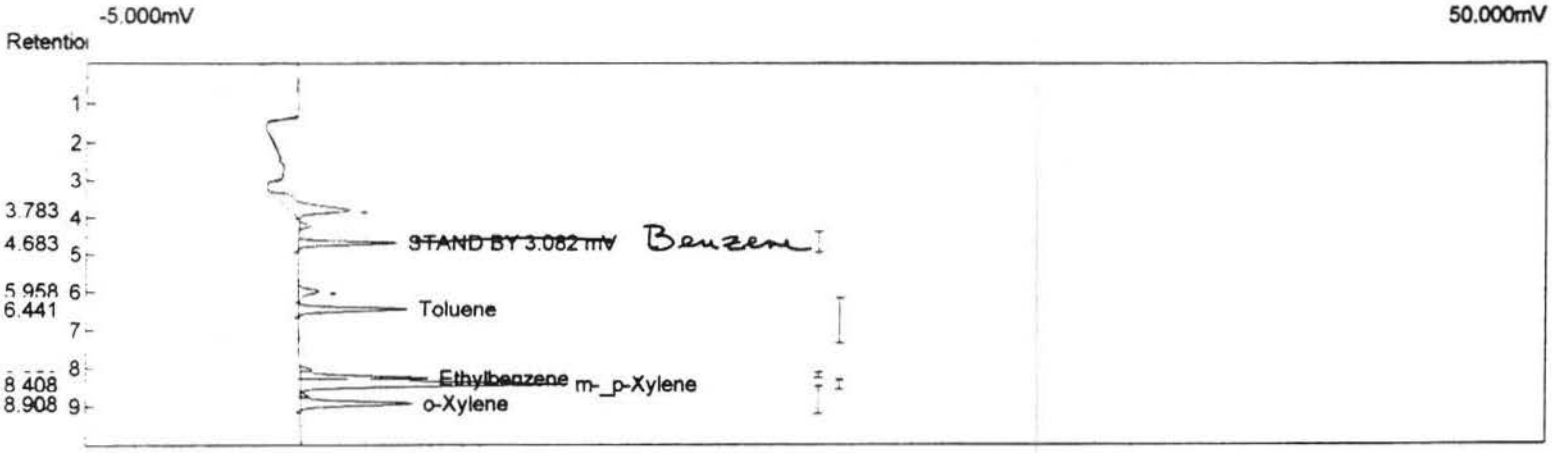
Component	Retention	Area	External	Internal	Units
Benzene	3.633	33.345	1.08	1.0806	ppm
Toluene	5.866	35.855	1.13	1.1335	ppm
Ethylbenzene	7.941	29.257	1.13	1.1340	ppm
m-_p-Xylene	8.108	82.490	2.18	2.1776	ppm
o-Xylene	8.641	34.569	1.12	1.1242	ppm
		215.516	6.65	6.6498	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 11:27:36
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0716PA2.CHR ()
Sample: matrix spike
Operator: JMP



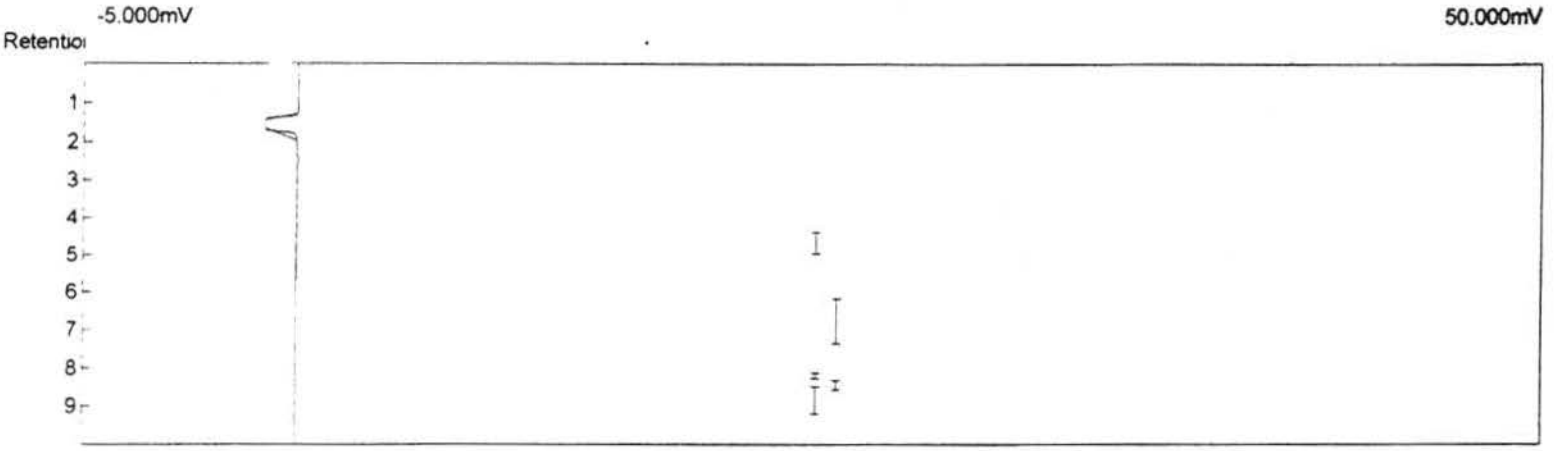
Component	Retention	Area	External	Internal	Units
Benzene	4.183	28.616	0.88	0.8805	ppm
Toluene	6.458	29.991	1.00	1.0037	ppm
Ethylbenzene	8.558	25.687	1.12	1.1168	ppm
m-_p-Xylene	8.725	70.940	2.15	2.1497	ppm
o-Xylene	9.266	28.358	1.05	1.0503	ppm
		183.594	6.20	6.2011	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 11:27:36
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0716PB2.CHR ()
Sample: matrix spike duplicate
Operator: JMP



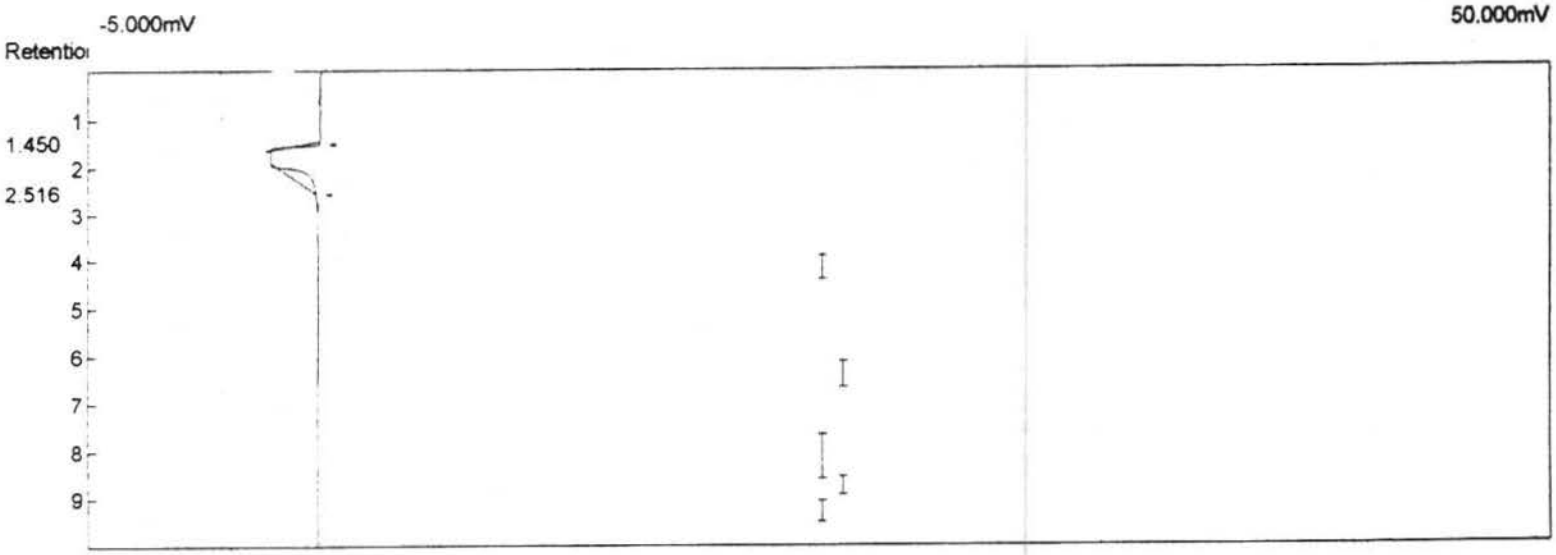
Component	Retention	Area	External	Internal	Units
Benzene	4.683	23.980	0.87	0.8703	ppm
Toluene	6.441	29.155	0.92	0.9217	ppm
Ethylbenzene	8.258	27.940	1.00	0.9963	ppm
m-_p-Xylene	8.408	86.061	2.27	2.2719	ppm
o-Xylene	8.908	32.740	1.06	1.0647	ppm
		199.877	6.12	6.1250	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 11:51:40
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0716PB3.CHR ()
Sample: method blank
Operator: JMP



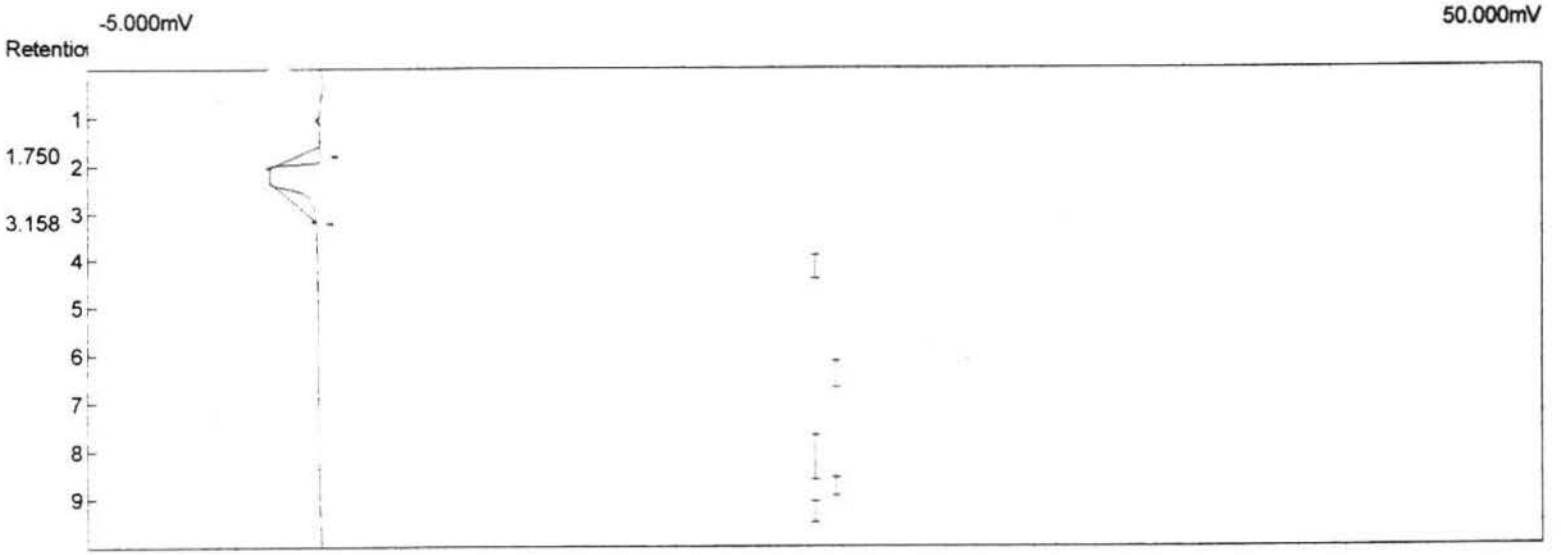
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 11:51:40
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0716PA3.CHR ()
Sample: method blank
Operator: JMP



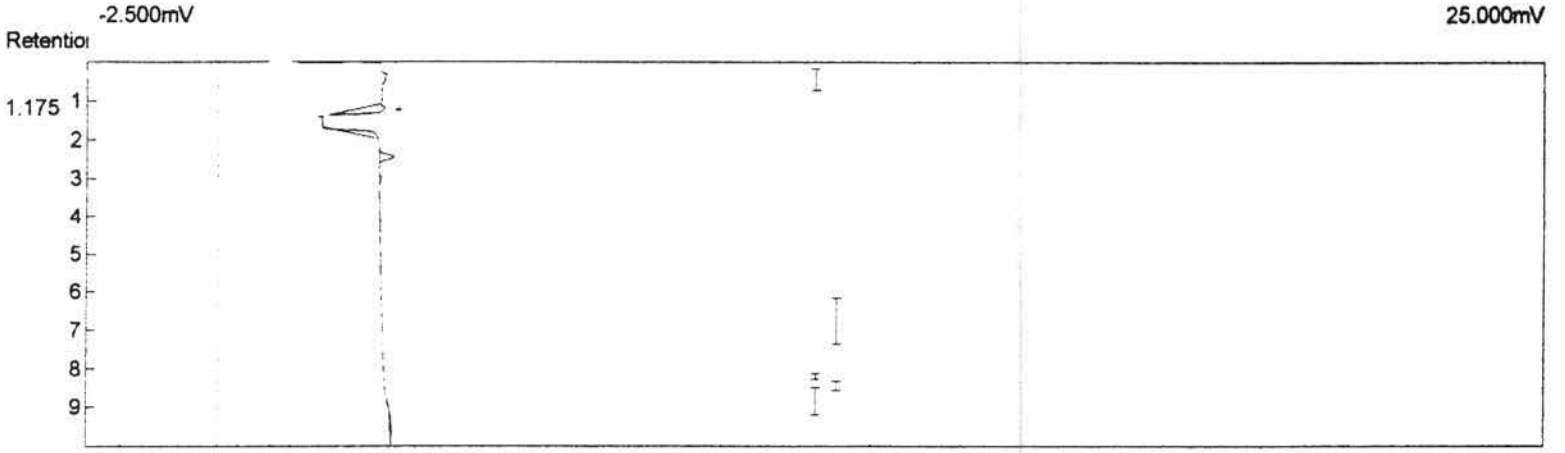
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 14:32:29
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0716PA10.CHR ()
Sample: 2842SB12@4-6/0716CH2
Operator: MAP



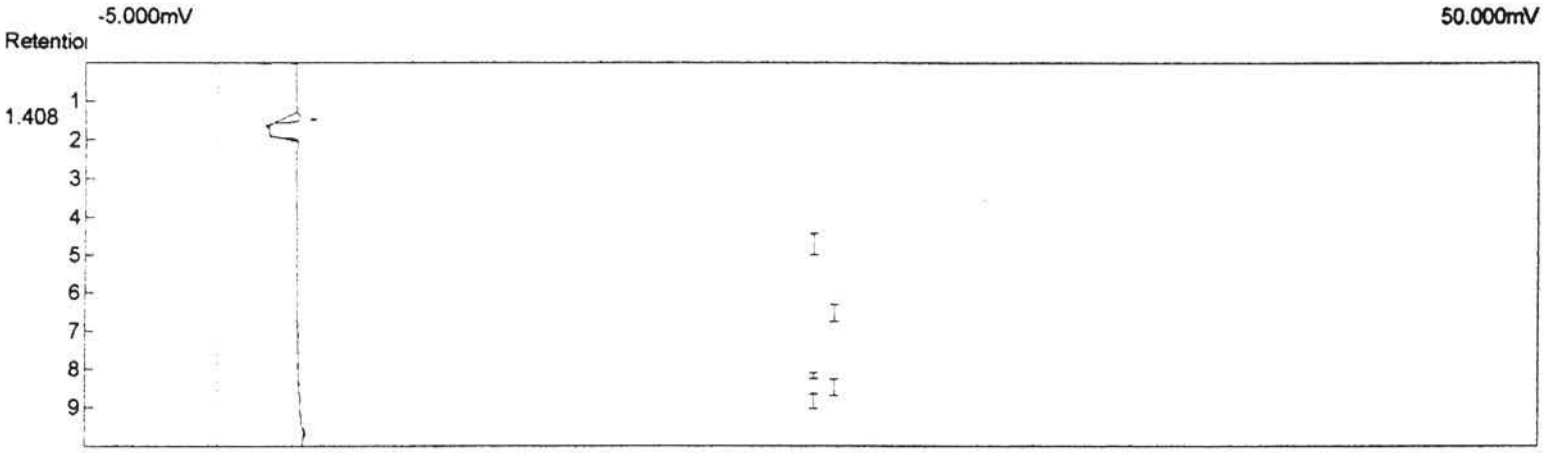
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 15:21:57
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0716PB12.CHR ()
Sample: 2842-SB13@4-6/0716CH2
Operator: MAP



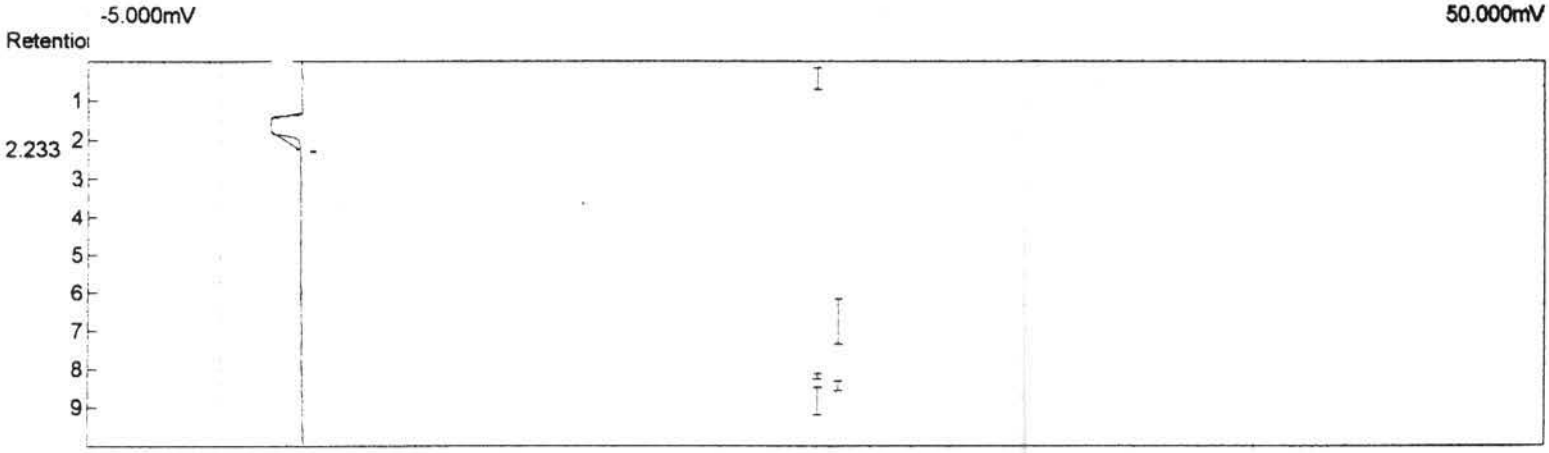
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 16:53:48
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0716PB16.CHR ()
Sample: 2842SB14@4-6/0715CH2
Operator: MAP



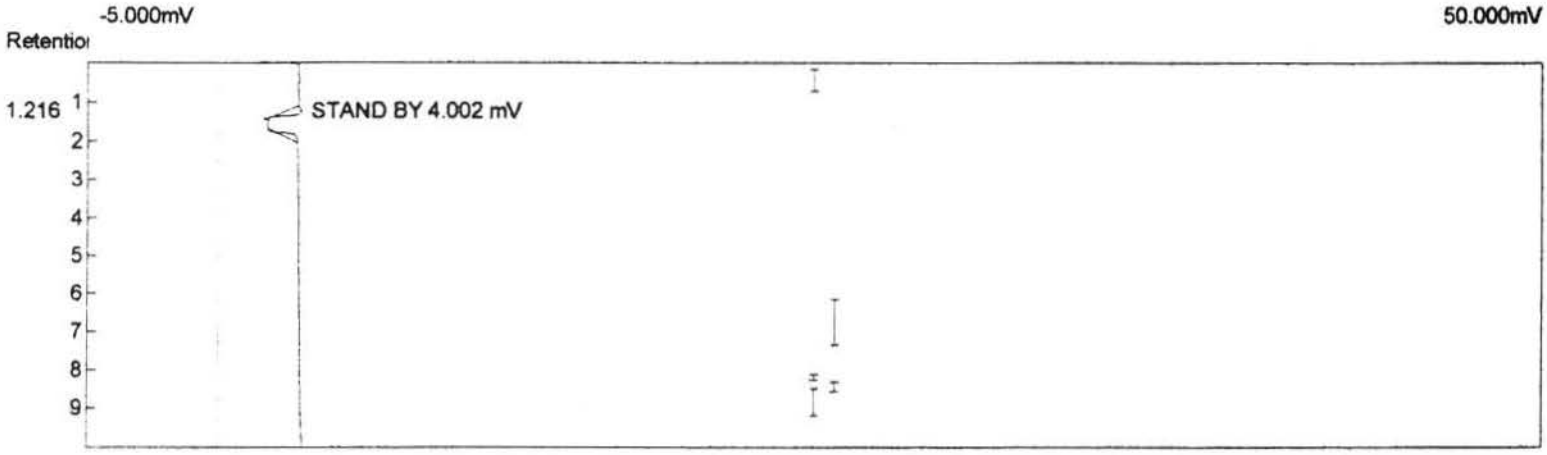
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 14:32:29
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0716PB10.CHR ()
Sample: 2842SB15@4-6/0716CH2
Operator: MAP



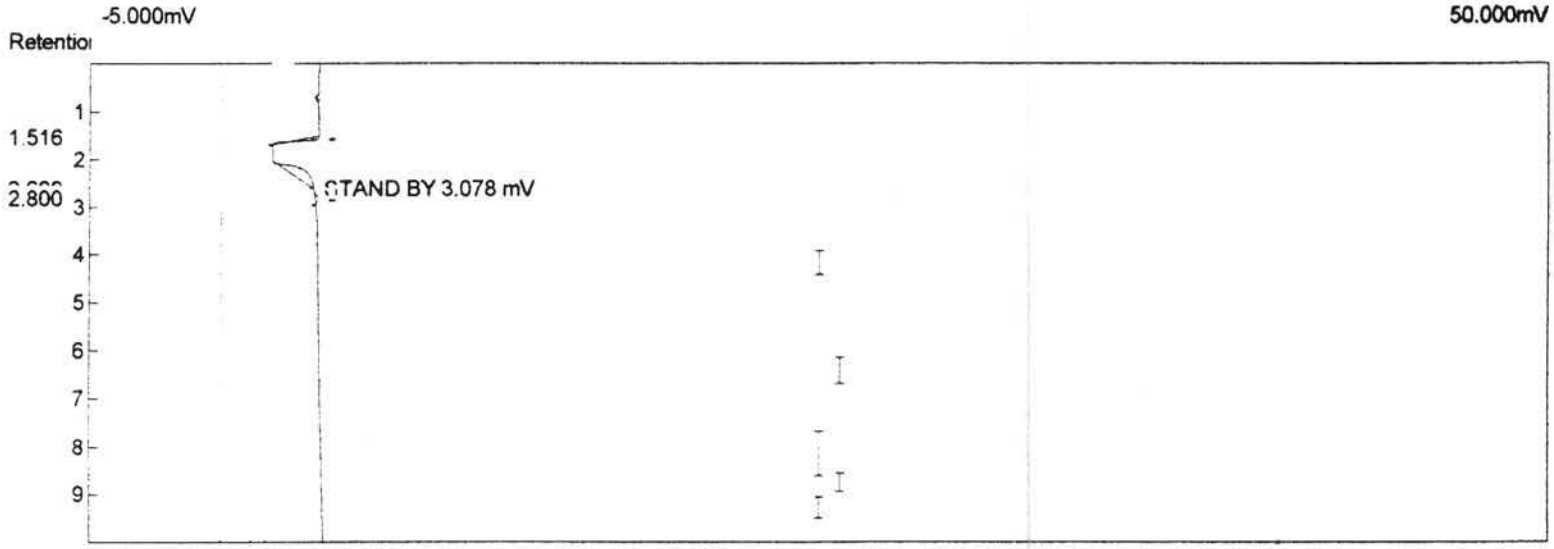
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 14:17:50
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0716PB9.CHR ()
Sample: 2842-SB-16@4-/0716CH2
Operator: JMP



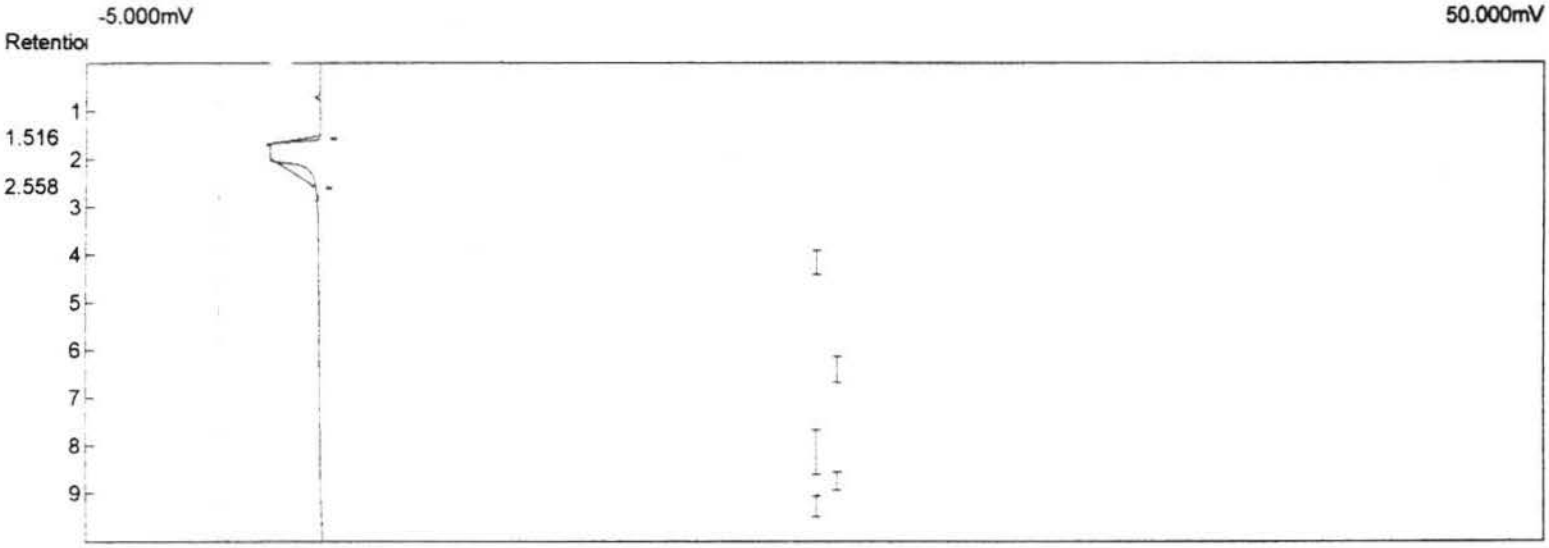
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 13:46:16
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0716PA8.CHR ()
Sample: 2842-SB-12/0716CH2
Operator: JMP



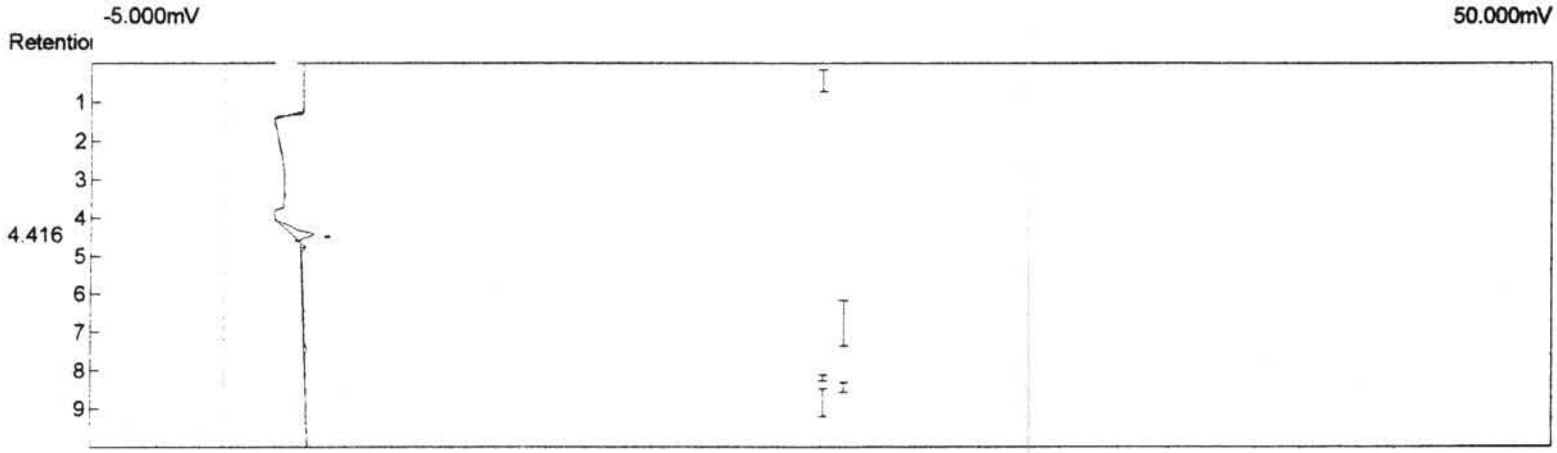
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 14:17:50
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0716PA9.CHR ()
Sample: 2842-SB-13/0716CH2
Operator: JMP



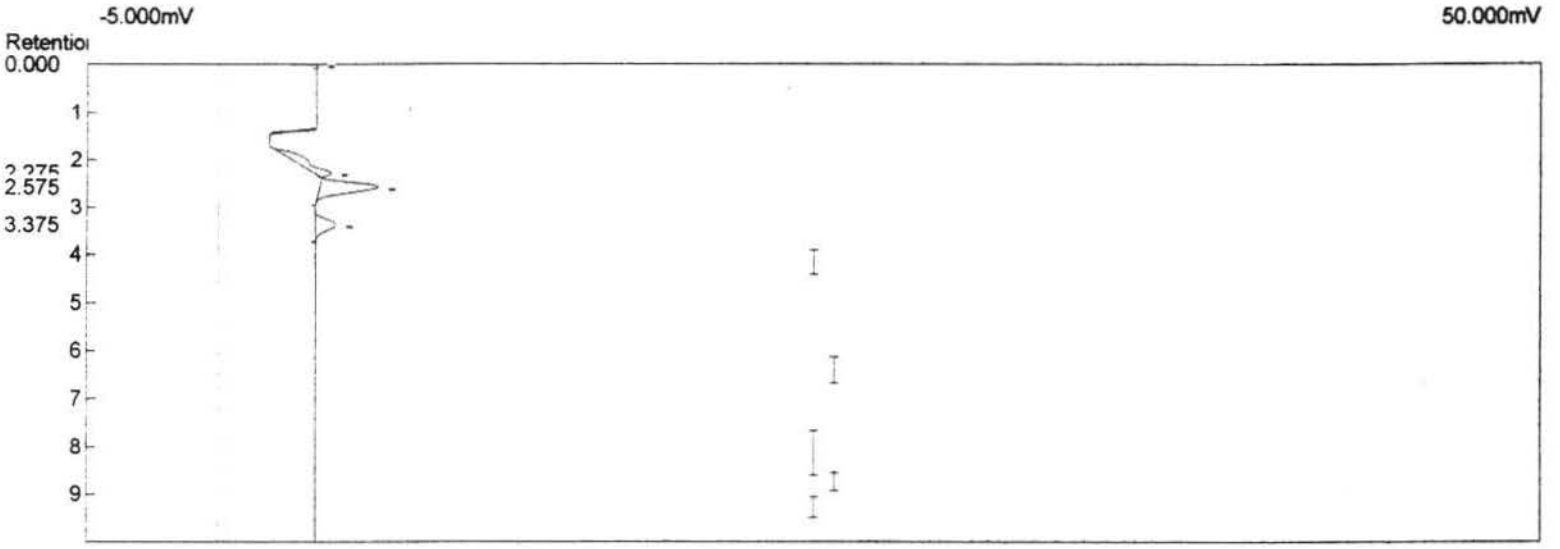
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 13:46:16
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0716PB8.CHR ()
Sample: 2842-SB-16/0716CH2
Operator: JMP



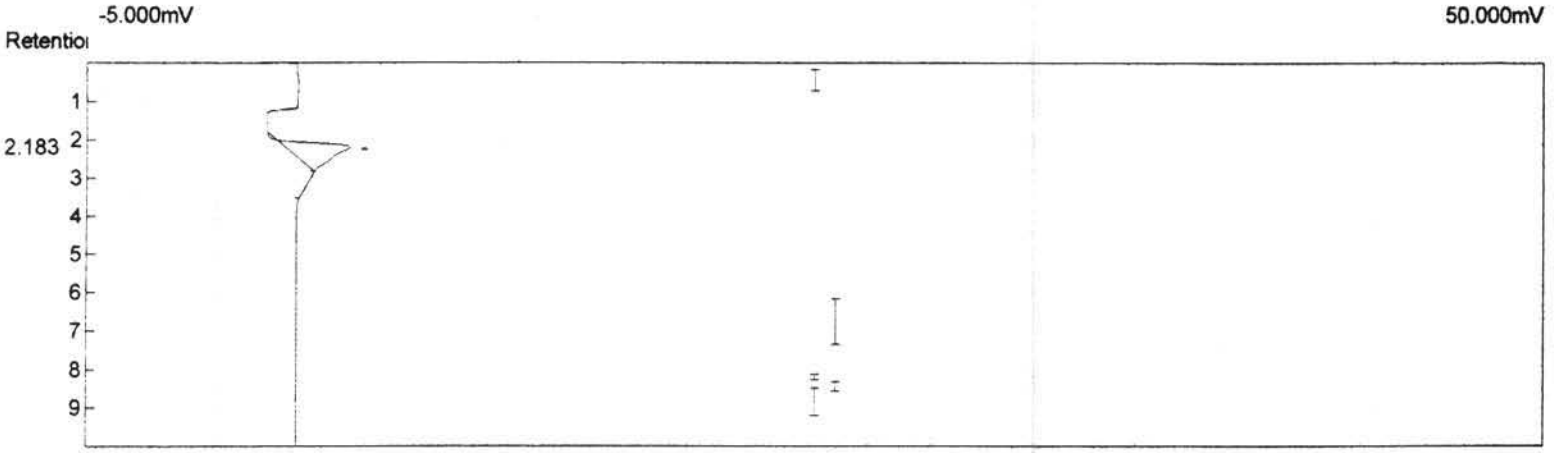
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 14:49:10
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0716PA11.CHR ()
Sample: 2842-EB3/0716CH2
Operator: MAP



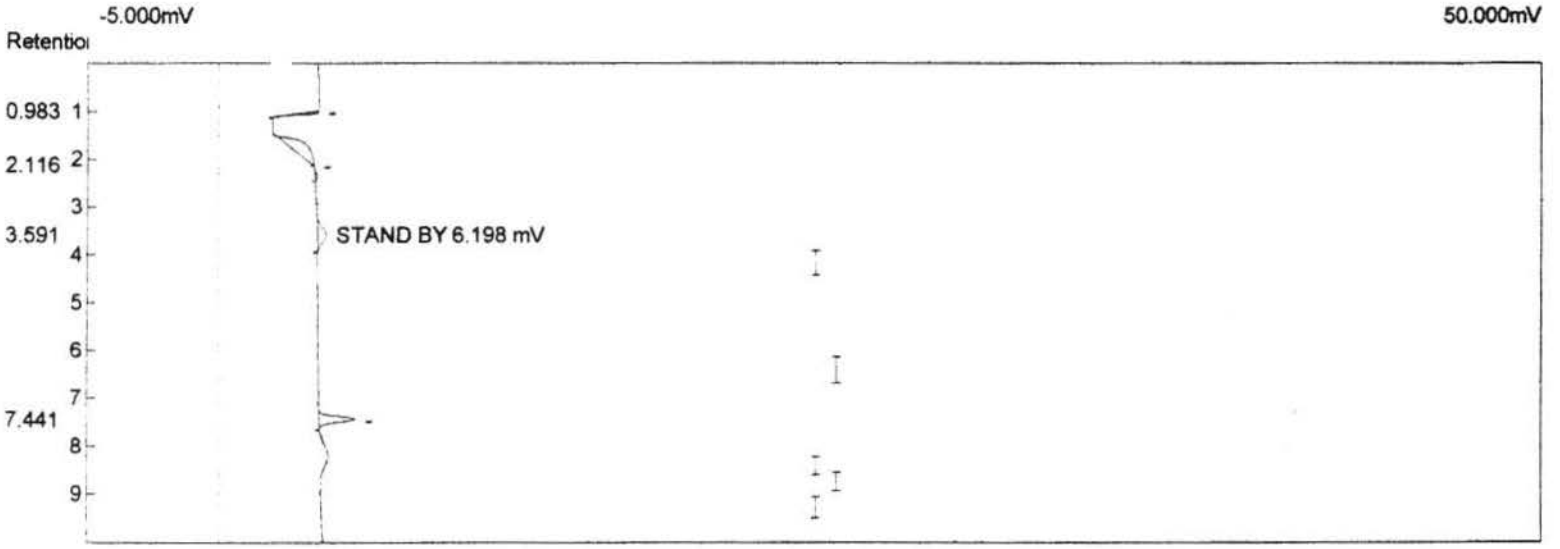
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 14:49:10
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0716PB11.CHR ()
Sample: 2842-EB4/0716CH2
Operator: MAP



Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/16/1998 16:53:48
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0716PA16.CHR ()
Sample: 2842EB-5/0715CH2
Operator: MAP



Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

teg Transglobal Environmental Geochemistry

Chain of Custody Record

PO # _____

Client: CH2M HILL

Address

Phone (787) 888-8713 FAX

Client Project # 146801.VS.SC Project Manager MARTY CLASEN/TAA

Date 7/14/98 Page 1 of 1

TEG Project # 98I0715CH2 Outside Lab.#

Location RRNS UST SC

Collector MIKE WEATHERBY Date of Collection 7/13-15/98

Sample #	Depth	Time	Sample Type	Container Type	VOA 8010	VOA 8020 (BTEX)	VOA 8260	SEMI VOL 8270	TRPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (gas & diesel)	TPH 8015 (oil)	PNA 610/8100	TOTAL LEAD	pH	METALS	RCI						FIELD NOTES / PRESERVATION	Total # of Containers
13 2842-EB3	—	1630	WATER	40 ML		1			1			1												STD TAT	3
14 2842-EB4	—	1430	WATER	40ML		1			1			1												↓	3
2842-SB14	4-6	1130	SOIL	2 OZ		1			1			1												24 TAT 8015M	3
2842-SB12	4-6	1540	SOIL	2 OZ		1			1			1												↓	3
2842-TRIPB	—	—	WATER	40ML								1												STD TAT	1
15 2842-SB12	—	0800	WATER	40ML		1			1			1												24 TAT ALL	~~3~~
2842-SB13	—	1000	WATER	40ML		1			1			1												24 TAT ALL	~~3~~
2842-SB15	4-6	1410	SOIL	2 OZ		1			1			1												24 TAT 8015M	3
2842-EB5	—	1430	WATER	40ML		1			1			1												STD TAT	3
2842-SB16	4-6	1545	SOIL	2 OZ		1			1			1												24 TAT 8015M	3
2842-SB16	—	1600	WATER	40ML		1			1			1												24 TAT ALL	3
2842 SB13			SOIL	2 OZ		1			1			1	JKS added per Rick M 7/16/98 5pm											8015 24HR TAT	
																									31

RELINQUISHED BY (signature)	Date/Time	RECEIVED BY (signature)	Date/Time
M. L. Weatherby	7/15/98	Franline Meeks	8:00pm 07/15/98
RELINQUISHED BY (signature)	Date/Time	RECEIVED BY (signature)	Date/Time

Total # of containers	31
Chain of Custody seals Y / N / NA	NA
Seals intact? Y / N / NA	NA
Received good conditions / cold	Yes

TEMPERATURE

4 C°

Sample disposal instructions: ____ TEG Disposal @ $2.00 each ____ Return to client ____ Pickup

teg

The World Leader In On-Site Sampling and Analysis

July 23, 1998
TEG Project #98I0708CH2-1

Mr. Marty Clasen
CH2M HILL
4350 W. Cypress Street, Suite 600
Tampa, Florida 33607

SUBJECT: DATA REPORT - CH2M HILL PROJECT NO. 146801.US.SC SITE #2842

Dear Marty,

Please find enclosed the analytical report for the samples collected by CH2M HILL personnel from the above-referenced site and delivered to TEG under the proper chain-of-custody protocol. TEG's Puerto Rico certified-chemist performed the following analyses:

- 5 soil samples analyzed for TRPH by modified EPA test method 418.1.
- 1 water sample analyzed for TRPH by modified EPA test method 418.1.
- 10 soil samples analyzed for TPH-gas/diesel by modified EPA test method 8015.
- 1 water sample analyzed for TPH-gas/diesel by modified EPA test method 8015.
- 5 soil samples analyzed for BTEX by modified EPA test method 8020.
- 1 water sample analyzed for BTEX by modified EPA test method 8020.
- 1 equipment blank water sample analyzed for TRPH, TPH-gas/diesel and BTEX.
- 1 trip blank water sample analyzed for BTEX by modified EPA test method 8020.
- Laboratory QA/QC analyses for TPH-gas/diesel, TRPH and BTEX.

The analytical results are summarized in the attached table. Applicable detection limits, QA/QC data, chromatograms, a chain-of-custody and an invoice are attached.

TEG appreciates the opportunity to provide analytical services for this project. If you have any questions relating to the data or report, please do not hesitate to contact us.

Sincerely,
TEG

Kevin Shelburne

Kevin Shelburne
Principal

Attachments

teg

The World Leader In On-Site Sampling and Analysis

CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVY BASE, SITE 2842
CEIBA, P. R.

TEG Project #98I0708CH2-1

TRPH (EPA Method 418.1) ANALYSES OF SOIL

SAMPLE NUMBER	DATE ANALYZED	TRPH (mg/Kg)
METHOD BLANK	7/17/98	ND
2842-SB5 @ 4-6'	7/17/98	**39,000**
2842-SB6 @ 4-6'	7/17/98	**2,900**
2842-SB7 @ 4-6'	7/17/98	**44,000**
2842-SB8 @ 4-6'	7/17/98	**280**
2842-SB8 @ 2-4'	7/17/98	**7,200**
DETECTION LIMIT (mg/Kg)		10

TRPH (EPA Method 418.1) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	TRPH (mg/L)
METHOD BLANK	7/17/98	ND
2842-SB4	7/17/98	ND
2842-EB-1	7/17/98	ND
DETECTION LIMIT (mg/L)		10

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT
mg/L = MILLIGRAMS PER LITER
mg/kg = MILLIGRAMS PER KILOGRAM
CONCENTRATIONS BASED ON DRY WEIGHT
ANALYSES PERFORMED BY: MARCO PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TEG-PUERTO RICO • PMB 627, HC-01 Box 29030, Caguas, PR 00725 • Phone (787) 720-0329 • Fax (787) 789-3858 • Pager 759-1255 Unit 217-4053

CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVY BASE, SITE 2842
CEIBA, P. R.

TEG Project #98I0708CH2-1

TPH (DOHS Mod. EPA Method 8015) ANALYSES OF SOIL

SAMPLE NUMBER	DATE ANALYZED	TPH-GAS C5-C12 (mg/kg)	TPH-DIESEL C13-C24 (mg/kg)
METHOD BLANK	7/9/98	ND	ND
2842-SB1 @ 4'-6'	7/9/98	ND	**7,200**
2842-SB2 @ 4'-6'	7/9/98	ND	ND
2842-SB3 @ 4'-6'	7/9/98	ND	**3,900**
2842-SB4 @ 4'-6'	7/9/98	ND	ND
2842-SB5 @ 4'-6'	7/9/98	ND	**14,000**
2842-SB6 @ 4'-6'	7/9/98	ND	**770**
2842-SB7 @ 4'-6'	7/9/98	ND	**36,000**
2842-SB8 @ 4'-6'	7/9/98	ND	ND
2842-SB8 @ 4'-6' rep.	7/9/98	ND	ND
2842-SB8 @ 2'-4'	7/9/98	ND	**4,800**
2842-DUPE 1	7/9/98	ND	**7,600**
DETECTION LIMIT (mg/kg)		10	25

TPH (DOHS Mod. EPA Method 8015) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	TPH-GAS C5-C12 (mg/L)	TPH-DIESEL C13-C24 (mg/L)
METHOD BLANK	7/9/98	ND	ND
2842-SB4	7/9/98	ND	ND
2842-EB1	7/9/98	ND	ND
DETECTION LIMIT (mg/L)		10	25

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT
CONCENTRATIONS BASED ON DRY WEIGHT

mg/kg = MILLIGRAMS PER KILOGRAM
mg/L = MILLIGRAMS PER LITER
ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TEG-PUERTO RICO • PMB 627, HC-01 Box 29030, Caguas, PR 00725 • Phone (787) 720-0329 • Fax (787) 789-3858 • Pager 759-1255 Unit 217-4053

CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVY BASE, SITE 2842
CEIBA, P. R.

TEG Project #98I0708CH2-1

BTEX (Mod. EPA Method 8020) ANALYSES OF SOIL

SAMPLE NUMBER	DATE ANALYZED	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL-BENZENE (mg/kg)	TOTAL XYLENES (mg/kg)
METHOD BLANK	7/21/98	ND	ND	ND	ND
2842-SB5 @ 4-6'	7/21/98	ND	ND	ND	ND
2842-SB6 @ 4-6'	7/21/98	ND	ND	ND	ND
2842-SB7 @ 4-6'	7/21/98	ND	ND	ND	ND
2842-SB8 @ 4-6'	7/21/98	ND	ND	ND	ND
2842-SB8 @ 2-4'	7/21/98	ND	ND	ND	ND
DETECTION LIMIT (mg/kg)		0.05	0.05	0.05	0.15

BTEX (Mod. EPA Method 8020) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL-BENZENE (mg/L)	TOTAL XYLENES (mg/L)
METHOD BLANK	7/21/98	ND	ND	ND	ND
2842-SB4	7/21/98	ND	ND	ND	ND
2842-EB-1	7/21/98	ND	ND	ND	ND
TRIP BLANK	7/21/98	ND	ND	ND	ND
DETECTION LIMIT (mg/L)		0.05	0.05	0.05	0.15

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
mg/kg = MILLIGRAMS PER KILOGRAM
mg/L = MILLIGRAMS PER LITER
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE
CONCENTRATIONS BASED ON DRY WEIGHT

A-526080
Asociado de Puerto Rico
LICENCIA NUM.

Marco A. Pedraza
Laboratory Manager

Kevin Shelburne
Principal

TEG-PUERTO RICO • PMB 627, HC-01 Box 29030, Caguas, PR 00725 • Phone (787) 720-0329 • Fax (787) 789-3858 • Pager 759-1255 Unit 217-4053

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QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0708CH2-1

CH2M HILL

DAILY CALIBRATION DATE : 7/17/98

PROJECT NAME: SITE 2842

			INITIAL		OPENING			CLOSING		
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	ABS	RF	%DIFF	ABS	RF	%DIFF
TRPH	IR	10 - 1,000	764.6	15.7%	0.703	711.2	7.0%	0.704	710.2	7.1%

CALIB RANGE - RANGE OF CALIBRATION CURVE IS IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 20% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: MARCO PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

teg

QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0708CH2-1
DATE : 7/17/98

CH2M HILL
PROJECT NAME: SITE 2842

COMPOUND	SPK CONC (ppm)	MS CONC (ppm)	%REC MS	MSD CONC (ppm)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
TRPH	500	534	107%	542	108%	1%	15%	80% - 120%

ppm = PARTS PER MILLION
MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE
% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX
RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY: MARCO PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

teg

QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0708CH2-1

CH2M HILL
PROJECT NAME: SITE 2842

COMPOUND	SPK CON (ppm)	MS CONC (ppm)	%REC MS	MSD CONC (ppm)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
TPH-GAS	100	116	116%	112	112%	3%	15%	80% - 120%
TPH-DIESEL	500	519	104%	552	110%	6%	15%	80% - 120%

ppm = PARTS PER MILLION
MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE
% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX
RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

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QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0708CH2-1
DAILY CALIBRATION DATE: 7/9/98

CH2M HILL
PROJECT NAME: SITE 2842

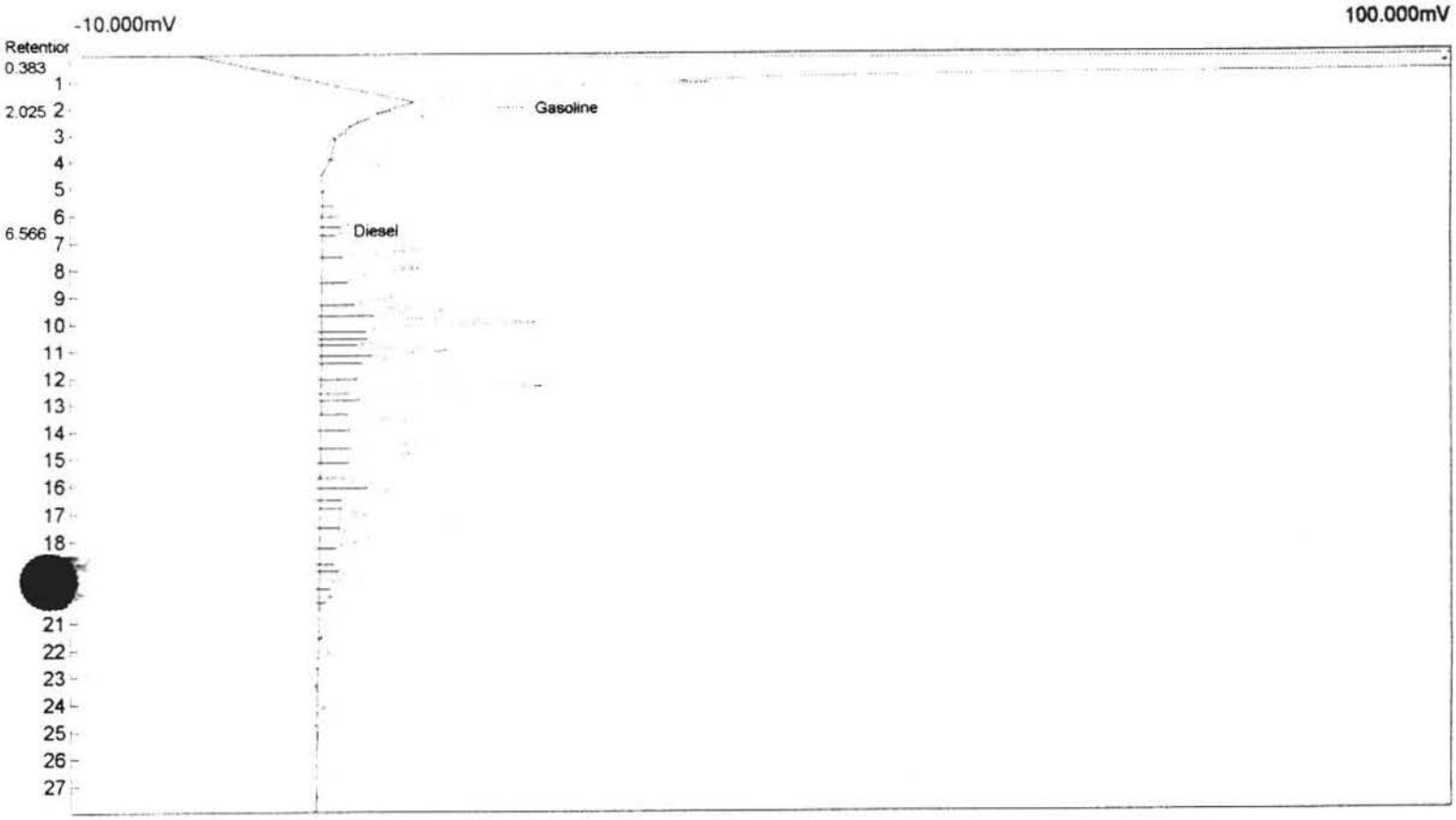
			INITIAL			OPENING			CLOSING	
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	AREA	RF	%DIFF	AREA	RF	%DIFF
TPH GASOLINE	FID #1 (gc4)	10 - 40,000	0.70	9.7%	429.39	0.72	2.2%	210.04	0.70	0.0%
TPH GASOLINE	FID #2 (gc4)	10 - 40,000	0.85	8.1%	479.43	0.80	5.7%	254.22	0.85	0.0%
TPH DIESEL	FID #1 (gc4)	25 - 40,000	0.90	8.8%	3129.47	0.78	13.4%	1573.93	0.79	12.9%
TPH DIESEL	FID #2 (gc4)	25 - 40,000	0.89	5.4%	3643.27	0.91	2.2%	2015.17	1.01	13.1%

CALIB RANGE - RANGE OF CALIBRATION CURVE IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 15% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

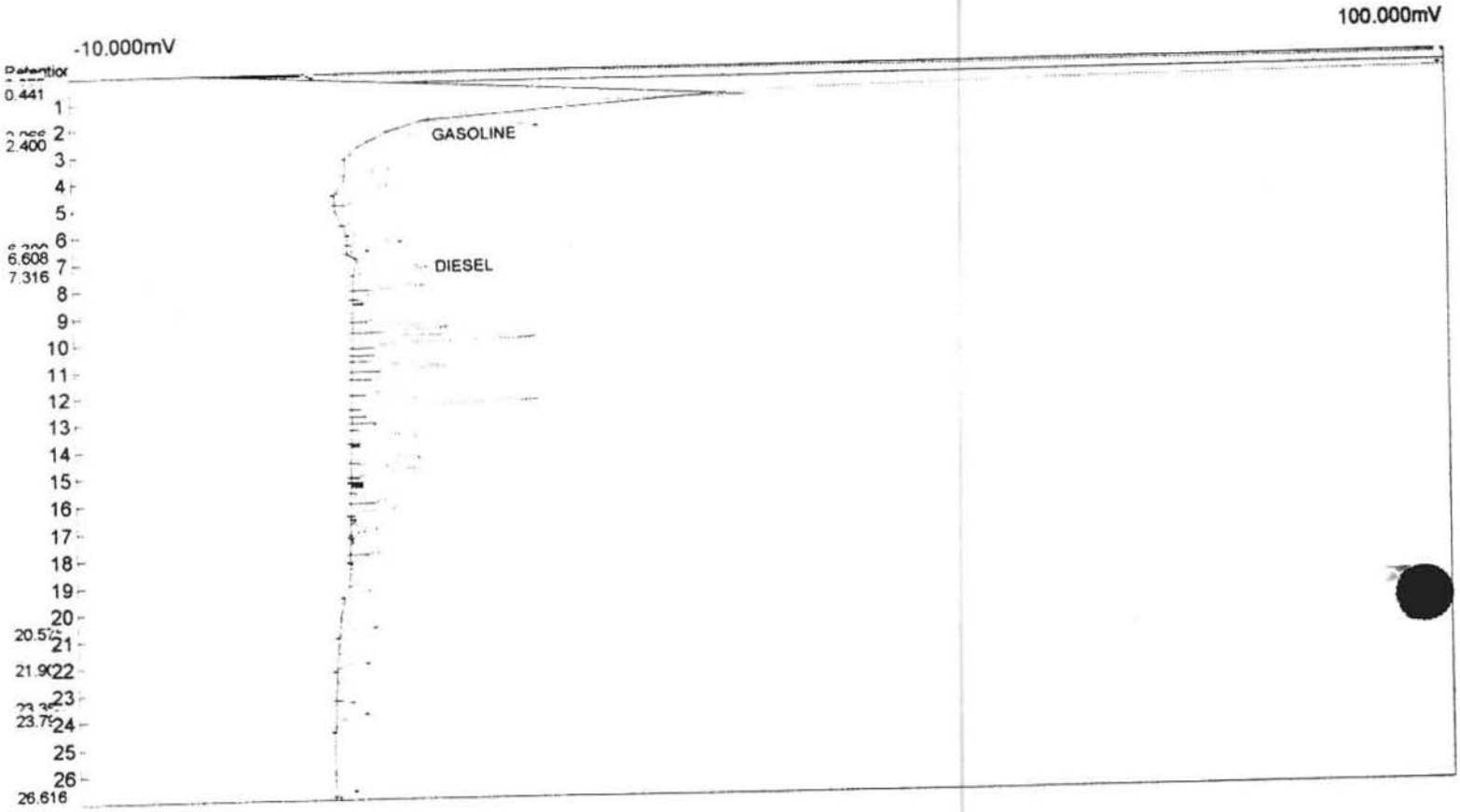
TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

Lab name: TEG PUERTO RICO MOBILE
Analysis date: 07/09/1998 10:56:51
Method: EPA 8015
Lab ID: GC-4
Description: CHANNEL 3 - FID 1
Column: XTI-5 30M,ID.53mm,1.5um
Carrier: NITROGEN 1 kg/cm3
onents: g&d1.cpt
ntrol filename: C:\PEAKW95\FULLRAN.con
Data file: C:\PEAKW95\0701fa32.CHR ()
Sample: ~~close std~~ OPENSID
Operator: JMP



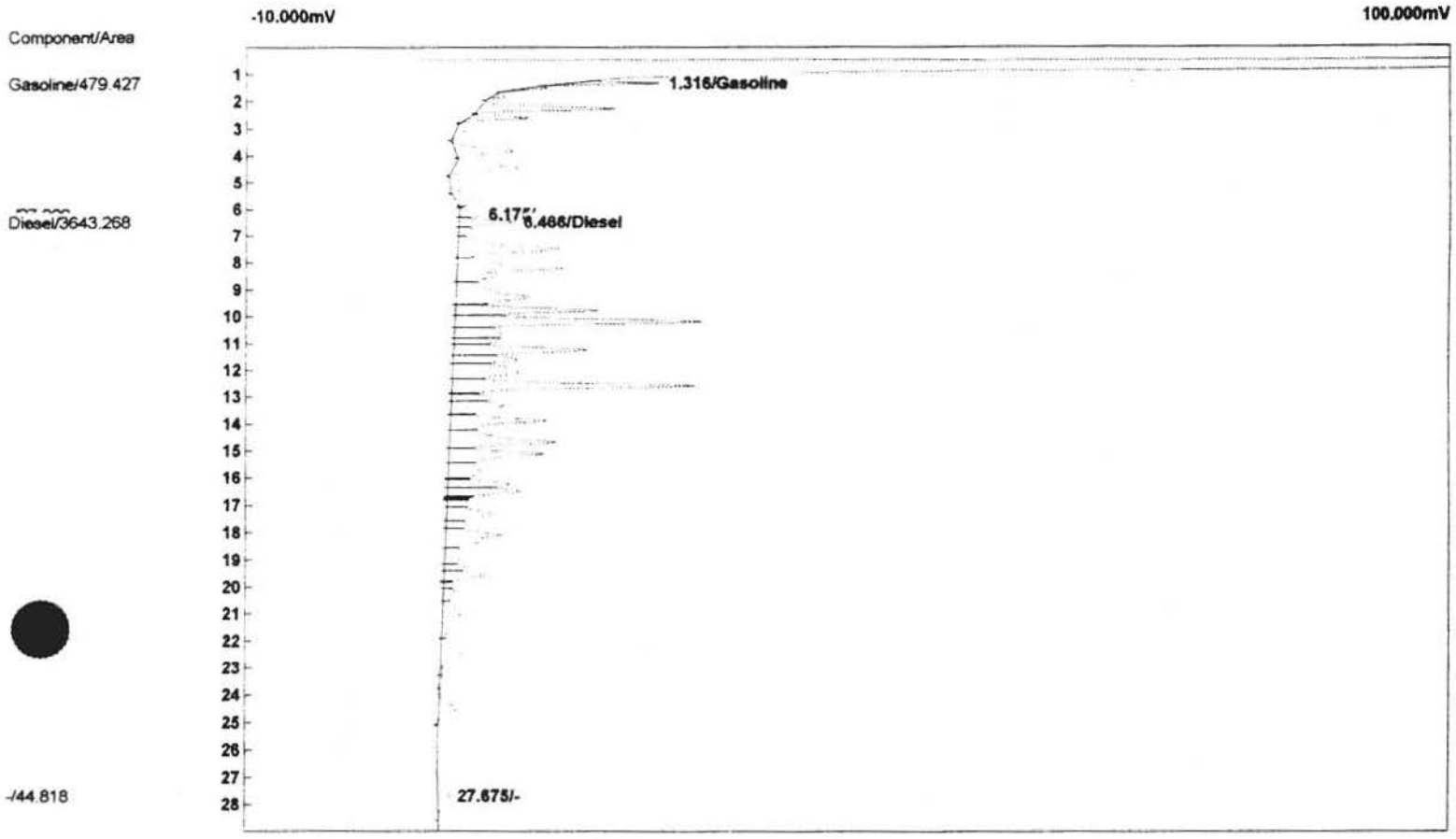
Component	Retention	Area	External	Internal	Units
Gasoline	2.025	429.391	204.27	204.2677	ppm
Diesel	6.566	3129.467	866.41	866.4084	ppm
		3558.858	1070.68	1070.6760	

Lab name: TEG Puerto Rico
Analysis date: 07/09/1998 21:05:54
Method: EPA 8015 mod
Lab ID: GC-4
Description: FID 1
Column: Rxt-1 (15 x 0.53x 0.25)
Carrier: N2 1.1 kg/cm2
Components: Dsl1.cpt
ntrol filename: C:\PEAKW95\FULLRAN.con
Data file: 0709fa15.CHR ()
Sample: close
Operator: MAP



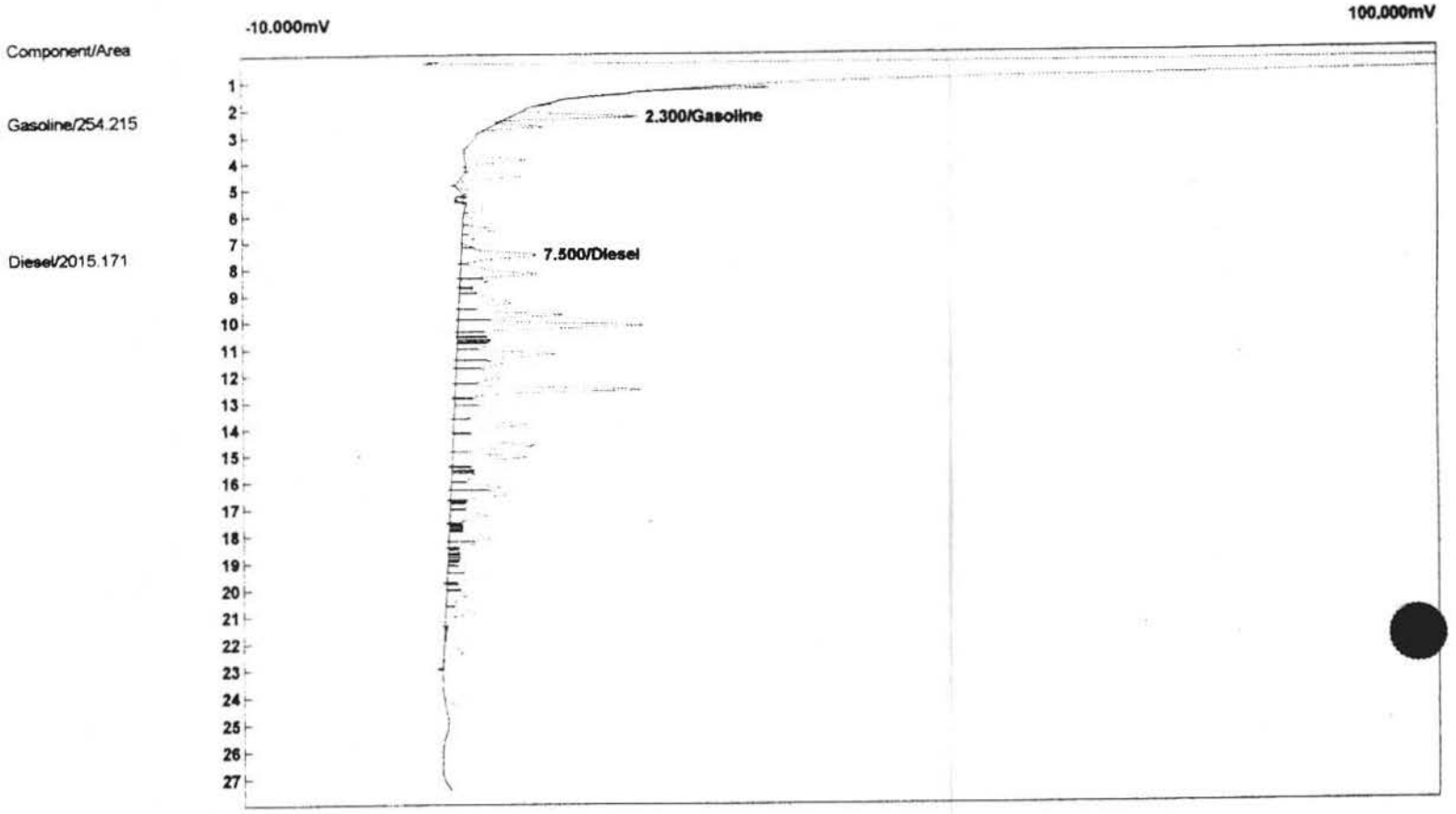
Component	Retention	Area	External	Internal	Units
GASOLINE	2.400	210.042	99.92	99.9200	
DIESEL	7.316	1573.929	522.90	522.9001	ppm
		1783.971	622.82	622.8201	

Lab name: *TEG PUERTO RICO MOBILE*
Analysis date: *07/09/1998 10:56:51*
Method: *EPA 8015*
Lab ID: *GC-4*
Description: *CHANNEL 4 - FID 2*
Column: *XTI-5 30M,ID.53mm,1.5um*
Carrier: *NITROGEN 1 kg/cm3*
Data file: *0701FB32.chr ()*
Sample: *OPEN*
Operator: *MAP*



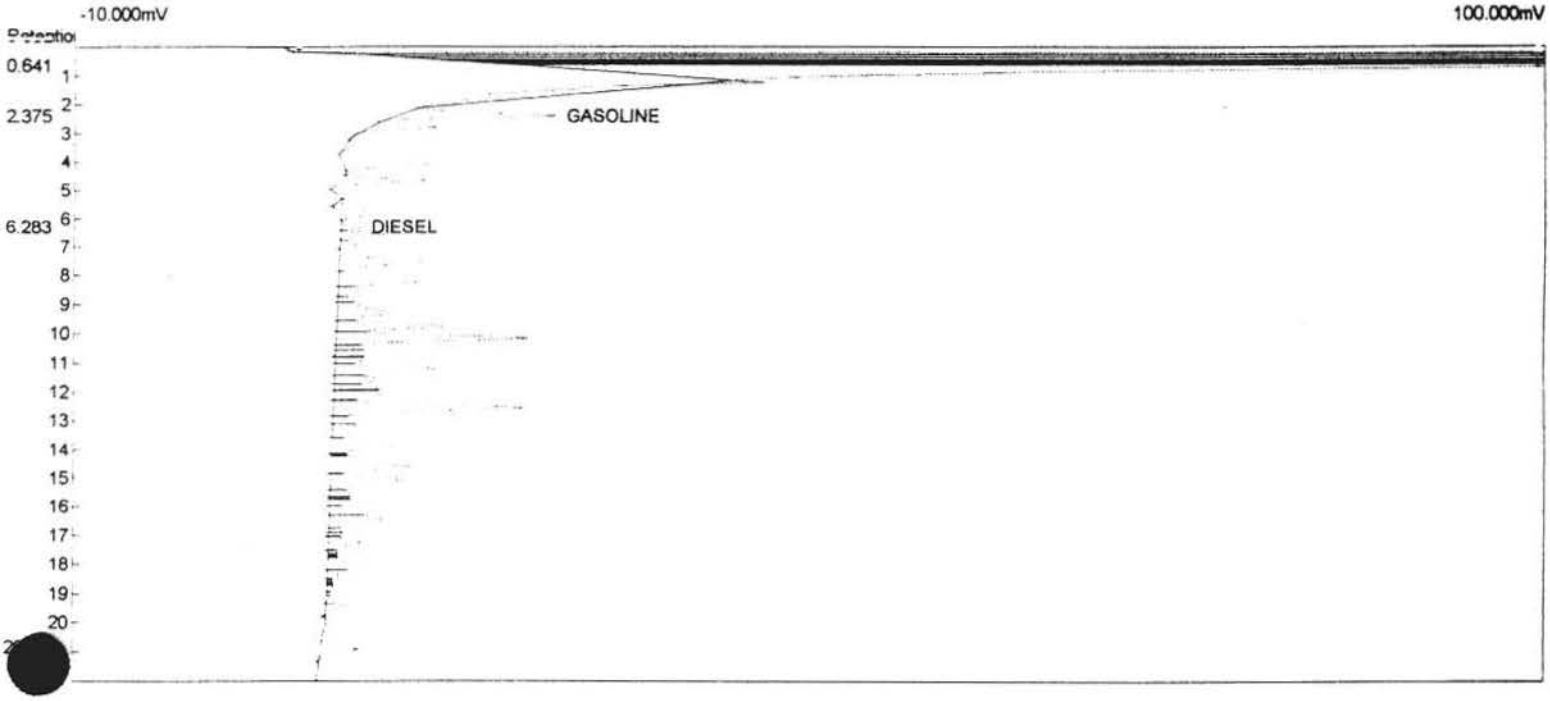
Component	Retention	Area	External	Internal	Units
Gasoline	1.316	479.427	188.49	188.4877	ppm
Diesel	6.466	3643.268	1022.24	1022.2414	ppm
		4122.695	1210.73	1210.7291	

Lab name: TEG Puerto Rico
Analysis date: 07/09/1998 21:05:54
Method: EPA 8015 mod
Lab ID: GC-4
Description: FID 2
Column: Rxt-1 (15 x 0.53x 0.25)
Carrier: N2 1.1 kg/cm2
Data file: 0709fb15.chr ()
Sample: CLOSE STD
Operator: MAP



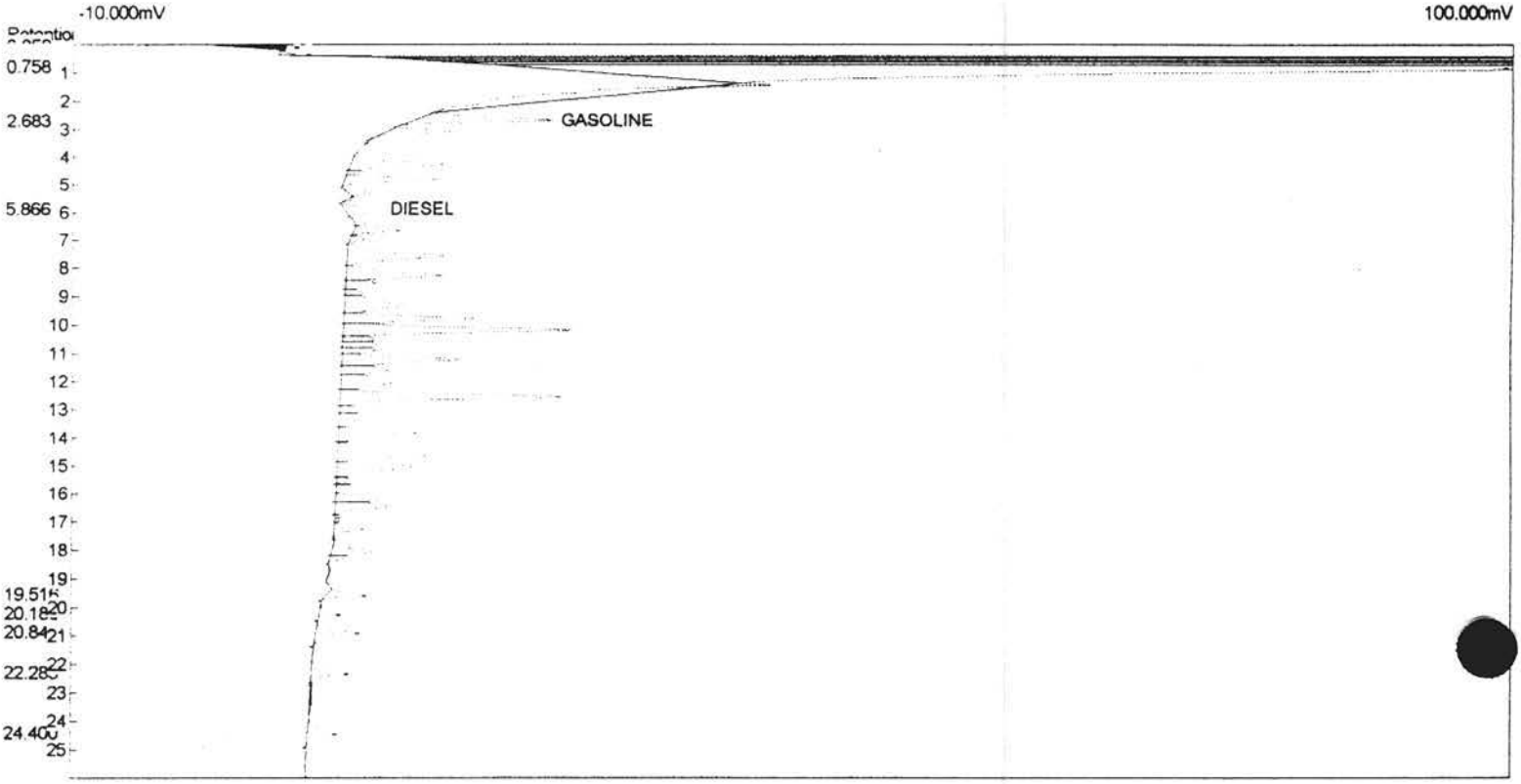
Component	Retention	Area	External	Internal	Units
Gasoline	2.300	254.215	99.95	99.9452	ppm
Diesel	7.500	2015.171	565.42	565.4241	ppm
		2269.387	665.37	665.3693	

Lab name: *TEG Puerto Rico*
Analysis date: *07/09/1998 19:45:13*
Method: *EPA 8015 mod*
Lab ID: *GC-4*
Description: *FID 2*
Column: *Rxt-1 (15 x 0.53x 0.25)*
Carrier: *N2 1.1 kg/cm2*
Data file: *0709fb13.CHR ()*
Sample: *~~2842-SB1 (6uL)~~* Matrix Spike
Operator: *MAP*
Comments:



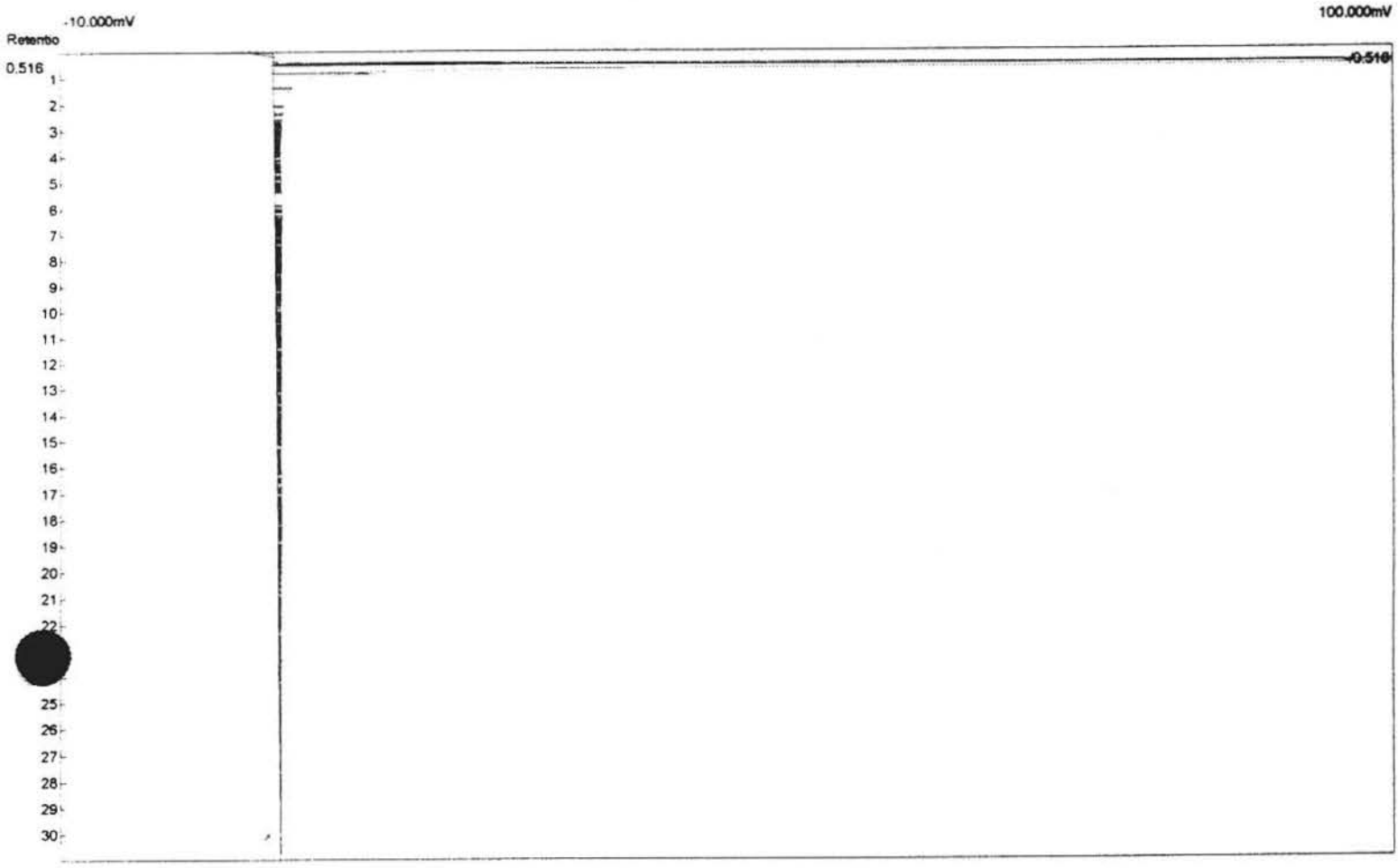
Component	Retention	Area	External	Internal	Units
GASOLINE	2.375	392.561	115.87	115.8682	
DIESEL	6.283	1850.213	519.14	519.1396	ppm
		2242.775	635.01	635.0078	

Lab name: *TEG Puerto Rico*
Analysis date: *07/09/1998 20:32:48*
Method: *EPA 8015 mod*
Lab ID: *GC-4*
Description: *FID 2*
Column: *Rxt-1 (15 x 0.53x 0.25)*
Carrier: *N2 1.1 kg/cm2*
Data file: *0709fb14.CHR ()*
Sample: *Matrix Spike Duplicate*
Operator: *MAP*
Comments:



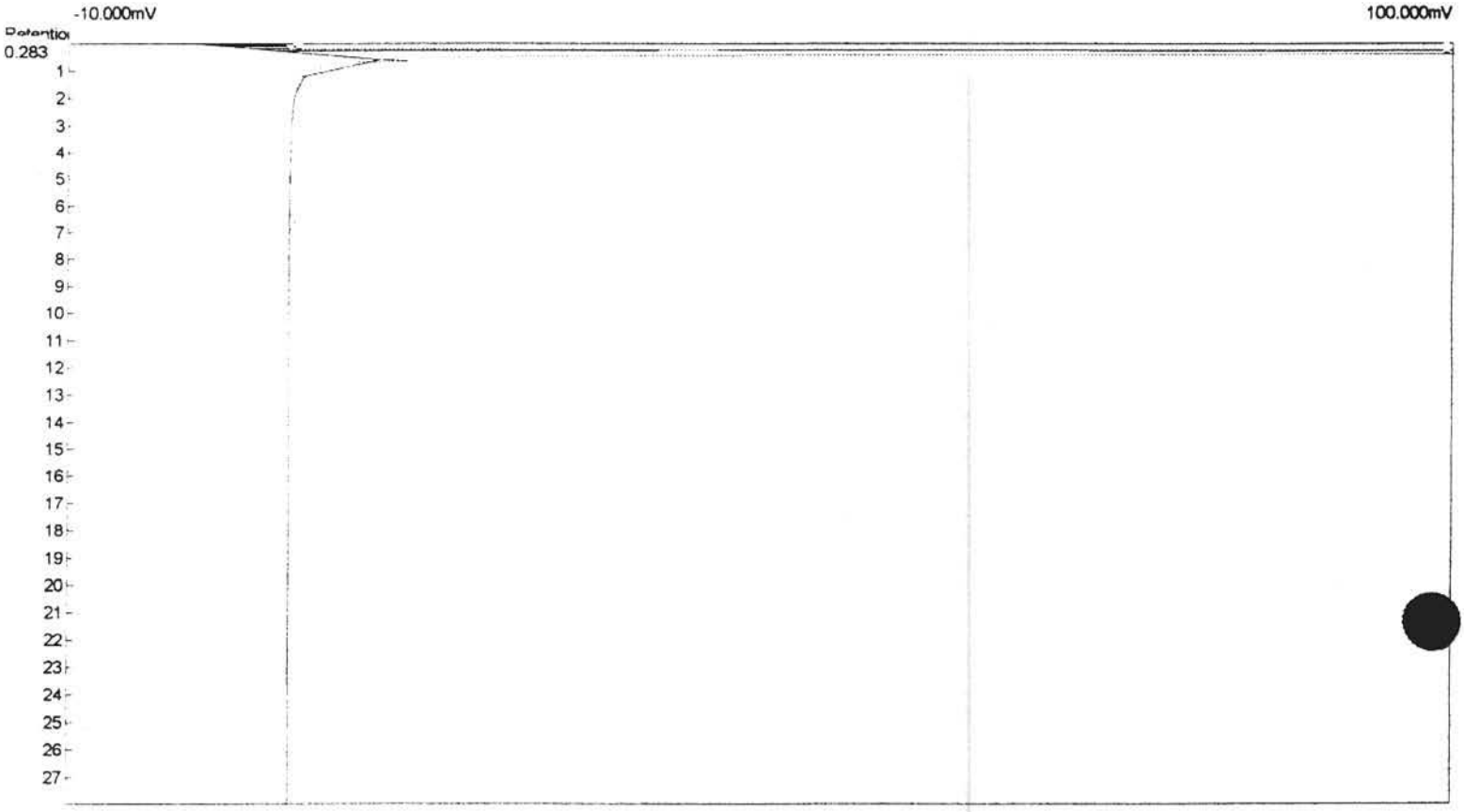
Component	Retention	Area	External	Internal	Units
GASOLINE	2.683	379.888	112.13	112.1274	
DIESEL	5.866	1967.616	552.08	552.0809	ppm
		2347.504	664.21	664.2082	

Lab name: TEG Puerto Rico
Analysis date: 07/09/1998 11:27:41
Method: EPA 8015 mod
Lab ID: GC-4
Description: FID 1
Column: Rxt-1 (15 x 0.53x 0.25)
Carrier: N2 1.1 kg/cm2
Data file: 0709Fa4.CHR ()
Sample: method blank
Operator: MAP



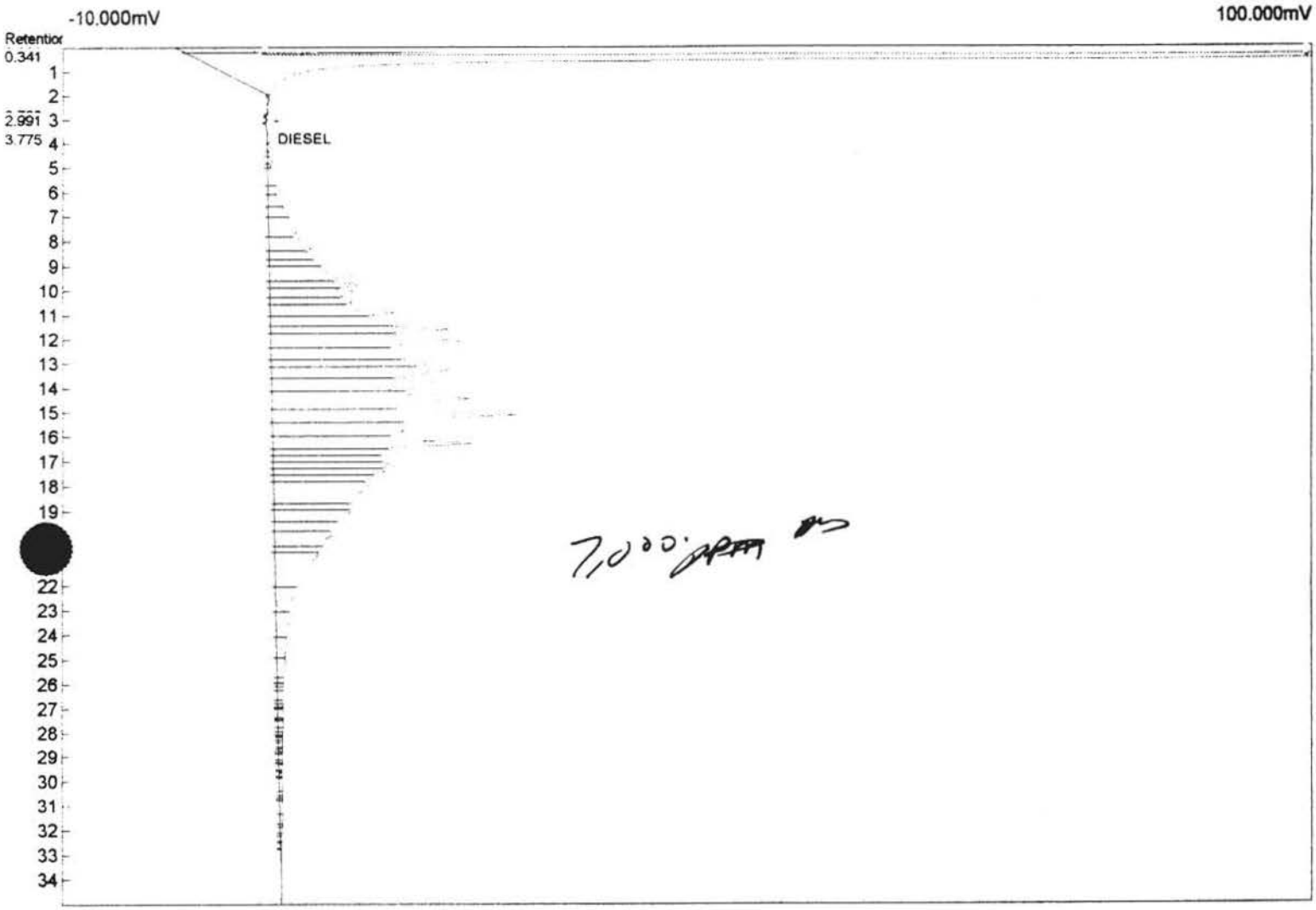
Retention	Component	Number	Area	External	Internal	Units
		0	0.000	0.00	0.0000	

Lab name: *TEG Puerto Rico*
Analysis date: *07/09/1998 12:03:13*
Method: *EPA 8015 mod*
Lab ID: *GC-4*
Description: *FID 2*
Column: *Rxt-1 (15 x 0.53x 0.25)*
Carrier: *N2 1.1 kg/cm2*
Data file: *0709FB5.chr ()*
Sample: *method blank*
Operator: *MAP*



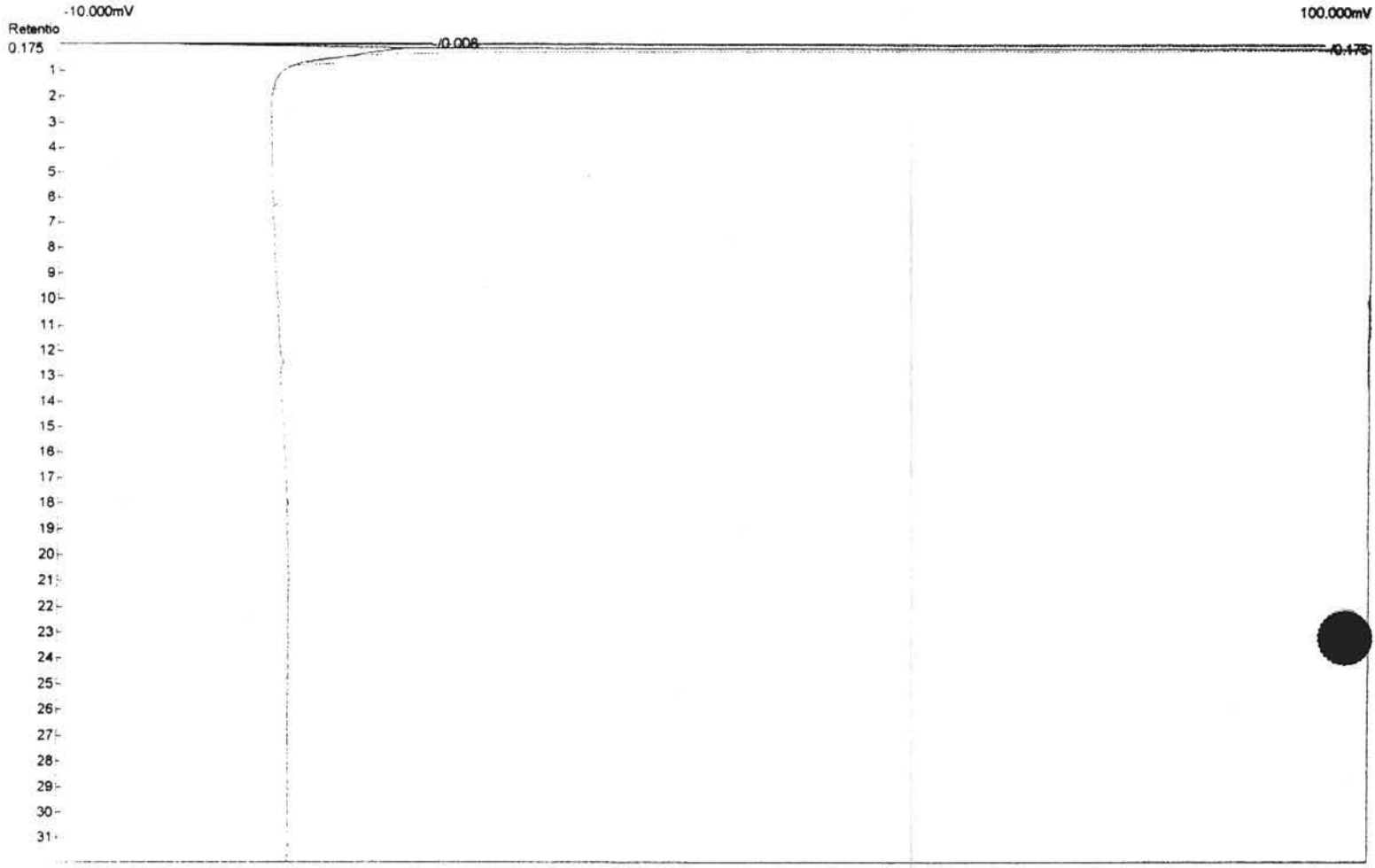
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: *TEG Puerto Rico*
Method: *EPA 8015 mod*
Lab ID: *GC-4*
Description: *FID 2*
Column: *Rxt-1 (15 x 0.53x 0.25)*
Carrier: *N2 1.1 kg/cm2*
Components: *fullra2.cpt*
Filename: *C:\PEAKW95\FULLRAN.con*
Data file: *0709fB12.CHR ()*
Sample: *2482-SB-1*
Operator: *MAP*



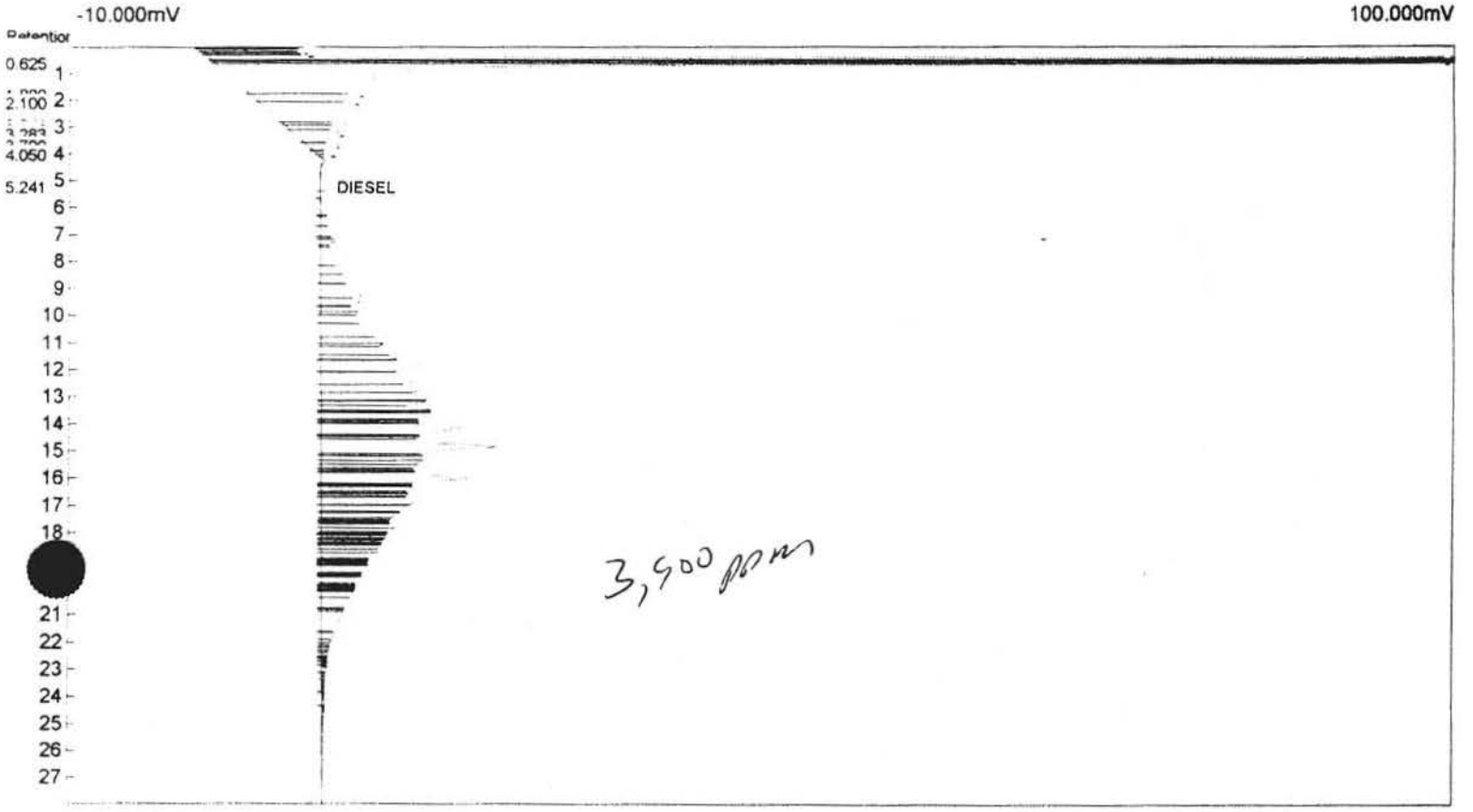
Component	Retention	Area	External	Internal	Units		
DIESEL	3.775	8024.809	2719.97	2719.9690	ppm	2.72	7,233.569
		8024.809	2719.97	2719.9690			

Lab name: TEG Puerto Rico
Analysis date: 07/09/1998 17:00:06
Method: EPA 8015 mod
Lab ID: GC-4
Description: FID 2
Column: Rxt-1 (15 x 0.53x 0.25)
Carrier: N2 1.1 kg/cm2
Data file: C:\PEAKW95\0709fb11.CHR ()
Sample: 2842-SB2
Operator: MAP



Retention	Component	Number	Area	External	Internal	Units
		0	0.000	0.00	0.0000 → NA	

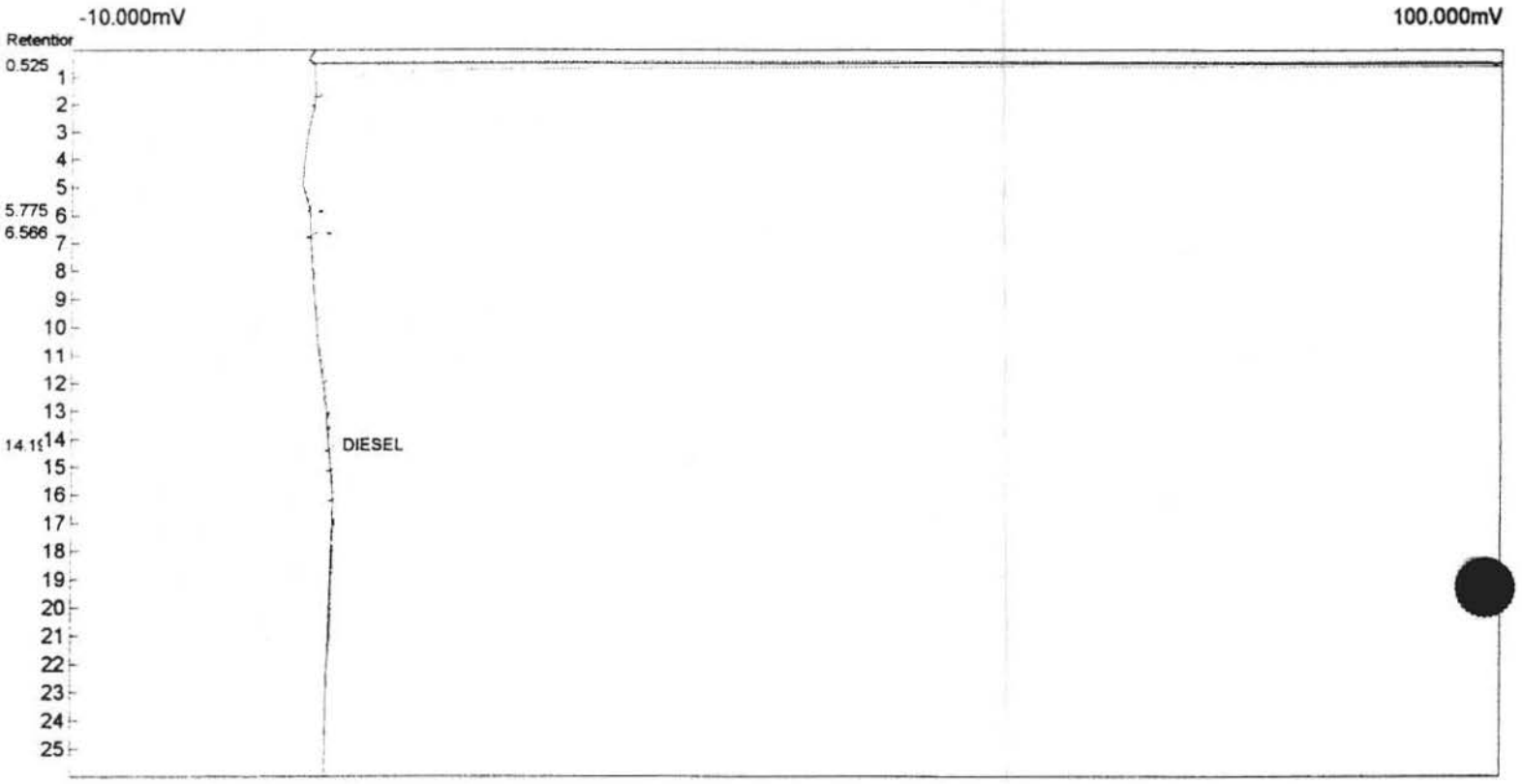
Lab name: TEG Puerto Rico
Analysis date: 07/09/1998 19:45:13
Method: EPA 8015 mod
Lab ID: GC-4
Description: FID 1
Column: Rxt-1 (15 x 0.53x 0.25)
Carrier: N2 1.1 kg/cm2
Components: Dsl1.cpt
ntrol filename: C:\PEAKW95\FULLRAN.con
Data file: 0709fa13.CHR ()
Sample: 2842-SB3
Operator: MAP



Component	Retention	Area	External	Internal	Units
DIESEL	5.241	4480.973	1488.70	1488.6954	ppm
		4480.973	1488.70	1488.6954	

2.757 = 3933.149

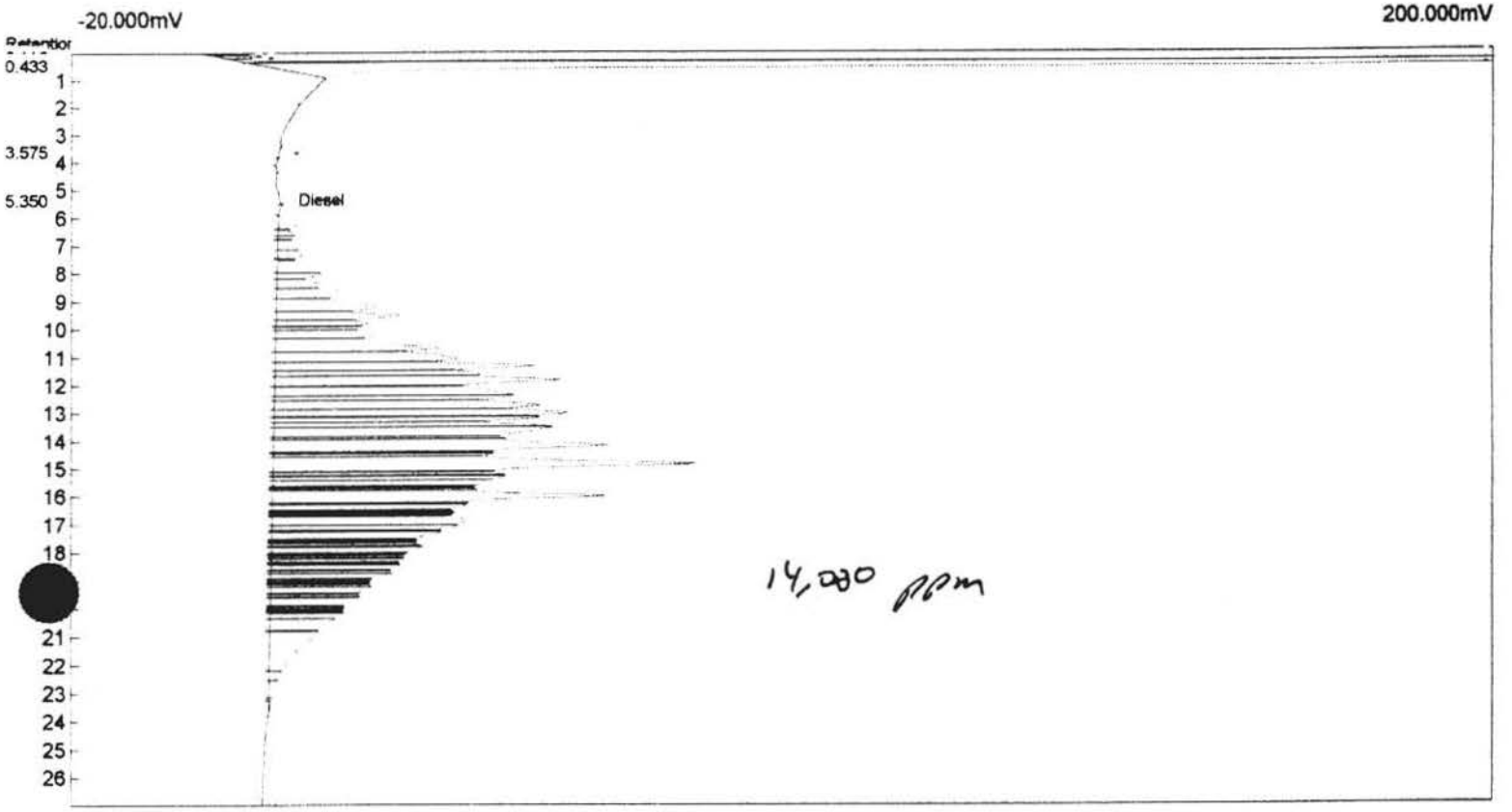
Lab name: *TEG Puerto Rico*
Analysis date: *07/09/1998 17:57:23*
Method: *EPA 8015 mod*
Lab ID: *GC-4*
Description: *FID 1*
Column: *Rxt-1 (15 x 0.53x 0.25)*
Carrier: *N2 1.1 kg/cm2*
Components: *Dsl1.cpt*
ntrol filename: *C:\PEAKW95\FULLRAN.con*
Data file: *0709fa12.CHR ()*
Sample: *2842-SB4*
Operator: *MAP*



Component	Retention	Area	External	Internal	Units
DIESEL	14.191	25.010	6.92	6.9241	ppm
		25.010	6.92	6.9241	

JMA

Lab name: TEG Puerto Rico
Analysis date: 07/09/1998 12:55:19
Method: EPA 8015 mod
Lab ID: GC-4
Description: FID 1
Column: Rxt-1 (15 x 0.53x 0.25)
Carrier: N2 1.1 kg/cm2
Components: fullra1.cpt
Control filename: C:\PEAKW95\FULLRAN.con
Data file: 0709fa7.CHR ()
Sample: sb-5 @ 4-6
Operator: MAP

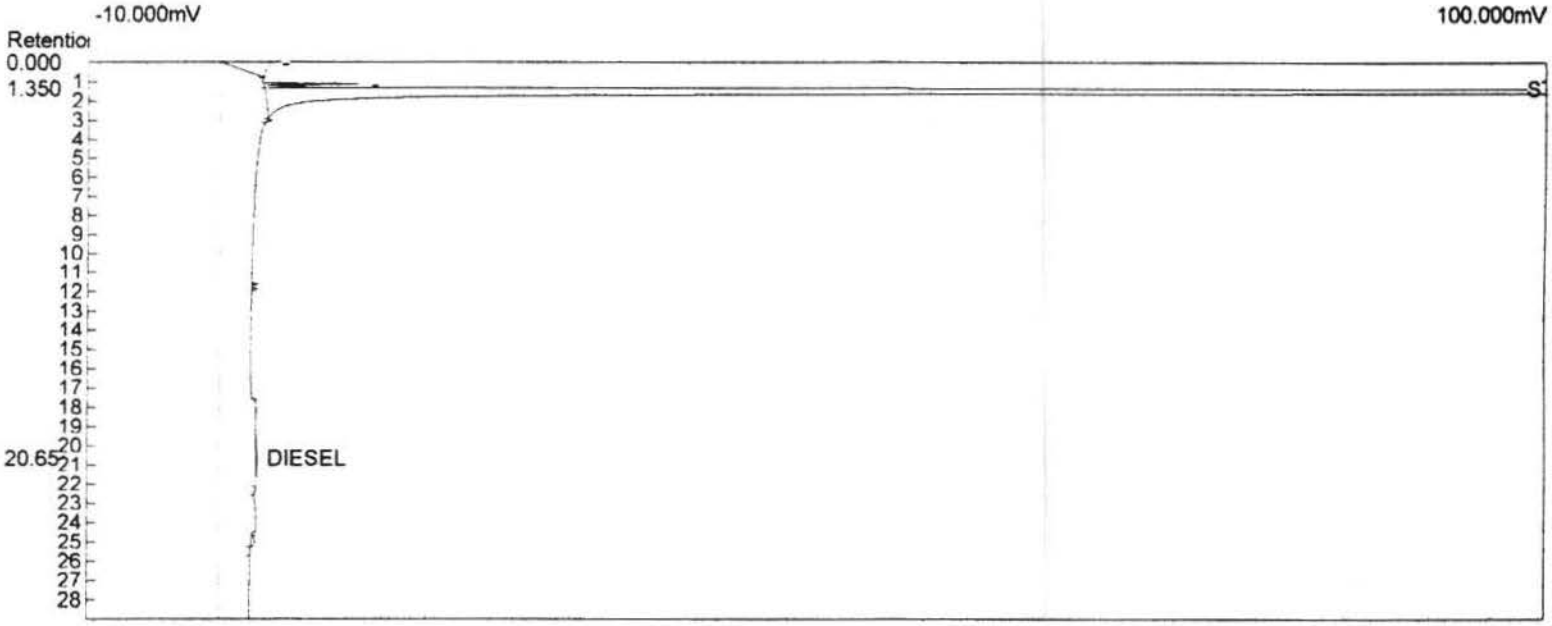


Component	Retention	Area	External	Internal	Units
Diesel	5.350	19891.101	5506.95	5506.9492	ppm
		19891.101	5506.95	5506.9492	

13,801.87

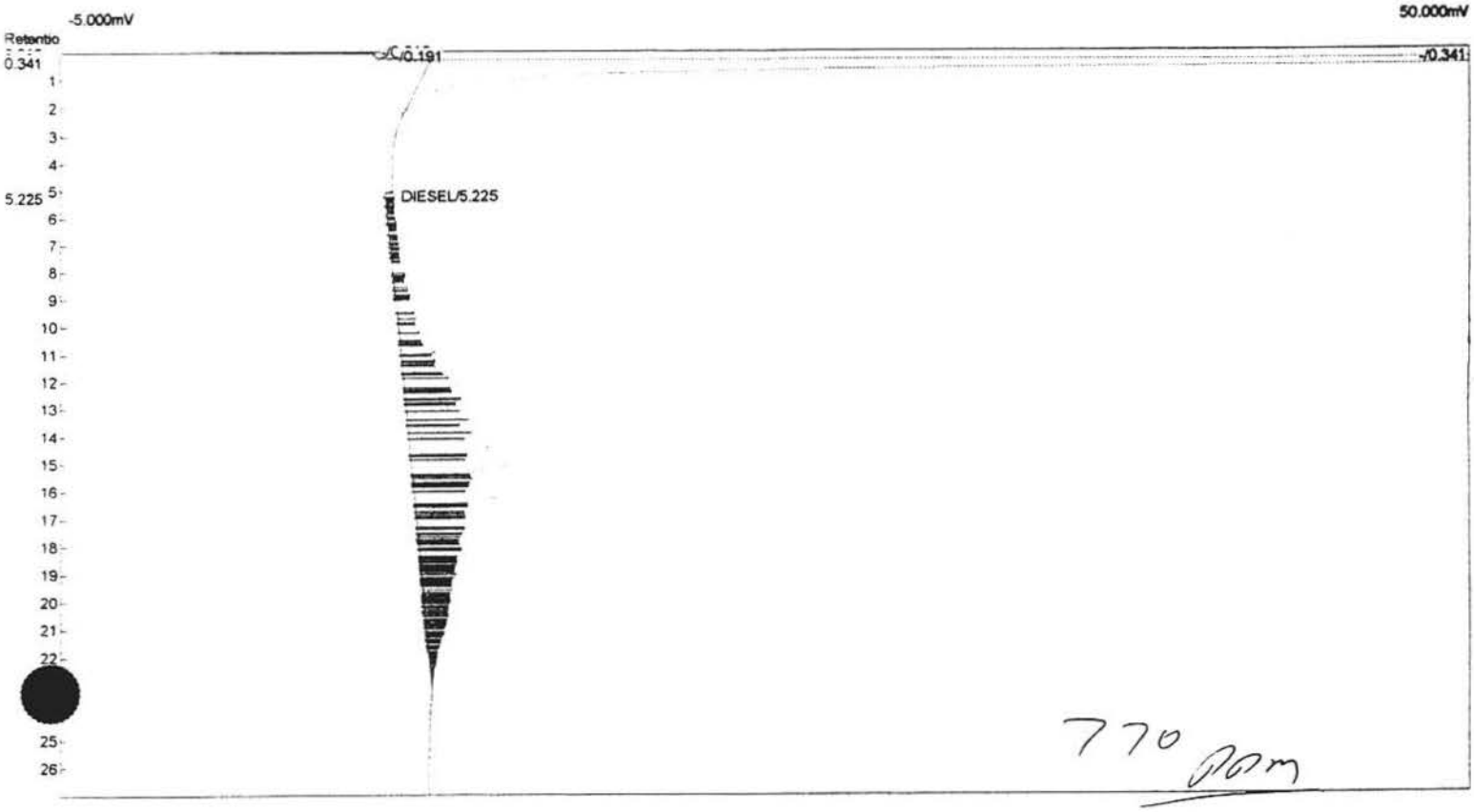
9.758

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 19:54:09
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0710FA7.CHR ()
Sample: 2842 SB4-H20
Operator: JMP



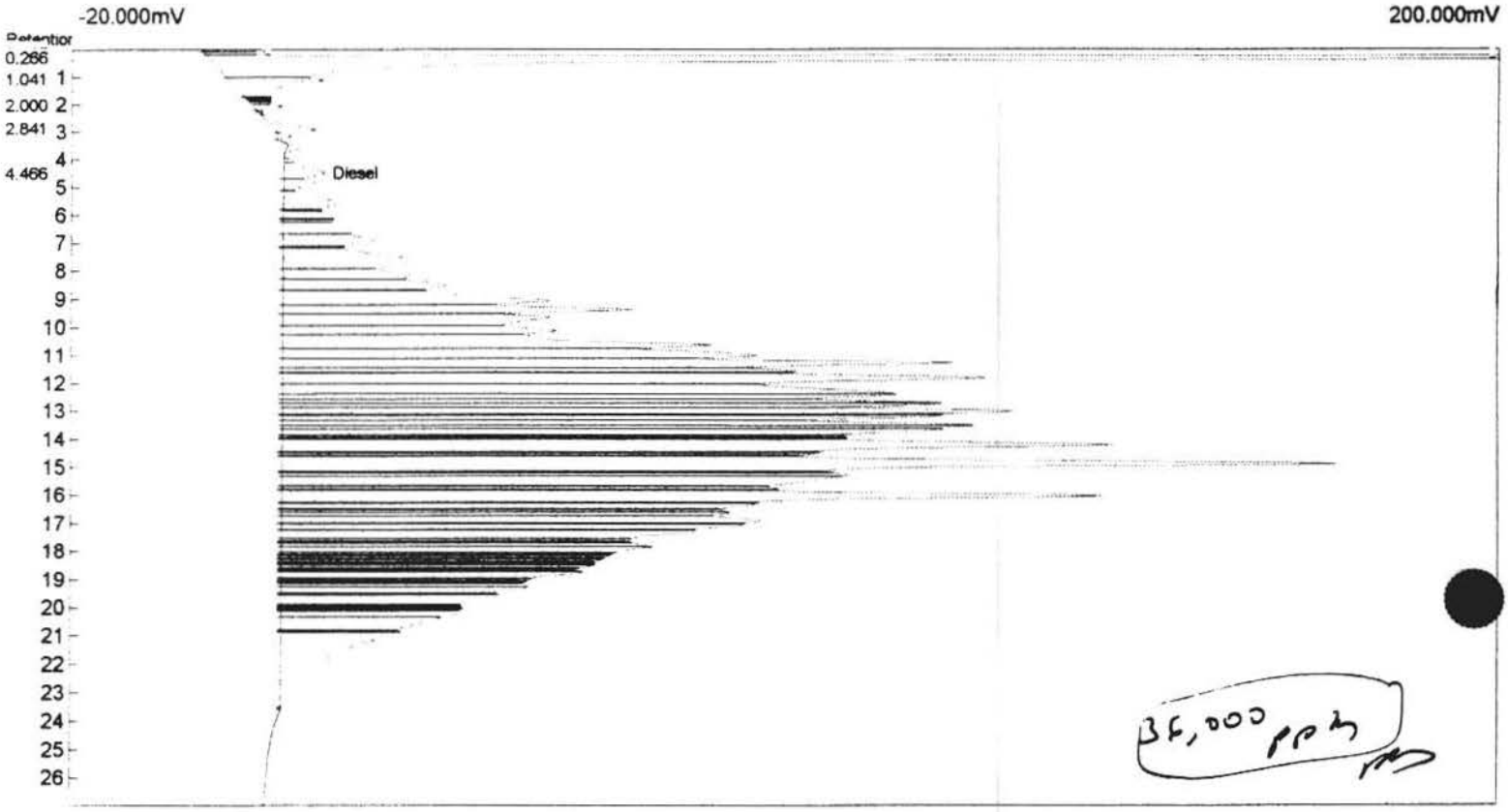
Component	Retention	Area	Internal	Units
DIESEL	20.650	18.473	13.1854	PPM
		18.473	13.1854	

Lab name: TEG Puerto Rico
Analysis date: 07/09/1998 15:16:22
Method: EPA 8015 mod
Lab ID: GC-4
Description: FID 2
Column: Rxt-1 (15 x 0.53x 0.25)
Carrier: N2 1.1 kg/cm2
ata file: C:\PEAKW95\0709fb10.CHR ()
ample: sb-6 @ 4-6'
Operator: MAP



Retention	Component	Number	Area	External	Internal	Units	
5.225	DIESEL	2	1223.555	343.31	343.3096	ppm	21.817
		1	1223.555	343.31	343.3096		774.92

Lab name: TEG Puerto Rico
Analysis date: 07/09/1998 14:20:59
Method: EPA 8015 mod
Lab ID: GC-4
Description: FID 1
Column: Rxt-1 (15 x 0.53x 0.25)
Carrier: N2 1.1 kg/cm2
Components: fullra1.cpt
ntrol filename: C:\PEAKW95\FULLRAN.con
Data file: 0709fa9.CHR ()
Sample: SB-7 @ 4-6
Operator: MAP

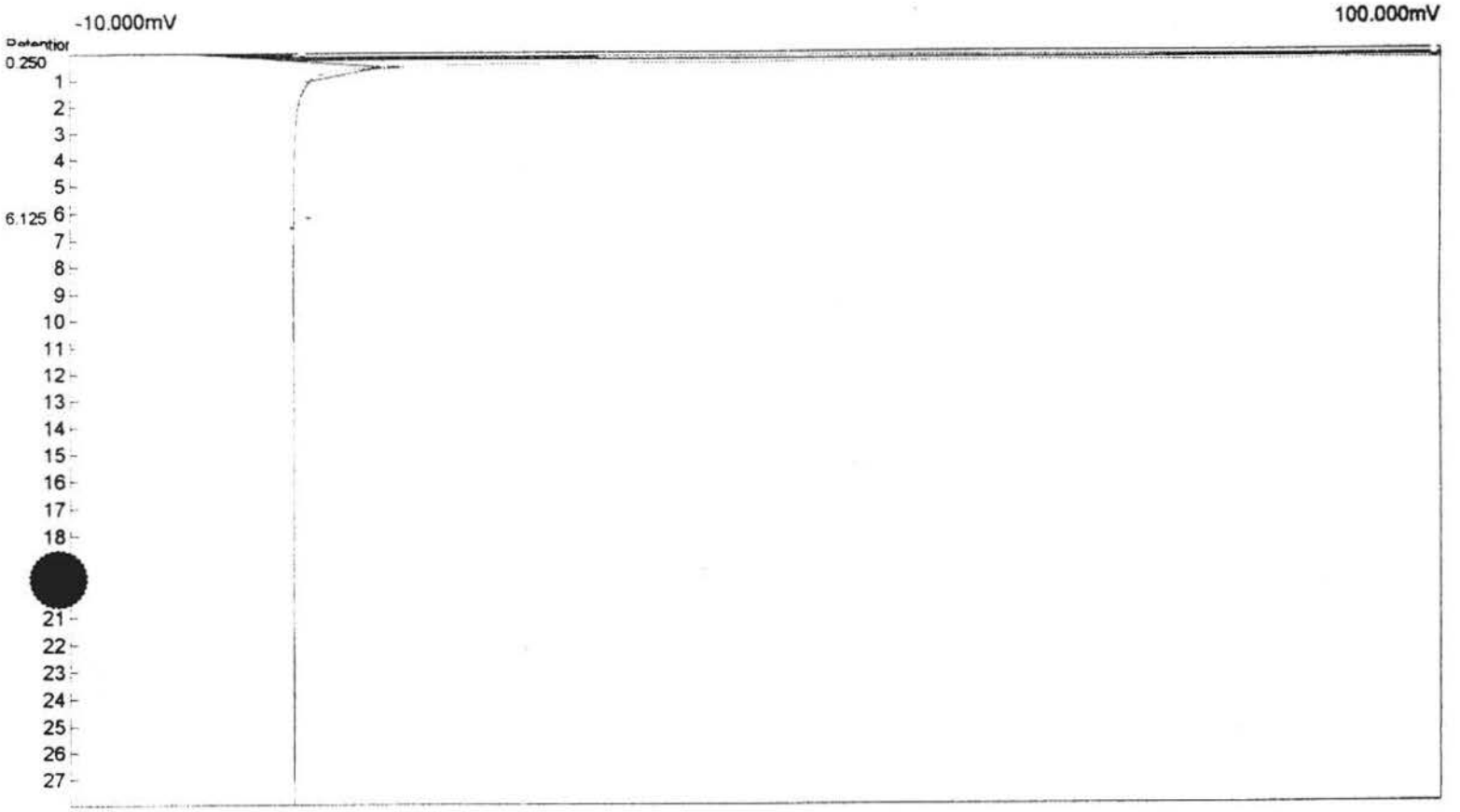


Component	Retention	Area	External	Internal	Units
Diesel	4.466	51314.235	14206.60	14206.5988	ppm
		51314.235	14206.60	14206.5988	

2/.790

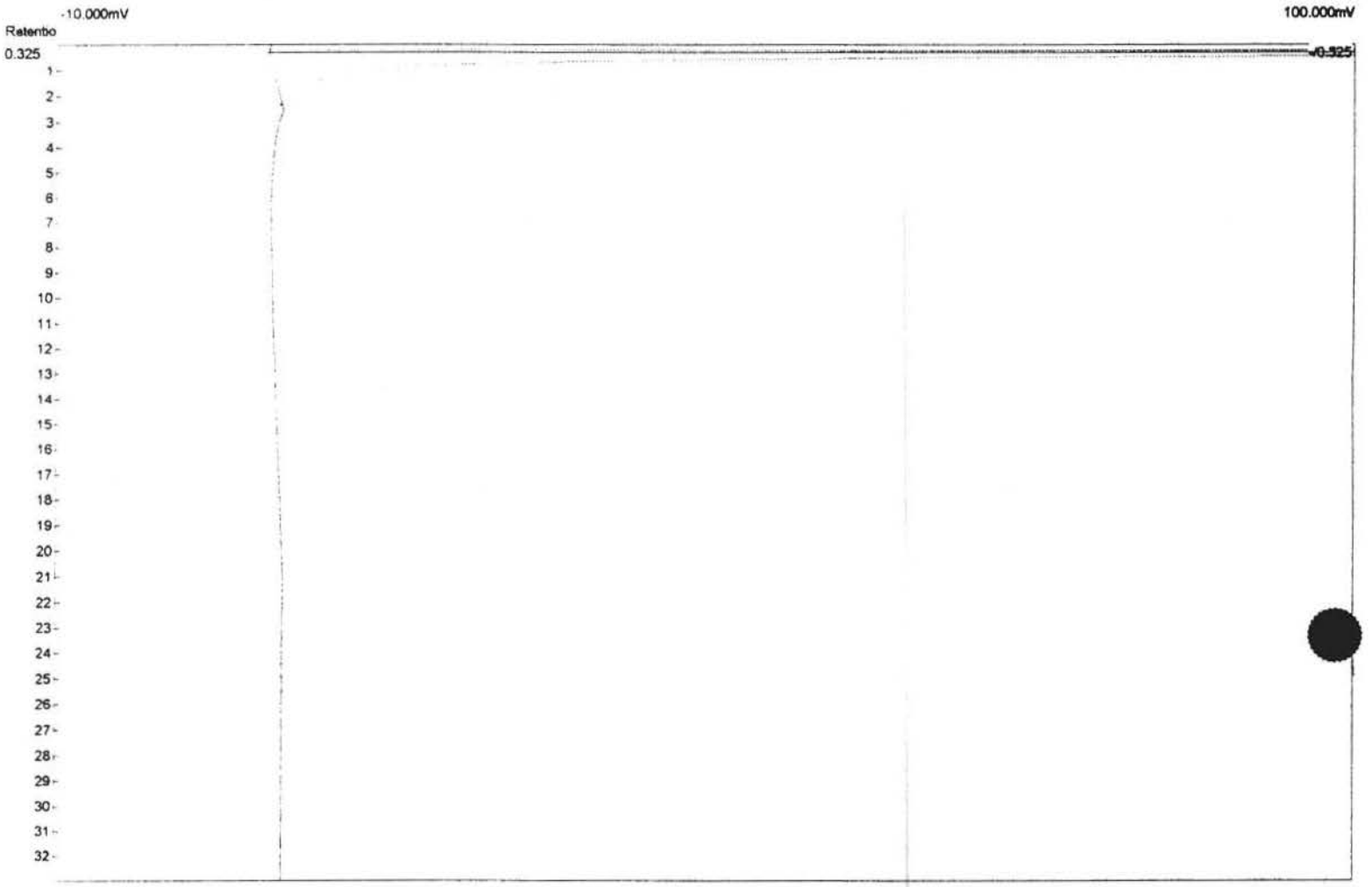
35,96610

Lab name: *TEG Puerto Rico*
Analysis date: *07/09/1998 12:03:13*
Method: *EPA 8015 mod*
Lab ID: *GC-4*
Description: *FID 1*
Column: *Rxt-1 (15 x 0.53x 0.25)*
Carrier: *N2 1.1 kg/cm2*
onents: *fullra1.cpt*
ntrol filename: *C:\PEAKW95\FULLRAN.con*
Data file: *0709FA5.chr ()*
Sample: *EB-1*
Operator: *MAP*



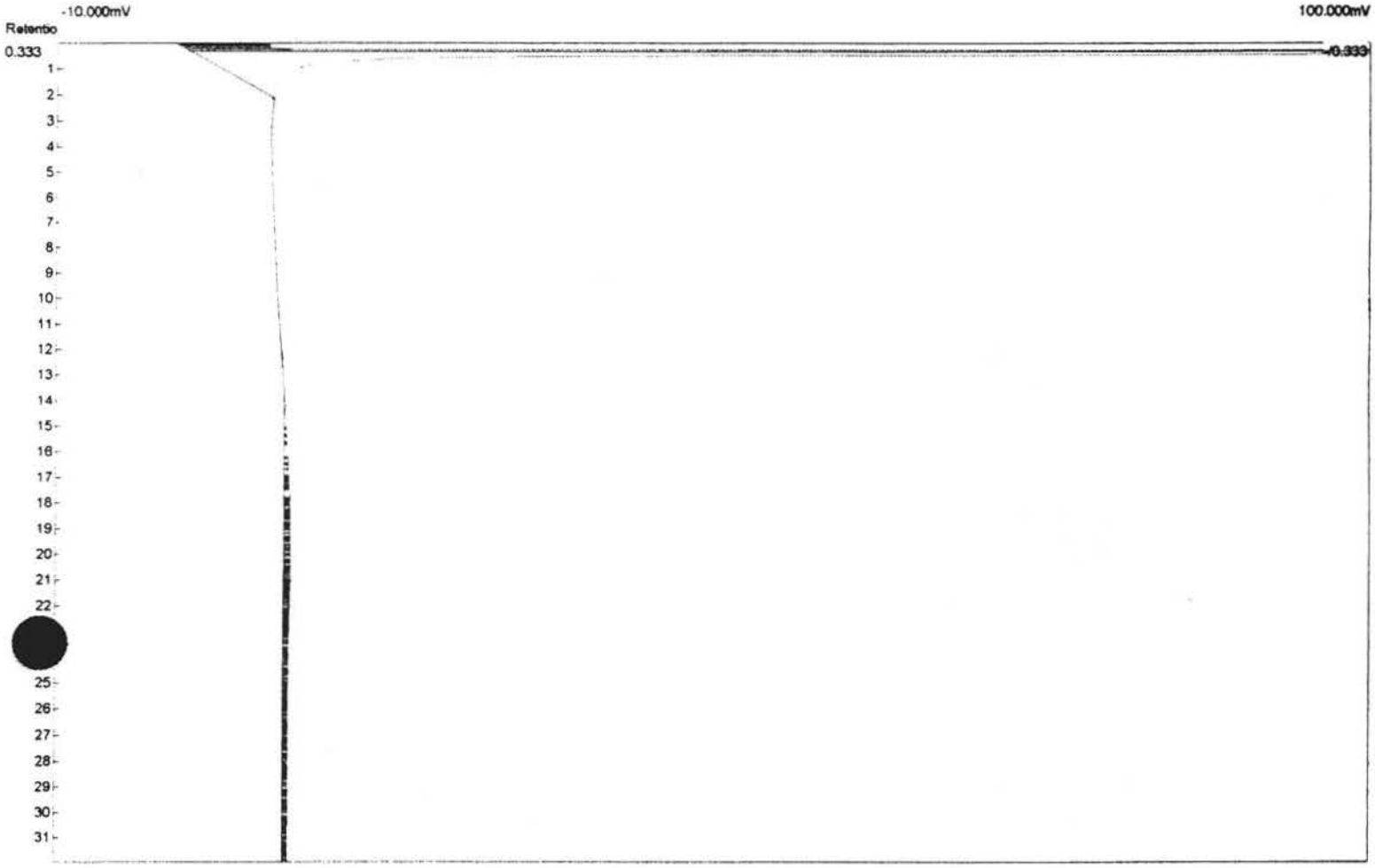
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/09/1998 14:20:59
Method: EPA 8015 mod
Lab ID: GC-4
Description: FID 2
Column: Rxt-1 (15 x 0.53x 0.25)
Carrier: N2 1.1 kg/cm2
Data file: 0709fb9.CHR ()
Sample: SB-8 @ 4-6
Operator: MAP



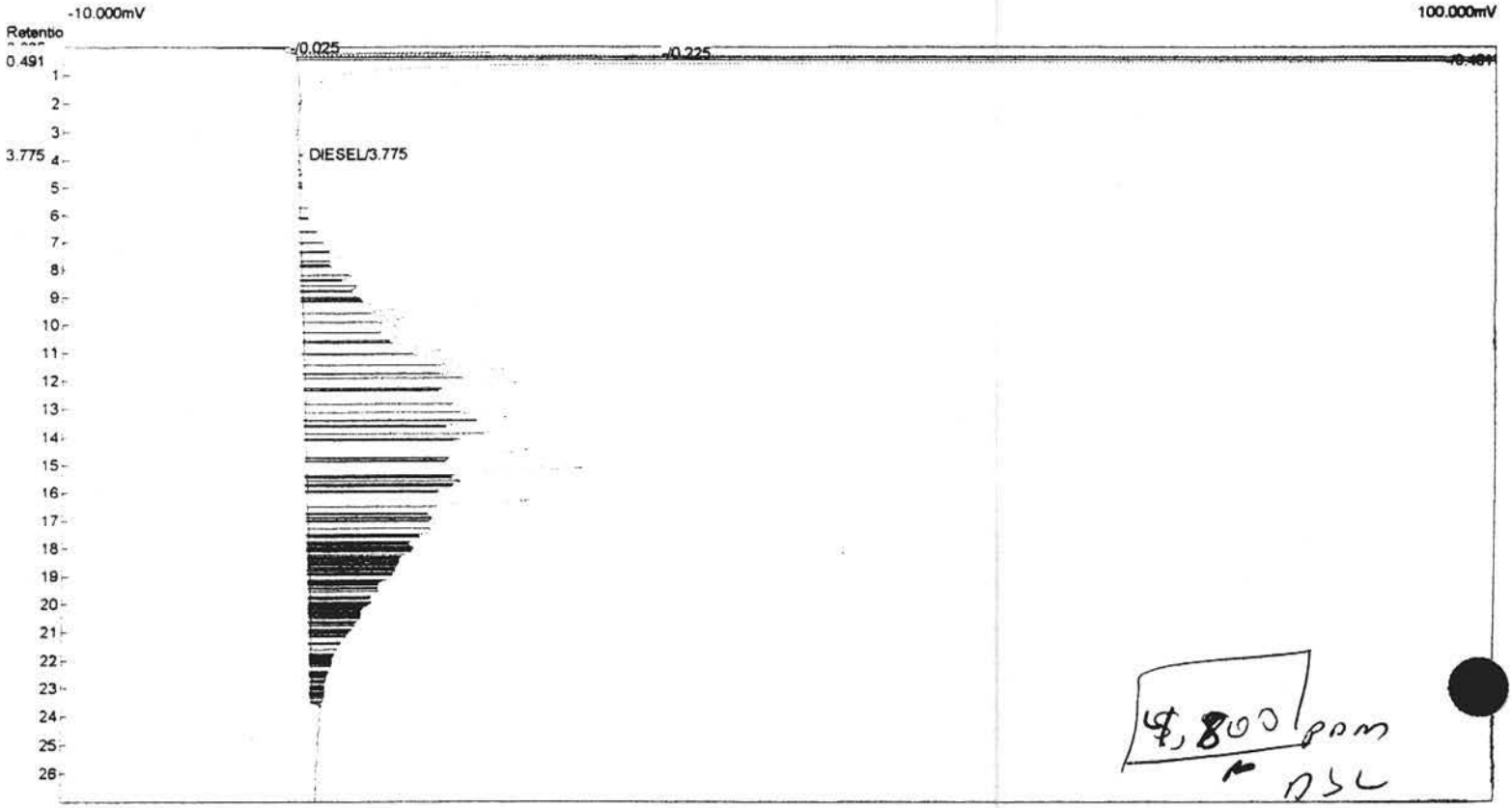
Retention	Component	Number	Area	External	Internal	Units
		0	0.000	0.00	0.0000	ND

Lab name: TEG Puerto Rico
Analysis date: 07/09/1998 15:16:22
Method: EPA 8015 mod
Lab ID: GC-4
Description: FID 1
Column: Rxt-1 (15 x 0.53x 0.25)
Carrier: N2 1.1 kg/cm2
Data file: 0709Fa10.CHR ()
Sample: SB-8 @ 4-6 REP
Operator: MAP



Retention	Component	Number	Area	External	Internal	Units
		0	0.000	0.00	0.0000	

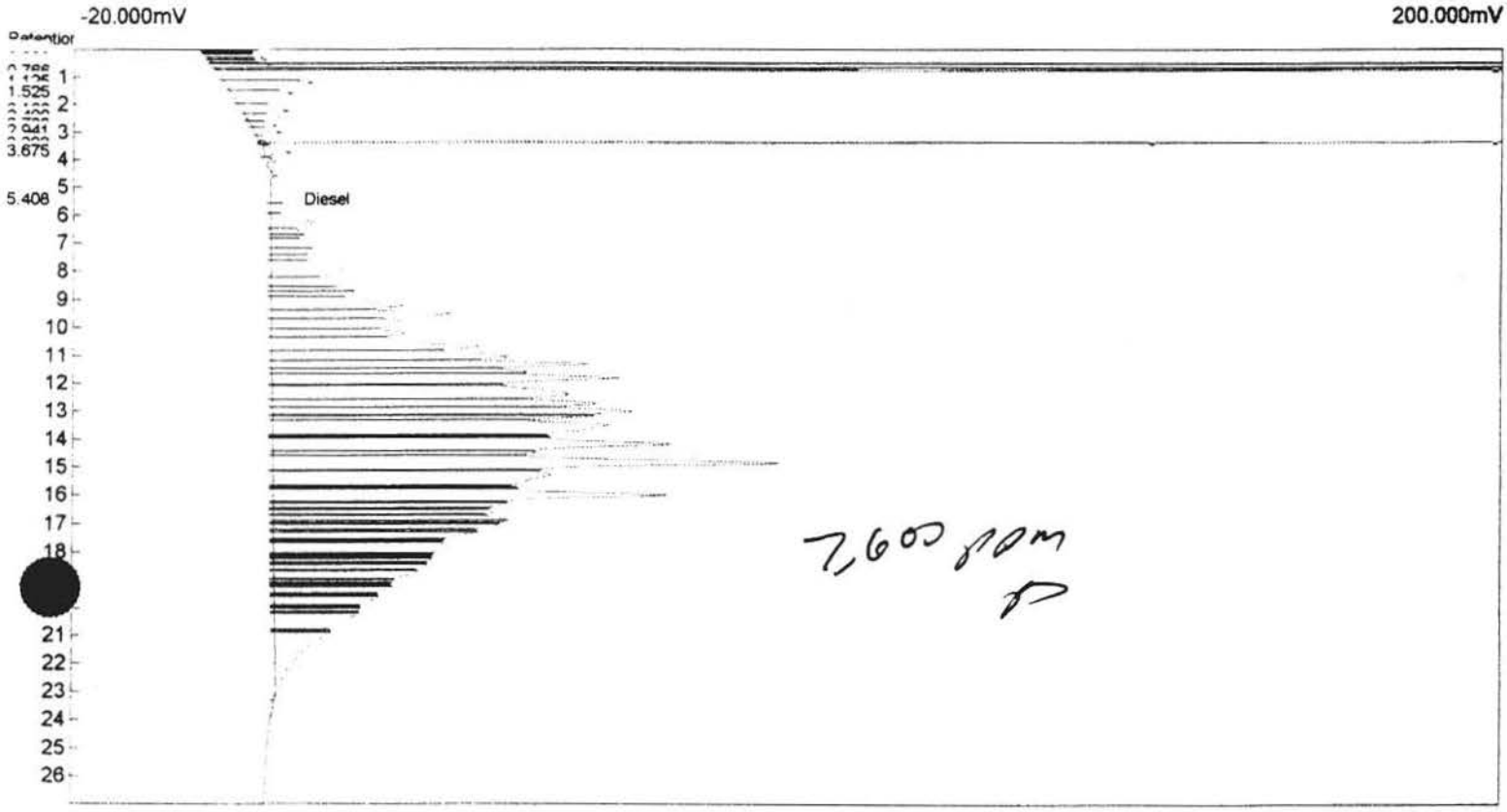
Lab name: TEG Puerto Rico
Analysis date: 07/09/1998 12:55:19
Method: EPA 8015 mod
Lab ID: GC-4
Description: FID 2
Column: Rxt-1 (15 x 0.53x 0.25)
Carrier: N2 1.1 kg/cm2
Data file: 0709fb7.CHR ()
Sample: sb-8 @ 2-4
Operator: MAP



Retention	Component	Number	Area	External	Internal	Units
3.775	DIESEL	2	7379.187	2070.48	2070.4790	ppm
		1	7379.187	2070.48	2070.4790	

2X 880
= ~~5494.28~~ ppm
4759.72

Lab name: TEG Puerto Rico
Analysis date: 07/09/1998 17:00:06
Method: EPA 8015 mod
Lab ID: GC-4
Description: FID 1
Column: Rxt-1 (15 x 0.53x 0.25)
Carrier: N2 1.1 kg/cm2
ponents: fullra1.cpt
ntrol filename: C:\PEAKW95\FULLRAN.con
Data file: 0709fa11.CHR ()
Sample: DUPE 8ML
Operator: MAP



Component	Retention	Area	External	Internal	Units
Diesel	5.408	24590.316	6018.23	6018.2278	ppm /.791 = 7608.39
		24590.316	6018.23	6018.2278	

teg

QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0708CH2-1
DAILY CALIBRATION DATE: 7/21/98

CH2M HILL
PROJECT NAME: SITE 2842

			INITIAL		OPENING			CLOSING		
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	AREA	RF	%DIFF	AREA	RF	%DIFF
BENZENE	PID #1	0.100 - 10.000	4.44	6.7%	86.75	4.34	2.3%	16.34	4.08	8.0%
TOLUENE	PID #1	0.100 - 10.000	4.73	9.4%	92.62	4.63	2.1%	17.19	4.30	9.1%
ETHYLBENZENE	PID #1	0.100 - 10.000	4.30	10.0%	81.71	4.09	5.0%	15.77	3.94	8.3%
m&p-XYLENES	PID #1	0.100 - 10.000	5.67	3.5%	233.80	5.85	3.1%	41.03	5.13	9.5%
o-XYLENES	PID #1	0.100 - 10.000	4.97	5.5%	94.71	4.74	4.7%	17.20	4.30	13.5%
BENZENE	PID #2	0.100 - 10.000	4.26	8.6%	79.03	3.95	7.2%	19.34	4.83	13.5%
TOLUENE	PID #2	0.100 - 10.000	4.73	10.2%	84.50	4.23	10.7%	20.32	5.08	7.4%
ETHYLBENZENE	PID #2	0.100 - 10.000	3.70	12.2%	71.84	3.59	2.9%	15.29	3.82	3.3%
m&p-XYLENES	PID #2	0.100 - 10.000	5.39	9.1%	204.18	5.10	5.3%	49.32	6.16	14.4%
o-XYLENES	PID #2	0.100 - 10.000	4.77	11.8%	85.79	4.29	10.1%	19.87	4.97	4.1%

CALIB RANGE - RANGE OF CALIBRATION CURVE IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 20% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY:MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

teg

QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0708CH2-1
DATE: 7/9/98

CH2M HILL
PROJECT NAME: SITE 2842

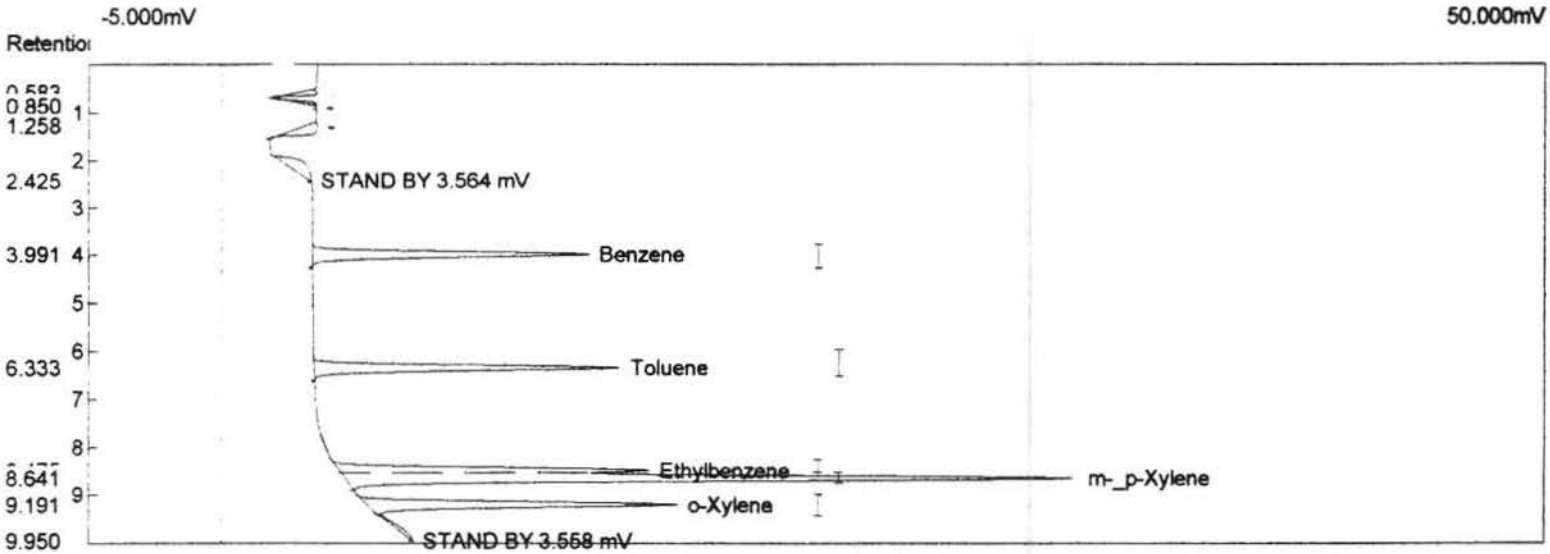
COMPOUND	SPK CONC (ppm)	MS CONC (ppm)	%REC MS	MSD CONC (ppm)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
BENZENE	10.0	9.52	95%	9.32	93%	2%	15%	76% - 120%
TOLUENE	10.0	9.73	97%	9.10	91%	7%	15%	75% - 120%
ETHYLBENZENE	10.0	9.20	92%	9.57	96%	4%	15%	65% - 125%
TOTAL XYLENES	30.0	29.9	100%	28.2	96%	6%	15%	72% - 120%

ppm = PARTS PER MILLION
MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE
% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX
RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY:MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

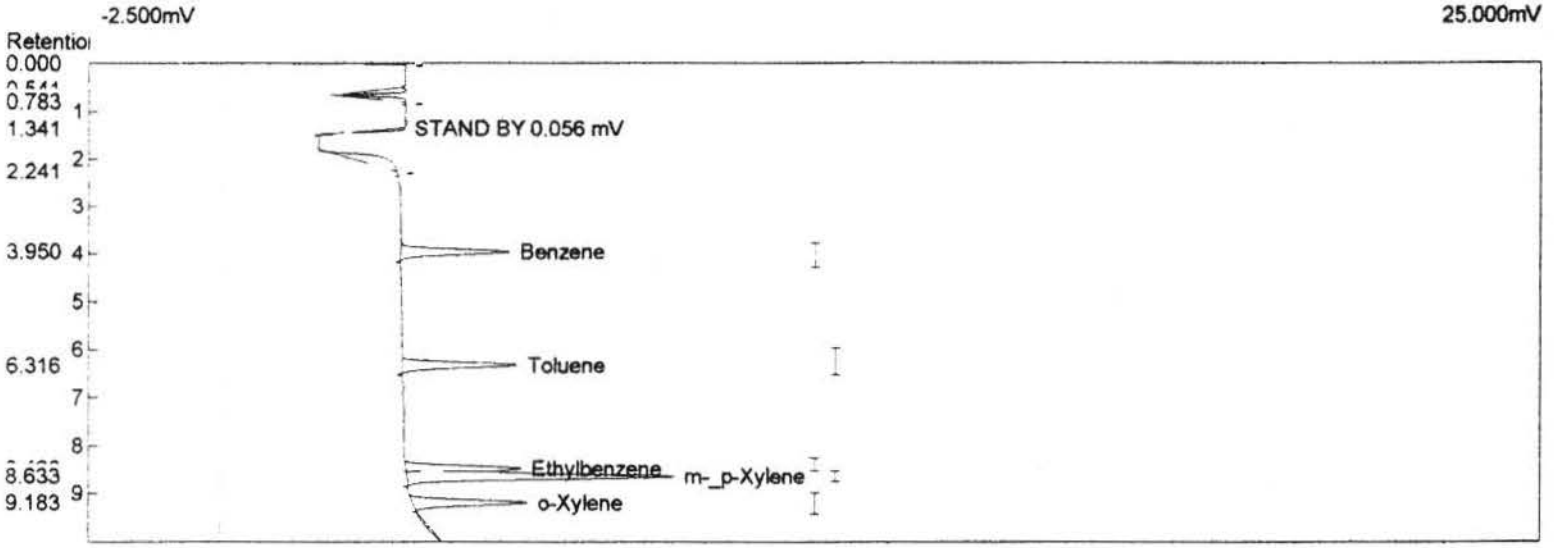
TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

Lab name: TEG Puerto Rico
Analysis date: 07/21/1998 13:16:06
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0721PA6.CHR ()
Sample: 5 ppm BTEX STD
Operator: MAP



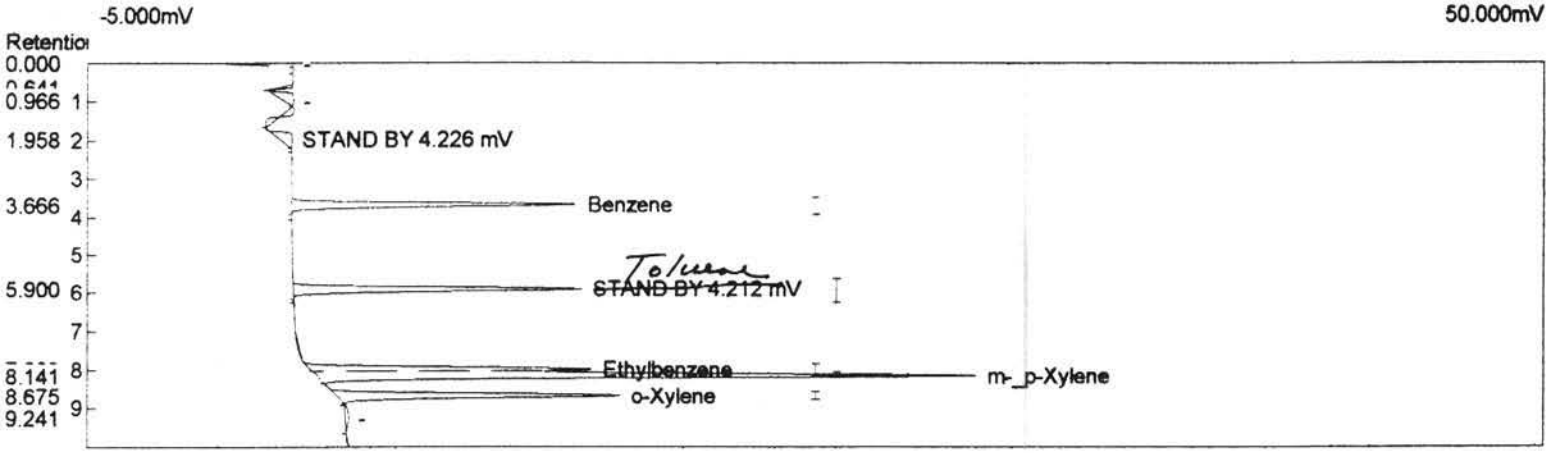
Component	Retention	Area
Benzene	3.991	86.748
Toluene	6.333	92.623
Ethylbenzene	8.475	81.705
m-_p-Xylene	8.641	233.800
o-Xylene	9.191	94.706
		589.582

Lab name: TEG Puerto Rico
Analysis date: 07/21/1998 16:40:40
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0721PA15.CHR ()
Sample: CLOSE 1 ppm
Operator: MAP



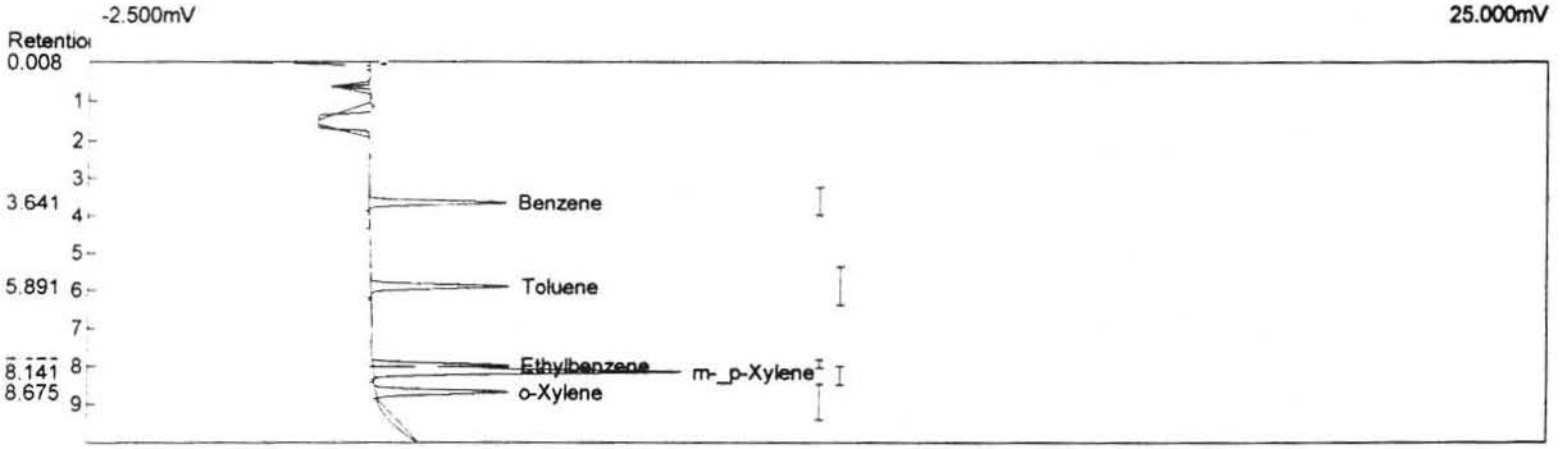
Component	Retention	Area
Benzene	3.950	16.338
Toluene	6.316	17.193
Ethylbenzene	8.466	15.767
m-_p-Xylene	8.633	41.030
o-Xylene	9.183	17.197
		107.525

Lab name: TEG Puerto Rico
Analysis date: 07/21/1998 13:16:06
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0721PB6.CHR ()
Sample: 5 ppm BTEX STD
Operator: MAP



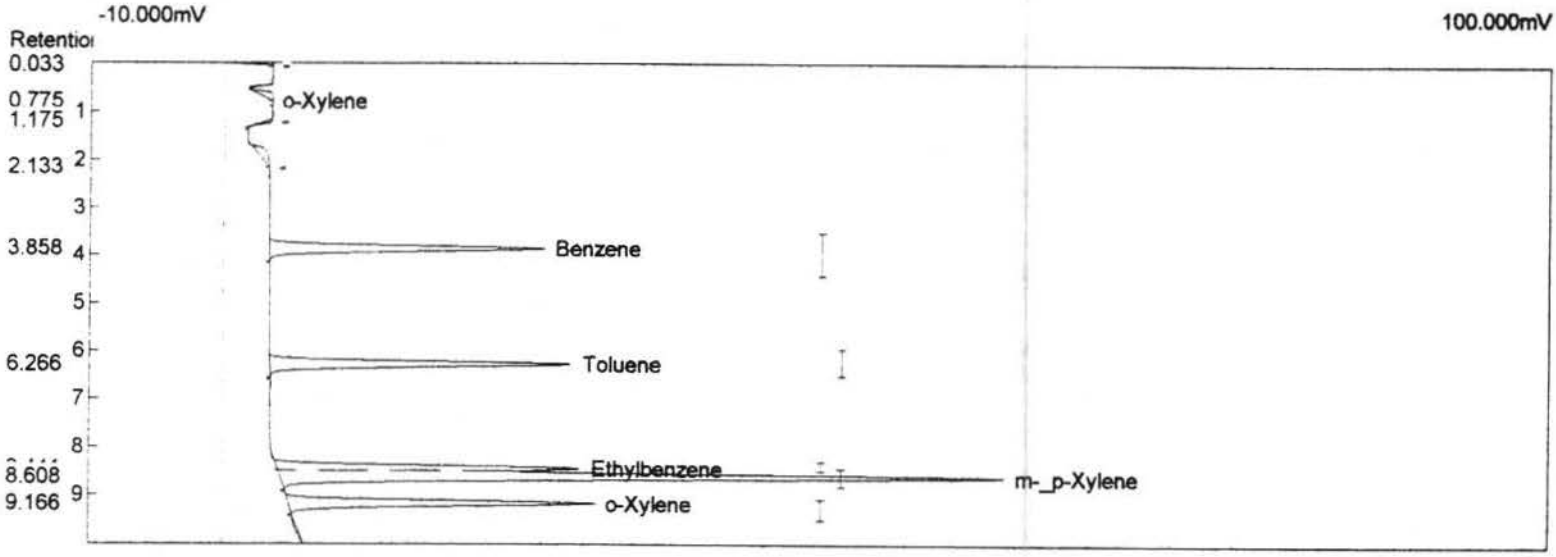
Component	Retention	Area
Benzene	3.666	79.025
Toluene	5.900	84.496
Ethylbenzene	7.983	71.838
m-_p-Xylene	8.141	204.176
o-Xylene	8.675	85.793
		525.329

Lab name: TEG Puerto Rico
Analysis date: 07/21/1998 16:40:40
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0721PB15.CHR ()
Sample: CLOSE 1 PPM STD
Operator: MAP



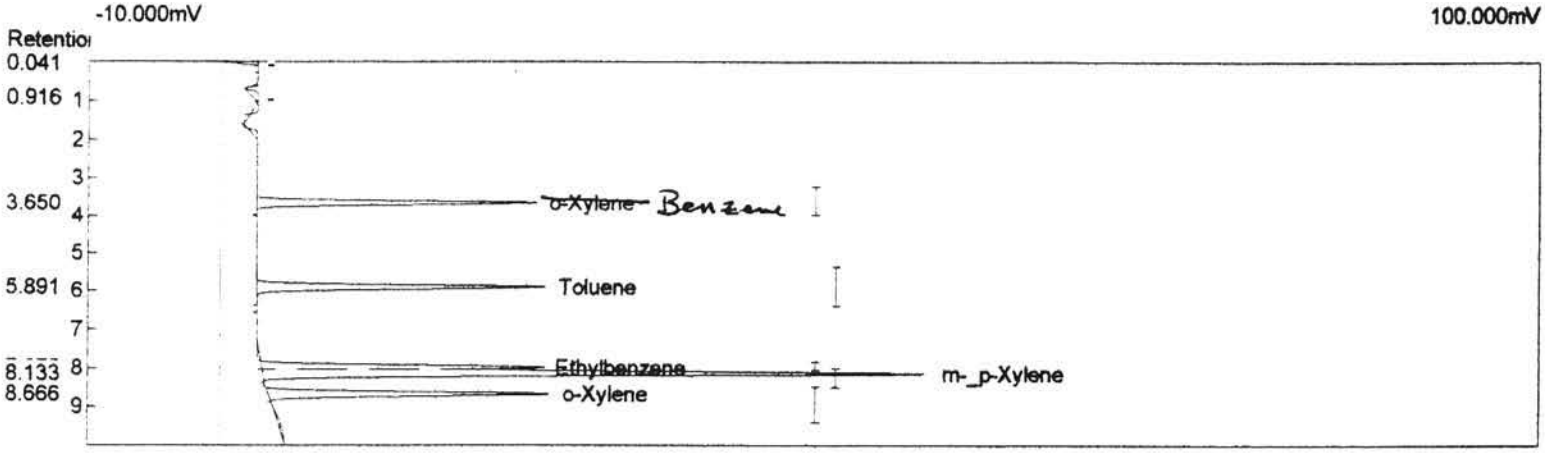
Component	Retention	Area	External	Internal	Units
Benzene	3.641	19.337	1.13	1.1341	ppm
Toluene	5.891	20.322	1.07	1.0741	ppm
Ethylbenzene	7.975	15.286	1.03	1.0341	ppm
m-_p-Xylene	8.141	49.316	2.29	2.2859	ppm
o-Xylene	8.675	19.871	1.04	1.0404	ppm
		124.132	6.57	6.5686	

Lab name: TEG Puerto Rico
Analysis date: 07/21/1998 13:38:47
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0721PA7.CHR ()
Sample: Matrix Spike
Operator: MAP



Component	Retention	Area	External	Internal	Units
Benzene	3.858	169.054	9.52	9.5188	ppm
Toluene	6.266	184.012	9.73	9.7258	ppm
Ethylbenzene	8.441	158.232	9.20	9.1995	ppm
m-_p-Xylene	8.608	461.755	20.36	20.3596	ppm
o-Xylene	9.166	188.848	9.50	9.4994	ppm
		1161.900	58.30	58.3031	

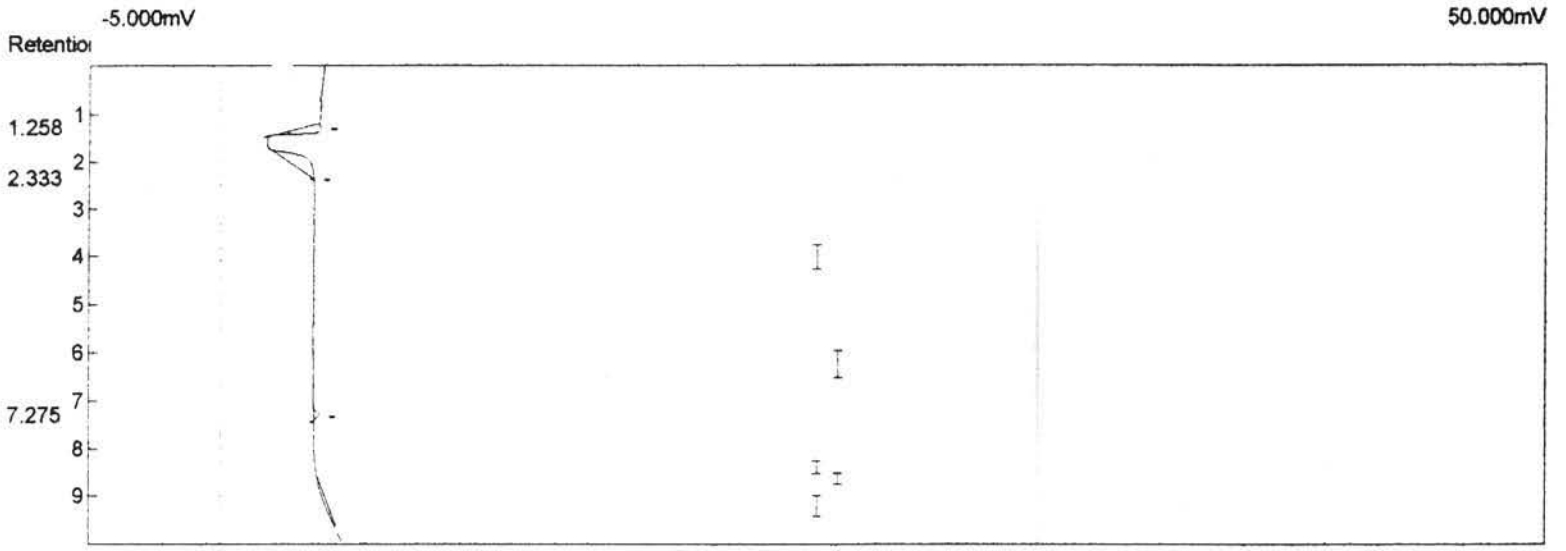
Lab name: TEG Puerto Rico
Analysis date: 07/21/1998 13:38:47
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0721PB7.CHR ()
Sample: Matrix Spike Duplicate
Operator: MAP



Component	Retention	Area	External	Internal	Units
Benzene	3.650	158.956	9.32	9.3229	ppm
Toluene	5.891	172.091	9.10	9.0957	ppm
Ethylbenzene	7.975	141.441	9.57	9.5685	ppm
m-_p-Xylene	8.133	415.389	19.25	19.2542	ppm
o-Xylene	8.666	170.243	8.91	8.9132	ppm
		1058.121	56.15	56.1545	

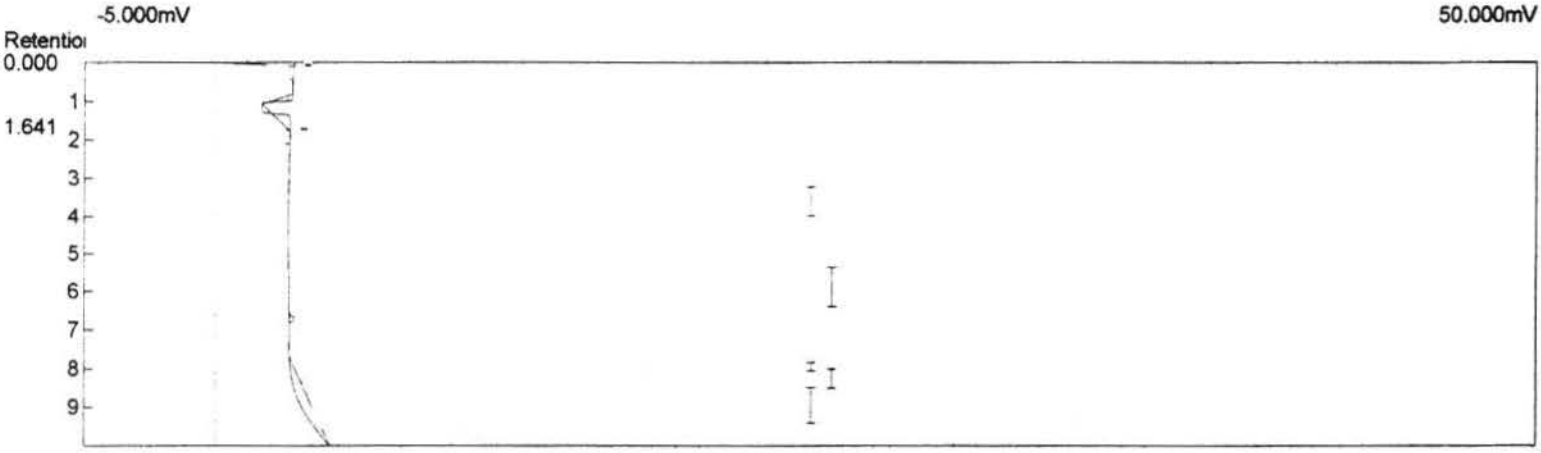
KA

Lab name: TEG Puerto Rico
Analysis date: 07/21/1998 14:00:20
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0721PA8.CHR ()
Sample: METHOD BLANK
Operator: MAP



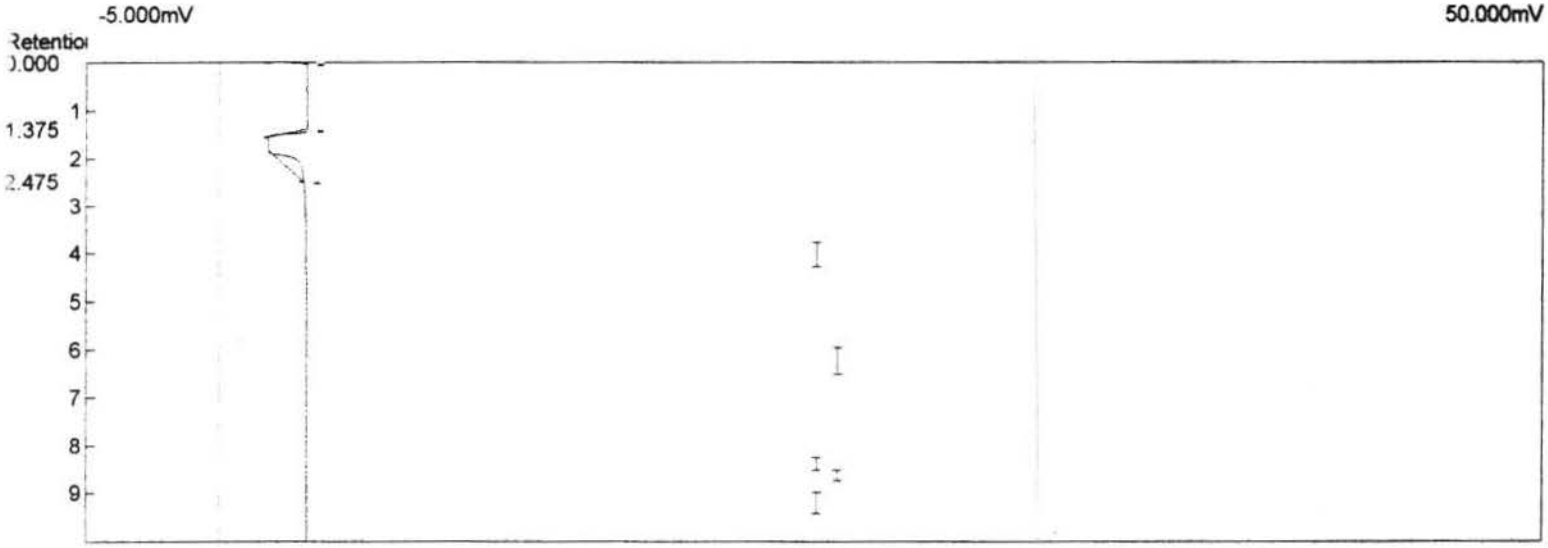
Component	Retention	Area
		0.000

Lab name: TEG Puerto Rico
Analysis date: 07/21/1998 14:00:20
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0721PB8.CHR ()
Sample: METHOD BLANK
Operator: MAP



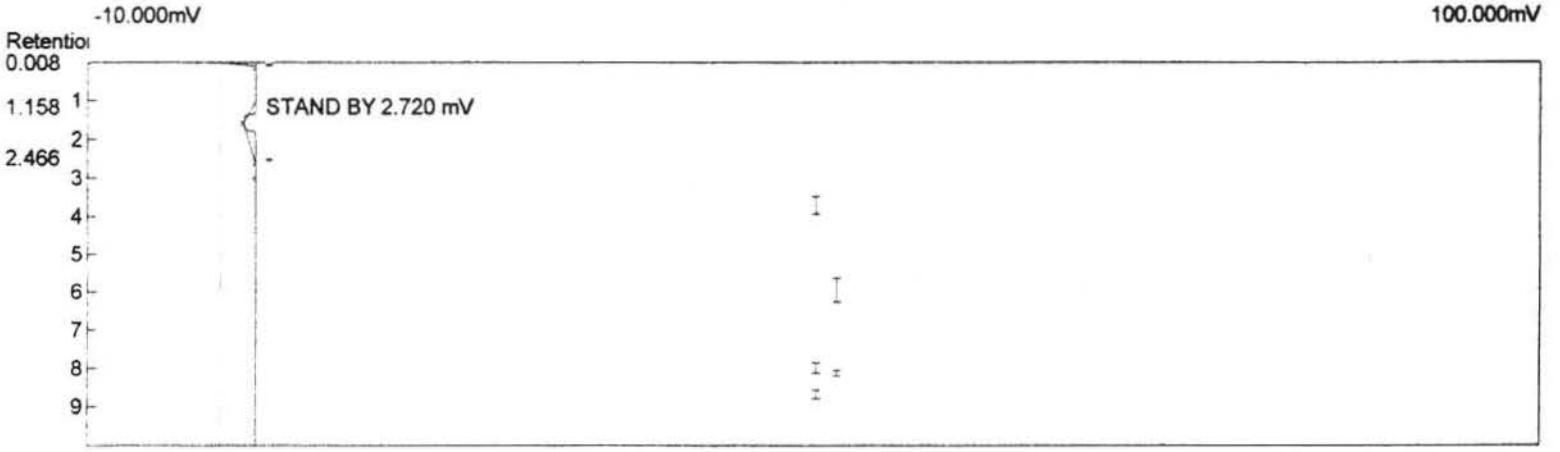
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/21/1998 15:12:00
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0721PA11.CHR ()
Sample: TRIP BLANK/0708CH2-1
Operator: MAP



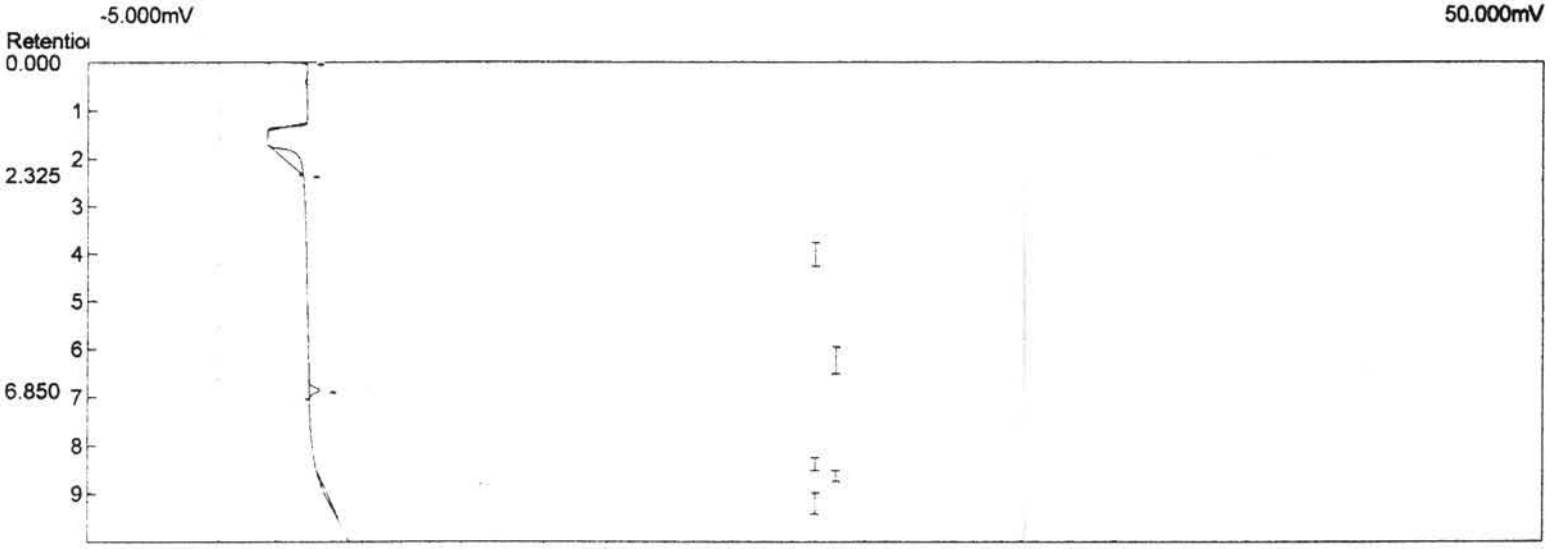
Component	Retention	Area
		0.000

Lab name: TEG Puerto Rico
Analysis date: 07/21/1998 15:12:00
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0721PB11.CHR ()
Sample: 2842-EB-1/0708CH2-1
Operator: MAP



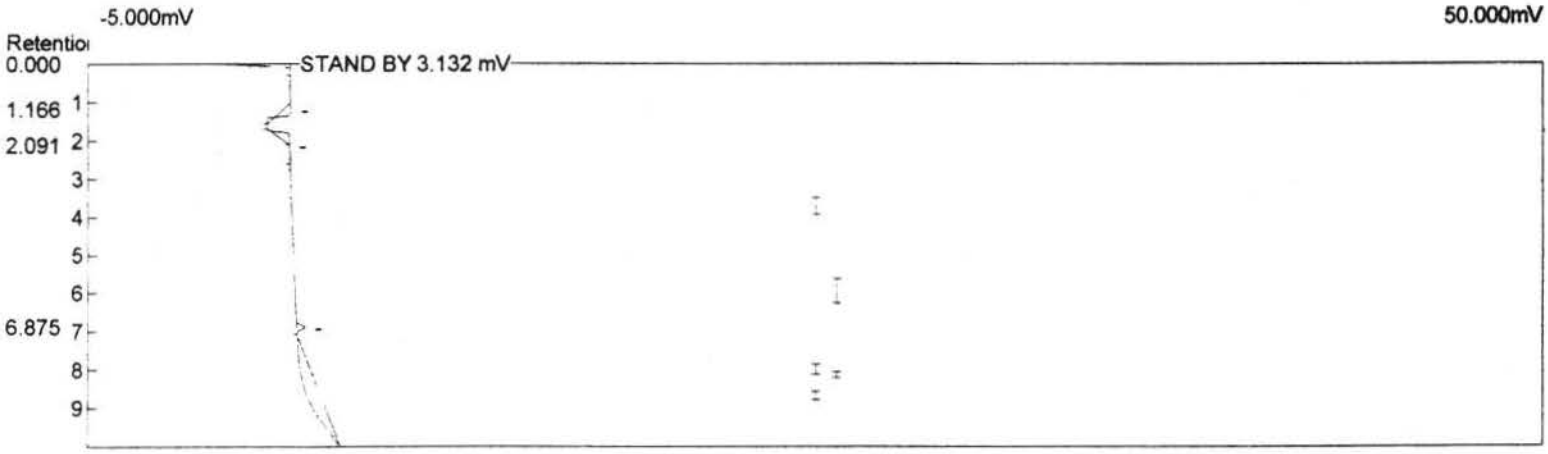
Component	Retention	Area
		0.000

Lab name: TEG Puerto Rico
Analysis date: 07/21/1998 16:15:44
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: C:\PEAKWIN\0721PA14.CHR ()
Sample: 2842-SB4 W/0708CH2-1
Operator: MAP



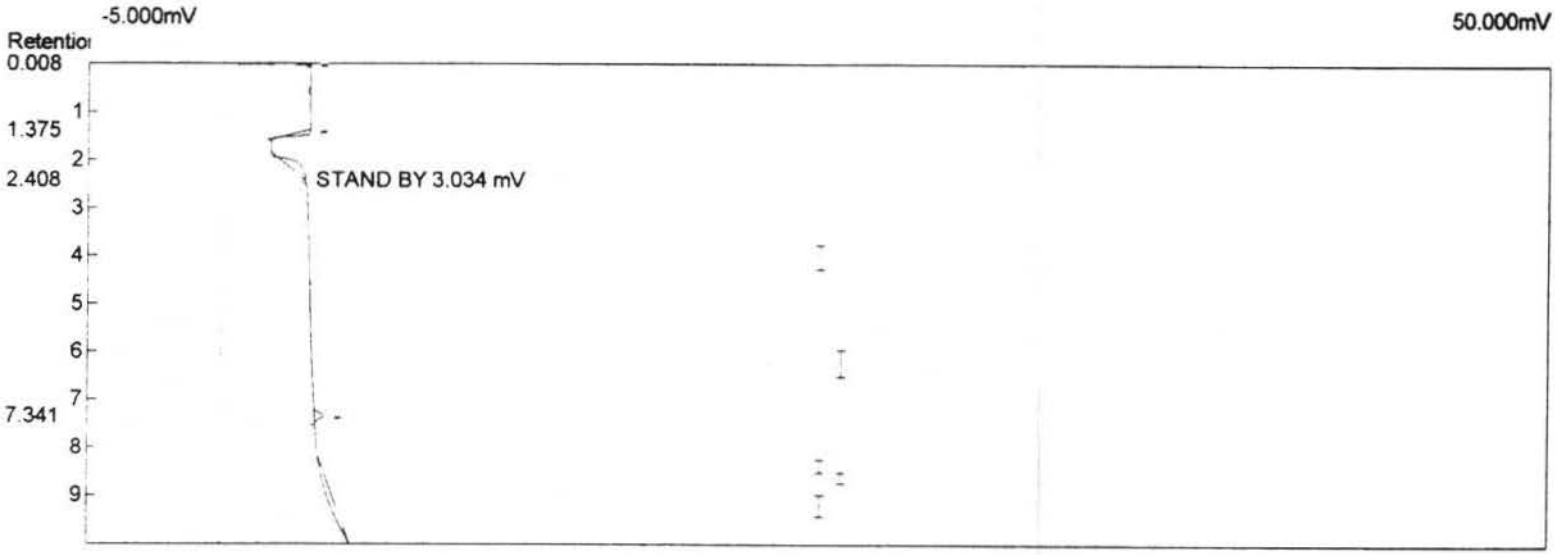
Component	Retention	Area
	0.000	

Lab name: TEG Puerto Rico
Analysis date: 07/21/1998 15:30:05
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0721PB12.CHR ()
Sample: 2842SB5@4-6/0708CH2-1
Operator: MAP



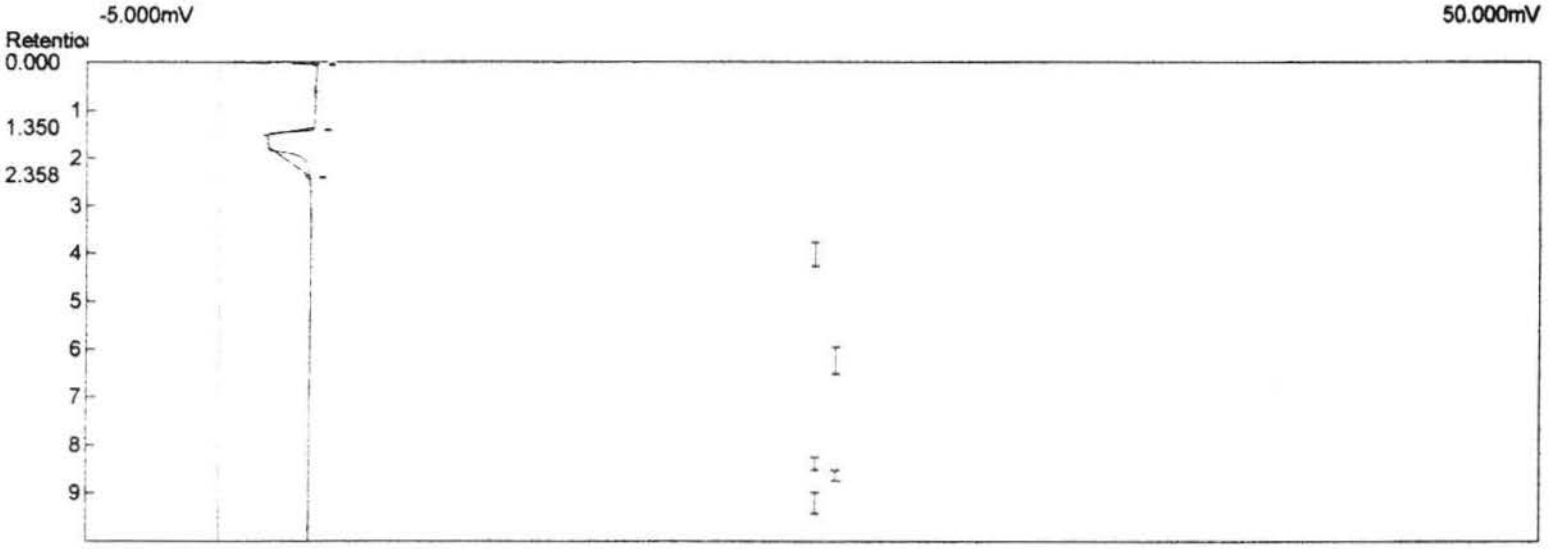
Component	Retention	Area
	0.000	

Lab name: TEG Puerto Rico
Analysis date: 07/21/1998 15:30:05
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0721PA12.CHR ()
Sample: 2842SB6@4-6/0708CH2-1
Operator: MAP



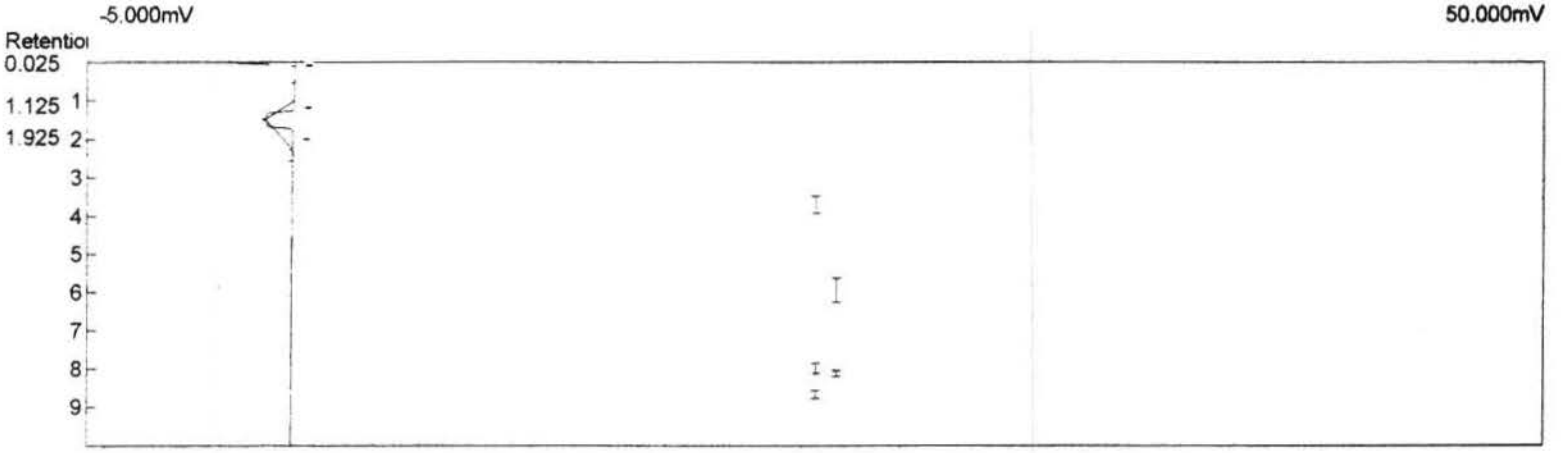
Component	Retention	Area
		0.000

Lab name: TEG Puerto Rico
Analysis date: 07/21/1998 15:52:42
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0721PA13.CHR ()
Sample: 2842SB7@4-6/0708CH2-1
Operator: MAP



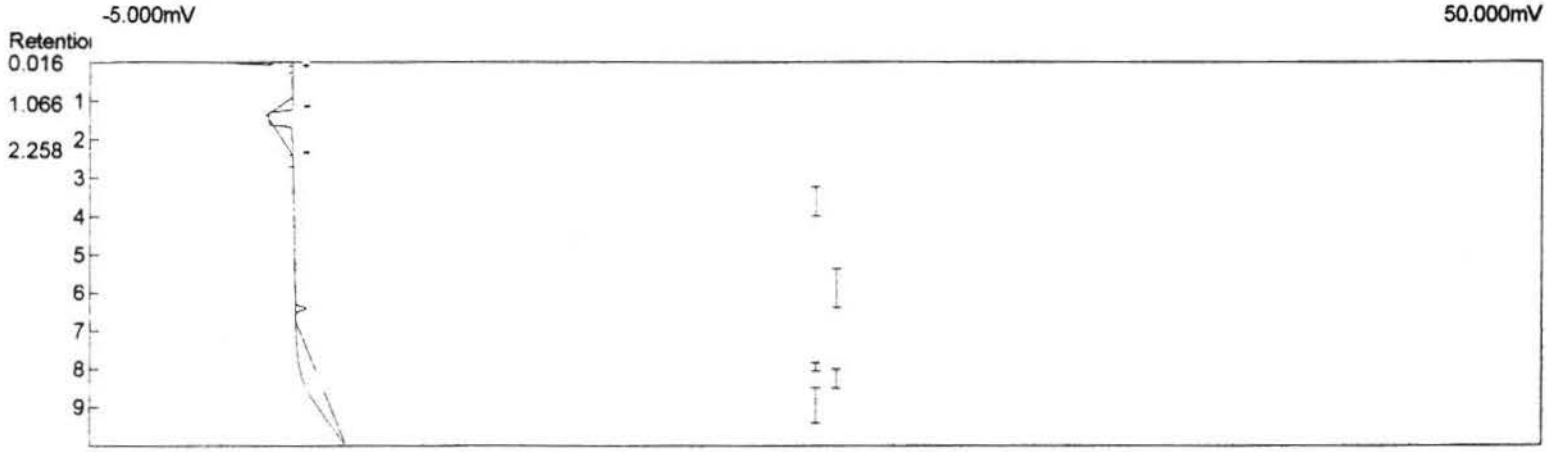
Component	Retention	Area
		0.000

Lab name: TEG Puerto Rico
Analysis date: 07/21/1998 15:52:42
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0721PB13.CHR ()
Sample: 2842SB8@4-6/0708CH2-1
Operator: MAP



Component	Retention	Area
		0.000

Lab name: TEG Puerto Rico
Analysis date: 07/21/1998 16:15:44
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0721PB14.CHR ()
Sample: 2842-SB8@2-4/0708CH2-
Operator: MAP



Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

teg Transglobal Environmental Geochemistry

Chain of Custody Record

PO # _____

Client: CH2M HILL

Address

Phone (787) 888-8713 FAX

Client Project #

Project Manager MARTY CLASEN/TPA

Date 7/8/98 Page 1 of 1

TEG Project # 98I 0708 CHZ-1 Outside Lab.#

Location RRNS

Collector MIKE WEATHERBY Date of Collection 7/8/98

Sample #	Depth	Time	Sample Type	Container Type	VOA 8010	VOA 8020 (BTEX)	VOA 8260	SEMI VOL 8270	TRPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (gas & diesel)	TPH 8015 (oil)	PNA 610/8100	TOTAL LEAD	pH	METALS	RCI						FIELD NOTES / PRESERVATION	Total # of Containers
2842-SB5	4-6	1100	SOIL	2oz		1			1	1	1						HIGH	ODORS						24 TAT 8015MGRO ONLY	3
2842-SB4	—	1120	WATER	40ml		1				1	1														2
2842-SB6	4-6	1200	SOIL	2oz		1			1	1	1														3
2842-SB7	4-6	1430	SOIL	2oz		1			1	1	1														3
2842-EB1	—	1520	WATER	40ml		1			1	1	1														3
2842-SB8	4-6	1605	SOIL	2oz		1			1	1	1														3
2842-SB8	2-4	1630	SOIL	2oz		1			1	1	1														3
TRIP BLNK	—	—	WATER	40ml		1																			1
																									21

RELINQUISHED BY (signature)	Date/Time	RECEIVED BY (signature)	Date/Time
Nicholas L. Weatherby	7/8/98	Francisco Nieves	7:20pm 7/8/98
RELINQUISHED BY (signature)	Date/Time	RECEIVED BY (signature)	Date/Time

		TEMPERATURE
Total # of containers	21	4 C°
Chain of Custody seals Y / N / NA	NA	
Seals intact? Y / N / NA	NA	
Received good conditions / cold	Ys	

Sample disposal instructions: ____ TEG Disposal @ $2.00 each ____ Return to client ____ Pickup

teg Transglobal Environmental Geochemistry

Chain of Custody Record

PO # _____

Client: CH2M HILL

Address _____

Phone (787) 888-8713 FAX _____

Client Project # _____ Project Manager MARTY CLASEN/EPA

Date 7/7/98 Page 1 of 1

TEG Project # 98I0707CH2 Outside Lab.# _____

Location Roosevelt Roads

Collector MIKE WEATHERBY/GNV Date of Collection 7/6 - 7/98

Sample #	Depth	Time	Sample Type	Container Type	VOA 8010	VOA 8020 (BTEX)	VOA 8260	SEMI VOL 8270	TRPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (gas & diesel)	TPH 8015 (oil)	PNA 610/8100	TOTAL LEAD	pH	METALS	RCI							FIELD NOTES / PRESERVATION	Total # of Containers
2842-SB1	4'-6'	1420	SOIL	2oz		1			1	1	1						HNO3	-DGR							24 TAT 8015M GRO ONLY	3
2842-SB2	4'-6'	1620	SOIL	2oz		1			1	1	1															3
2842-DUPE1	4'-6'	—	SOIL	2oz		1			1	1	1															3
2842-SB3	4'-6'	1130	SOIL	2oz		1			1	1	1															3
2842-SB4	4-6	1430	SOIL	2oz		1			1	1	1															3
TRIP BLANK	—	—	WATER	40ml		1																			per Mike directive	1
																										16

RELINQUISHED BY (signature)	Date/Time	RECEIVED BY (signature)	Date/Time
Michael L. Weatherby	7/7/98	Francine Martin	6:45pm 070798
RELINQUISHED BY (signature)	Date/Time	RECEIVED BY (signature)	Date/Time

Total # of containers	16
Chain of Custody seals Y / N / NA	NA
Seals intact? Y / N / NA	NA
Received good conditions / cold	Yes

TEMPERATURE 4°

Sample disposal Instructions: ____ TEG Disposal @ $2.00 each ____ Return to client ____ Pickup

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The World Leader In On-Site Sampling and Analysis

July 20, 1998
TEG Project #98I0707CH2

Mr. Marty Clasen
CH2M HILL
4350 W. Cypress Street, Suite 600
Tampa, Florida 33607

SUBJECT: DATA REPORT - CH2M HILL PROJECT NO. 146801.US.SC SITE #2842

Dear Marty,

Please find enclosed the analytical report for the samples collected by CH2M HILL personnel from the above-referenced site and delivered to TEG under the proper chain-of-custody protocol. TEG's Puerto Rico certified-chemist performed the following analyses:

- 5 soil samples analyzed for TRPH by modified EPA test method 418.1.
- 5 soil samples analyzed for TPH-gas by modified EPA test method 8015.
- 5 soil samples analyzed for BTEX by modified EPA test method 8020.
- 1 trip blank water sample analyzed for BTEX by modified EPA test method 8020.
- Laboratory QA/QC analyses for TPH-gas, TRPH and BTEX.

The analytical results are summarized in the attached table. Applicable detection limits, QA/QC data, chromatograms, a chain-of-custody and an invoice are attached.

TEG appreciates the opportunity to provide analytical services for this project. If you have any questions relating to the data or report, please do not hesitate to contact us.

Sincerely,
TEG

Kevin Shelburne

Kevin Shelburne
Principal

Attachments

TEG-PUERTO RICO • PMB 627, HC-01 Box 29030, Caguas, PR 00725 • Phone (787) 720-0329 • Fax (787) 789-3858 • Pager 759-1255 Unit 217-4053

The World Leader In On-Site Sampling and Analysis

CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVAL BASE, SITE 2842
CEIBA, P. R.

TEG Project #98I0707CH2

TRPH (EPA Method 418.1) ANALYSES OF SOIL

SAMPLE NUMBER	DATE ANALYZED	TRPH (mg/kg)
METHOD BLANK	7/17/98	ND
2842-SB 1 @ 4'-6'	7/17/98	**19,000**
2842-SB 2 @ 4'-6'	7/17/98	**1,800**
2842-DUPE1 @ 4'-6'	7/17/98	**19,000**
2842-SB 3 @ 4'-6'	7/17/98	**4,000**
2842-SB 4 @ 4'-6'	7/17/98	**1,500**
DETECTION LIMIT (mg/kg)		10

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT
mg/kg = MILLIGRAMS PER KILOGRAM
ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

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CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVY BASE, SITE 2842
CEIBA, P. R.

TEG Project #98I0707CH2

TPH (DOHS Mod. EPA Method 8015) ANALYSES OF SOIL

SAMPLE NUMBER	DATE ANALYZED	TPH-GAS C5-C12 (mg/kg)
METHOD BLANK	7/8/98	ND
2842-SB 1 @ 4'-6'	7/8/98	ND
2842-SB 2 @ 4'-6'	7/8/98	ND
2842-SB 3 @ 4'-6'	7/8/98	ND
2842-SB 4 @ 4'-6'	7/8/98	ND
2842-DUPE1 @ 4'-6'	7/8/98	ND
DETECTION LIMIT (mg/kg)		10

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT
CONCENTRATIONS BASED ON DRY WEIGHT
mg/kg = MILLIGRAMS PER KILOGRAM
ANALYSES PERFORMED BY: JOSE MIGUEL
DATA REVIEWED BY: KEVIN SHELBURNE

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CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVY BASE, SITE 2842
CEIBA, P. R.

TEG Project #98I0707CH2

BTEX (Mod. EPA Method 8020) ANALYSES OF SOIL

SAMPLE NUMBER	DATE ANALYZED	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL-BENZENE (mg/kg)	TOTAL XYLENES (mg/kg)
METHOD BLANK	7/17/98	ND	ND	ND	ND
2842-SB 1 @ 4'-6'	7/17/98	ND	ND	ND	ND
2842-SB 2 @ 4'-6'	7/17/98	ND	ND	ND	ND
2842-SB 3 @ 4'-6'	7/17/98	ND	ND	ND	ND
2842-SB 4 @ 4'-6'	7/17/98	ND	ND	ND	ND
2842-SB 4 @ 4'-6' rep.	7/17/98	ND	ND	ND	ND
2842-DUPE1 @ 4'-6'	7/17/98	ND	ND	ND	ND
DETECTION LIMIT (mg/kg)		0.05	0.05	0.05	0.15

BTEX (Mod. EPA Method 8020) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL-BENZENE (mg/L)	TOTAL XYLENES (mg/L)
METHOD BLANK	7/17/98	ND	ND	ND	ND
TRIP BLANK	7/17/98	ND	ND	ND	ND
DETECTION LIMIT (mg/L)		0.05	0.05	0.05	0.15

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
mg/kg = MILLIGRAMS PER KILOGRAM
mg/L = MILLIGRAMS PER LITER
CONCENTRATIONS BASED ON DRY WEIGHT

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT

Marco A. Pedraza
Laboratory Manager

Kevin Shelburne
Principal

A 526116

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QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0707CH2

DAILY CALIBRATION DATE : 7/17/98

CH2M HILL 146801.US.SC

PROJECT NAME: SITE 2842

			INITIAL		OPENING			CLOSING		
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	ABS	RF	%DIFF	ABS	RF	%DIFF
TRPH	IR	10 - 1,000	764.6	15.7%	0.703	711.2	7.0%	0.704	710.2	7.1%

CALIB RANGE - RANGE OF CALIBRATION CURVE IS IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 20% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

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QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0707CH2
DAILY CALIBRATION DATE: 7/8/98

CH2M HILL
PROJECT NAME: SITE 2842

			INITIAL			OPENING			CLOSING	
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	AREA	RF	%DIFF	AREA	RF	%DIFF
TPH GASOLINE	FID #1 (gc1)	10 - 40,000	0.50	9.7%	146.93	0.49	1.5%	156.22	0.52	4.8%
TPH GASOLINE	FID #2 (gc1)	10 - 40,000	0.65	8.1%	180.79	0.60	7.7%	170.20	0.57	13.1%

CALIB RANGE - RANGE OF CALIBRATION CURVE IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 15% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: MARCO A PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

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QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0707CH2

CH2M HILL
PROJECT NAME: SITE 2842

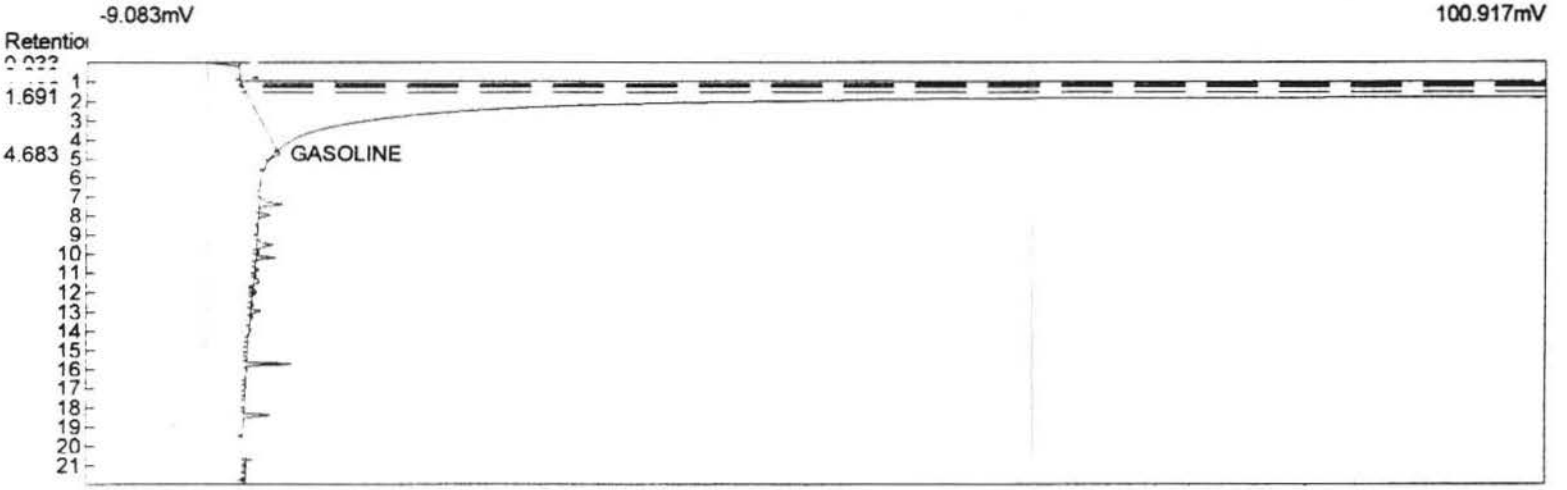
COMPOUND	SPK CONC (ppm)	MS CONC (ppm)	%REC MS	MSD CONC (ppm)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
TPH-GAS	100	97	97%	89	89%	9%	15%	80% - 120%
TRPH	500	534	107%	542	108%	1%	15%	80% - 120%
BENZENE	1.0	1.07	107%	1.05	105%	2%	15%	76% - 120%
TOLUENE	1.0	1.06	106%	1.13	113%	6%	15%	75% - 120%
ETHYLBENZENE	1.0	0.96	96%	0.95	95%	1%	15%	65% - 125%
TOTAL XYLENES	3.0	3.4	115%	3.3	111%	5%	15%	72% - 120%

ppm = PARTS PER MILLION
MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE
% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX
RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

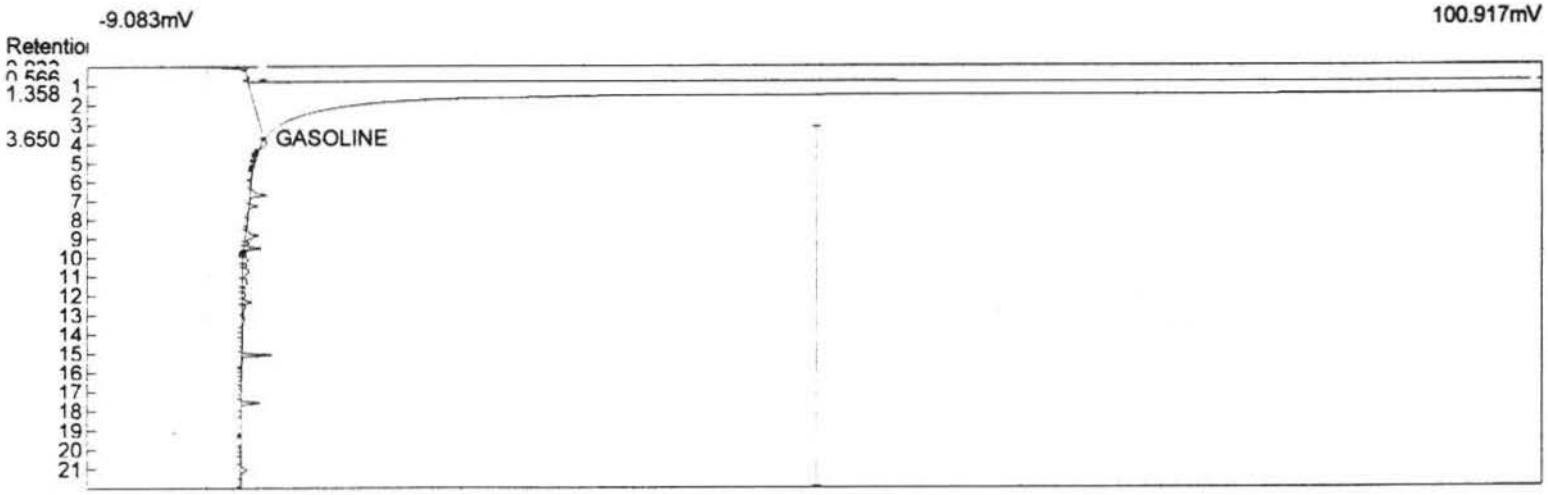
TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

Lab name: TEG Puerto Rico
Analysis date: 07/08/1998 10:05:12
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0708FA1.CHR ()
Sample: 100 ppm Gas Opening
Operator: JMP



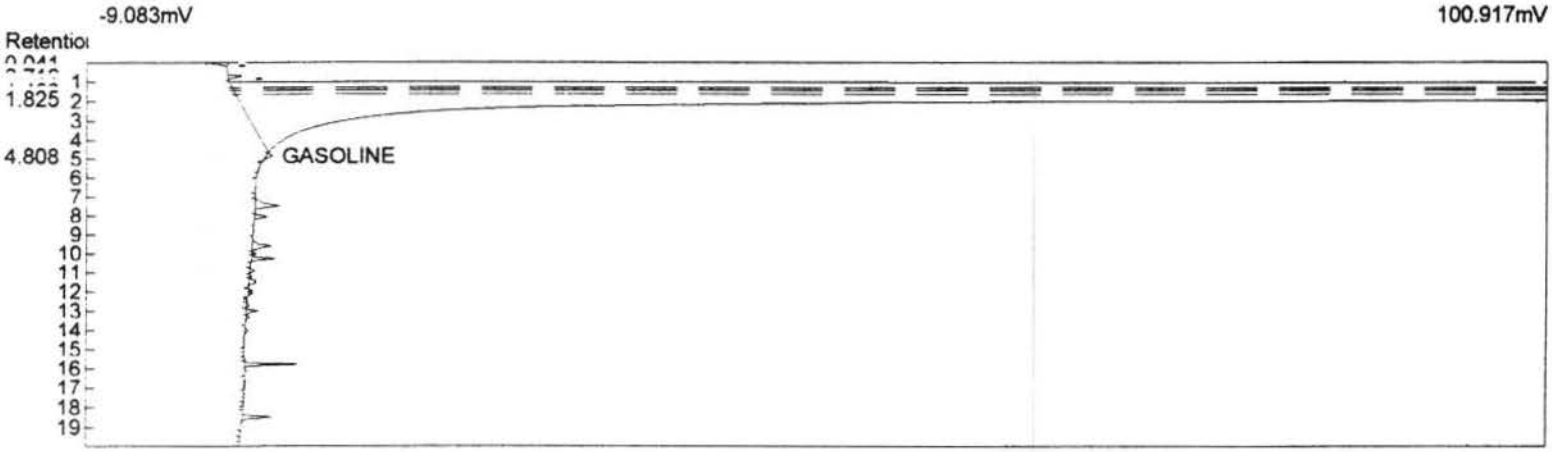
Component	Retention	Area	Internal	Units
GASOLINE	4.683	146.926	98.4430	ppm
		146.926	98.4430	

Lab name: TEG Puerto Rico
Analysis date: 07/08/1998 10:05:12
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0708FB1.CHR ()
Sample: 100 ppm Gas Opening
Operator: JMP



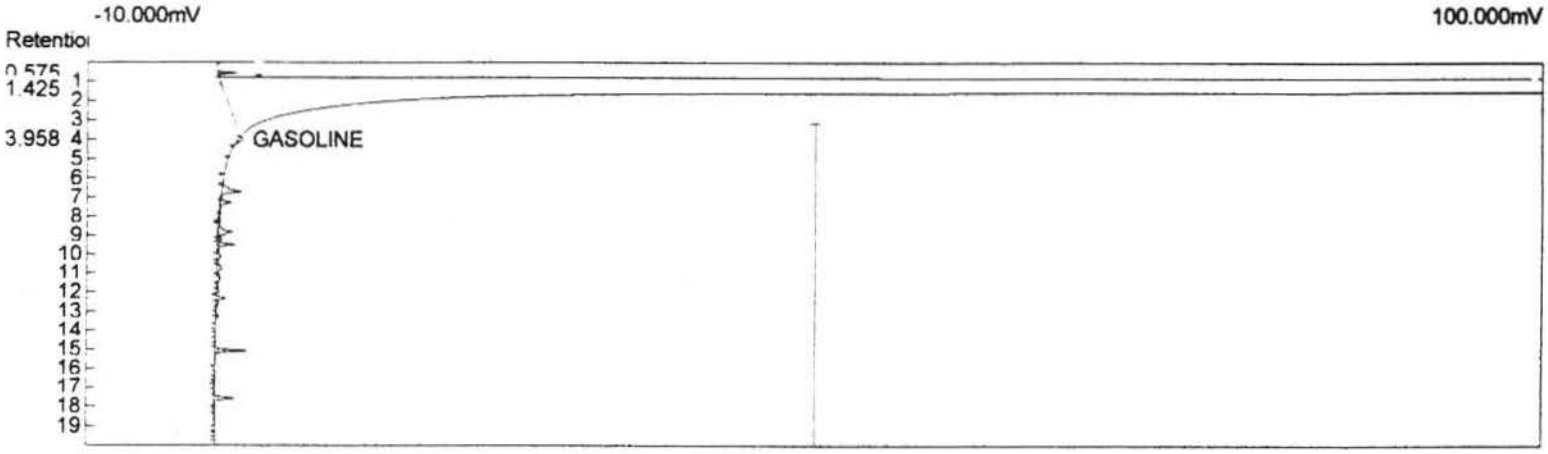
Component	Retention	Area	External	Units
GASOLINE	3.650	180.788	92.19	ppm
		180.788	92.19	

Lab name: TEG Puerto Rico
Analysis date: 07/08/1998 17:00:28
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0708FA13.CHR ()
Sample: 100 ppm Gas Closing
Operator: JMP



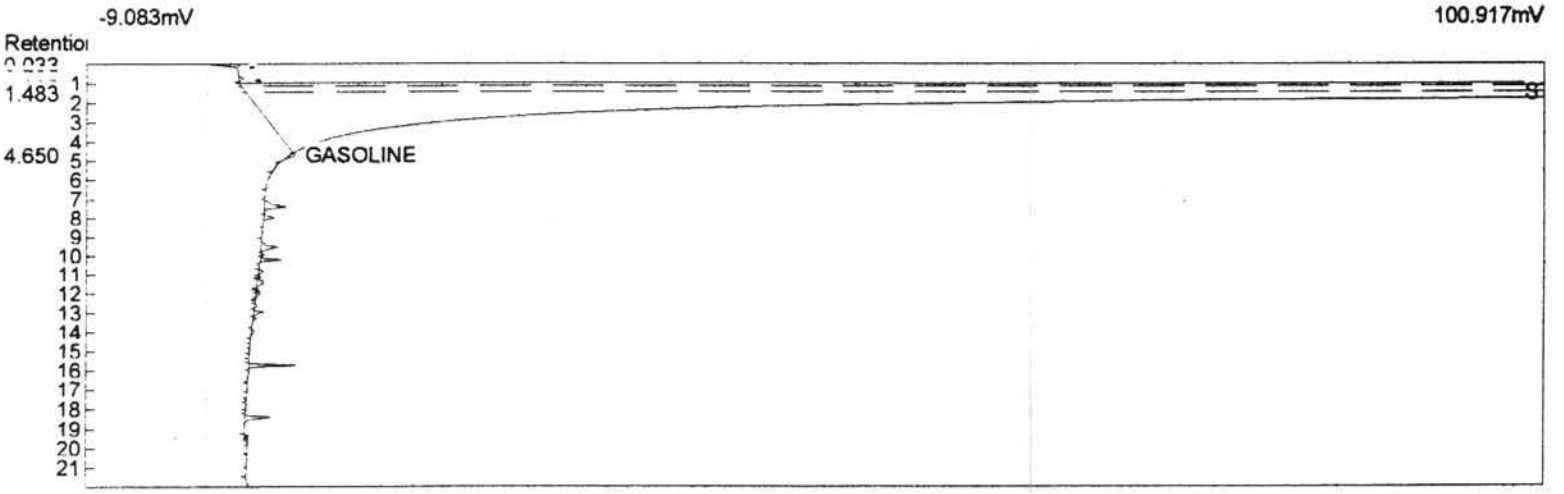
Component	Retention	Area	Internal	Units
GASOLINE	4.808	156.219	104.6695	ppm
		156.219	104.6695	

Lab name: TEG Puerto Rico
Analysis date: 07/08/1998 17:00:28
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0708FB13.CHR ()
Sample: 100 ppm Gas Closing
Operator: JMP



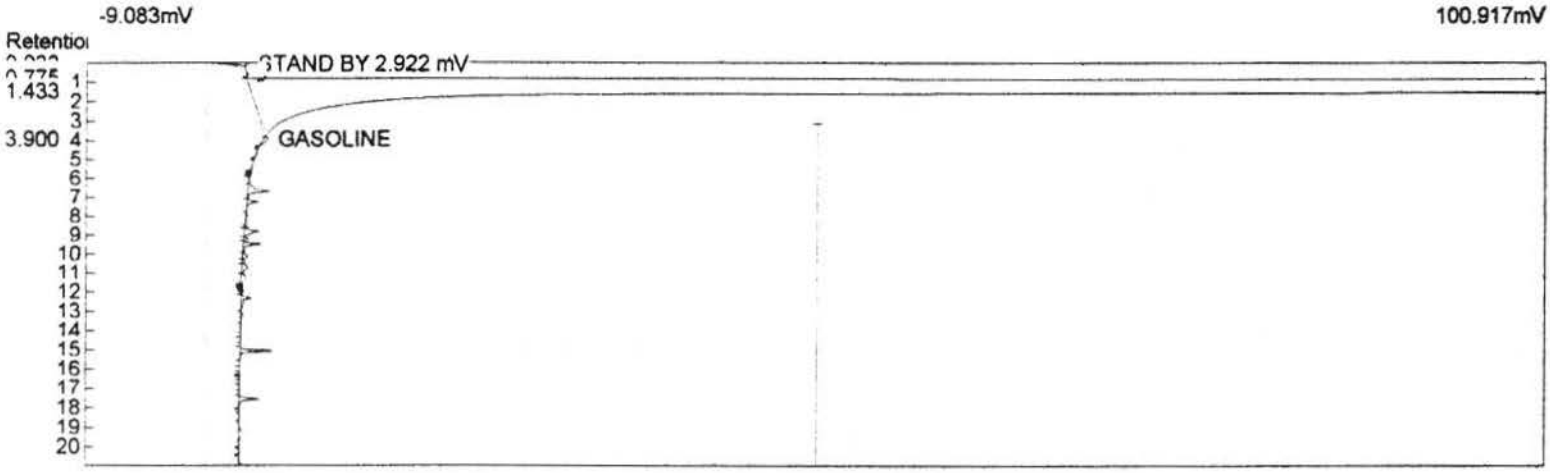
Component	Retention	Area	External	Units
GASOLINE	3.958	170.202	86.79	ppm
		170.202	86.79	

Lab name: TEG Puerto Rico
Analysis date: 07/08/1998 10:35:34
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0708FA2.CHR ()
Sample: Matrix Spike
Operator: JMP



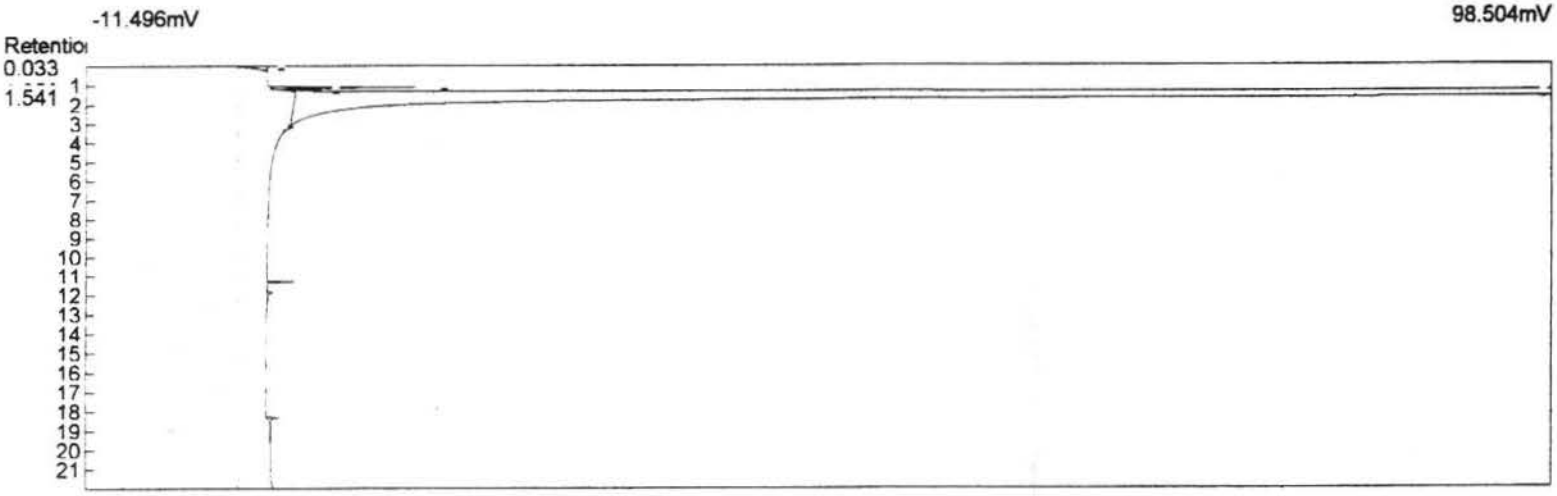
Component	Retention	Area	Internal	Units
GASOLINE	4.650	145.309	97.3601	ppm
		145.309	97.3601	

Lab name: TEG Puerto Rico
Analysis date: 07/08/1998 10:35:34
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0708FB2.CHR ()
Sample: ~~100 ppm Gas Opening~~ Matrix Spike Dup.
Operator: JMP



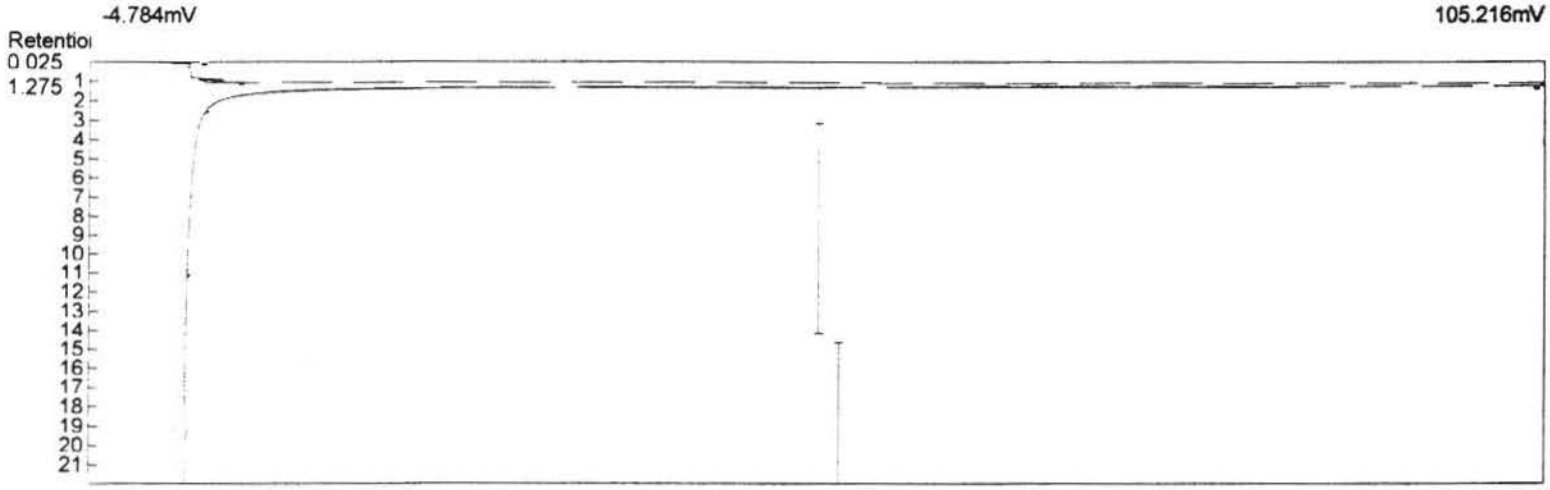
Component	Retention	Area	External	Units
GASOLINE	3.900	174.669	89.07	ppm
		174.669	89.07	

Lab name: TEG Puerto Rico
Analysis date: 07/08/1998 11:22:09
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0708FA3.CHR ()
Sample: Method Blank
Operator: JMP



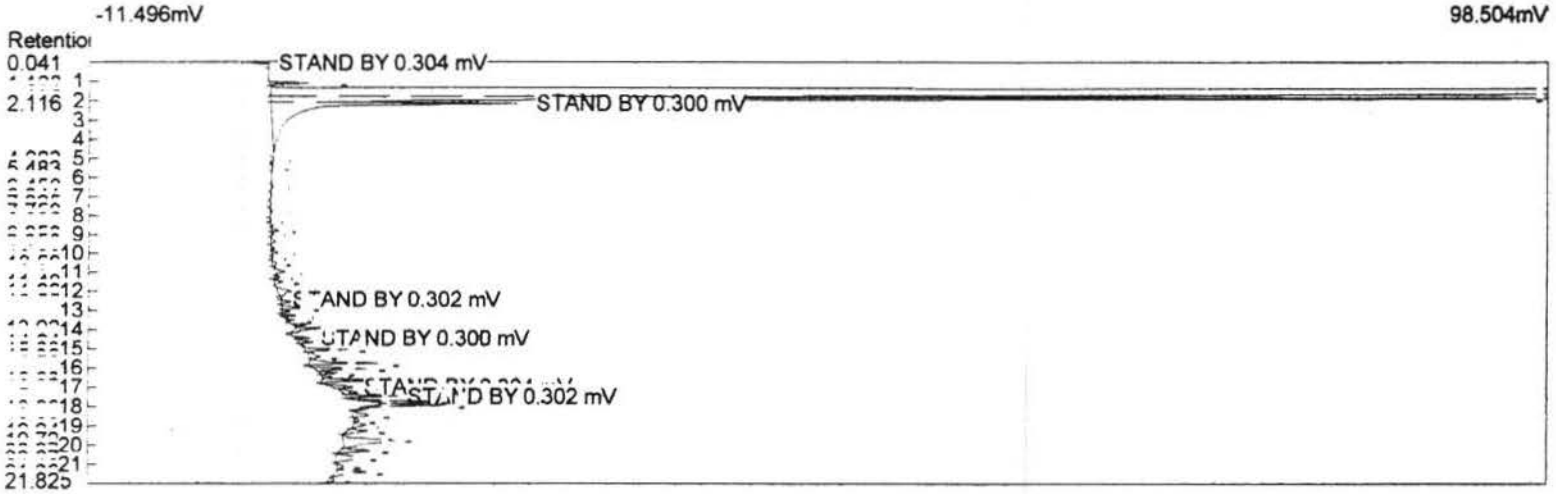
Component	Retention	Area	Internal	Units
		0.000	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/08/1998 11:22:09
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0708FB3.CHR ()
Sample: Method Blank
Operator: JMP



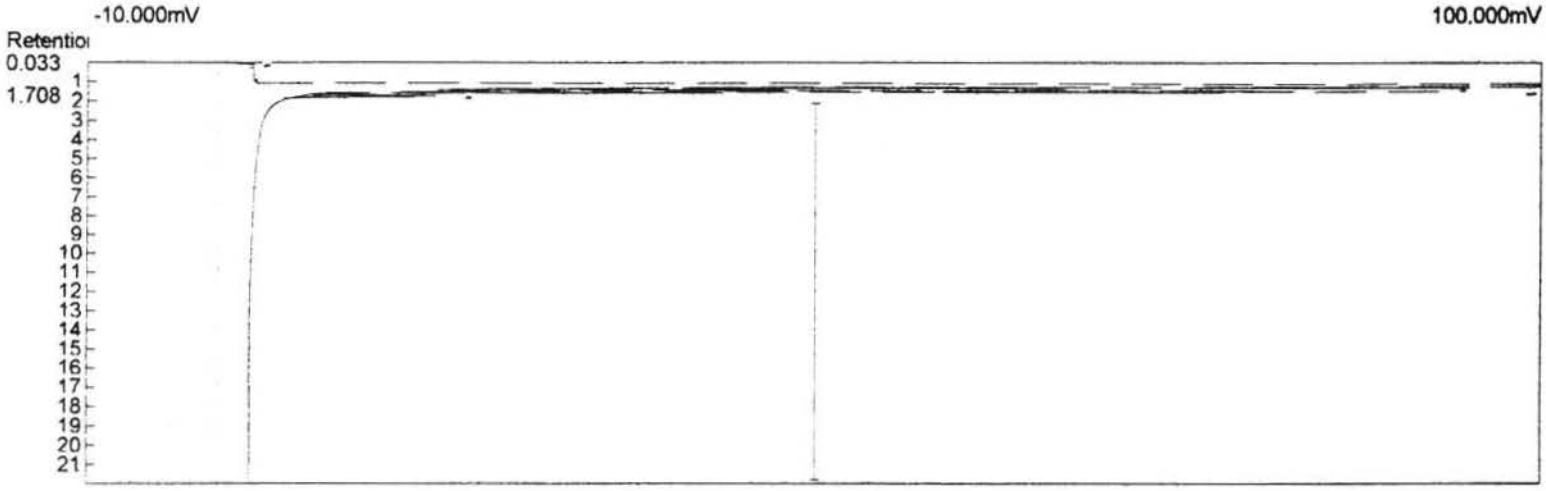
Component	Retention	Area	External	Units
		0.000	0.00	

Lab name: TEG Puerto Rico
Analysis date: 07/08/1998 12:40:20
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0708FA5.CHR ()
Sample: 2842-SB1/0707CH2
Operator: JMP



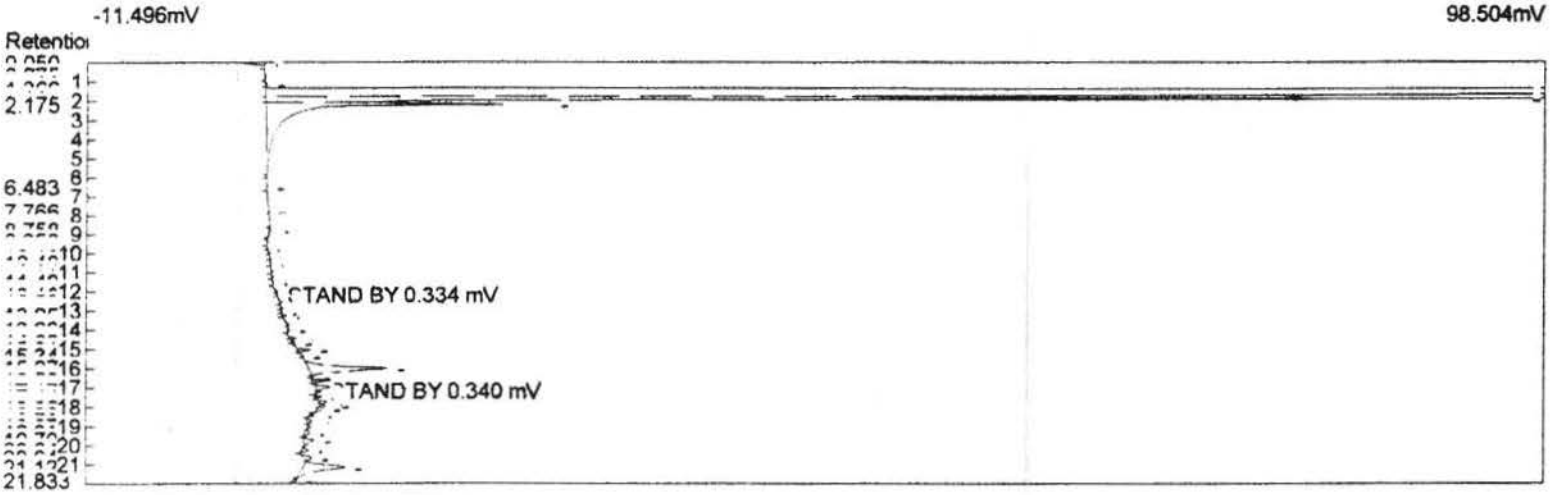
Component	Retention	Area	Internal	Units
		0.000	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/08/1998 12:40:20
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0708FB5.CHR ()
Sample: 2842-SB2/0707CH2
Operator: JMP



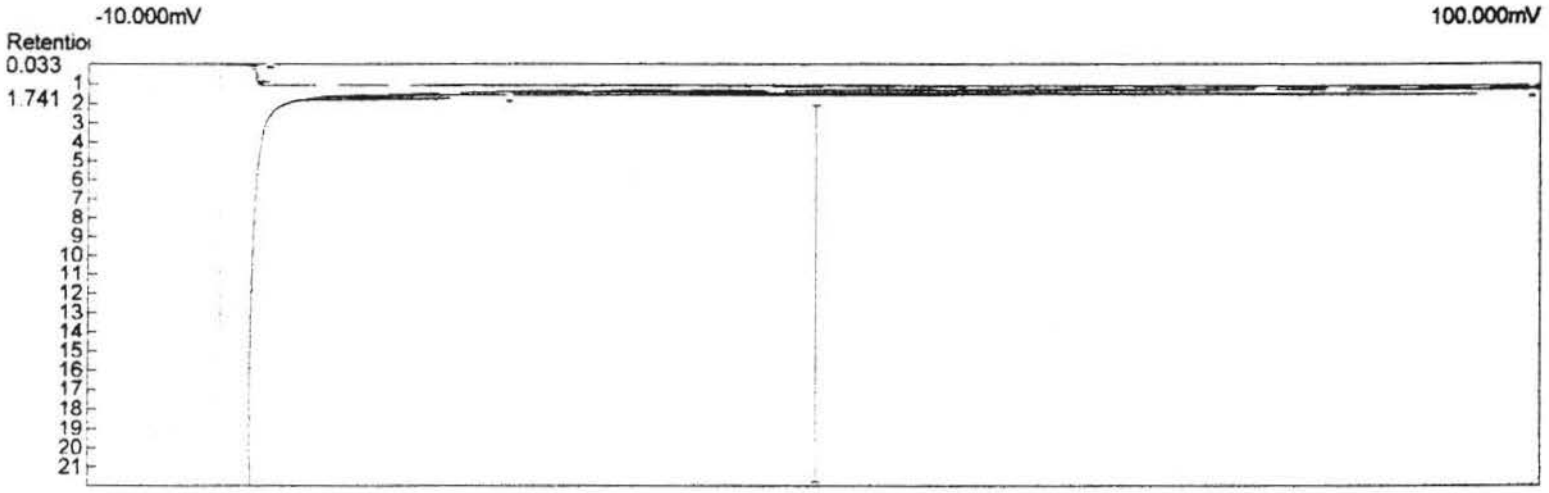
Component	Retention	Area	External	Units
		0.000	0.00	

Lab name: TEG Puerto Rico
Analysis date: 07/08/1998 13:08:25
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0708FA6.CHR ()
Sample: 2842-SB3/0707CH2
Operator: JMP



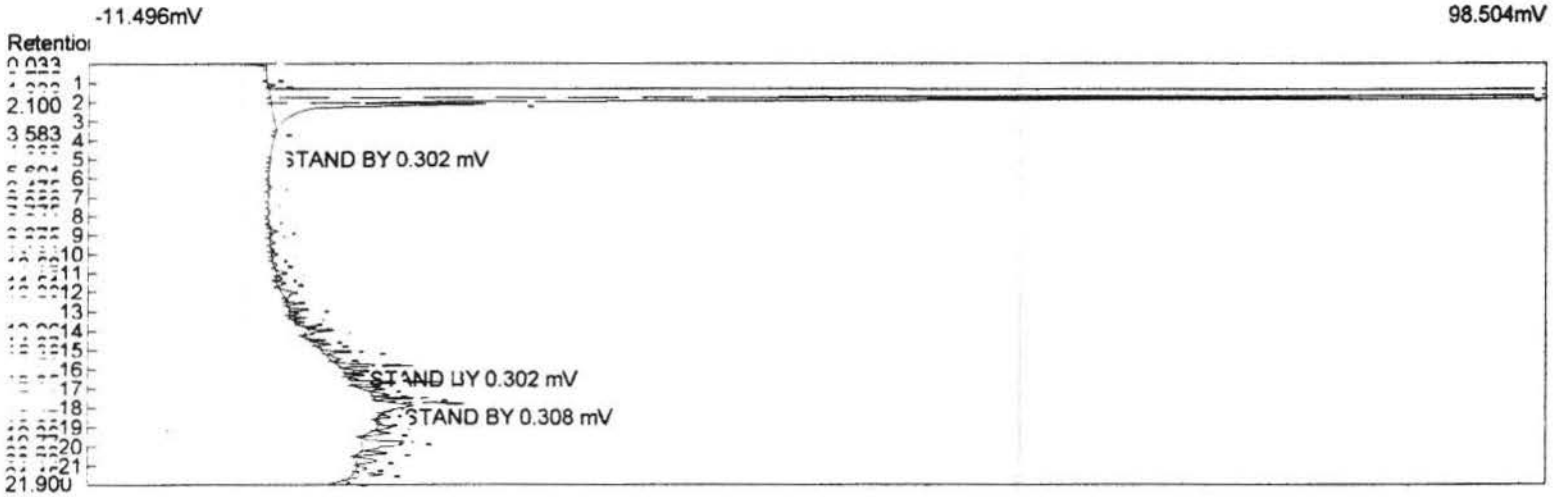
Component	Retention	Area	Internal	Units
		0.000	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/08/1998 13:08:25
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0708FB6.CHR ()
Sample: 2842-SB4/0707CH2
Operator: JMP



Component	Retention	Area	External	Units
		0.000	0.00	

Lab name: TEG Puerto Rico
Analysis date: 07/08/1998 13:38:37
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0708FA7.CHR ()
Sample: 2842-Dup.-1 JKS
Operator: JMP



Component	Retention	Area	Internal	Units
		0.000	0.0000	

teg

QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0707CH2
DAILY CALIBRATION DATE: 7/17/98

CH2M HILL
PROJECT NAME: SITE 2842

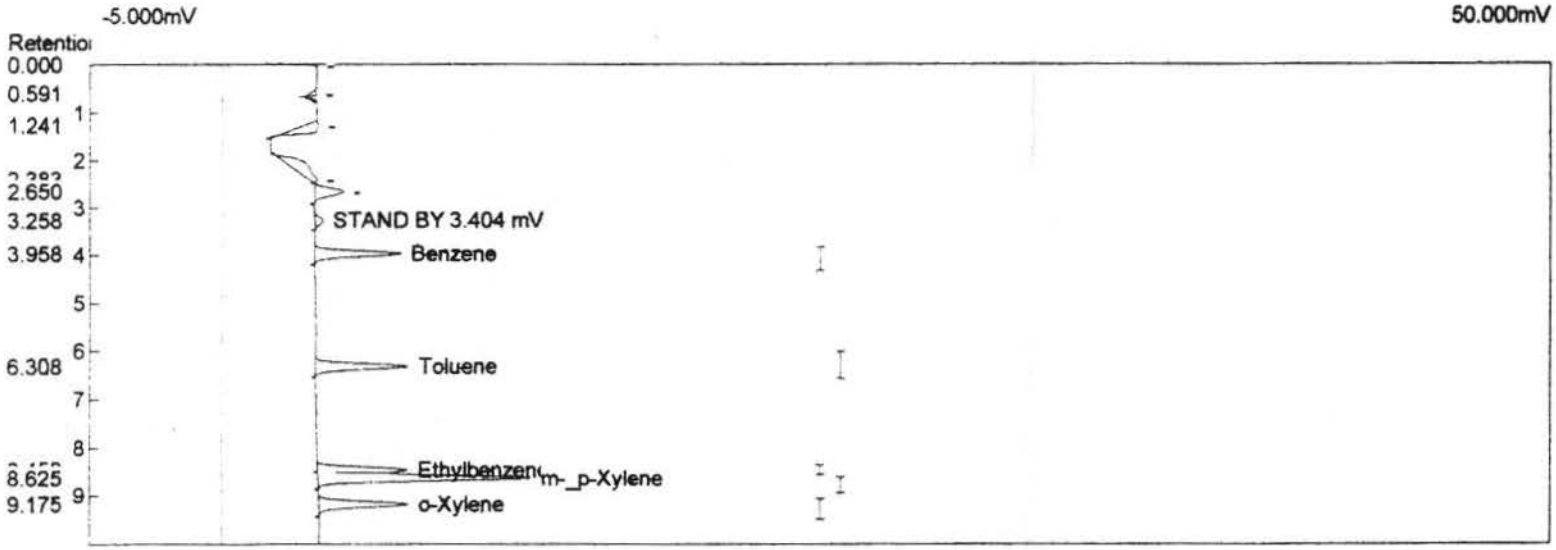
			INITIAL		OPENING			CLOSING		
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	AREA	RF	%DIFF	AREA	RF	%DIFF
BENZENE	PID #1	0.100 - 10.000	26	7.1%	26.33	26.33	0.0%	24.00	24.00	8.8%
TOLUENE	PID #1	0.100 - 10.000	27	4.9%	27.66	27.66	2.9%	26.64	26.64	0.9%
ETHYLBENZENE	PID #1	0.100 - 10.000	23	9.0%	23.82	23.82	3.6%	24.24	24.24	5.4%
m&p-XYLENES	PID #1	0.100 - 10.000	33	9.9%	66.50	33.25	0.5%	68.01	34.01	1.8%
o-XYLENES	PID #1	0.100 - 10.000	27	8.9%	27.65	27.65	1.6%	27.32	27.32	0.4%
BENZENE	PID #2	0.100 - 10.000	31	7.3%	29.43	29.43	5.1%	31.08	31.08	0.3%
TOLUENE	PID #2	0.100 - 10.000	32	8.4%	32.30	32.30	0.9%	29.58	29.58	7.6%
ETHYLBENZENE	PID #2	0.100 - 10.000	26	5.2%	24.02	24.02	7.6%	25.25	25.25	2.9%
m&p-XYLENES	PID #2	0.100 - 10.000	37	3.8%	75.95	37.98	2.6%	74.01	37.01	0.0%
o-XYLENES	PID #2	0.100 - 10.000	31	2.6%	31.79	31.79	2.5%	33.70	33.70	8.7%

CALIB RANGE - RANGE OF CALIBRATION CURVE IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 20% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

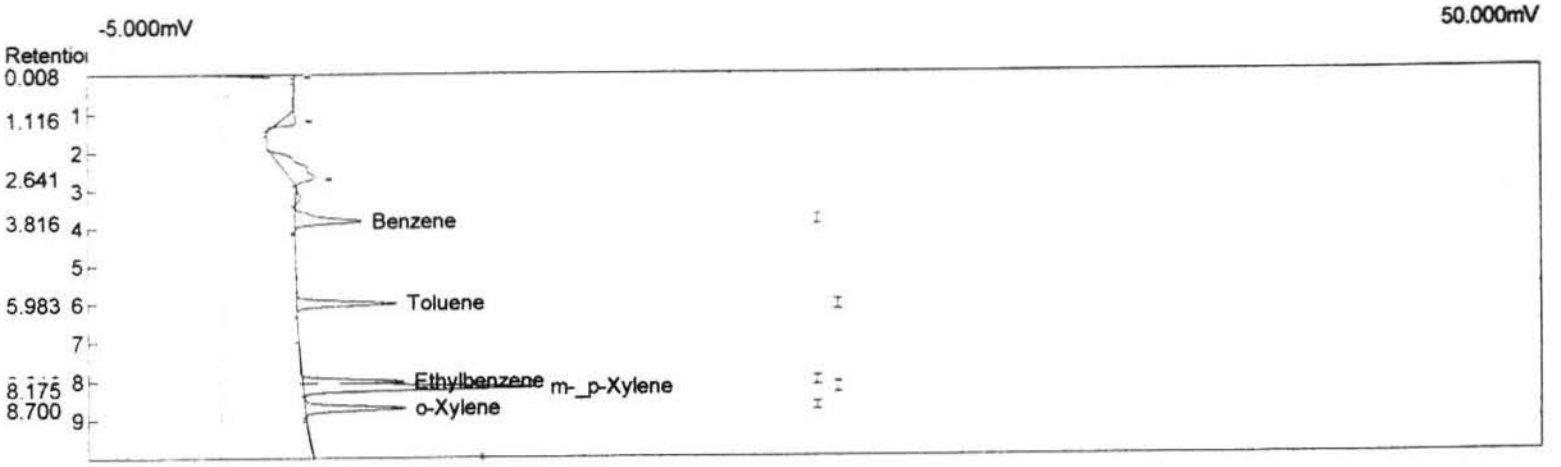
TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 09:21:29
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0717PA1.CHR ()
Sample: 1 ppm BTEX OPEN
Operator: JMP



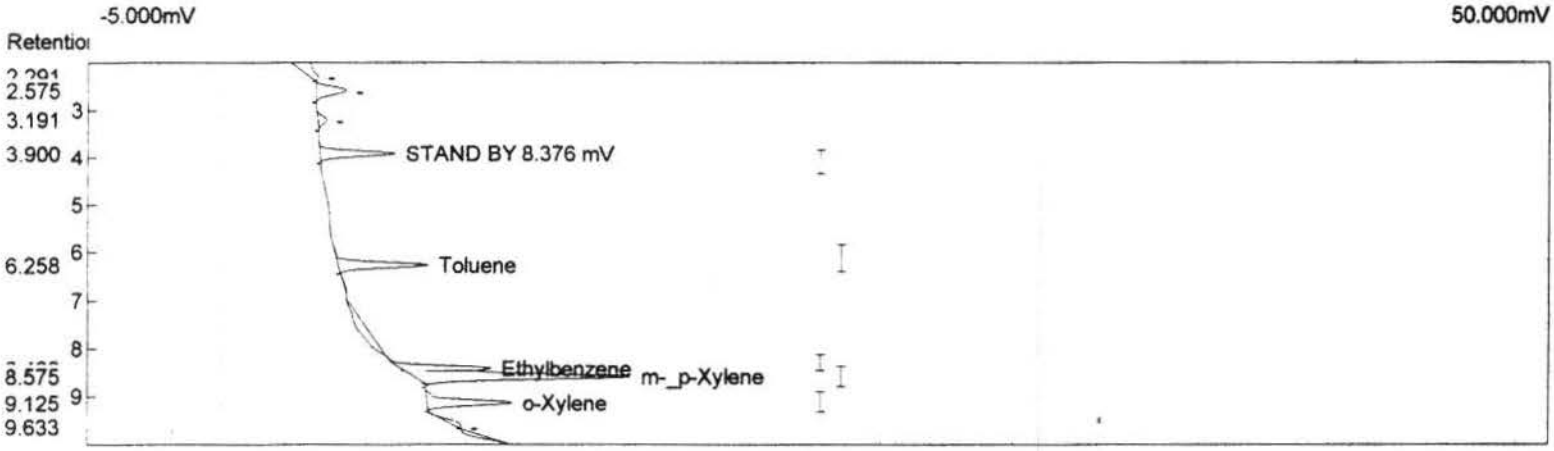
Component	Retention	Area	External	Internal	Units
Benzene	3.958	26.328	1.01	1.0126	ppm
Toluene	6.308	27.662	0.93	0.9258	ppm
Ethylbenzene	8.458	23.820	1.04	1.0356	ppm
m-_p-Xylene	8.625	66.497	2.02	2.0151	ppm
o-Xylene	9.175	27.648	1.02	1.0240	ppm
		171.954	6.01	6.0131	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 09:21:29
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: C:\PEAKWIN\0707PB34.CHR ()
Sample: 1 ppm BTEX OPEN
Operator: JMP



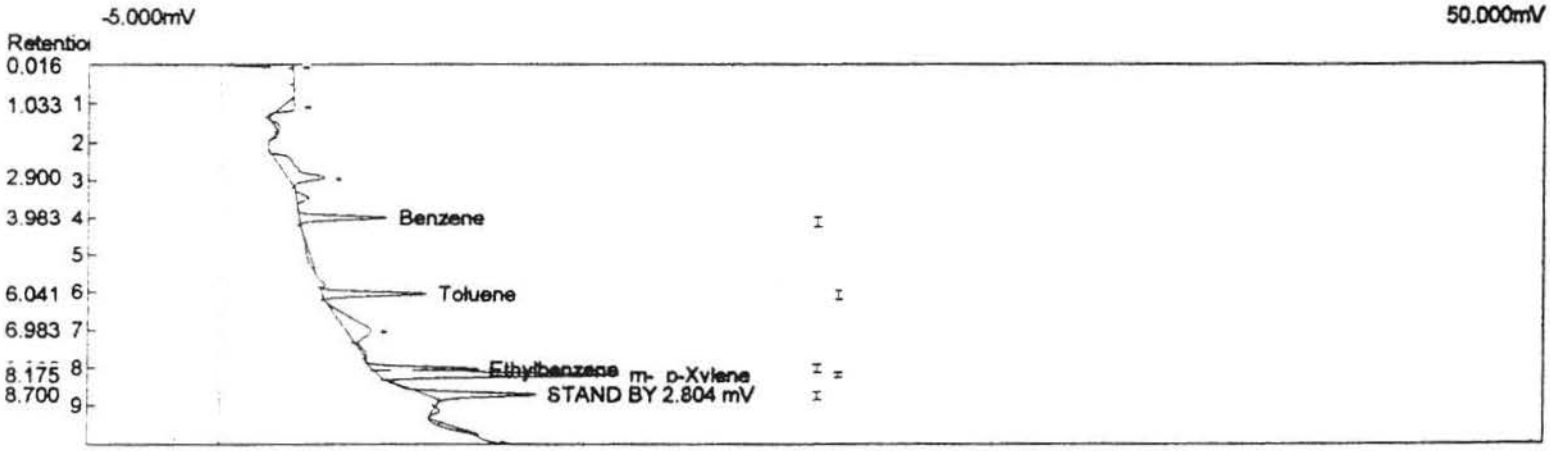
Component	Retention	Area	External	Internal	Units
Benzene	3.816	29.429	0.95	0.9537	ppm
Toluene	5.983	32.300	1.02	1.0211	ppm
Ethylbenzene	8.016	24.017	0.86	0.8564	ppm
m-_p-Xylene	8.175	75.947	2.00	2.0049	ppm
o-Xylene	8.700	31.793	1.03	1.0339	ppm
		193.486	5.87	5.8700	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 17:54:17
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: C:\PEAKWIN\0717PA16.CHR ()
Sample: CLOSE STD
Operator: map



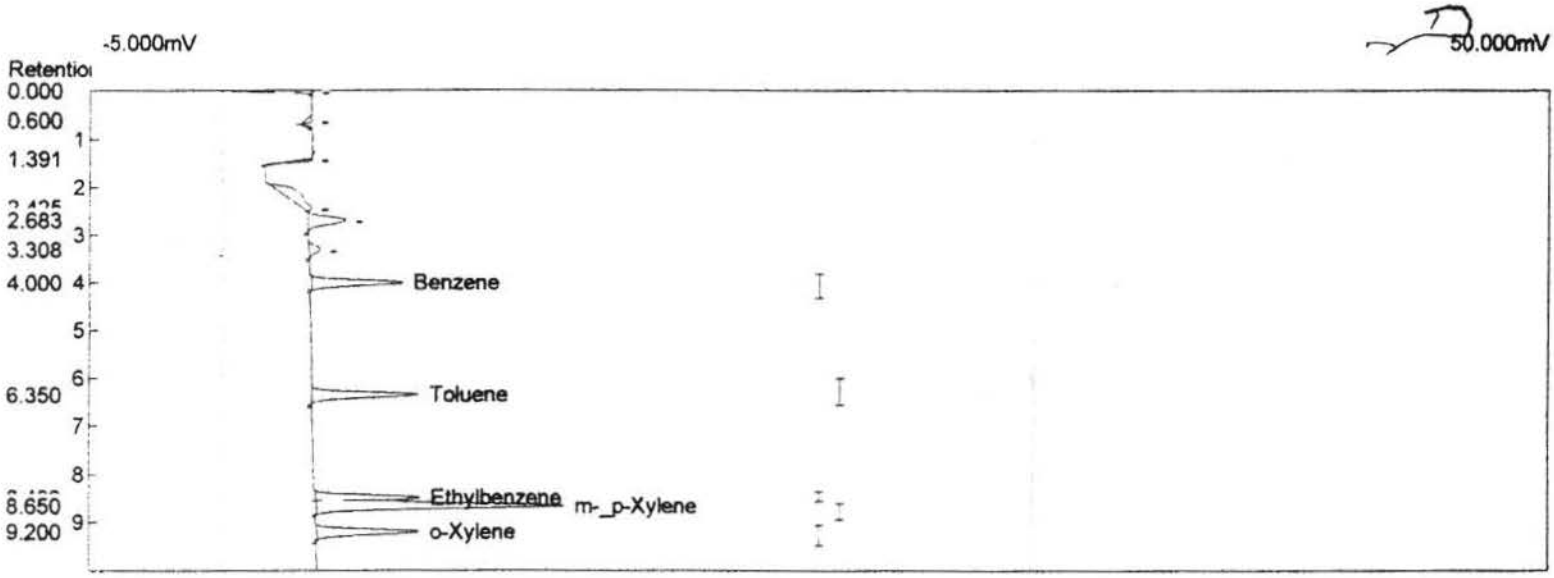
Component	Retention	Area	External	Internal	Units
Benzene	3.900	24.000	0.92	0.9231	ppm
Toluene	6.258	26.635	0.99	0.9905	ppm
Ethylbenzene	8.408	24.238	1.05	1.0538	ppm
m-_p-Xylene	8.575	68.005	2.06	2.0608	ppm
o-Xylene	9.125	27.316	1.01	1.0117	ppm
		170.194	6.04	6.0398	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 17:54:17
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0717PB16.CHR ()
Sample: CLOSE STD
Operator: map



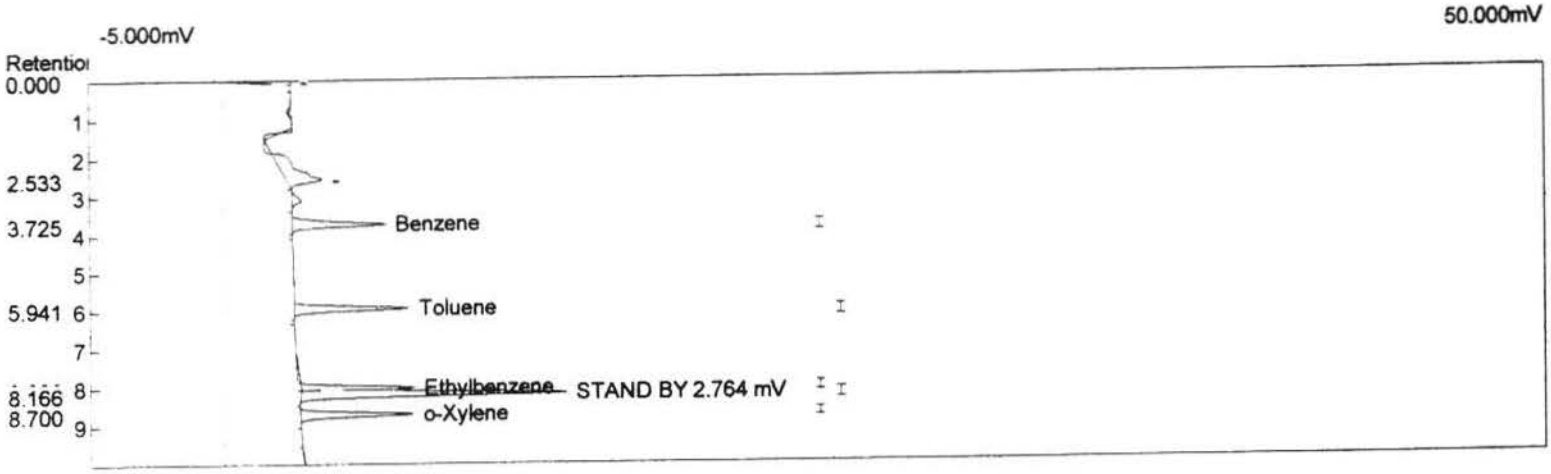
Component	Retention	Area	External	Internal	Units
Benzene	3.983	31.084	1.01	1.0073	ppm
Toluene	6.041	29.576	0.94	0.9350	ppm
Ethylbenzene	8.025	25.254	0.90	0.9005	ppm
m-_p-Xylene	8.175	74.009	1.95	1.9537	ppm
o-Xylene	8.700	33.703	1.10	1.0961	ppm
		193.626	5.89	5.8926	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 10:12:56
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0717PA2.CHR ()
Sample: matrix spike
Operator: JMP



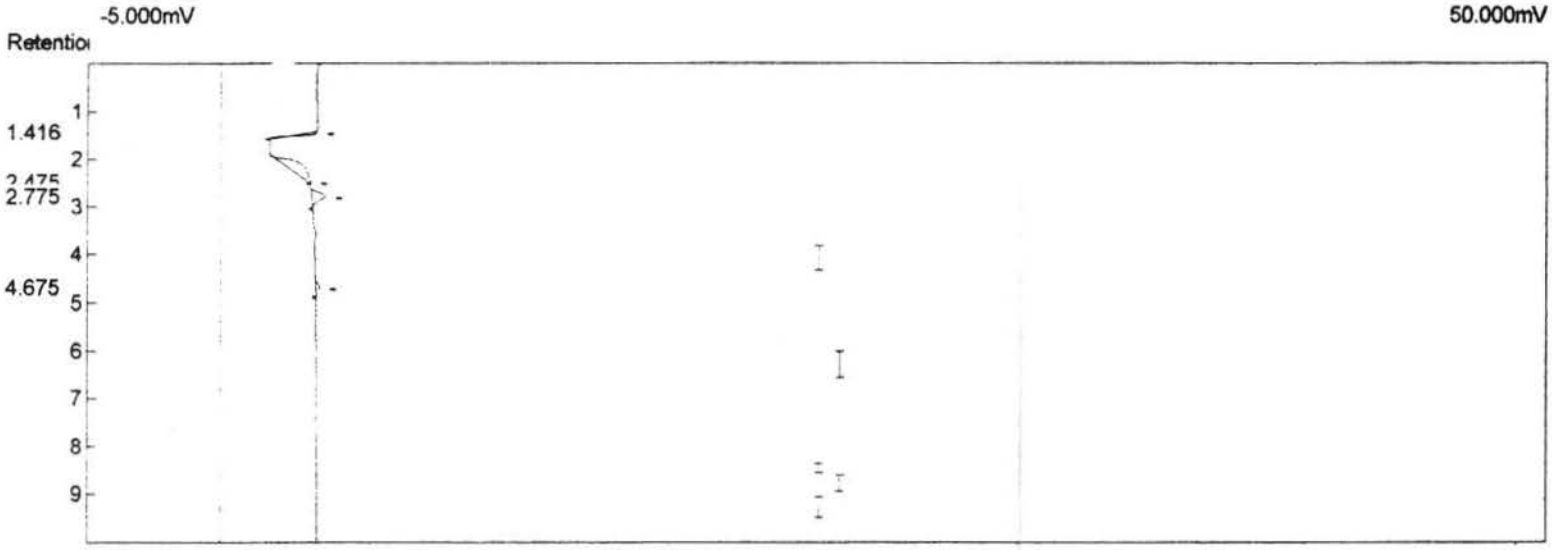
Component	Retention	Area	External	Internal	Units
Benzene	4.000	27.760	1.07	1.0677	ppm
Toluene	6.350	31.732	1.06	1.0620	ppm
Ethylbenzene	8.483	27.636	0.96	0.9613	ppm
m-_p-Xylene	8.650	75.567	2.29	2.2899	ppm
o-Xylene	9.200	29.849	1.15	1.1498	ppm
		192.545	6.53	6.5306	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 10:12:56
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0717PB2.CHR ()
Sample: matrix spike duplicate
Operator: JMP



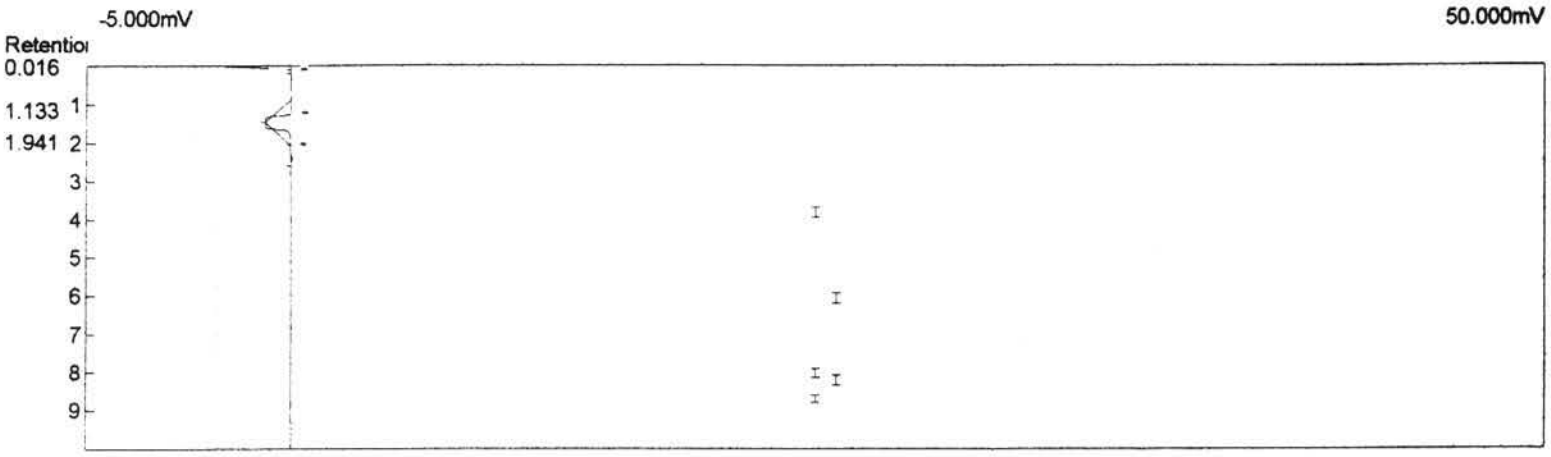
Component	Retention	Area	External	Internal	Units
Benzene	3.725	32.307	1.05	1.0469	ppm
Toluene	5.941	35.590	1.13	1.1251	ppm
Ethylbenzene	8.008	26.774	0.95	0.9547	ppm
m-_p-Xylene	8.166	81.728	2.16	2.1575	ppm
o-Xylene	8.700	34.172	1.11	1.1113	ppm
		210.572	6.40	6.3956	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 11:15:50
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0717PA3.CHR ()
Sample: method blank
Operator: JMP



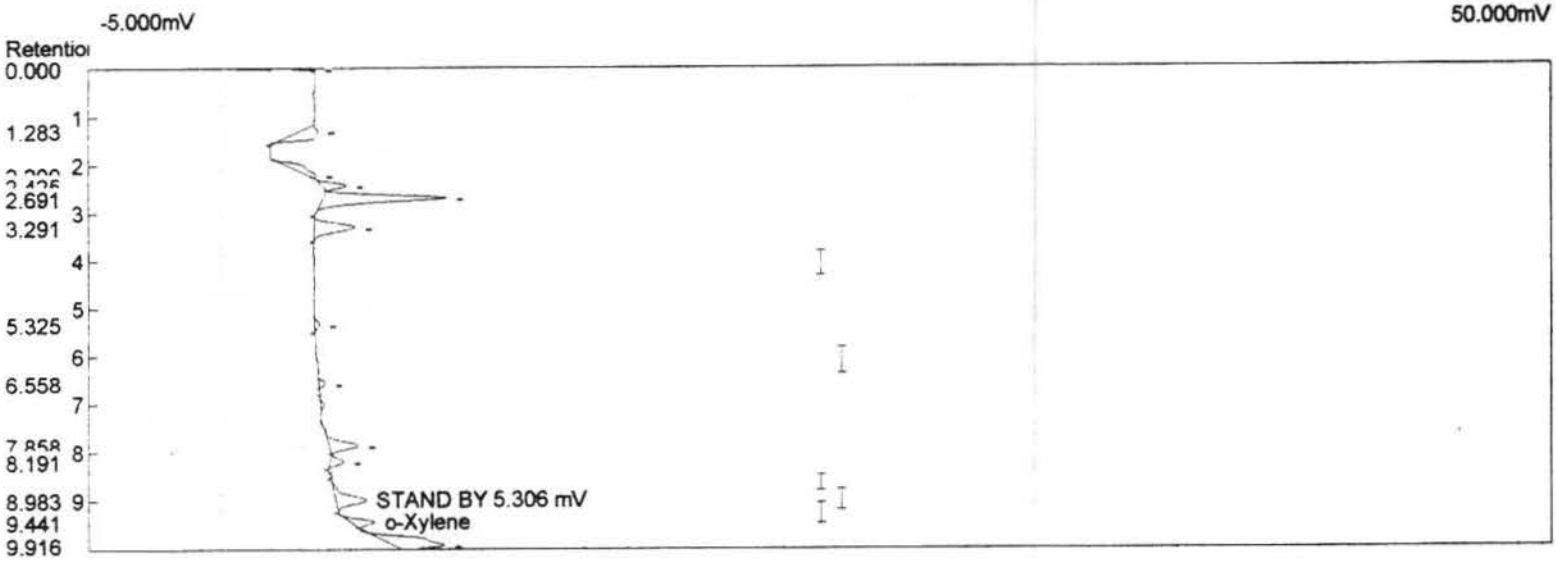
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 11:15:50
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0717PB3.CHR ()
Sample: method blk
Operator: JMP



Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Analysis date: 07/17/1998 17:11:12
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0717PA13.CHR ()
Sample: 2842sb1@4-6/0707ch2
Operator: map

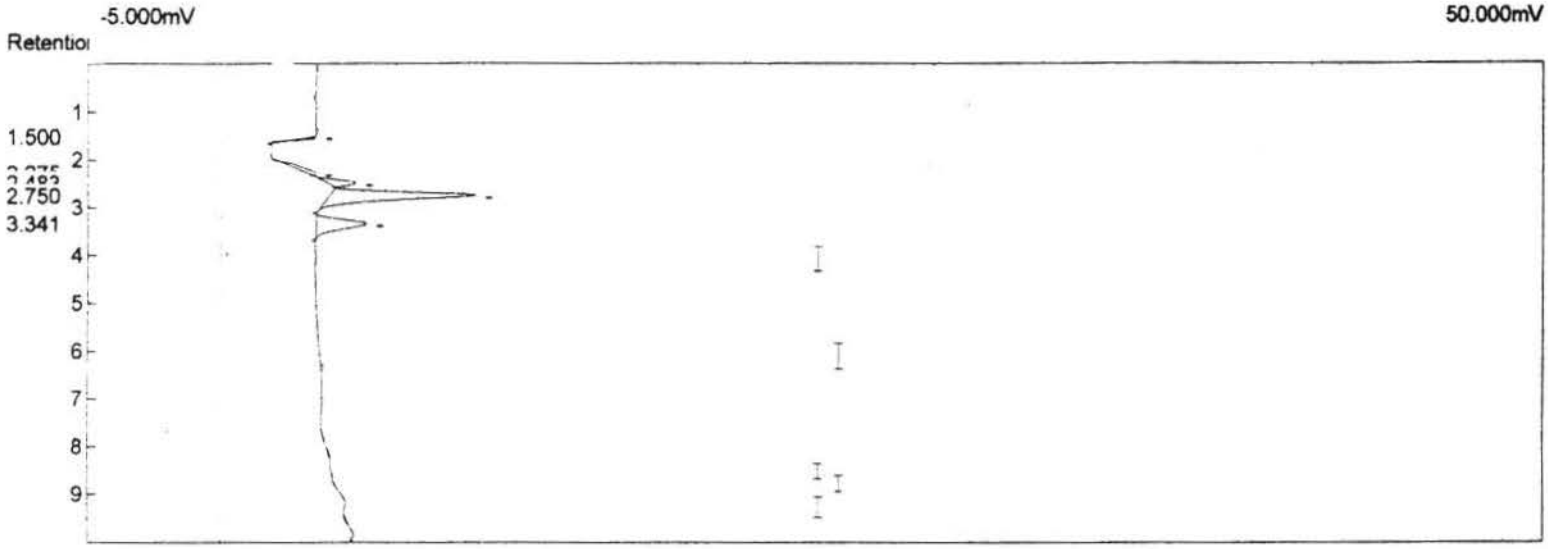


Component	Retention	Area	External	Internal	Units
m-_p-Xylene	8.983	15.508	0.47	0.4699	ppm
o-Xylene	9.441	7.152	0.26	0.2649	ppm
		22.660	0.73	0.7348	

ND

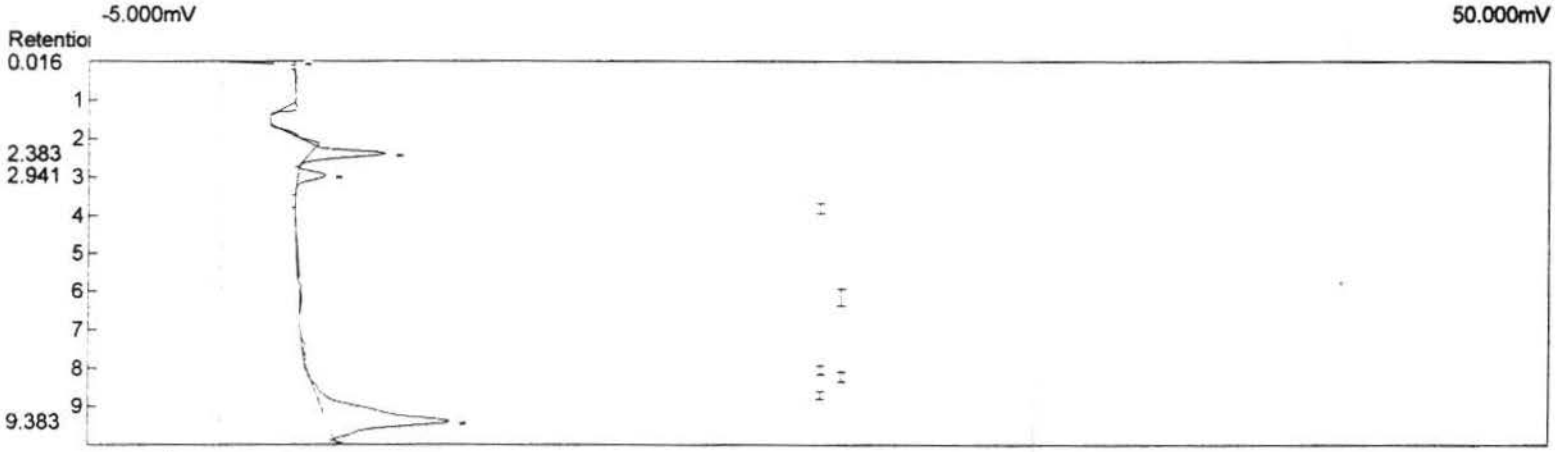
KR

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 16:49:58
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0717PA12.CHR ()
Sample: 2842sb2@4-6/0707ch2
Operator: map



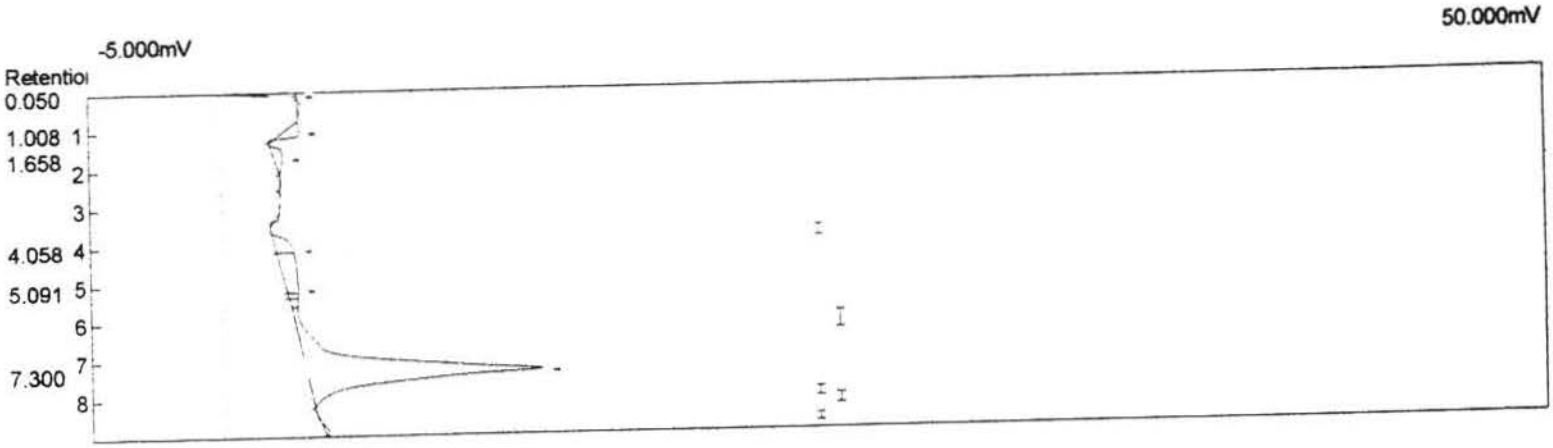
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 16:49:58
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0717PB12.CHR ()
Sample: 2842sb3@4-6/0707ch2
Operator: map



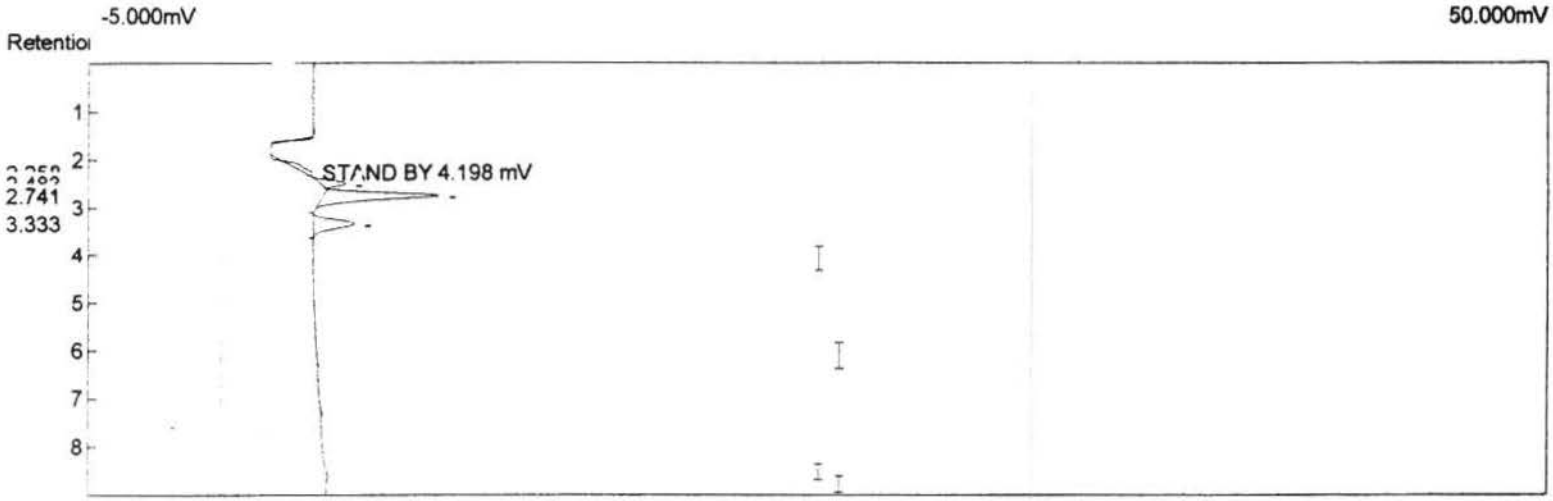
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 16:29:09
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0717PB11.CHR ()
Sample: bk
Operator: map



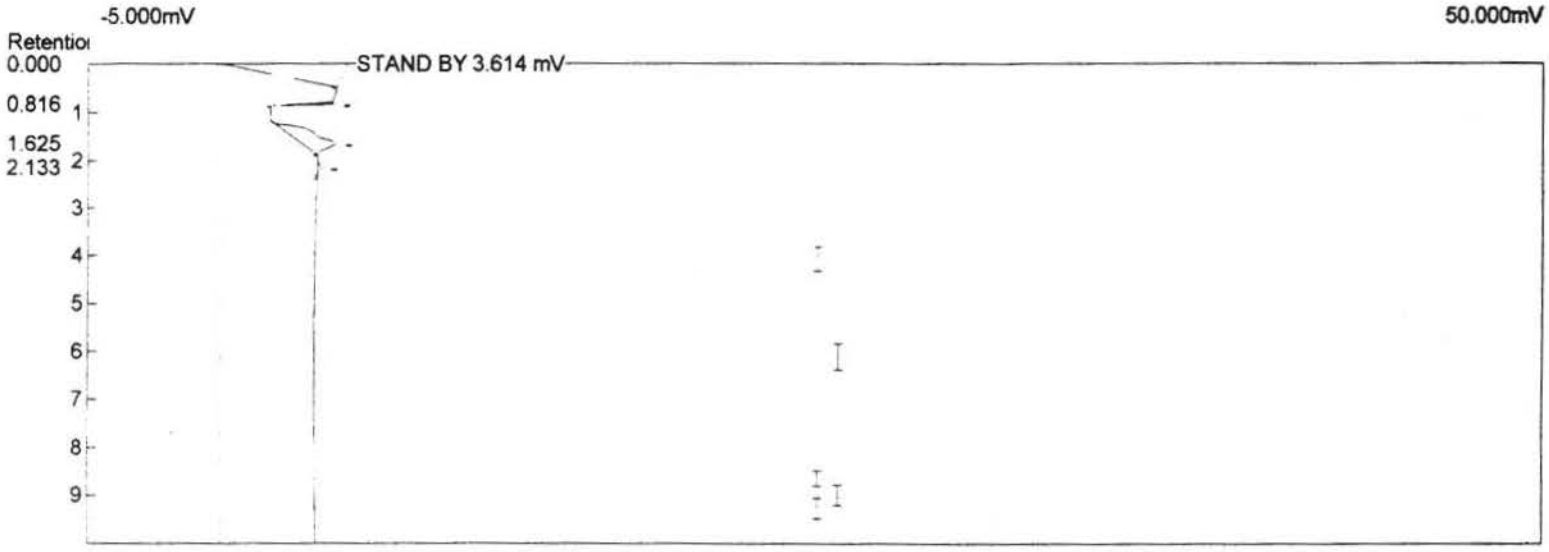
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 16:29:09
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0717PA11.CHR ()
Sample: 2842sb4@4-6/0707ch2
Operator: map



Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

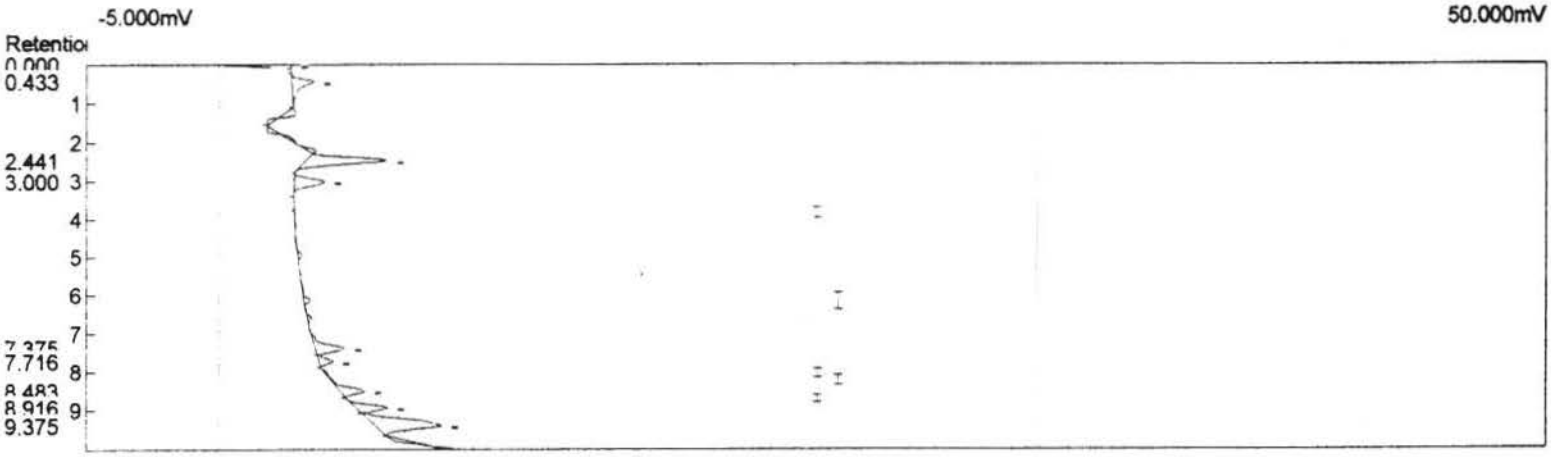
Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 17:25:16
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0717PA14.CHR ()
Sample: 2842sb4@4-6/0707ch2R
Operator: map



Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

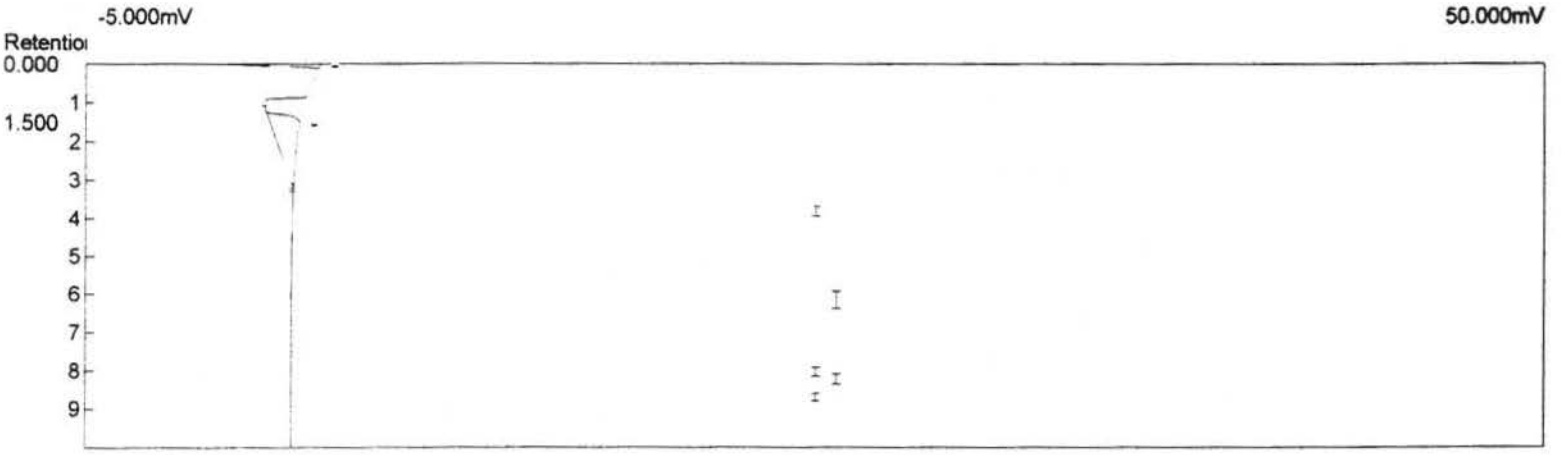
Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 17:11:12
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0717PB13.CHR ()
Sample: ~~2842DUPE~~/0707ch2
Operator: map

2842 DUPE-1 JKS



Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 17:25:16
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0717PB14.CHR ()
Sample: TRIP/0707ch2
Operator: map



Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

teg Transglobal Environmental Geochemistry

Chain of Custody Record

PO # _____

000582

Client: CH2M HILL

Address

Phone (787)888-8713 FAX

Client Project # Project Manager MARTY CLASEN/EPA

Date 7/7/98 Page 1 of 1

TEG Project # 98I0707CH2 Outside Lab.#

Location Roosevelt Roads

Collector MIKE WEATHERBY/GNV Date of Collection 7/6-7/98

Sample #	Depth	Time	Sample Type	Container Type	VOA 8010	VOA 8020 (BTEX)	VOA 8260	SEMI VOL 8270	TRPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (gas & diesel)	TPH 8015 (oil)	PNA 610/8100	TOTAL LEAD	pH	METALS	RCI							FIELD NOTES / PRESERVATION	Total # of Containers
1/6 2842-SB1	4'-6'	1420	SOIL	2oz		1			1	1							HIGH	ODOR							24 TAT POISM GRO ONLY	3
1/6 2842-SB2	4'-6'	1620	SOIL	2oz		1			1	1																3
1/6 2842-DUPE1	4'-6'	—	SOIL	2oz		1			1	1																3
1/7 2842-SB3	4'-6'	1130	SOIL	2oz		1			1	1																3
1/7 2842-SB4	4-6	1430	SOIL	2oz		1			1	1																3
TRIP BLANK	—	—	WATER	40ml		1																				1
																										16

RELINQUISHED BY (signature)	Date/Time	RECEIVED BY (signature)	Date/Time
Michael L. Weatherby	7/7/98	Pauline Martin	6:45pm 070798
RELINQUISHED BY (signature)	Date/Time	RECEIVED BY (signature)	Date/Time

Total # of containers	16
Chain of Custody seals Y / N / NA	NA
Seals intact? Y / N / NA	NA
Received good conditions / cold	Y

TEMPERATURE 4°

Sample disposal instructions: ____ TEG Disposal @ $2.00 each ____ Return to client ____ Pickup

teg

The World Leader In On-Site Sampling and Analysis

July 19, 1998
TEG Project #98I0717CH2

Mr. Marty Clasen
CH2M HILL
4350 W. Cypress Street, Suite 600
Tampa, Florida 33607

SUBJECT: DATA REPORT - CH2M HILL PROJECT NO. 146801.US.SC SITE #2842

Dear Marty,

Please find enclosed the analytical report for the samples collected by CH2M HILL personnel from the above-referenced site and delivered to TEG under the proper chain-of-custody protocol. TEG's Puerto Rico certified-chemist performed the following analyses:

- 2 soil samples analyzed for TRPH by modified EPA test method 418.1.
- 2 water samples analyzed for TRPH by modified EPA test method 418.1.
- 2 soil samples analyzed for TPH-gas/diesel by modified EPA test method 8015.
- 2 water samples analyzed for TPH-gas/diesel by modified EPA test method 8015.
- 2 soil samples analyzed for BTEX by modified EPA test method 8020.
- 2 water samples analyzed for BTEX by modified EPA test method 8020.
- 1 equipment blank water sample analyzed for TPH-gas/diesel, TRPH and BTEX.
- 1 trip blank water sample analyzed for TPH-gas/diesel.
- Laboratory QA/QC analyses for TPH-gas/diesel, TRPH and BTEX.

The analytical results are summarized in the attached table. Applicable detection limits, QA/QC data, chromatograms, a chain-of-custody and an invoice are attached.

TEG appreciates the opportunity to provide analytical services for this project. If you have any questions relating to the data or report, please do not hesitate to contact us.

Sincerely,
TEG

Kevin Shelburne

Kevin Shelburne
Principal

Attachments

The World Leader In On-Site Sampling and Analysis

CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVY BASE, SITE 2842
CEIBA, P. R.

TEG Project #98I0717CH2

TRPH (EPA Method 418.1) ANALYSES OF SOIL

SAMPLE NUMBER	DATE ANALYZED	TRPH (mg/kg)
METHOD BLANK	7/17/98	ND
2842-SB17 @ 4'-6'	7/17/98	91
2842-SB18 @ 2'-4'	7/17/98	79
DETECTION LIMIT (mg/kg)		10

TRPH (EPA Method 418.1) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	TRPH (mg/L)
METHOD BLANK	7/17/98	ND
2842-SB17	7/17/98	ND
2842-SB18	7/17/98	ND
2842-EB6	7/17/98	ND
DETECTION LIMIT (mg/L)		10

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT
mg/L = MILLIGRAMS PER LITER
mg/kg = MILLIGRAMS PER KILOGRAM
CONCENTRATIONS BASED ON DRY WEIGHT
ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

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CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVY BASE, SITE 2842
CEIBA, P. R.

TEG Project #98I0717CH2

TPH (DOHS Mod. EPA Method 8015) ANALYSES OF SOIL

SAMPLE NUMBER	DATE ANALYZED	TPH-GAS C5-C12 (mg/kg)	TPH-DIESEL C13-C24 (mg/kg)
METHOD BLANK	7/17/98	ND	ND
2842-SB17 @ 4'-6'	7/17/98	ND	ND
2842-SB18 @ 2'-4'	7/17/98	ND	ND
DETECTION LIMIT (mg/kg)		10	25

TPH (DOHS Mod. EPA Method 8015) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	TPH-GAS C5-C12 (mg/L)	TPH-DIESEL C13-C24 (mg/L)
METHOD BLANK	7/17/98	ND	ND
2842-SB17	7/17/98	ND	ND
2842-SB18	7/17/98	ND	ND
2842-TRIP BLANK	7/17/98	ND	ND
2842-EB6	7/17/98	ND	ND
DETECTION LIMIT (mg/L)		10	25

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT
CONCENTRATIONS BASED ON DRY WEIGHT

mg/kg = MILLIGRAMS PER KILOGRAM
mg/L = MILLIGRAMS PER LITER
ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

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CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVY BASE, SITE 2842
CEIBA, P. R.

TEG Project #98I0717CH2

BTEX (Mod. EPA Method 8020) ANALYSES OF SOIL

SAMPLE NUMBER	DATE ANALYZED	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL-BENZENE (mg/kg)	TOTAL XYLENES (mg/kg)
METHOD BLANK	7/17/98	ND	ND	ND	ND
2842-SB17 @ 4'-6'	7/17/98	ND	ND	ND	ND
2842-SB18 @ 2'-4'	7/17/98	ND	ND	ND	ND
DETECTION LIMIT (mg/kg)		0.05	0.05	0.05	0.15

BTEX (Mod. EPA Method 8020) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL-BENZENE (mg/L)	TOTAL XYLENES (mg/L)
METHOD BLANK	7/17/98	ND	ND	ND	ND
2842-SB17	7/17/98	ND	ND	ND	ND
2842-SB17 rep.	7/17/98	ND	ND	ND	ND
2842-SB18	7/17/98	ND	ND	ND	ND
2842-EB6	7/17/98	ND	ND	ND	ND
DETECTION LIMIT (mg/L)		0.05	0.05	0.05	0.15

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
mg/kg = MILLIGRAMS PER KILOGRAM
mg/L = MILLIGRAMS PER LITER
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE
CONCENTRATIONS BASED ON DRY WEIGHT

Marco A. Pedraza
Laboratory Manager

Kevin Shelburne
Principal

A-526126

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QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0717CH2

CH2M HILL

DAILY CALIBRATION DATE : 7/17/98

PROJECT NAME: SITE 2842

			INITIAL		OPENING			CLOSING		
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	ABS	RF	%DIFF	ABS	RF	%DIFF
TRPH	IR	10 - 1,000	764.6	15.7%	0.703	711.2	7.0%	0.704	710.2	7.1%

CALIB RANGE - RANGE OF CALIBRATION CURVE IS IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 20% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
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QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0717CH2
DATE : 7/17/98

CH2M HILL
PROJECT NAME: SITE 2842

COMPOUND	SPK CONC (ppm)	MS CONC (ppm)	%REC MS	MSD CONC (ppm)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
TRPH	500	535	107%	542	108%	1%	15%	80% - 120%

ppm = PARTS PER MILLION
MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE
% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX
RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY: MARCO A. PEDRAZA /JOSE M. PEREZ
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
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QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0717CH2
DAILY CALIBRATION DATE: 7/17/98

CH2M HILL
PROJECT NAME: SITE 2842

			INITIAL			OPENING			CLOSING	
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	AREA	RF	%DIFF	AREA	RF	%DIFF
TPH GASOLINE	FID #1 (gc1)	10 - 40,000	0.50	9.7%	158.89	0.53	6.6%	136.11	0.45	8.7%
TPH GASOLINE	FID #2 (gc1)	10 - 40,000	0.65	8.1%	175.51	0.59	10.4%	205.29	0.68	4.8%
TPH DIESEL	FID #1 (gc1)	25 - 40,000	0.47	8.8%	803.52	0.54	14.7%	792.07	0.53	13.1%
TPH DIESEL	FID #2 (gc1)	25 - 40,000	0.27	5.4%	418.45	0.28	1.8%	421.66	0.28	2.6%

CALIB RANGE - RANGE OF CALIBRATION CURVE IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 15% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

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QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0717CH2

CH2M HILL
PROJECT NAME: SITE 2842

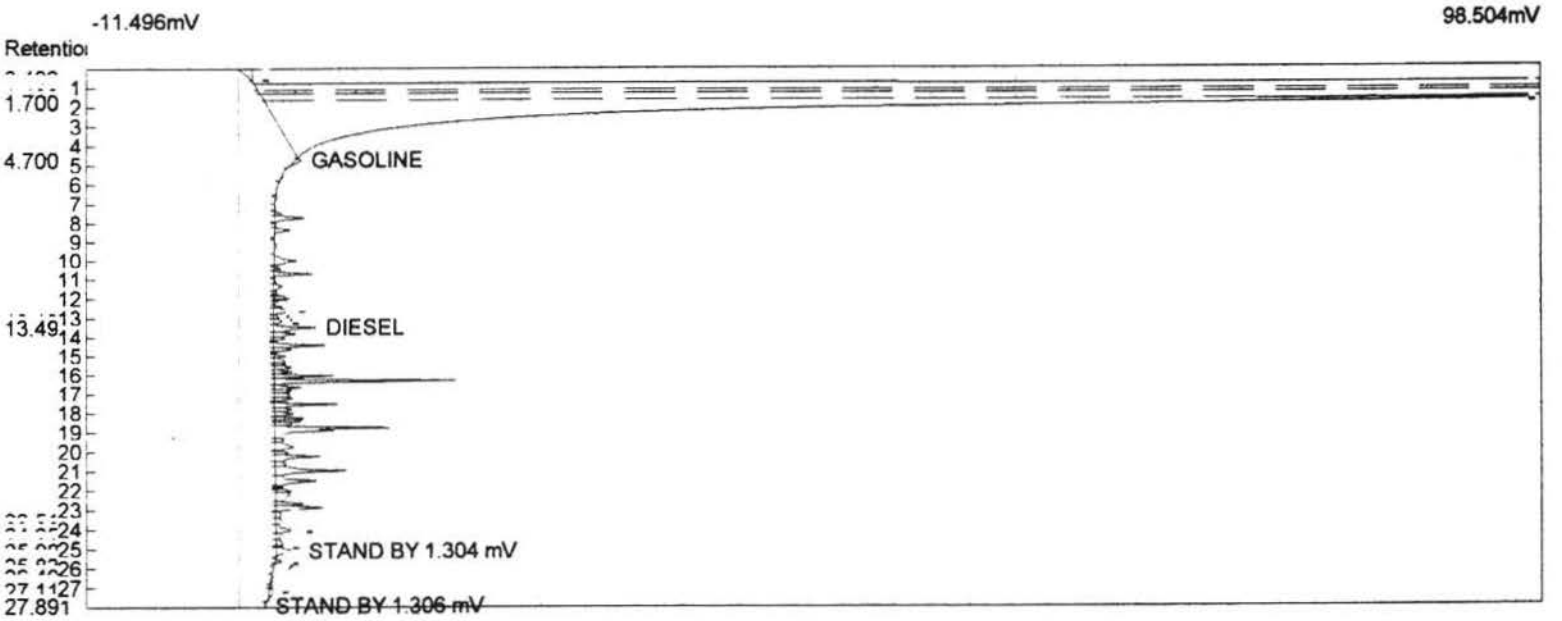
COMPOUND	SPK CON (ppm)	MS CONC (ppm)	%REC MS	MSD CONC (ppm)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
TPH-GAS	100	90	90%	86	86%	5%	15%	80% - 120%
TPH-DIESEL	500	571	114%	546	109%	4%	15%	80% - 120%

ppm = PARTS PER MILLION
MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE
% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX
RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

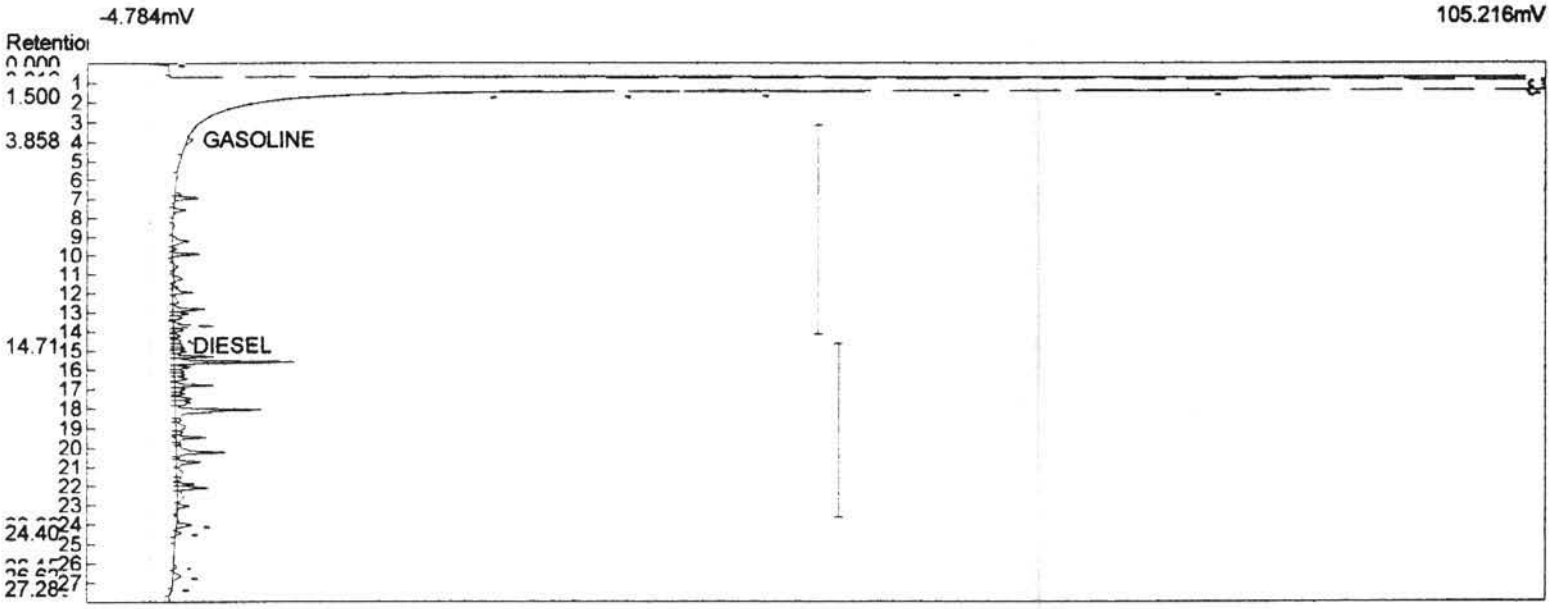
TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 10:15:56
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0717FA1.CHR ()
Sample: 100/500 ppm G/D Open
Operator: JMP



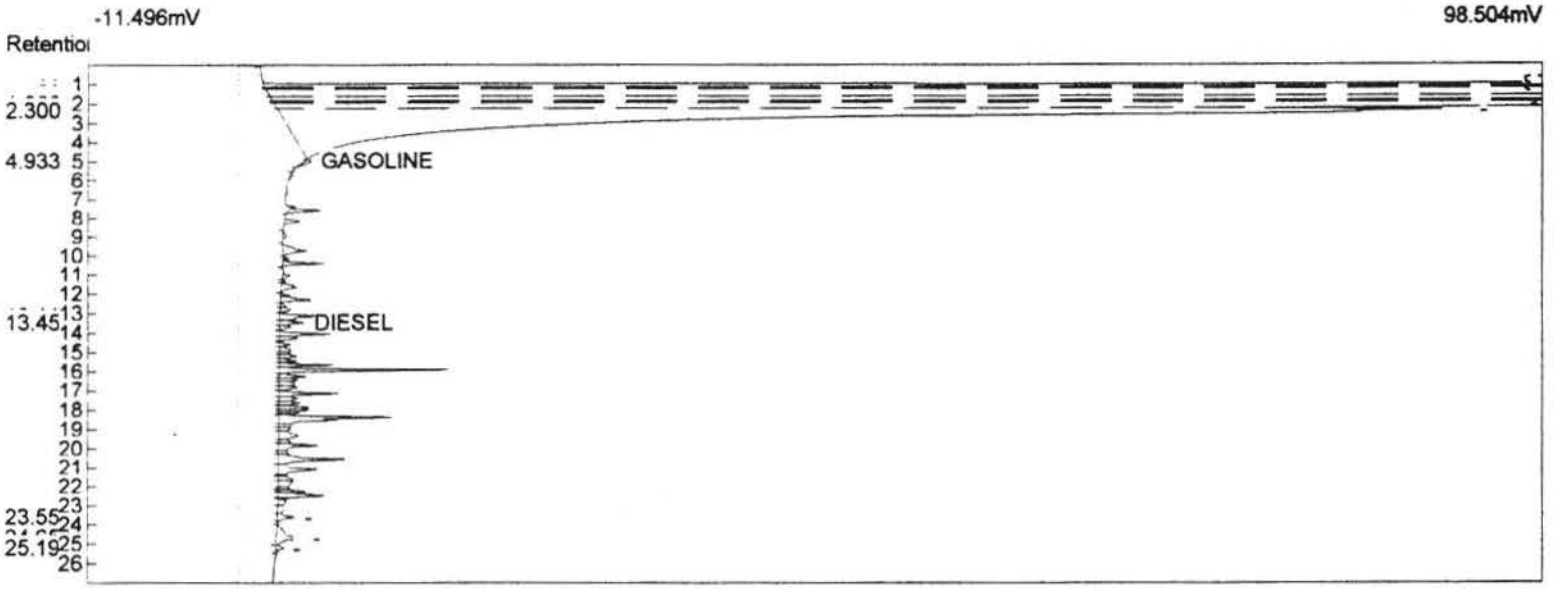
Component	Retention	Area	Internal	Units
GASOLINE	4.700	159.889	107.1290	ppm
DIESEL	13.491	803.515	573.5237	PPM
		963.404	680.6527	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 10:15:56
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0717FB1.CHR ()
Sample: 100/500 ppm G/D Open
Operator: JMP



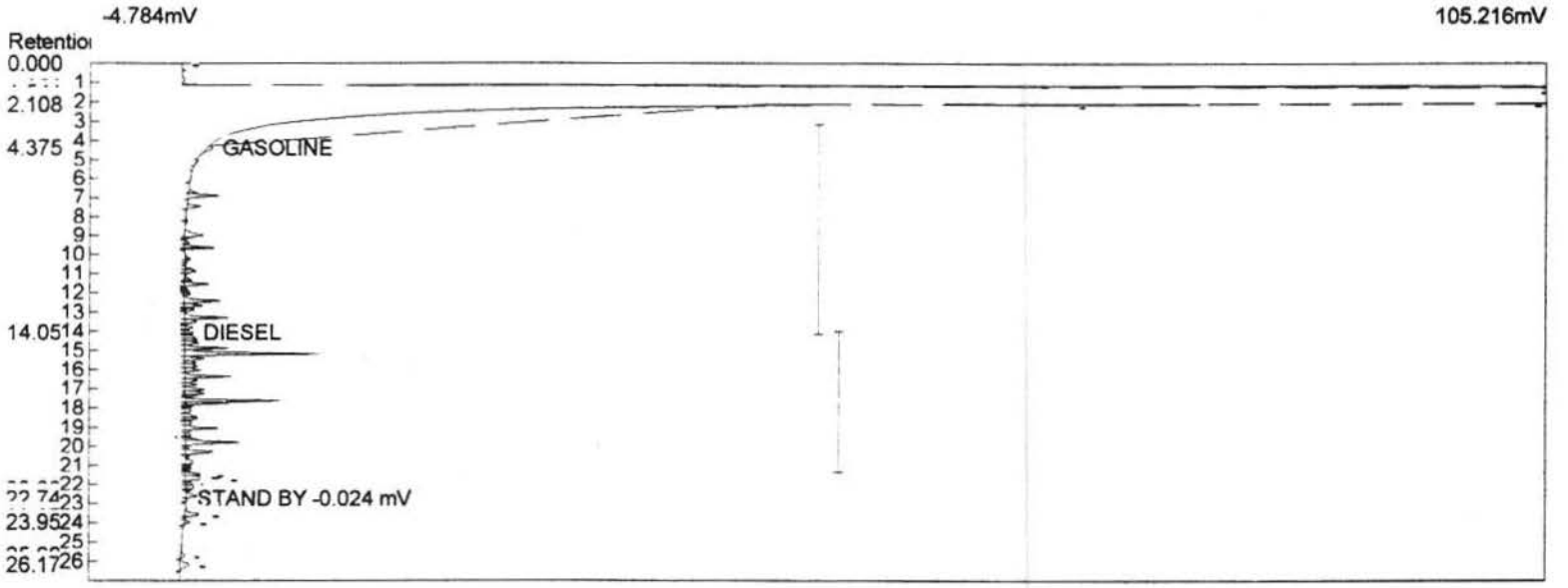
Component	Retention	Area	External	Units
GASOLINE	3.858	175.511	91.38	ppm
DIESEL	14.716	418.446	564.14	PPM
		593.956	655.52	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 16:16:25
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: C:\PEAKWIN\0717FA7.CHR ()
Sample: CLOSE STD
Operator: MAP



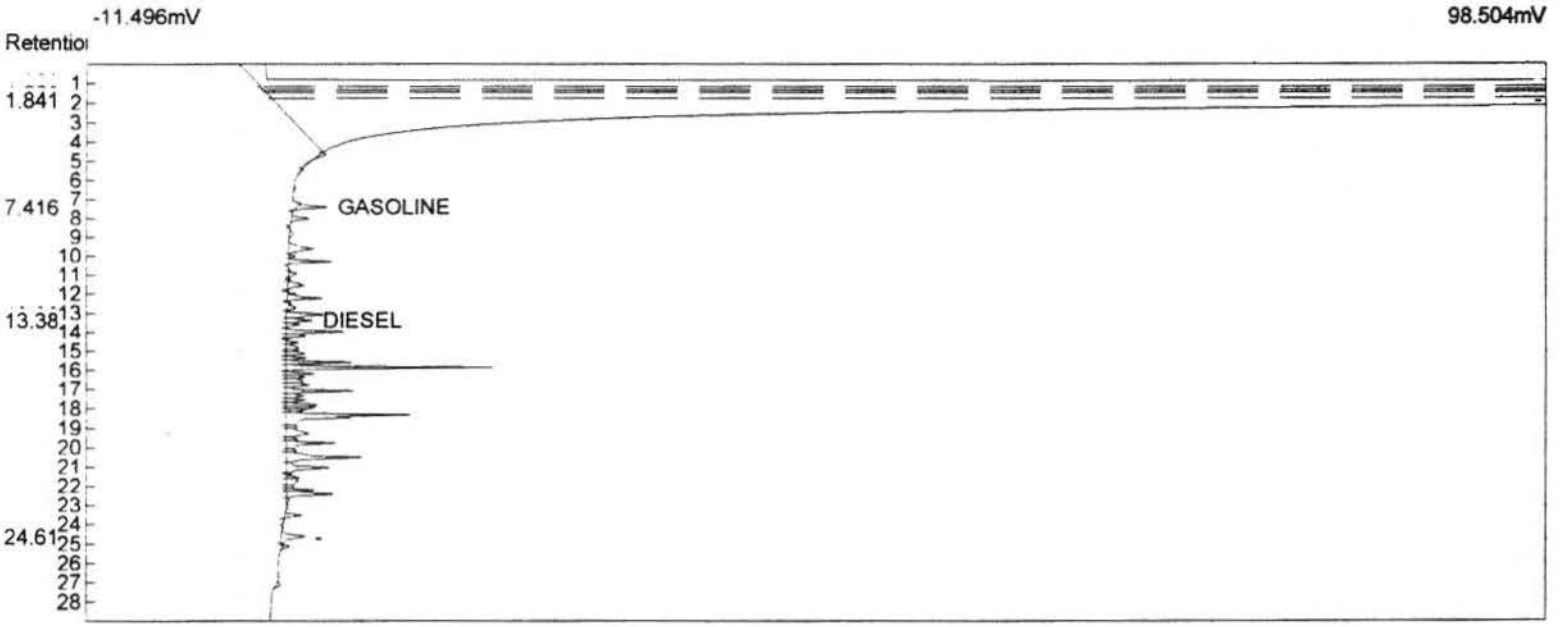
Component	Retention	Area	Internal	Units
G[redacted]LINE	4.933	136.108	91.1951	ppm
D[redacted]L	13.450	792.069	565.3539	PPM
		928.177	656.5490	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 16:16:25
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: C:\PEAKWIN\0717FB7.CHR ()
Sample: CLOSE STD
Operator: MAP



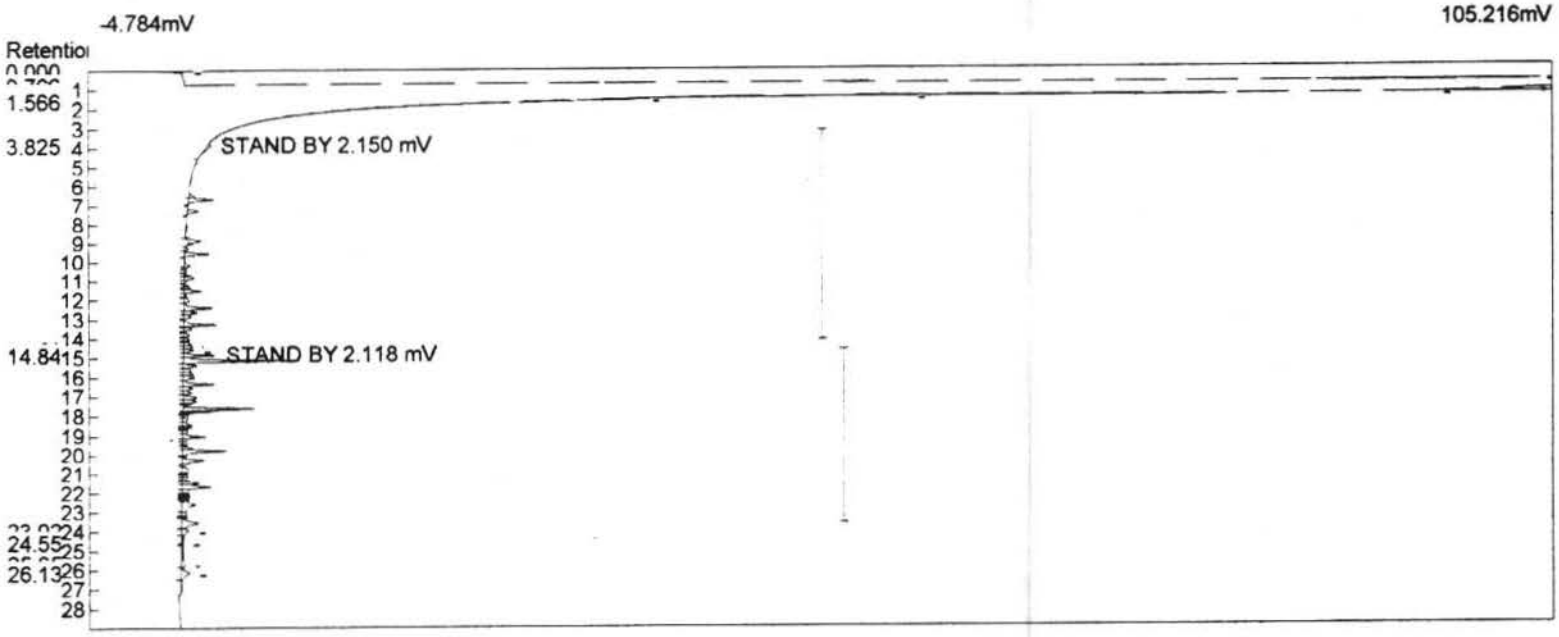
Component	Retention	Area	External	Units
GASOLINE	4.375	205.285	106.89	ppm
DIESEL	14.050	421.662	568.48	PPM
		626.947	675.36	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 15:40:46
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: C:\PEAKWIN\0717FA6.CHR ()
Sample: matrix spike
Operator: MAP



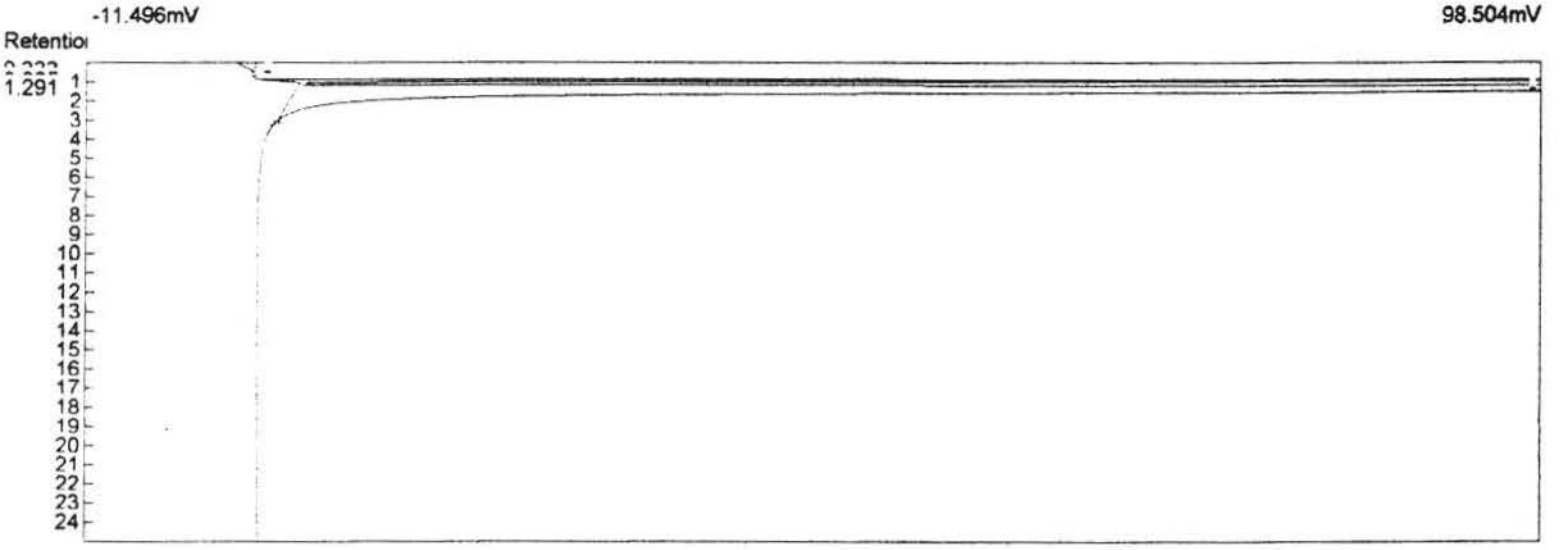
Component	Retention	Area	Internal	Units
GASOLINE	7.416	134.839	90.3445	ppm
DIESEL	13.383	799.854	570.9106	PPM
		934.692	661.2551	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 15:40:46
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: C:\PEAKWIN\0717FB6.CHR ()
Sample: matrix spike duplicate
Operator: MAP



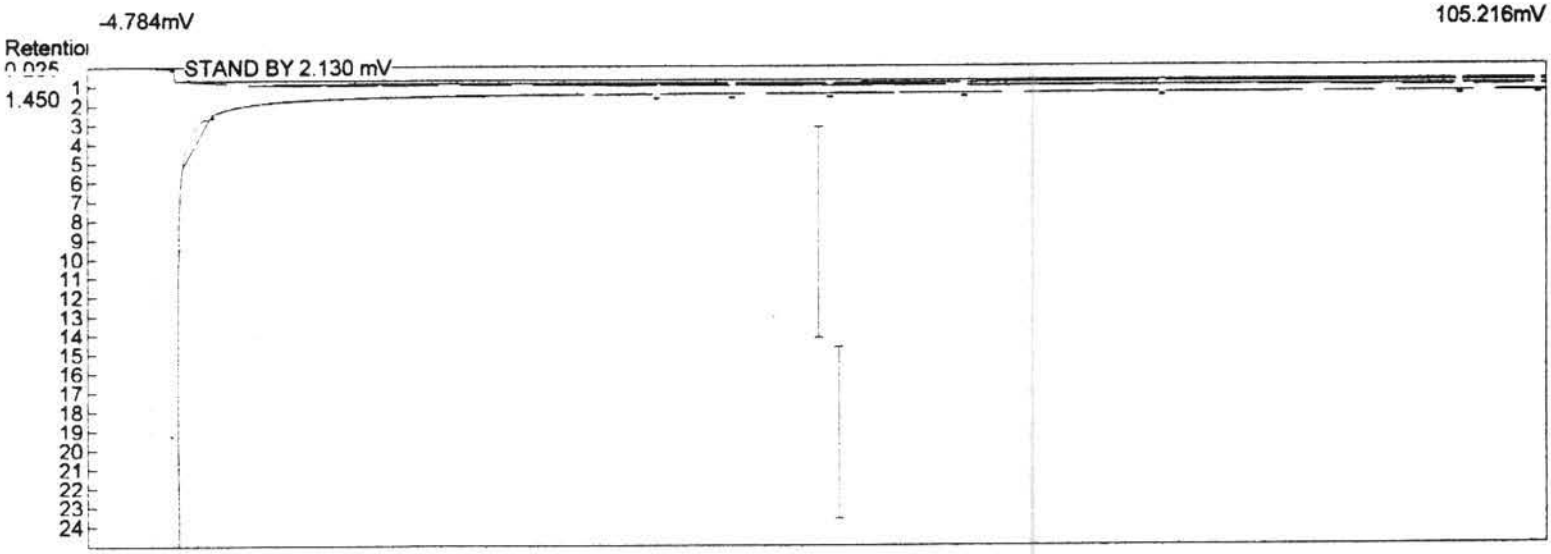
Component	Retention	Area	External	Units
GASOLINE	3.825	165.534	86.19	ppm
DIESEL	14.841	405.186	546.26	PPM
		570.720	632.45	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 11:07:32
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0717FA2.CHR ()
Sample: method blank
Operator: JMP



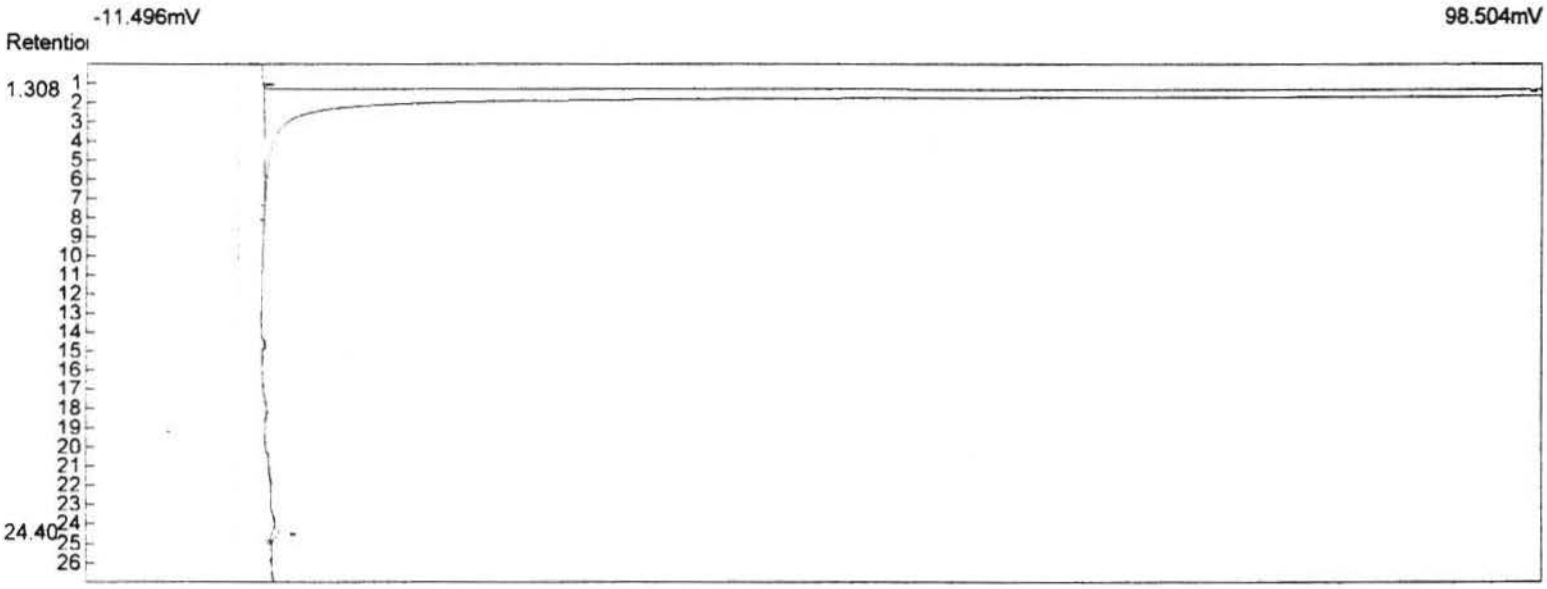
Component	Retention	Area	Internal	Units
		0.000	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 11:07:32
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0717FB2.CHR ()
Sample: method blank
Operator: JMP



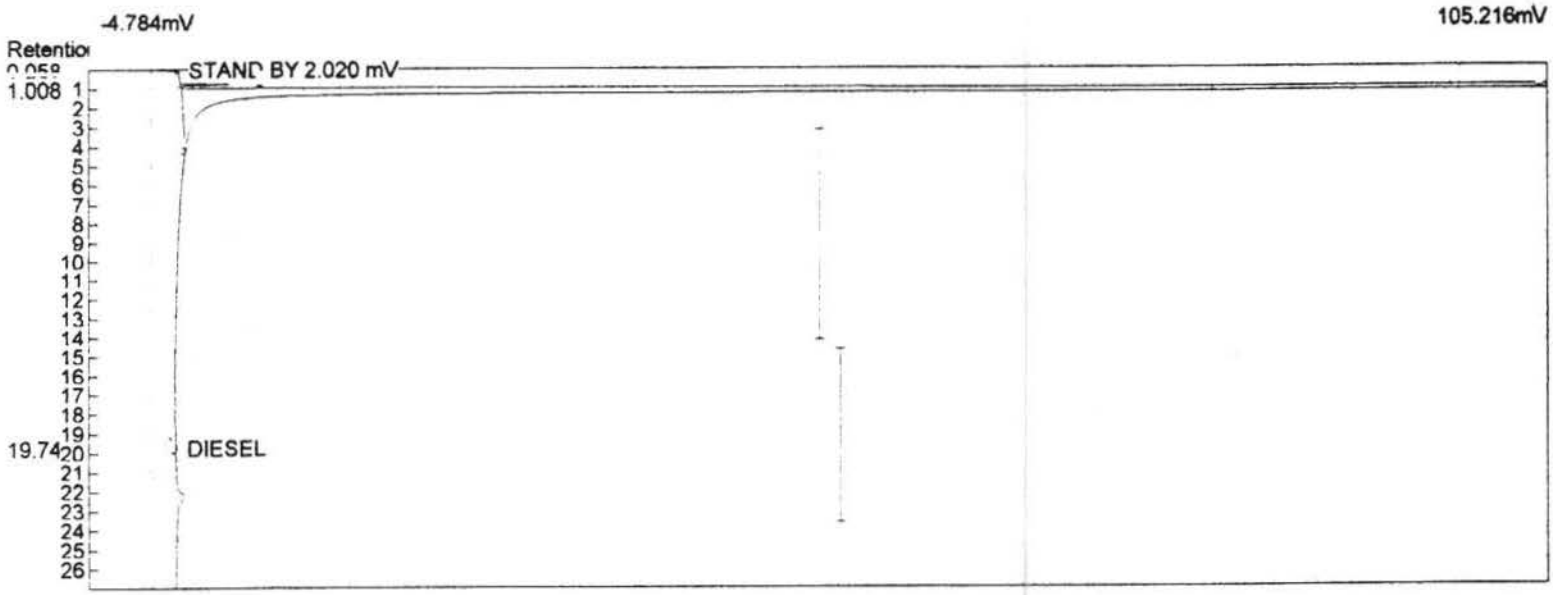
Component	Retention	Area	External	Units
		0.000	0.00	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 12:32:56
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0717FA3.CHR ()
Sample: 2842-sb17@4-6/0717ch2
Operator: MAP



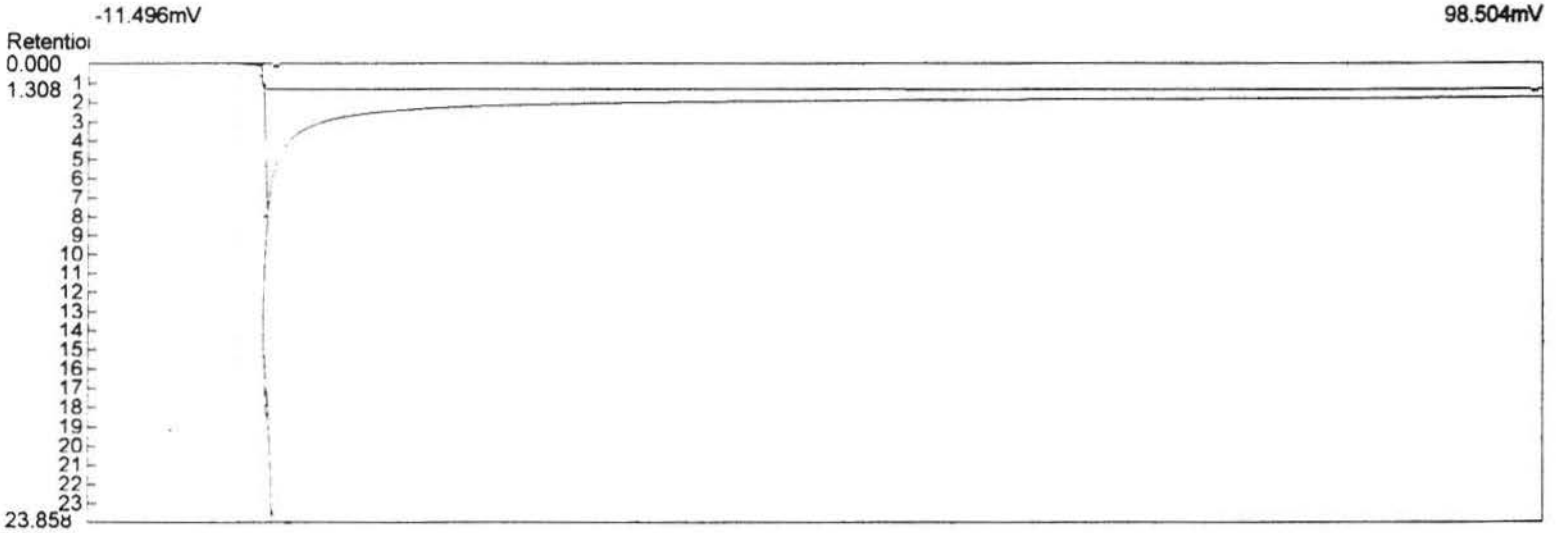
Component	Retention	Area	Internal	Units
		0.000	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 12:32:56
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0717FB3.CHR ()
Sample: 2842-sb18@2-4/0717ch2
Operator: MAP



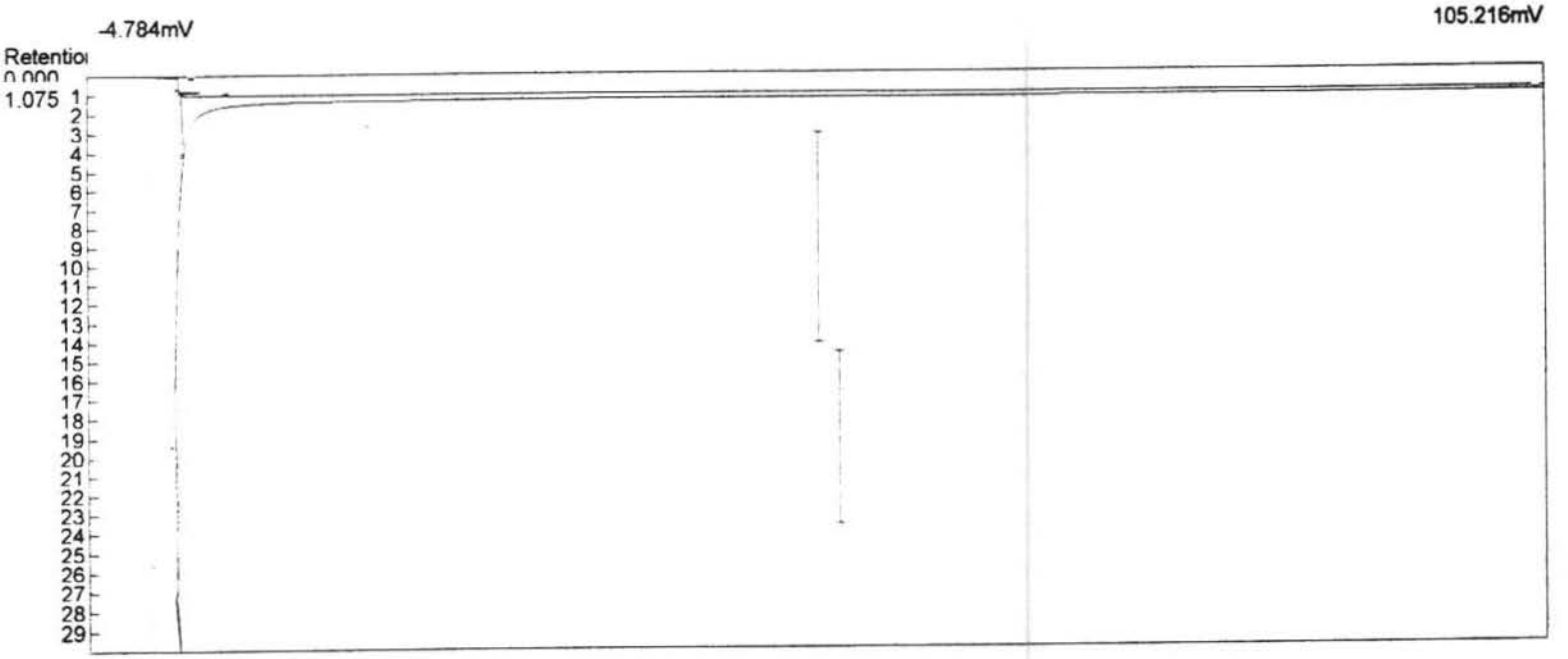
Component	Retention	Area	External	Units
DIESEL	19.741	1.765	2.38	PPM
		1.765	2.38	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 13:39:53
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0717FA4.CHR ()
Sample: 2842-sb17 water/0717ch2
Operator: MAP



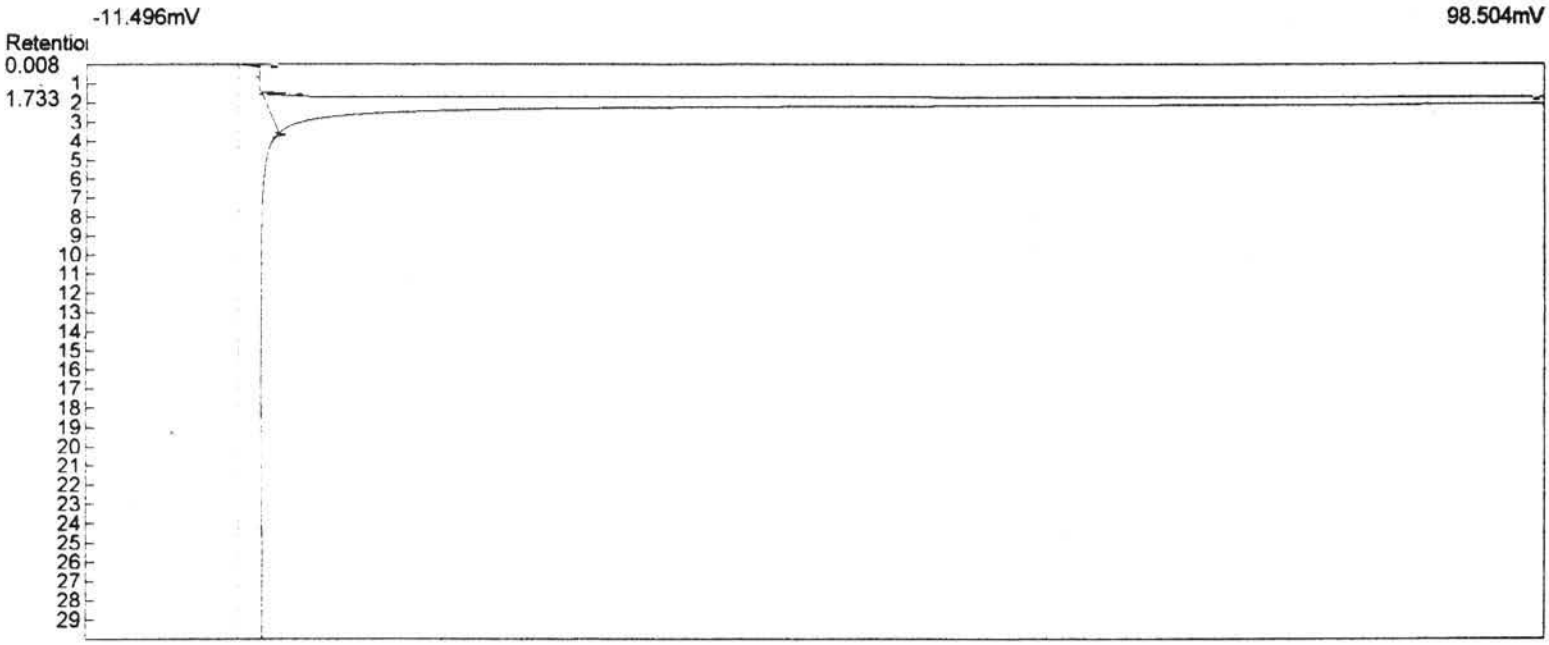
Component	Retention	Area	Internal	Units
		0.000	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 13:39:53
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0717FB4.CHR ()
Sample: 2842-sb18water/0717ch2
Operator: MAP



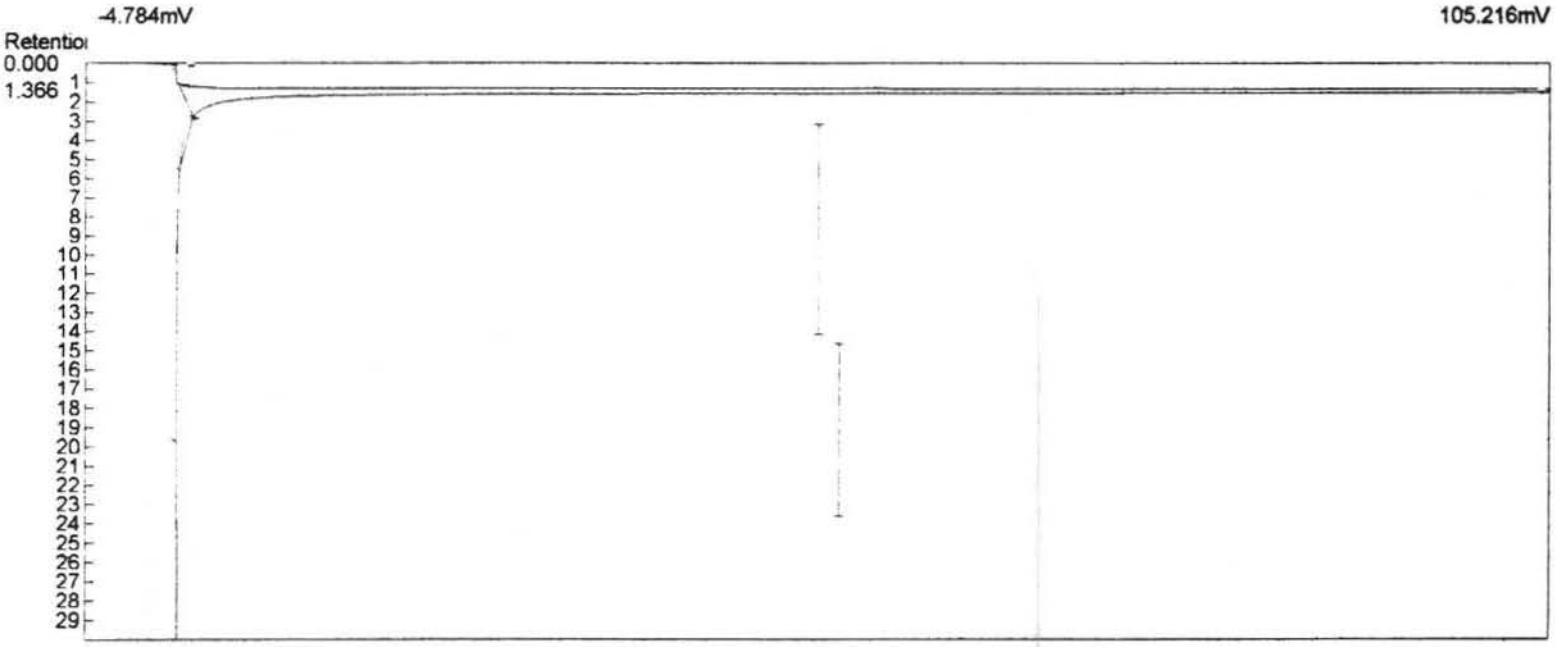
Component	Retention	Area	External	Units
		0.000	0.00	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 14:17:12
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0717FA5.CHR ()
Sample: 2842-trip/0717ch2
Operator: MAP



mponent	Retention	Area	Internal	Units
		0.000	0.0000	

Lab name: TLG Puerto Rico
Analysis date: 07/17/1998 14:17:12
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0717FB5.CHR ()
Sample: 2842-EB6/0717ch2
Operator: MAP



Component	Retention	Area	External	Units
		0.000	0.00	

teg

QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0717CH2
DAILY CALIBRATION DATE: 7/17/98

CH2M HILL
PROJECT NAME: SITE 2842

			INITIAL		OPENING			CLOSING		
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	AREA	RF	%DIFF	AREA	RF	%DIFF
BENZENE	PID #1	0.100 - 10.000	26	7.1%	26.33	26.33	0.0%	24.00	24.00	8.8%
TOLUENE	PID #1	0.100 - 10.000	27	4.9%	27.66	27.66	2.9%	26.64	26.64	0.9%
ETHYLBENZENE	PID #1	0.100 - 10.000	23	9.0%	23.82	23.82	3.6%	24.24	24.24	5.4%
m&p-XYLENES	PID #1	0.100 - 10.000	33	9.9%	66.50	33.25	0.5%	68.01	34.01	1.8%
o-XYLENES	PID #1	0.100 - 10.000	27	8.9%	27.65	27.65	1.6%	27.32	27.32	0.4%
BENZENE	PID #2	0.100 - 10.000	31	7.3%	29.43	29.43	5.1%	31.08	31.08	0.3%
TOLUENE	PID #2	0.100 - 10.000	32	8.4%	32.30	32.30	0.9%	29.58	29.58	7.6%
ETHYLBENZENE	PID #2	0.100 - 10.000	26	5.2%	24.02	24.02	7.6%	25.25	25.25	2.9%
m&p-XYLENES	PID #2	0.100 - 10.000	37	3.8%	75.95	37.98	2.6%	74.01	37.00	0.0%
o-XYLENES	PID #2	0.100 - 10.000	31	2.6%	31.79	31.79	2.5%	33.70	33.70	8.7%

CALIB RANGE - RANGE OF CALIBRATION CURVE IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 20% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

teg

QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0717CH2
DATE: 7/17/98

CH2M HILL
PROJECT NAME: SITE 2842

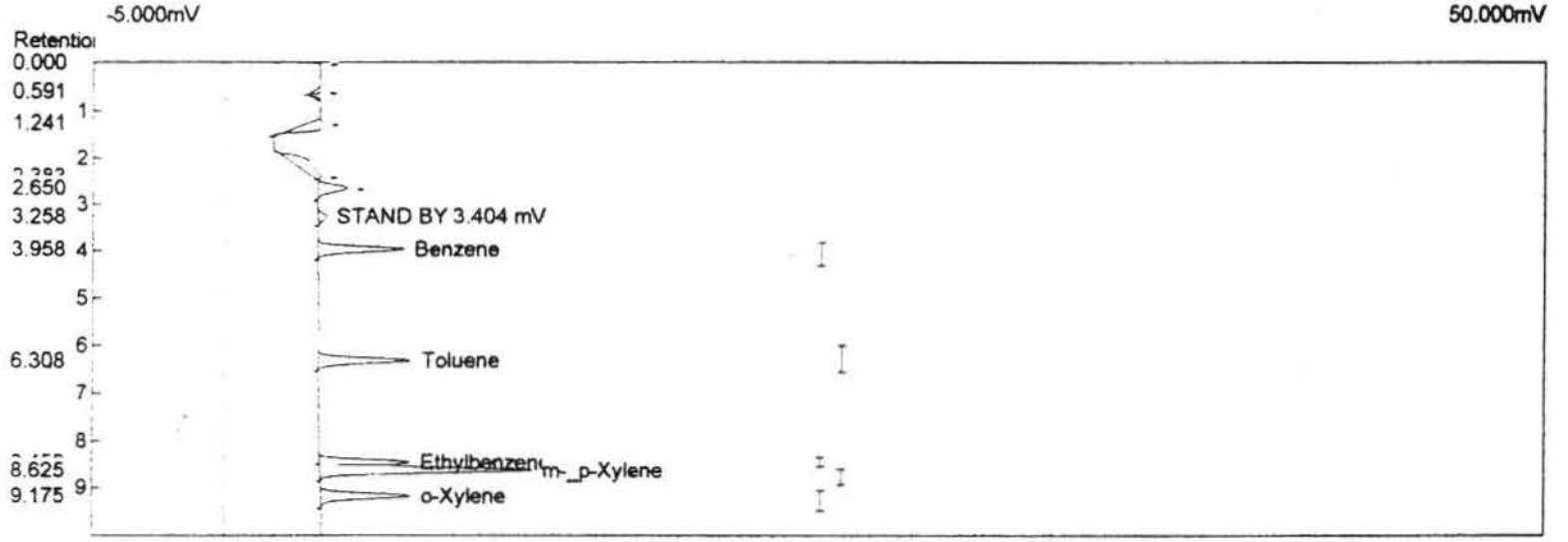
COMPOUND	SPK CON (ppm)	MS CONC (ppm)	%REC MS	MSD CONC (ppm)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
BENZENE	1.0	1.07	107%	1.05	105%	2%	15%	76% - 120%
TOLUENE	1.0	1.06	106%	1.13	113%	6%	15%	75% - 120%
ETHYLBENZENE	1.0	0.96	96%	0.95	95%	1%	15%	65% - 125%
TOTAL XYLENES	3.0	3.4	115%	3.3	111%	5%	15%	72% - 120%

ppm = PARTS PER MILLION
MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE
% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX
RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY:MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

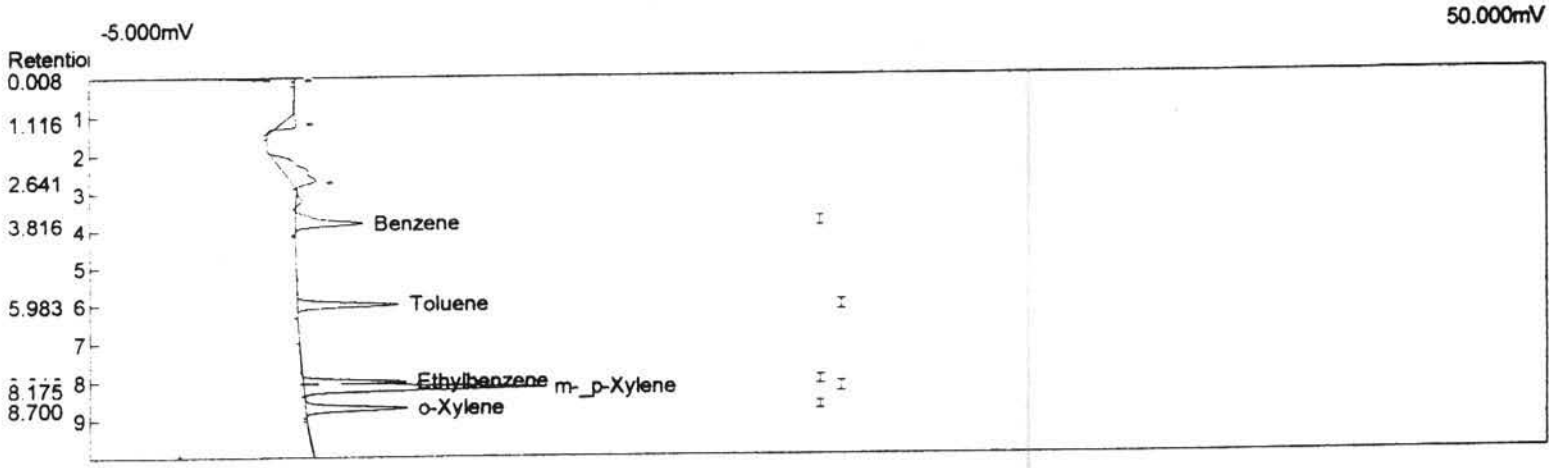
TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 09:21:29
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0717PA1.CHR ()
Sample: 1 ppm BTEX OPEN
Operator: JMP



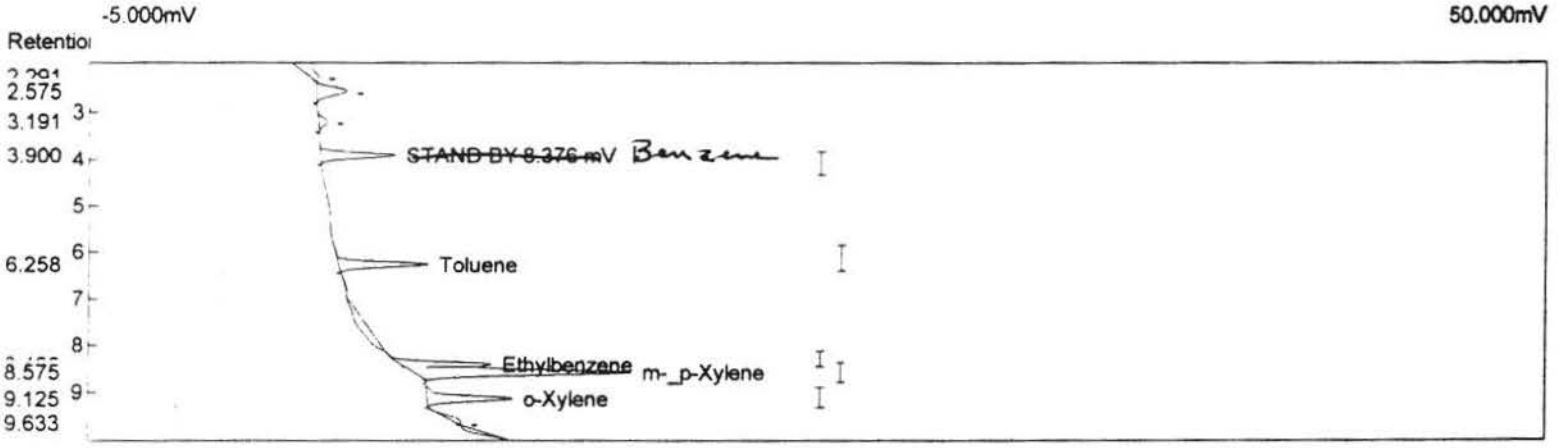
Component	Retention	Area	External	Internal	Units
Benzene	3.958	26.328	1.01	1.0126	ppm
To[redacted]	6.308	27.662	0.93	0.9258	ppm
Eth[redacted]nzene	8.458	23.820	1.04	1.0356	ppm
m-_p-Xylene	8.625	66.497	2.02	2.0151	ppm
o-Xylene	9.175	27.648	1.02	1.0240	ppm
		171.954	6.01	6.0131	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 09:21:29
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: C:\PEAKWIN\0707PB34.CHR ()
Sample: 1 ppm BTEX OPEN
Operator: JMP



Component	Retention	Area	External	Internal	Units
Benzene	3.816	29.429	0.95	0.9537	ppm
Toluene	5.983	32.300	1.02	1.0211	ppm
Ethylbenzene	8.016	24.017	0.86	0.8564	ppm
m-_p-Xylene	8.175	75.947	2.00	2.0049	ppm
o-Xylene	8.700	31.793	1.03	1.0339	ppm
		193.486	5.87	5.8700	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 17:54:17
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: C:\PEAKWIN\0717PA16.CHR ()
Sample: CLOSE STD
Operator: map

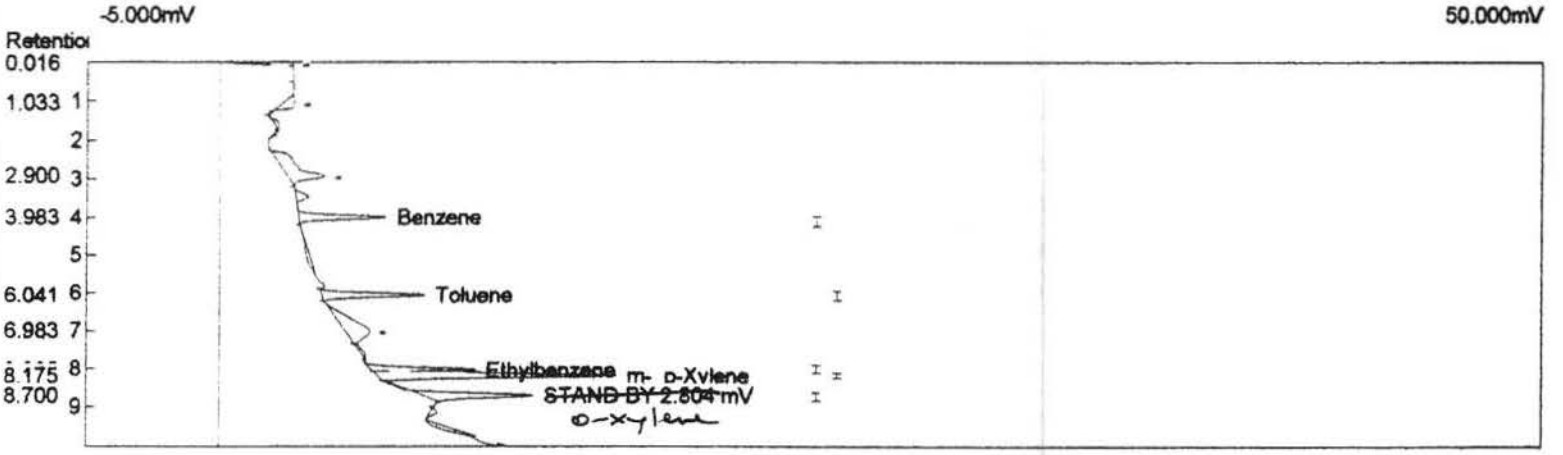


Component	Retention	Area	External	Internal	Units
Benzene	3.900	24.000	0.92	0.9231	ppm
Toluene	6.258	26.635	0.99	0.9905	ppm
Ethylbenzene	8.408	24.238	1.05	1.0538	ppm
m-_p-Xylene	8.575	68.005	2.06	2.0608	ppm
o-Xylene	9.125	27.316	1.01	1.0117	ppm
		170.194	6.04	6.0398	

KS

17

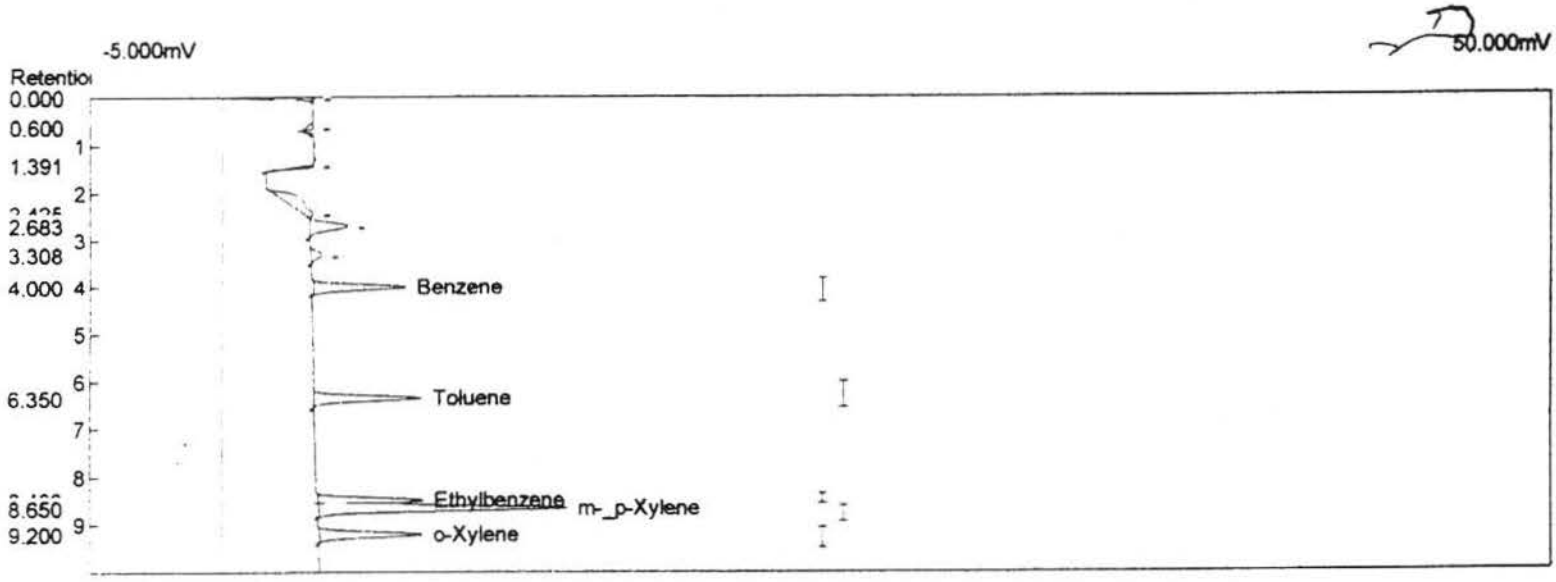
Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 17:54:17
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0717PB16.CHR ()
Sample: CLOSE STD
Operator: map



Component	Retention	Area	External	Internal	Units
Benzene	3.983	31.084	1.01	1.0073	ppm
Toluene	6.041	29.576	0.94	0.9350	ppm
Ethylbenzene	8.025	25.254	0.90	0.9005	ppm
m-_p-Xylene	8.175	74.009	1.95	1.9537	ppm
o-Xylene	8.700	33.703	1.10	1.0961	ppm
		193.626	5.89	5.8926	

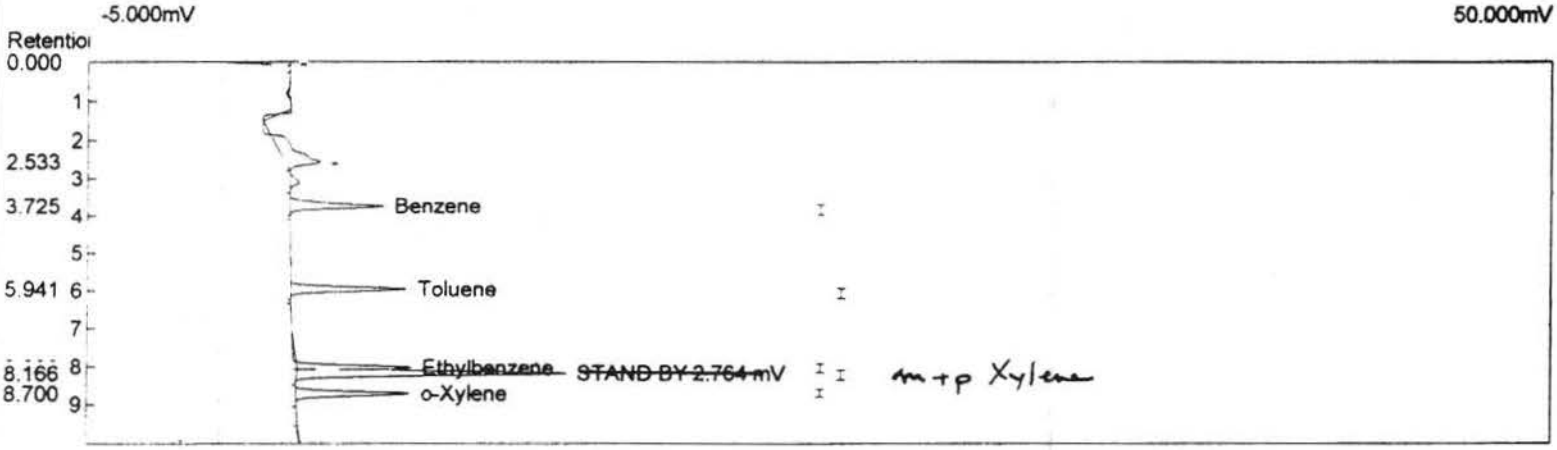
KS

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 10:12:56
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0717PA2.CHR ()
Sample: matrix spike
Operator: JMP



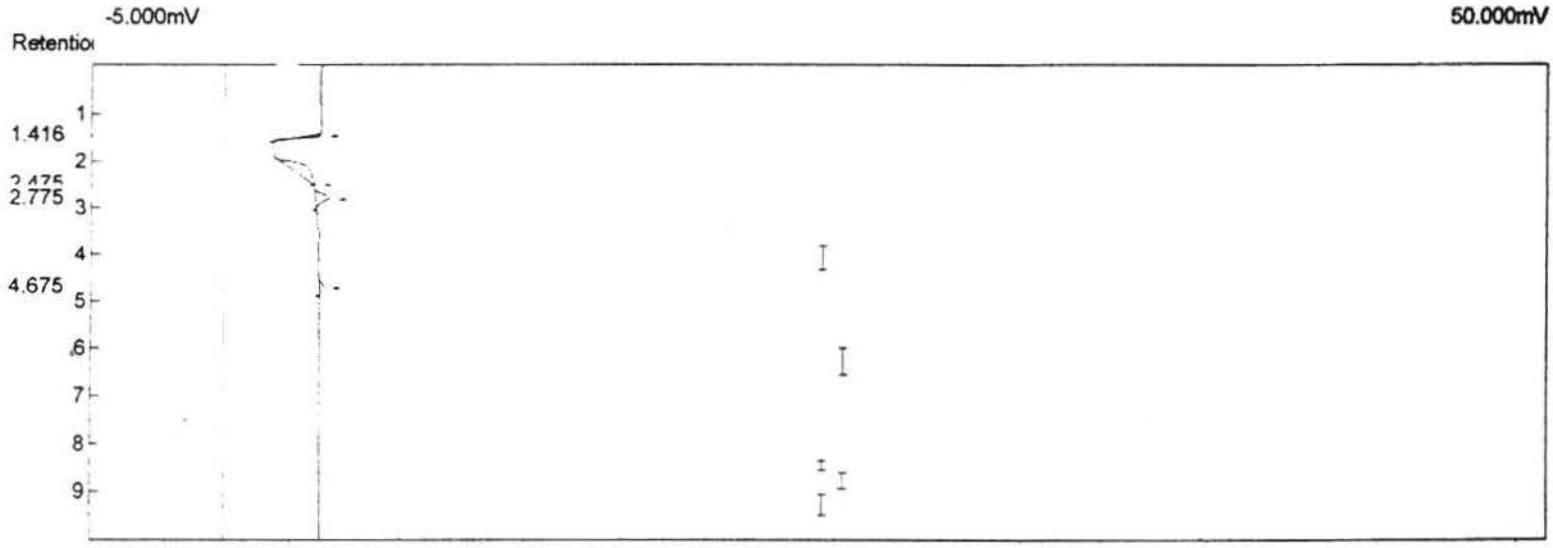
Component	Retention	Area	External	Internal	Units
Benzene	4.000	27.760	1.07	1.0677	ppm
Toluene	6.350	31.732	1.06	1.0620	ppm
Ethylbenzene	8.483	27.636	0.96	0.9613	ppm
m-_p-Xylene	8.650	75.567	2.29	2.2899	ppm
o-Xylene	9.200	29.849	1.15	1.1498	ppm
		192.545	6.53	6.5306	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 10:12:56
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0717PB2.CHR ()
Sample: matrix spike duplicate
Operator: JMP



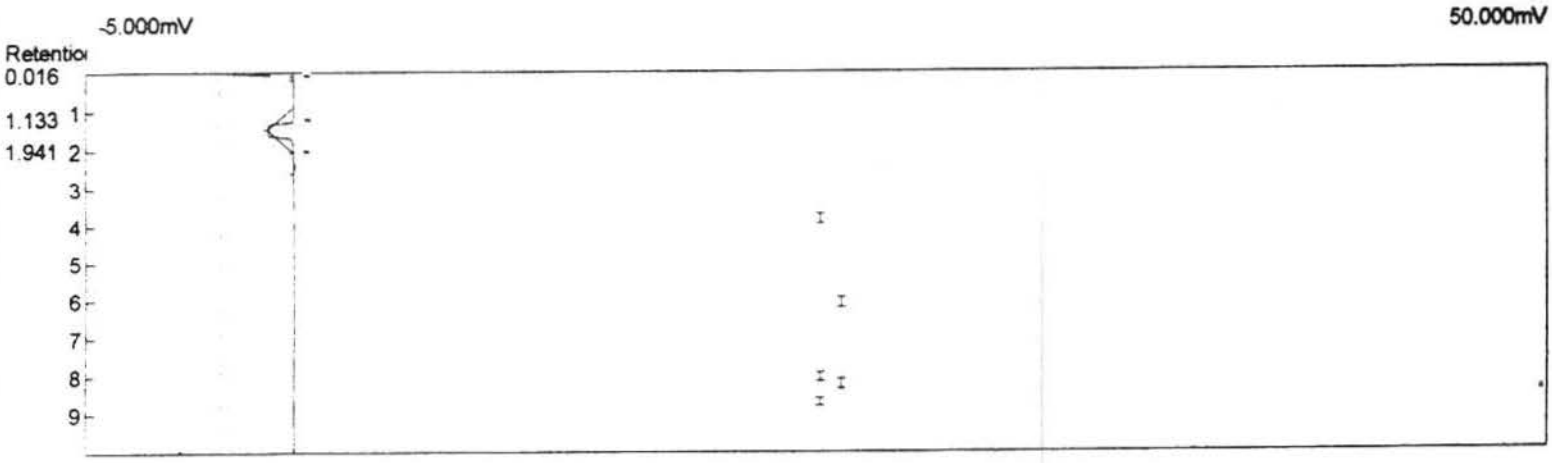
Component	Retention	Area	External	Internal	Units
Benzene	3.725	32.307	1.05	1.0469	ppm
Toluene	5.941	35.590	1.13	1.1251	ppm
Ethylbenzene	8.008	26.774	0.95	0.9547	ppm
m-_p-Xylene	8.166	81.728	2.16	2.1575	ppm
o-Xylene	8.700	34.172	1.11	1.1113	ppm
		210.572	6.40	6.3956	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 11:15:50
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
ata file: 0717PA3.CHR ()
Sample: method blank
Operator: JMP



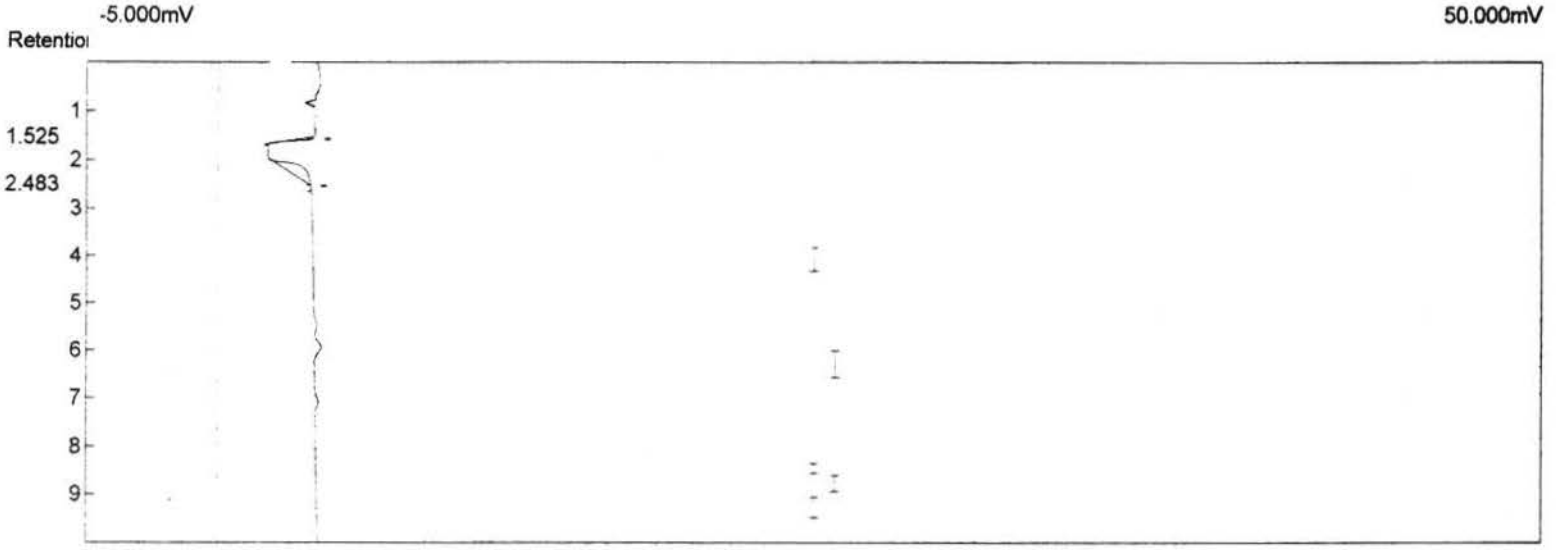
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 11:15:50
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0717PB3.CHR ()
Sample: method blk
Operator: JMP



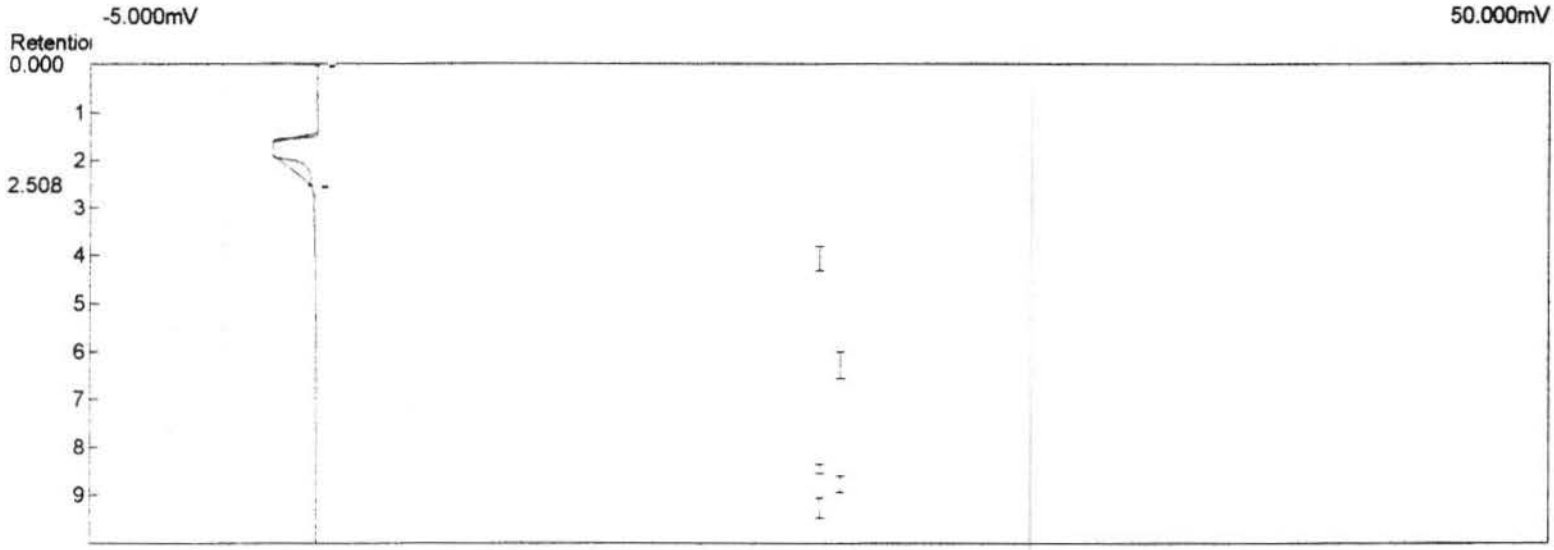
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0717PA4.CHR ()
Sample: 2842-sb17@4-6/0717ch2
Operator: JMP



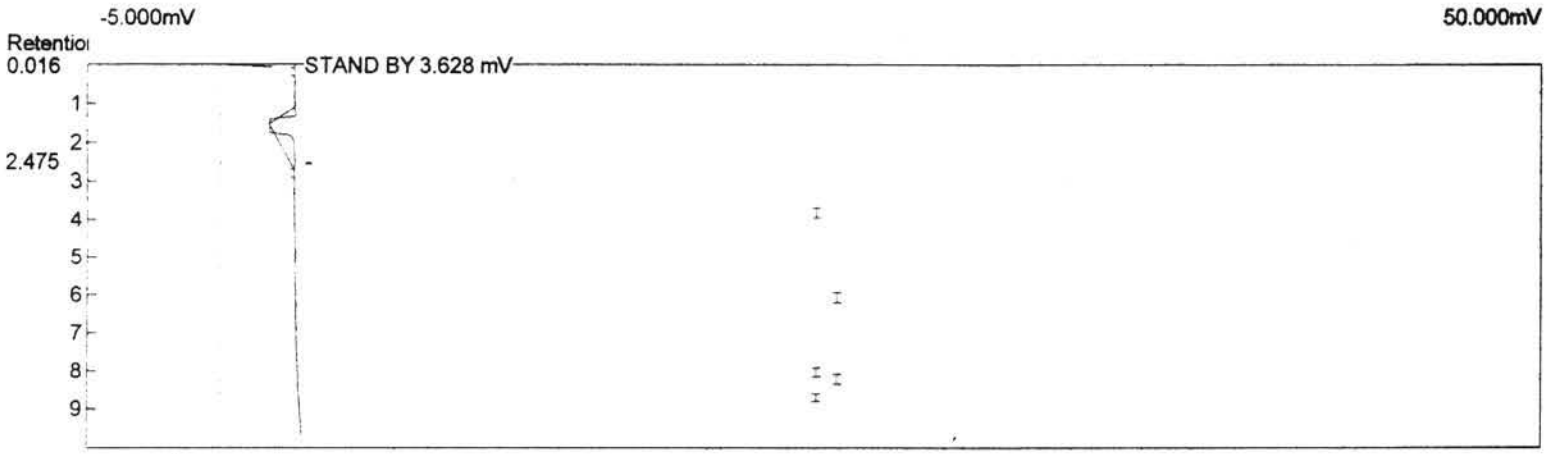
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 12:30:31
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0717PA5.CHR ()
Sample: 2842-sb17@4-6/0717ch2R
Operator: JMP



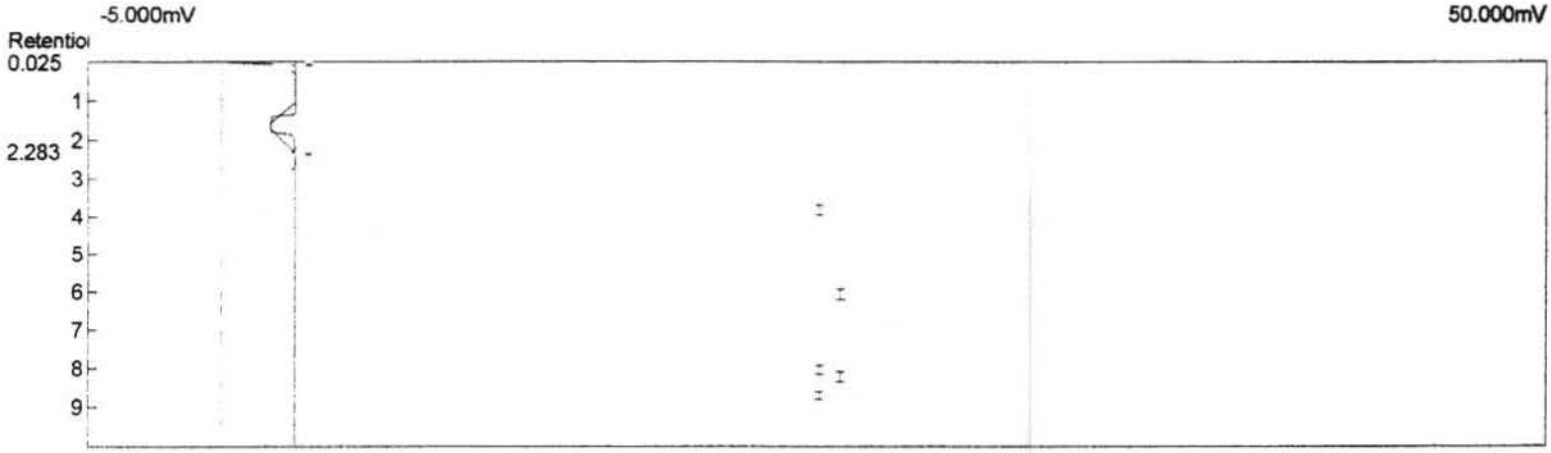
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 11:31:26
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0717PB4.CHR ()
Sample: 2842-sb18@2-4/0717ch2
Operator: JMP



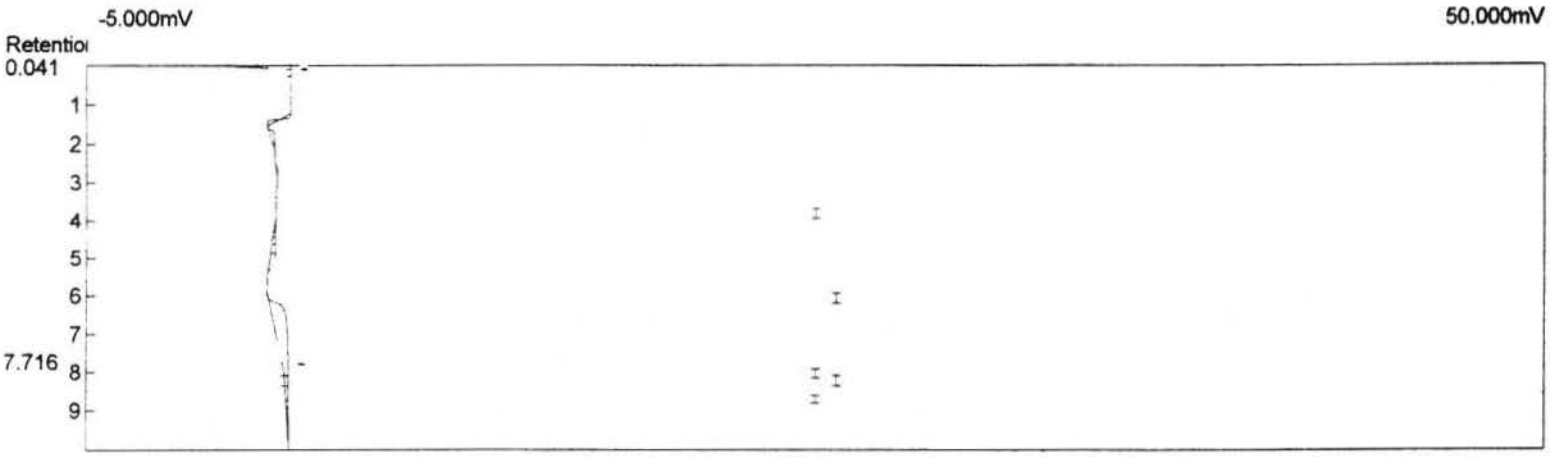
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 12:30:31
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0717PB5.CHR ()
Sample: 2842-EB-6/0717ch2
Operator: JMP



Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/17/1998 12:45:12
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0717PB6.CHR ()
Sample: 2842-sb18 WA/0717ch2
Operator: map



Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

teg Transglobal Environmental Geochemistry

Chain of Custody Record

PO # _____

Client: CH2M HILL

Address

Phone (787) 8713 FAX

Client Project # Project Manager

Date 7/16/98 Page 1 of 1

TEG Project # 9810717CHZ Outside Lab.#

Location Roosevelt Roads

Collector MIKE WEATHERBY Date of Collection 7/16/98

Sample #	Depth	Time	Sample Type	Container Type	VOA 8010	VOA 8020 (BTEX)	VOA 8260	SEMI VOL 8270	TRPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (gas & diesel)	TPH 8015 (oil)	PNA 610/8100	TOTAL LEAD	pH	METALS	RCI							FIELD NOTES / PRESERVATION	Total # of Containers
2842-SB17	4-6	1000	SOIL	2oz		1			1			1													24HR TAT 8015M	3
2842-SB18	2-4	1610	SOIL	2oz		1			1			1													↓	3
2842-SB17	—	1620	WATER	40ml		1			1			1													24HR TAT ALL	3
2842-SB18	—	1630	WATER	40ml		1			1			1													↓	3
2842-EB16	—	1650	WATER	40ml		1			1			1													STD TAT	3
2842-TRIP	—	—	WATER	40ml								1													↓	1
																										16

RELINQUISHED BY (signature) Date/Time: Michael K. Weatherby 7/16/98

RECEIVED BY (signature) Date/Time: Franklin Martin 7/17/98 8:05AM

RELINQUISHED BY (signature) Date/Time

RECEIVED BY (signature) Date/Time

Total # of containers	16
Chain of Custody seals Y / N / NA	NA
Seals intact? Y / N / NA	NA
Received good conditions / cold	Yes

TEMPERATURE: 4C

Sample disposal instructions: ____ TEG Disposal @ $2.00 each ____ Return to client ____ Pickup

teg

rld Leader In On-Site Sampling and Analysis

July 19, 1998
TEG Project #98I0709CH2

Mr. Marty Clasen
CH2M HILL
4350 W. Cypress Street, Suite 600
Tampa, Florida 33607

SUBJECT: DATA REPORT - CH2M HILL PROJECT NO. 146801.US.SC SITE #2842

Dear Marty,

Please find enclosed the analytical report for the samples collected by CH2M HILL personnel from the above-referenced site and delivered to TEG under the proper chain-of-custody protocol. TEG's Puerto Rico certified-chemist performed the following analyses:

- 3 soil samples analyzed for TRPH by modified EPA test method 418.1.
- 2 water samples analyzed for TRPH by modified EPA test method 418.1.
- 3 soil samples analyzed for TPH-gas/diesel by modified EPA test method 8015.
- 2 water samples analyzed for TPH-gas/diesel by modified EPA test method 8015.
- 3 soil samples analyzed for BTEX by modified EPA test method 8020.
- 2 water samples analyzed for BTEX by modified EPA test method 8020.
- 1 trip blank water sample analyzed for BTEX by modified EPA test method 8020.
- 1 equipment blank water sample analyzed for TPH-gas/diesel, TRPH and BTEX.
- Laboratory QA/QC analyses for TPH-gas/diesel, TRPH and BTEX.

The analytical results are summarized in the attached table. Applicable detection limits, QA/QC data, chromatograms, a chain-of-custody and an invoice are attached.

TEG appreciates the opportunity to provide analytical services for this project. If you have any questions relating to the data or report, please do not hesitate to contact us.

Sincerely,
TEG

Kevin Shelburne

Kevin Shelburne
Principal

Attachments

teg

The World Leader In On-Site Sampling and Analysis

CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVY BASE, SITE 2842
CEIBA, P. R.

TEG Project #98I0709CH2

TRPH (EPA Method 418.1) ANALYSES OF SOIL

SAMPLE NUMBER	DATE ANALYZED	TRPH (mg/kg)
METHOD BLANK	7/17/98	ND
2842-SB8 @ 10'-12'	7/17/98	100
2842-SB9 @ 4'-6'	7/17/98	80
2842-DUPE2	7/17/98	77
DETECTION LIMIT (mg/kg)		10

TRPH (EPA Method 418.1) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	TRPH (mg/L)
METHOD BLANK	7/17/98	ND
2842-SB8	7/17/98	ND
2842-SB9	7/17/98	ND
2842-EB2	7/17/98	ND
DETECTION LIMIT (mg/L)		10

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT
mg/L = MILLIGRAMS PER LITER
mg/kg = MILLIGRAMS PER KILOGRAM
CONCENTRATIONS BASED ON DRY WEIGHT
ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TEG-PUERTO RICO • PMB 627, HC-01 Box 29030, Caguas, PR 00725 • Phone (787) 720-0329 • Fax (787) 789-3858 • Pager 759-1255 Unit 217-4053

CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVY BASE, SITE 2842
CEIBA, P. R.

TEG Project #98I0709CH2

TPH (DOHS Mod. EPA Method 8015) ANALYSES OF SOIL

SAMPLE NUMBER	DATE ANALYZED	TPH-GAS C5-C12 (mg/kg)	TPH-DIESEL C13-C24 (mg/kg)
METHOD BLANK	7/10/98	ND	ND
2842-SB8 @ 10'-12'	7/10/98	ND	ND
2842-SB9 @ 4'-6'	7/10/98	ND	ND
2842-DUPE2	7/10/98	ND	ND
DETECTION LIMIT (mg/kg)		10	25

TPH (DOHS Mod. EPA Method 8015) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	TPH-GAS C5-C12 (mg/L)	TPH-DIESEL C13-C24 (mg/L)
METHOD BLANK	7/10/98	ND	ND
2842-SB8	7/10/98	ND	ND
2842-SB9	7/10/98	ND	ND
2842-EB2	7/10/98	ND	ND
DETECTION LIMIT (mg/L)		10	25

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT
CONCENTRATIONS BASED ON DRY WEIGHT

mg/kg = MILLIGRAMS PER KILOGRAM
mg/L = MILLIGRAMS PER LITER
ANALYSES PERFORMED BY: JOSE M. PEREZ
DATA REVIEWED BY: KEVIN SHELBURNE

TEG-PUERTO RICO • PMB 627, HC-01 Box 29030, Caguas, PR 00725 • Phone (787) 720-0329 • Fax (787) 789-3858 • Pager 759-1255 Unit 217-4053

CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVY BASE, SITE 2842
CEIBA, P. R.

TEG Project #98I0709CH2

BTEX (Mod. EPA Method 8020) ANALYSES OF SOIL

SAMPLE NUMBER	DATE ANALYZED	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL-BENZENE (mg/kg)	TOTAL XYLENES (mg/kg)
METHOD BLANK	7/10/98	ND	ND	ND	ND
2842-SB8 @ 10'-12'	7/10/98	ND	ND	ND	ND
2842-SB9 @ 4'-6'	7/10/98	ND	ND	ND	ND
2842-DUPE2	7/10/98	ND	ND	ND	ND
DETECTION LIMIT (mg/kg)		0.05	0.05	0.05	0.15

BTEX (Mod. EPA Method 8020) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL-BENZENE (mg/L)	TOTAL XYLENES (mg/L)
METHOD BLANK	7/10/98	ND	ND	ND	ND
2842-SB8	7/10/98	ND	ND	ND	ND
2842-SB8 rep.	7/10/98	ND	ND	ND	ND
2842-SB9	7/10/98	ND	ND	ND	ND
2842-TRIP	7/10/98	ND	ND	ND	ND
2842-EB2	7/10/98	ND	ND	ND	ND
DETECTION LIMIT (mg/L)		0.05	0.05	0.05	0.15

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
mg/kg = MILLIGRAMS PER KILOGRAM
mg/L = MILLIGRAMS PER LITER
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT

ANALYSES PERFORMED BY: JOSE M. PEREZ
DATA REVIEWED BY: KEVIN SHELBURNE
CONCENTRATIONS BASED ON DRY WEIGHT

Marco A. Pedraza
Laboratory Manager

Kevin Shelburne
Principal

MARCO A. PEDRAZA RUIZ
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LICENCIA NUM. 526136

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QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0709CH2

DAILY CALIBRATION DATE : 7/17/98

CH2M HILL

PROJECT NAME: SITE 2842

			INITIAL		OPENING			CLOSING		
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	ABS	RF	%DIFF	ABS	RF	%DIFF
TRPH	IR	10 - 1,000	764.6	15.7%	0.703	711.2	7.0%	0.704	710.2	7.1%

CALIB RANGE - RANGE OF CALIBRATION CURVE IS IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 20% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
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QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0709CH2 | CH2M HILL
DATE : 6/26/98 | PROJECT NAME: SITE 2842

COMPOUND	SPK CONC (ppm)	MS CONC (ppm)	%REC MS	MSD CONC (ppm)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
TRPH	500	535	107%	542	108%	1%	15%	80% - 120%

ppm = PARTS PER MILLION
MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE
% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX
RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

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QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0709CH2
DAILY CALIBRATION DATE: 7/10/98

CH2M HILL
PROJECT NAME: SITE 2842

			INITIAL			OPENING			CLOSING	
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	AREA	RF	%DIFF	AREA	RF	%DIFF
TPH GASOLINE	FID #1 (gc1)	10 - 40,000	0.50	9.7%	129.89	0.43	12.9%	136.29	0.45	8.6%
TPH GASOLINE	FID #2 (gc1)	10 - 40,000	0.65	8.1%	186.27	0.62	4.9%	189.54	0.63	3.2%
TPH DIESEL	FID #1 (gc1)	25 - 40,000	0.47	8.8%	606.11	0.40	13.5%	770.91	0.51	10.1%
TPH DIESEL	FID #2 (gc1)	25 - 40,000	0.25	5.4%	344.94	0.23	6.9%	410.84	0.27	10.9%

CALIB RANGE - RANGE OF CALIBRATION CURVE IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 15% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: JOSE M. PEREZ
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
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QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0709CH2

CH2M HILL
PROJECT NAME: SITE 2842

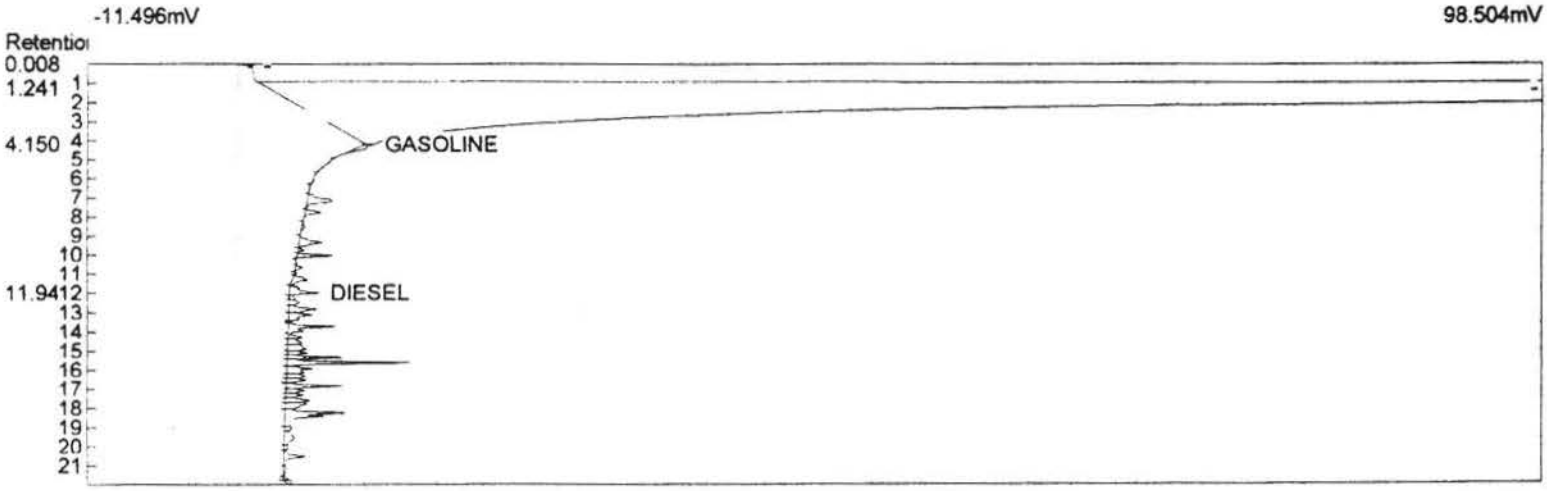
COMPOUND	SPK CON (ppm)	MS CONC (ppm)	%REC MS	MSD CONC (ppm)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
TPH-GAS	100	85	85%	83	83%	3%	15%	80% - 120%
TPH-DIESEL	500	535	107%	581	116%	8%	15%	80% - 120%

ppm = PARTS PER MILLION
MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE
% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX
RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY: JOSE M. PEREZ
DATA REVIEWED BY: KEVIN SHELBURNE

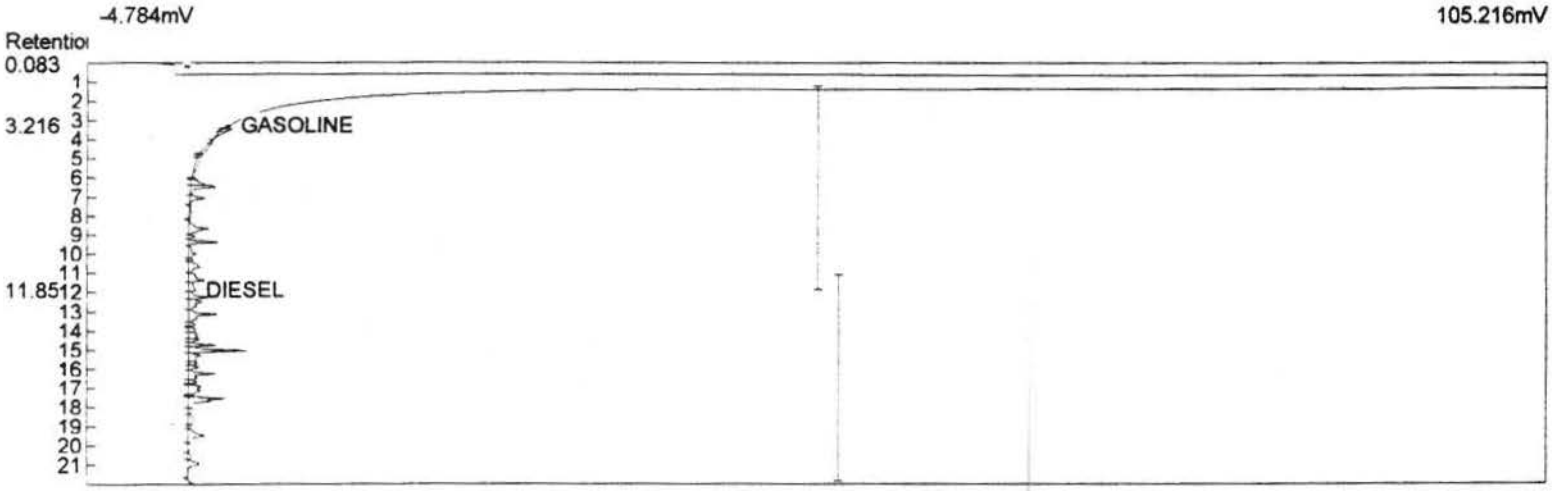
TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 11:43:23
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0710FA1.CHR ()
Sample: 100/500ppm G/D Opening
Operator: JMP



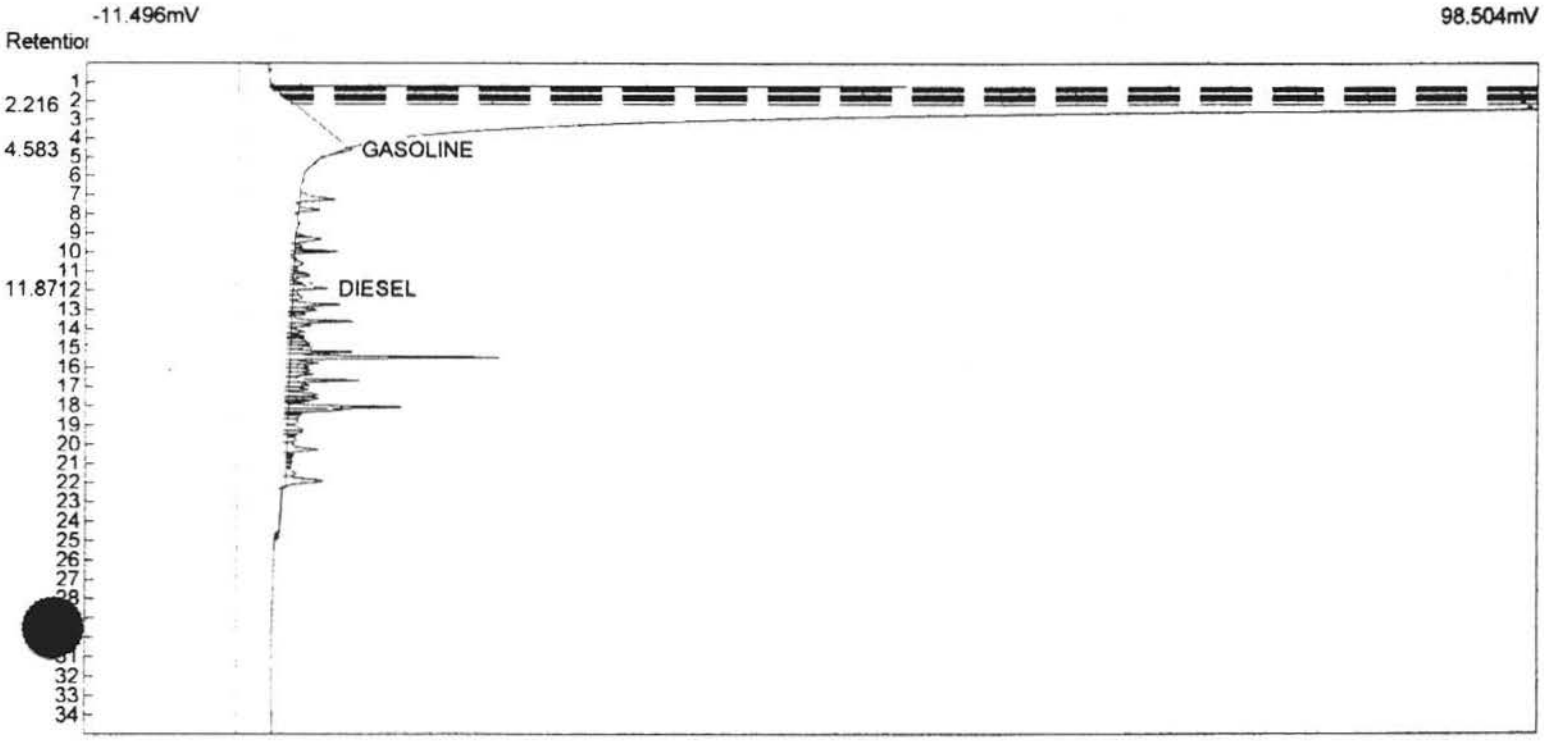
Component	Retention	Area	Internal	Units
GASOLINE	4.150	129.890	87.0289	ppm
DIESEL	11.941	606.112	432.6240	PPM
		736.002	519.6529	

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 11:43:23
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0710FB1.CHR ()
Sample: 100/500ppm G/D Opening
Operator: JMP



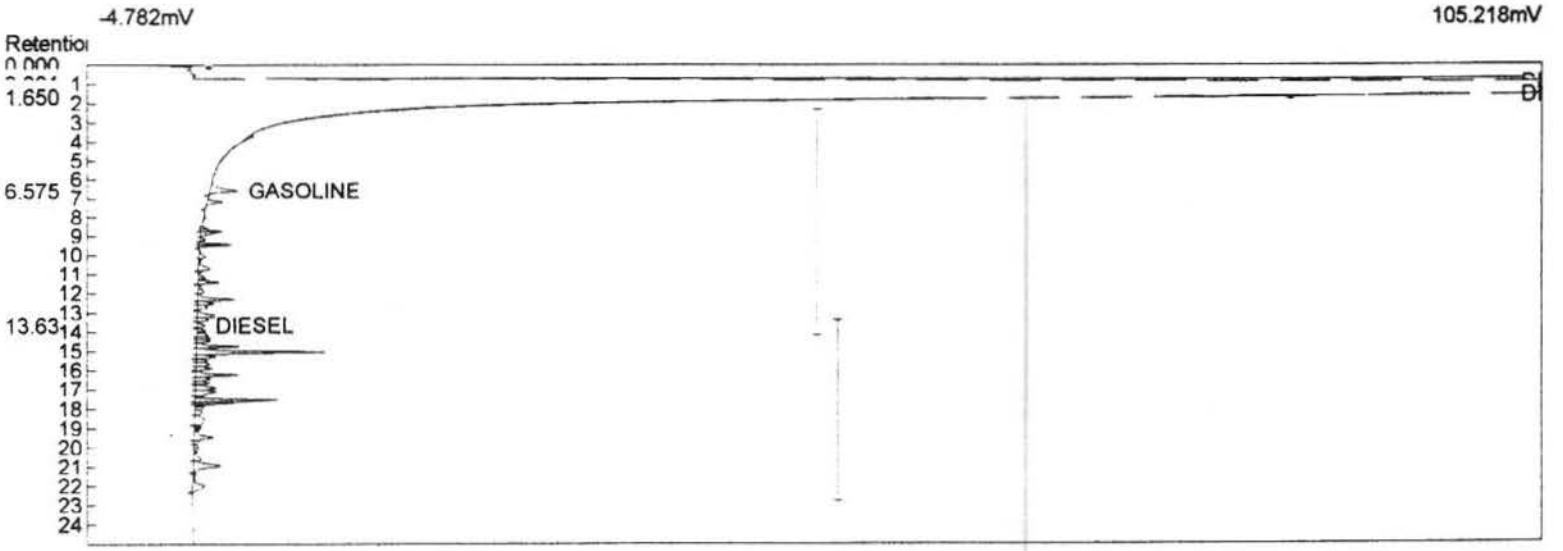
Component	Retention	Area	External	Units
GASOLINE	3.216	186.274	94.99	ppm
DIESEL	11.858	344.943	465.05	PPM
		531.218	560.04	

Lab name: TEG Puerto Rico
Holding time:
Analysis date: 07/10/1998 20:30:11
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Temp. prog: 10DEGMIN.TEM
Data file: 0710FA8.CHR ()
Sample: 100/500 gas dsl closing
Operator: JMP



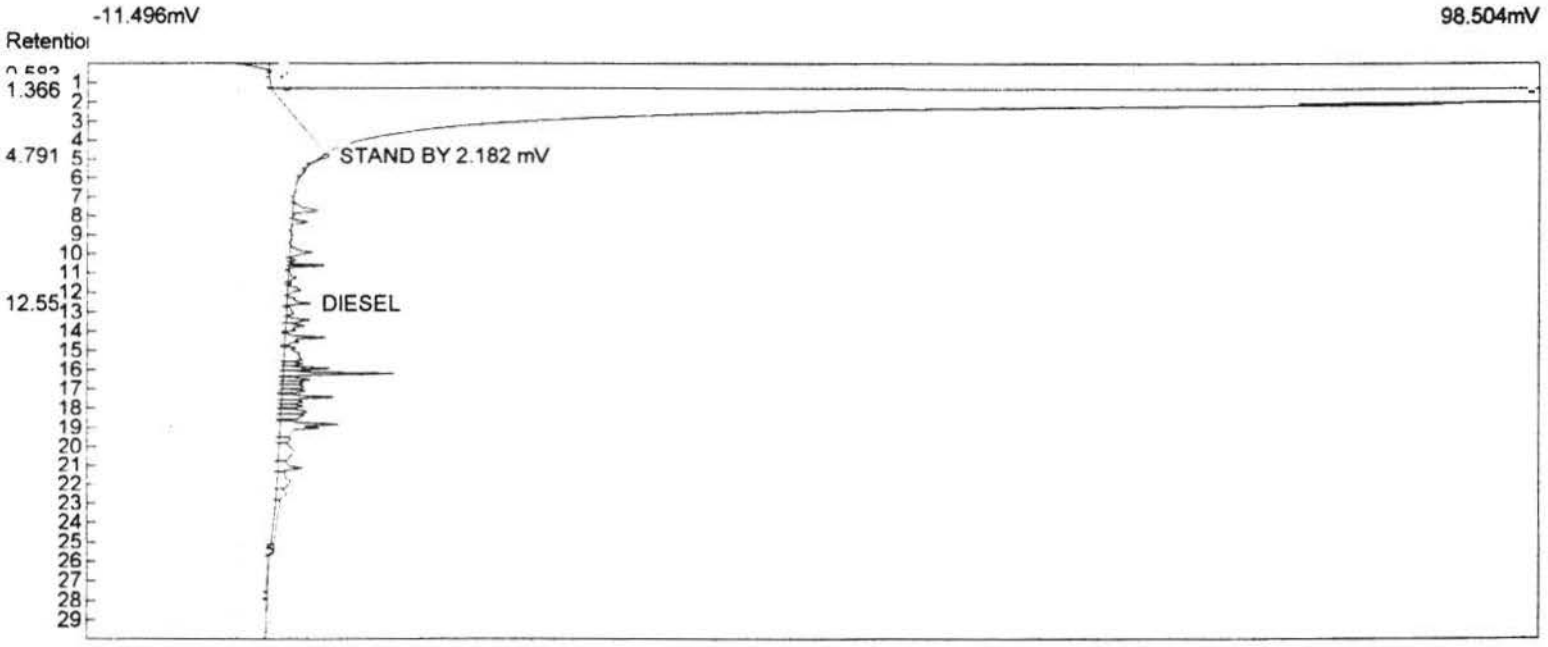
Component	Retention	Area	Internal	Units
GASOLINE	4.583	136.291	91.3179	ppm
DIESEL	11.875	770.907	550.2491	PPM
		907.198	641.5670	

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 20:30:11
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0710FB8.CHR ()
Sample: 100/500 gas dsl closing
Operator: JMP



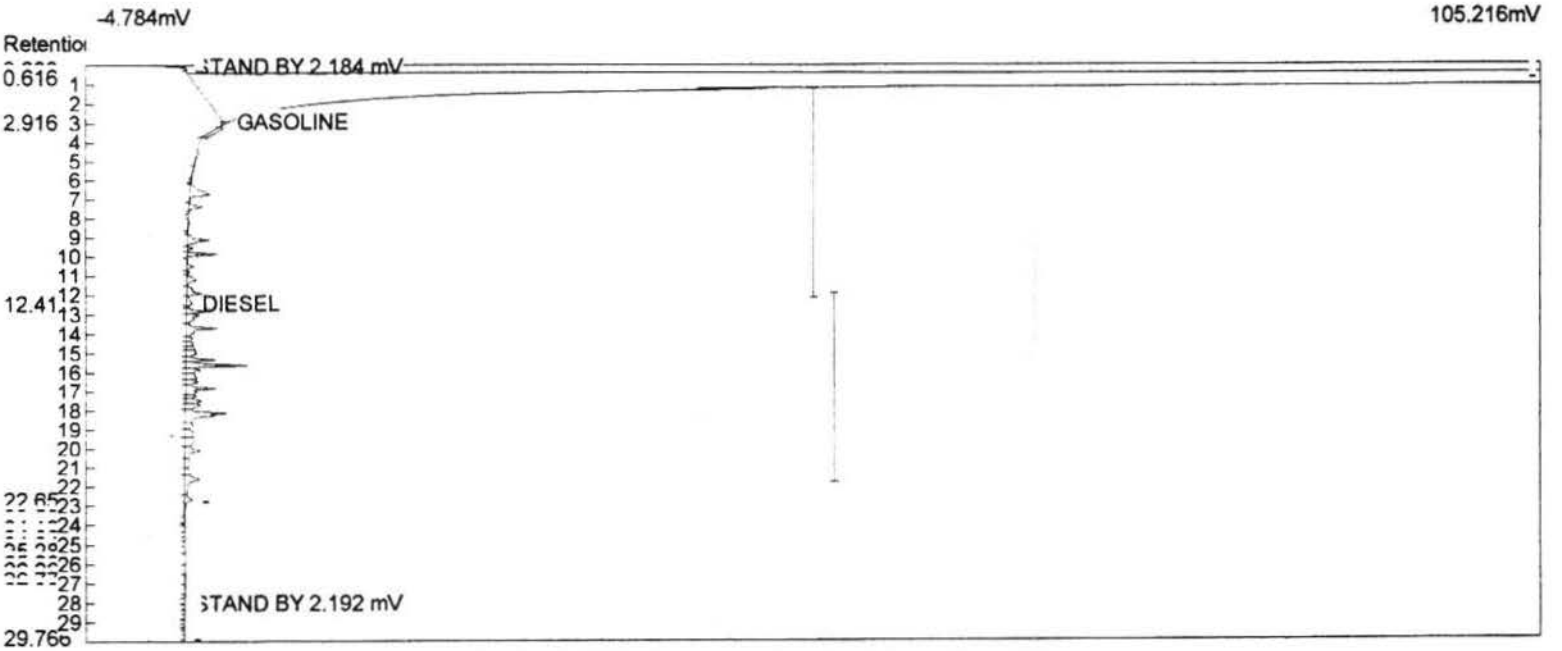
Component	Retention	Area	External	Units
GASOLINE	6.575	189.539	96.66	ppm
DIESEL	13.633	410.837	553.88	PPM
		600.376	650.54	

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 12:15:03
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0710FA2.CHR ()
Sample: matrix spike
Operator: JMP



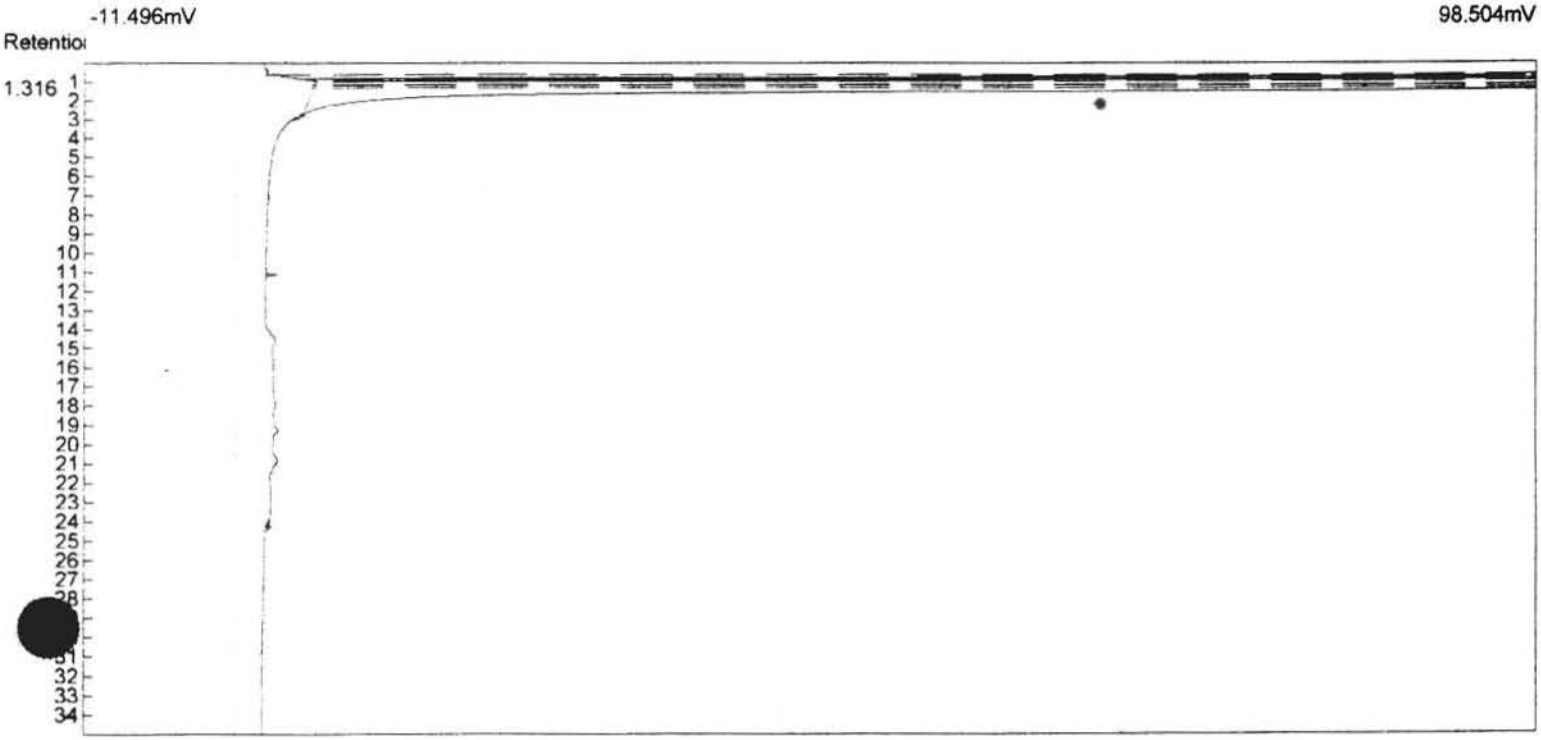
Component	Retention	Area	Internal	Units
GASOLINE	4.791	127.469	85.4066	ppm
DIESEL	12.550	750.072	535.3779	PPM
		877.541	620.7846	

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 12:15:03
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0710FB2.CHR ()
Sample: matrix spike duplicate
Operator: JMP



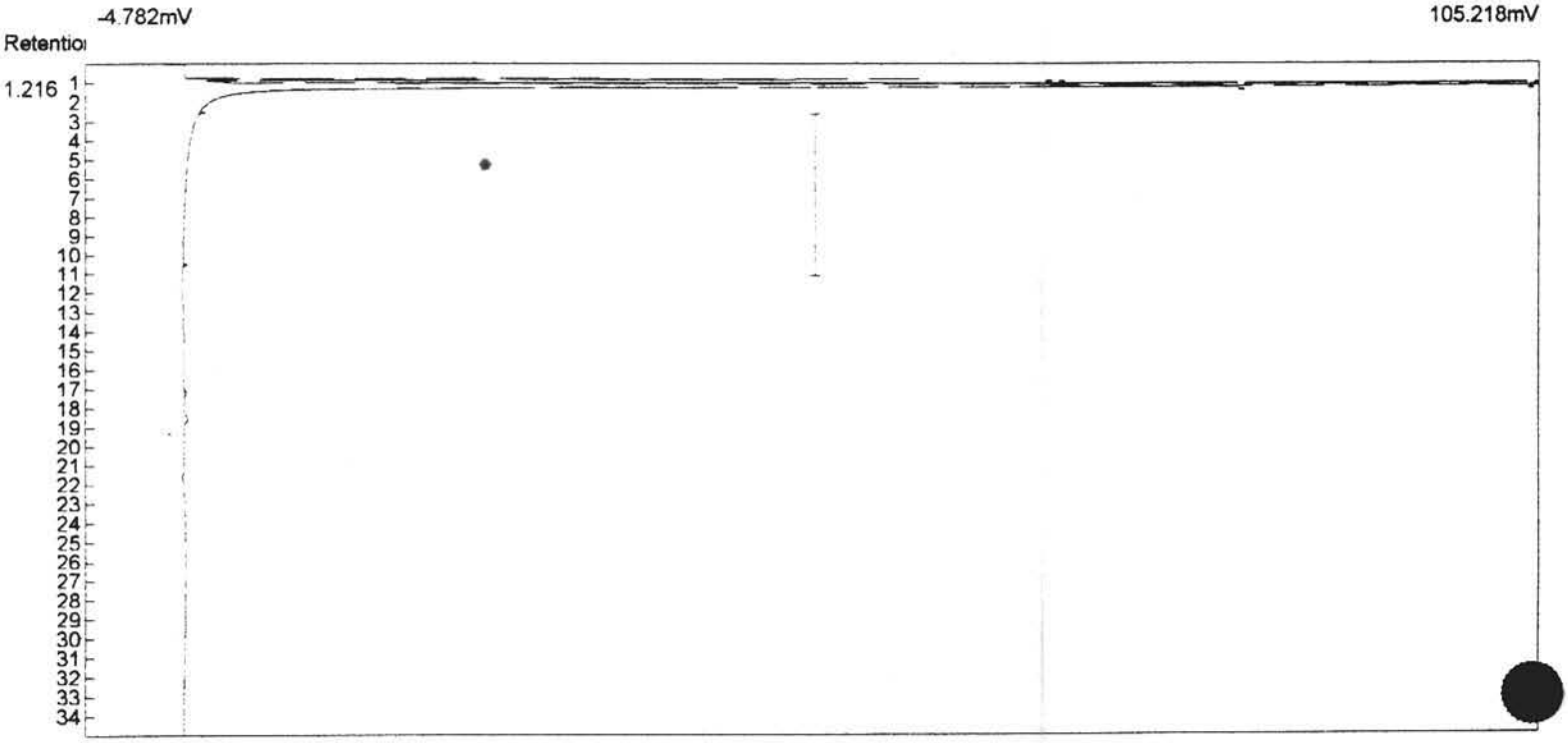
Component	Retention	Area	External	Units
GASOLINE	2.916	162.003	82.61	ppm
DIESEL	12.416	431.093	581.19	PPM
		593.096	663.80	

Lab name: TEG Puerto Rico
Holding time:
Analysis date: 07/10/1998 12:52:06
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Temp. prog: 10DEGMIN.TEM
Data file: 0710FA3.CHR ()
Sample: METHOD BLANK
Operator: JMP



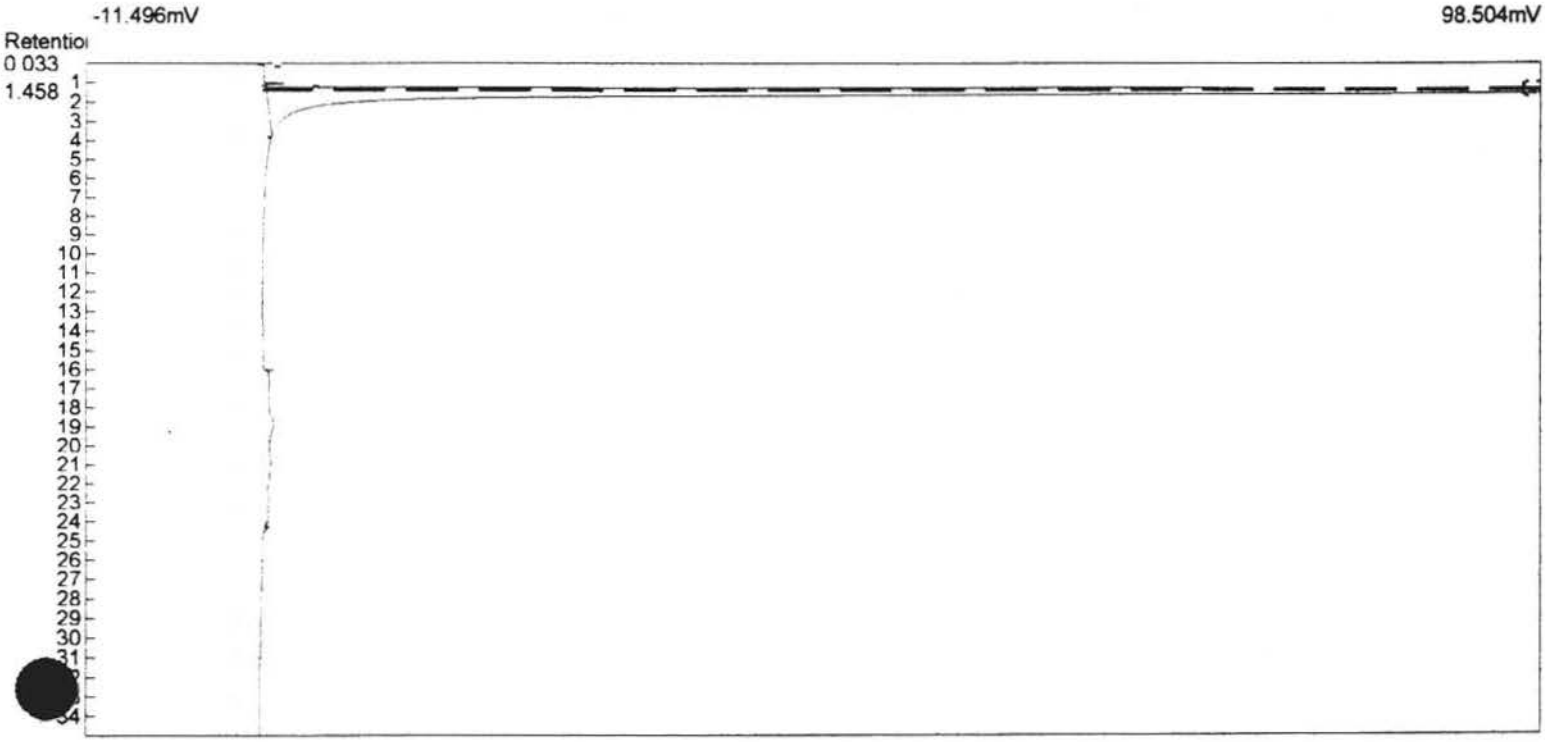
Component	Retention	Area	Internal	Units
		0.000	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 12:52:06
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0710FB3.CHR ()
Sample: METHOD BLANK
Operator: JMP



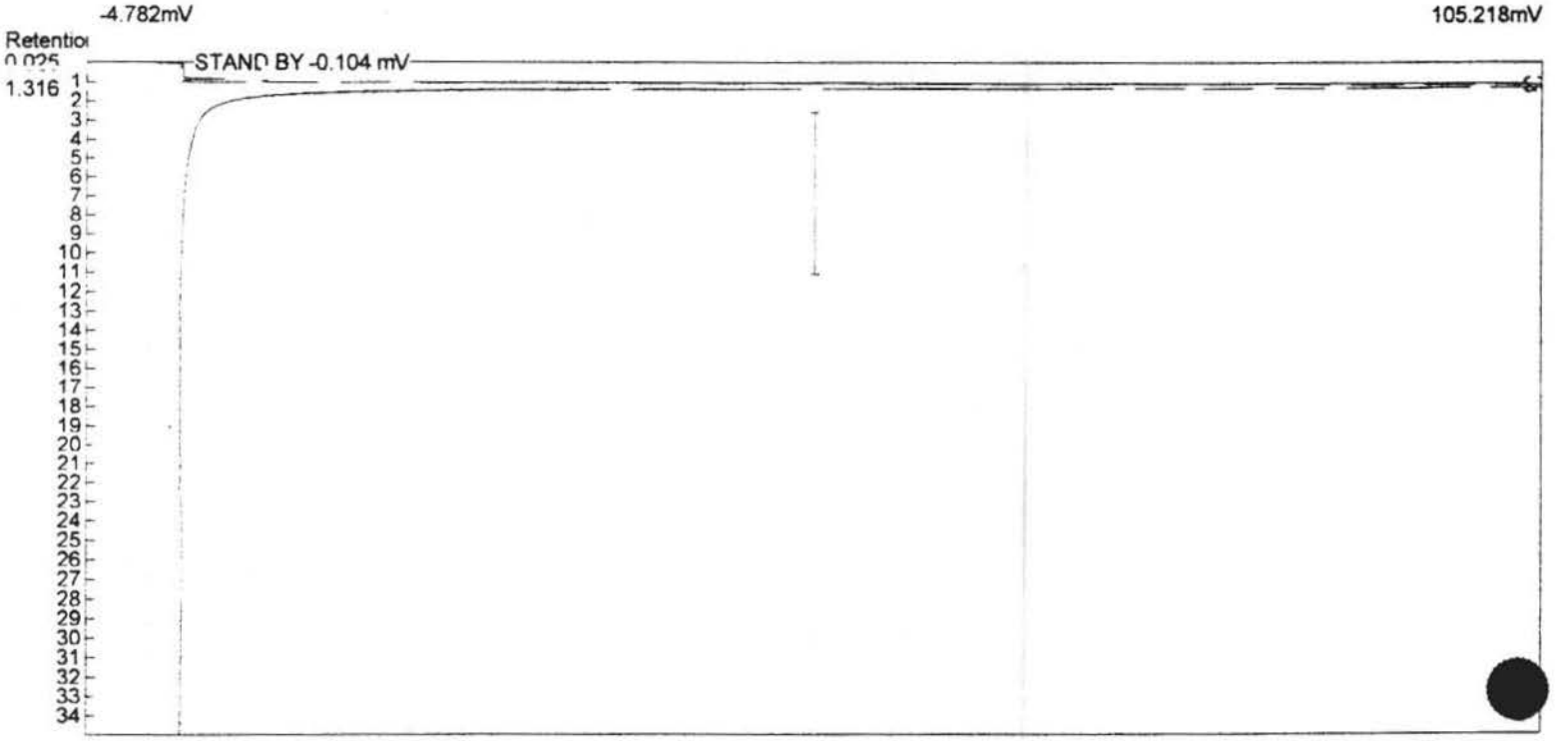
Component	Retention	Area	External	Units
		0.000	0.00	

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 14:10:29
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0710FA4.CHR ()
Sample: 2842 SB-8/0709CH2
Operator: JMP



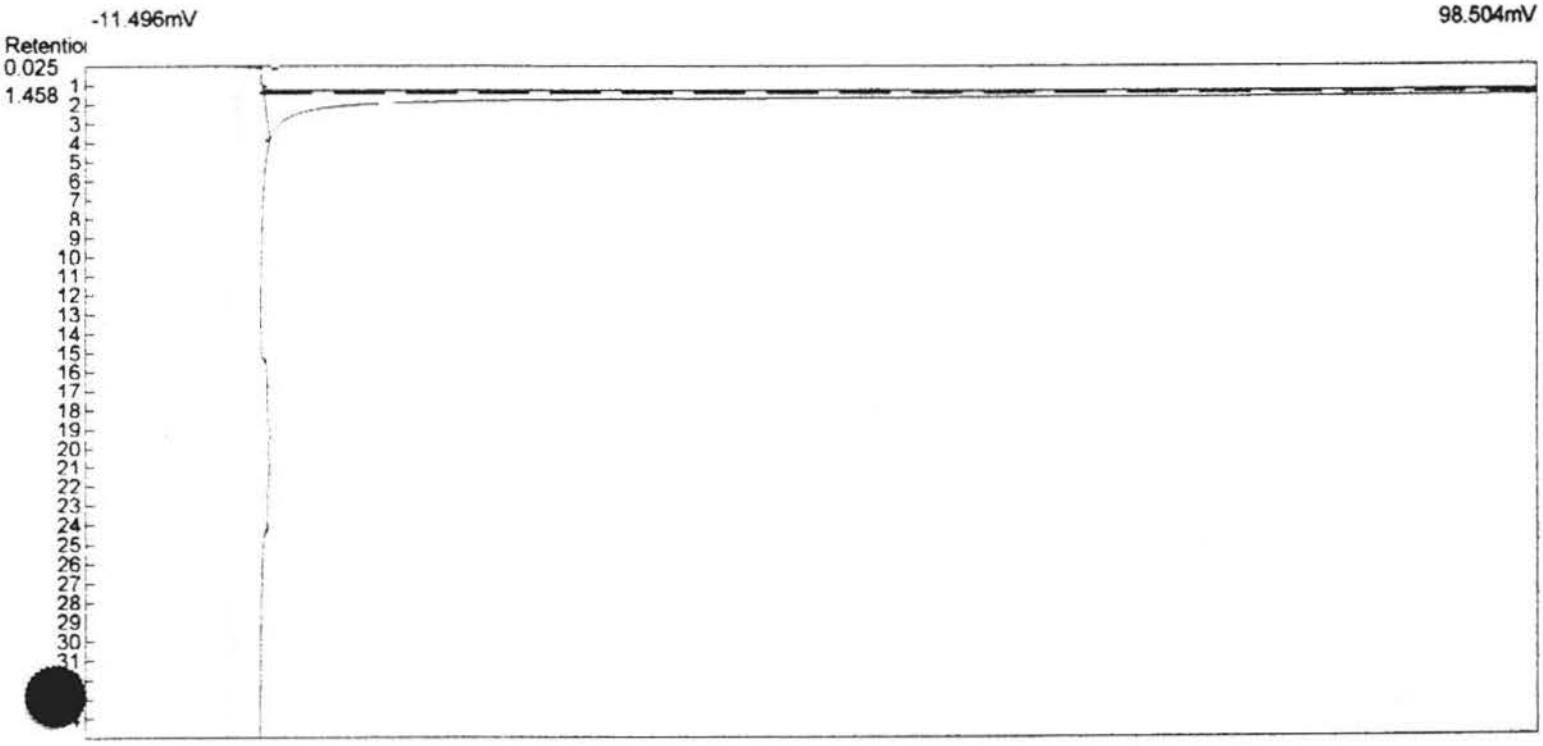
Component	Retention	Area	Internal	Units
		0.000	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 14:10:29
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0710FB4.CHR ()
Sample: 2842 SB-9/0709CH2
Operator: JMP



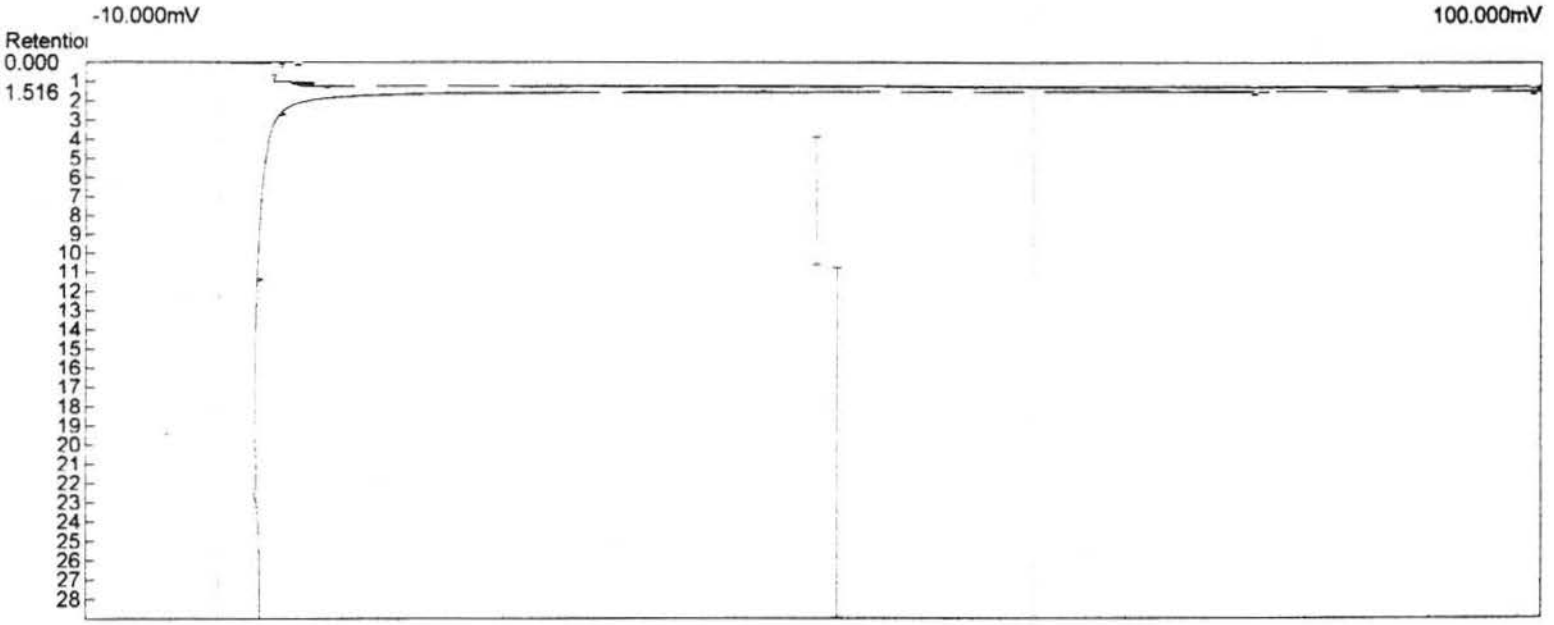
Component	Retention	Area	External	Units
		0.000	0.00	

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 15:05:07
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0710FA5.CHR ()
Sample: 2842 DUPE 2/0709CH2
Operator: JMP



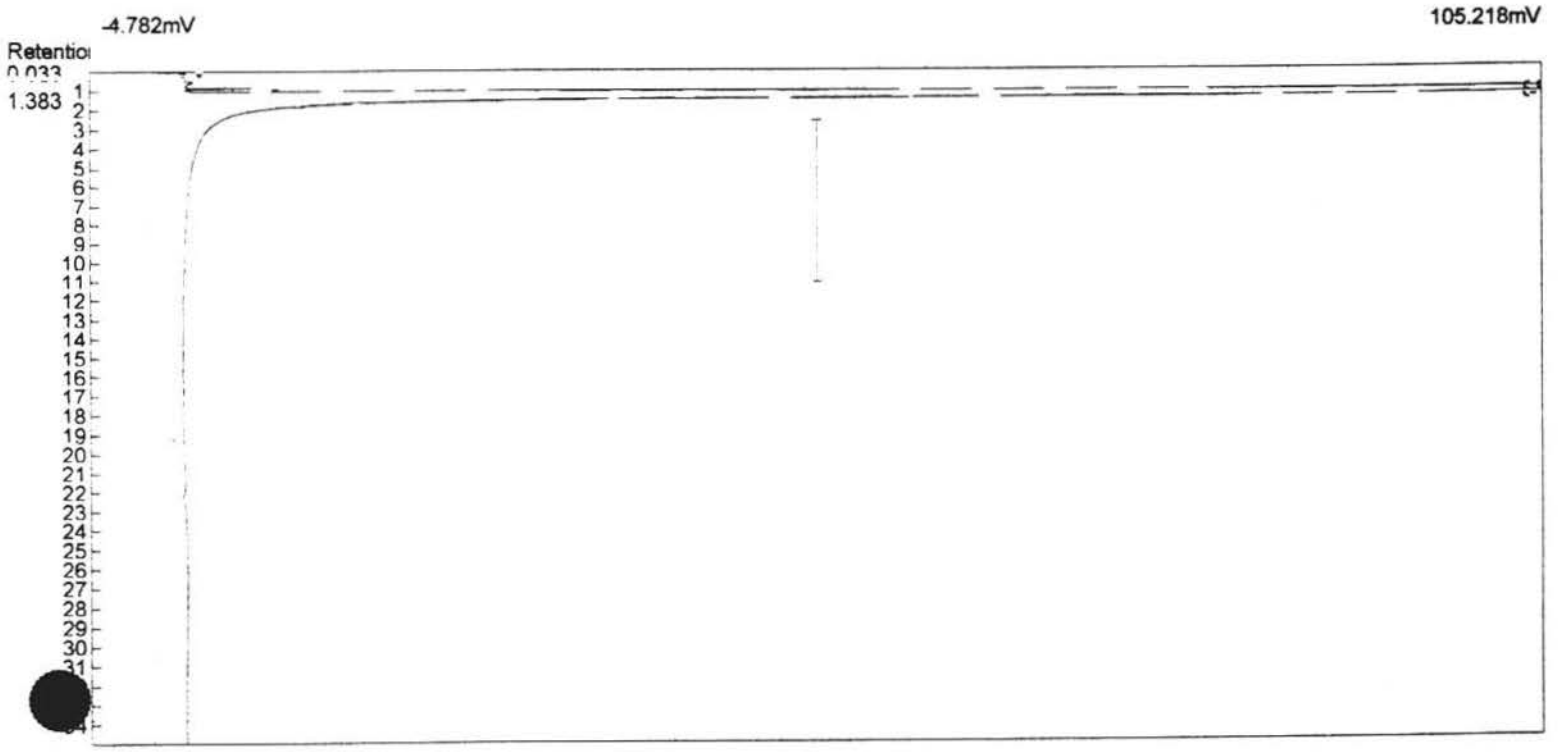
Component	Retention	Area	Internal	Units
		0.000	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 19:54:09
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0710FB7.CHR ()
Sample: 2842-SB8-H20
Operator: JMP



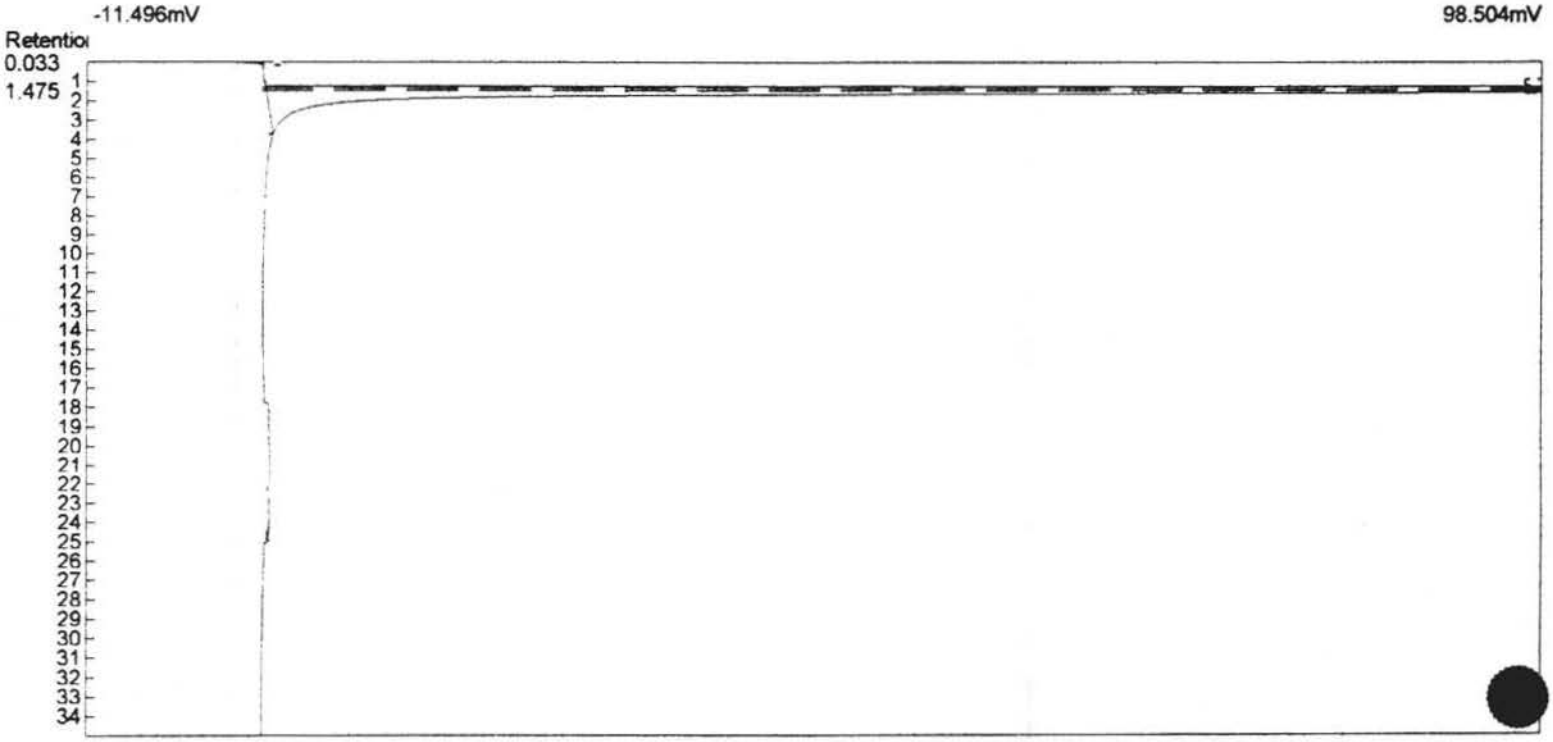
Component	Retention	Area	External	Units
		0.000	0.00	

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 15:05:07
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0710FB5.CHR ()
Sample: 2842 SB-9 H20/0709CH2
Operator: JMP



Component	Retention	Area	External	Units
		0.000	0.00	

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 15:56:31
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0710FA6.CHR ()
Sample: 2842 EB2/0709CH2
Operator: JMP



Component	Retention	Area	Internal	Units
		0.000	0.0000	

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QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0709CH2
DAILY CALIBRATION DATE: 7/10/98

CH2M HILL
PROJECT NAME: SITE 2842

			INITIAL		OPENING			CLOSING		
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	AREA	RF	%DIFF	AREA	RF	%DIFF
BENZENE	PID #1	0.100 - 10.000	26	7.1%	131.59	26.32	0.0%	14.68	29.35	11.5%
TOLUENE	PID #1	0.100 - 10.000	27	4.9%	134.46	26.89	0.0%	15.29	30.58	13.7%
ETHYLBENZENE	PID #1	0.100 - 10.000	23	9.0%	114.97	22.99	0.0%	12.86	25.71	11.8%
m&p-XYLENES	PID #1	0.100 - 10.000	33	9.9%	334.05	33.41	0.0%	33.82	33.82	1.2%
o-XYLENES	PID #1	0.100 - 10.000	27	8.9%	136.08	27.22	0.0%	13.07	26.15	3.9%
BENZENE	PID #2	0.100 - 10.000	31	7.3%	154.29	30.86	0.5%	16.79	33.58	8.3%
TOLUENE	PID #2	0.100 - 10.000	32	8.4%	158.16	31.63	1.2%	17.71	35.41	10.7%
ETHYLBENZENE	PID #2	0.100 - 10.000	26	5.2%	129.00	25.80	0.8%	14.79	29.57	13.7%
m&p-XYLENES	PID #2	0.100 - 10.000	37	3.8%	378.81	37.88	2.4%	40.56	40.56	9.6%
o-XYLENES	PID #2	0.100 - 10.000	31	2.6%	153.75	30.75	0.8%	16.63	33.27	7.3%

CALIB RANGE - RANGE OF CALIBRATION CURVE IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 20% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: JOSE M. PEREZ
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
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QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0709CH2
DATE: 7/10/98

CH2M HILL
PROJECT NAME: SITE 2842

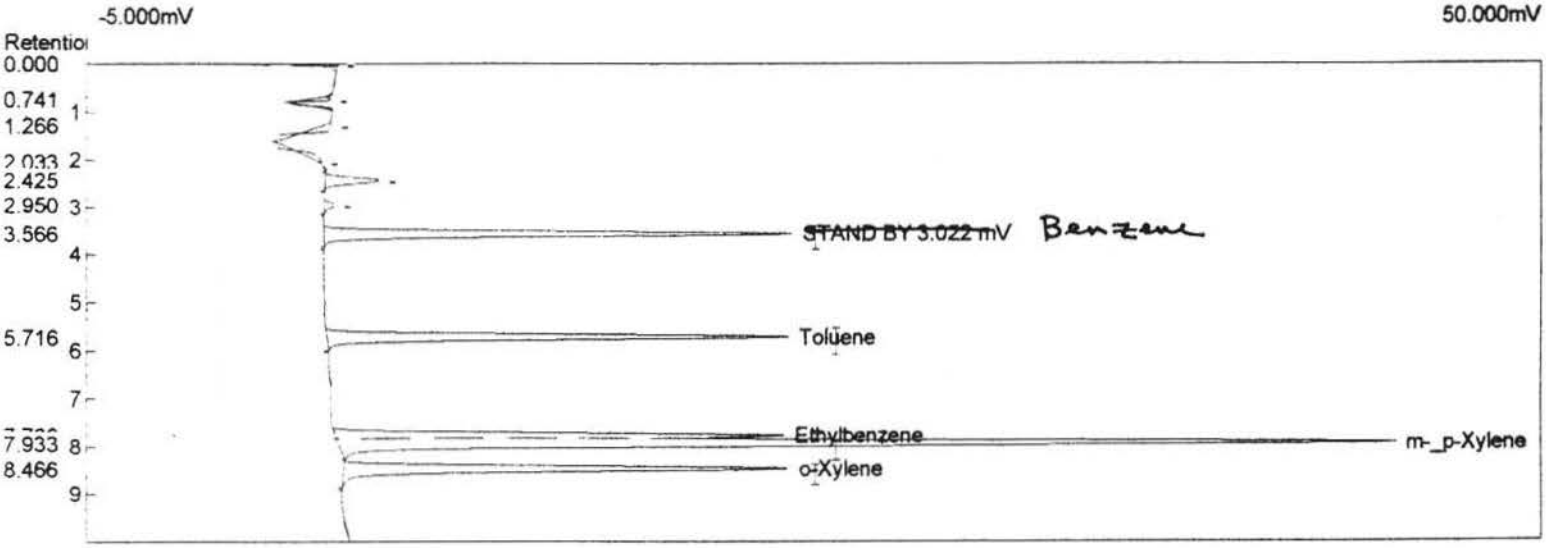
COMPOUND	SPK CONC (ppm)	MS CONC (ppm)	%REC MS	MSD CONC (ppm)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
BENZENE	5.0	4.96	99%	4.72	94%	5%	15%	76% - 120%
TOLUENE	5.0	4.97	99%	4.79	96%	4%	15%	75% - 120%
ETHYLBENZENE	5.0	4.97	99%	4.95	99%	0%	15%	65% - 125%
TOTAL XYLENES	15.0	14.9	100%	14.3	98%	4%	15%	72% - 120%

ppm = PARTS PER MILLION
MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE
% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX
RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY: JOSE M. PEREZ
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

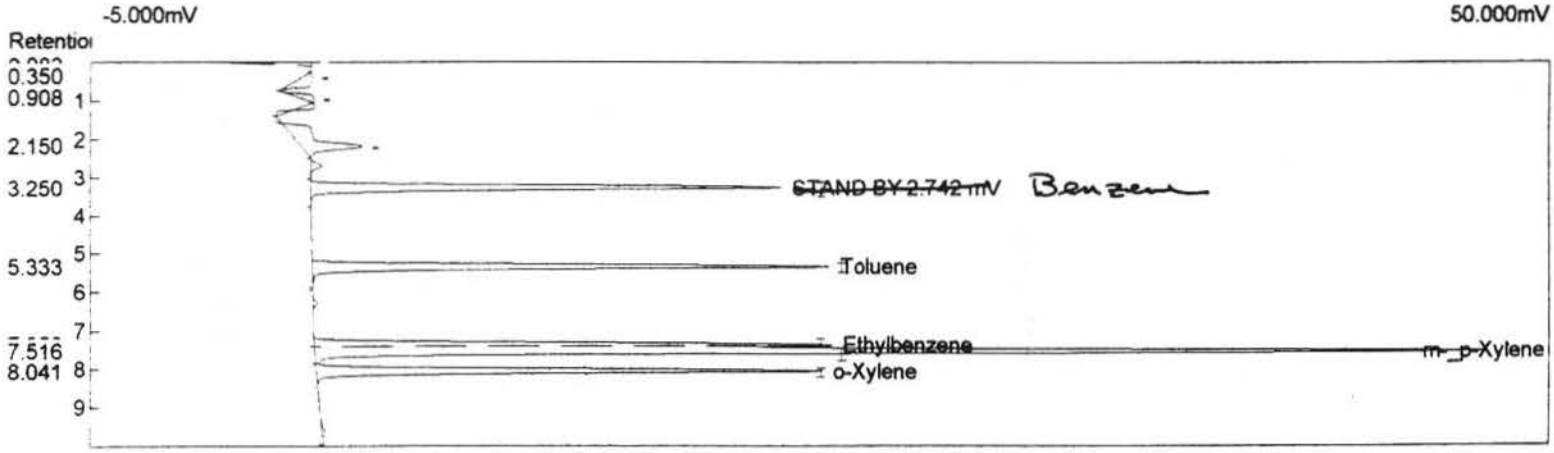
Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 13:36:46
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0710PA1.CHR ()
Sample: 5 ppm BTEX Opening
Operator: JMP



Component	Retention	Area	External	Internal	Units
Benzene	3.566	131.594	5.06	5.0613	ppm
T[illegible]ne	5.716	134.458	5.00	5.0000	ppm
E[illegible]enzene	7.766	114.970	5.00	5.0000	ppm
m-_p-Xylene	7.933	334.050	~~5.00~~ 10.	5.0000	ppm X 2 = 10.00
o-Xylene	8.466	136.079	5.00	5.0000	ppm
		851.151	25.06	25.0613	

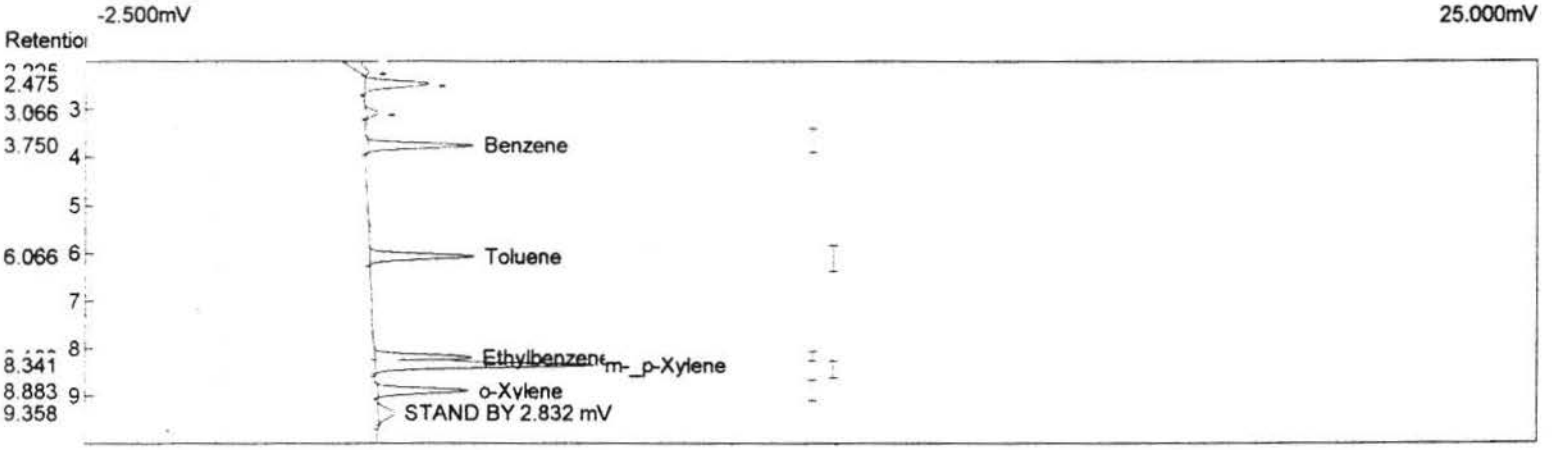
KL

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 13:36:46
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0710PB1.CHR ()
Sample: 5 ppm BTEX Opening
Operator: JMP



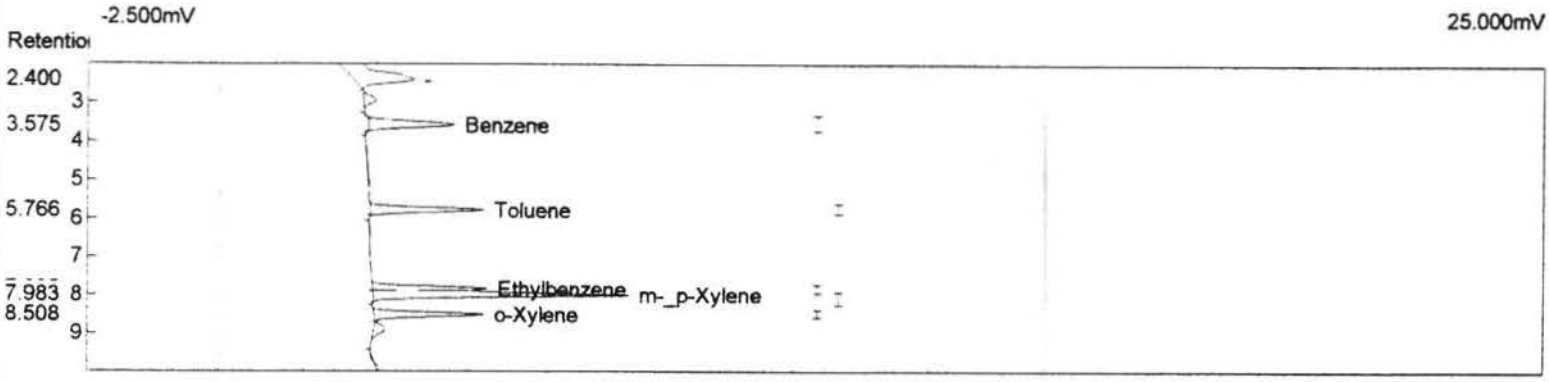
Component	Retention	Area	External	Internal	Units
Benzene	3.250	154.294	5.00	5.0000	ppm
Toluene	5.333	158.160	5.00	5.0000	ppm
Ethylbenzene	7.358	129.003	5.00	5.0000	ppm
m-_p-Xylene	7.516	378.812	10.00	10.0000	ppm
o-Xylene	8.041	153.748	5.00	5.0000	ppm
		974.017	30.00	30.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 17:29:40
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: C:\PEAKWIN\0710PA10.CHR ()
Sample: 0.5 ppm CLOSE STD
Operator: JMP



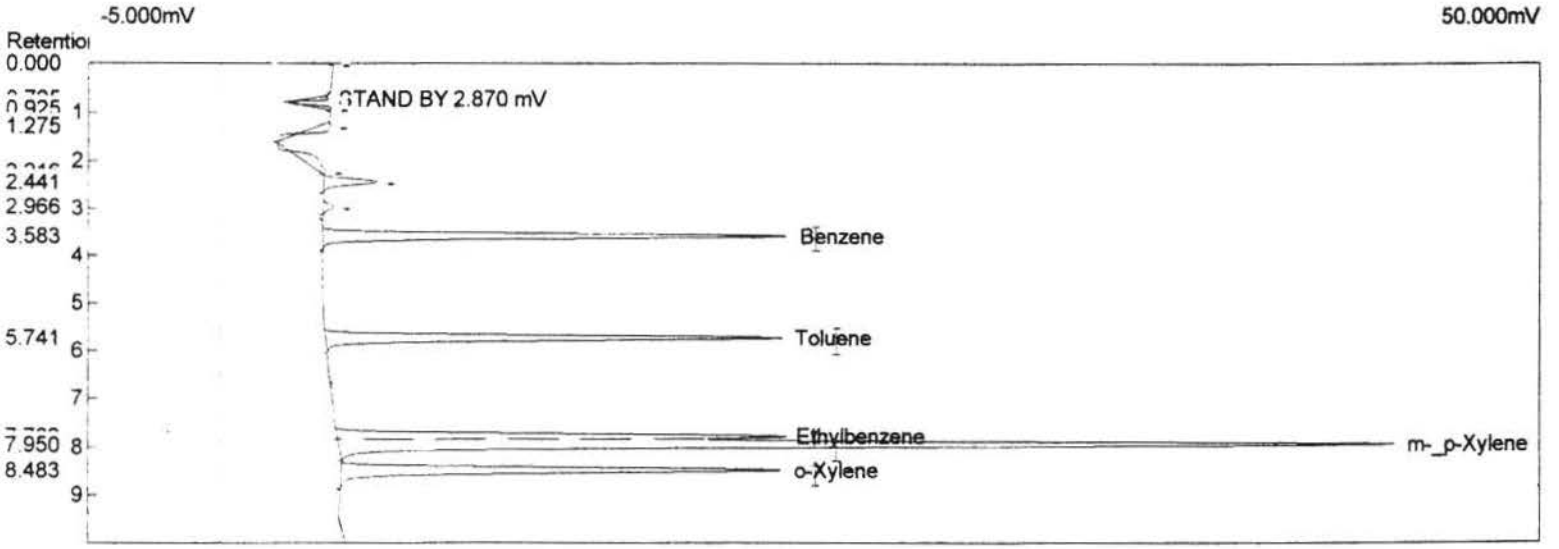
Component	Retention	Area	External	Internal	Units
Benzene	3.750	14.676	0.56	0.5645	ppm
Toluene	6.066	15.290	0.57	0.5686	ppm
Ethylbenzene	8.183	12.855	0.56	0.5591	ppm
m-_p-Xylene	8.341	33.823	1.01	1.0125	ppm
o-Xylene	8.883	13.073	0.48	0.4803	ppm
		89.717	3.18	3.1850	

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 17:29:40
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: C:\PEAKWIN\0710PB10.CHR ()
Sample: 0.5 ppm CLOSE STD
Operator: JMP



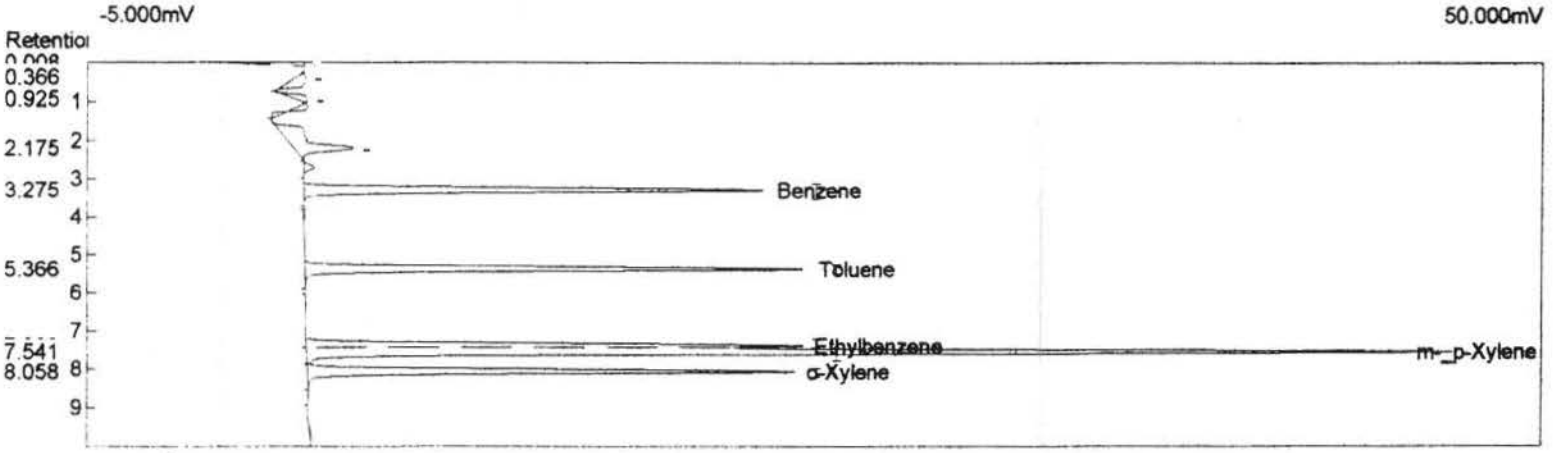
Component	Retention	Area	External	Internal	Units
Benzene	3.575	16.790	0.54	0.5441	ppm
Toluene	5.766	17.706	0.56	0.5598	ppm
Ethylbenzene	7.825	14.786	0.57	0.5731	ppm
m-_p-Xylene	7.983	40.555	1.07	1.0706	ppm
o-Xylene	8.508	16.633	0.54	0.5409	ppm
		106.470	3.29	3.2884	

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 13:56:05
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0710PA2.CHR ()
Sample: Matrix Spike
Operator: JMP



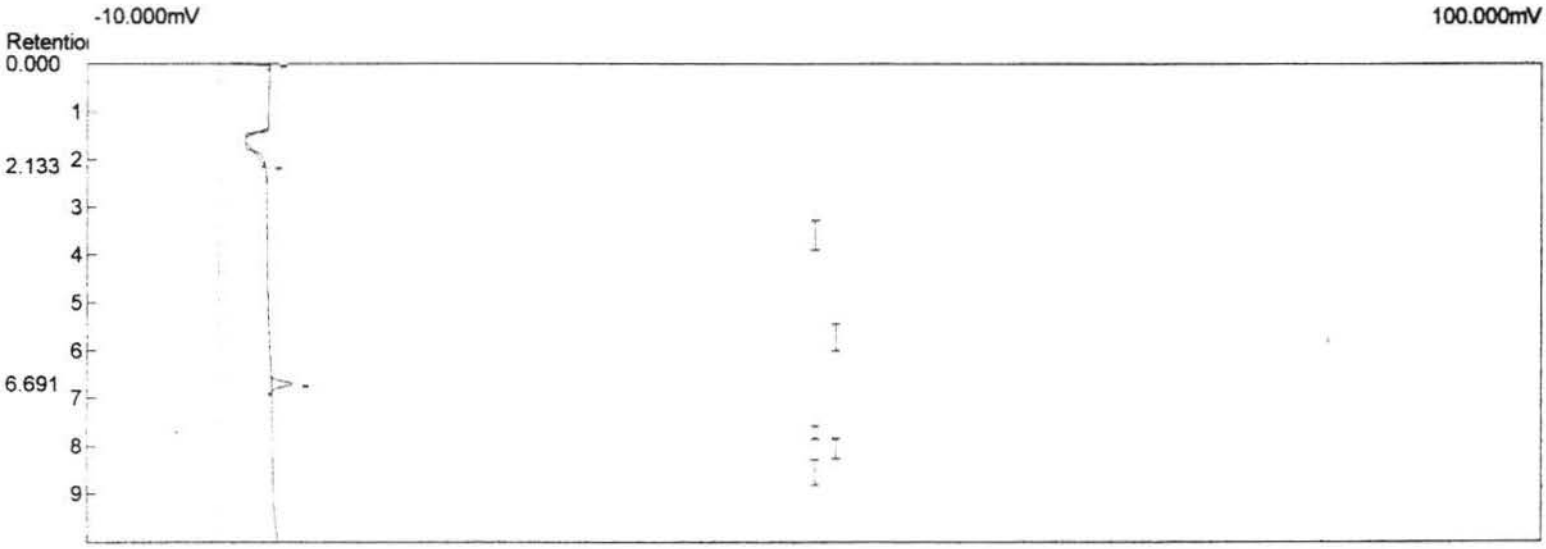
Component	Retention	Area	External	Internal	Units
Benzene	3.583	128.980	4.96	4.9608	ppm
Toluene	5.741	133.519	4.97	4.9651	ppm
Ethylbenzene	7.783	114.327	4.97	4.9720	ppm
m-_p-Xylene	7.950	334.666 33.41	~~5.01~~	5.~~0092~~ ppm	- 10.0168
o-Xylene	8.483	134.050	4.93	4.9255	ppm
		845.543	24.83	24.8326	

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 13:56:05
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0710PB2.CHR ()
Sample: Matrix Spike Duplicate
Operator: JMP



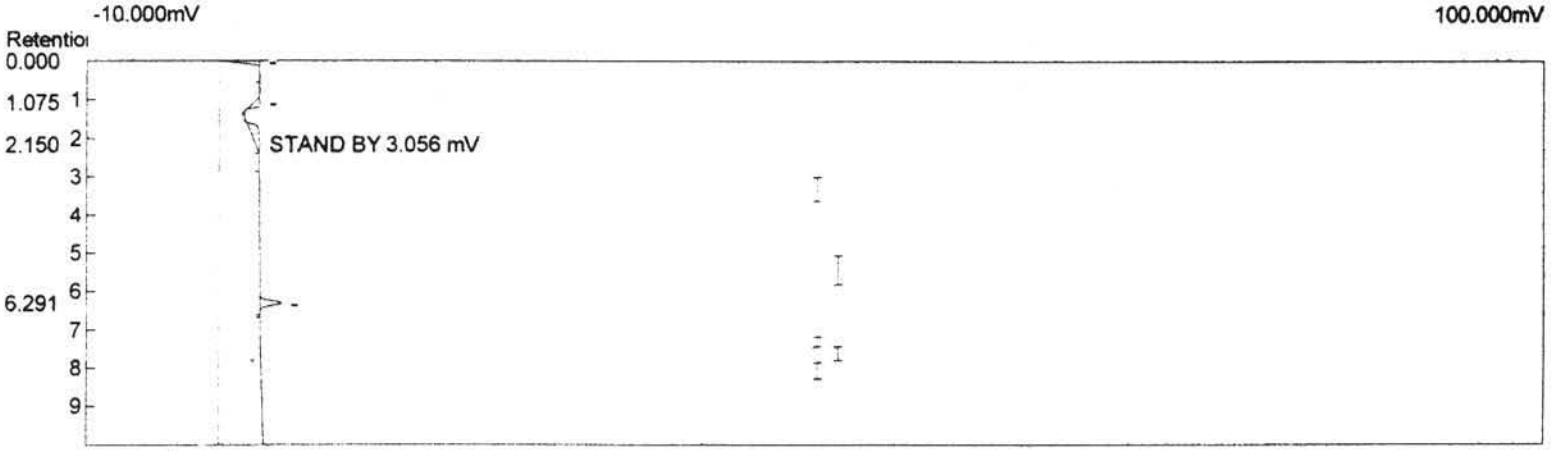
Component	Retention	Area	External	Internal	Units
Benzene	3.275	145.535	4.72	4.7162	ppm
Toluene	5.366	151.439	4.79	4.7875	ppm
Ethylbenzene	7.383	127.765	4.95	4.9520	ppm
m-_p-Xylene	7.541	360.195	9.51	9.5085	ppm
o-Xylene	8.058	148.457	4.83	4.8279	ppm
		933.391	28.79	28.7922	

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 14:15:29
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0710PA3.CHR ()
Sample: Method Blank
Operator: JMP



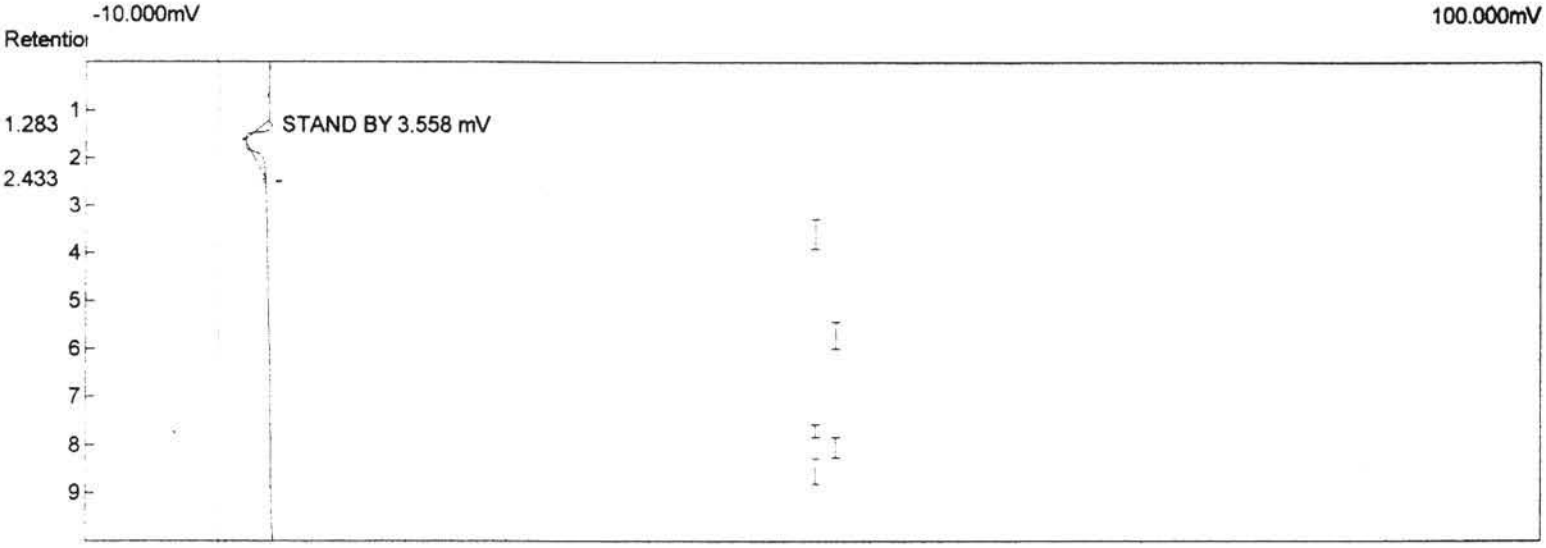
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 14:15:29
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0710PB3.CHR ()
Sample: Method Blank
Operator: JMP



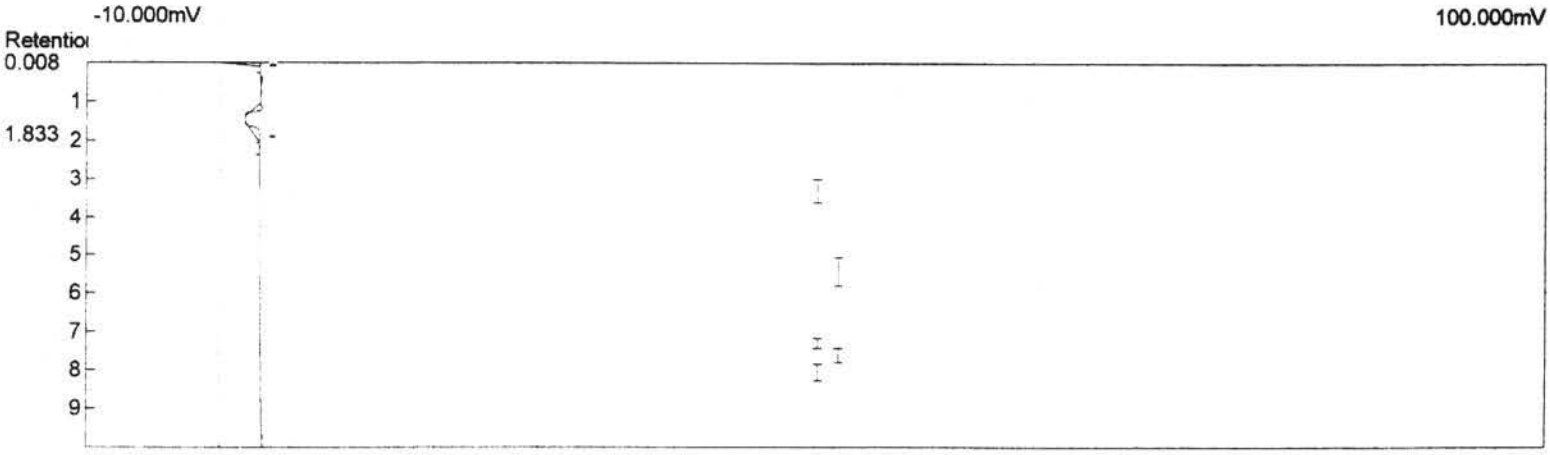
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 14:40:37
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0710PA4.CHR ()
Sample: 2842 SB-8/0709CH2
Operator: JMP



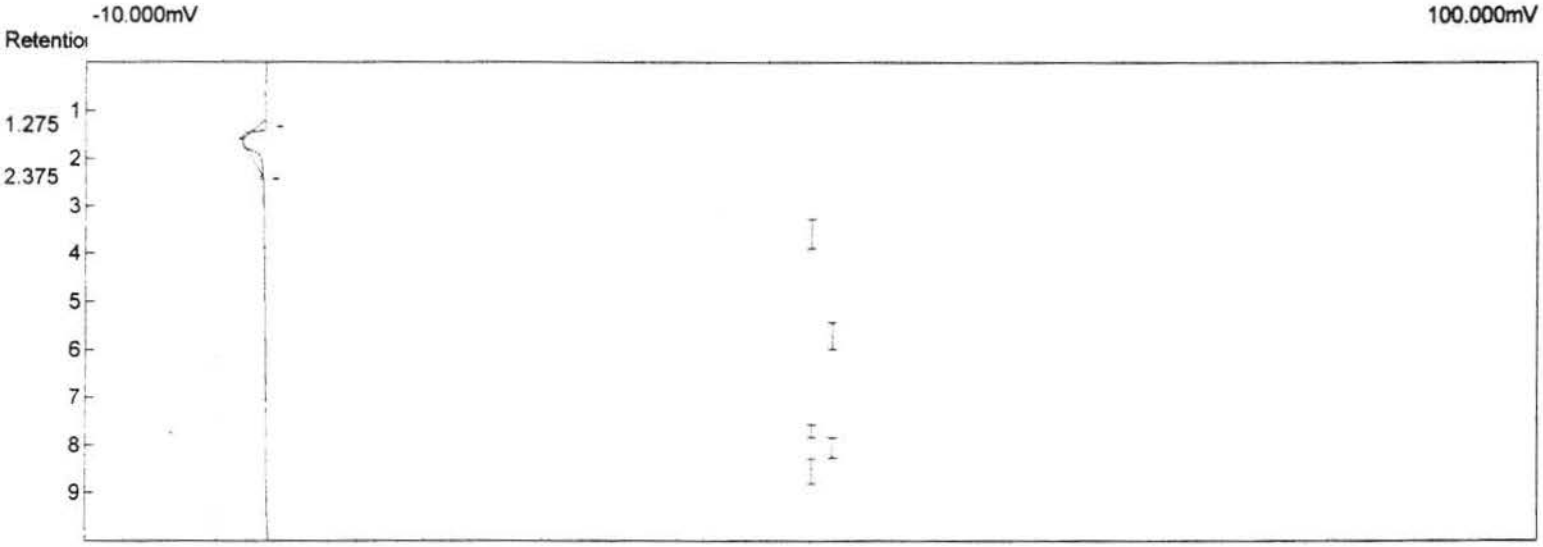
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 14:40:37
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0710PB4.CHR ()
Sample: 2842 SB-9/0709CH2
Operator: JMP



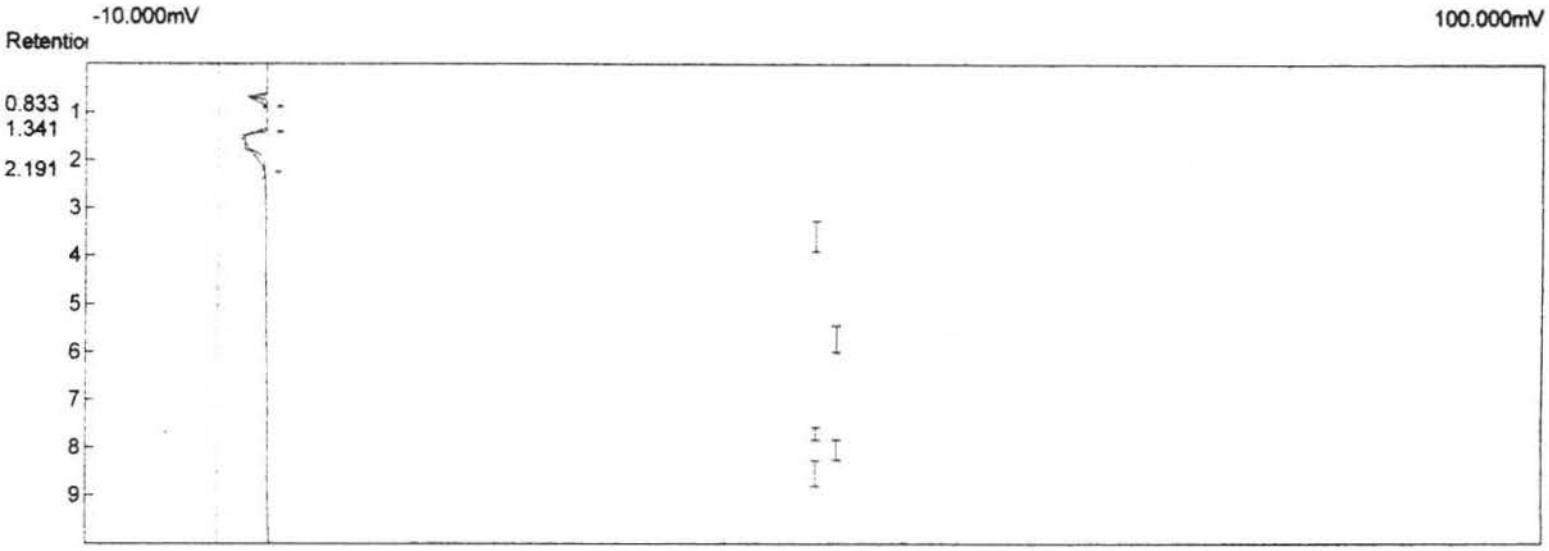
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 15:06:04
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0710PA5.CHR ()
Sample: 2842 DUPE 2/0709CH2
Operator: JMP



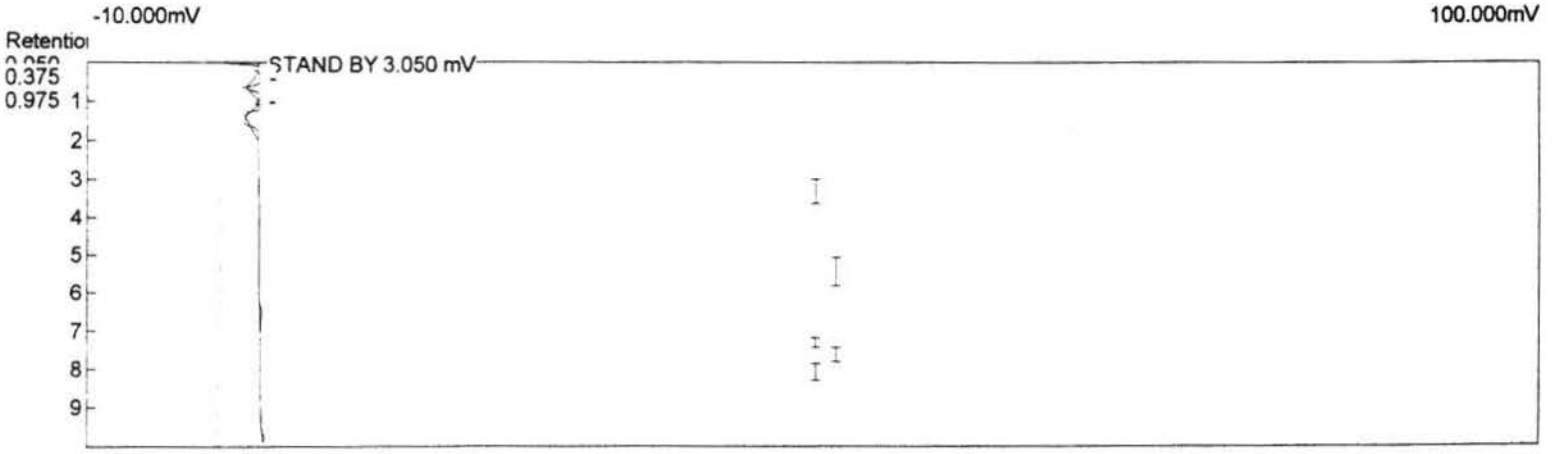
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 15:55:32
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0710PA7.CHR ()
Sample: 2842 SB8 H20/0709CH2
Operator: JMP



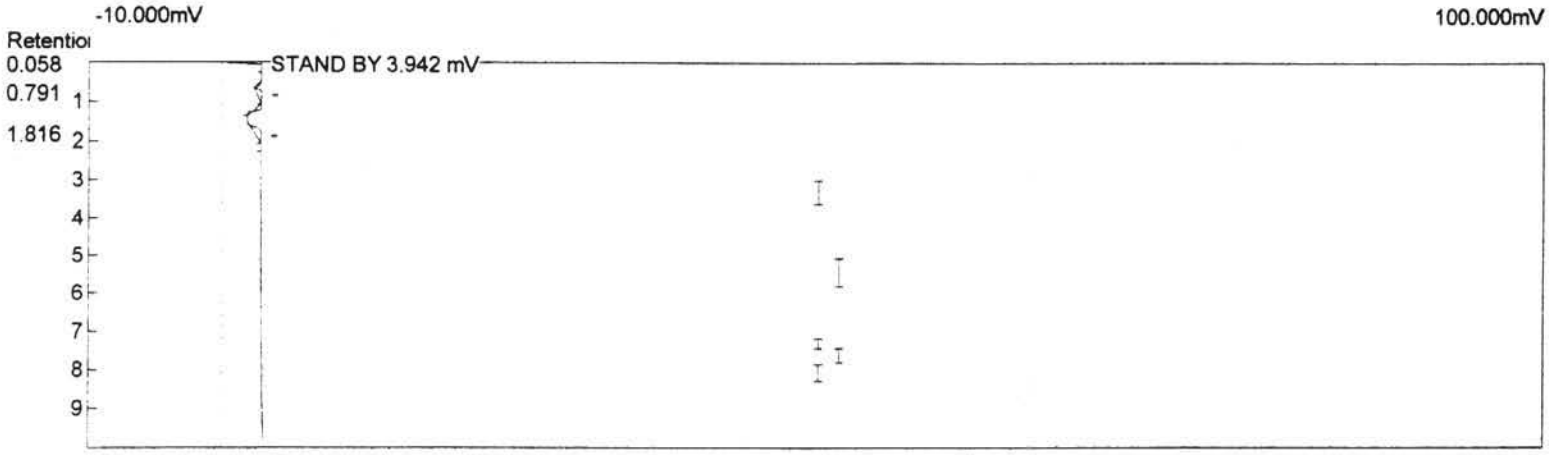
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 15:55:32
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0710PB7.CHR ()
Sample: 2842SB8H20/0709CH2 re
Operator: JMP



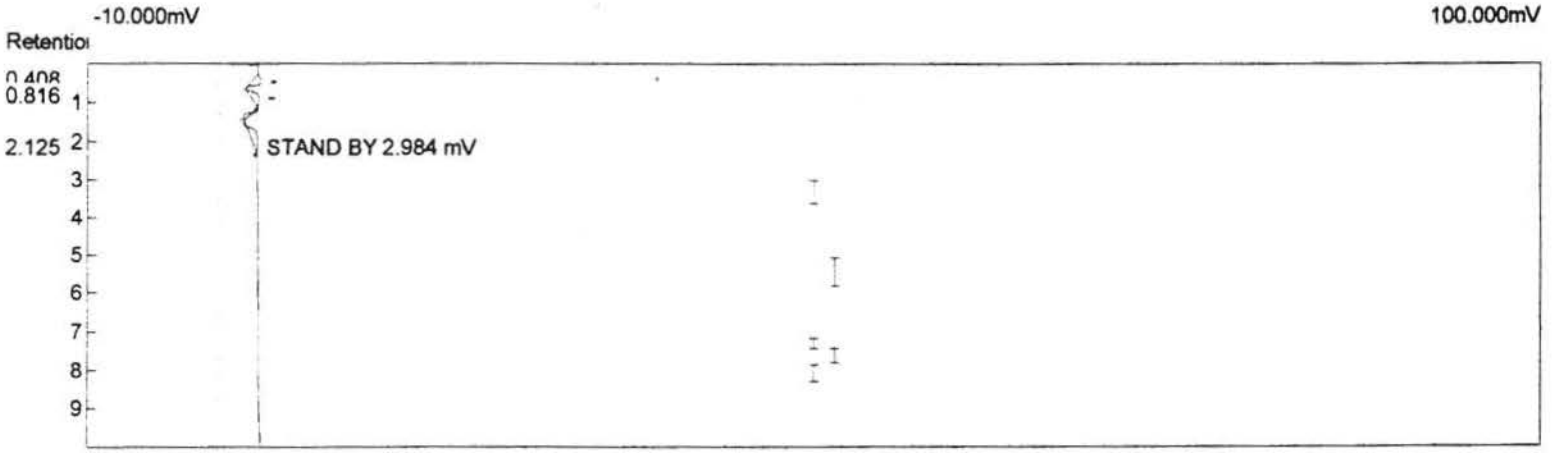
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 15:06:04
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0710PB5.CHR ()
Sample: 2842 SB-9 H20/0709CH2
Operator: JMP



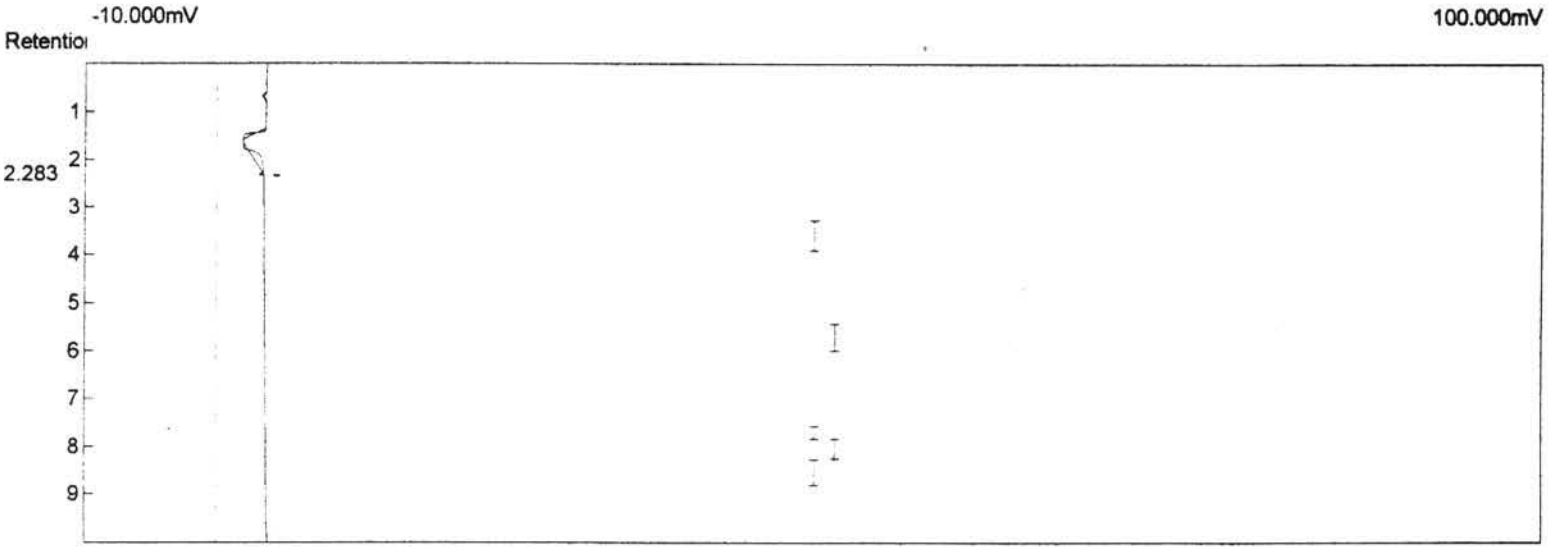
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 15:28:28
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0710PB6.CHR ()
Sample: 2842 TRIP/0709CH2
Operator: JMP



Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/10/1998 15:28:28
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0710PA6.CHR ()
Sample: 2842 EB2/0709CH2
Operator: JMP



Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

teg Transglobal Environmental Geochemistry

Chain of Custody Record

PO # _____

Client: CH2M HILL

Address: _____

Phone: (787) 888-8713 FAX: _____

Client Project #: 146901.US.SC Project Manager: NALTY CLASEN/TPA

Date: 7/9/98 Page 1 of 1

TEG Project #: 98T0709CH2 Outside Lab.#: _____

Location: RRNS UST SC

Collector: MIKE WEATHERBY Date of Collection: 7/9/98

Sample #	Depth	Time	Sample Type	Container Type	VOA 8010	VOA 8020 (BTEX)	VOA 8260	SEMI VOL 8270	TRPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (gas & diesel)	TPH 8015 (oil)	PNA 610/8100	TOTAL LEAD	pH	METALS	RCI							FIELD NOTES / PRESERVATION	Total # of Containers
2842-SB8	10-12	1400	SOIL	2oz		1			1			1													24 TAT 8015M GRO/DRO	3
2842-SB9	4-6	1500	SOIL	~~40mL~~ 2oz		1			1			1													↓	3
2842-DUPE2	—	—	SOIL	2oz		1			1			1														3
2842-SB9	—		WATER	40mL		1			1			1														3
2842-TRIP	—	—	WATER	40mL		1																				1
2842-EB2	—	1540	WATER	40mL		1			1			1														3
2842-SB8	—		WATER	40mL		1			1			1													added by TEG	

RELINQUISHED BY (signature)	Date/Time	RECEIVED BY (signature)	Date/Time
Michael R. Weatherby	7/9/98	Lucille Martin	6:15 7/9/98
RELINQUISHED BY (signature)	Date/Time	RECEIVED BY (signature)	Date/Time

Total # of containers	16
Chain of Custody seals Y / N / NA	NA
Seals intact? Y / N / NA	NA
Received good conditions / cold	Y

TEMPERATURE: 4°C

Sample disposal Instructions: ____ TEG Disposal @ $2.00 each ____ Return to client ____ Pickup

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The World Leader In On-Site Sampling and Analysis

July 15, 1998
TEG Project #98I0713CH2-2

Mr. Marty Clasen
CH2M HILL
4350 W. Cypress Street, Suite 600
Tampa, Florida 33607

SUBJECT: DATA REPORT - CH2M HILL PROJECT NO. 146801.US.SC SITE #2842

Dear Marty,

Please find enclosed the analytical report for the samples collected by CH2M HILL personnel from the above-referenced site and delivered to TEG under the proper chain-of-custody protocol. TEG's Puerto Rico certified-chemist performed the following analyses:

- 2 soil samples analyzed for TRPH by modified EPA test method 418.1.
- 2 soil samples analyzed for TPH-gas/diesel by modified EPA test method 8015.
- 1 water sample analyzed for TPH-gas/diesel by modified EPA test method 8015.
- 2 soil samples analyzed for BTEX by modified EPA test method 8020.
- 1 water sample analyzed for BTEX by modified EPA test method 8020.
- 1 trip blank water sample analyzed for BTEX by modified EPA test method 8020.
- Laboratory QA/QC analyses for TPH-gas/diesel, TRPH and BTEX.

The analytical results are summarized in the attached table. Applicable detection limits, QA/QC data, chromatograms, a chain-of-custody and an invoice are attached.

TEG appreciates the opportunity to provide analytical services for this project. If you have any questions relating to the data or report, please do not hesitate to contact us.

Sincerely,
TEG

Kevin Shelburne

Kevin Shelburne
Principal

Attachments

TEG-PUERTO RICO • PMB 627, HC-01 Box 29030, Caguas, PR 00725 • Phone (787) 720-0329 • Fax (787) 789-3858 • Pager 759-1255 Unit 217-4053

CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVY BASE, SITE 2842
CEIBA, P. R.

TEG Project #98I0713CH2-2

BTEX (Mod. EPA Method 8020) ANALYSES OF SOIL

SAMPLE NUMBER	DATE ANALYZED	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL-BENZENE (mg/kg)	TOTAL XYLENES (mg/kg)
METHOD BLANK	7/14/98	ND	ND	ND	ND
2842-SB10 @ 4'-6'	7/14/98	ND	ND	ND	ND
2842-SB11 @ 2'-4'	7/14/98	ND	ND	ND	ND
DETECTION LIMIT (mg/kg)		0.05	0.05	0.05	0.15

BTEX (Mod. EPA Method 8020) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL-BENZENE (mg/L)	TOTAL XYLENES (mg/L)
METHOD BLANK	7/14/98	ND	ND	ND	ND
2842-SB11	7/14/98	ND	ND	ND	ND
2842-SB11 rep.	7/14/98	ND	ND	ND	ND
2842-TRIP	7/14/98	ND	ND	ND	ND
DETECTION LIMIT (mg/L)		0.05	0.05	0.05	0.15

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
mg/kg = MILLIGRAMS PER KILOGRAM
mg/L = MILLIGRAMS PER LITER
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE
CONCENTRATIONS BASED ON DRY WEIGHT

Marco A. Pedraza
Laboratory Manager

Kevin Shelburne
Principal

Marco A. Pedraza Ruiz
Químico Licenciado
A-526161
Estado Libre Asociado de Puerto Rico

TEG-PUERTO RICO • PMB 627, HC-01 Box 29030, Caguas, PR 00725 • Phone (787) 720-0329 • Fax (787) 789-3858 • Pager 759-1255 Unit 217-4053

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CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVY BASE, SITE 2842
CEIBA, P. R.

TEG Project #98I0713CH2-2

TRPH (EPA Method 418.1) ANALYSES OF SOIL

SAMPLE NUMBER	DATE ANALYZED	TRPH (mg/kg)
METHOD BLANK	7/14/98	ND
2842-SB10 @ 4'-6'	7/14/98	260
2842-SB11 @ 2'-4'	7/14/98	830
DETECTION LIMIT (mg/kg)		10

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT
mg/kg = MILLIGRAMS PER KILOGRAM
CONCENTRATIONS BASED ON DRY WEIGHT
ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TEG-PUERTO RICO • PMB 627, HC-01 Box 29030, Caguas, PR 00725 • Phone (787) 720-0329 • Fax (787) 789-3858 • Pager 759-1255 Unit 217-4053

CH2M HILL PROJECT NO. 146801.US.SC
ROOSEVELT ROADS NAVY BASE, SITE 2842
CEIBA, P. R.

TEG Project #98I0713CH2-2

TPH (DOHS Mod. EPA Method 8015) ANALYSES OF SOIL

SAMPLE NUMBER	DATE ANALYZED	TPH-GAS C5-C12 (mg/kg)	TPH-DIESEL C13-C24 (mg/kg)
METHOD BLANK	7/14/98	ND	ND
2842-SB10 @ 4'-6'	7/14/98	ND	ND
2842-SB11 @ 2'-4'	7/14/98	ND	ND
DETECTION LIMIT (mg/kg)		10	25

TPH (DOHS Mod. EPA Method 8015) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	TPH-GAS C5-C12 (mg/L)	TPH-DIESEL C13-C24 (mg/L)
METHOD BLANK	7/14/98	ND	ND
2842-SB11	7/14/98	ND	47
2842-SB11 rep.	7/14/98	ND	46
DETECTION LIMIT (mg/L)		10	25

SAMPLING PERFORMED BY CH2M HILL PERSONNEL
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT
CONCENTRATIONS BASED ON DRY WEIGHT

mg/kg = MILLIGRAMS PER KILOGRAM
mg/L = MILLIGRAMS PER LITER
ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TEG-PUERTO RICO • PMB 627, HC-01 Box 29030, Caguas, PR 00725 • Phone (787) 720-0329 • Fax (787) 789-3858 • Pager 759-1255 Unit 217-4053

teg

QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0713CH2-2

CH2M HILL

DAILY CALIBRATION DATE : 7/14/98

PROJECT NAME: SITE 2842

			INITIAL		OPENING			CLOSING		
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	ABS	RF	%DIFF	ABS	RF	%DIFF
TRPH	IR	10 - 1,000	764.6	15.7%	0.706	708.2	7.4%	0.706	708.2	7.4%

CALIB RANGE - RANGE OF CALIBRATION CURVE IS IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 20% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

teg

QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0713CH2-2
DATE : 7/14/98

CH2M HILL
PROJECT NAME: SITE 2842

COMPOUND	SPK CONC (ppm)	MS CONC (ppm)	%REC MS	MSD CONC (ppm)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
TRPH	500	536	107%	534	107%	0%	15%	80% - 120%

ppm = PARTS PER MILLION
MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE
% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX
RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

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teg

QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0713CH2-2
DAILY CALIBRATION DATE: 7/14/98

CH2M HILL
PROJECT NAME: SITE 2842

			INITIAL			OPENING			CLOSING	
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	AREA	RF	%DIFF	AREA	RF	%DIFF
TPH GASOLINE	FID #1 (gc1)	10 - 40,000	0.50	9.7%	138.80	0.46	6.9%	326.41	0.54	9.5%
TPH GASOLINE	FID #2 (gc1)	10 - 40,000	0.65	8.1%	210.03	0.70	7.2%	360.10	0.60	8.1%
TPH DIESEL	FID #1 (gc1)	25 - 40,000	0.47	8.8%	707.30	0.47	1.0%	2811.21	0.47	0.3%
TPH DIESEL	FID #2 (gc1)	25 - 40,000	0.25	5.4%	395.66	0.26	6.8%	1349.22	0.22	9.0%

CALIB RANGE - RANGE OF CALIBRATION CURVE IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 15% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

teg

QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0713CH2-2

CH2M HILL
PROJECT NAME: SITE 2842

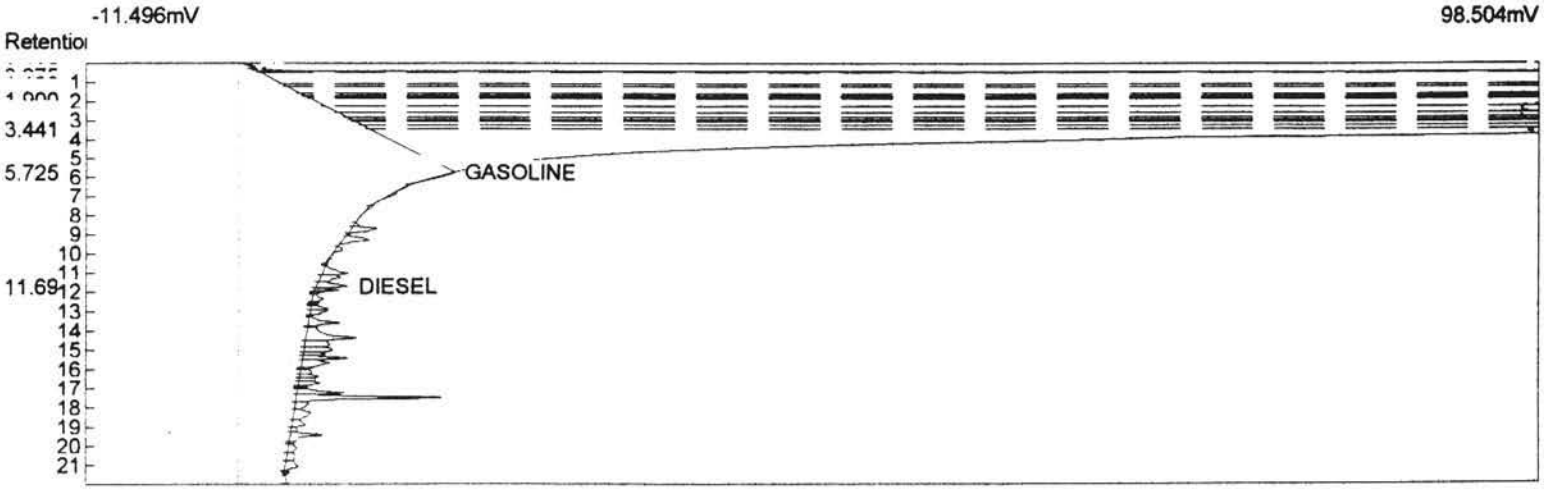
COMPOUND	SPK CON (ppm)	MS CONC (ppm)	%REC MS	MSD CONC (ppm)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
TPH-GAS	100	101	101%	99	99%	3%	15%	80% - 120%
TPH-DIESEL	1000	893	89%	879	88%	2%	15%	80% - 120%

ppm = PARTS PER MILLION
MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE
% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX
RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

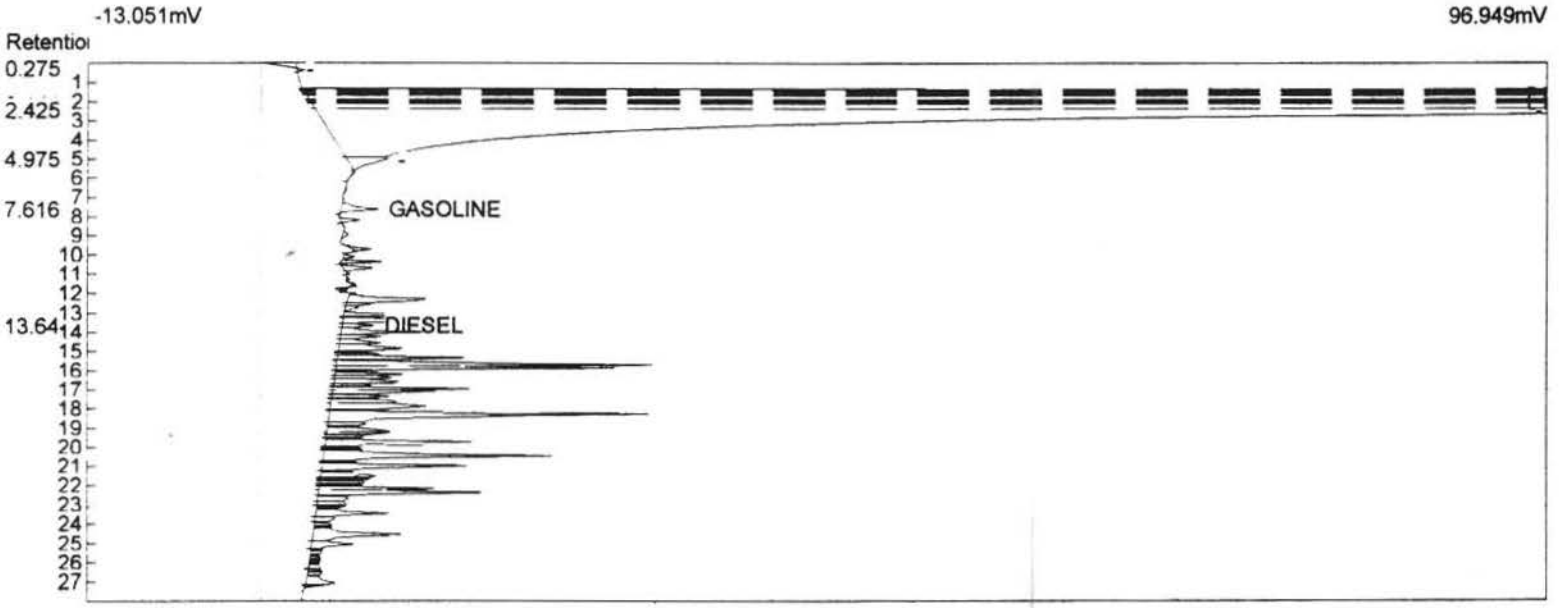
TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

Lab name: TEG Puerto Rico
Analysis date: 07/14/1998 10:34:40
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0714FA1.CHR ()
Sample: 100/500 ppm G/D Open
Operator: JMP



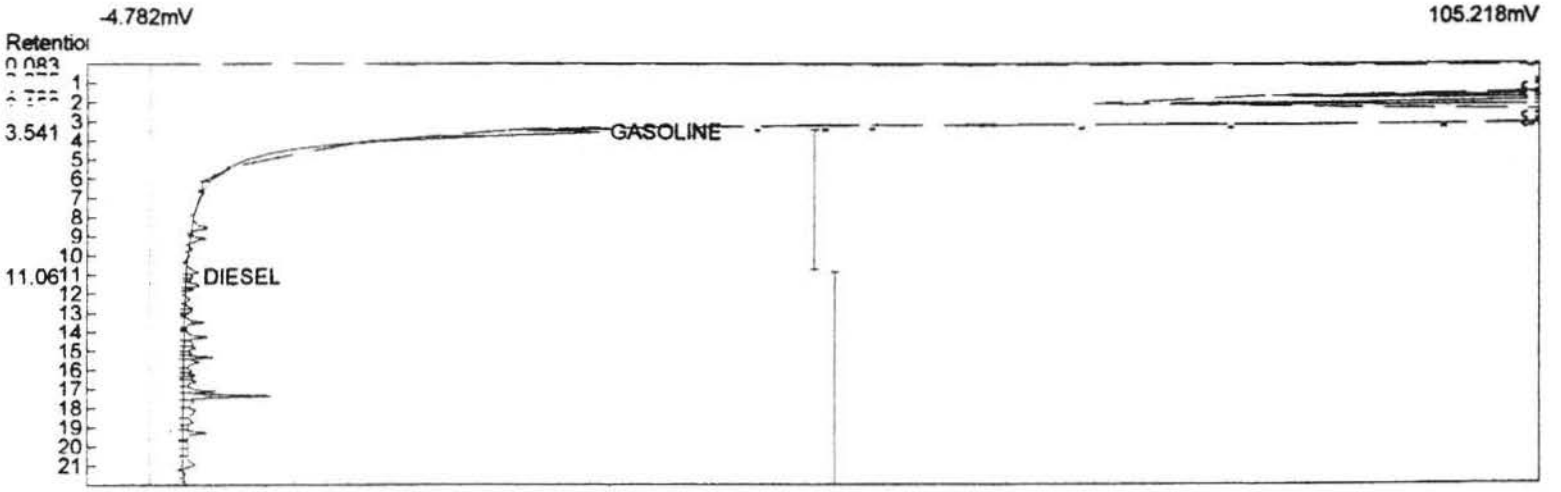
Component	Retention	Area	Internal	Units
GASOLINE	5.725	138.800	92.9990	ppm
DIESEL	11.691	707.304	504.8513	PPM
		846.104	597.8503	

Lab name: TEG Puerto Rico
Analysis date: 07/14/1998 16:39:36
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0714FA10.CHR ()
Sample: 200/2000 G/D CLOSE ST
Operator: JMP



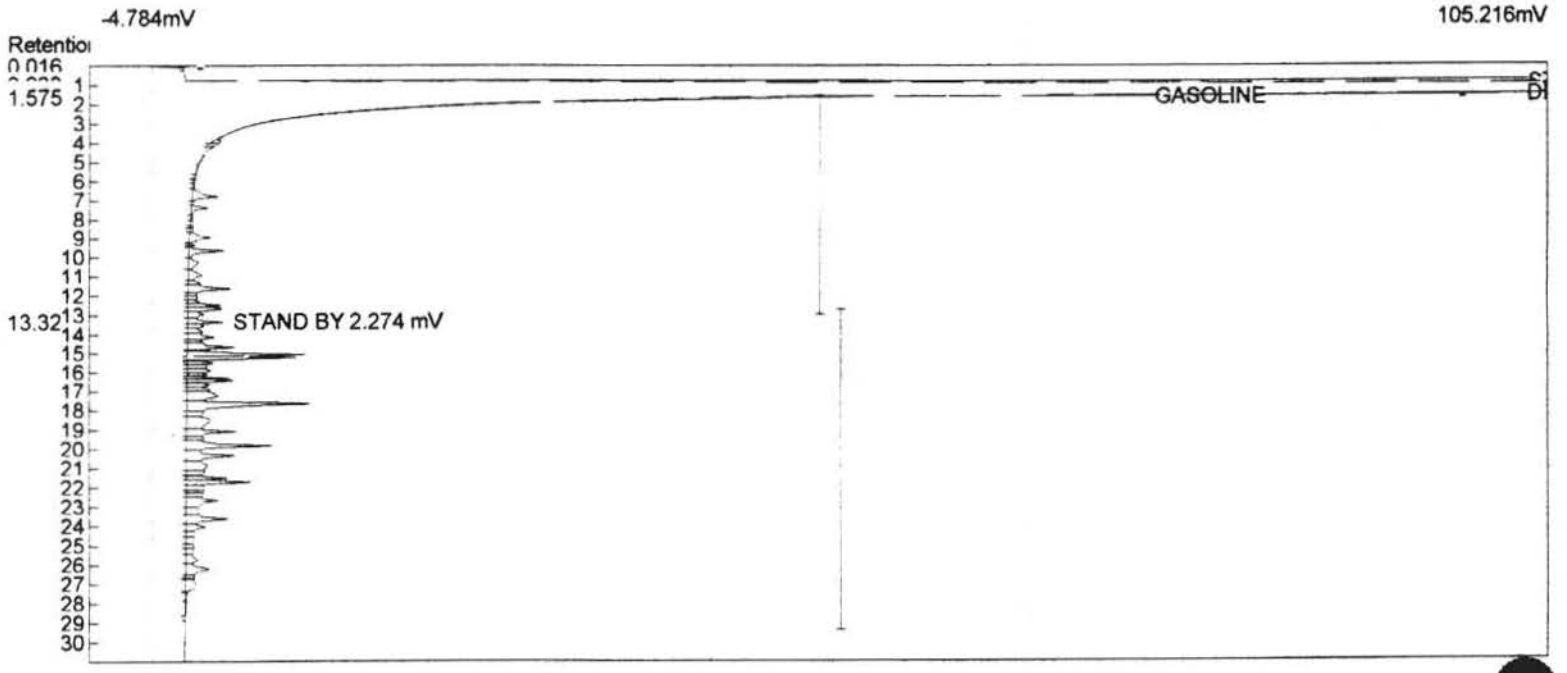
Component	Retention	Area	Internal	Units
GASOLINE	7.616	326.408	218.6998	ppm
DIESEL	13.641	2811.210	2006.5540	PPM
		3137.618	2225.2537	

Lab name: TEG Puerto Rico
Analysis date: 07/14/1998 10:34:40
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0714FB1.CHR ()
Sample: 100/500 ppm G/D Open
Operator: JMP



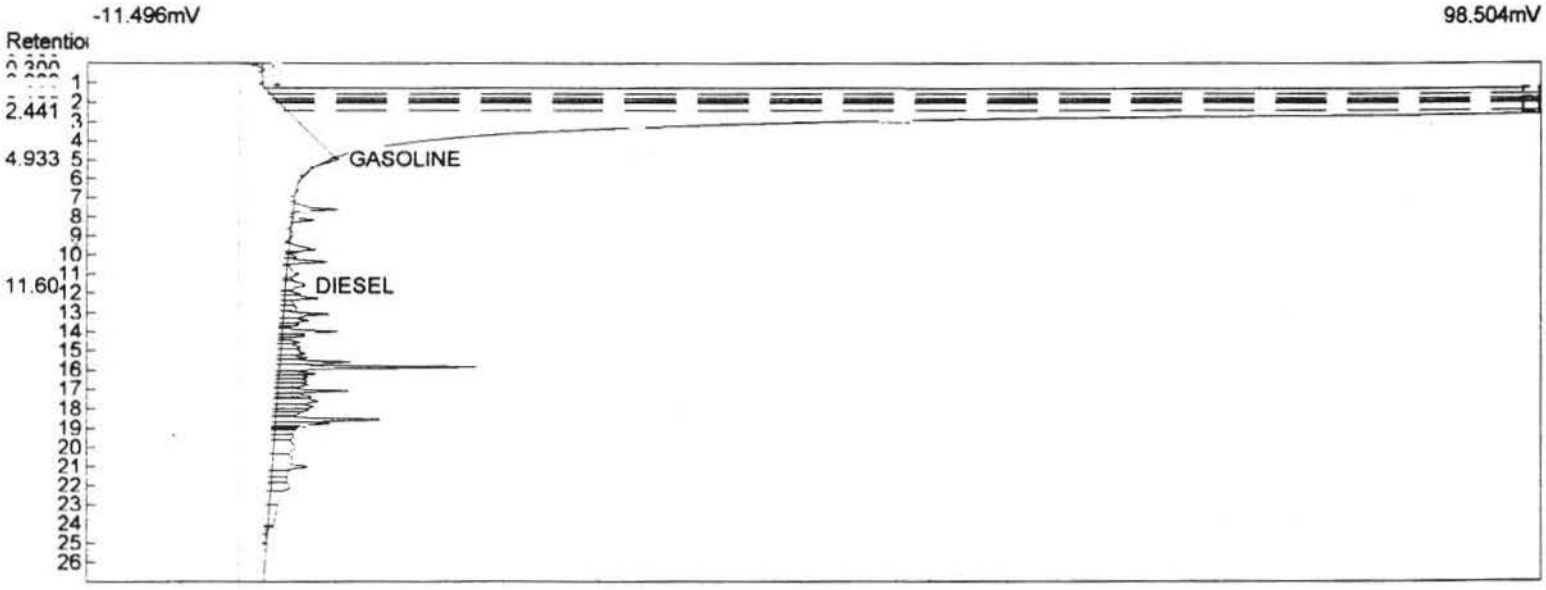
Component	Retention	Area	External	Units
GASOLINE	3.541	210.033	107.11	ppm
DIESEL	11.066	395.658	533.42	PPM
		605.691	640.52	

Lab name: TEG Puerto Rico
Analysis date: 07/14/1998 16:39:36
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0714FB10.CHR ()
Sample: 200/2000 G/D CLOSE ST
Operator: JMP



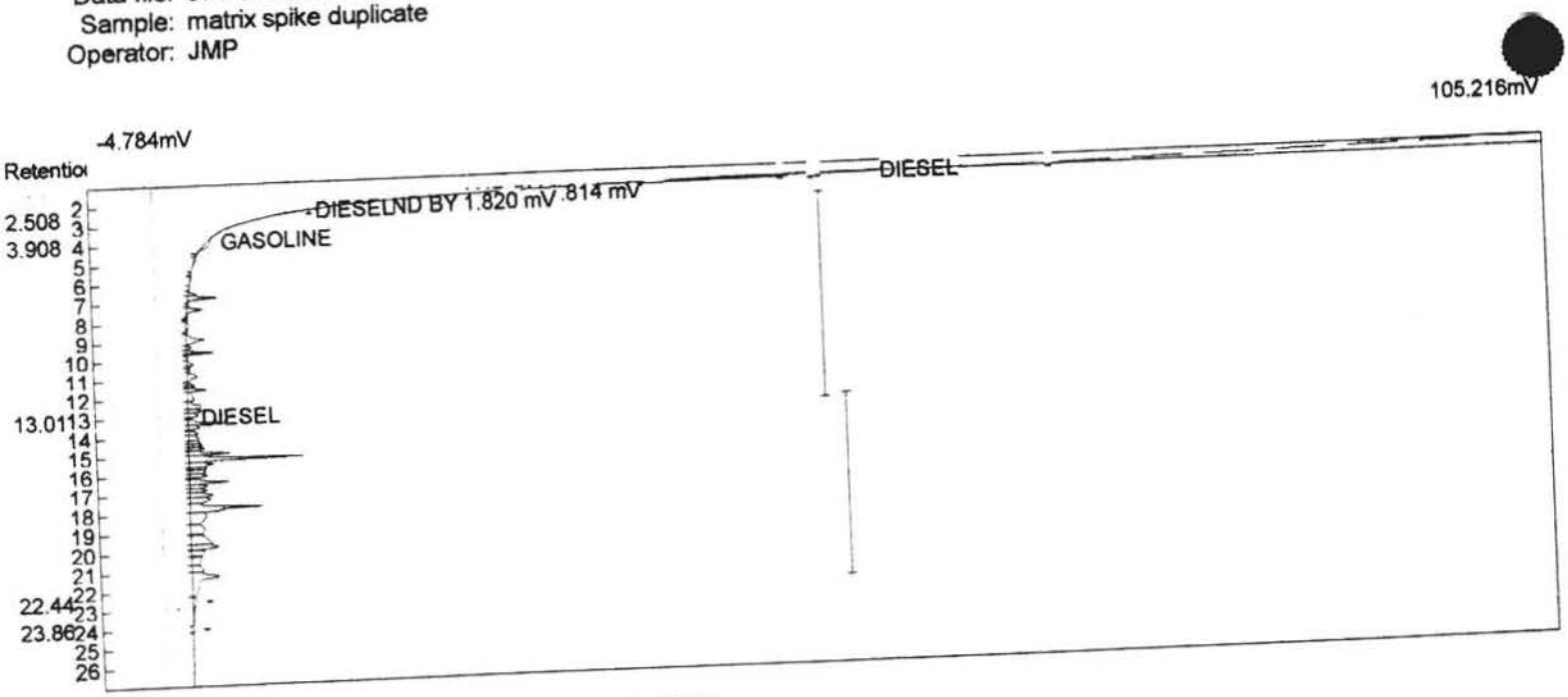
Component	Retention	Area	External	Units
GASOLINE	1.575	360.102	183.64	ppm
DIESEL	13.325	1349.216	1818.98	PPM
		1709.318	2002.62	

Lab name: TEG Puerto Rico
Analysis date: 07/14/1998 12:26:25
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0714FA3.CHR ()
Sample: 100/500 ppm G/D Open matrix Spike
Operator: JMP



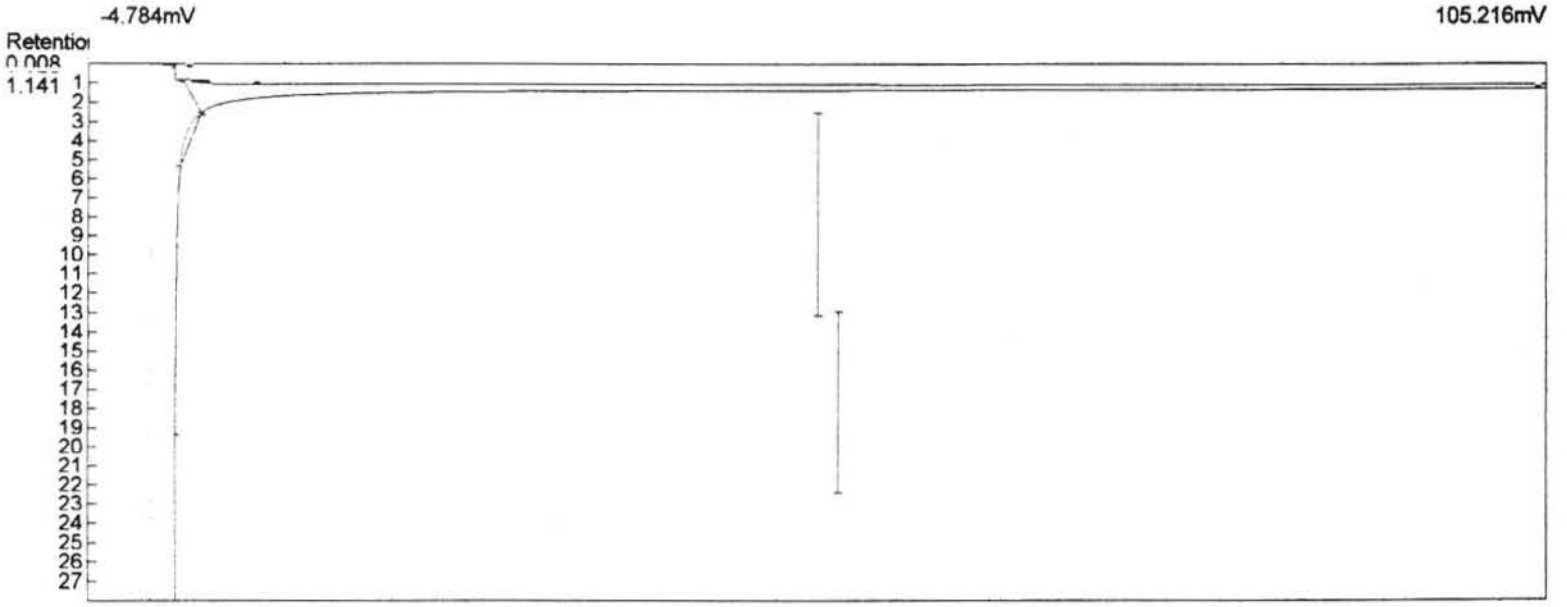
Component	Retention	Area	Internal	Units
GA[redacted]INE	4.933	151.437	101.4658	ppm
DI[redacted]	11.600	1251.445	893.2427	PPM
		1402.882	994.7085	

Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0714FB3.CHR ()
Sample: matrix spike duplicate
Operator: JMP



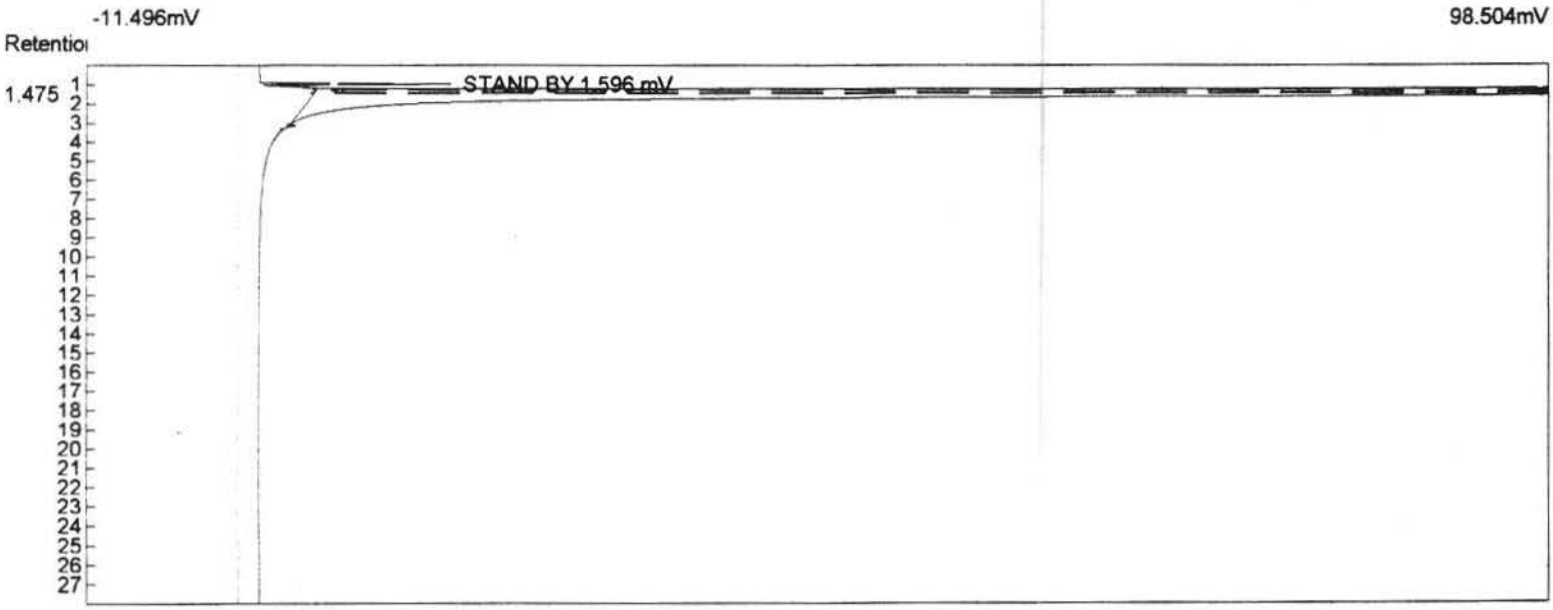
Component	Retention	Area	External	Units
GASOLINE	3.908	193.917	98.89	ppm
DIESEL	13.016	652.043	879.07	PPM
		845.961	977.96	

Lab name: TEG Puerto Rico
Analysis date: 07/14/1998 13:04:02
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0714FB4.CHR ()
Sample: METHOD BLANK
Operator: JMP



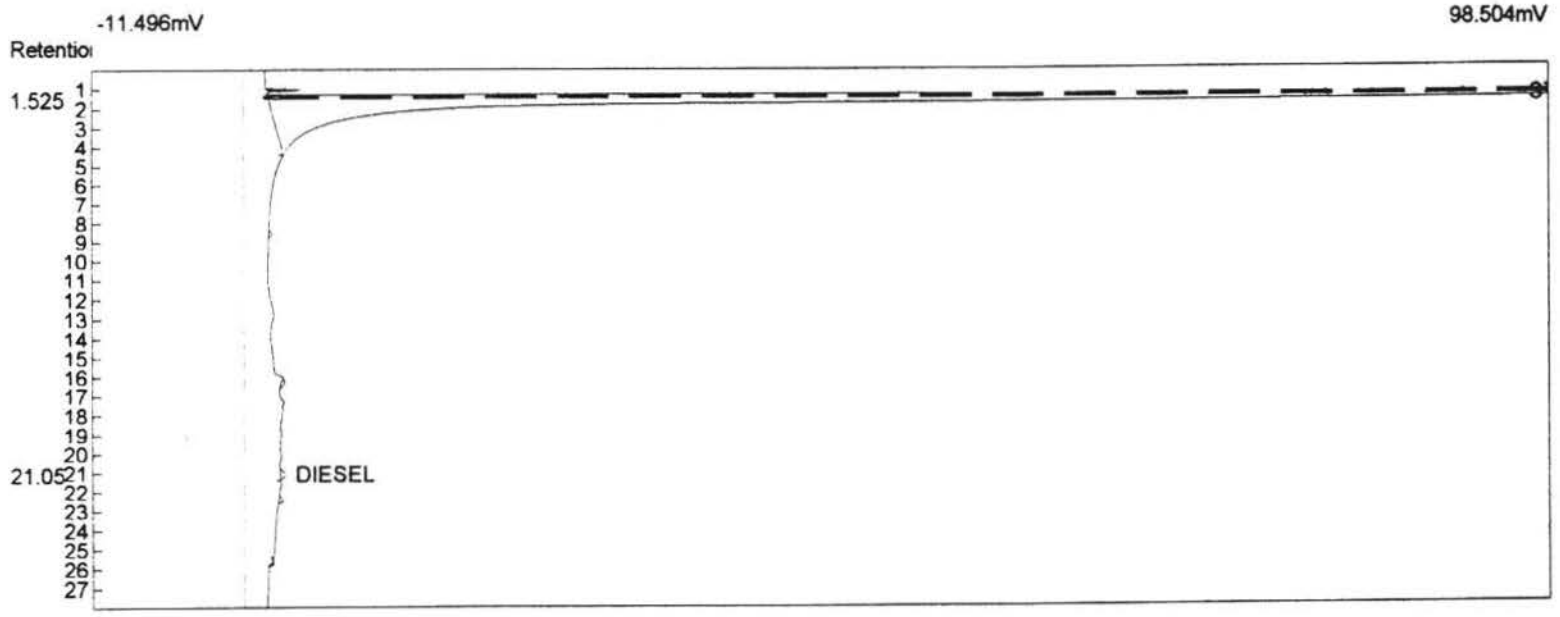
Component	Retention	Area	External	Units
		0.000	0.00	

Lab name: TEG Puerto Rico
Analysis date: 07/14/1998 13:04:02
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0714FA4.CHR ()
Sample: METHOD BLANK
Operator: JMP



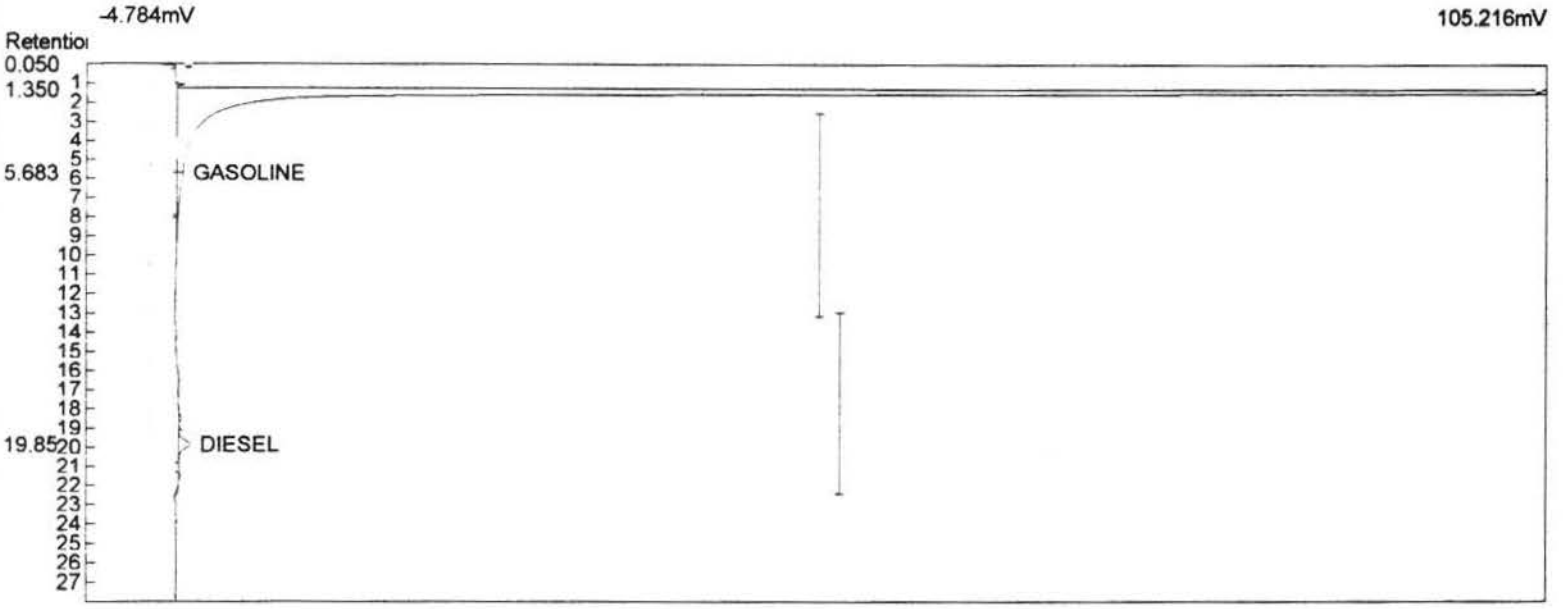
Component	Retention	Area	Internal	Units
		0.000	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/14/1998 13:39:02
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0714FA5.CHR ()
Sample: 2842-SB10@4-6'/0713CH2
Operator: JMP



Component	Retention	Area	Internal	Units
DI[illegible]	21.058	8.504	6.0699	PPM
		8.504	~~6.0699~~	ND

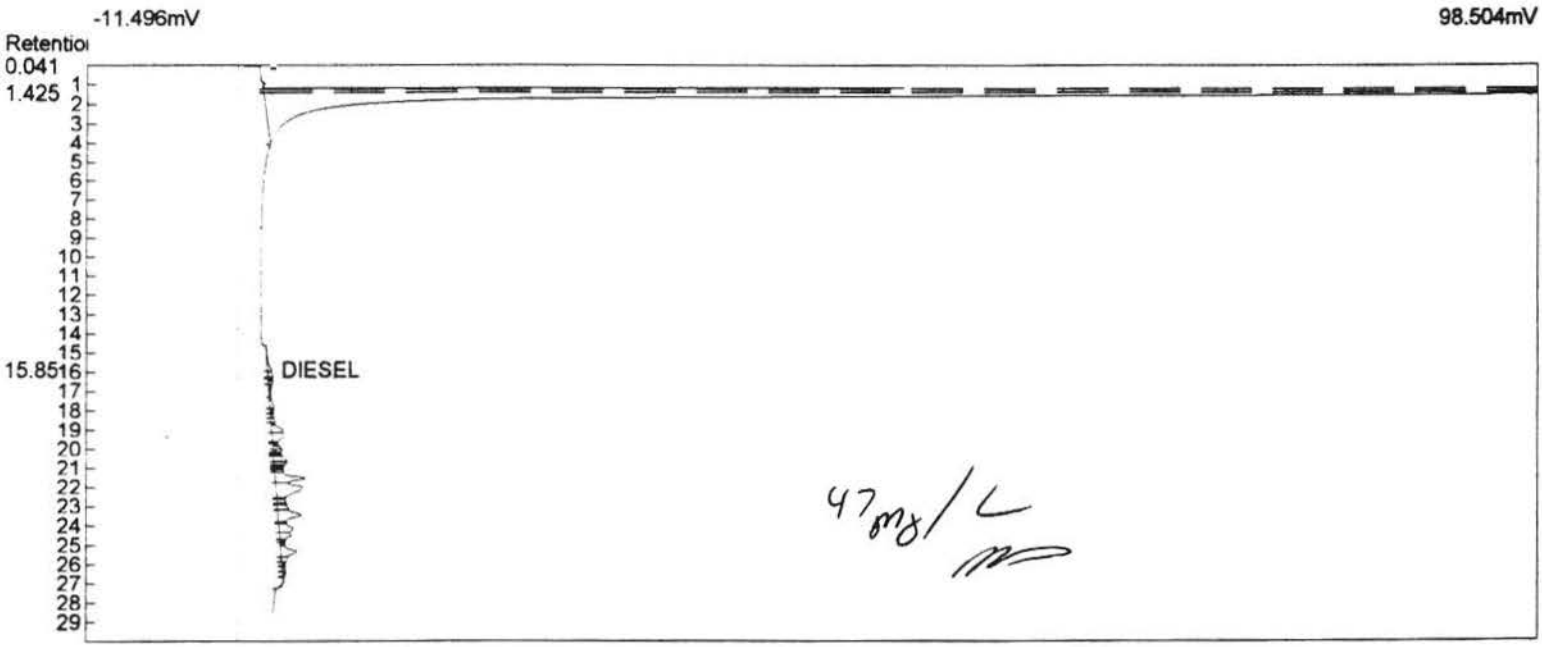
Lab name: TEG Puerto Rico
Analysis date: 07/14/1998 13:39:02
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0714FB5.CHR ()
Sample: 2842-SB11@2-4'/0713CH2
Operator: JMP



Component	Retention	Area	External	Units
GASOLINE	5.683	35.626	~~18.17 ppm~~	
DIESEL	19.858	27.845	~~37.54 PPM~~	
		63.470	55.71	

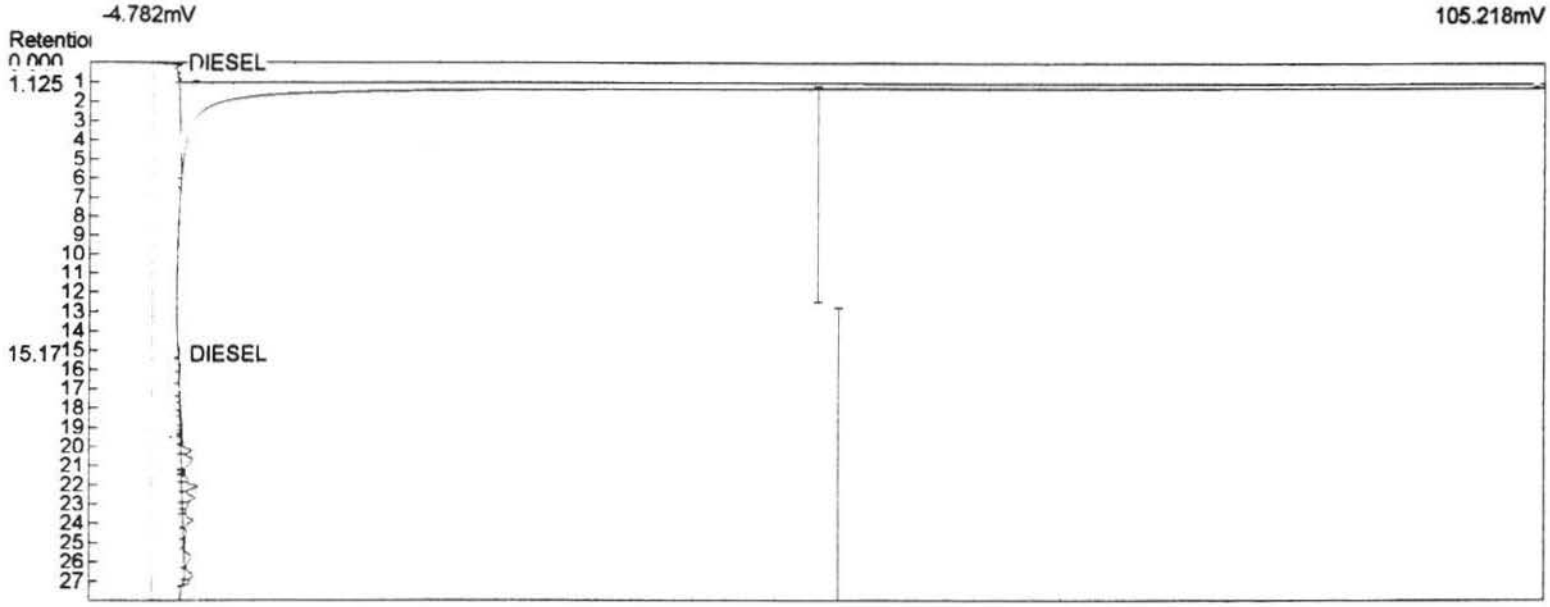
noise
false positive

Lab name: TEG Puerto Rico
Analysis date: 07/14/1998 14:17:02
Method: EPA 8015 Mod
Lab ID: GC-1
Description: Fid 1
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0714FA6.CHR ()
Sample: 2842-SB11 /0713CH2
Operator: JMP



mponent	Retention	Area	Internal	Units	DF. 1/6
DIESEL	15.858	393.394	280.7925	PPM	46.79
		393.394	280.7925		

Lab name: TEG Puerto Rico
Analysis date: 07/14/1998 14:17:02
Method: EPA 8015 Mod
Lab ID: GC-1
Description: FID 2
Column: XTI-5 (30x.53x1.5)
Carrier: N2 1.1 kg/cm2
Data file: 0714FB6.CHR ()
Sample: 2842-SB11 /0713CH2 a
Operator: JMP



Component	Retention	Area	External	Units	DF
DIESEL	15.175	206.119	277.88	PPM	1/6
		206.119	277.88		

46 mg/L

teg

QA/QC REPORT - CALIBRATION DATA

TEG Project #98I0713CH2-2
DAILY CALIBRATION DATE: 7/14/98

CH2M HILL
PROJECT NAME: SITE 2842

			INITIAL		OPENING			CLOSING		
COMPOUND	DETECTOR	CALIB RANGE	RF	%RSD	AREA	RF	%DIFF	AREA	RF	%DIFF
BENZENE	PID #1	0.100 - 10.000	26	7.1%	137.95	27.59	4.8%	66.39	26.56	0.9%
TOLUENE	PID #1	0.100 - 10.000	27	4.9%	146.67	29.33	9.1%	72.19	28.87	7.4%
ETHYLBENZENE	PID #1	0.100 - 10.000	23	9.0%	128.64	25.73	11.9%	62.85	25.14	9.4%
m&p-XYLENES	PID #1	0.100 - 10.000	33	9.9%	372.35	37.24	11.4%	179.74	35.95	7.6%
o-XYLENES	PID #1	0.100 - 10.000	27	8.9%	155.94	31.19	14.6%	72.08	28.83	5.9%
BENZENE	PID #2	0.100 - 10.000	31	7.3%	164.10	32.82	5.9%	150.78	30.16	2.7%
TOLUENE	PID #2	0.100 - 10.000	32	8.4%	174.32	34.86	8.9%	164.74	32.95	3.0%
ETHYLBENZENE	PID #2	0.100 - 10.000	26	5.2%	145.74	29.15	12.1%	140.77	28.15	8.3%
m&p-XYLENES	PID #2	0.100 - 10.000	37	3.8%	413.00	41.30	11.6%	394.79	39.48	6.7%
o-XYLENES	PID #2	0.100 - 10.000	31	2.6%	172.08	34.42	11.0%	162.80	32.56	5.0%

CALIB RANGE - RANGE OF CALIBRATION CURVE IN ppm
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 20% ACCEPTABLE LIMITS)
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

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PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
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teg

QA/QC REPORT - MS/MSD DATA

MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0713CH2-2
DATE: 7/14/98

CH2M HILL
PROJECT NAME: SITE 2842

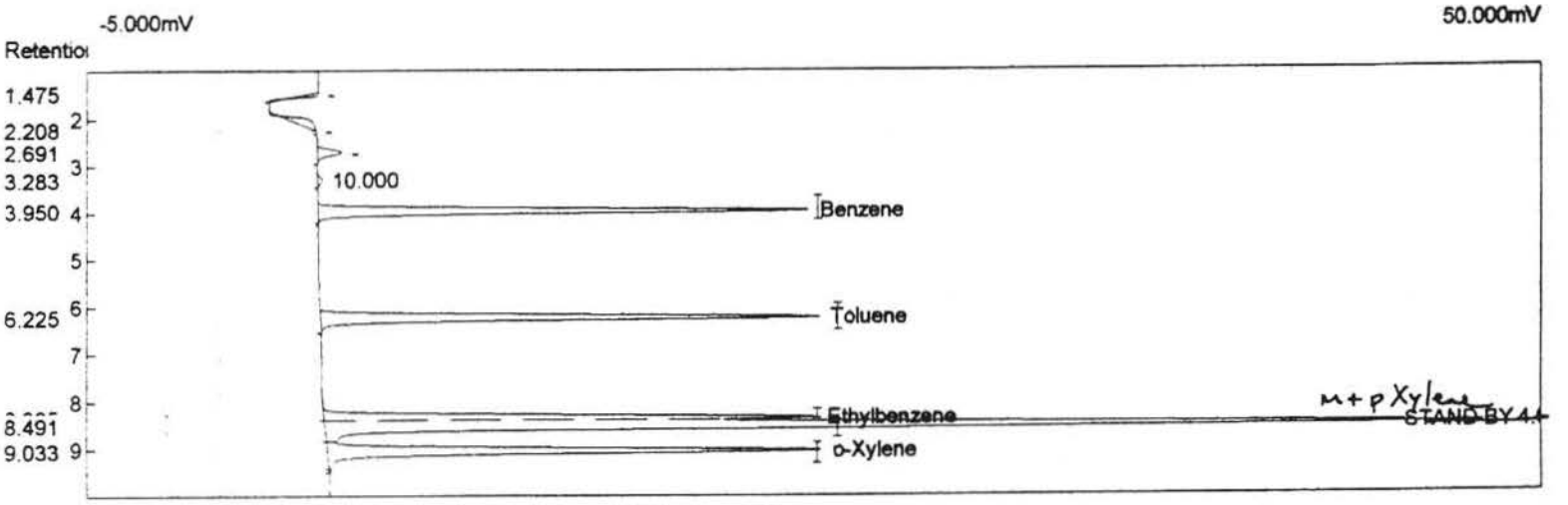
COMPOUND	SPK CONC (ppm)	MS CONC (ppm)	%REC MS	MSD CONC (ppm)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
BENZENE	5.0	5.42	108%	5.86	117%	8%	15%	76% - 120%
TOLUENE	5.0	5.75	115%	5.92	118%	3%	15%	75% - 120%
ETHYLBENZENE	5.0	6.02	120%	6.03	121%	0%	15%	65% - 125%
TOTAL XYLENES	15.0	17.2	115%	18.1	123%	5%	15%	72% - 125%

ppm = PARTS PER MILLION
MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE
% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX
RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

ANALYSES PERFORMED BY: MARCO A. PEDRAZA
DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725
TELEPHONE (787) 720-0329 FAX 789-3858

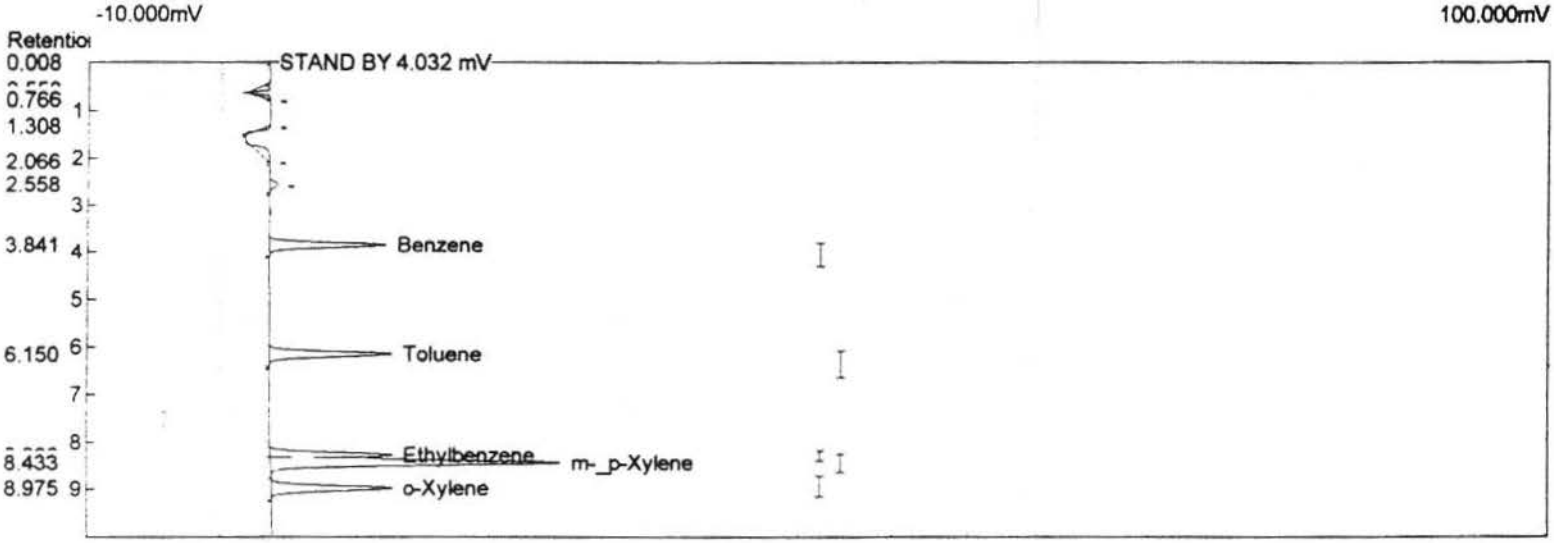
Lab name: TEG Puerto Rico
Analysis date: 07/14/1998 12:22:41
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0714PA2.CHR ()
Sample: 5 ppm BTEX OPEN
Operator: JMP



Component	Retention	Area	External	Internal	Units
Benzene	3.950	137.951	5.31	5.3058	ppm
Toluene	6.225	146.670	5.45	5.4541	ppm
Ethylbenzene	8.325	128.644	5.59	5.5947	ppm
m+p Xylene	8.491	372.354	11.15	11.1467	ppm
o-Xylene	9.033	155.939	5.73	5.7297	ppm
		941.557	33.23	33.2310	

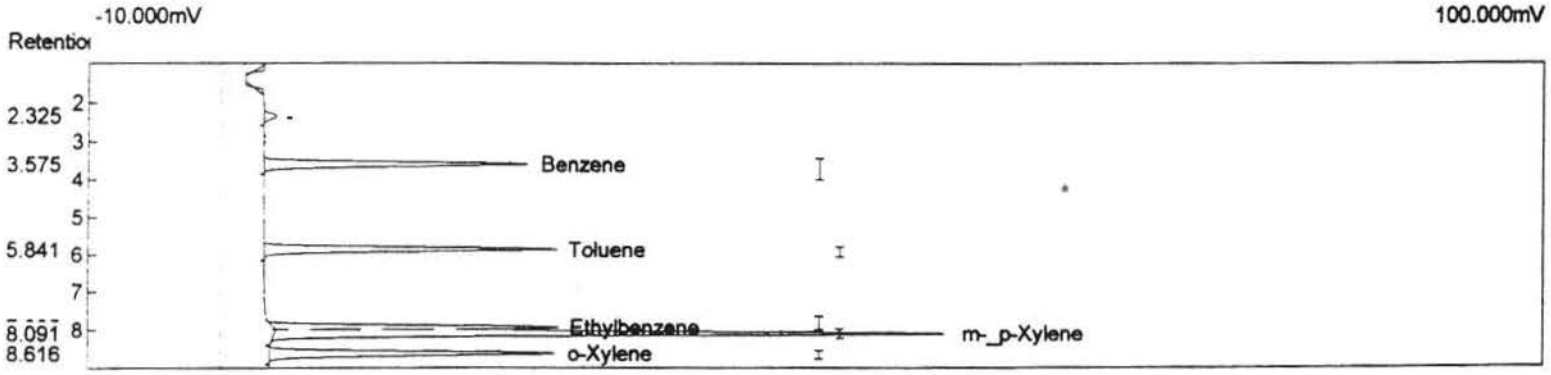
Lab name: TEG Puerto Rico
Analysis date: 07/14/1998 17:49:15
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0714PA18.CHR ()
Sample: 2.5 ppm BTEX Closing (MAO
Operator: JMP

7/14/98



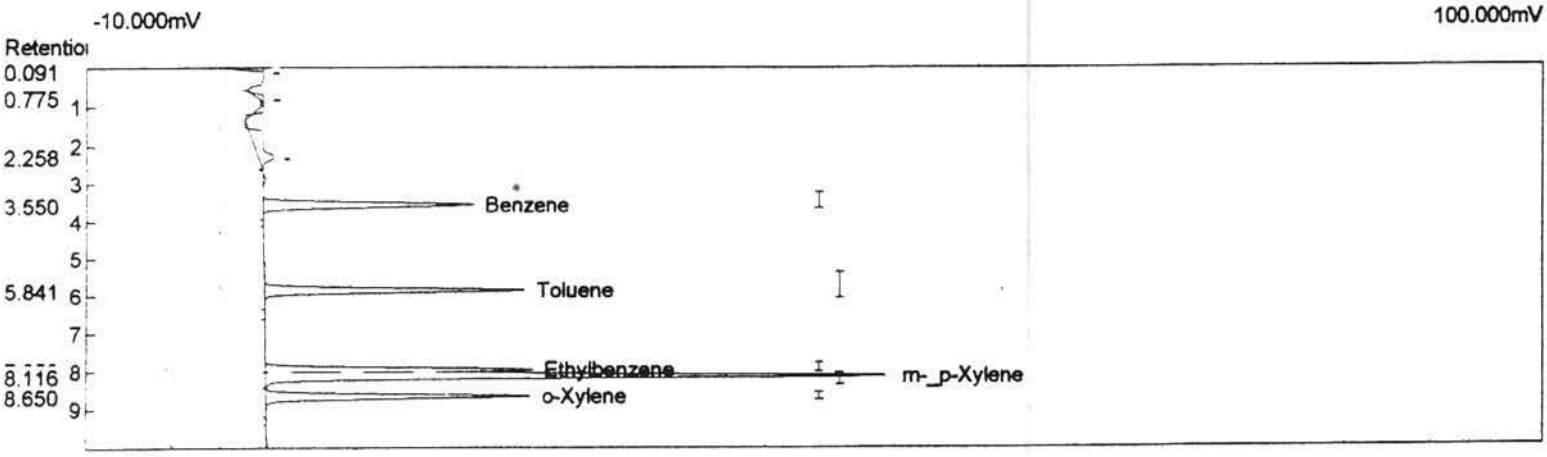
Component	Retention	Area
Benzene	3.841	66.390
Toluene	6.150	72.187
Ethylbenzene	8.266	62.849
m-_p-Xylene	8.433	179.743
o-Xylene	8.975	72.082
		453.250

Lab name: TEG Puerto Rico
Analysis date: 07/14/1998 12:22:41
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0714PB2.CHR ()
Sample: 5 ppm BTEX OPEN
Operator: JMP



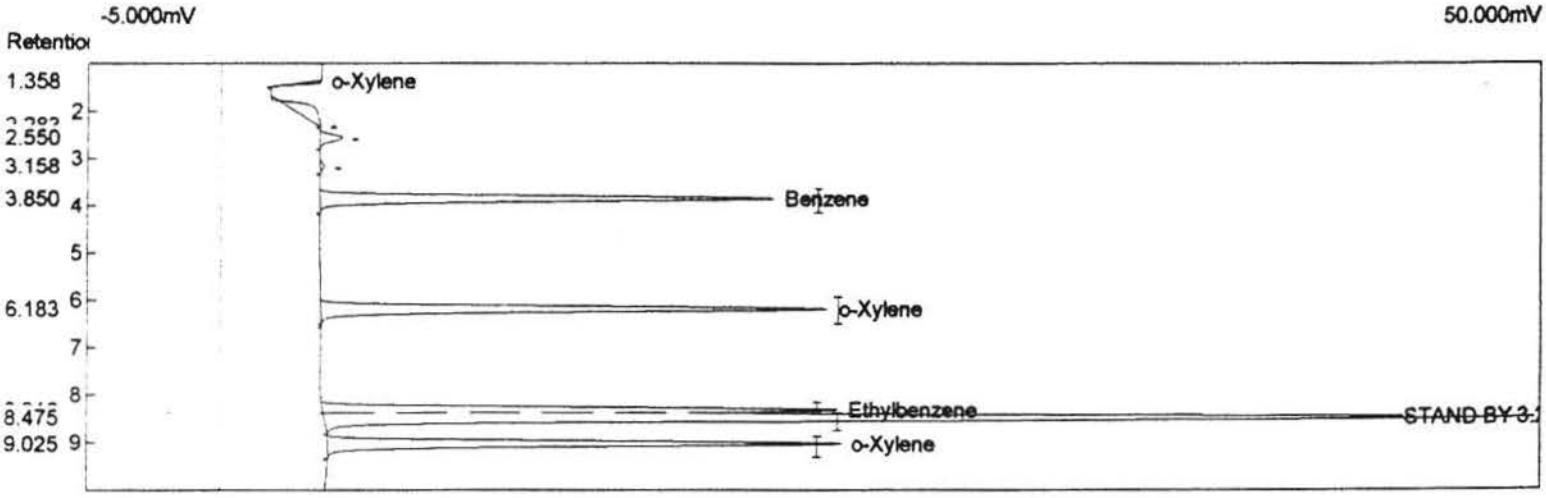
Component	Retention	Area	External	Internal	Units
Benzene	3.575	164.096	5.32	5.3176	ppm
Toluene	5.841	174.316	5.51	5.5107	ppm
Ethylbenzene	7.925	145.737	5.65	5.6486	ppm
m-_p-Xylene	8.091	413.004	10.90	10.9026	ppm
o-Xylene	8.616	172.075	5.60	5.5960	ppm
		1069.227	32.98	32.9756	

Lab name: TEG Puerto Rico
Analysis date: 07/14/1998 17:00:40
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: C:\PEAKWIN\0714PB17.CHR ()
Sample: 5 ppm BTEX Closing
Operator: JMP



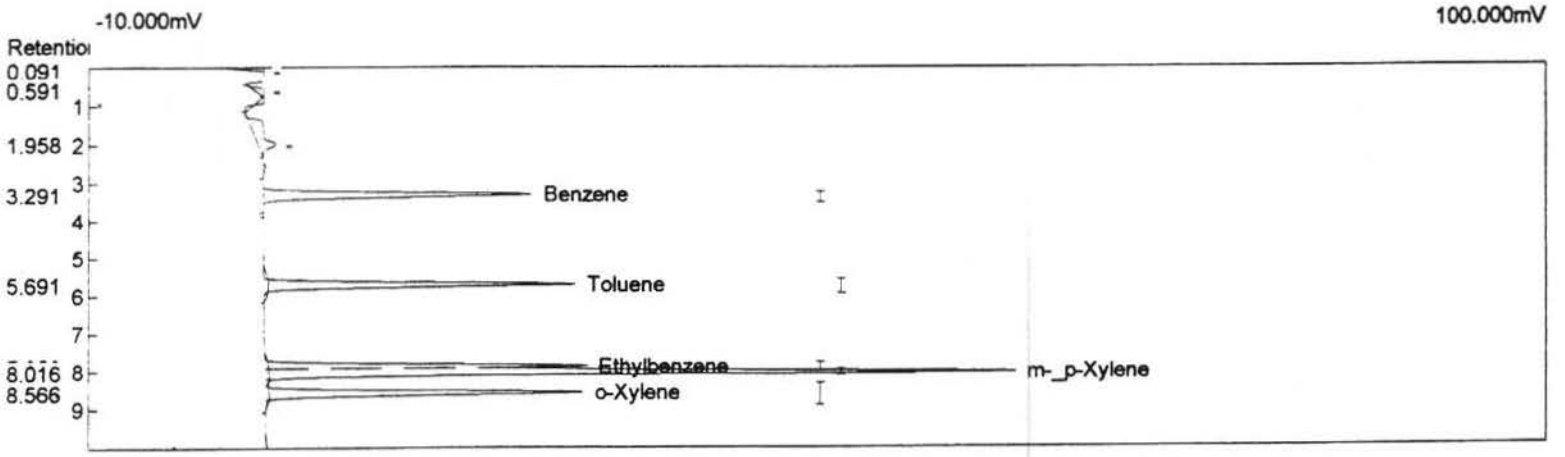
Component	Retention	Area	External	Internal	Units
Benzene	3.550	150.782	4.89	4.8862	ppm
Toluene	5.841	164.744	5.21	5.2081	ppm
Ethylbenzene	7.950	140.773	5.46	5.4562	ppm
m-_p-Xylene	8.116	394.791	10.42	10.4218	ppm
o-Xylene	8.650	162.804	5.29	5.2945	ppm
		1013.894	31.27	31.2669	

Lab name: TEG Puerto Rico
Analysis date: 07/14/1998 12:37:37
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0714PA3.CHR ()
Sample: matrix spike
Operator: JMP



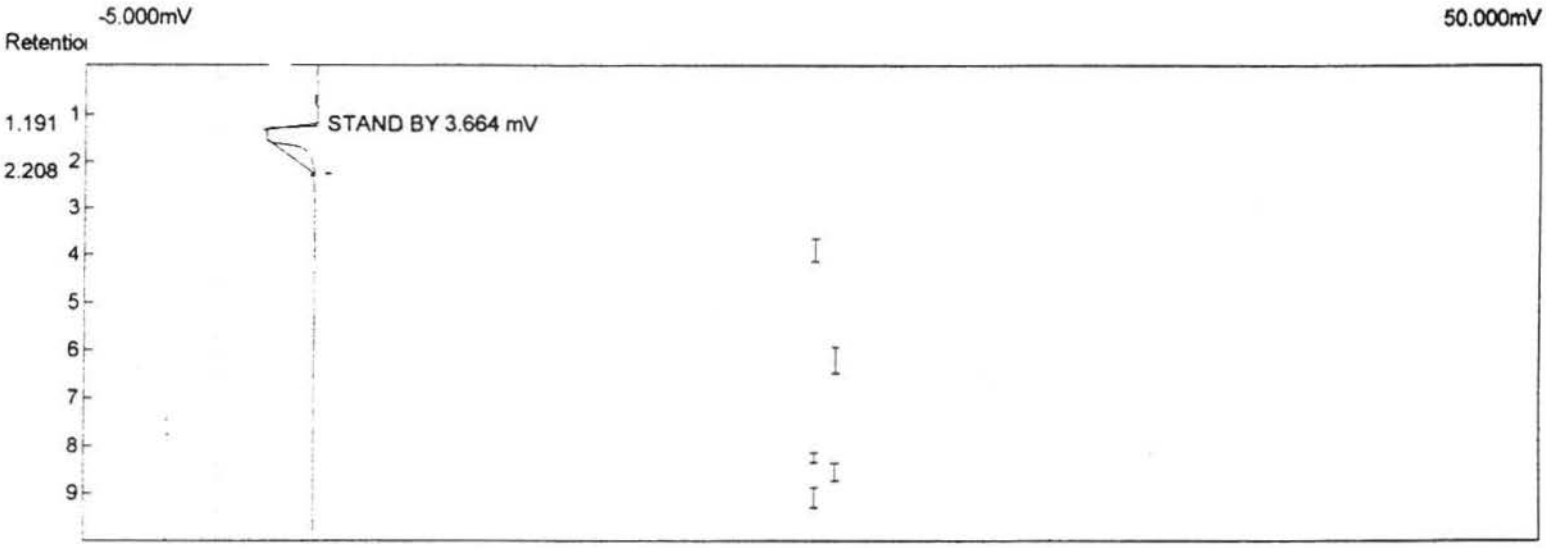
Component	Retention	Area	External	Internal	Units
Benzene	3.850	140.831	5.42	5.4166	ppm
Toluene	6.183	154.574	5.75	5.7480	ppm
Ethylbenzene	8.316	138.514	6.02	6.0239	ppm
m-Xylene	8.475	383.820	11.49	11.4899	ppm
o-Xylene	9.025	156.095	5.74	5.7355	ppm
		973.834	34.41	34.4139	

Lab name: TEG Puerto Rico
Analysis date: 07/14/1998 12:37:37
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0714PB3.CHR ()
Sample: matrix spike duplicate
Operator: JMP



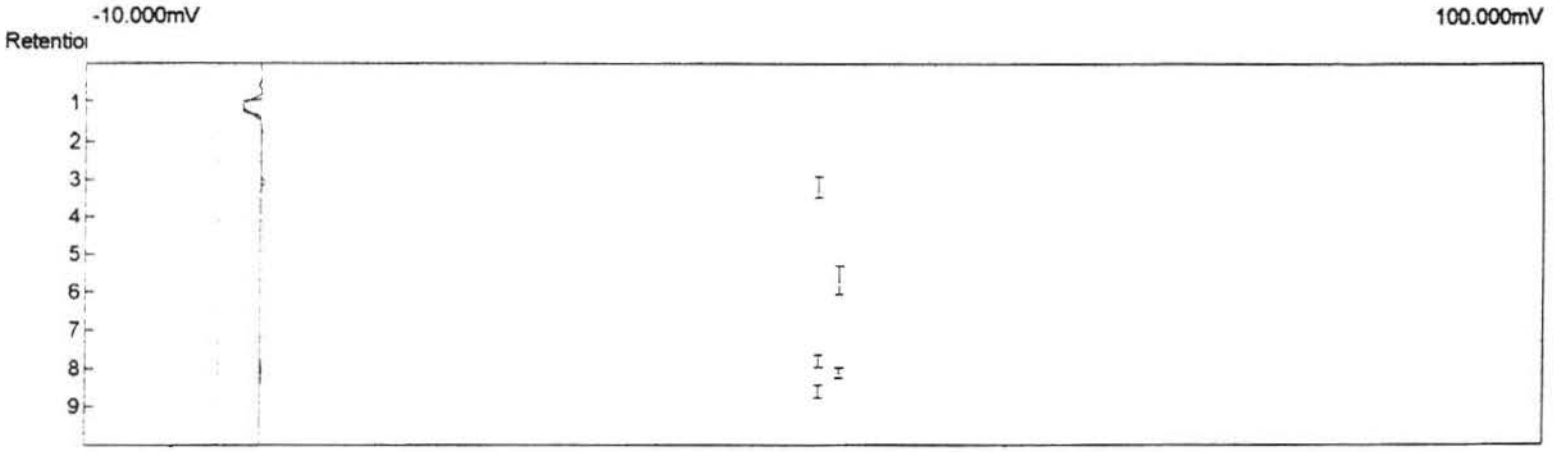
Component	Retention	Area	External	Internal	Units
Benzene	3.291	180.841	5.86	5.8603	ppm
Toluene	5.691	187.147	5.92	5.9164	ppm
Ethylbenzene	7.858	163.711	6.03	6.0280	ppm
m-_p-Xylene	8.016	475.738	11.93	11.9307	ppm
o-Xylene	8.566	189.196	6.15	6.1528	ppm
		1196.634	35.89	35.8882	

Lab name: TEG Puerto Rico
Analysis date: 07/14/1998 12:53:21
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0714PA4.CHR ()
Sample: method blank
Operator: JMP



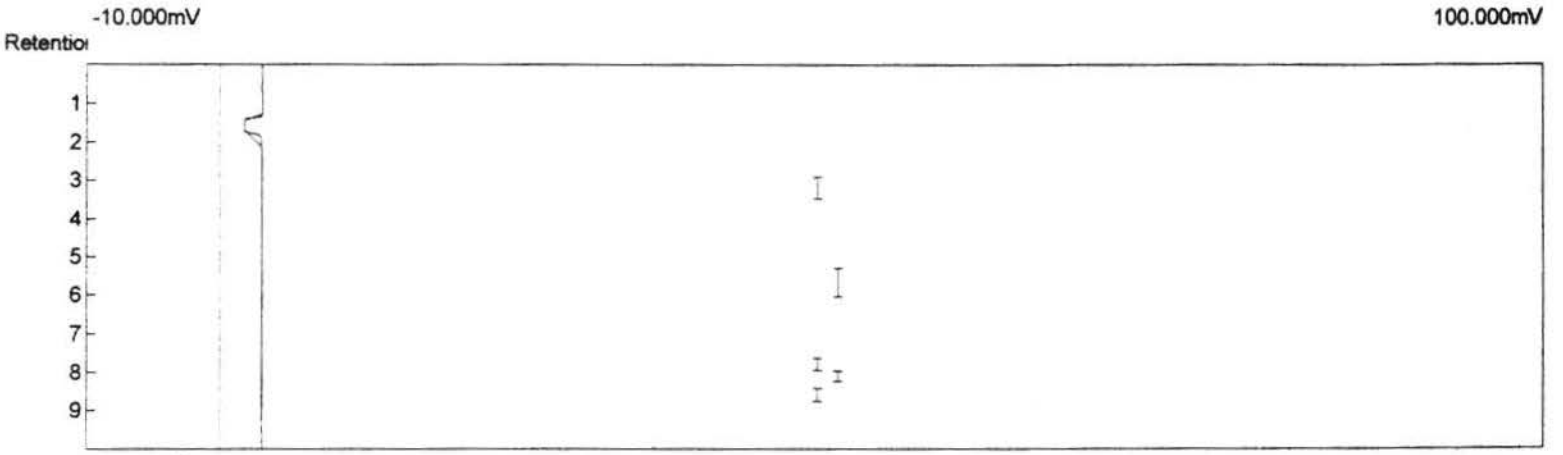
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/14/1998 12:53:21
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0714PB4.CHR ()
Sample: method blank
Operator: JMP



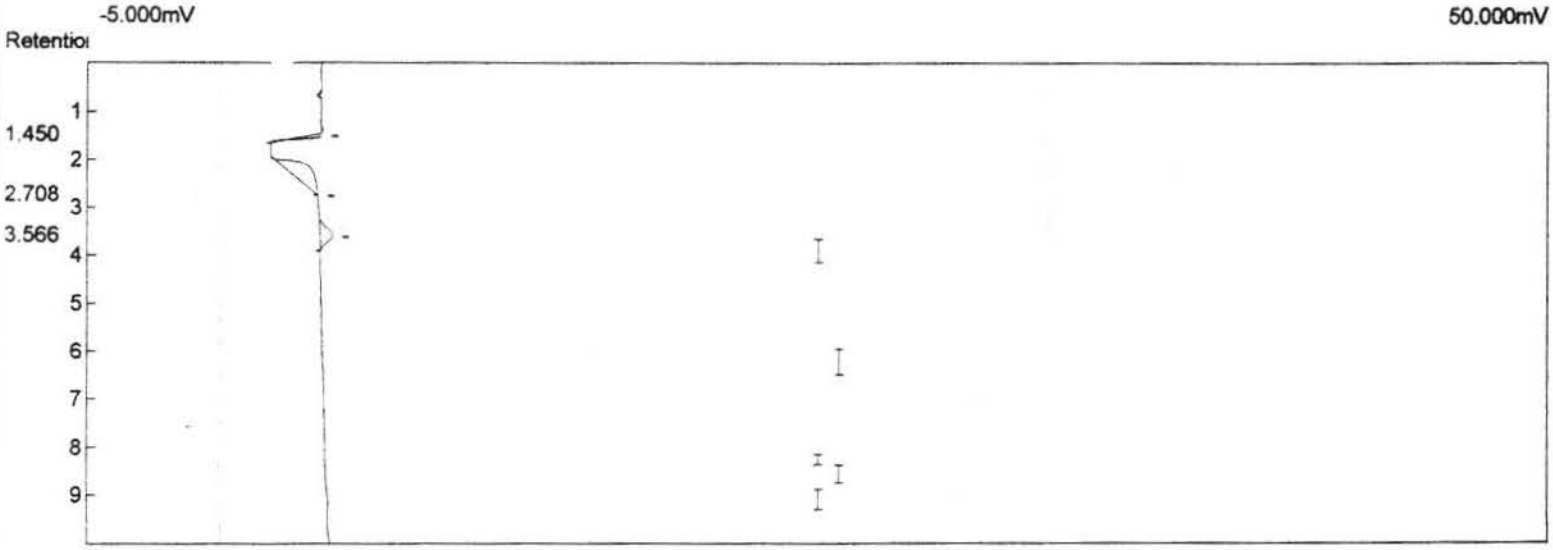
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/14/1998 14:13:11
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0714PB8.CHR ()
Sample: 2842-TRIP/0713CH2-2
Operator: JMP



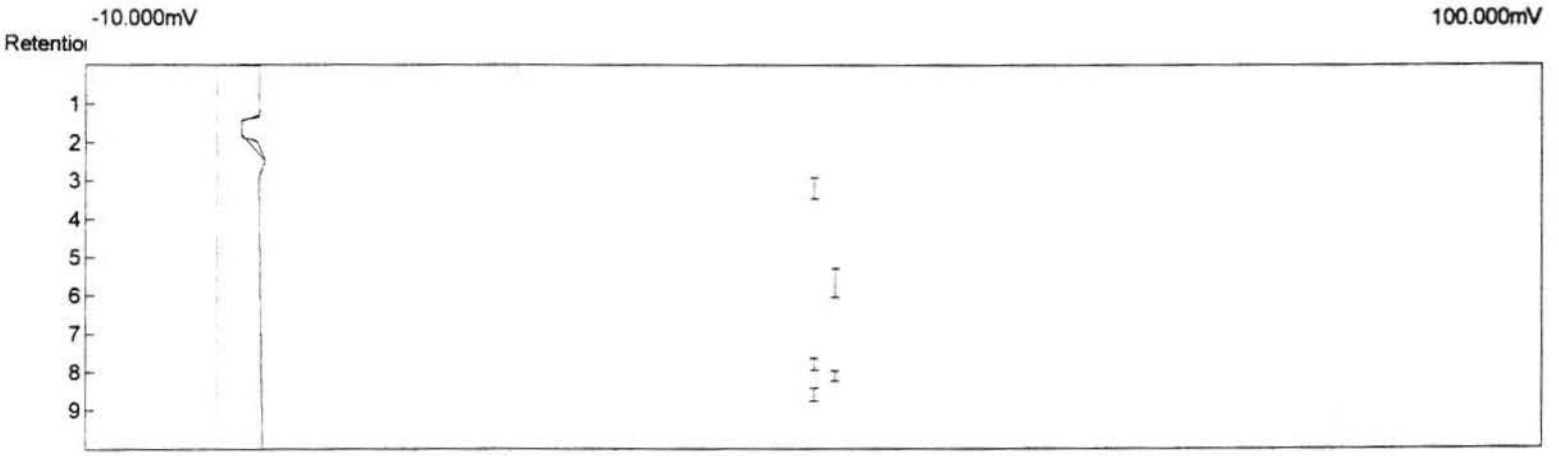
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/14/1998 14:24:35
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0714PA9.CHR ()
Sample: 2842-SB10@4'/0713CH2-2
Operator: JMP



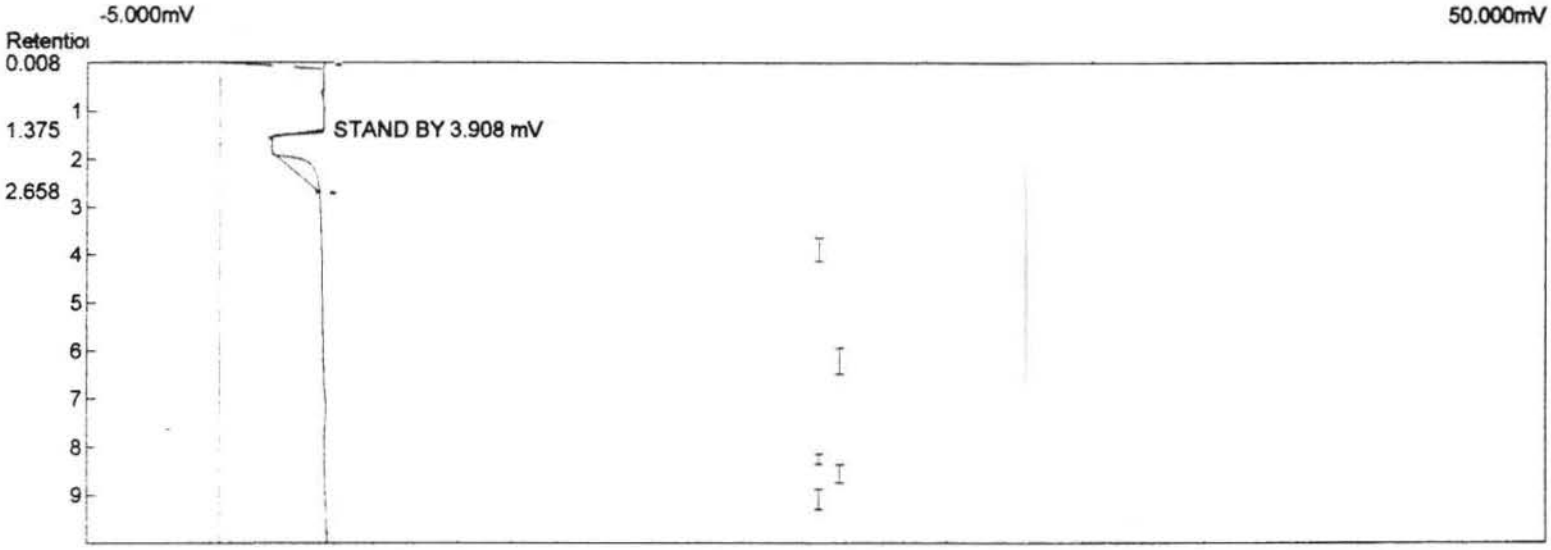
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/14/1998 14:24:35
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0714PB9.CHR ()
Sample: 2842-SB11@2'/0713CH2-2
Operator: JMP



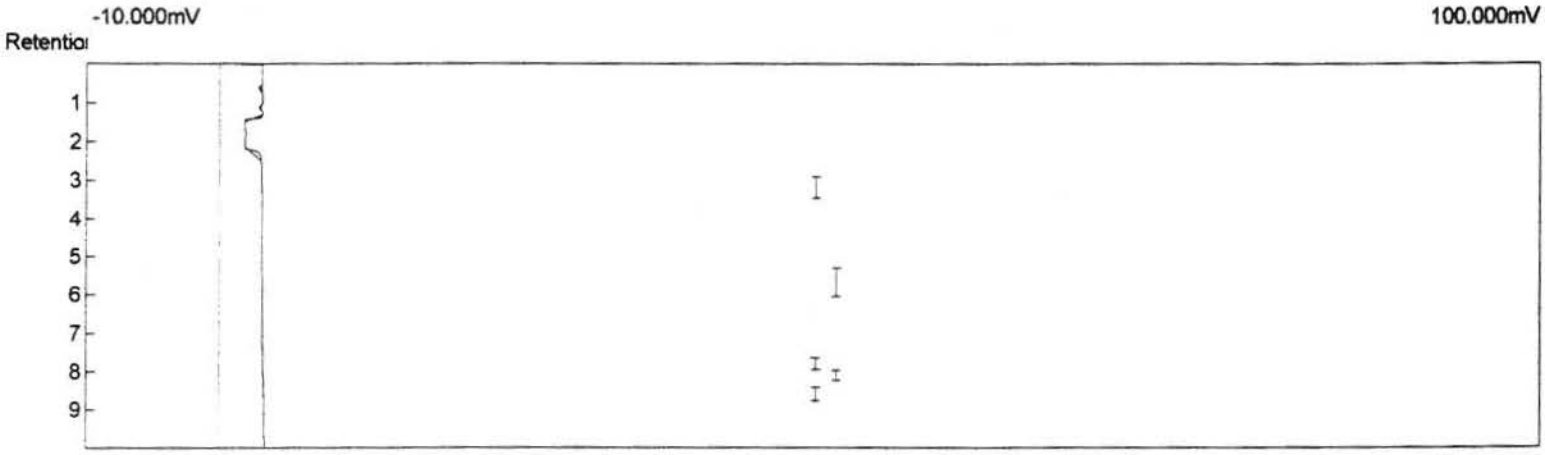
Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/14/1998 14:40:32
Method: EPA 602/8020
Lab ID: GC-2
Description: PID 1
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0714PA10.CHR ()
Sample: 2842-SB11W/0713CH2-2
Operator: JMP



Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

Lab name: TEG Puerto Rico
Analysis date: 07/14/1998 14:40:32
Method: EPA 602/8020
Description: PID 2
Column: RXT-5 (30x.53x5.0)
Carrier: N2 1.1 kg/cm2
Data file: 0714PB10.CHR ()
Sample: 2842-SB11W/0713CH2-2REP.
Operator: JMP



Component	Retention	Area	External	Internal	Units
		0.000	0.00	0.0000	

teg Transglobal Environmental Geochemistry

Chain of Custody Record

PO # _____

Client: CH2M HILL

Address _____

Phone (787) 818-8713 FAX _____

Client Project # _____ Project Manager MARTY CLASEN/TPA

Date 7/13/98 Page 1 of 1

TEG Project # 98I0713CH2-2 Outside Lab.# _____

Location RRNS UST SC

Collector MIKE WEATHERLY Date of Collection 7/10-13

Sample #	Depth	Time	Sample Type	Container Type	VOA 8010	VOA 8020 (BTEX)	VOA 8260	SEMI VOL 8270	TRPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (gas & diesel)	TPH 8015 (oil)	PNA 610/8100	TOTAL LEAD	pH	METALS	RCI							FIELD NOTES / PRESERVATION	Total # of Containers
2842-SB10	4-6	0900	Soil	2 oz		1			1			1													24 TAT 8015M GRO/DRO	3
2842-SB11	2-4	1130	Soil	2 oz		1			1			1													↓	3
2842-SB11	—	1550	WATER	40 ml		1						2											24 TAT		8015M GRO/DRO + BTEX	3
2842-TRIP	—	—	WATER	40 ml		1																				1
																										10

RELINQUISHED BY (signature)	Date/Time	RECEIVED BY (signature)	Date/Time
Michael A. Weatherly	7/13/98	Franklin Nelson	7:30 pm 07/13/98
RELINQUISHED BY (signature)	Date/Time	RECEIVED BY (signature)	Date/Time

Total # of containers	10
Chain of Custody seals Y / N / NA	NA
Seals intact? Y / N / NA	NA
Received good conditions / cold	Yes

TEMPERATURE

4.0

Sample disposal Instructions: _____ TEG Disposal @ $2.00 each _____ Return to client _____ Pickup