AIR SPARGE PILOT TEST REPORT
ARCO FACILITY NO. 836
11611 NE 8TH STREET
BELLEVUE WASHINGTON
DELTA PROJECT NO. M094-501

Prepared for

ARCO Products Company
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Prepared by:

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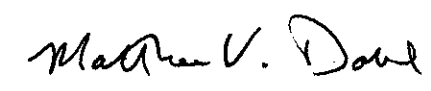

Matthew V. Dahl
Project Engineer

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April 3, 1995

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1.0 INTRODUCTION

Delta Environmental Consultants, Inc. (Delta) was contracted by ARCO Products Company (ARCO) to conduct an air sparge pilot test at ARCO Facility No. 836, located at 11611 NE 8th Street, Bellevue, Washington (the Site) (see Figure 1). The objective of the Air Sparging (AS) pilot test was to evaluate the feasibility of utilizing this technology to remediate the petroleum hydrocarbon-impacted soil and groundwater at the site. Petroleum hydrocarbon-impacted soil and groundwater were detected during previous site assessment activities conducted by Geraghty & Miller, Inc. and Delta. This report presents the results of the pilot test conducted on January 24, 1995.

2.0 GENERAL DISCUSSION

Air sparging involves the injection of atmospheric air into the groundwater through an array of specially designed AS wells. Air sparging will accomplish the following objectives.

- Remove volatile compounds present in the groundwater. The introduction of air beneath the water table will tend to force adsorbed and dissolved-phase volatile hydrocarbons to transfer to the injected air stream. Due to the density difference between air and water, the air bubbles will percolate through the saturated zone to the unsaturated zone.
- Increase the dissolved oxygen (DO) concentrations present in the groundwater. The increased oxygen content is accomplished by injecting atmospheric air (an oxygen source) into the groundwater. Introduction of atmospheric air into the groundwater increases the amount of oxygen available for naturally occurring organisms which stimulates their propagation and accelerates hydrocarbon degradation.

If the soil is reasonably permeable, the applied air pressure will induce air flow through the subsurface. The induced air flow will carry oxygen into the impacted areas and will enhance the natural biodegradation of the hydrocarbons. The data and results obtained from the AS pilot

test were used to determine the feasibility of utilizing AS technology to remediate the hydrocarbon impacted soil and groundwater at the site.

3.0 INSTALLATION OF AS WELLS

On December 20 and 21, 1994 Delta visited the site to install two AS wells (AS-1 and AS-2), and three monitoring wells (TMW-1, TMW-2, and MW-7) (see Figure 2). Installation of the wells was accomplished utilizing a truck-mounted, hollow-stem auger, drilling rig. The AS wells were constructed of 0.02-inch factory-slotted, stainless-steel double wrapped screens connected to two-inch diameter blank schedule 40 PVC well casing extending to the ground surface. Air sparge well AS-1 has a two-foot screen starting at 22.5 feet below ground surface (bgs) and AS-2 has a two-foot screen starting at 22 feet bgs. Monitoring wells TMW-1 and TMW-2 were constructed of two-inch diameter 0.01-inch, factory-slotted well screen ten feet long connected to four feet of blank well casing to ground surface. Monitoring well MW-7 was constructed of two-inch diameter 0.01-inch, factory-slotted well screen 15 feet in length connected to four feet of blank well casing to ground surface. Copies of the boring and well construction logs and survey report from a licensed surveyor for these five wells are attached as Appendix A.

The hollow stem auger and sampling tools were steam cleaned prior to advancing each boring. During the advancement of each soil boring, soil samples were collected at 2.5-foot intervals starting from 2.5 feet bgs. The samples were collected using a two-inch inside diameter split-spoon sampler. After collection, each discrete soil sample was screened in the field for the presence of volatile organic compounds with a photoionization detector (PID) to facilitate selecting representative soil samples for chemical analysis. Soil samples were placed in glass jars with teflon sealed lids and stored in an ice-cooled chest for transport (under chain-of-custody documentation) to the laboratory for chemical analysis. The samples were submitted to Analytical Technologies, Inc. for analysis of total petroleum hydrocarbons as gasoline (TPH-g),

diesel (TPH-d), benzene, toluene, ethylbenzene, and xylenes (BTEX) according to Washington Department of Ecology (Ecology) Methods WTPH-G, WTPH-D and Environmental Protection Agency (EPA) Method 8020, respectively. The laboratory results for soil samples collected during the installation of the wells are summarized in Table 1 and the analytical laboratory reports are included in Appendix B.

4.0 AS PILOT TEST PROCEDURES

On January 24, 1995, Delta visited the site to conduct an AS pilot test. The site currently has an operating soil vapor extraction (SVE) system, and the SVE system was allowed to run during the AS pilot test. However, MW-1 had to be taken off line from the SVE system early in the test due to high water levels in the well. A summary of the pilot test is presented below.

4.1 AS Pilot Test Description

The AS pilot test involves the simultaneous injection of air beneath the water table and vapor extraction from the vadose zone. An air compressor was used to provide pressurized air to a two-inch diameter sparge well. The compressed air is first filtered to remove particulates and routed through a control panel equipped to regulate and monitor injection pressures and flow rates. Pressurized air was injected into the sparge well through a two-foot stainless-steel screen installed at a depth of approximately 10 to 15 feet below the water table. The operating SVE system utilized a Rotron Model EN-6 blower to provide approximately 55 inches of water column (WC) vacuum to two four-inch diameter SVE wells (MW-1 and MW-2).

Air sparge well AS-1 was used as the pilot test air sparge well. Monitoring wells TMW-1, TMW-2, MW-1 and MW-2 were used as observation wells to monitor the influence of the AS pilot test. Observation wells TMW-1, TMW-2, MW-1, and MW-2 are located approximately 5, 10, 20, and 31 feet, respectively, from AS-1. To establish baseline conditions, DO concentrations and depth to water (DTW) measurements were recorded from observation wells

AS-1, AS-2, TMW-1, TMW-2, MW-1, and MW-2 prior to the AS pilot test start-up. Dedicated DO meters and water level indicators were placed in wells TMW-1, TMW-2, MW-1 and MW-2 (MW-2 had a DO meter only) to monitor changes in DTW and DO concentrations during the AS pilot test. MW-1 was taken off-line from the SVE system during the AS pilot test due to pressure induced high water levels in the well.

The AS portion of the test was performed with step injection flow rates of approximately 4.5 and 13 CFM with corresponding injection pressures of approximately 19 and 24 pounds per square inch (psi). The SVE system was operated at an extraction flow rate of approximately 130 SCFM with a corresponding extraction vacuum of approximately 55 inches WC. The AS pilot test was performed over a period of approximately four hours. At 15-minute intervals, Delta recorded the injection flow rate, injection pressure, DTW and DO concentrations in select observation wells. The induced vacuum was also monitored at the blower during the course of the test. A flame ionization detector (FID) was used to monitor the concentration of volatile organic compounds (VOC) at the SVE system blower during the test. VOC's were monitored at the beginning of the test, two hours into the test, and then again at the end of the four hour test. Delta's standard operating procedures for conducting air sparging and soil vapor extraction pilot tests is presented in Appendix C. VOC monitoring results are presented in Table 2.

5.0 SAMPLE COLLECTION AND ANALYSIS

5.1 Groundwater Samples

Prior to start-up of the pilot tests, groundwater samples were collected from wells AS-1, AS-2, TMW-1 and TMW-2 to establish baseline environmental conditions. Immediately following the conclusion of the pilot test groundwater samples were again collected from the wells. The groundwater samples were submitted to Analytical Technologies, Inc., of Renton, Washington, under chain-of-custody documentation, for analysis of TPHg and BTEX by Ecology Method WTPH-G and by EPA Method 8020, respectively. Table 3 presents a summary of the analytical

results for groundwater samples collected during this test. Copies of the laboratory reports are attached as Appendix B.

6.0 RESULTS OF THE AS PILOT TEST

As discussed in Section 2.0 of this report, the potential beneficial effects of air sparging include the following: (1) increase oxygen content of the groundwater and enhance aerobic biodegradation of hydrocarbons in the subsurface; (2) increase the desorption and dissolution of adsorbed-phase hydrocarbons in the saturated zone; and (3) transfer of volatile hydrocarbons from the dissolved phase to the vapor phase. Since pilot tests are typically very short, relative to the duration of site remediation, any positive indication of one or more of these beneficial effects suggests the remedial feasibility of utilizing AS technologies at a specific site. The following is a discussion of the pilot test results in the context of remedial feasibility.

6.1 Dissolved Oxygen Radius of Influence

The AS radius of influence is typically considered to be the distance in which DO concentrations present in the groundwater are increased as a result of air sparging. The factors that affect the observed AS radius of influence include the air/oxygen delivery flow rate, delivery pressure, air/oxygen delivery location (depth), and lithology within the saturated zone. Delta measured the DO concentrations in the observation wells before, during, and after the AS pilot test to determine the radius of influence.

The DO concentrations, measured in monitoring wells TMW-1, TMW-2, MW-1, and MW-2 (located approximately 5, 10, 20 and 31 feet from air sparge point AS-1, respectively) increased over background levels during the AS pilot test (see Table 2 and Graph 1). At an injection flow rate of approximately 4.5 CFM, the DO concentrations were approximately 9, 7, and 10 milligrams per liter (mg/L) in wells TMW-1, TMW-2, and MW-2, respectively. At the maximum injection flow rate of approximately 13 CFM, the DO concentration increased to

approximately 11, 9, and 10 mg/L in observation wells TMW-1, TMW-2, and MW-2 respectively. MW-1 was not evaluated because of fluctuating DO concentrations throughout the test (probably a result of shutting off the SVE vacuum at MW-1 during the middle of the AS test). Based on the results of the AS pilot tests, a radius of influence of at least 30 feet may be achieved under 19 psi. As a practical consideration, we recommend that the AS system be designed for a radius of influence of 25 to 30 feet under design pressures of 10 to 12 psi.

6.2 Active Stripping Zone

The active stripping zone is the area where the dissolved-phase hydrocarbons are stripped from the groundwater and transferred to the injected air. The injected air (in the form of bubbles) then percolates upward through the groundwater to the unsaturated zone. If a uniform distribution of the air is assumed, air stripping can be a quick and efficient method to treat the volatile, dissolved-phase, and adsorbed-phase hydrocarbons within the saturated zone. This area of active stripping is generally within the AS radius of influence. Delta uses two methods to define the active stripping zone: (1) observed bubbling in an observation well; and (2) relative reductions of dissolved-phase petroleum hydrocarbon concentrations in groundwater samples collected from wells before and after the pilot test.

The analytical results of groundwater samples collected before and after the pilot test suggest that observation wells TMW-1 and TMW-2 are located within the active stripping zone of AS-1. Observation wells TMW-1 and TMW-2 are located approximately five and ten feet, respectively, from AS-1. Laboratory results indicate that air sparging significantly affected the Benzene and TPHg concentrations in both wells. Laboratory results are presented in Table 3. Although water samples were not taken from other site wells, active bubbling was observed in MW-1, MW-2, and MW-7 (located 20, 31 and 32 feet, respectively, from AS-1). This bubbling strongly indicates that an active stripping zone of at least 30 feet was present during the AS pilot test.

6.3 Water Table Fluctuations

A common effect of air sparging is an increase in water table elevation (mounding) within the immediate sparging area. As shown in Graph 2, water table elevations fluctuated on the order of approximately two feet in the observation wells during the AS pilot test. Prior to the end of the pilot test, the water table elevation in the observation wells was at least as high or higher than the initial elevations. The mounding in conjunction with the high pressures used for the AS test indicates that the aquifer has a relatively low permeability and tends to restrict groundwater flow. Excessive groundwater mounding is not desirable on AS remediation sites because groundwater mounding can potentially contribute to contaminant migration. Therefore, as stated earlier, we recommend that the AS system be designed with lower design pressures (i.e. 10 - 12 psi) and a smaller radius of influence (i.e. 25- 30 feet) than was achieved in the AS pilot test.

6.4 VOC Changes in SVE System Exhaust

Soil vapor extraction (SVE) systems commonly accompany air sparging to capture the mobilized volatile hydrocarbons and mitigate continued migration of the hydrocarbons. Results of FID measurements indicated only a minor increase of volatile hydrocarbons was evident as a result of the AS pilot test.

7.0 SUMMARY OF RESULTS

The following is a summary of the AS/SVE pilot test results:

- An observed relative increase in DO concentrations at the observation wells suggests a conservative AS radius of influence of approximately 25 to 30 feet can be achieved using 10 - 12 psi of pressure.
- A reported reduction in dissolved-phase hydrocarbon concentrations and bubbling in surrounding observation wells suggests an active stripping zone extending at least 30 feet from the sparge well during the AS pilot test.

- Water level mounding and relative high test pressures suggest the aquifer lies within relatively low permeable soils.
- VOC increases from the SVE system exhaust were small during the AS pilot test.

Based on these results, Delta believes that AS technology, in conjunction with the existing SVE system, would be effective in remediating the petroleum hydrocarbon-impacted soil and groundwater at the site.

8.0 REMARKS

The information contained in this report represents our professional opinions. These opinions are based on currently available information and are arrived at in accordance with currently accepted hydrogeologic and engineering practices at this time and location. Other than this, no warranty is implied or intended.

GENERAL NOTES:
BASE MAP FROM U.S.G.S.
BELLEVUE NORTH AND SOUTH, WA.
7.5 x 15 MINUTE TOPOGRAPHIC
Printed 1982/1983

North

QUADRANGLE LOCATION

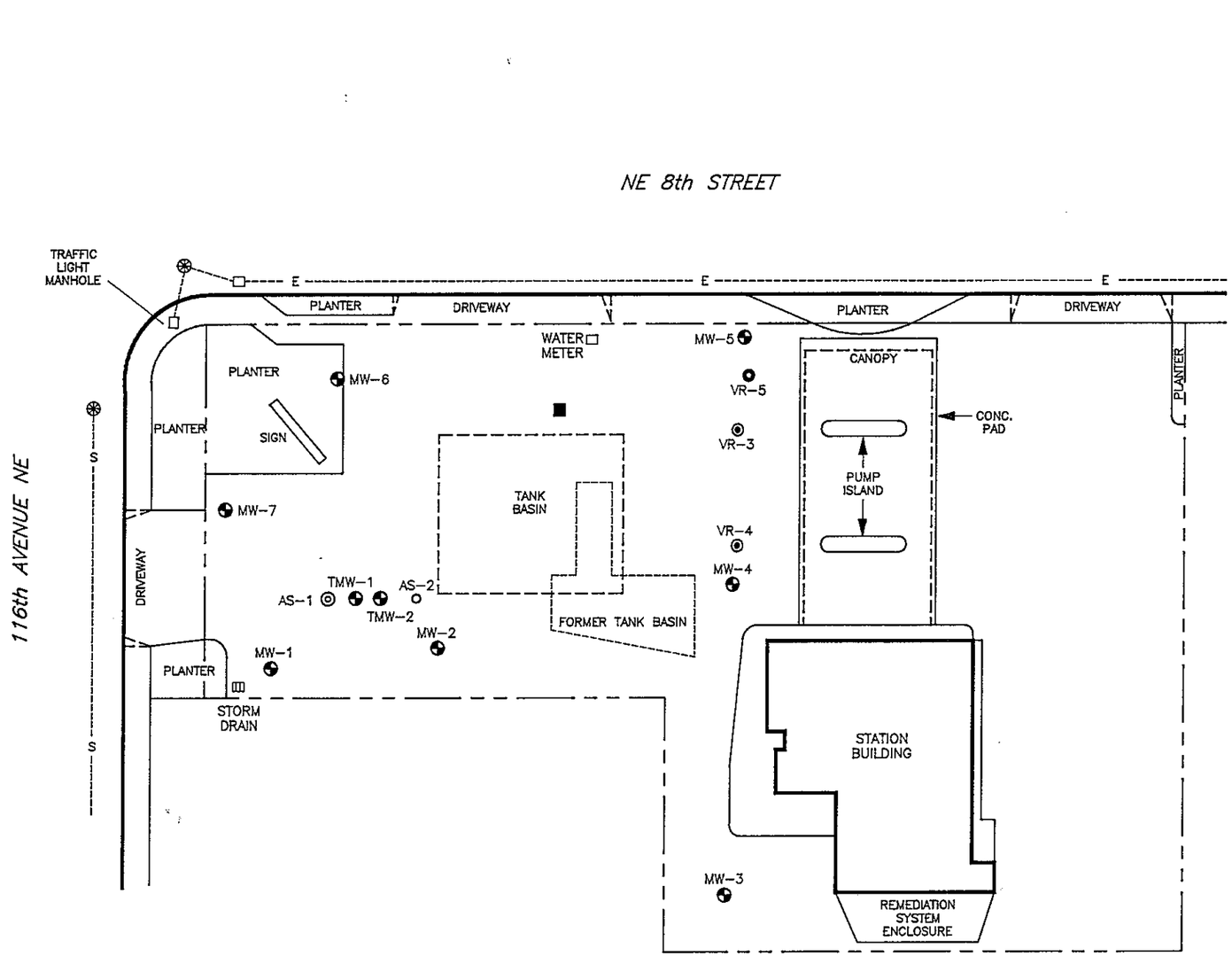
0 2000 FT

SCALE 1 : 25,000

FIGURE 1
SITE LOCATION MAP
ARCO PRODUCTS COMPANY
SERVICE STATION NO. 00836
1161 NE 8th STREET
BELLEVUE, WA.

PROJECT NO. M094-501	DRAWN BY I.H. 9/13/94
FILE NO. —	PREPARED BY A.S.
REVISION NO. 1	REVIEWED BY

Delta Environmental Consultants, Inc.



North

LEGEND:

———	PROPERTY LINE
■	ABANDONED MONITORING WELL
MW-1	MONITORING WELL LOCATION
TMW-1	SHALLOW MONITORING WELL LOCATION
VR-3	VAPOR RECOVERY PROBE LOCATION
VR-5	BURIED VAPOR RECOVERY PROBE LOCATION
AS-1	AIR SPARGING POINT NESTED WITH A VAPOR RECOVERY POINT
AS-2	AIR SPARGING POINT

UTILITIES

⊛	MANHOLE
---- E ----	ELECTRICAL LINE (BURIED)
---- S ----	SEWER LINE (BURIED)

0 30 FT

SCALE

FIGURE 2
SITE MAP
ARCO PRODUCTS COMPANY
SERVICE STATION NO. 00836
11611 NE 8th STREET
BELLEVUE, WA.

PROJECT NO. M094-501	DRAWN BY I.H. 3/15/95
FILE NO. M094501A	PREPARED BY A.S.
REVISION NO. 4	REVIEWED BY

Delta Environmental Consultants, Inc.

TABLE 1

SOIL BORING SAMPLE ANALYTICAL RESULTS
ARCO FACILITY NO. 836
11611 NE 8TH STREET
BELLEVUE, WASHINGTON
DELTA PROJECT NO. M094-501

SAMPLE ID.	CONCENTRATIONS (mg/kg)						
	TPHg	TPHd	TPH - 418.1	BENZENE	TOLUENE	ETHYLBENZENE	XYLENES
AS-1 @10'	11	NT	NT	ND	ND	0.053	0.18
AS-2 @12'	ND	NT	NT	ND	ND	ND	ND
MW-7 @6'	400	37	160	ND	0.11	0.67	3.3

mg/kg = Milligrams per kilogram NT = No Test
TPHg = Total petroleum hydrocarbons as gasoline
TPHd = Total petroleum hydrocarbons as diesel
TPH-418.1 = Total petroleum hydrocarbons by Ecology Method WTPH-418.1
ND = Not present above stated limit of detection
Detection Limits: See attached laboratory reports

TABLE 2
AS PILOT TEST DATA
ARCO FACILITY NO. 836
11611 NE 8TH STREET
BELLEVUE, WASHINGTON
DELTA PROJECT NO. M094-501

Test Well	Time Date (9/22)	Injection Parameters		Extraction Parameters			TMW-1 (distance from test well = 5 FT)		TMW-2 (distance from test well = 10.25 FT)		MW-1 (distance from test well = 19.75 FT)		MW-2 (distance from test well = 30.5 FT)	
		Pres. (PSI)	Flow (CFM)	Vac. (in H_2O)	Flow (CFM)	Conc. (ppm)	D.T.W. (FT)	D.O. (mg/L)	D.T.W. (FT)	D.O. (mg/L)	D.T.W. (FT)	D.O. (mg/L)	D.T.W. (FT)	D.O. (mg/L)
AS-1	14:15	---	---	---	---	---	8.43	6.3	8.40	7.4	2.99	2.7		0.3
AS-1	14:30	20.0	4.0	55	130	7.0	7.60	7.7	3.55	8.3	3.65	10.0		1.6
AS-1	14:50	19.5	4.5	---	---	---	7.35	8.6	4.36	7.0	4.10	6.8		3.4
AS-1	15:08	19.0	4.5	---	---	---	7.32	9.0	4.70	6.9	4.21	5.6		2.8
AS-1	15:25	19.0	5.0	---	---	---	7.23	9.8	5.05	6.9	4.25	5.0		3.0
AS-1	15:40	19.0	5.0	---	---	---	7.15	10.1	5.11	7.0	4.20	4.7		4.3
AS-1	15:55	19.0	5.2	---	---	---	7.09	10.6	5.25	7.1	4.25	4.6		4.9
AS-1	16:05	25.0	12.3	---	---	---	7.02	11.1	4.91	7.9	4.22	4.8		5.7
AS-1	16:20	25.0	13.0	---	---	---	6.58	11.6	4.24	8.4	3.38	4.7		6.7
AS-1	16:35	25.0	13.0	53	135	15	6.40	11.3	3.62	8.9	2.92	3.2		7.6
AS-1	16:50	24.5	13.2	---	---	---	6.24	10.9	3.46	9.0	2.91	2.5		7.8

TABLE 2
AS PILOT TEST DATA
ARCO FACILITY NO. 836
1161 NE 8TH STREET
BELLEVUE, WASHINGTON
DELTA PROJECT NO. M094-501

Test Well	Time Date (9/22)	Injection Parameters		Extraction Parameters			TMW-1 (distance from test well = 5 FT)		TMW-2 (distance from test well = 10.25 FT)		MW-1 (distance from test well = 19.75 FT)		MW-2 (distance from test well = 30.5 FT)	
		Pres. (PSI)	Flow (CFM)	Vac. (in H_2O)	Flow (CFM)	Conc. (ppm)	D.T.W. (FT)	D.O. (mg/L)	D.T.W. (FT)	D.O. (mg/L)	D.T.W. (FT)	D.O. (mg/L)	D.T.W. (FT)	D.O. (mg/L)
AS-1	17:05	24.5	13.2	---	---	---	6.09	11.1	3.38	9.1	2.45	1.5		8.5
AS-1	17:20	24.0	13.5	---	---	---	5.99	11.2	3.38	9.4	2.40	1.1		9.6
AS-1	17:35	24.0	13.7	---	---	---	5.87	11.5	3.38	9.4	2.36	1.1		9.1
AS-1	17:50	24.0	14.0	---	---	---	5.77	11.6	3.42	9.7	2.32	1.7		10.7
AS-1	18:05	23.6	14.3	---	---	---	5.70	11.6	3.45	9.8	2.33	2.9		10.3
AS-1	18:20	23.5	14.5	---	---	---	5.64	11.6	3.54	9.7	2.32	4.0		9.5
AS-1	18:35	23.5	14.5	52	135	4.0	5.51	11.7	3.51	9.8	2.40	5.4	0.9	11.3

Pres. = Pressure
Vac. = Vacuum
Temp. = Temperature
D.T.W. = Depth to water
D.O. = Dissolved oxygen

PSI = Pounds per square inch
in H_2O = Inches of water column
F = Degrees fahrenheit
FT = Feet
mg/L = Milligrams per liter

TABLE 3

GROUNDWATER SAMPLE ANALYTICAL RESULTS
ARCO FACILITY NO. 836
11611 NE 8TH STREET
BELLEVUE, WASHINGTON
DELTA PROJECT NO. M094-501

SAMPLE ID.	CONCENTRATIONS (µg/L)				
	TPHg	BENZENE	TOLUENE	ETHYLBENZENE	XYLENES
AS-1 BEFORE	1500	46	1.3	11	18
AS-1 AFTER	ND	1.7	ND	0.6	1.0
AS-2 BEFORE	ND	ND	ND	ND	0.7
AS-2 AFTER	ND	0.7	ND	ND	0.7
TMW-1 BEFORE	160	0.8	ND	ND	1.0
TMW-1 AFTER	280	6.6	ND	ND	1.6
TMW-2 BEFORE	470	12	ND	ND	2.7
TMW-2 AFTER	150	21	ND	ND	3.4

µg/L = Micrograms per liter
TPHg = Total petroleum hydrocarbons as gasoline
Detection Limits: See attached laboratory reports

TABLE 4

PRE/POST-AS PILOT TEST GROUNDWATER DATA
ARCO FACILITY NO. 836
11611 NE 8TH STREET
BELLEVUE, WASHINGTON
DELTA PROJECT NO. M094-501

PRETEST DATA

WELL I.D.	Time	D.T.W. (FT)	D.O. (mg/L)
AS-1	13:53	7.10	---
AS-2	14:00	8.74	0.2
TMW-1	13:55	8.43	6.3
TMW-2	13:56	8.40	7.4
MW-1	13:57	2.99	2.7
MW-2	13:57	---	0.3

Continued..

TABLE 4

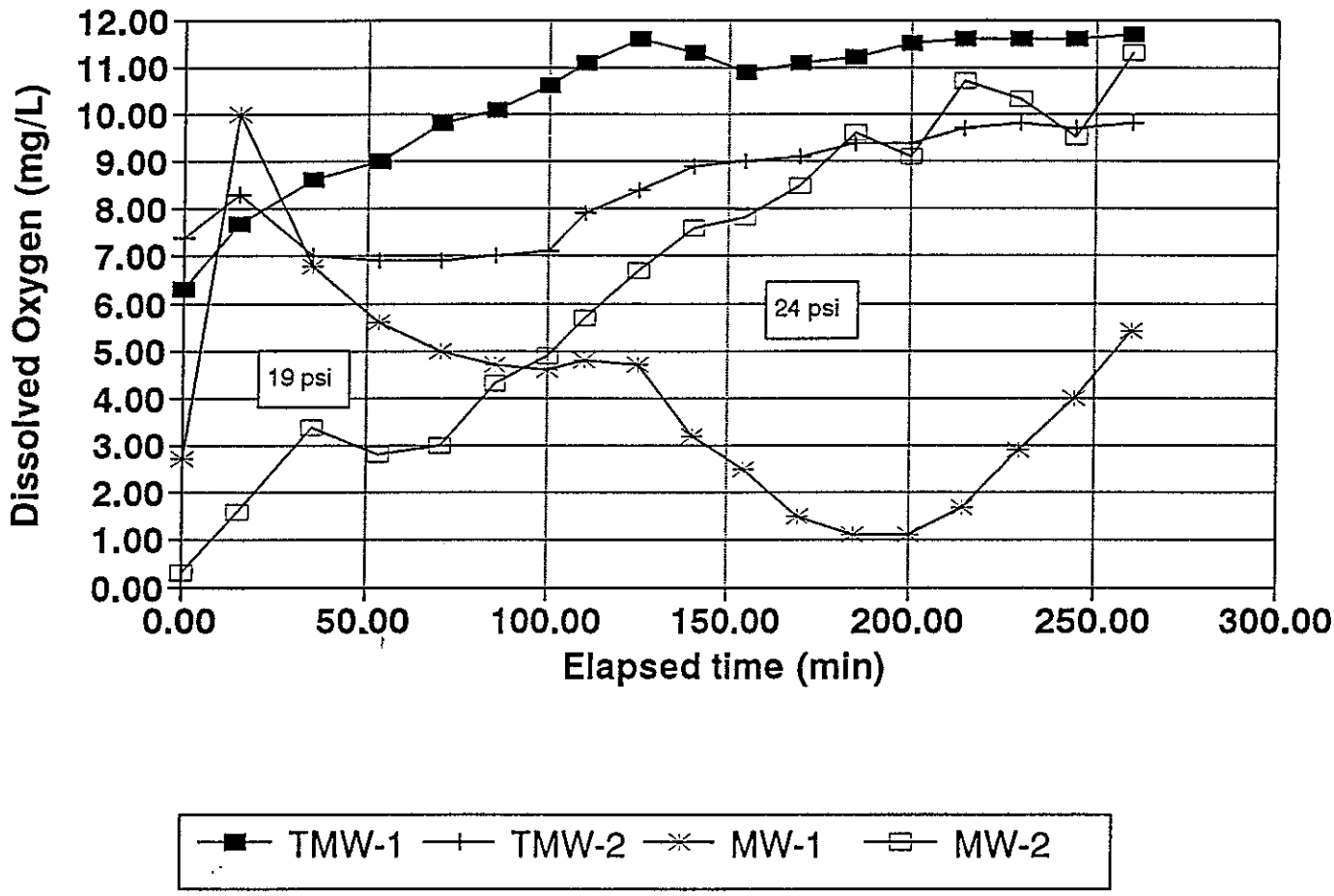
PRE/POST-AS PILOT TEST GROUNDWATER DATA
ARCO FACILITY NO. 836
11611 NE 8TH STREET
BELLEVUE, WASHINGTON
DELTA PROJECT NO. M094-501

POST TEST DATA

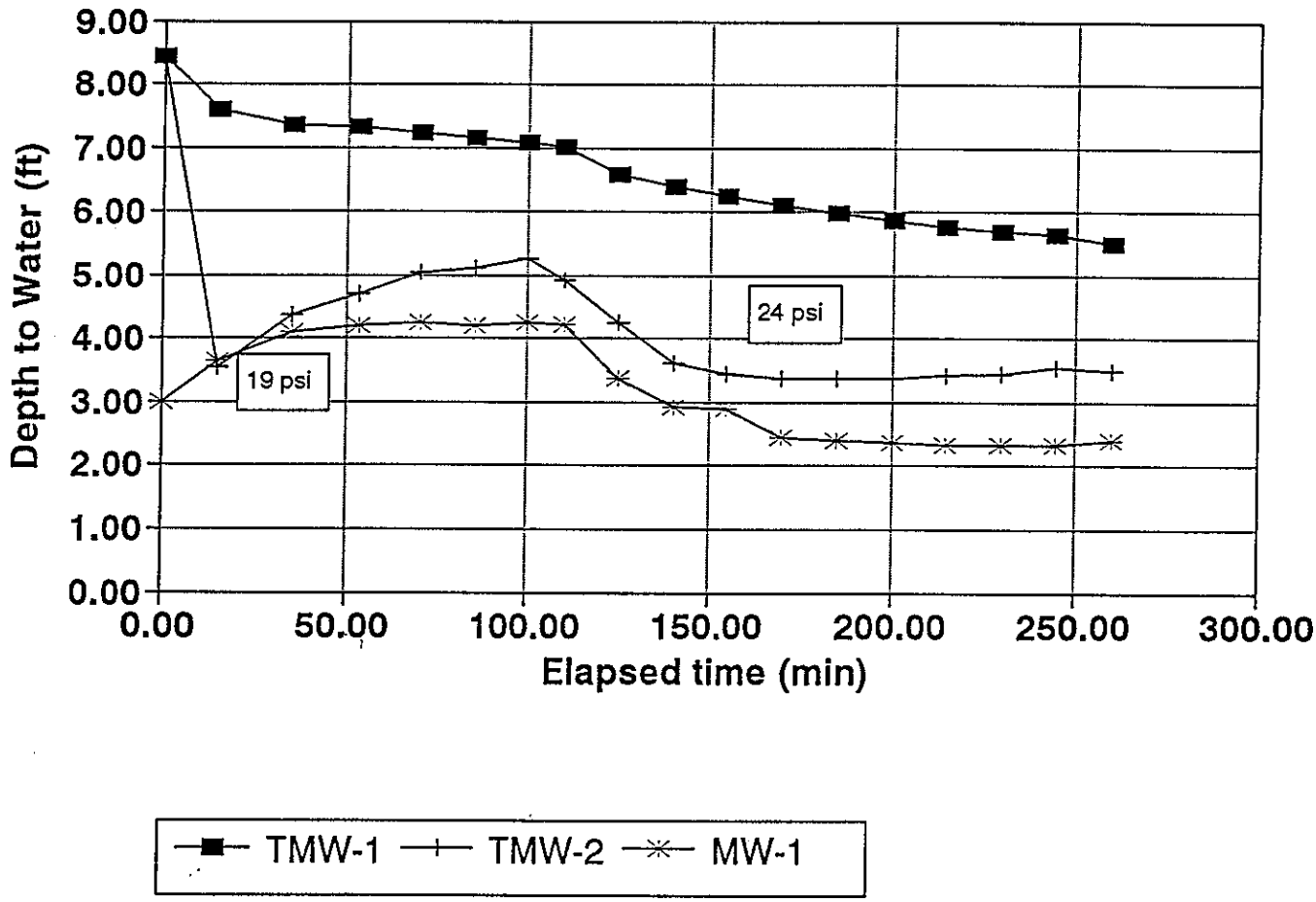
Well I.D.	Time	D.T.W. (FT)	D.O. (mg/L)
AS-1	18:35	---	---
AS-2	18:35	0	0.2
TMW-1	18:35	5.51	11.7
TMW-2	18:35	3.51	9.8
MW-1	18:35	2.40	5.4
MW-2	18:35	---	11.3

D.T.W. = Depth to water
D.O. = Dissolved oxygen
O.R.P. = Oxidation reduction potential
FT = Feet
mg/L = Milligrams per liter
mV = Millivolts

GRAPH 1: DISSOLVED OXYGEN
AIR SPARGE PILOT TEST



GRAPH 2: DEPTH TO WATER
AIR SPARGE PILOT TEST



APPENDIX A

Boring and Well Construction Logs
and Licensed Well Survey

PROJECT NAME/LOCATION:	Project Number	M094-501	Boring Number	AS-1
ARCO Facility No. 836 11611 NE 8th Avenue Bellevue, WA	Contractor	Cascade Drilling	Drilling Method	6½" ID HSA
	Driller	Steve	Drilling Rig	Ingersoll Rand T3W
	Start	8:10 a.m. 12/21/94	Completed	11:20 a.m. 12/21/94
Landowner: ARCO Products Co.	Surface Elev.	—	Logged By	Ron Bruce

Sample Type	Sample No.	Blow Count	Sample Interval (ft)	Sample Recovery (in.)	Depth Scale 1" = 4'	Descriptions of Materials and Conditions	Observations Instrument: Units: hNu ppm	Comments
					0	Asphalt 4 inches		
					1			
					2	SILTY SAND WITH GRAVEL; light brown, dense, damp (SM). (Fill)		
					3			
					4			
SB	AS-1-5	50	5.0-6.0	12	5		0	
					6			
SB	AS-1-7	20	7.5-8.5	12	7		100	
					8			
					9			
SB	AS-1-10	12	10.0-11.0	12	10	SILTY SAND; gray, coarse sand, damp (SM) SILT; dark brown, organic, damp (OL)	50	
					11	SILT; gray, damp, medium dense (ML)		
SB	AS-1-12	64	12.5-13.5	12	12	SANDY SILT WITH CLAY; gray, saturated, very dense (ML)	4	
					13			
					14			
SB	AS-1-15	50 for 6"	15-16	12	15	Becomes dark gray.	4	
					16			
SB	AS-1-17	50 for 3"	17.5-18.5	8	17	Becomes gravelly.	5	
					18			
					19			
SB	AS-1-20	50 for 6"	20-21	12	20		0	
					21			
SB	AS-1-22	50 for 6"	22.5-23	6	22	SILTY SAND WITH GRAVEL; fine grained, gray, saturated, very dense (SM)	0	
					23			

BOREHOLE WATER LEVEL DATA			
Date			
Time			
GWL			
Casing Depth			

Delta Environmental Consultants, Inc.

PROJECT NAME/LOCATION:	Project Number	M094-501	Boring Number	AS-1
ARCO Facility No. 836 11611 NE 8th Avenue Bellevue, WA	Contractor	Cascade Drilling	Drilling Method	6½" ID HSA
	Driller	Steve	Drilling Rig	Ingersoll Rand T3W
	Start	8:10 a.m. 12/21/94	Completed	11:20 a.m. 12/21/94
Landowner: ARCO Products Co.	Surface Elev.	---	Logged By	Ron Bruce

Sample Type	Sample No.	Blow Count	Sample Interval (ft)	Sample Recovery (in.)	Depth Scale 1" = 4'	Descriptions of Materials and Conditions	Observations Instrument: hNu Units: ppm	Comments
SB	AS-1-25	50 for 6"	25-25.5	6	24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47	SILTY SAND WITH GRAVEL; gray, medium grained sand, saturated, very dense (SM) Boring terminated at 25 feet	0	

BOREHOLE WATER LEVEL DATA			
Date			
Time			
GWL			
Casing Depth			

Delta Environmental Consultants, Inc.

PROJECT NAME/LOCATION:	Project Number	M094-501	Boring Number	AS-2
ARCO Facility No. 836 11611 NE 8th Avenue Bellevue, WA	Contractor	Cascade Drilling	Drilling Method	4¼" ID HSA
	Driller	Steve	Drilling Rig	Ingersoll Rand T3W
	Start	8:45 a.m. 12/20/94	Completed	11:15 a.m. 12/20/94
Landowner: ARCO Products Co.	Surface Elev.	---	Logged By	Ron Bruce

Sample Type	Sample No.	Blow Count	Sample Interval (ft)	Sample Recovery (in.)	Depth Scale 1" = 4'	Descriptions of Materials and Conditions	Observations Instrument: hNu Units: ppm	Comments
					0	Asphalt 4 inches.		
					1	Brown gravelly sand (Fill)		
					2			
					3			
					4	Pea gravel.		
SB	AS-2-5		5.0-6.0	12	5	SILTY SAND WITH GRAVEL; light brown, moist to wet (SM).	0	
					6			
SB	AS-2-7	39	7.5-8.5	12	7	SILTY SAND WITH SOME CLAY AND TRACE GRAVEL; light brown, dense, moist to wet (SM-SC).	0	
					8			
					9			
SB	AS-2-10	34	NR	0	10			Spoon obstructed
					11			
SB	AS-2-12	44	12.5-14	18	12	SILTY CLAY WITH SOME ORGANICS; gray, moist, dense (OL).	▼ 50	
					13			
					14			
SB	AS-2-15	51	15-16	12	15	SAND WITH TRACE SILT; dark gray, saturated, very dense (SW).	0	
					16			
					17			
SB	AS-2-17		17.5-18.5	12	18	SANDY SILT WITH TRACE CLAY; dark gray, saturated (ML).	0	
					19			
SB	AS-1-19		20-21	12	20		0	
					21			
					22			
SB	AS-2-22		22.5-23.5	12	23		0	

BOREHOLE WATER LEVEL DATA			
Date			
Time			
GWL			
Casing Depth			

Delta Environmental Consultants, Inc.

Rev. February 16, 1995

PROJECT NAME/LOCATION:	Project Number	M094-501	Boring Number	AS-2
ARCO Facility No. 836 11611 NE 8th Avenue Bellevue, WA	Contractor	Cascade Drilling	Drilling Method	4¼" ID HSA
	Driller	Steve	Drilling Rig	Ingersoll Rand T3W
	Start	8:45 a.m. 12/20/94	Completed	11:15 a.m. 12/20/94
Landowner: ARCO Products Co.	Surface Elev.	---	Logged By	Ron Bruce

Sample Type	Sample No.	Blow Count	Sample Interval (ft)	Sample Recovery (in.)	Depth Scale 1" = 4'	Descriptions of Materials and Conditions	Observations Instrument: hNu Units: ppm	Comments
SB	AS-2-24		24.5-25.5	12	24	SANDY SILT WITH TRACE CLAY; dark gray, saturated (ML).	0	
					25			
					26	Boring terminated at 24 ft.		
					27			
					28			
					29			
					30			
					31			
					32			
					33			
					34			
					35			
					36			
					37			
					38			
					39			
					40			
					41			
					42			
					43			
					44			
					45			
					46			
					47			

BOREHOLE WATER LEVEL DATA			
Date			
Time			
GWL			
Casing Depth			

Delta Environmental Consultants, Inc.

Rev. February 16, 1995

PROJECT NAME/LOCATION:	Project Number	M094-501	Boring Number	MW-7
ARCO Facility No. 836 11611 NE 8th Avenue Bellevue, WA	Contractor	Cascade Drilling	Drilling Method	4¼" ID HSA
	Driller	Steve	Drilling Rig	Ingersoll Rand T3W
	Start	2:30 p.m. 12/20/94	Completed	4:10 p.m. 12/20/94
Landowner: ARCO Products Co.	Surface Elev.	---	Logged By	Ron Bruce

Sample Type	Sample No.	Blow Count	Sample Interval (ft)	Sample Recovery (in.)	Depth Scale 1" = 4'	Descriptions of Materials and Conditions	Observations Instrument: hNu Units: ppm	Comments
					0	Asphalt 4 inches.		
					1			
					2			
					3	SILTY SAND WITH GRAVEL; light brown, moist, loose (Fill) (SM-SW).		
					4			
					5			
SB	MW-7-6	9	6-7	12	6		130	
					7	ORGANIC CLAY WITH SILT; dark brown, damp, medium dense (OL).		
SB	MW-7-7	22	7.5-8.5	12	8	SILTY CLAY WITH SAND AND TRACE GRAVEL; gray, moist, medium dense (CL).	70	
					9	SANDY SILT WITH CLAY; dark gray, wet, medium dense, (ML).		
SB	MW-7-10	22	10-11	12	10		20	
					11	SILTY CLAY WITH TRACE SAND; medium to dark grey, saturated, very dense (CL).		
					12			
SB	MW-7-12	44	12.5-13.5	12	13		8	
					14			
SB	MW-7-15	50 for 5"	15-15.5	5	15		6	
					16			
					17			
SB	MW-7-17	50 for 6"	17.5-18	6	18		1	
SB	MW-7-19	50 for 8"	19-19.75	8	19	Boring terminated at 19 ft.	1	
					20			
					21			
					22			
					23			

BOREHOLE WATER LEVEL DATA			
Date			
Time			
GWL			
Casing Depth			

Delta Environmental Consultants, Inc.

Sheet 1 of 1

Rev. February 16, 1995

PROJECT NAME/LOCATION:	Project Number	M094-501	Boring Number	TMW-1
ARCO Facility No. 836 11611 NE 8th Avenue Bellevue, WA	Contractor	Cascade Drilling	Drilling Method	4¼" ID HSA
	Driller	Steve	Drilling Rig	Ingersoll Rand T3W
	Start	1:10 p.m. 12/20/94	Completed	2:30 p.m. 12/20/94
Landowner: ARCO Products Co.	Surface Elev.	---	Logged By	Ron Bruce

Sample Type	Sample No.	Blow Count	Sample Interval (ft)	Sample Recovery (in.)	Depth Scale 1" = 4'	Descriptions of Materials and Conditions	Observations Instrument: hNu Units: ppm	Observations Comments
					0	Asphalt 4 inches.		
					1			
					2			
					3	SILTY SAND WITH GRAVEL; brown, damp (Fill).		
					4			
SB	TMW-1-5	50 for 3"	5-5.5	6	5		8	
					6			
					7			
SB	TMW-1-7	57	7.5-8.5	12	8	SILTY SAND WITH COBBLES; light brown, damp to moist, very dense (SM-SW). (Fill)		
					9			
SB	TMW-1-10	9	10-11	12	10	Becomes gray.	0	
					11	ORGANIC SILT; dark brown, damp, loose (OL).		
					12			
SB	TMW-1-12	50 for 6"	NR	0	13			Spoon coated with mud.
SB	TMW-1-14	50 for 6"	14-15	6	14	SANDY SILT WITH SOME CLAY; gray, saturated, very dense (ML).	0	
					15			
					16	Boring terminated at 14 ft.		
					17			
					18			
					19			
					20			
					21			
					22			
					23			

BOREHOLE WATER LEVEL DATA			
Date			
Time			
GWL			
Casing Depth			

Delta Environmental Consultants, Inc.

Sheet 1 of 1

Rev. February 16, 1995

PROJECT NAME/LOCATION:	Project Number	M094-501	Boring Number	TMW-2
ARCO Facility No. 836 11611 NE 8th Avenue Bellevue, WA	Contractor	Cascade Drilling	Drilling Method	4¼" ID HSA
	Driller	Steve	Drilling Rig	Ingersoll Rand T3W
	Start	11:30 a.m. 12/20/94	Completed	2:00 p.m. 12/20/94
Landowner: ARCO Products Co.	Surface Elev.	---	Logged By	Ron Bruce

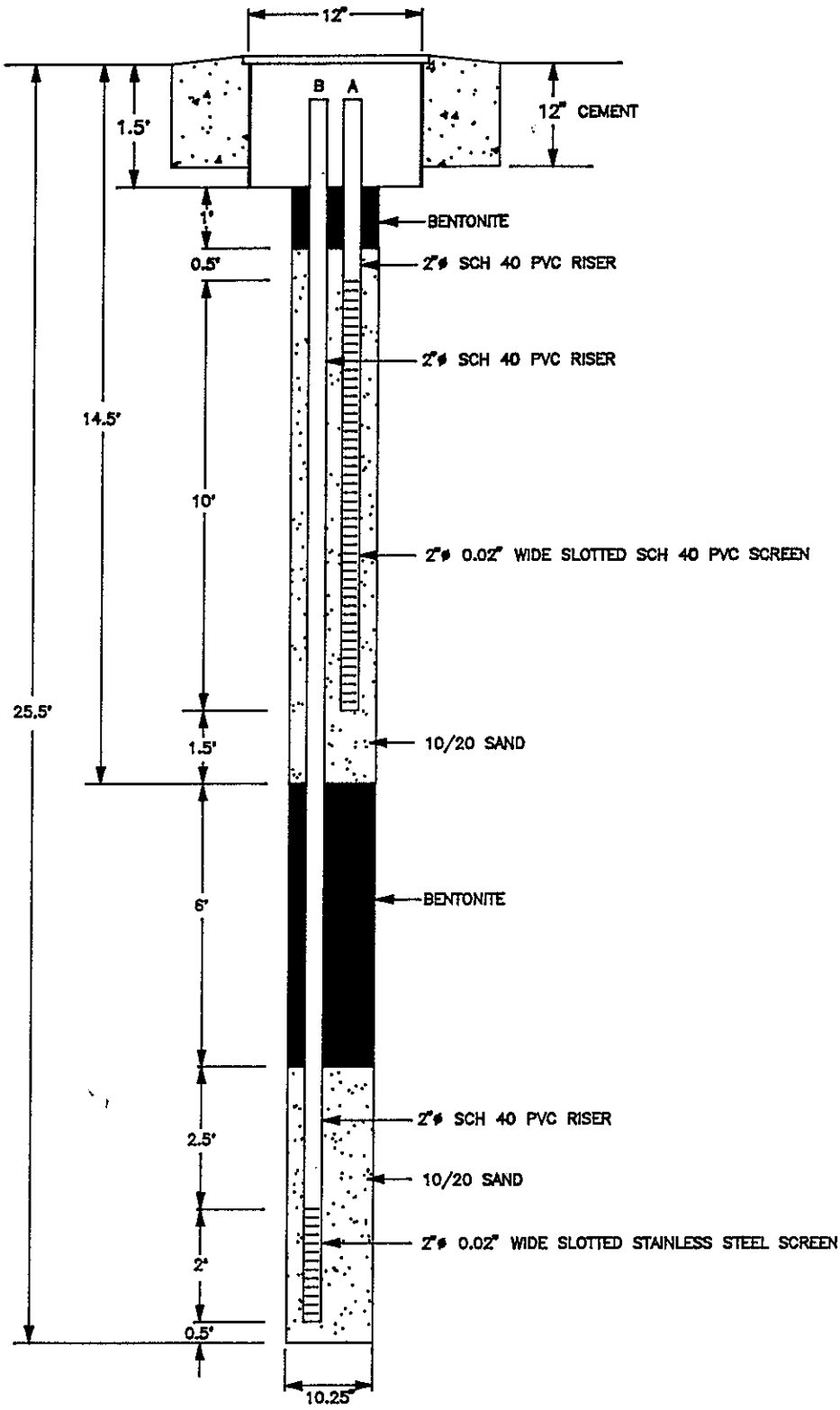
Sample Type	Sample No.	Blow Count	Sample Interval (ft)	Sample Recovery (in.)	Depth Scale 1" = 4'	Descriptions of Materials and Conditions	Observations Instrument: hNu Units: ppm	Comments
					0	Asphalt 4 inches.		
					1			
					2			
					3			
					4			
SB	TMW-2-5	56	5-6.5	12	5	SILTY SAND WITH GRAVEL; light brown, damp, very dense (SM-SW). (Fill)	6	
					6			
SB	TMW-2-7	43	7.5-9	12	7		2	
					8			
					9			
SB	TMW-2-10	19	10-11.5	12	10	Becomes cobbly.	0	
					11			
					12			
SB	TMW-2-12	35	12.5-14	12	13	SILTY SAND WITH TRACE CLAY; dark gray, saturated, dense (SM).	2	
SB	TMW-2-14	34	14-15.5	12	14	Boring terminated at 14 ft.	0	
					15			
					16			
					17			
					18			
					19			
					20			
					21			
					22			
					23			

BOREHOLE WATER LEVEL DATA			
Date			
Time			
GWL			
Casing Depth			

Delta Environmental Consultants, Inc.

Sheet 1 of 1

Rev. February 16, 1995



NOT TO SCALE

NESTED AIR SPARGING WELL CONSTRUCTION
AS-1
ARCO PRODUCTS COMPANY
SERVICE STATION NO. 00836
11611 NE 8th STREET
BELLEVUE, WA.

PROJECT NO. M094-501	DRAWN BY I.H. 2/28/95
FILE NO. M094501B	PREPARED BY R.B.
REVISION NO. 1	REVIEWED BY

Delta Environmental Consultants, Inc.

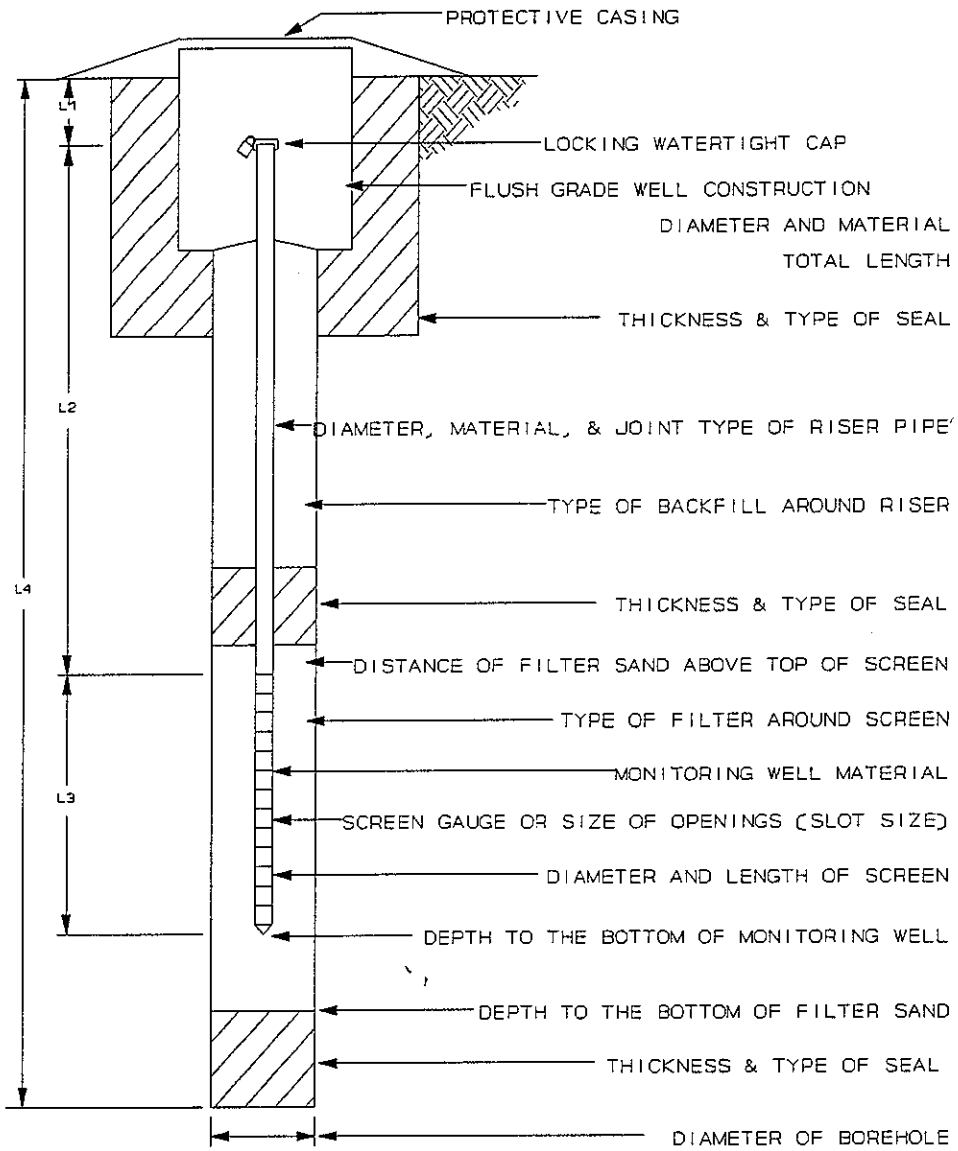
INSTALLATION OF FLUSH GRADE MONITORING WELL

Project: ARCO Facility No. 836
11611 NE 8th Avenue
Bellevue, WA

Delta No. M094-501

Monitoring Well No. AS-2

Elevations:
Top of Riser:
Ground Level:



DIAMETER AND MATERIAL	8 inch steel
TOTAL LENGTH	15 inches
THICKNESS & TYPE OF SEAL	2 feet cement
DIAMETER, MATERIAL, & JOINT TYPE OF RISER PIPE	2-inch PVC SCH 40 threaded
TYPE OF BACKFILL AROUND RISER	
THICKNESS & TYPE OF SEAL	17 feet bentonite
DISTANCE OF FILTER SAND ABOVE TOP OF SCREEN	2.5 feet
TYPE OF FILTER AROUND SCREEN	#3 monterey sand
MONITORING WELL MATERIAL	Stainless steel
SCREEN GAUGE OR SIZE OF OPENINGS (SLOT SIZE)	0.020 inch
DIAMETER AND LENGTH OF SCREEN	2 feet x 2 inches
DEPTH TO THE BOTTOM OF MONITORING WELL	24 feet
DEPTH TO THE BOTTOM OF FILTER SAND	24.5 feet
THICKNESS & TYPE OF SEAL	
DIAMETER OF BOREHOLE	8.25 inch

L1 = _____ FT
L2 = 21.25 FT
L3 = 3 FT
L4 = 24.5 FT

Installation Completed
Date: 12/20/94
Time: 11:15 a.m.

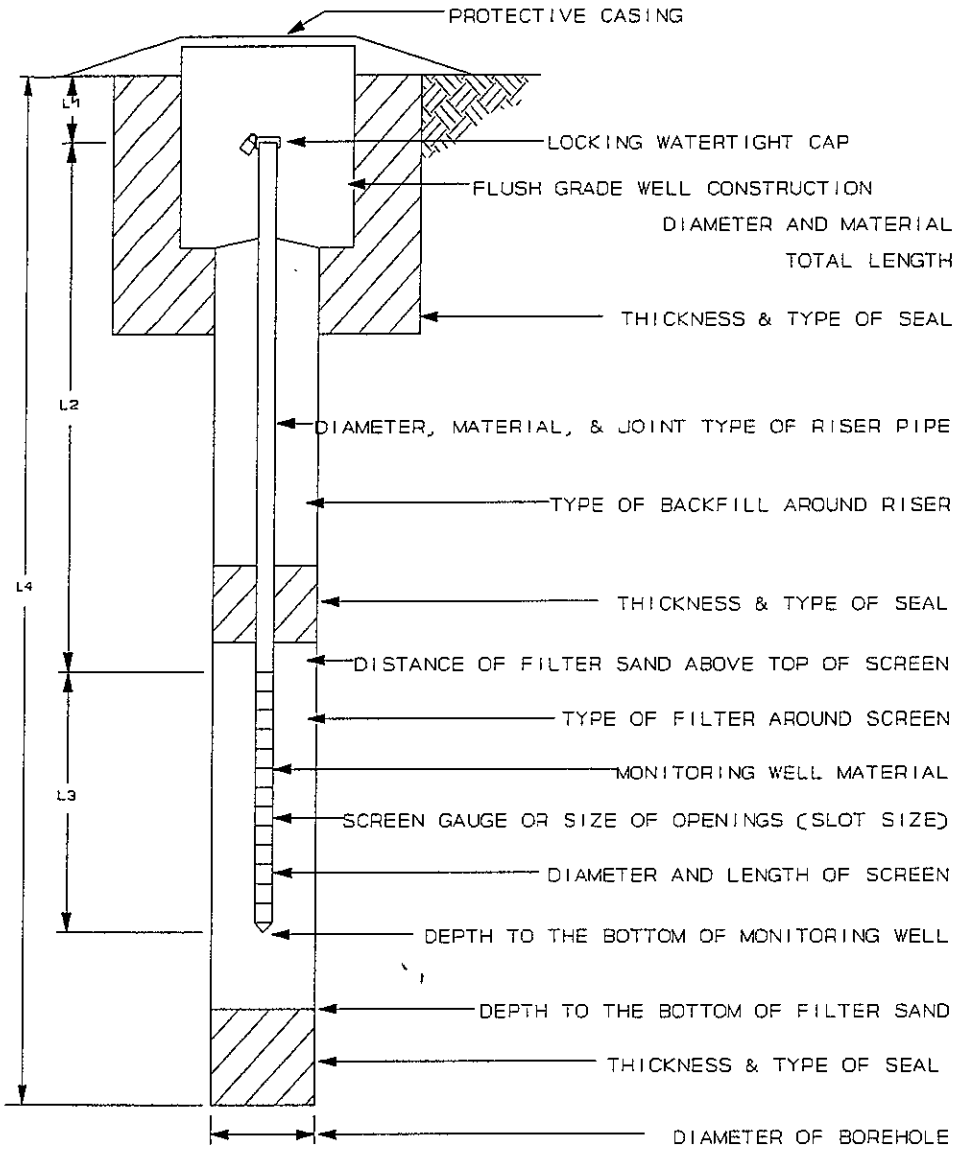
Delta Environmental Consultants, Inc.

Monitoring Well Water Level Measurements		
Date	Time	Water Level*

* Measure Point _____

INSTALLATION OF FLUSH GRADE MONITORING WELL

Project	ARCO Facility No. 836	Monitoring Well No.	TMW-1
	11611 NE 8th Avenue	Elevations:	
	Bellevue, WA	Top of Riser:	
Delta No.	M094-501	Ground Level:	



DIAMETER AND MATERIAL	8 inch steel
TOTAL LENGTH	15 inches
THICKNESS & TYPE OF SEAL	1.5 feet cement
DIAMETER, MATERIAL, & JOINT TYPE OF RISER PIPE	2-inch PVC SCH 40 threaded
TYPE OF BACKFILL AROUND RISER	
THICKNESS & TYPE OF SEAL	1.5 feet bentonite
DISTANCE OF FILTER SAND ABOVE TOP OF SCREEN	1 foot
TYPE OF FILTER AROUND SCREEN	10-20 Colorado Silica Sand
MONITORING WELL MATERIAL	Schedule 40 PVC
SCREEN GAUGE OR SIZE OF OPENINGS (SLOT SIZE)	0.010 inch
DIAMETER AND LENGTH OF SCREEN	10 feet x 2 inches
DEPTH TO THE BOTTOM OF MONITORING WELL	14 feet
DEPTH TO THE BOTTOM OF FILTER SAND	14 feet
THICKNESS & TYPE OF SEAL	
DIAMETER OF BOREHOLE	8.25 inch

L1 = _____ FT
L2 = 3.75 FT
L3 = 10 FT
L4 = 14 FT

Installation Completed
Date: 12/20/94
Time: 2:30 p.m.

Delta Environmental Consultants, Inc.

Monitoring Well Water Level Measurements		
Date	Time	Water Level*

* Measure Point _____

INSTALLATION OF FLUSH GRADE MONITORING WELL

Project: ARCO Facility No. 836
11611 NE 8th Avenue
Bellevue, WA

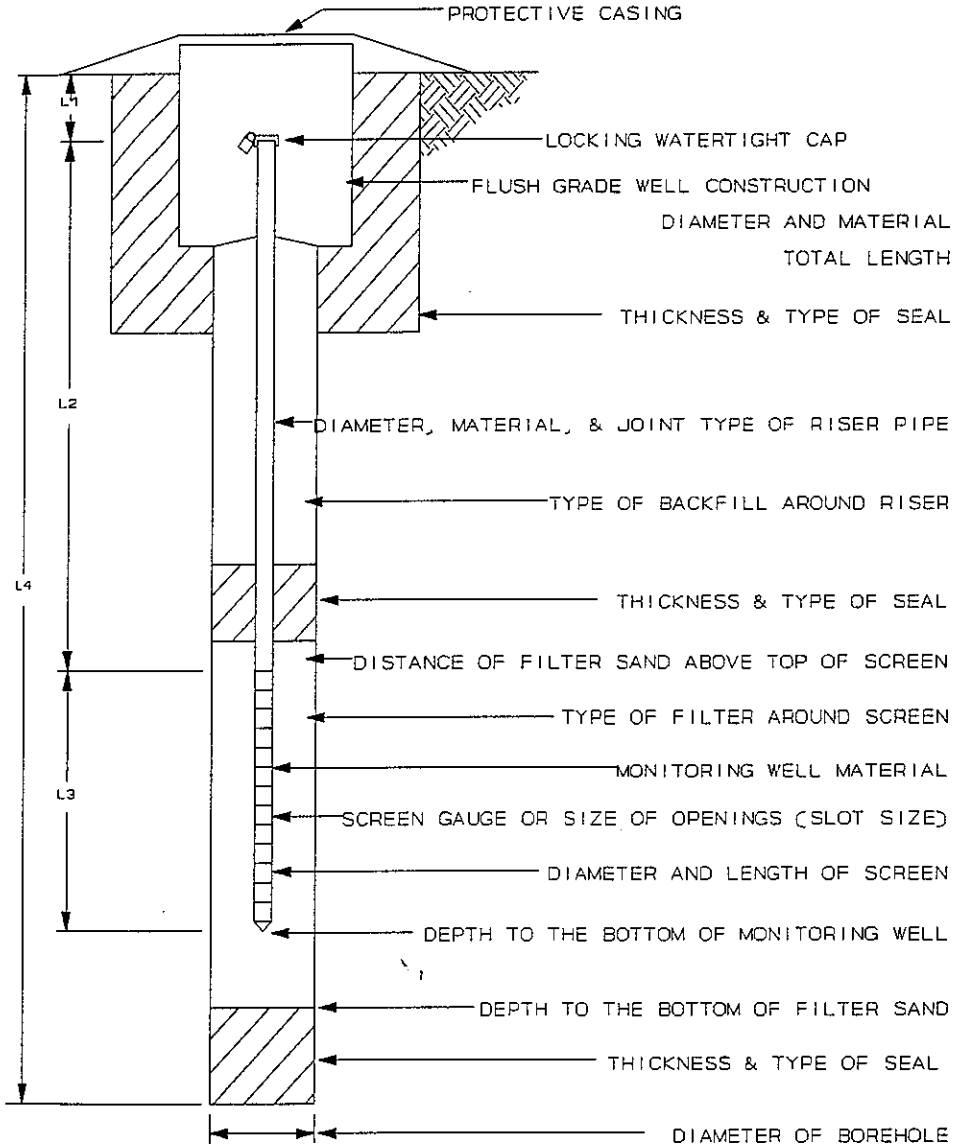
Delta No. M094-501

Monitoring Well No. TMW-2

Elevations:

Top of Riser:

Ground Level:



DIAMETER AND MATERIAL	8 inch steel
TOTAL LENGTH	15 inches
THICKNESS & TYPE OF SEAL	1.5 feet cement
DIAMETER, MATERIAL, & JOINT TYPE OF RISER PIPE	2-inch PVC SCH 40 threaded
TYPE OF BACKFILL AROUND RISER	
THICKNESS & TYPE OF SEAL	1.5 feet bentonite
DISTANCE OF FILTER SAND ABOVE TOP OF SCREEN	1 foot
TYPE OF FILTER AROUND SCREEN	10-20 Colorado Silica Sand
MONITORING WELL MATERIAL	Schedule 40 PVC
SCREEN GAUGE OR SIZE OF OPENINGS (SLOT SIZE)	0.010 inch
DIAMETER AND LENGTH OF SCREEN	10 feet x 2 inches
DEPTH TO THE BOTTOM OF MONITORING WELL	14 feet
DEPTH TO THE BOTTOM OF FILTER SAND	14 feet
THICKNESS & TYPE OF SEAL	
DIAMETER OF BOREHOLE	8.25 inch

L1 = _____ FT
L2 = 3.75 FT
L3 = 10 FT
L4 = 14 FT

Installation Completed
Date: 12/20/94
Time: 2:00 p.m.

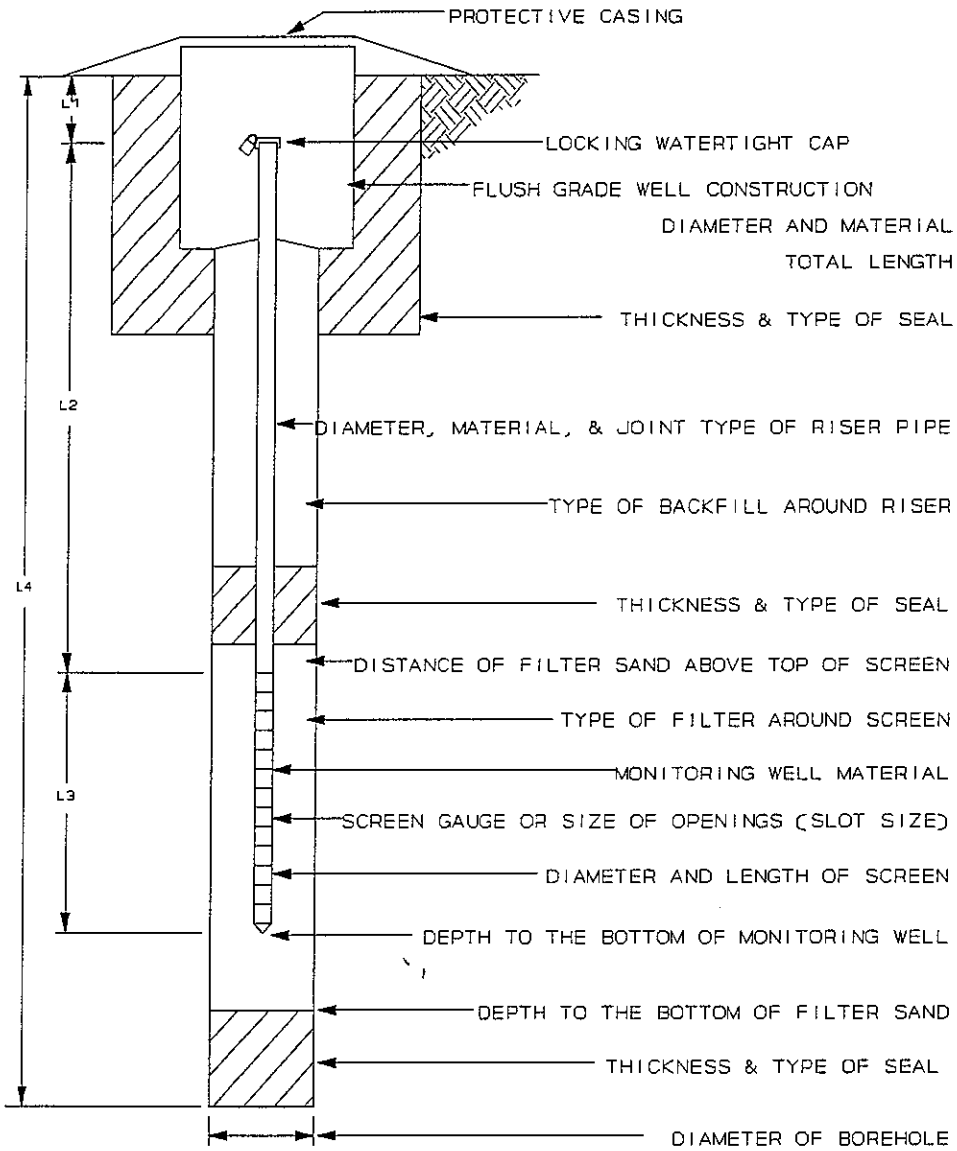
Delta Environmental Consultants, Inc.

Monitoring Well Water Level Measurements		
Date	Time	Water Level*

* Measure Point _____

INSTALLATION OF FLUSH GRADE MONITORING WELL

Project	ARCO Facility No. 836	Monitoring Well No.	MW-7
	11611 NE 8th Avenue	Elevations:	
	Bellevue, WA	Top of Riser:	
Delta No.	M094-501	Ground Level:	



DIAMETER AND MATERIAL	8 inch steel
TOTAL LENGTH	15 inches
THICKNESS & TYPE OF SEAL	1 foot cement
DIAMETER, MATERIAL, & JOINT TYPE OF RISER PIPE	2-inch PVC SCH 40 threaded
TYPE OF BACKFILL AROUND RISER	
THICKNESS & TYPE OF SEAL	2 feet bentonite
DISTANCE OF FILTER SAND ABOVE TOP OF SCREEN	1 foot
TYPE OF FILTER AROUND SCREEN	10-20 Colorado Silica Sand
MONITORING WELL MATERIAL	Schedule 40 PVC
SCREEN GAUGE OR SIZE OF OPENINGS (SLOT SIZE)	0.010 inch
DIAMETER AND LENGTH OF SCREEN	15 feet x 2 inches
DEPTH TO THE BOTTOM OF MONITORING WELL	19 feet
DEPTH TO THE BOTTOM OF FILTER SAND	19 feet
THICKNESS & TYPE OF SEAL	
DIAMETER OF BOREHOLE	8.25 inch

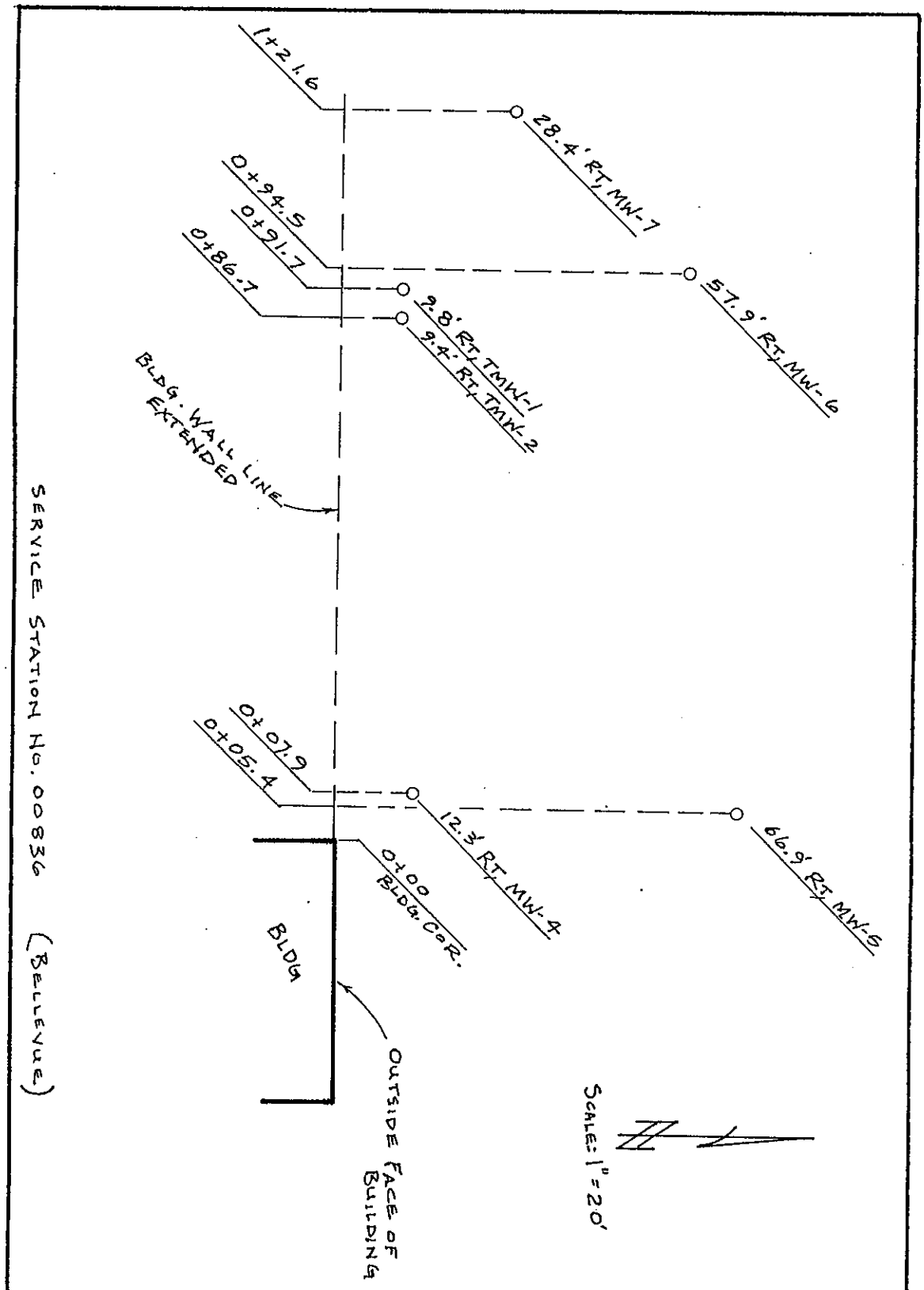
L1 = _____ FT
L2 = 3.75 FT
L3 = 15 FT
L4 = 19 FT

Installation Completed
Date: 12/20/94
Time: 4:10 p.m.

Delta Environmental Consultants, Inc.

Monitoring Well Water Level Measurements		
Date	Time	Water Level*

* Measure Point _____



CHARLES A. RICHARDSON
PROFESSIONAL LAND SURVEYOR
STATE OF WASHINGTON
REGISTERED
23231
PROFESSIONAL LAND SURVEYOR
EXPIRES 8/29/95

2/24/95

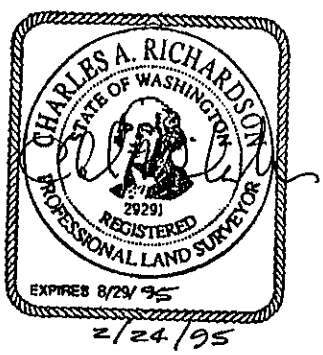
CHARLES A. RICHARDSON
PROFESSIONAL LAND SURVEYOR
P.O. BOX 566, KIRKLAND, WA. 98083-0566
(206) 823-8867

DATE: 2-23-95	PROJ-NO-95003
DRAWN: C A R	
CHECKED: C A R	SHEET 1 OF 2

SERVICE STATION NO. 00836 (BELLEVUE)

MONITOR WELL	ELEV. @ TOP NORTH EDGE OF PIPE	ELEV. @ TOP CENTER OF LID
TMW-1	97.29	97.68
TMW-2	97.84	98.18
MW-4	103.84	104.06
MW-5	103.76	104.01
MW-6	98.93	99.27
MW-7	95.20	95.61

NOTE: ALL ELEVATIONS ARE BASED ON AN ASSUMED VERTICAL DATUM.



2/24/95

CHARLES A. RICHARDSON
PROFESSIONAL LAND SURVEYOR
P.O. BOX 566, KIRKLAND, WA. 98083-0566
(206) 825-8867

DATE : 2-23-95	PROJ-NO-95003
DRAWN : CAR	
CHECKED: CAR	SHEET 2 OF 2

APPENDIX B

Laboratory Reports

FEB - 7 1995

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

ATI I.D. # 501103

February 6, 1995

Delta Environmental
3150 Richards Rd.
Suite 100
Bellevue WA 98005

Attention : Andy Smith

Project Number : Facil.#836,Task Order # 836-94-3

Project Name : Bellevue, WA

Dear Mr. Smith:

On January 25, 1995, Analytical Technologies, Inc. (ATI), received eight samples for analysis. The samples were analyzed with EPA methodology or equivalent methods as specified in the attached analytical schedule. The results, sample cross reference, and quality control data are enclosed.

Sincerely,

Diana Spence

Diana Spence
Project Manager

DS/hal/mrj

Enclosure

Analytical Technologies, Inc.

ATI I.D. # 501103

SAMPLE CROSS REFERENCE SHEET

CLIENT : DELTA ENVIRONMENTAL
PROJECT # : FACIL.#836,TO # 836-94-3
PROJECT NAME : BELLEVUE, WA

ATI #	CLIENT DESCRIPTION	DATE SAMPLED	MATRIX
501103-1	AS-2-A	01/24/95	WATER
501103-2	TMW-2-A	01/24/95	WATER
501103-3	TMW-1-A	01/24/95	WATER
501103-4	AS-1-A	01/24/95	WATER
501103-5	AS-2	01/24/95	WATER
501103-6	TMW-2	01/24/95	WATER
501103-7	TMW-1	01/24/95	WATER
501103-8	AS-1	01/24/95	WATER

----- TOTALS -----

MATRIX	# SAMPLES
WATER	8

ATI STANDARD DISPOSAL PRACTICE

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

Analytical Technologies, Inc.

ATI I.D. # 501103

ANALYTICAL SCHEDULE

CLIENT : DELTA ENVIRONMENTAL
PROJECT # : FACIL.#836,TO # 836-94-3
PROJECT NAME : BELLEVUE, WA

ANALYSIS	TECHNIQUE	REFERENCE	LAB
BETX	GC/PID	EPA 8020	R
TOTAL PETROLEUM HYDROCARBONS	GC/FID	WA DOE WTPH-G	R

R = ATI - Renton
SD = ATI - San Diego
PHX = ATI - Phoenix
PTL = ATI - Portland
ANC = ATI - Anchorage
PNR = ATI - Pensacola
FC = ATI - Fort Collins
SUB = Subcontract

Analytical Technologies, Inc.

ATI I.D. # 501103

BETX - GASOLINE
DATA SUMMARY

CLIENT	: DELTA ENVIRONMENTAL	DATE SAMPLED	: N/A
PROJECT #	: FACIL.#836,TO # 836-94-3	DATE RECEIVED	: N/A
PROJECT NAME	: BELLEVUE, WA	DATE EXTRACTED	: N/A
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 01/25/95
SAMPLE MATRIX	: WATER	UNITS	: ug/L
METHOD	: WA DOE WTPH-G/8020(BETX)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	<0.5
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	<0.5
FUEL HYDROCARBONS	<100
HYDROCARBON RANGE	TOLUENE TO DODECANE
HYDROCARBON QUANTITATION USING	GASOLINE

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	97	76 - 120
TRIFLUOROTOLUENE	97	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 501103

BETX - GASOLINE
DATA SUMMARY

CLIENT	: DELTA ENVIRONMENTAL	DATE SAMPLED	: N/A
PROJECT #	: FACIL.#836,TO # 836-94-3	DATE RECEIVED	: N/A
PROJECT NAME	: BELLEVUE, WA	DATE EXTRACTED	: N/A
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 01/26/95
SAMPLE MATRIX	: WATER	UNITS	: ug/L
METHOD	: WA DOE WTPH-G/8020(BETX)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	<0.5
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	<0.5
FUEL HYDROCARBONS	<100
HYDROCARBON RANGE	TOLUENE TO DODECANE
HYDROCARBON QUANTITATION USING	GASOLINE

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	99	76 - 120
TRIFLUOROTOLUENE	98	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 501103

BETX - GASOLINE
DATA SUMMARY

CLIENT	: DELTA ENVIRONMENTAL	DATE SAMPLED	: N/A
PROJECT #	: FACIL.#836,TO # 836-94-3	DATE RECEIVED	: N/A
PROJECT NAME	: BELLEVUE, WA	DATE EXTRACTED	: N/A
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 01/27/95
SAMPLE MATRIX	: WATER	UNITS	: ug/L
METHOD	: WA DOE WTPH-G/8020(BETX)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	<0.5
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	<0.5
FUEL HYDROCARBONS	<100
HYDROCARBON RANGE	TOLUENE TO DODECANE
HYDROCARBON QUANTITATION USING	GASOLINE

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	98	76 - 120
TRIFLUOROTOLUENE	95	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 501103-1

BETX - GASOLINE
DATA SUMMARY

CLIENT	: DELTA ENVIRONMENTAL	DATE SAMPLED	: 01/24/95
PROJECT #	: FACIL.#836,TO # 836-94-3	DATE RECEIVED	: 01/25/95
PROJECT NAME	: BELLEVUE, WA	DATE EXTRACTED	: N/A
CLIENT I.D.	: AS-2-A	DATE ANALYZED	: 01/26/95
SAMPLE MATRIX	: WATER	UNITS	: ug/L
METHOD	: WA DOE WTPH-G/8020(BETX)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	0.7
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	0.7
FUEL HYDROCARBONS	<100
HYDROCARBON RANGE	TOLUENE TO DODECANE
HYDROCARBON QUANTITATION USING	GASOLINE

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	96	76 - 120
TRIFLUOROTOLUENE	95	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 501103-2

BETX - GASOLINE
DATA SUMMARY

CLIENT	: DELTA ENVIRONMENTAL	DATE SAMPLED	: 01/24/95
PROJECT #	: FACIL.#836,TO # 836-94-3	DATE RECEIVED	: 01/25/95
PROJECT NAME	: BELLEVUE, WA	DATE EXTRACTED	: N/A
CLIENT I.D.	: TMW-2-A	DATE ANALYZED	: 01/26/95
SAMPLE MATRIX	: WATER	UNITS	: ug/L
METHOD	: WA DOE WTPH-G/8020(BETX)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	21
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	3.4
FUEL HYDROCARBONS	150
HYDROCARBON RANGE	TOLUENE TO DODECANE
HYDROCARBON QUANTITATION USING	GASOLINE

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	96	76 - 120
TRIFLUOROTOLUENE	94	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 501103-3

BETX - GASOLINE
DATA SUMMARY

CLIENT	: DELTA ENVIRONMENTAL	DATE SAMPLED	: 01/24/95
PROJECT #	: FACIL.#836,TO # 836-94-3	DATE RECEIVED	: 01/25/95
PROJECT NAME	: BELLEVUE, WA	DATE EXTRACTED	: N/A
CLIENT I.D.	: TMW-1-A	DATE ANALYZED	: 01/26/95
SAMPLE MATRIX	: WATER	UNITS	: ug/L
METHOD	: WA DOE WTPH-G/8020(BETX)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	6.6
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	1.6
FUEL HYDROCARBONS	280
HYDROCARBON RANGE	TOLUENE TO DODECANE
HYDROCARBON QUANTITATION USING	GASOLINE

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	96	76 - 120
TRIFLUOROTOLUENE	81	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 501103-4

BETX - GASOLINE
DATA SUMMARY

CLIENT	: DELTA ENVIRONMENTAL	DATE SAMPLED	: 01/24/95
PROJECT #	: FACIL.#836,TO # 836-94-3	DATE RECEIVED	: 01/25/95
PROJECT NAME	: BELLEVUE, WA	DATE EXTRACTED	: N/A
CLIENT I.D.	: AS-1-A	DATE ANALYZED	: 01/26/95
SAMPLE MATRIX	: WATER	UNITS	: ug/L
METHOD	: WA DOE WTPH-G/8020(BETX)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	1.7
ETHYLBENZENE	0.6
TOLUENE	<0.5
TOTAL XYLENES	1.0
FUEL HYDROCARBONS	<100
HYDROCARBON RANGE	TOLUENE TO DODECANE
HYDROCARBON QUANTITATION USING	GASOLINE

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	95	76 - 120
TRIFLUOROTOLUENE	95	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 501103-5

BETX - GASOLINE
DATA SUMMARY

CLIENT	: DELTA ENVIRONMENTAL	DATE SAMPLED	: 01/24/95
PROJECT #	: FACIL.#836,TO # 836-94-3	DATE RECEIVED	: 01/25/95
PROJECT NAME	: BELLEVUE, WA	DATE EXTRACTED	: N/A
CLIENT I.D.	: AS-2	DATE ANALYZED	: 01/26/95
SAMPLE MATRIX	: WATER	UNITS	: ug/L
METHOD	: WA DOE WTPH-G/8020(BETX)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	<0.5
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	0.7
FUEL HYDROCARBONS	<100
HYDROCARBON RANGE	TOLUENE TO DODECANE
HYDROCARBON QUANTITATION USING	GASOLINE

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	98	76 - 120
TRIFLUOROTOLUENE	87	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 501103-6

BETX - GASOLINE
DATA SUMMARY

CLIENT	: DELTA ENVIRONMENTAL	DATE SAMPLED	: 01/24/95
PROJECT #	: FACIL.#836,TO # 836-94-3	DATE RECEIVED	: 01/25/95
PROJECT NAME	: BELLEVUE, WA	DATE EXTRACTED	: N/A
CLIENT I.D.	: TMW-2	DATE ANALYZED	: 01/26/95
SAMPLE MATRIX	: WATER	UNITS	: ug/L
METHOD	: WA DOE WTPH-G/8020(BETX)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	12
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	2.7
FUEL HYDROCARBONS	470
HYDROCARBON RANGE	TOLUENE TO DODECANE
HYDROCARBON QUANTITATION USING	GASOLINE

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	99	76 - 120
TRIFLUOROTOLUENE	96	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 501103-7

BETX - GASOLINE
DATA SUMMARY

CLIENT	: DELTA ENVIRONMENTAL	DATE SAMPLED	: 01/24/95
PROJECT #	: FACIL.#836,TO # 836-94-3	DATE RECEIVED	: 01/25/95
PROJECT NAME	: BELLEVUE, WA	DATE EXTRACTED	: N/A
CLIENT I.D.	: TMW-1	DATE ANALYZED	: 01/25/95
SAMPLE MATRIX	: WATER	UNITS	: ug/L
METHOD	: WA DOE WTPH-G/8020(BETX)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	0.8
ETHYLBENZENE	<0.5
TOLUENE	<0.5
TOTAL XYLENES	1.0
FUEL HYDROCARBONS	160
HYDROCARBON RANGE	TOLUENE TO DODECANE
HYDROCARBON QUANTITATION USING	GASOLINE

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	96	76 - 120
TRIFLUOROTOLUENE	95	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 501103-8

BETX - GASOLINE
DATA SUMMARY

CLIENT	: DELTA ENVIRONMENTAL	DATE SAMPLED	: 01/24/95
PROJECT #	: FACIL.#836,TO # 836-94-3	DATE RECEIVED	: 01/25/95
PROJECT NAME	: BELLEVUE, WA	DATE EXTRACTED	: N/A
CLIENT I.D.	: AS-1	DATE ANALYZED	: 01/25/95
SAMPLE MATRIX	: WATER	UNITS	: ug/L
METHOD	: WA DOE WTPH-G/8020(BETX)	DILUTION FACTOR	: 1

COMPOUNDS	RESULTS
BENZENE	46
ETHYLBENZENE	11
TOLUENE	1.3
TOTAL XYLENES	18
FUEL HYDROCARBONS	1500
HYDROCARBON RANGE	TOLUENE TO DODECANE
HYDROCARBON QUANTITATION USING	GASOLINE

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	95	76 - 120
TRIFLUOROTOLUENE	99	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 501103

BETX - GASOLINE
QUALITY CONTROL DATA

CLIENT	: DELTA ENVIRONMENTAL	SAMPLE I.D. #	: BLANK
PROJECT #	: FACIL.#836,TO # 836-94-3	DATE EXTRACTED	: N/A
PROJECT NAME	: BELLEVUE, WA	DATE ANALYZED	: 01/25/95
SAMPLE MATRIX	: WATER	UNITS	: ug/L
METHOD	: WA DOE WTPH-G/8020(BETX)		

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
BENZENE	<0.500	20.0	20.1	101	N/A	N/A	N/A
TOLUENE	<0.500	20.0	20.5	102	N/A	N/A	N/A
TOTAL XYLENES	<0.500	40.0	40.5	101	N/A	N/A	N/A
GASOLINE	<100	1000	960	96	N/A	N/A	N/A

CONTROL LIMITS	% REC.	RPD
BENZENE	89 - 110	10
TOLUENE	89 - 113	10
TOTAL XYLENES	89 - 111	10
GASOLINE	78 - 116	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
BROMOFLUOROBENZENE	97	N/A	76 - 120
TRIFLUOROTOLUENE	97	N/A	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 501103

BETX - GASOLINE
QUALITY CONTROL DATA

CLIENT : DELTA ENVIRONMENTAL
PROJECT # : FACIL.#836,TO # 836-94-3
PROJECT NAME : BELLEVUE, WA
SAMPLE MATRIX : WATER
METHOD : WA DOE WTPH-G/8020(BETX)

SAMPLE I.D. # : BLANK
DATE EXTRACTED : N/A
DATE ANALYZED : 01/26/95
UNITS : ug/L

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
BENZENE	<0.500	20.0	20.1	101	N/A	N/A	N/A
TOLUENE	<0.500	20.0	20.5	102	N/A	N/A	N/A
TOTAL XYLENES	<0.500	40.0	40.5	101	N/A	N/A	N/A
GASOLINE	<100	1000	953	95	N/A	N/A	N/A

CONTROL LIMITS	% REC.	RPD
BENZENE	89 - 110	10
TOLUENE	89 - 113	10
TOTAL XYLENES	89 - 111	10
GASOLINE	78 - 116	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
BROMOFLUOROBENZENE	98	N/A	76 - 120
TRIFLUOROTOLUENE	95	N/A	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 501103

BETX - GASOLINE
QUALITY CONTROL DATA

CLIENT	: DELTA ENVIRONMENTAL	SAMPLE I.D. #	: BLANK
PROJECT #	: FACIL.#836,TO # 836-94-3	DATE EXTRACTED	: N/A
PROJECT NAME	: BELLEVUE, WA	DATE ANALYZED	: 01/27/95
SAMPLE MATRIX	: WATER	UNITS	: ug/L
METHOD	: WA DOE WTPH-G/8020(BETX)		

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
BENZENE	<0.500	20.0	20.3	102	N/A	N/A	N/A
TOLUENE	<0.500	20.0	20.6	103	N/A	N/A	N/A
TOTAL XYLENES	<0.500	40.0	41.1	103	N/A	N/A	N/A
GASOLINE	<100	1000	999	100	N/A	N/A	N/A

CONTROL LIMITS	% REC.	RPD
BENZENE	89 - 110	10
TOLUENE	89 - 113	10
TOTAL XYLENES	89 - 111	10
GASOLINE	78 - 116	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
BROMOFLUOROBENZENE	98	N/A	76 - 120
TRIFLUOROTOLUENE	100	N/A	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 501103

BETX - GASOLINE
QUALITY CONTROL DATA

CLIENT	: DELTA ENVIRONMENTAL	SAMPLE I.D. #	: 501094-8
PROJECT #	: FACIL.#836,TO # 836-94-3	DATE EXTRACTED	: N/A
PROJECT NAME	: BELLEVUE, WA	DATE ANALYZED	: 01/25/95
SAMPLE MATRIX	: WATER	UNITS	: ug/L
METHOD	: WA DOE WTPH-G/8020(BETX)		

COMPOUND	SAMPLE RESULT	SAMPLE DUP. RESULT	RPD	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
GASOLINE	<100	<100	NC	N/A	N/A	N/A	N/A	N/A	N/A

CONTROL LIMITS	% REC.	RPD
GASOLINE	N/A	20

SURROGATE RECOVERIES	SAMPLE	SAMPLE DUP.	LIMITS
TRIFLUOROTOLUENE	96	98	50 - 150

NC = Not calculable.

Analytical Technologies, Inc.

ATI I.D. # 501103

BETX - GASOLINE
QUALITY CONTROL DATA

CLIENT	: DELTA ENVIRONMENTAL	SAMPLE I.D. #	: 501094-4
PROJECT #	: FACIL.#836,TO # 836-94-3	DATE EXTRACTED	: N/A
PROJECT NAME	: BELLEVUE, WA	DATE ANALYZED	: 01/25/95
SAMPLE MATRIX	: WATER	UNITS	: ug/L
METHOD	: WA DOE WTPH-G/8020(BETX)		

COMPOUND	SAMPLE RESULT	SAMPLE DUP. RESULT	RPD	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<0.500	N/A	N/A	20.0	20.1	101	20.2	101	0
TOLUENE	<0.500	N/A	N/A	20.0	20.1	101	20.3	102	1
TOTAL XYLENES	<0.500	N/A	N/A	40.0	40.0	100	40.3	101	1
GASOLINE	<100	<100	NC	1000	945	95	932	93	1

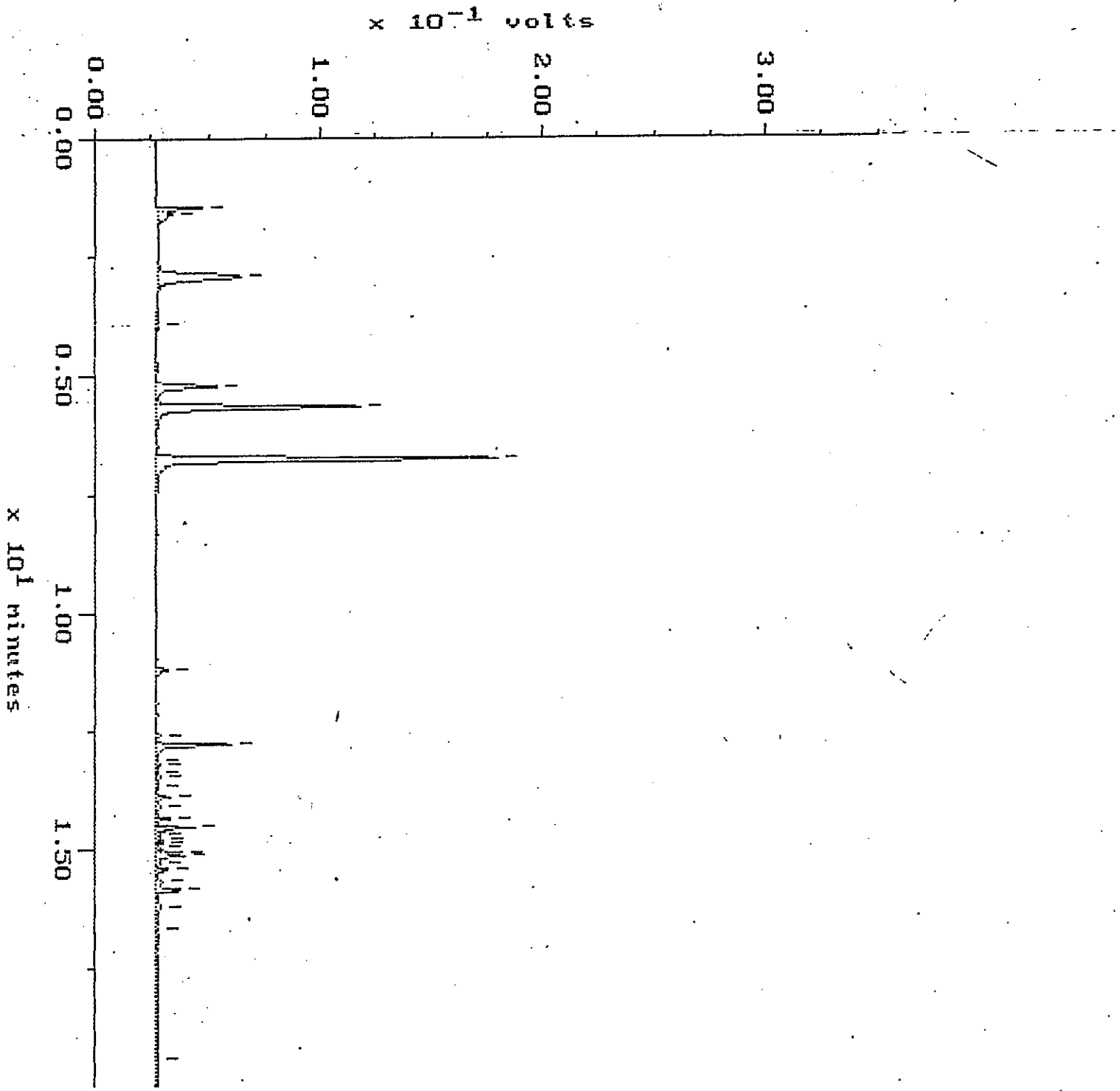
CONTROL LIMITS	% REC.	RPD
BENZENE	86 - 113	10
TOLUENE	87 - 114	10
TOTAL XYLENES	85 - 113	10
GASOLINE	80 - 113	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
BROMOFLUOROBENZENE	98	98	76 - 120
TRIFLUOROTOLUENE	96	96	50 - 150

NC = Not calculable.

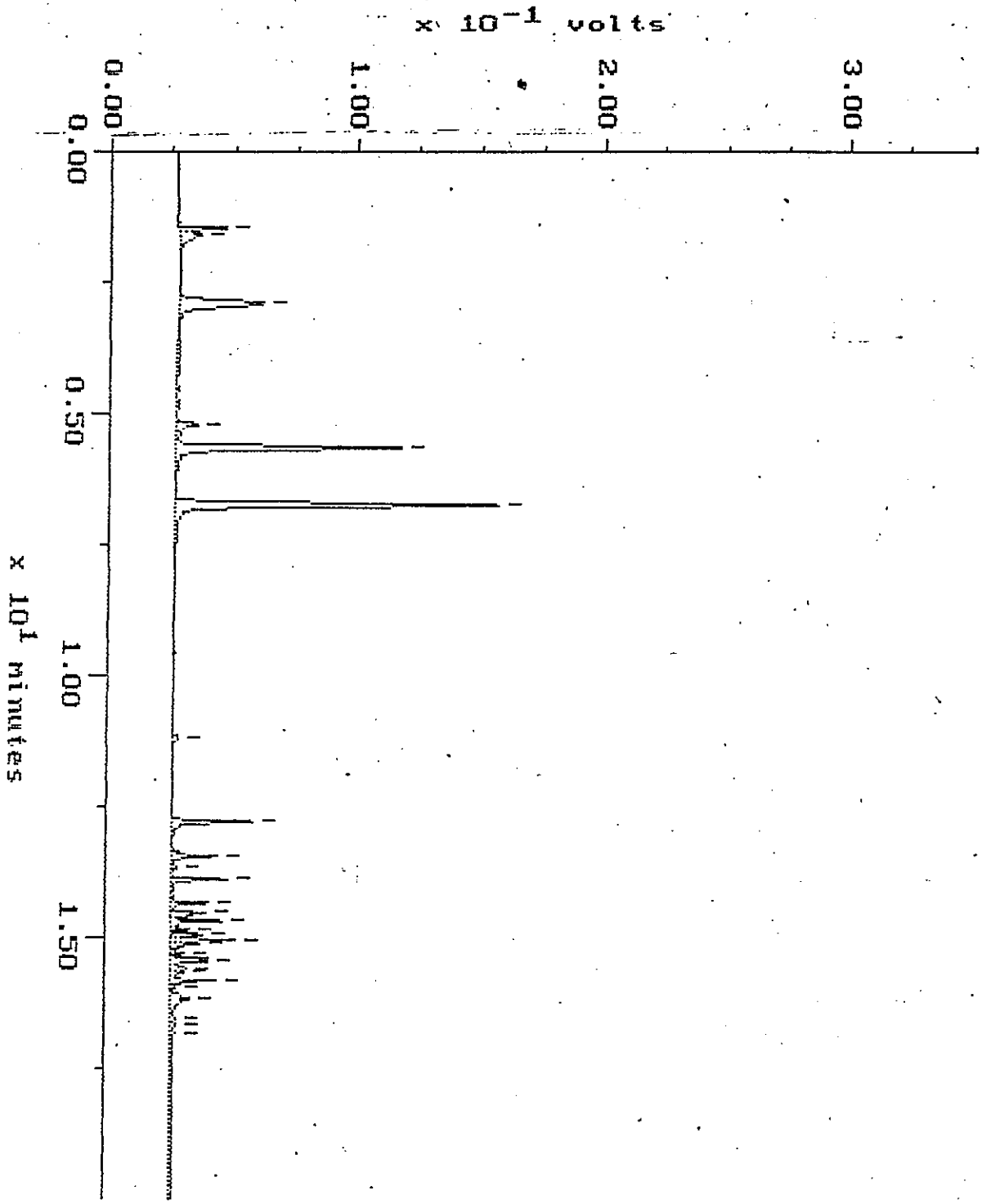
WA DOE WTPH-G

Sample: 501103-2 Channel: FID Filename: R1259P32
Acquired: 26-JAN-95 2:34 Method: X:\MAXDATA\PICARD\012595PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



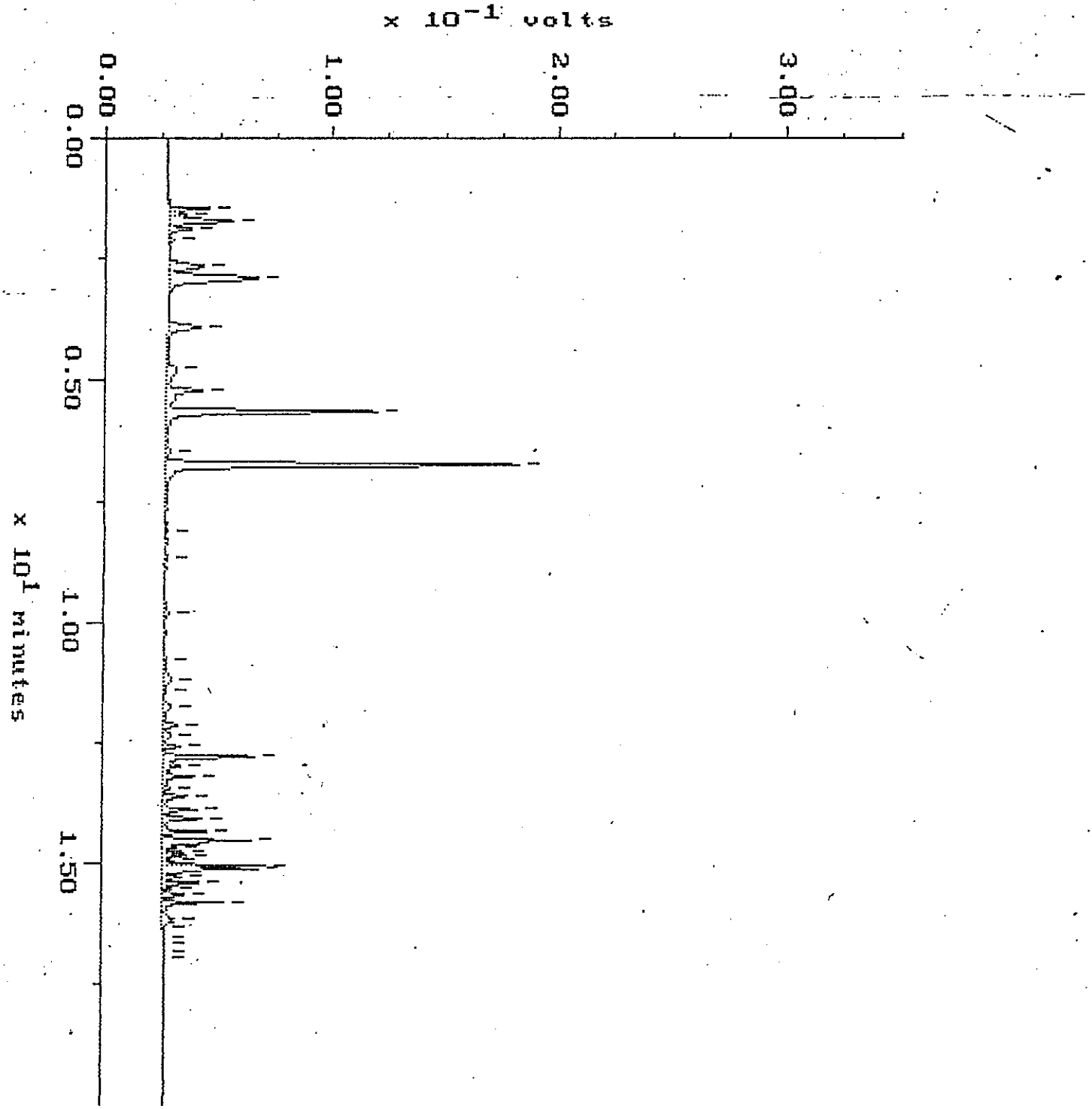
WA DO WTPH-G

Sample: 501103-3 Channel: FID Filename: R1259P31
Acquired: 26-JAN-95 2:06 Method: X:\MAXDATA\PICARD\012595PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



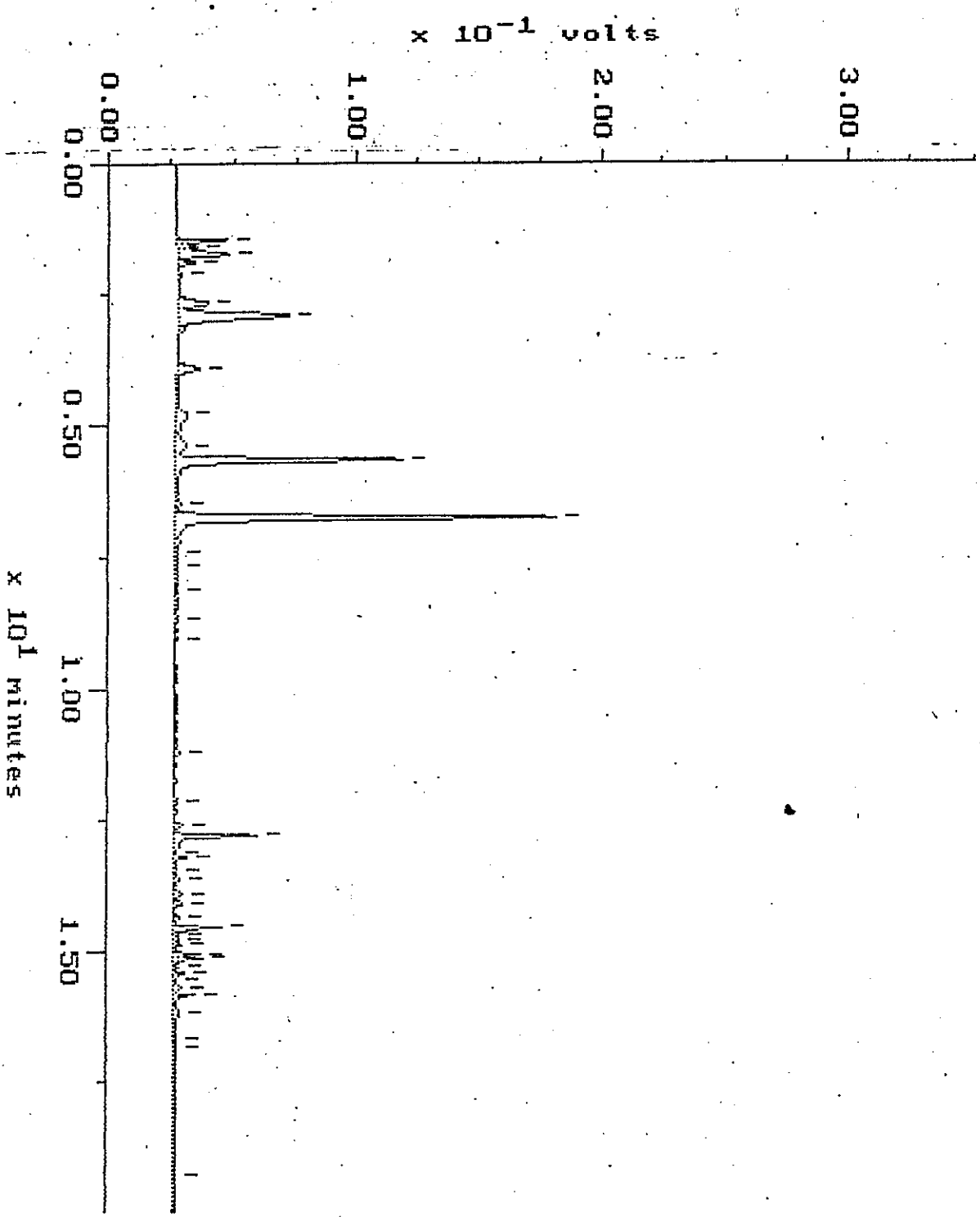
WA DO WTPH-G

Sample: 501103-6 Channel: FID Filename: R1259P27
Acquired: 26-JAN-95 0:14 Method: X:\MAXDATA\PICARD\012595PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



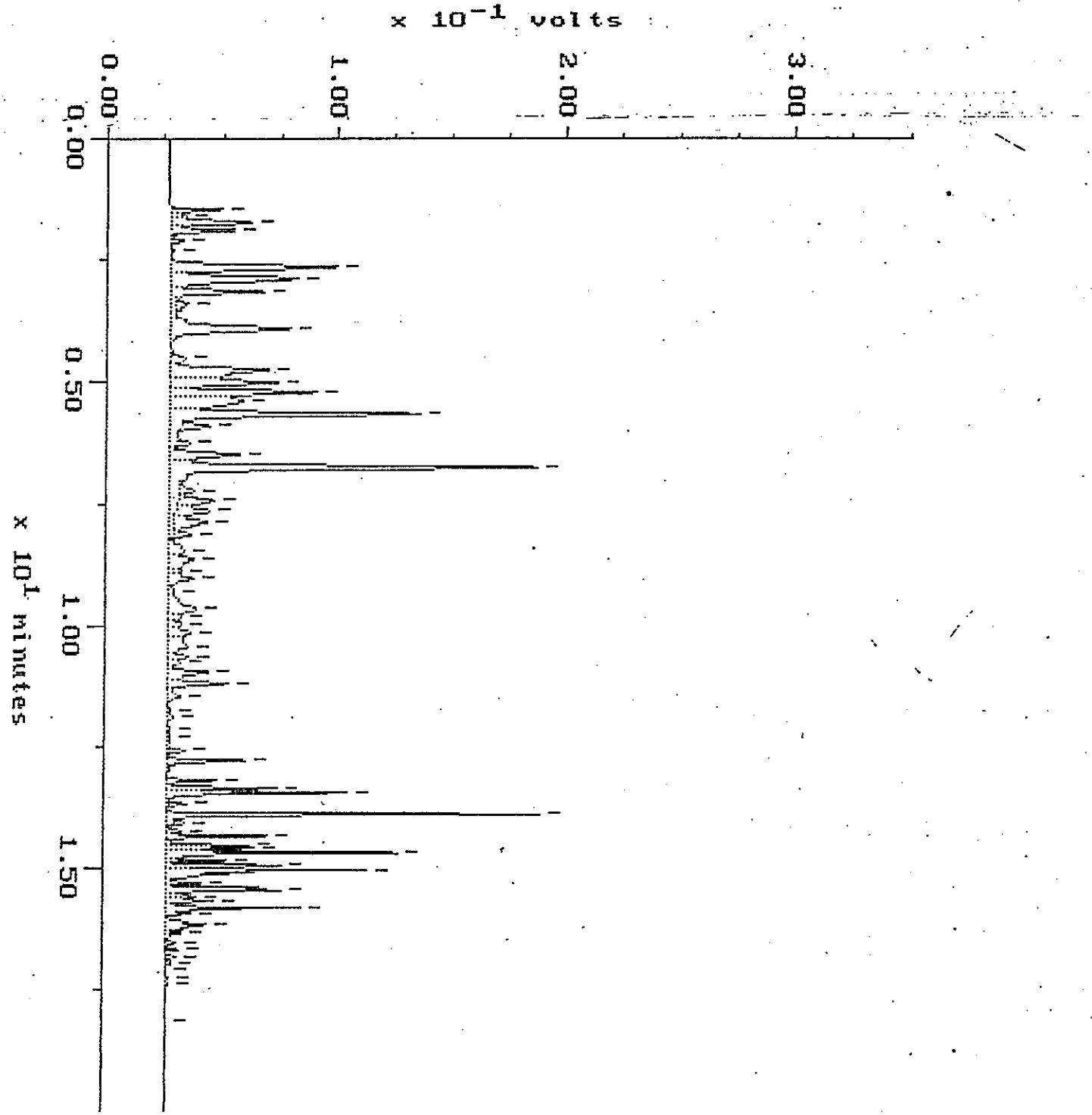
WA DO WTPH-G

Sample: 501103-7 Channel: FID Filename: R1259P26
Acquired: 25-JAN-95 23:45 Method: X:\MAXDATA\PICARD\012595PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



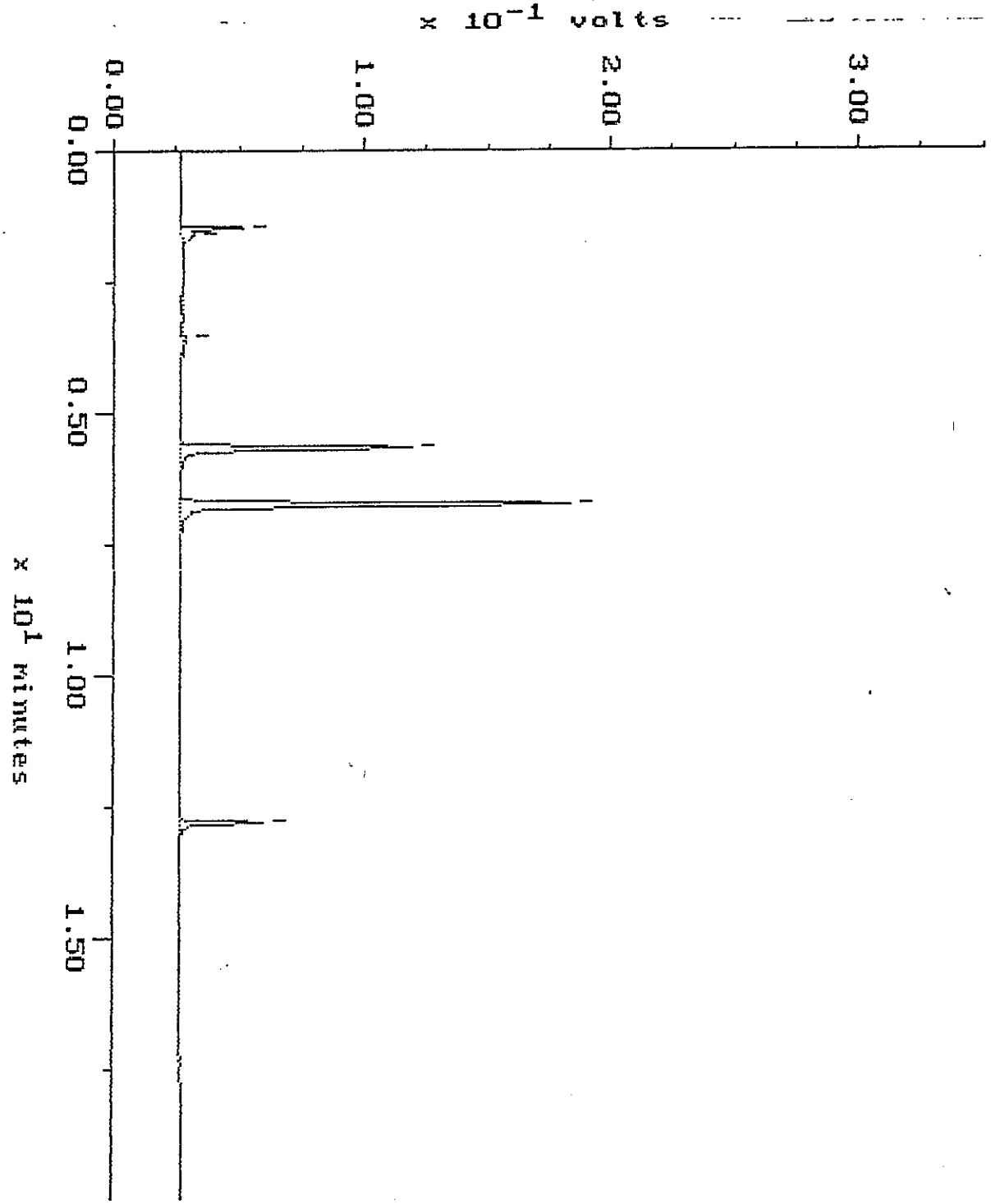
WA DOE WTPH-G

Sample: 501103-8 Channel: FID Filename: R1259P23
Acquired: 25-JAN-95 22:21 Method: X:\MAXDATA\PICARD\012595PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



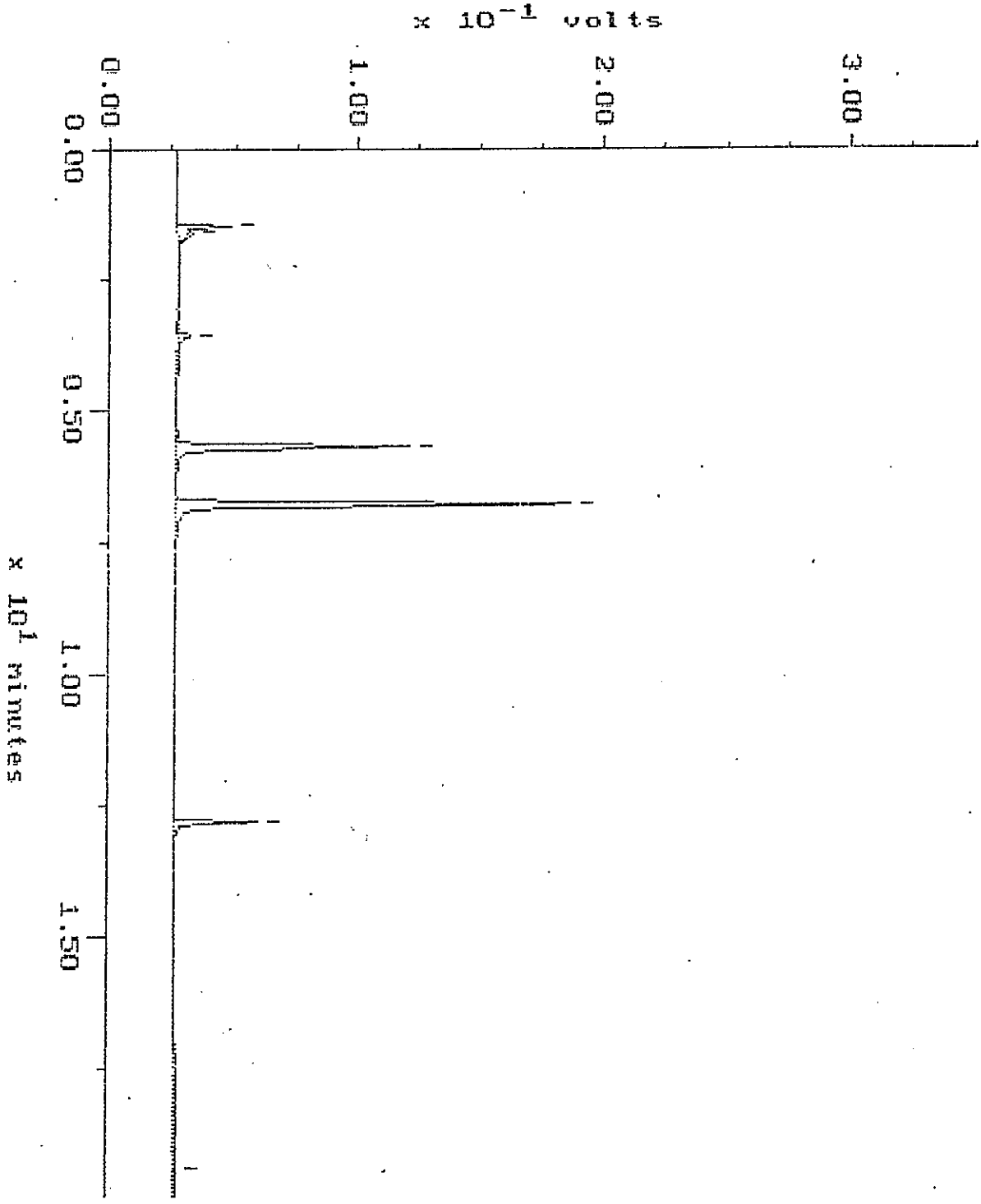
WA DOE WTPH-G Blank

Sample: WRB 1-25 Channel: FID Filename: R1259P03
Acquired: 25-JAN-95 11:07 Method: X:\MAXDATA\PICARD\012595PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



Blank WA DOE WTPH-G

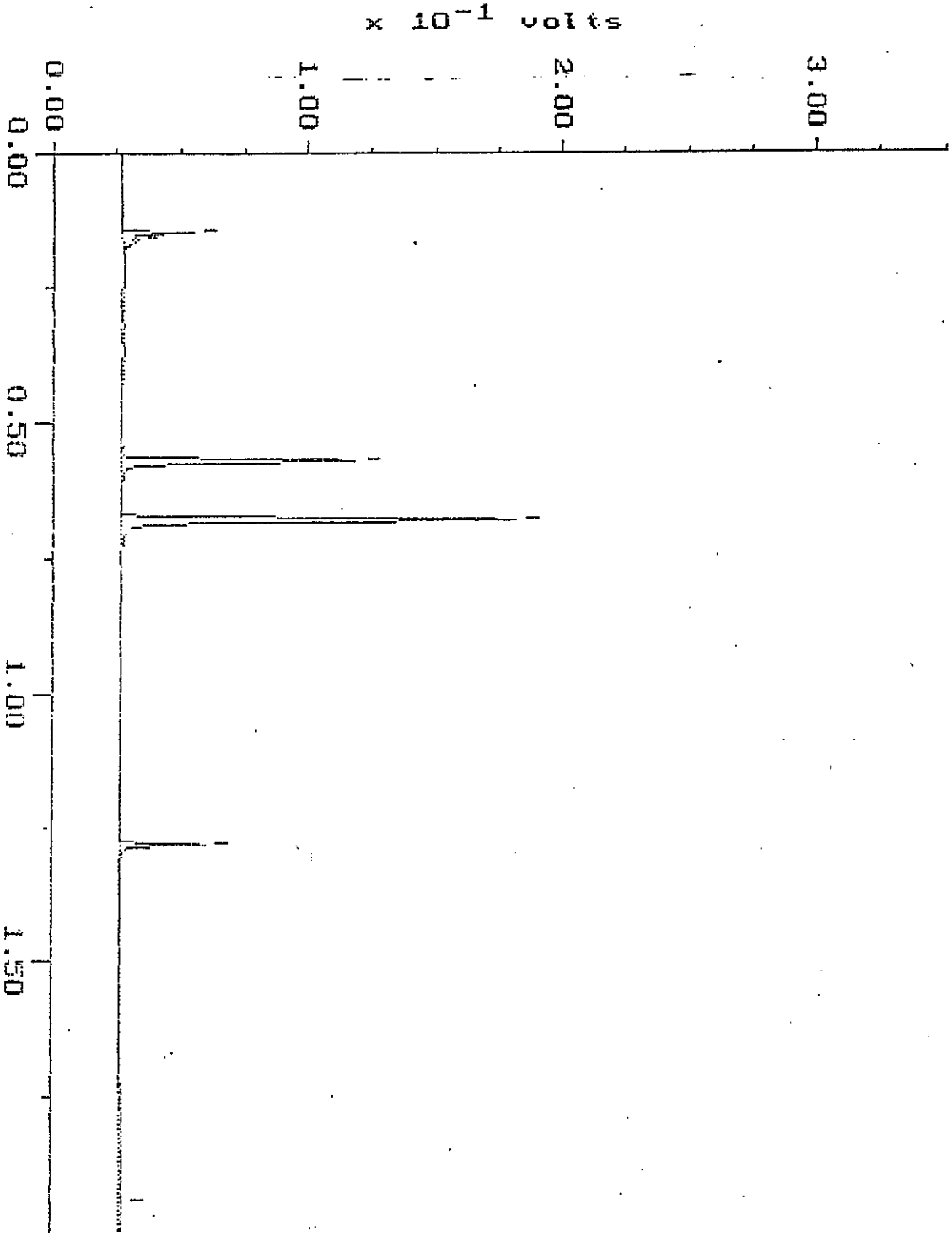
Sample: WRB 1-26 Channel: FID Filename: R1269P03
Acquired: 26-JAN-95 10:01 Method: X:\MAXDATA\PICARD\012695PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



Blank

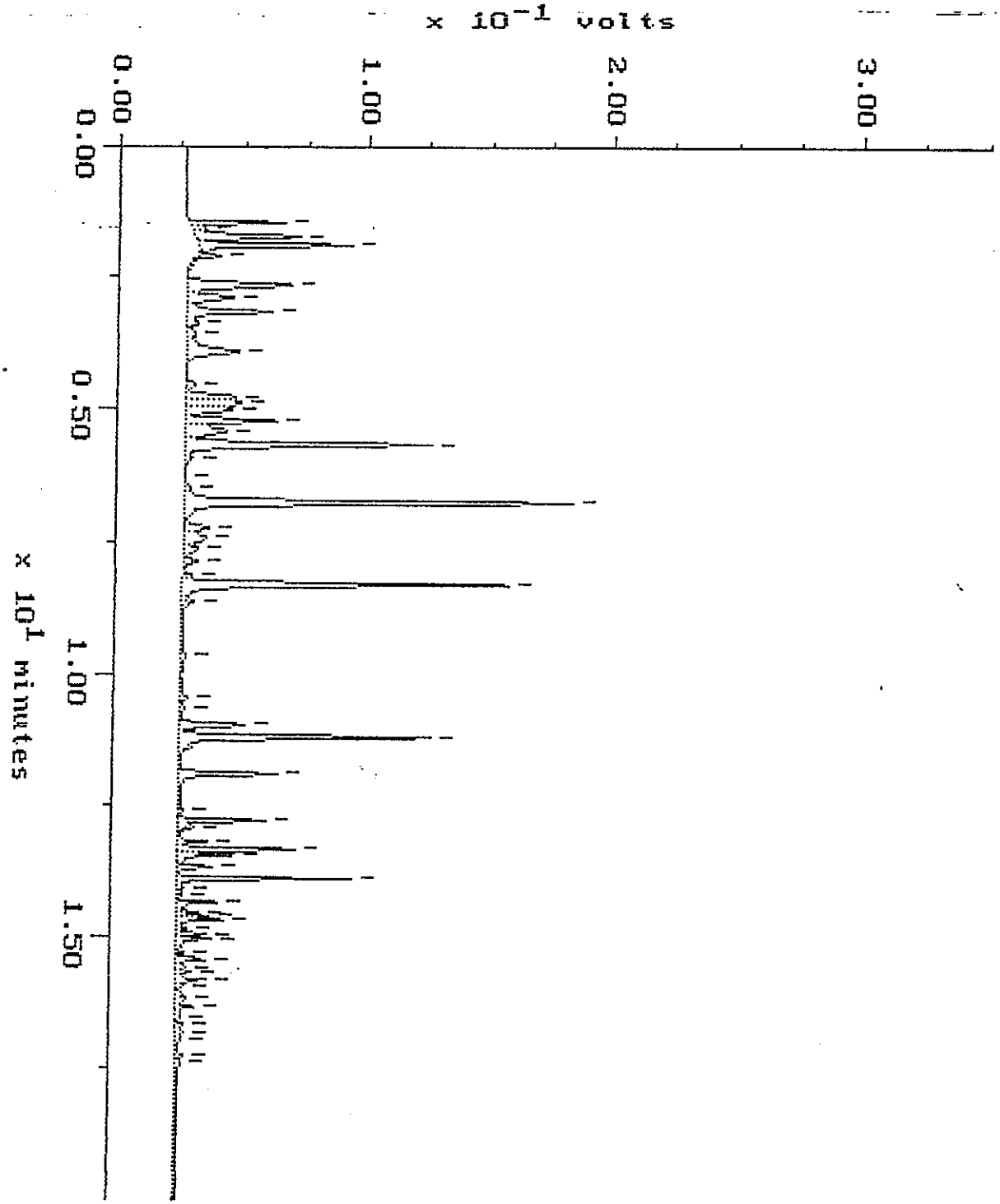
WA DOT WTPH-G

Sample: WRB 1-27 Channel: FID Filename: R1279P01
Acquired: 27-JAN-95 7:17 Method: X:\MAXDATA\PICARD\012795PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



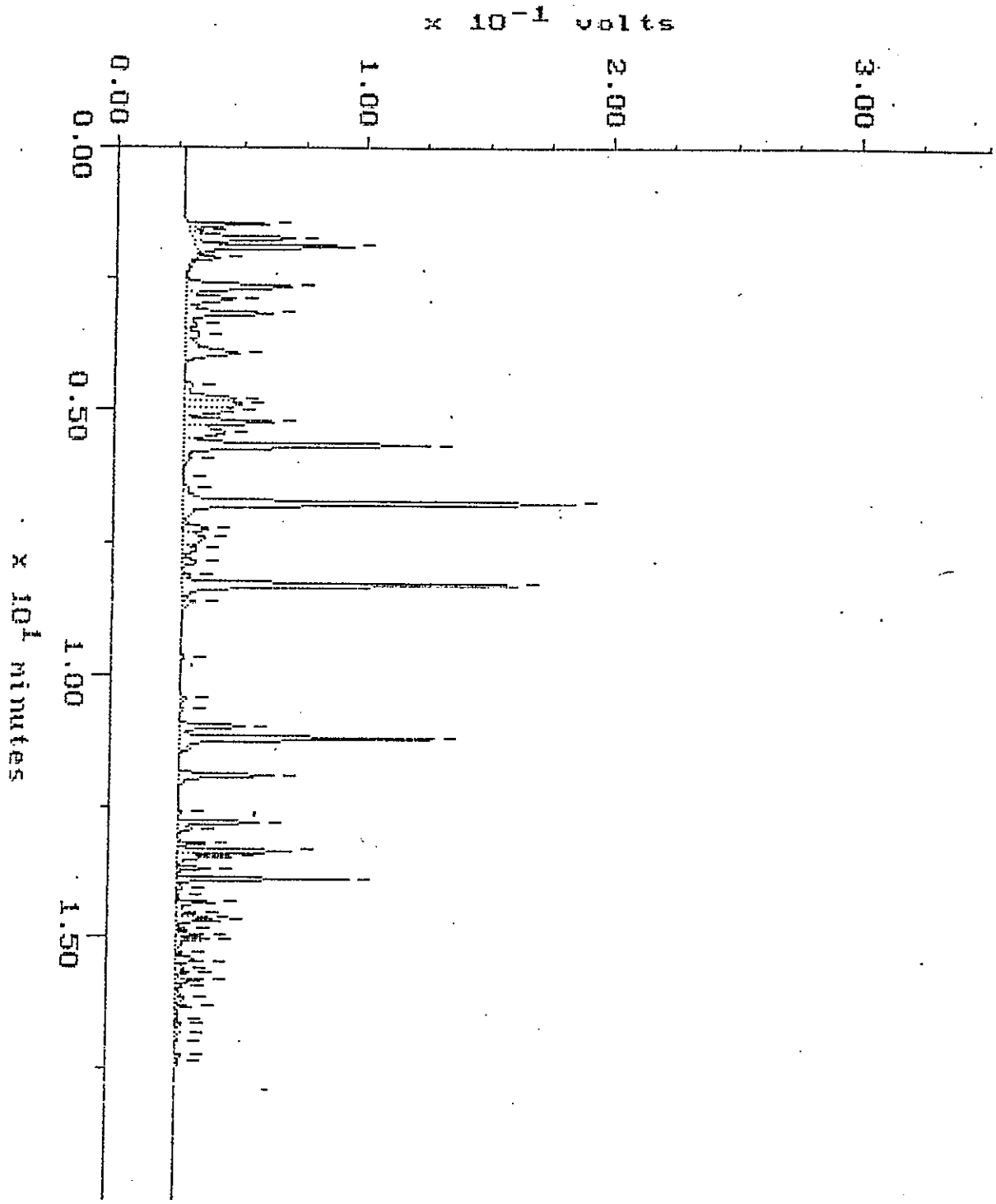
CONTINUING CALIBRATION

Sample: STD-C 6 Channel: FID Filename: R1259P01
Acquired: 25-JAN-95 10:08 Method: X:\MAXDATA\PICARD\012595PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



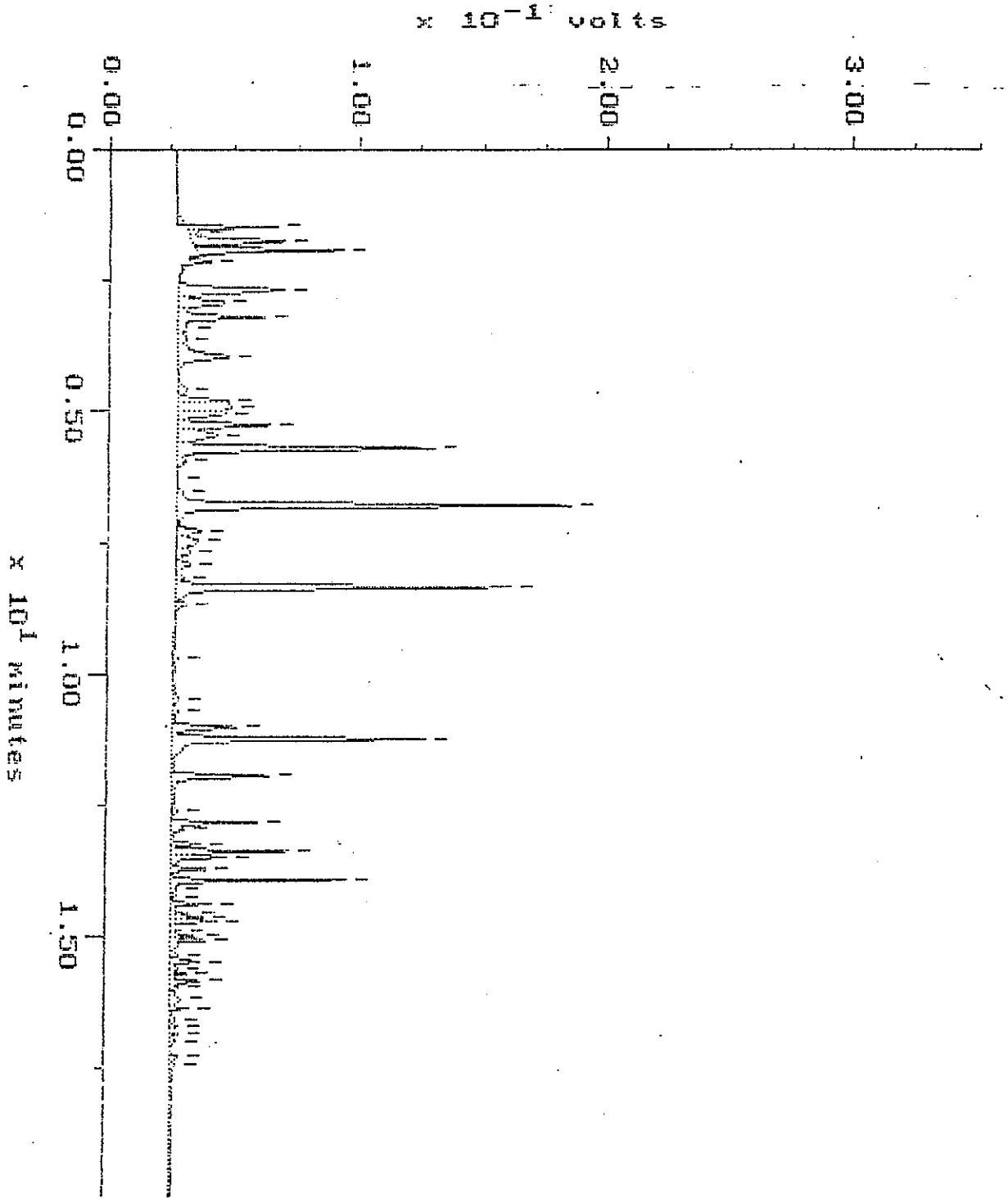
CONTINUING CALIBRATION

Sample: STD-C G Channel: FID Filename: R1269P01
Acquired: 26-JAN-95 9:32 Method: X:\MAXDATA\PICARD\013695PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



CONTINUING CALIBRATION

Sample: STD-C 6 **Channel:** FID **Filename:** R1269P45
Acquired: 27-JAN-95 6:13 **Method:** X:\MAXDATA\PICARD\012695PC **Operator:** ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



ARCO Products Company
Division of AtlanticRichfieldCompany

936-94-3 US V25/45
Task Order No. 501103

Chain of Custody

ARCO Facility no. 00836	City (Facility) Bellevue	Project manager (Consultant) Andy Smith	Laboratory name ATI
ARCO engineer Chuck Hutchens	Telephone no. (ARCO)	Telephone no. (Consultant) 649-9663	Fax no. (Consultant) 649-0409	Contract number 836-94-~~950-94-5B~~
Consultant name Delta Environmental Consultants, Inc.	Address (Consultant) 3150 Richards Road Suite 100 Bellevue, Wa 98005		Method of shipment

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas☒ Diesel☐	Oil and Grease 413.1☐ 413.2☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals☐ Semi VOA☐ VOA☐	CAM Metals EPA 6010/7000 TTLC☐ STLC☐	Lead Org./DHS☐ Lead EPA 7420/7421☐		
AS2-A	1			X		X	X	1/24/95	1911	X		X										
TMW-2-A	2			X		X	X	1/24/95	1918	X		X										
TMW-1-A	3			X		X	X	1/24/95	1923	X		X										
AS-1-A	4			X		X	X	1/24/95	1929	X		X										

Special detection Limit/reporting: /

Special QA/QC

Remarks

Lab number

Turnaround time
- Priority Rush 1 Business Day ☐
- Rush 2 Business Days ☐
- Expedited 5 Business Days ☐
- Standard 10 Business Days ☒

Condition of sample:

Temperature received:

Relinquished by sampler	Date 1/25/95 Time 1257	Received by
Relinquished by	Date Time	Received by
Relinquished by	Date Time	Received by laboratory Brian Sunden — Date 1-25-95 — Time 1251

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant
APPC-3292 (2-91)

ARCO Products Company
Division of AtlanticRichfieldCompany

836 94-3 1/25/95 Task Order No. 501103

Chain of Custody

ARCO Facility no. #836	City (Facility) Bellevue	Project manager (Consultant) Andy Smith	Laboratory name ATI
ARCO engineer Chuck Hutchens	Telephone no. (ARCO)	Telephone no. (Consultant) 649-9663	Fax no. (Consultant) 649-0409	Contract number 836-94-3
Consultant name Delta Environmental Consultants, Inc.	Address (Consultant) 3150 Richards Rd Suite 100 Bellevue, Wa 98005		Method of shipment

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☒ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ VOA ☐ Semi ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
AS-2	5			X		X	X	1/24/95	1222	X		X										
TMW-2	6			X		X	X	1/24/95	1251	X		X										
TMW-1	7			X		X	X	1/24/95	1302	X		X										
AS-1	8			X		X	X	1/24/95	1315	X		X										
	MW 1/25/95																					

Special detection Limit/reporting

Special QA/QC

Remarks

Lab number

Turnaround time

- Priority Rush 1 Business Day ☐
- Rush 2 Business Days ☐
- Expedited 5 Business Days ☐
- Standard 10 Business Days ☒

Condition of sample:

Temperature received:

	Date	Time			
Relinquished by sampler	1/25/95	1251	Received by	1-25-95	
Relinquished by			Received by		
Relinquished by			Received by laboratory	Date 1-25-95	Time 1251

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant
APPC-3292 (2-91)

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

ATI I.D. # 412178

January 17, 1995

Delta Environmental
3150 Richards Rd.
Suite 100
Bellevue WA 98005

Attention : Andy Smith

Project Number : Facil.#836,Task Order # 836-94-3

Project Name : Bellevue, WA

Dear Mr. Smith:

On December 22, 1994, Analytical Technologies, Inc. (ATI), received 27 samples for analysis. The samples were analyzed with EPA methodology or equivalent methods as specified in the attached analytical schedule. The results, sample cross reference, and quality control data are enclosed.

Sincerely,

Elaine M. Walker

for Diana Spence
Project Manager

DS/hal/ff

Enclosure

Analytical Technologies, Inc.

ATI I.D. # 412178

SAMPLE CROSS REFERENCE SHEET

CLIENT : DELTA ENVIRONMENTAL
PROJECT # : FACIL.#836,TASK ORDER # 836-94-3
PROJECT NAME : BELLEVUE, WA

ATI #	CLIENT DESCRIPTION	DATE SAMPLED	MATRIX
412178-1	AS-1-5	12/21/94	SOIL
412178-2	AS-1-10	12/21/94	SOIL
412178-3	AS-1-12	12/21/94	SOIL
412178-4	AS-1-15	12/21/94	SOIL
412178-5	AS-1-20	12/21/94	SOIL
412178-6	AS-1-25	12/21/94	SOIL
412178-7	AS-2-5	12/20/94	SOIL
412178-8	AS-2-7	12/20/94	SOIL
412178-9	AS-2-12	12/20/94	SOIL
412178-10	AS-2-15	12/20/94	SOIL
412178-11	AS-2-17	12/20/94	SOIL
412178-12	AS-2-19	12/20/94	SOIL
412178-13	AS-2-22	12/20/94	SOIL
412178-14	AS-2-24	12/20/94	SOIL
412178-15	TMW-1-5	12/20/94	SOIL
412178-16	TMW-1-10	12/20/94	SOIL
412178-17	TMW-1-14	12/20/94	SOIL
412178-18	TMW-2-5	12/20/94	SOIL
412178-19	TMW-2-10	12/20/94	SOIL
412178-20	TMW-2-14	12/20/94	SOIL
412178-21	MW-7-6	12/20/94	SOIL
412178-22	MW-7-7	12/20/94	SOIL
412178-23	MW-7-10	12/20/94	SOIL
412178-24	MW-7-15	12/20/94	SOIL
412178-25	MW-7-19	12/20/94	SOIL
412178-26	SP-1	12/21/94	SOIL
412178-27	SP-2	12/21/94	SOIL

----- TOTALS -----

MATRIX	# SAMPLES
SOIL	27

ATI STANDARD DISPOSAL PRACTICE

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

Analytical Technologies, Inc.

ATI I.D. # 412178

ANALYTICAL SCHEDULE

CLIENT : DELTA ENVIRONMENTAL
PROJECT # : FACIL.#836,TASK ORDER # 836-94-3
PROJECT NAME : BELLEVUE, WA

ANALYSIS	TECHNIQUE	REFERENCE	LAB
POLYCHLORINATED BIPHENYLS (PCBs)	GC/ECD	EPA 8080	R
BETX	GC/PID	EPA 8020	R
TOTAL PETROLEUM HYDROCARBONS	GC/FID	WA DOE WTPH-G	R
HYDROCARBON IDENTIFICATION	GC/FID	WA DOE WTPH-HCID	R
TOTAL PETROLEUM HYDROCARBONS	GC/FID	WA DOE WTPH-D	R
PETROLEUM HYDROCARBONS	IR	WA DOE WTPH-418.1 MODIFIED	R
ARSENIC	AA/GF	EPA 7060	R
BARIUM	ICAP	EPA 6010	R
CADMIUM	ICAP	EPA 6010	R
CHROMIUM	ICAP	EPA 6010	R
LEAD	ICAP	EPA 6010	R
MERCURY	AA/COLD VAPOR	EPA 7471	R
SELENIUM	AA/GF	EPA 7740	R
SILVER	ICAP	EPA 6010	R
MOISTURE	GRAVIMETRIC	CLP SOW ILM01.0	R

R = ATI - Renton
SD = ATI - San Diego
PHX = ATI - Phoenix
PTL = ATI - Portland
ANC = ATI - Anchorage
PNR = ATI - Pensacola
FC = ATI - Fort Collins
SUB = Subcontract

Analytical Technologies, Inc.

ATI I.D. # 412178

PCB ANALYSIS
DATA SUMMARY

CLIENT	: DELTA ENVIRONMENTAL	DATE SAMPLED	: N/A
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE RECEIVED	: N/A
PROJECT NAME	: BELLEVUE, WA	DATE EXTRACTED	: 01/10/95
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 01/12/95
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8080	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
PCB 1016	<0.033
PCB 1221	<0.033
PCB 1232	<0.033
PCB 1242	<0.033
PCB 1248	<0.033
PCB 1254	<0.033
PCB 1260	<0.033

SURROGATE PERCENT RECOVERY		LIMITS
DECACHLOROBIPHENYL	98	52 - 125
DIBUTYLCHLORENDATE	79	24 - 137

Analytical Technologies, Inc.

ATI I.D. # 412178-26

PCB ANALYSIS
DATA SUMMARY

CLIENT	: DELTA ENVIRONMENTAL	DATE SAMPLED	: 12/21/94
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE RECEIVED	: 12/22/94
PROJECT NAME	: BELLEVUE, WA	DATE EXTRACTED	: 01/10/95
CLIENT I.D.	: SP-1	DATE ANALYZED	: 01/12/95
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8080	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
PCB 1016	<0.037
PCB 1221	<0.037
PCB 1232	<0.037
PCB 1242	<0.037
PCB 1248	<0.037
PCB 1254	<0.037
PCB 1260	<0.037

SURROGATE PERCENT RECOVERY		LIMITS
DECACHLOROBIPHENYL	102	52 - 125
DIBUTYLCHLORENDATE	95	24 - 137

Analytical Technologies, Inc.

ATI I.D. # 412178

PCB ANALYSIS
QUALITY CONTROL DATA

CLIENT	: DELTA ENVIRONMENTAL	SAMPLE I.D. #	: BLANK
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE EXTRACTED	: 01/10/95
PROJECT NAME	: BELLEVUE, WA	DATE ANALYZED	: 01/12/95
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8080		

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
PCB 1260	<0.0333	0.333	0.345	104	N/A	N/A	N/A

CONTROL LIMITS	% REC.	RPD
PCB 1260	74 - 120	31

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
DECACHLOROBIPHENYL	100	N/A	52 - 125
DIBUTYLCHLORENDATE	85	N/A	24 - 137

Analytical Technologies, Inc.

ATI I.D. # 412178

PCB ANALYSIS
QUALITY CONTROL DATA

CLIENT	: DELTA ENVIRONMENTAL	SAMPLE I.D. #	: 501024-1
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE EXTRACTED	: 01/10/95
PROJECT NAME	: BELLEVUE, WA	DATE ANALYZED	: 01/12/95
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
EPA METHOD	: 8080		

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
PCB 1260	<0.0333	0.333	0.374	112	0.372	112	1

CONTROL LIMITS	% REC.	RPD
PCB 1260	55 - 131	31

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
DECACHLOROBIPHENYL	104	106	52 - 125
DIBUTYLCHLORENDATE	107	97	24 - 137

Analytical Technologies, Inc.

ATI I.D. # 412178

BETX - GASOLINE
DATA SUMMARY

CLIENT	: DELTA ENVIRONMENTAL	DATE SAMPLED	: N/A
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE RECEIVED	: N/A
PROJECT NAME	: BELLEVUE, WA	DATE EXTRACTED	: 12/27/94
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 12/28/94
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
METHOD	: WA DOE WTPH-G/8020(BETX)	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
BENZENE	<0.025
ETHYLBENZENE	<0.025
TOLUENE	<0.025
TOTAL XYLENES	<0.025
FUEL HYDROCARBONS	<5
HYDROCARBON RANGE	TOLUENE TO DODECANE
HYDROCARBON QUANTITATION USING	GASOLINE

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	104	52 - 116
TRIFLUOROTOLUENE	104	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 412178-2

BETX - GASOLINE
DATA SUMMARY

CLIENT	: DELTA ENVIRONMENTAL	DATE SAMPLED	: 12/21/94
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE RECEIVED	: 12/22/94
PROJECT NAME	: BELLEVUE, WA	DATE EXTRACTED	: 12/27/94
CLIENT I.D.	: AS-1-10	DATE ANALYZED	: 12/29/94
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
METHOD	: WA DOE WTPH-G/8020(BETX)	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
BENZENE	<0.028
ETHYLBENZENE	0.053
TOLUENE	<0.028
TOTAL XYLENES	0.18
FUEL HYDROCARBONS	11
HYDROCARBON RANGE	TOLUENE TO DODECANE
HYDROCARBON QUANTITATION USING	GASOLINE

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	100	52 - 116
TRIFLUOROTOLUENE	89	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 412178-9

BETX - GASOLINE
DATA SUMMARY

CLIENT	: DELTA ENVIRONMENTAL	DATE SAMPLED	: 12/20/94
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE RECEIVED	: 12/22/94
PROJECT NAME	: BELLEVUE, WA	DATE EXTRACTED	: 12/27/94
CLIENT I.D.	: AS-2-12	DATE ANALYZED	: 12/29/94
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
METHOD	: WA DOE WTPH-G/8020(BETX)	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
BENZENE	<0.030
ETHYLBENZENE	<0.030
TOLUENE	<0.030
TOTAL XYLENES	<0.030
FUEL HYDROCARBONS	<6
HYDROCARBON RANGE	TOLUENE TO DODECANE
HYDROCARBON QUANTITATION USING	GASOLINE

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	97	52 - 116
TRIFLUOROTOLUENE	89	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 412178-21

BETX - GASOLINE
DATA SUMMARY

CLIENT	: DELTA ENVIRONMENTAL	DATE SAMPLED	: 12/20/94
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE RECEIVED	: 12/22/94
PROJECT NAME	: BELLEVUE, WA	DATE EXTRACTED	: 12/27/94
CLIENT I.D.	: MW-7-6	DATE ANALYZED	: 12/30/94
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
METHOD	: WA DOE WTPH-G/8020(BETX)	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
BENZENE	<0.028
ETHYLBENZENE	0.67
TOLUENE	0.11
TOTAL XYLENES	3.3
FUEL HYDROCARBONS	400 D5
HYDROCARBON RANGE	TOLUENE TO DODECANE
HYDROCARBON QUANTITATION USING	GASOLINE

SURROGATE PERCENT RECOVERY		LIMITS
BROMOFLUOROBENZENE	98	52 - 116
TRIFLUOROTOLUENE	83	50 - 150

D5 = Value from a twenty fold diluted analysis.

Analytical Technologies, Inc.

ATI I.D. # 412178

BETX - GASOLINE
QUALITY CONTROL DATA

CLIENT	: DELTA ENVIRONMENTAL	SAMPLE I.D. #	: BLANK
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE EXTRACTED	: 12/27/94
PROJECT NAME	: BELLEVUE, WA	DATE ANALYZED	: 12/28/94
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
METHOD	: WA DOE WTPH-G/8020(BETX)		

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
BENZENE	<0.0250	1.00	1.05	105	N/A	N/A	N/A
TOLUENE	<0.0250	1.00	1.09	109	N/A	N/A	N/A
TOTAL XYLENES	<0.0250	2.00	2.19	110	N/A	N/A	N/A
GASOLINE	<5.00	50.0	51.3	103	N/A	N/A	N/A

CONTROL LIMITS	% REC.	RPD
BENZENE	82 - 109	20
TOLUENE	86 - 116	20
TOTAL XYLENES	83 - 119	20
GASOLINE	78 - 115	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
BROMOFLUOROBENZENE	107	N/A	52 - 116
TRIFLUOROTOLUENE	109	N/A	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 412178

BETX - GASOLINE
QUALITY CONTROL DATA

CLIENT	: DELTA ENVIRONMENTAL	SAMPLE I.D. #	: 412187-1
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE EXTRACTED	: 12/27/94
PROJECT NAME	: BELLEVUE, WA	DATE ANALYZED	: 12/29/94
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
METHOD	: WA DOE WTPH-G/8020(BETX)		

COMPOUND	SAMPLE RESULT	SAMPLE DUP. RESULT	RPD	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
GASOLINE	<5.00	<5.00	NC	N/A	N/A	N/A	N/A	N/A	N/A

CONTROL LIMITS	% REC.	RPD
GASOLINE	N/A	20

SURROGATE RECOVERIES	SAMPLE	SAMPLE DUP.	LIMITS
TRIFLUOROTOLUENE	93	86	50 - 150

NC = Not calculable.

Analytical Technologies, Inc.

ATI I.D. # 412178

BETX - GASOLINE
QUALITY CONTROL DATA

CLIENT	: DELTA ENVIRONMENTAL	SAMPLE I.D. #	: 412158-4
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE EXTRACTED	: 12/27/94
PROJECT NAME	: BELLEVUE, WA	DATE ANALYZED	: 12/29/94
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
METHOD	: WA DOE WTPH-G/8020(BETX)		

COMPOUND	SAMPLE RESULT	SAMPLE DUP. RESULT	RPD	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
BENZENE	<0.0250	N/A	N/A	1.00	0.920	92	0.937	94	2
TOLUENE	<0.0250	N/A	N/A	1.00	0.958	96	0.964	96	1
TOTAL XYLENES	<0.0250	N/A	N/A	2.00	1.90	95	1.93	97	2
GASOLINE	5.94	5.04	16	50.0	46.4	81	45.1	78	3

CONTROL LIMITS	% REC.	RPD
BENZENE	62 - 105	20
TOLUENE	63 - 115	20
TOTAL XYLENES	64 - 117	20
GASOLINE	59 - 111	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
BROMOFLUOROBENZENE	92	94	52 - 116
TRIFLUOROTOLUENE	78	78	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 412178

HYDROCARBON IDENTIFICATION
DATA SUMMARY

CLIENT	: DELTA ENVIRONMENTAL	DATE SAMPLED	: N/A
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE RECEIVED	: N/A
PROJECT NAME	: BELLEVUE, WA	DATE EXTRACTED	: 12/28/94
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 12/30/94
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
METHOD	: WA DOE WTPH-HCID	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

RESULTS

GASOLINE CONCENTRATION LESS THAN 20 mg/Kg BY WA DOE WTPH-HCID.

DIESEL CONCENTRATION LESS THAN 50 mg/Kg BY WA DOE WTPH-HCID.

PETROLEUM HYDROCARBONS >C24 CONCENTRATION LESS THAN 100 mg/Kg BY WA DOE WTPH-HCID.

SURROGATE PERCENT RECOVERY		LIMITS
O-TERPHENYL	127	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 412178-26

HYDROCARBON IDENTIFICATION
DATA SUMMARY

CLIENT	: DELTA ENVIRONMENTAL	DATE SAMPLED	: 12/21/94
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE RECEIVED	: 12/22/94
PROJECT NAME	: BELLEVUE, WA	DATE EXTRACTED	: 12/28/94
CLIENT I.D.	: SP-1	DATE ANALYZED	: 12/30/94
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
METHOD	: WA DOE WTPH-HCID	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

RESULTS

GASOLINE CONCENTRATION LESS THAN 20 mg/Kg BY WA DOE WTPH-HCID.

DIESEL QUALITATIVELY IDENTIFIED BY WA DOE WTPH-HCID.

PETROLEUM HYDROCARBONS >C24 QUALITATIVELY IDENTIFIED BY WA DOE WTPH-HCID.

SURROGATE PERCENT RECOVERY		LIMITS
O-TERPHENYL	114	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 412178-27

HYDROCARBON IDENTIFICATION
DATA SUMMARY

CLIENT	: DELTA ENVIRONMENTAL	DATE SAMPLED	: 12/21/94
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE RECEIVED	: 12/22/94
PROJECT NAME	: BELLEVUE, WA	DATE EXTRACTED	: 12/28/94
CLIENT I.D.	: SP-2	DATE ANALYZED	: 12/30/94
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
METHOD	: WA DOE WTPH-HCID	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

RESULTS

GASOLINE CONCENTRATION LESS THAN 20 mg/Kg BY WA DOE WTPH-HCID.

DIESEL QUALITATIVELY IDENTIFIED BY WA DOE WTPH-HCID.

PETROLEUM HYDROCARBONS >C24 QUALITATIVELY IDENTIFIED BY WA DOE WTPH-HCID.

SURROGATE PERCENT RECOVERY		LIMITS
O-TERPHENYL	113	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 412178

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: DELTA ENVIRONMENTAL	DATE SAMPLED	: N/A
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE RECEIVED	: N/A
PROJECT NAME	: BELLEVUE, WA	DATE EXTRACTED	: 12/23/94
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 01/04/95
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	<10
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL

SURROGATE PERCENT RECOVERY		LIMITS
O-TERPHENYL	90	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 412178

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: DELTA ENVIRONMENTAL	DATE SAMPLED	: N/A
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE RECEIVED	: N/A
PROJECT NAME	: BELLEVUE, WA	DATE EXTRACTED	: 01/06/95
CLIENT I.D.	: METHOD BLANK	DATE ANALYZED	: 01/06/95
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	<10
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL

SURROGATE PERCENT RECOVERY		LIMITS
O-TERPHENYL	96	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 412178-21

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: DELTA ENVIRONMENTAL	DATE SAMPLED	: 12/20/94
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE RECEIVED	: 12/22/94
PROJECT NAME	: BELLEVUE, WA	DATE EXTRACTED	: 12/23/94
CLIENT I.D.	: MW-7-6	DATE ANALYZED	: 01/04/95
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 1

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	37
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL

SURROGATE PERCENT RECOVERY		LIMITS
O-TERPHENYL	85	50 - 150

AnalyticalTechnologies,Inc.

ATI I.D. # 412178-26

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: DELTA ENVIRONMENTAL	DATE SAMPLED	: 12/21/94
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE RECEIVED	: 12/22/94
PROJECT NAME	: BELLEVUE, WA	DATE EXTRACTED	: 01/06/95
CLIENT I.D.	: SP-1	DATE ANALYZED	: 01/06/95
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
METHOD	: WA DOE WTPH-D	DILUTION FACTOR	: 5

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

COMPOUNDS	RESULTS
FUEL HYDROCARBONS	590
HYDROCARBON RANGE	C12 - C24
HYDROCARBON QUANTITATION USING	DIESEL

SURROGATE PERCENT RECOVERY		LIMITS
O-TERPHENYL	112	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 412178

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT	: DELTA ENVIRONMENTAL	SAMPLE I.D. #	: BLANK
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE EXTRACTED	: 12/23/94
PROJECT NAME	: BELLEVUE, WA	DATE ANALYZED	: 01/04/95
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
METHOD	: WA DOE WTPH-D		

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
DIESEL	<10.0	200	171	86	172	86	1

CONTROL LIMITS	% REC.	RPD
DIESEL	69 - 115	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
O-TERPHENYL	93	95	50 - 150

AnalyticalTechnologies,Inc.

ATI I.D. # 412178

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT	: DELTA ENVIRONMENTAL	SAMPLE I.D. #	: BLANK
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE EXTRACTED	: 01/06/95
PROJECT NAME	: BELLEVUE, WA	DATE ANALYZED	: 01/06/95
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
METHOD	: WA DOE WTPH-D		

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
DIESEL	<10.0	200	199	100	205	103	3

CONTROL LIMITS	% REC.	RPD
DIESEL	69 - 115	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
O-TERPHENYL	101	102	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 412178

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT	: DELTA ENVIRONMENTAL	SAMPLE I.D. #	: 412158-2
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE EXTRACTED	: 12/23/94
PROJECT NAME	: BELLEVUE, WA	DATE ANALYZED	: 01/03/95
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
METHOD	: WA DOE WTPH-D		

COMPOUND	SAMPLE RESULT	SAMPLE DUP. RESULT	RPD	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
DIESEL	118	114	3	N/A	N/A	N/A	N/A	N/A	N/A

CONTROL LIMITS	% REC.	RPD
DIESEL	N/A	20

SURROGATE RECOVERIES	SAMPLE	SAMPLE DUP.	LIMITS
O-TERPHENYL	80	89	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 412178

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT	: DELTA ENVIRONMENTAL	SAMPLE I.D. #	: 412156-18
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE EXTRACTED	: 12/23/94
PROJECT NAME	: BELLEVUE, WA	DATE ANALYZED	: 01/05/95
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
METHOD	: WA DOE WTPH-D		

COMPOUND	SAMPLE RESULT	SAMPLE DUP. RESULT	RPD	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
DIESEL	333	242	32F	N/A	N/A	N/A	N/A	N/A	N/A

CONTROL LIMITS	% REC.	RPD
DIESEL	N/A	20

SURROGATE RECOVERIES	SAMPLE	SAMPLE DUP.	LIMITS
O-TERPHENYL	89	109	50 - 150

F = Out of limits due to matrix interference.

Analytical Technologies, Inc.

ATI I.D. # 412178

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT	: DELTA ENVIRONMENTAL	SAMPLE I.D. #	: 412156-25
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE EXTRACTED	: 12/23/94
PROJECT NAME	: BELLEVUE, WA	DATE ANALYZED	: 01/04/95
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
METHOD	: WA DOE WTPH-D		

COMPOUNDS	SAMPLE RESULT	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED SAMPLE	DUP. % REC.	RPD
DIESEL	935	200	1110	88	1230	148G	10

CONTROL LIMITS	% REC.	RPD
DIESEL	61 - 120	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
O-TERPHENYL	99	101	50 - 150

G = Out of limits due to high levels of target analytes in sample.

Analytical Technologies, Inc.

ATI I.D. # 412178

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT	: DELTA ENVIRONMENTAL	SAMPLE I.D. #	: 412178-26
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE EXTRACTED	: 01/06/95
PROJECT NAME	: BELLEVUE, WA	DATE ANALYZED	: 01/06/95
SAMPLE MATRIX	: SOIL	UNITS	: mg/Kg
METHOD	: WA DOE WTPH-D		

COMPOUND	SAMPLE RESULT	SAMPLE DUP. RESULT	RPD	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
DIESEL	535	460	15	200	707	86	768	117	8

CONTROL LIMITS	% REC.	RPD
DIESEL	61 - 120	20

SURROGATE RECOVERIES	SPIKE	DUP. SPIKE	LIMITS
O-TERPHENYL	116	120	50 - 150

Analytical Technologies, Inc.

ATI I.D. # 412178

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: DELTA ENVIRONMENTAL	DATE EXTRACTED	: 12/24/94
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE ANALYZED	: 12/27/94
PROJECT NAME	: BELLEVUE, WA	UNITS	: mg/Kg
METHOD	: WA DOE WTPH-418.1 MODIFIED	SAMPLE MATRIX	: SOIL

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

ATI I.D. #	CLIENT I.D.	TOTAL PETROLEUM HYDROCARBONS	TOTAL PETROLEUM HYDROCARBONS *
412178-21	MW-7-6	160	160
METHOD BLANK	-	<20	<20

* Reanalyzed after second aliquot of silica gel added.

AnalyticalTechnologies,Inc.

ATI I.D. # 412178

TOTAL PETROLEUM HYDROCARBONS
DATA SUMMARY

CLIENT	: DELTA ENVIRONMENTAL	DATE EXTRACTED	: 01/06/95
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE ANALYZED	: 01/06/95
PROJECT NAME	: BELLEVUE, WA	UNITS	: mg/Kg
METHOD	: WA DOE WTPH-418.1 MODIFIED	SAMPLE MATRIX	: SOIL

RESULTS ARE CORRECTED FOR MOISTURE CONTENT

ATI I.D. #	CLIENT I.D.	TOTAL PETROLEUM HYDROCARBONS		TOTAL PETROLEUM HYDROCARBONS *	
412178-26	SP-1	2100	D3	2000	D3
METHOD BLANK	-	<20		<20	

D3 = Value from a five fold diluted analysis.
* Reanalyzed after second aliquot of silica gel added.

Analytical Technologies, Inc.

ATI I.D. # 412178

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT	: DELTA ENVIRONMENTAL	SAMPLE I.D. #	: BLANK
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE EXTRACTED	: 12/24/94
PROJECT NAME	: BELLEVUE, WA	DATE ANALYZED	: 12/27/94
METHOD	: WA DOE WTPH-418.1 MODIFIED	UNITS	: mg/Kg
SAMPLE MATRIX	: SOIL		

COMPOUND	SAMPLE RESULT	SAMPLE DUP. RESULT	RPD	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
PETROLEUM HYDROCARBONS (MOTOR OIL)	<20.0	N/A	N/A	400	520	130	532	133	2

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

$$\text{RPD (Relative \% Difference)} = \frac{|(\text{Spike Result} - \text{Dup. Spike Result})|}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc.

ATI I.D. # 412178

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT	: DELTA ENVIRONMENTAL	SAMPLE I.D. #	: BLANK
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE EXTRACTED	: 01/06/95
PROJECT NAME	: BELLEVUE, WA	DATE ANALYZED	: 01/06/95
METHOD	: WA DOE WTPH-418.1 MODIFIED	UNITS	: mg/Kg
SAMPLE MATRIX	: SOIL		

COMPOUND	SAMPLE RESULT	SAMPLE DUP. RESULT	RPD	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
PETROLEUM HYDROCARBONS (MOTOR OIL)	<20.0	N/A	N/A	400	522	131	N/A	N/A	N/A

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

$$\text{RPD (Relative \% Difference)} = \frac{|(\text{Spike Result} - \text{Dup. Spike Result})|}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc.

ATI I.D. # 412178

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT	: DELTA ENVIRONMENTAL	SAMPLE I.D. #	: 412158-4
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE EXTRACTED	: 12/24/94
PROJECT NAME	: BELLEVUE, WA	DATE ANALYZED	: 12/27/94
METHOD	: WA DOE WTPH-418.1 MODIFIED	UNITS	: mg/Kg
SAMPLE MATRIX	: SOIL		

COMPOUND	SAMPLE RESULT	SAMPLE DUP. RESULT	RPD	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
PETROLEUM HYDROCARBONS (MOTOR OIL)	144	144	0	400	639	124	N/A	N/A	N/A

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

$$\text{RPD (Relative \% Difference)} = \frac{|(\text{Spike Result} - \text{Dup. Spike Result})|}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc.

ATI I.D. # 412178

TOTAL PETROLEUM HYDROCARBONS
QUALITY CONTROL DATA

CLIENT	: DELTA ENVIRONMENTAL	SAMPLE I.D. #	: 412178-26
PROJECT #	: FACIL.#836,TASK ORDER # 836-94-3	DATE EXTRACTED	: 01/06/95
PROJECT NAME	: BELLEVUE, WA	DATE ANALYZED	: 01/06/95
METHOD	: WA DOE WTPH-418.1 MODIFIED	UNITS	: mg/Kg
SAMPLE MATRIX	: SOIL		

COMPOUND	SAMPLE RESULT	SAMPLE DUP. RESULT	RPD	SPIKE ADDED	SPIKED RESULT	% REC.	DUP. SPIKED RESULT	DUP. % REC.	RPD
PETROLEUM HYDROCARBONS (MOTOR OIL)	1820	1480	21	400	2330	128	N/A	N/A	N/A

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

$$\text{RPD (Relative \% Difference)} = \frac{|(\text{Spike Result} - \text{Dup. Spike Result})|}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc.

ATI I.D. # 412178

METALS ANALYSIS

CLIENT : DELTA ENVIRONMENTAL MATRIX : SOIL
PROJECT # : FACIL.#836,TASK ORDER # 836-94-3
PROJECT NAME : BELLEVUE, WA

ELEMENT	DATE PREPARED	DATE ANALYZED
ARSENIC	01/11/95	01/12/95
BARIUM	01/11/95	01/12/95
CADMIUM	01/11/95	01/12/95
CHROMIUM	01/11/95	01/12/95
LEAD	01/11/95	01/12/95
MERCURY	01/11/95	01/12/95
SELENIUM	01/11/95	01/12/95
SILVER	01/11/95	01/12/95

Analytical Technologies, Inc.

ATI I.D. # 412178

METALS ANALYSIS
DATA SUMMARY

CLIENT : DELTA ENVIRONMENTAL MATRIX : SOIL
PROJECT # : FACIL.#836,TASK ORDER # 836-94-3
PROJECT NAME : BELLEVUE, WA UNITS : mg/Kg
RESULTS ARE CORRECTED FOR MOISTURE CONTENT

ATI I.D. #	CLIENT I.D.	ARSENIC	BARIUM	CADMIUM
412178-26	SP-1	3.1	48	<0.58 D1
METHOD BLANK	-	<0.25	<0.50	<0.25

D1 = Value from a two fold diluted analysis.

AnalyticalTechnologies, Inc.

ATI I.D. # 412178

METALS ANALYSIS
DATA SUMMARY

CLIENT : DELTA ENVIRONMENTAL MATRIX : SOIL
PROJECT # : FACIL.#836,TASK ORDER # 836-94-3
PROJECT NAME : BELLEVUE, WA UNITS : mg/Kg
RESULTS ARE CORRECTED FOR MOISTURE CONTENT

ATI I.D. #	CLIENT I.D.	CHROMIUM	LEAD	MERCURY
412178-26	SP-1	18	2.3	<0.11
METHOD BLANK	-	<0.50	<1.5	<0.10

AnalyticalTechnologies, Inc.

ATI I.D. # 412178

METALS ANALYSIS
DATA SUMMARY

CLIENT : DELTA ENVIRONMENTAL MATRIX : SOIL
PROJECT # : FACIL.#836,TASK ORDER # 836-94-3
PROJECT NAME : BELLEVUE, WA UNITS : mg/Kg
RESULTS ARE CORRECTED FOR MOISTURE CONTENT

ATI I.D. #	CLIENT I.D.	SELENIUM	SILVER
412178-26	SP-1	<0.31	<0.58 D1
METHOD BLANK	-	<0.25	<0.25

D1 = Value from a two fold diluted analysis.

Analytical Technologies, Inc.

ATI I.D. # 412178

METALS ANALYSIS
QUALITY CONTROL DATA

CLIENT : DELTA ENVIRONMENTAL
PROJECT # : FACIL.#836,TASK ORDER # 836-94-3
PROJECT NAME : BELLEVUE, WA

MATRIX : SOIL
UNITS : mg/Kg

ELEMENT	ATI I.D.	SAMPLE RESULT	DUP RESULT	RPD	SPIKED RESULT	SPIKE ADDED	% REC.
ARSENIC	BLANK	<0.250	N/A	N/A	2.18	2.00	109
ARSENIC	412178-26	3.08	2.94	5	4.85	2.39	74
BARIUM	BLANK	<0.500	N/A	N/A	45.4	50.0	91
BARIUM	412178-26	48.4	47.5	2	97.2	57.3	85
CADMIUM	BLANK	<0.250	N/A	N/A	45.0	50.0	90
CADMIUM	412178-26	<0.578	<0.575	NC	50.2	57.3	88
CHROMIUM	BLANK	<0.500	N/A	N/A	45.2	50.0	90
CHROMIUM	412178-26	18.4	22.4	20	67.7	57.3	86
LEAD	BLANK	<1.50	N/A	N/A	44.4	50.0	89
LEAD	412178-26	2.26	2.23	1	52.4	57.3	88
MERCURY	BLANK	<0.100	N/A	N/A	0.525	0.500	105
MERCURY	501022-2	<0.114	<0.116	NC	0.721	0.572	126
SELENIUM	BLANK	<0.250	N/A	N/A	1.24	1.25	99
SELENIUM	412178-26	<0.306	<0.297	NC	0.940	1.49	63
SILVER	BLANK	<0.250	N/A	N/A	45.6	50.0	91
SILVER	412178-26	<0.578	<0.575	NC	51.1	57.3	89

NC = Not Calculable.

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

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

Analytical Technologies, Inc.

ATI I.D. # 412178

GENERAL CHEMISTRY ANALYSIS

CLIENT : DELTA ENVIRONMENTAL MATRIX : SOIL
PROJECT # : FACIL.#836,TASK ORDER # 836-94-3
PROJECT NAME : BELLEVUE, WA

PARAMETER	DATE ANALYZED
MOISTURE	12/23/94

Analytical Technologies, Inc.

ATI I.D. # 412178

GENERAL CHEMISTRY ANALYSIS
DATA SUMMARY

CLIENT : DELTA ENVIRONMENTAL MATRIX : SOIL
PROJECT # : FACIL.#836,TASK ORDER # 836-94-3
PROJECT NAME : BELLEVUE, WA UNITS : %

ATI I.D. #	CLIENT I.D.	MOISTURE
412178-2	AS-1-10	12
412178-9	AS-2-12	17
412178-21	MW-7-6	12
412178-26	SP-1	9.8
412178-27	SP-2	11

AnalyticalTechnologies,Inc.

ATI I.D. # 412178

GENERAL CHEMISTRY ANALYSIS
QUALITY CONTROL DATA

CLIENT : DELTA ENVIRONMENTAL MATRIX : SOIL
PROJECT # : FACIL.#836,TASK ORDER # 836-94-3
PROJECT NAME : BELLEVUE, WA UNITS : %

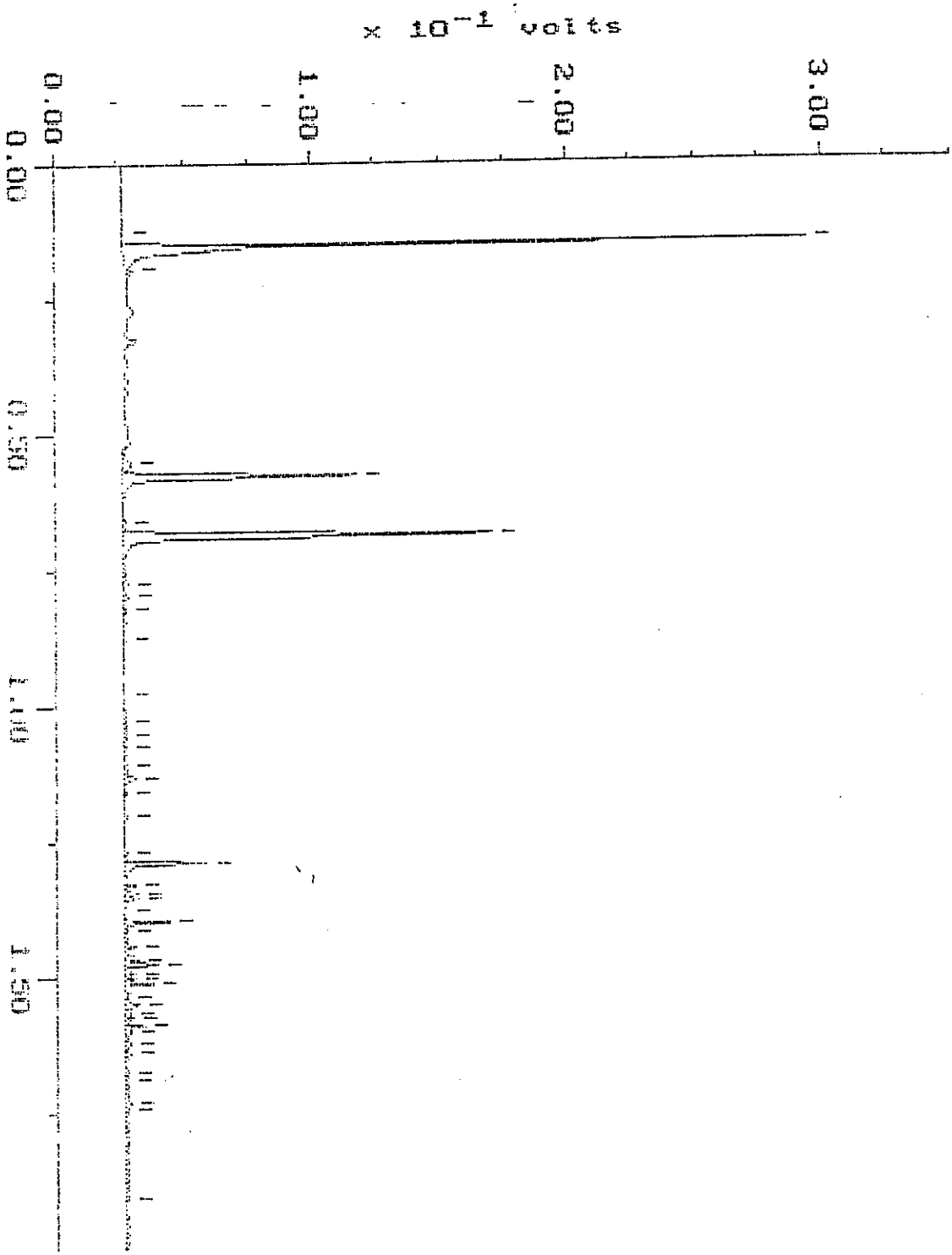
PARAMETER	ATI I.D.	SAMPLE RESULT	DUP RESULT	RPD	SPIKED RESULT	SPIKE ADDED	% REC
MOISTURE	412178-26	9.8	9.8	0	N/A	N/A	N/A
MOISTURE	412183-2	48	44	9	N/A	N/A	N/A

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

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

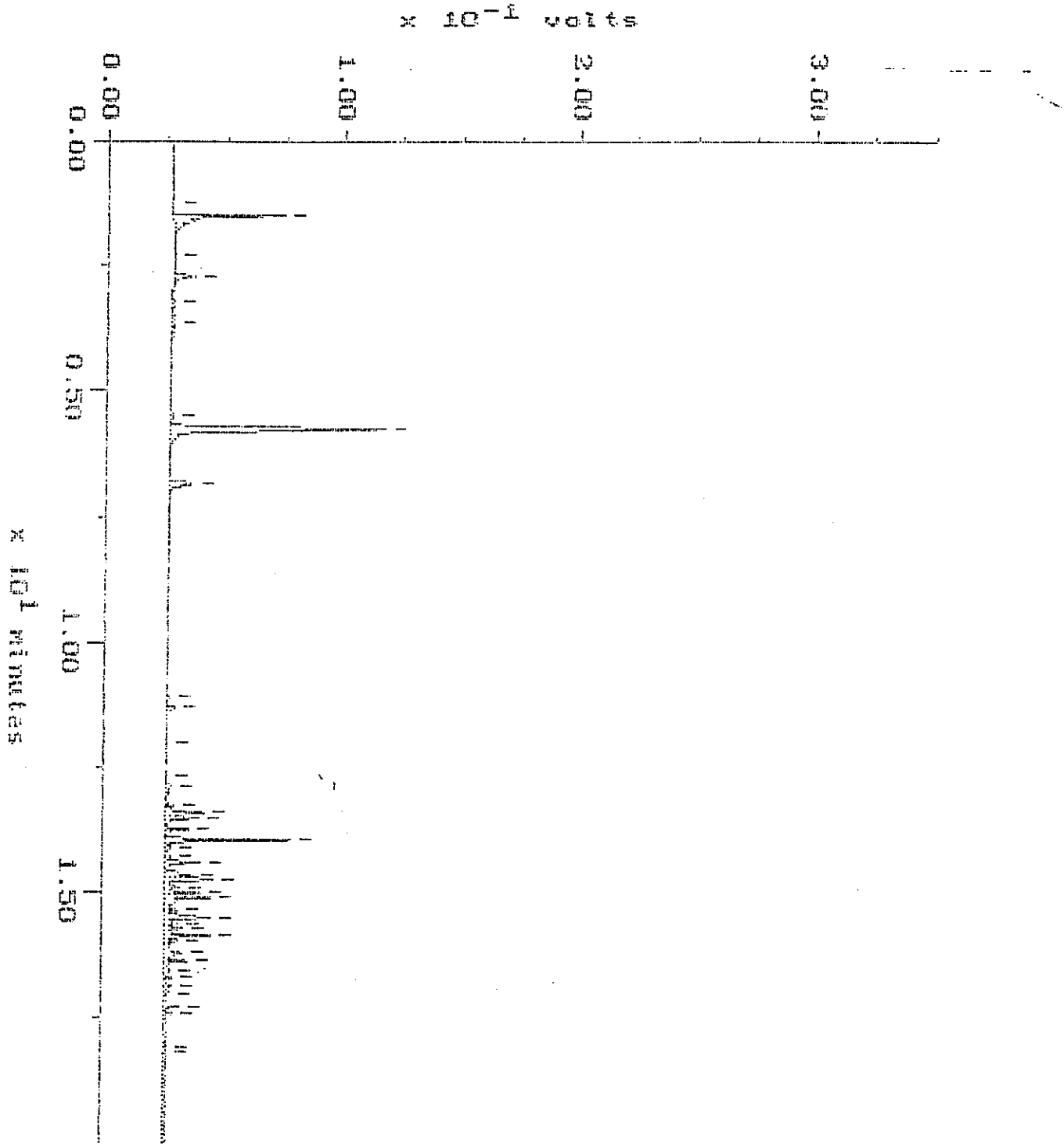
WA DOE WTPH-G

Sample: 412176-2 Channel: FID Filename: RC299P15
Acquired: 29-DEC-94 17:58 Method: X:\MAXDATA\PICARD\122994PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



WA DOE WTPH-G

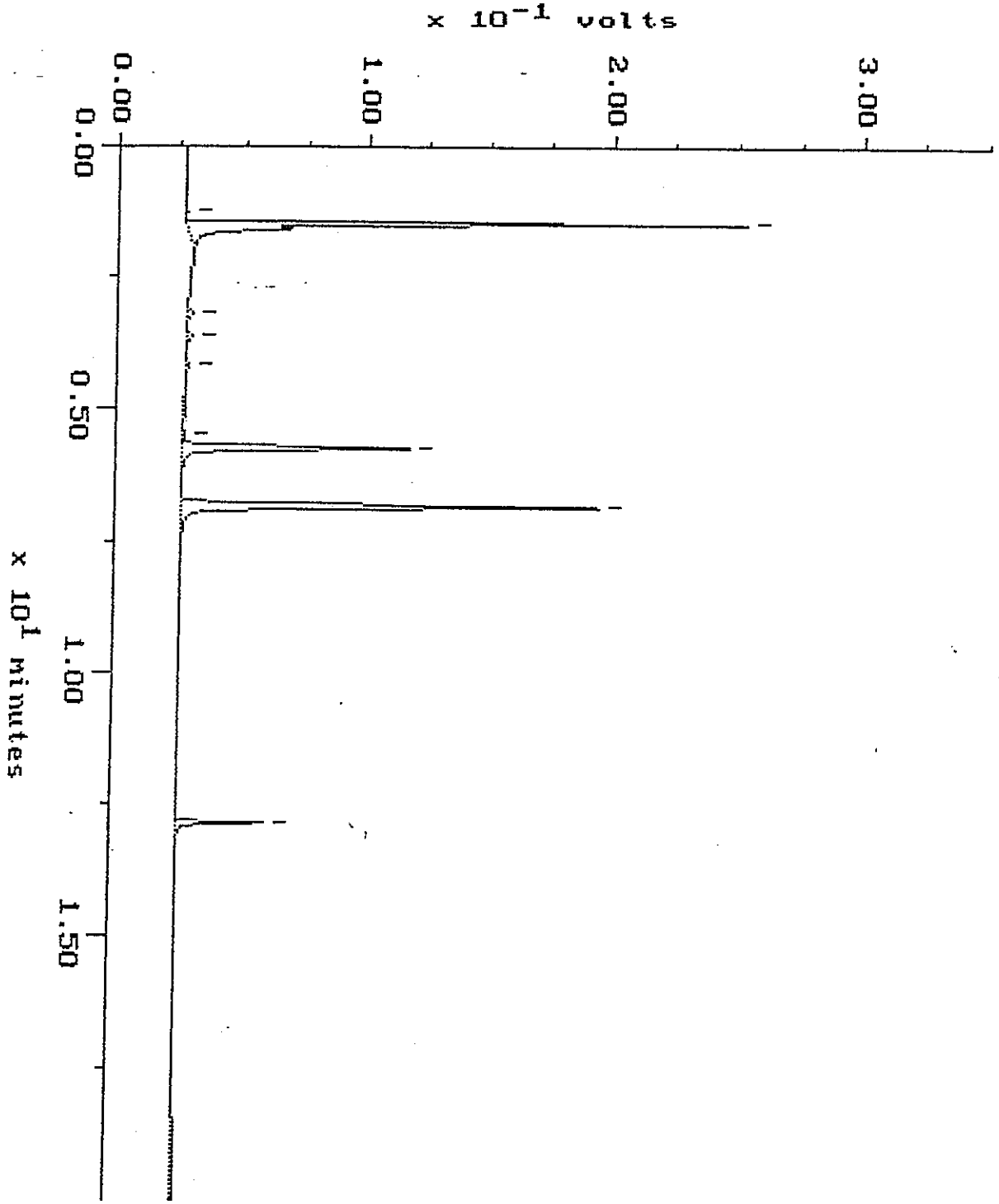
Sample: 412178-21 DIL Channel: FID Filename: R0295F17
Acquired: 29-DEC-94 18:55 Method: X:\MAXDATA\PICARD\1229945C Operator: ATI
Dilution: 1 : 20.000
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



WA DOE WTPH-G

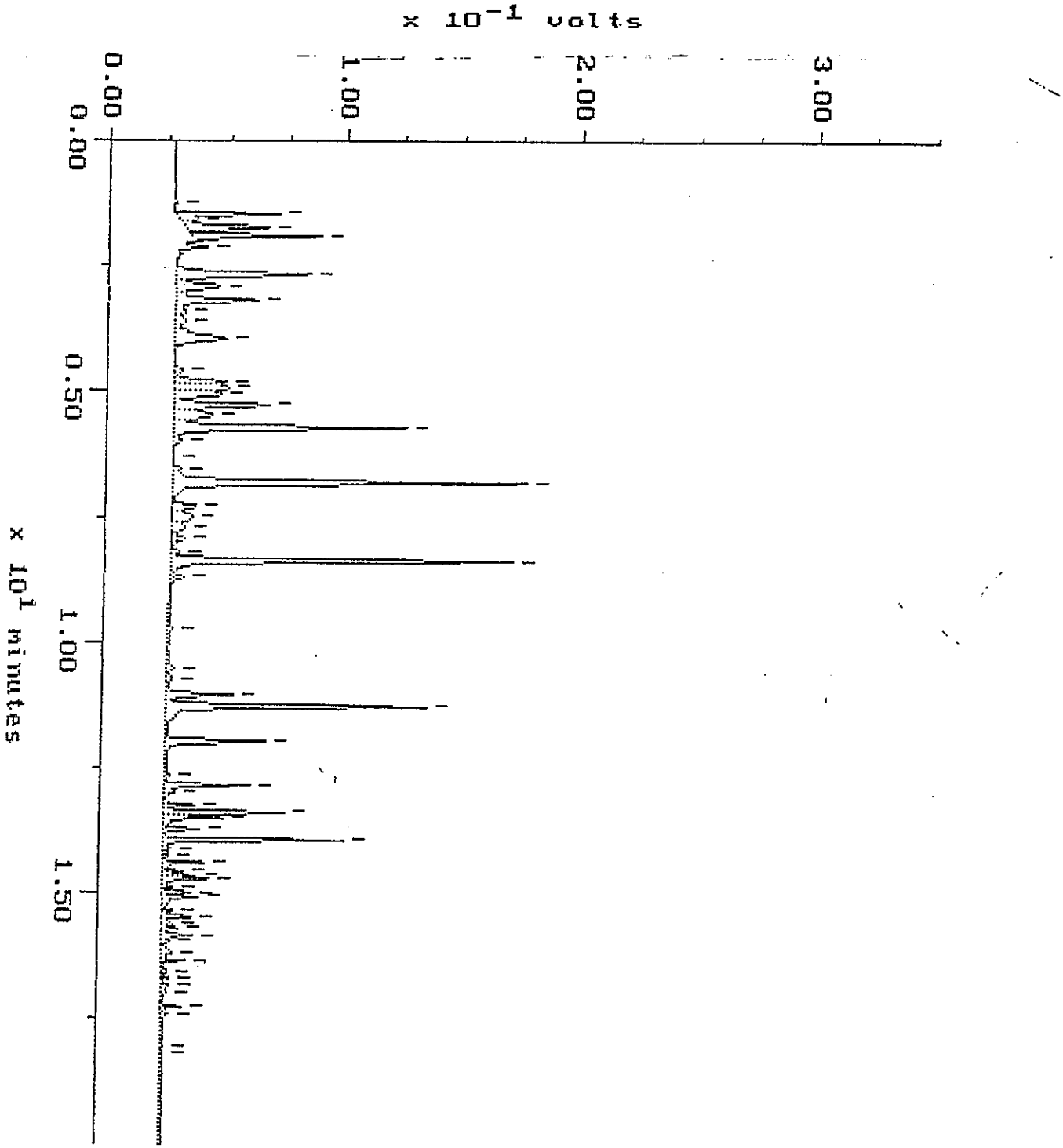
Blank

Sample: SRB 12-27 Channel: FID Filename: RC279P44
Acquired: 28-DEC-94 4:47 Method: X:\MAXDATA\PICARD\122794PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



CONTINUING CALIBRATION

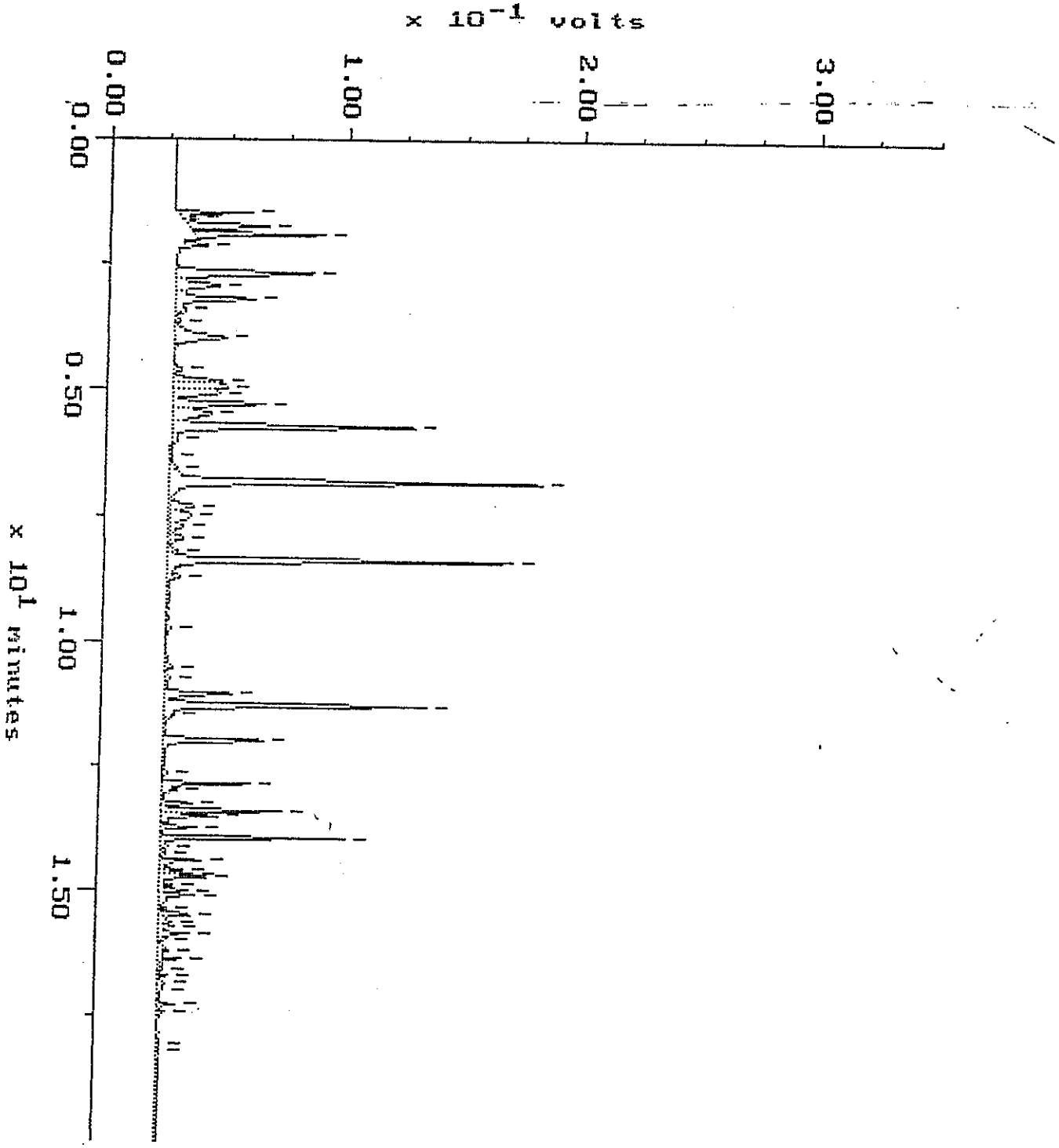
Sample: STD-C 6 Channel: FID Filename: RC269P30
Acquired: 27-DEC-94 6:35 Method: X:\MAXDATA\PICARD\122694PC Operator: ATI
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.



CONTINUING CALIBRATION

Sample: STD-C 6
Channel: FID
Acquired: 28-DEC-94 10:58 Method: X:\MAXDATA\PICARD\122894PC
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.

Filename: RC289P01
Operator: ATI

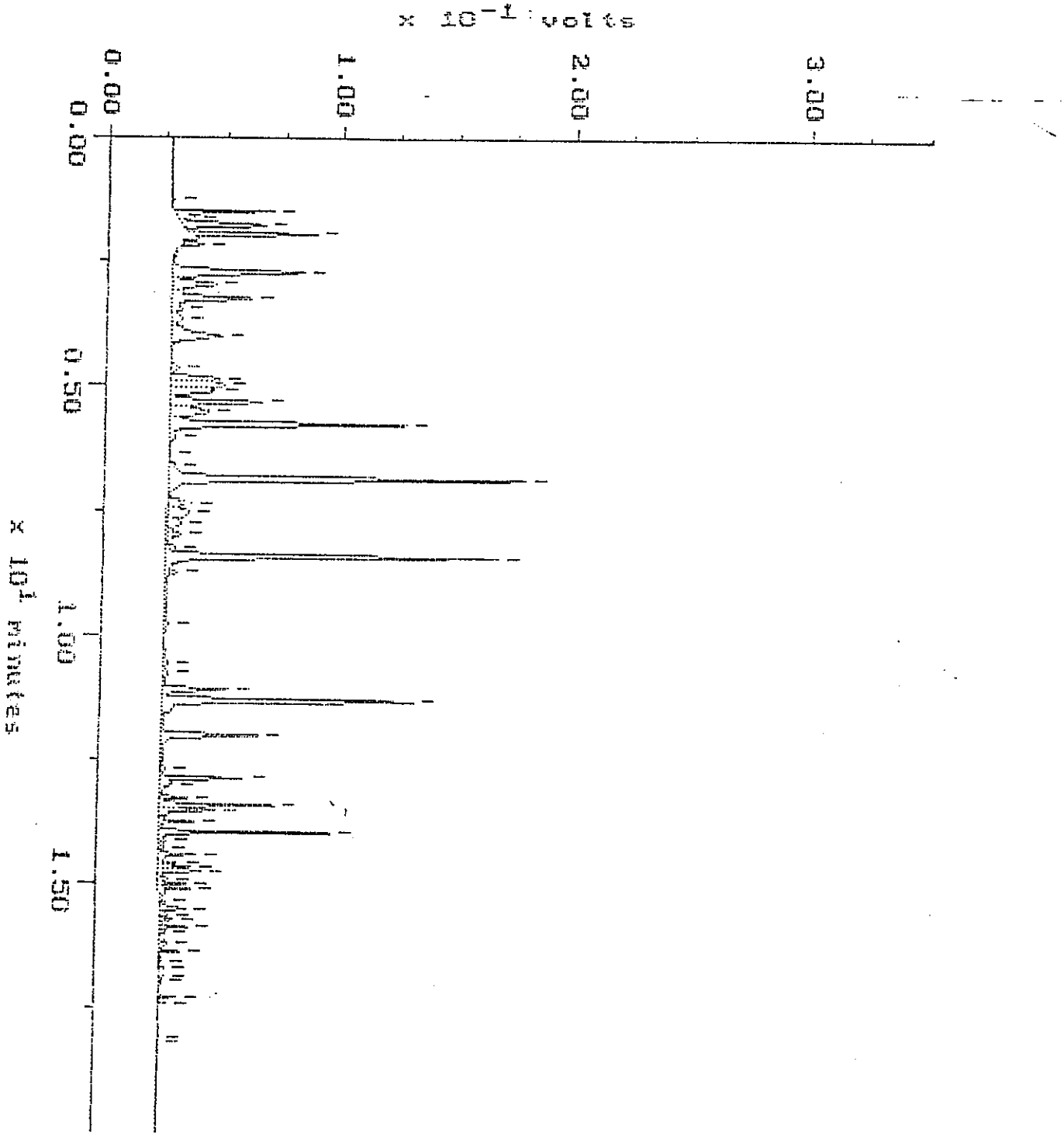


CONTINUING CALIBRATION

Sample: STD-C G
Acquired: 29-DEC-94 9:16
Comments: ATI FUELS: A MISSION OF EXCELLENCE IN ANALYTICAL CHROMATOGRAPHY.

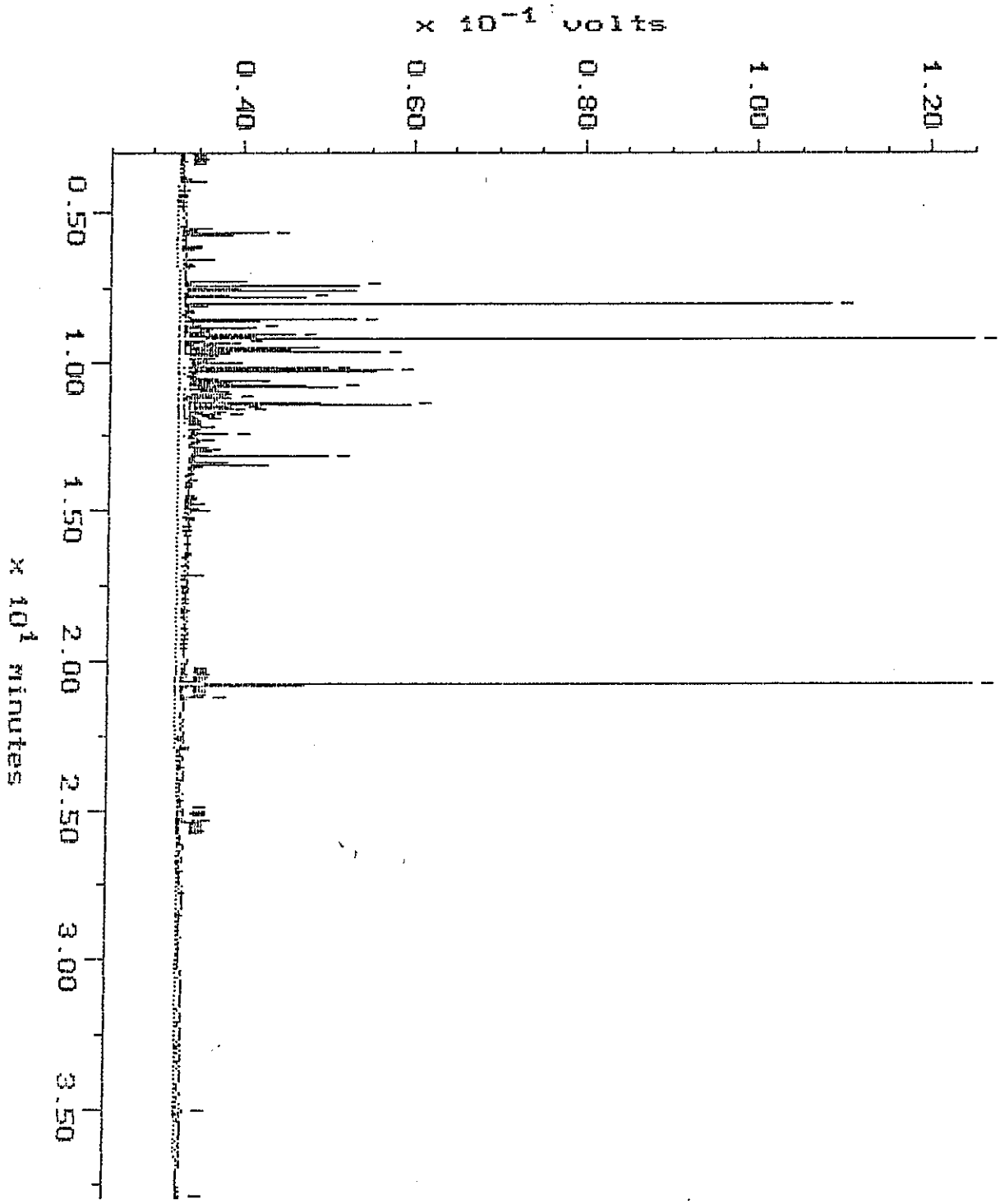
Channel: FID
Method: X:\MAXDATA\PICARD\122894PC

Filename: RC289P47
Operator: ATI

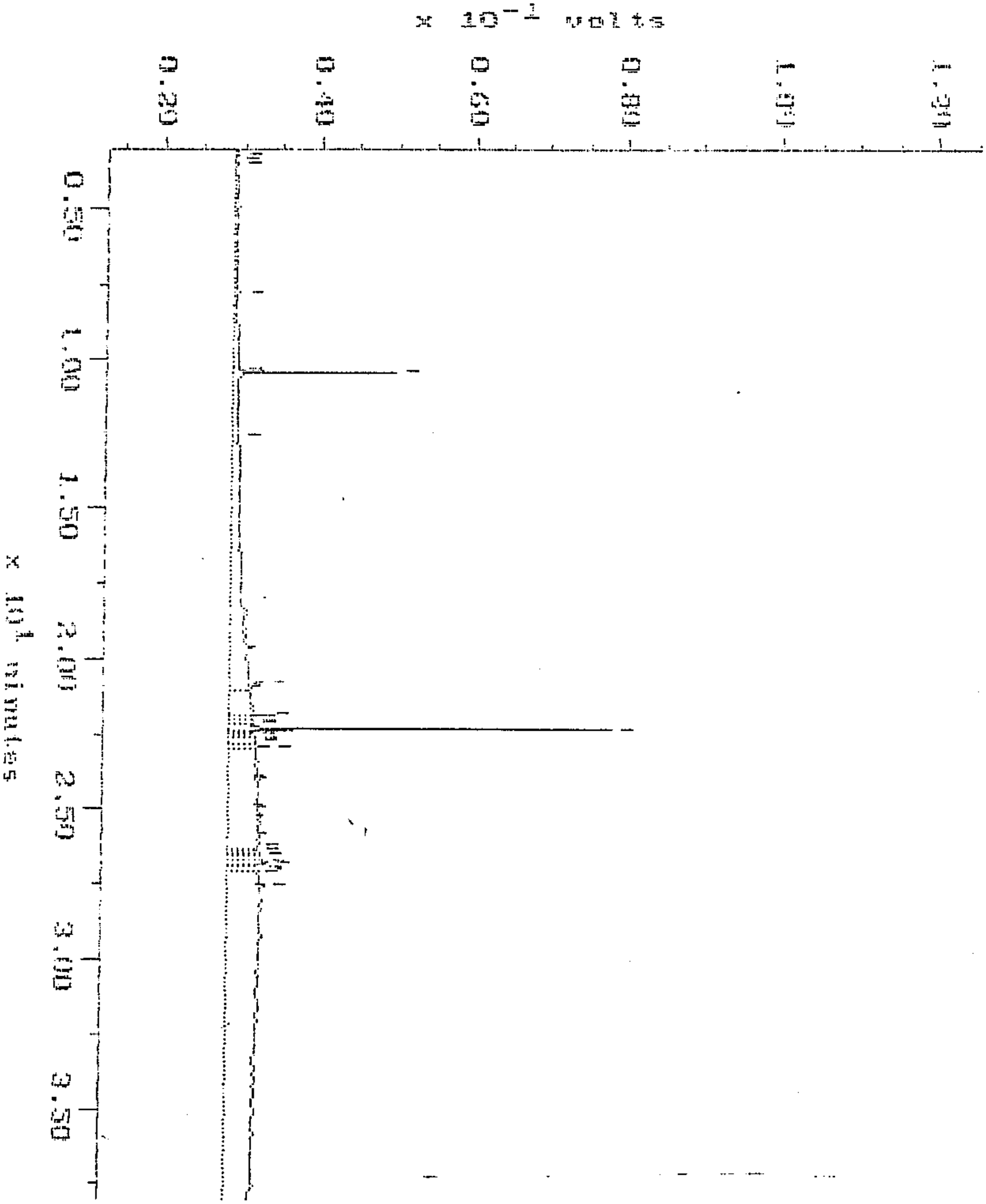


WA DOE WTPH-D

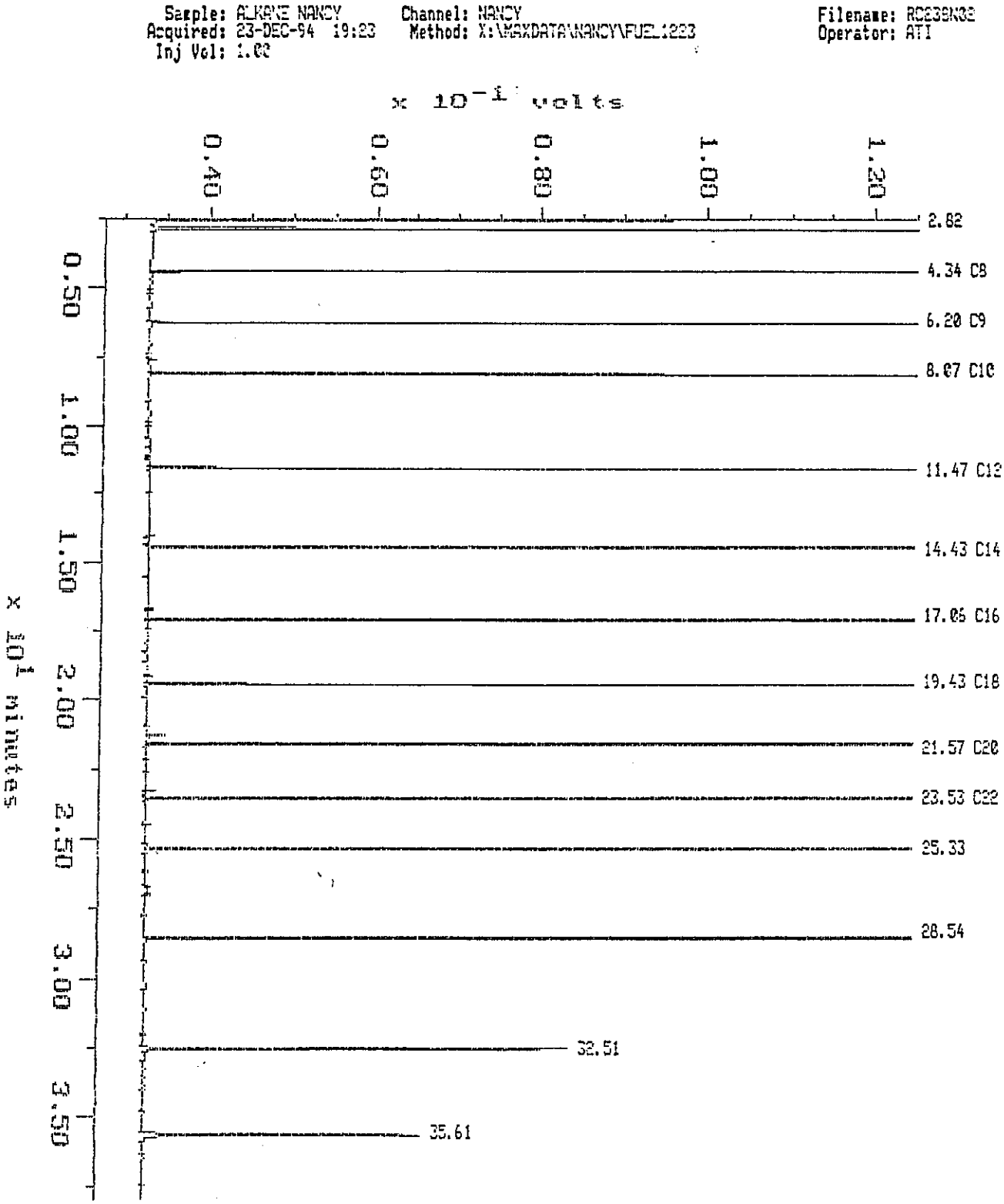
Sample: 412178-21 Channel: NANCY Filename: R1038N17
Acquired: 04-JAN-95 9:54 Method: X:\MAXDATA\NANCY\FUEL0103 Operator: ATI
Comments: ATI RUSH FUELS:PROVIDERS OF EXCELLENCE AND QUALITY IN CLIENT SERVICE



Sample: 412173-26 DIL Channel: BERT Filename: R1362B06
Acquired: 06-JAN-95 22:57 Method: X:\MAXDATA\BERT\FUEL0126 Operator: ATI
Dilution: 1 : 5.000
Comments: ATI: THE QUALITY TEAM



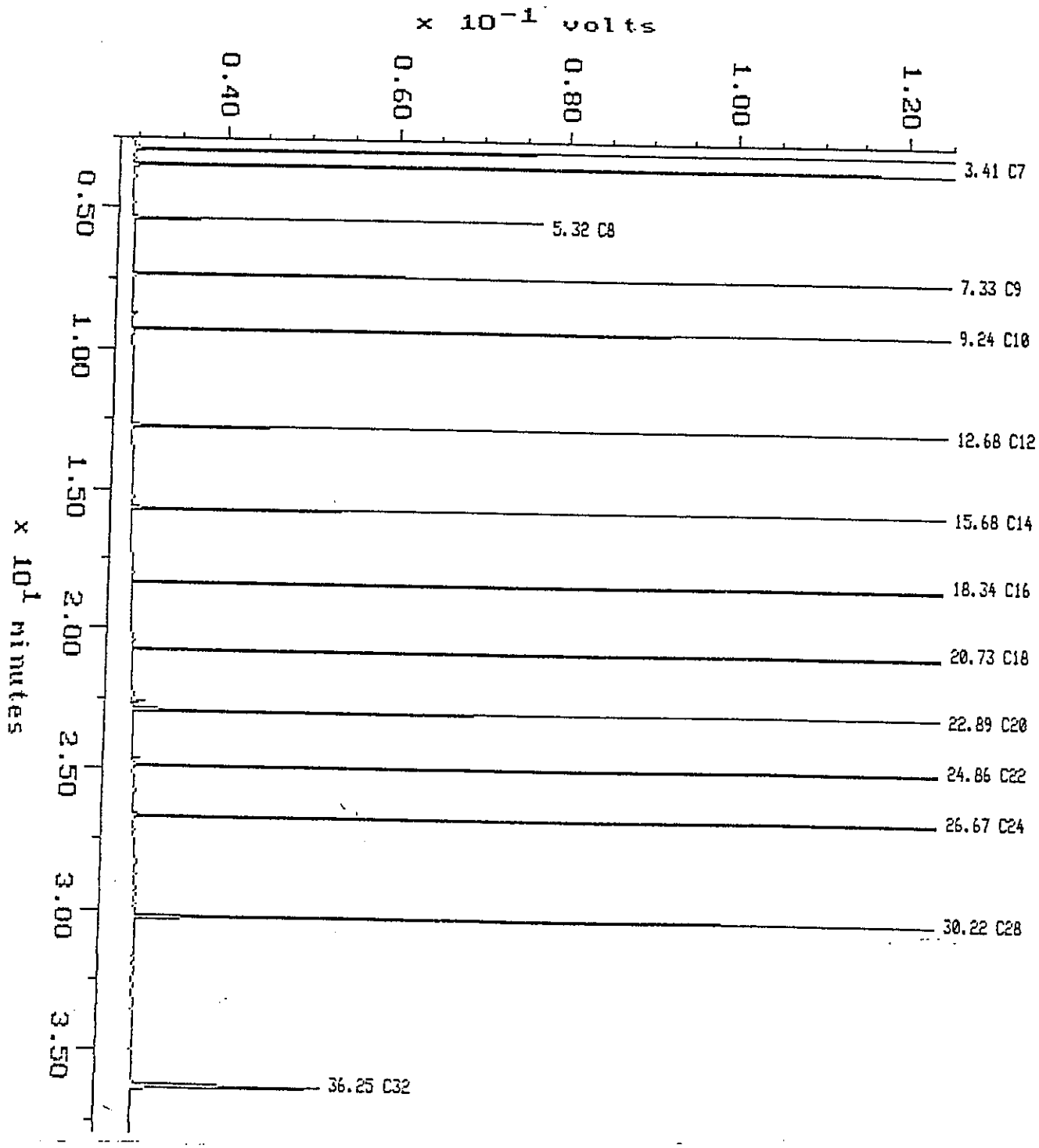
Alkane


Sample: ALKANE NANCY
Acquired: 23-DEC-94 19:23
Inj Vol: 1.00
Channel: NANCY
Method: X:\MAXDATA\NANCY\FUEL1223
Filename: RC838N33
Operator: ATI
x 10⁻¹ volts
0.40
0.60
0.80
1.00
1.20
0.50
1.00
1.50
2.00
2.50
3.00
3.50
x 10¹ minutes
2.82
4.34 C8
6.20 C9
8.07 C10
11.47 C12
14.43 C14
17.06 C16
19.43 C18
21.57 C20
23.53 C22
25.33
28.54
32.51
35.61

Sample: ALKANE BERT
Acquired: 27-DEC-94 15:37
Inj Vol: 1.00

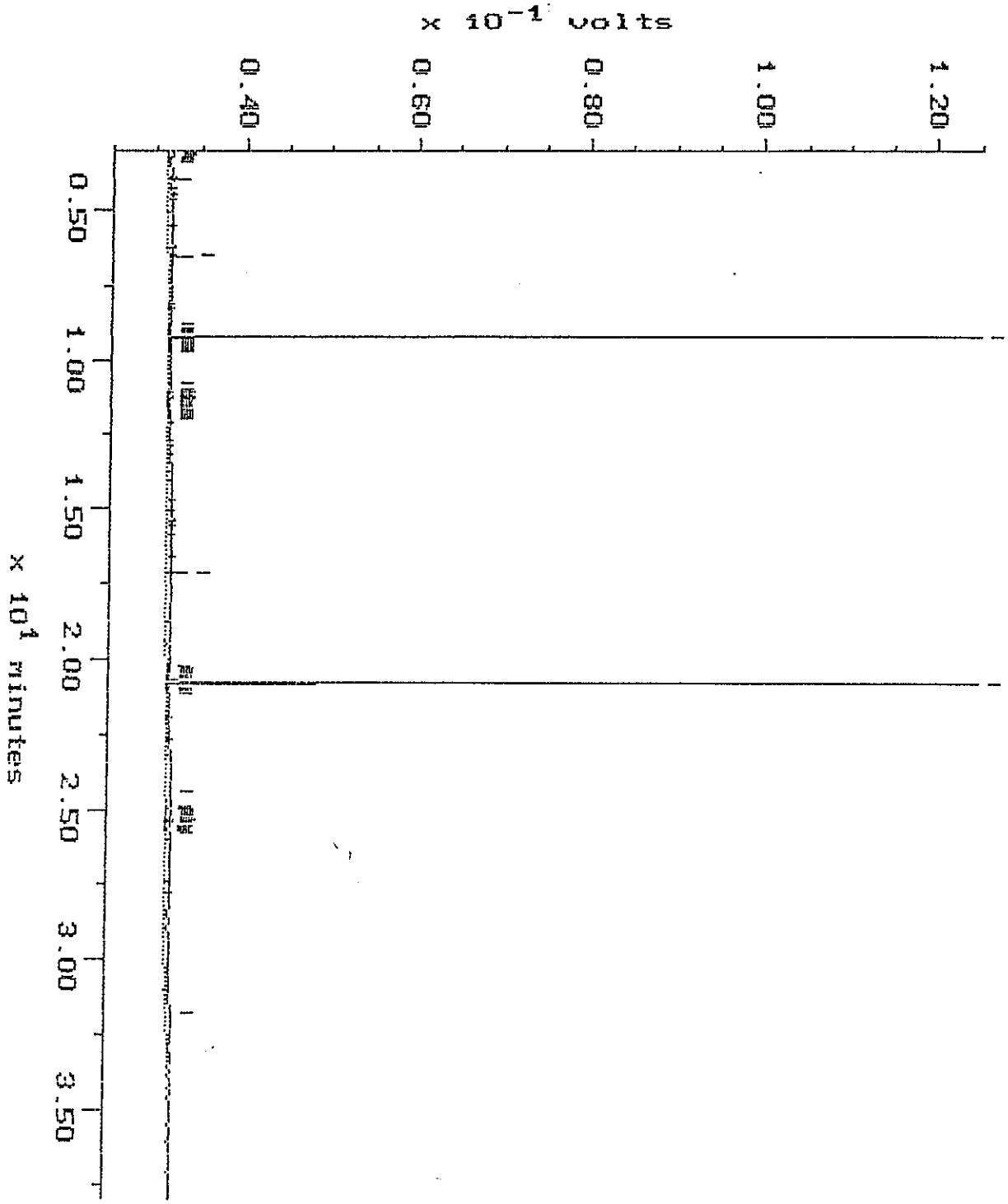
Channel: BERT
Method: X:\MAXDATA\BERT\FUEL1227

Filename: RC278B02
Operator: ATI



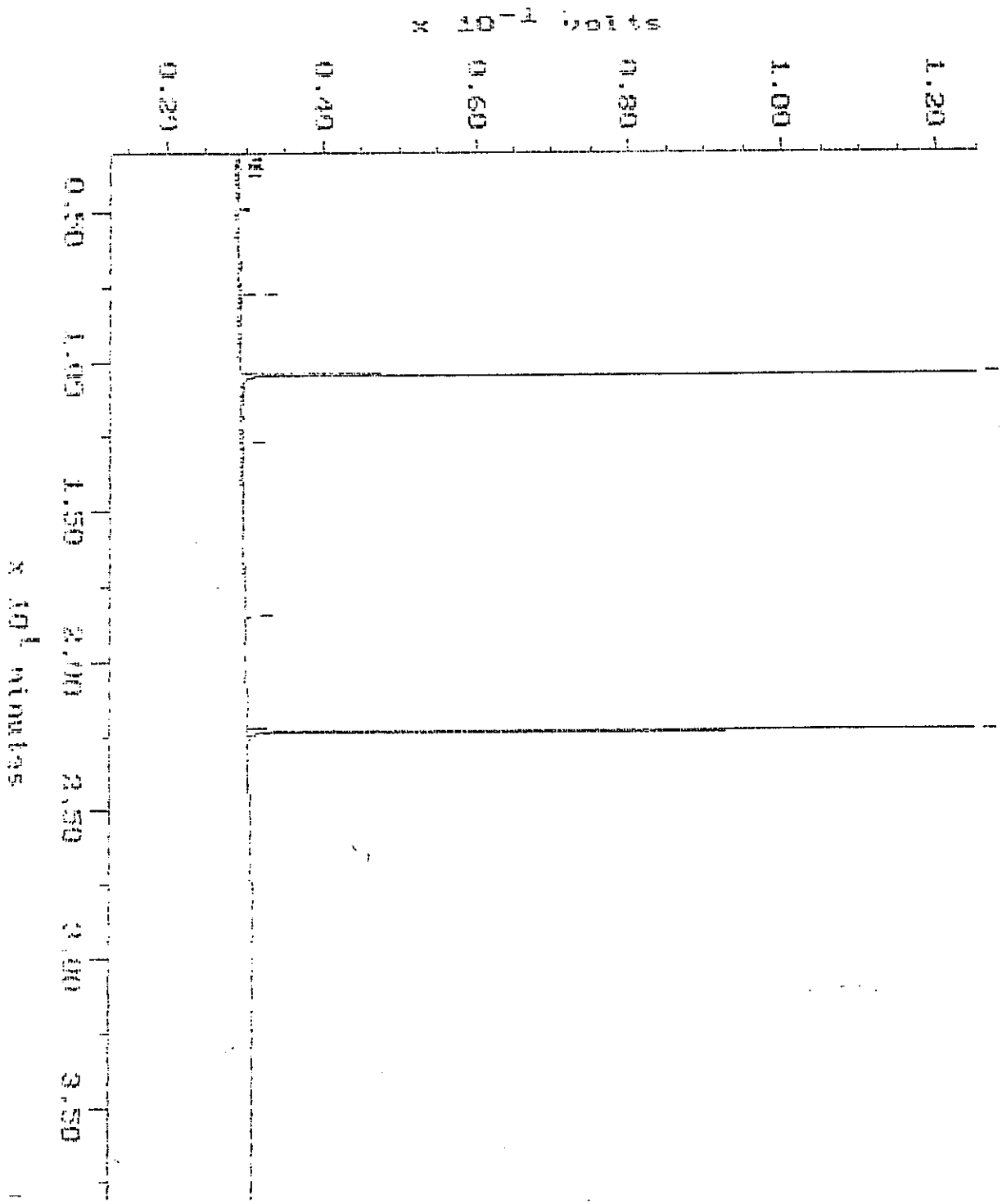
WA DOE WTPH-D

Sample: SRB A12-23 Channel: NANCY Filename: R1038N14
Acquired: 04-JAN-95 7:31 Method: X:\MAXDATA\NANCY\FUEL0103 Operator: ATI
Comments: ATI RUSH FUELS:PROVIDERS OF EXCELLENCE AND QUALITY IN CLIENT SERVICE

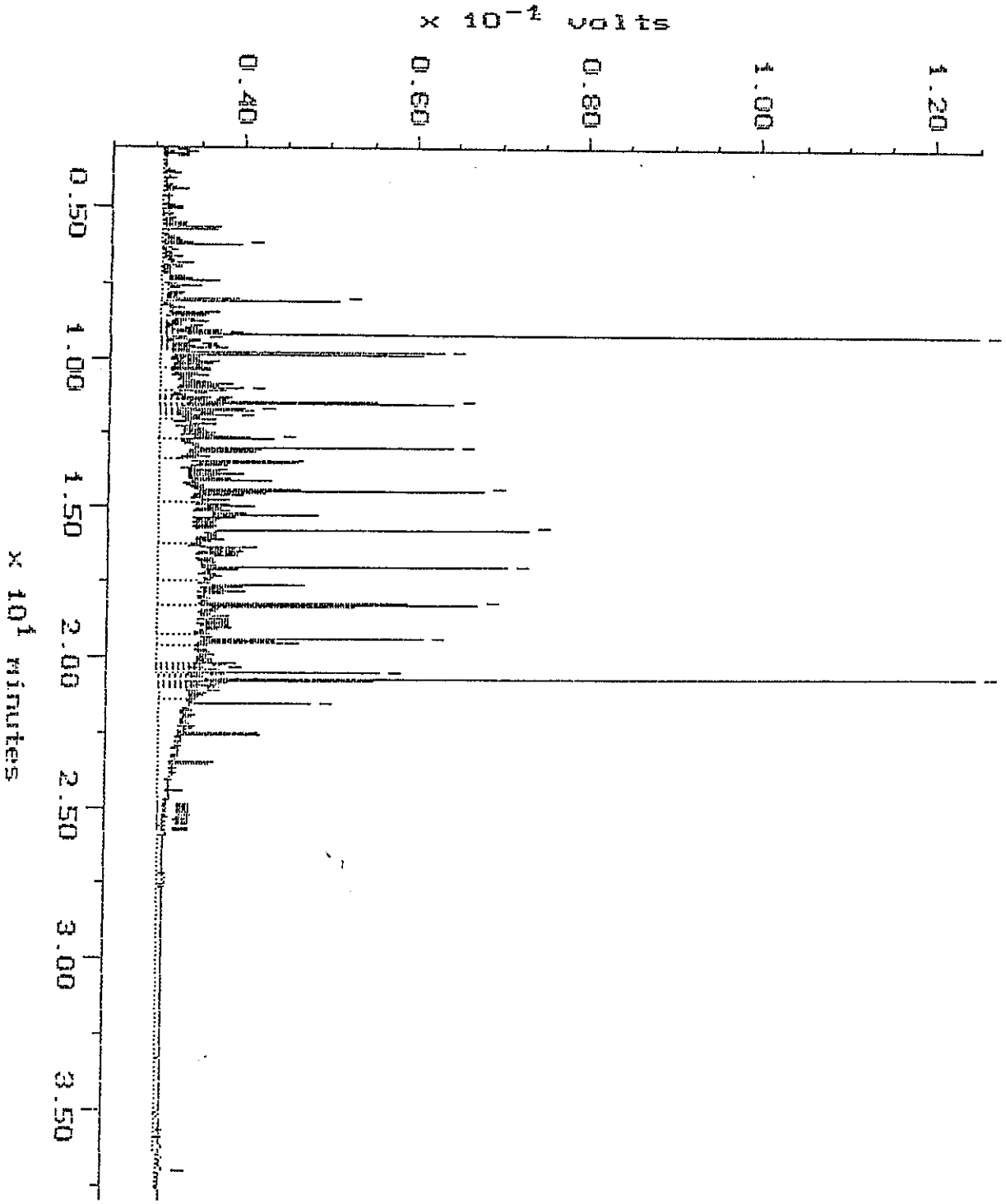


Blank

Sample: SRB A0106 Channel: BERT Filename: R1066B03
Acquired: 06-JAN-95 08:39 Method: X:\MAXDATA\BERT\FUEL0106 Operator: ATI
Comments: ATI: THE QUALITY TEAM

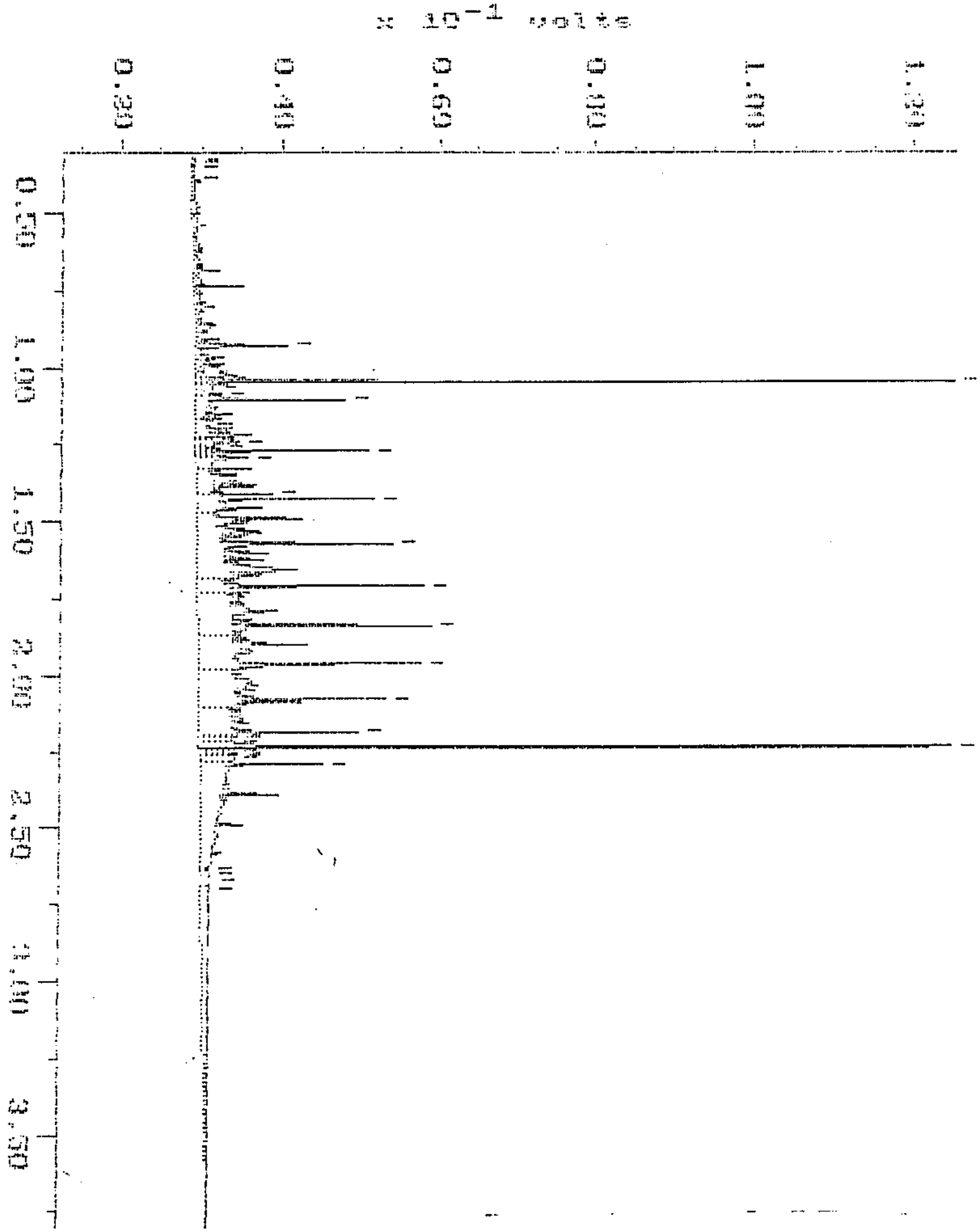


Sample: D 500 R91181 Channel: NANCY
Acquired: 04-JAN-95 6:43 Method: X:\MAXDATA\NANCY\FUEL0103 Filename: A1038N13
Comments: ATI RUSH FUELS:PROVIDERS OF EXCELLENCE AND QUALITY IN CLIENT SERVICE Operator: ATI



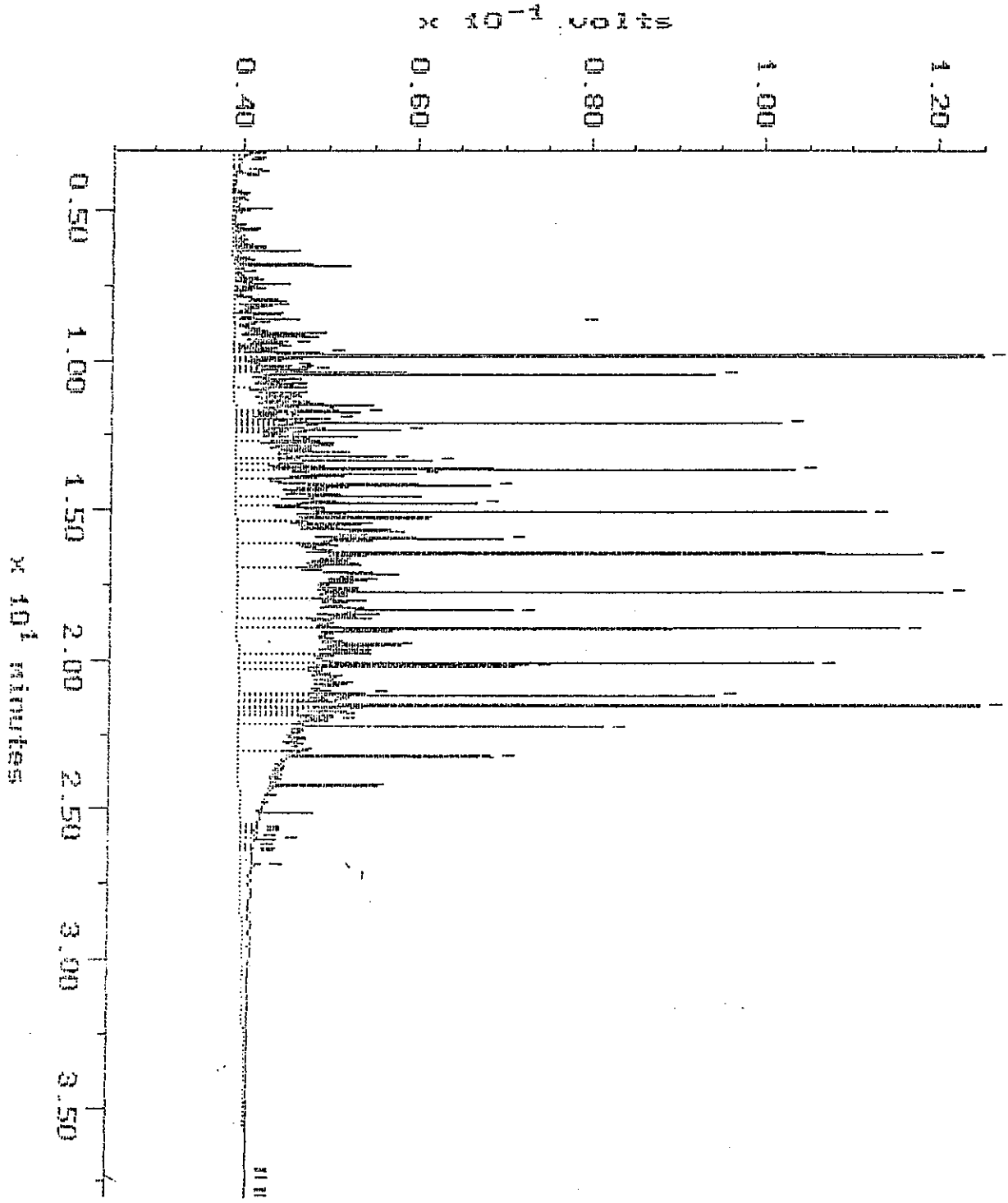
CONTINUING CALIBRATION

Sample: D 3C3 891121 Channel: BERT Filename: R1263B02
Acquired: 06-JAN-95 10:53 Method: X:\MAXDATA\BERT\FUEL0105 Operator: ATI
Comments: ATI: THE QUALITY TEAM



CONTIN...G CALIBRATION

Sample: D 500 R91181 Channel: WILMA Filename: R1068W02
Acquired: 06-JAN-95 20:02 Method: X:\MAXDATA\WILMA\FUEL0106 Operator: BRD



ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 836-94-3

Chain of Custody

ARCO Facility no. 836	City (Facility) Bellevue	Project manager (Consultant) Andy Smith	Laboratory name ATI
ARCO engineer Chuck Hutchens	Telephone no. (ARCO) 485-8792	Telephone no. (Consultant) 649-9063	Fax no. (Consultant) -0409	Contract number 88101
Consultant name Delta Environmental Consultants	Address (Consultant) 3150 Richards Rd #100 Bellevue WA 98005		Method of shipment

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐	TPH - HCID
SP-1	26	2	X			X		12/21/94	1100												X
SP-2	27	2	X			X		12/21/94	1105												X

Special detection Limit/reporting

Special QA/QC

Remarks

Lab number 412178

Turnaround time

Priority Rush 1 Business Day ☐

Rush 2 Business Days ☐

Expedited 5 Business Days ☒

Standard 10 Business Days ☐

Condition of sample:

Temperature received:

Relinquished by sampler	Date 12/22/94	Time 1000	Received by ENA Courier
Relinquished by	Date	Time	Received by
Relinquished by	Date	Time	Received by laboratory	Date 12-22-94	Time 1350

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant
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ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 836-94-3

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ARCO engineer Chuck Hutchens	Telephone no. (ARCO) 485-8792	Telephone no. (Consultant) (206) 649-9663	Fax no. (Consultant) (206) 649-0409
Consultant name Delta Environmental Consultants Inc.	Address (Consultant) 3150 Richards Rd #100 Bellevue, Wa 98005		Contract number 88101

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
AS-1-5	1	2	X			X		12/21/94	825													
AS-1-10	2	2	X			X		12/21/94	845		X											
AS-1-12	3	1	X			X		12/21/94	850					X		X		X				
AS-1-15	4	2	X			X		12/21/94	855													
AS-1-20	5	2	X			X		12/21/94	910													
AS-1-25	6	2	X			X		12/21/94	925													
AS-2-5	7	2	X			X		12/20/94	900													
AS-2-7	8	2	X			X		12/20/94	903	X												
AS-2-12	9	2	X			X		12/20/94	912		X											
AS-2-15	10	2	X			X		12/20/94	930							/						
AS-2-17	11	2	X			X		12/20/94	940													
AS-2-19	12	2	X			X		12/20/94	945													
AS-2-22	13	2	X			X		12/20/94	1000						-							
AS-2-24	14	2	X			X		12/20/94	1010													
TMW-1-5	15	2	X			X		12/20/94	1320													
TMW-1-10	16	2	X			X		12/20/94	1330													

Special detection Limit/reporting

Special QA/QC

Remarks: Please hold remaining samples

Lab number: 412178

Turnaround time

- Priority Rush 1 Business Day ☐
- Rush 2 Business Days ☐
- Expedited 5 Business Days ☐
- Standard 10 Business Days ☒

Condition of sample:

Temperature received:

	Date	Time	
Relinquished by sampler: Ron Bruce	12/12/94	1000	Received by: ENA Courier
Relinquished by	Date	Time	Received by
Relinquished by	Date	Time	Received by laboratory: Date 12.22.94 Time 1350

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant

APPC-3292 (2-91)

ARCO Products Company
Division of AtlanticRichfieldCompany

Task Order No. 836-94-3

Chain of Custody

ARCO Facility no. 836	City (Facility) Bellevue	Project manager (Consultant) Andy Smith	Laboratory name ATI
ARCO engineer Chuck Hutchens	Telephone no. (ARCO) 485-8792	Telephone no. (Consultant) (206)649-9663	Fax no. (Consultant) -0409	Contract number 88101
Consultant name Delta Environmental Consultants	Address (Consultant) 3150 Richards Rd Suite 100 Bellevue, Wa 98005		Method of shipment

Sample I.D.	Lab no.	Container no.	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: Acid	Sampling date	Sampling time	BTEX 602/EPA 8020	BTEX/TPH EPA M602/8020/8015	TPH Modified 8015 Gas ☐ Diesel ☐	Oil and Grease 413.1 ☐ 413.2 ☐	TPH EPA 418.1/SM503E	EPA 601/8010	EPA 624/8240	EPA 625/8270	TCLP Metals ☐ Semi VOA ☐ VOA ☐	CAM Metals EPA 6010/7000 TTLC ☐ STLC ☐	Lead Org./DHS ☐ Lead EPA 7420/7421 ☐		
TMW-1-14	17	2	X			X		12/20/94	1340													
TMW-2-5	18	2	X			X		12/20/94	1150													
TMW-2-10	19	1	X			X		12/20/94	1200													
TMW-2-14	20	1	X			X		12/20/94	1210													
MW-7-6	21	2	X			X		12/20/94	1445		X	X		X								
MW-7-7	22	1	X			X		12/20/94	1500													
MW-7-10	23	2	X			X		12/20/94	1510													
MW-7-15	24	1	X			X		12/20/94	1520													
MW-7-19	25	1	X			X		12/20/94	1530													
FBR-1X																						
SPLIT																						

Special detection Limit/reporting

Special QA/QC

Remarks: Please Hold remaining Samples.

Lab number 412178

Turnaround time

- Priority Rush 1 Business Day ☐
- Rush 2 Business Days ☐
- Expedited 5 Business Days ☐
- Standard 10 Business Days ☒

Condition of sample:

Temperature received:

	Date	Time			
Relinquished by sampler: Ron Bruce	12/22/94	1000	Received by: ENA Collier		
Relinquished by	Date	Time	Received by		
Relinquished by	Date	Time	Received by laboratory: Brian Leader	Date 12-22-94	Time 1350

Distribution: White copy — Laboratory; Canary copy — ARCO Environmental Engineering; Pink copy — Consultant
APPC-3292 (2-91)

APPENDIX C

Standard Operating Procedures
for
Conducting Air Sparge/Soil Vapor Extraction Pilot Tests

APPENDIX C

DELTA ENVIRONMENTAL CONSULTANTS, INC.

Standard Operating Procedure

for

Conducting an Air Sparge/Soil Vapor Extraction Pilot Test

1.0 Scope and Application

Delta Environmental Consultants, Inc. (Delta) has developed the following Standard Operating Procedure (SOP) to conduct an air sparge/soil vapor extraction (AS/SVE) pilot test. The objective of this SOP is to establish guidelines to conduct an AS/SVE pilot test. An AS/SVE pilot test is conducted to study the feasibility of utilizing the combined technologies of air sparge (AS) and soil vapor extraction (SVE) in order to remediate petroleum hydrocarbon-impacted soil and groundwater. The pilot test is conducted in the following steps: (1) AS only; (2) SVE only; and (3) combined AS and SVE. By conducting the pilot tests in steps, the individual and combined effects of the technologies can be evaluated.

2.0 Required Equipment and Supplies

Quantity	Description
1	Electronic water level indicator.
1	Dissolved oxygen (DO) meter.
1	Air compressor.
1	SVE unit with off-gas treatment (provided and operated by a subcontractor).
As required	Pressure and temperature monitoring devices (provided by the subcontractor).
As needed	Tools required to remove well box cover (typically a standard socket set). Also requires the appropriate key to unlock well plugs.
As needed	Decontamination supplies (See SOP for Field Equipment Decontamination).

3.0 Procedures (AS Only)

3.1 Identify the AS/SVE test point at the site.

3.2 Select the appropriate observation wells. The observation wells should be situated at varying distances from the AS/SVE test point. Typically, the distances between the AS/SVE test point and the observation wells range from 7 to 20 feet.

3.3 Measure the depth to water in the observation wells using a water level indicator. The procedures for measuring the depth to water are detailed in the SOP for Groundwater Level Measurements.

3.4 Measure the DO in the observation wells using a calibrated DO meter. The procedures for operating the DO meter are detailed in the instruction manual provided by the manufacturer.

3.5 Connect an air line from the air compressor to the AS test well.

3.6 Begin to inject air into the AS test well. The injected air flowrate and pressure depends on site-specific conditions.

3.7 At regular intervals, monitor the following test parameters: injection flowrate, injection air pressure, the water level, and DO in each of the observation wells. Also note visual observations such as bubbling in the observation wells. Typically, DO meters require substantial time to stabilize before a representative reading can be obtained. To minimize any delays in obtaining the DO reading, dedicated DO meters are placed within the observation wells.

3.8 Continue to monitor the AS test parameters until they have stabilized. Following stabilization of the AS test parameters, the AS test is completed. If desired, a different injection air flowrate and pressure could be selected and another AS test could be performed. It is suggested that a minimum of two AS tests are conducted to evaluate the relationship between injection flowrate and pressure.

3.9 Upon completion of the test, turn off the compressor and detach the air line.

4.0 Procedures (SVE Only)

4.1 Select the appropriate observation wells. The observation wells should be situated at greater distances from the AS/SVE test point than in the AS only test. The radius of influence within the unsaturated zone is usually larger than within the saturated zone.

4.2 Install dedicated pressure monitoring devices to measure the induced vacuum on each of the observation wells.

4.3 Measure the depth to water in the SVE well using a water level indicator. The procedures for measuring the depth to water are detailed in the SOP for Groundwater Level Measurements.

4.4 Connect a vacuum hose from the SVE unit to the SVE test well.

4.5 Begin extracting air from the SVE test point. Slowly increase the extraction flowrate and pressure until a maximum is obtained. Record the maximum flowrate and pressure. Based on the maximum flowrate, select a minimum of three steps to conduct the SVE test.

4.6 Conduct the first step of the SVE test at the lowest selected extraction flowrate.

4.7 At regular intervals, monitor the following test parameters: extraction flowrate, extraction vacuum, vapor temperature at the extraction well, and induced vacuum at each of the observation wells.

4.8 Continue to monitor the SVE test parameters until they have stabilized. Following stabilization, this step of the SVE test is completed. Increase the extraction flowrate to the next highest selected extraction flowrate and return to Step 4.7. Upon completion of a minimum of three steps, go to Step 4.9.

4.9 During the SVE only test, collect an air sample of the extracted vapor using a laboratory-provided Tedlar™ bag.

4.10 Upon completion of the SVE test, request the operator to shut down the SVE unit and detach the vacuum hose.

5.0 Procedures (Combined AS/SVE)

5.1 Conduct the AS only and SVE only tests simultaneously following the procedures outlined above.

5.2 Determine the pilot-scale operating parameters. Remember when selecting the AS/SVE test parameters to keep in mind the full-scale AS/SVE system design criteria. These criteria include a typical maximum air compressor output of 15 pounds per square inch and 48 cubic feet per minute, and a minimum desired ratio of extraction flowrate to injection flowrate of 3:1.