



PACIFIC ENVIRONMENTAL GROUP INC.

400435

DEPARTMENT OF ECOLOGY
NWRO/TCP TANK UNIT

INTERIM CLEANUP REPORT
 SITE CHARACTERIZATION
 FINAL CLEANUP REPORT
 OTHER _____
 AFFECTED MEDIA: SOIL
 OTHER _____ GW
 INSPECTOR (INIT.) W/M DATE 5-19-97

COPY

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DEC 17 1996
DEPT. OF ECOLOGY

November 28, 1995
Project 530-009.5B

Mr. Chuck Hutchens
ARCO Products Company
12520 NE 160th Place
Woodinville, Washington 98072-7960

Re: Remedial System Monitoring Report -August through September 1995
ARCO Service Station No. 6175
3910 South 320th Street
Federal Way, Washington

Dear Mr. Hutchens:

This report presents the results of remedial system monitoring performed by Pacific Environmental Group, Inc. (PACIFIC) at the site referenced above (Figure 1). The remedial system consists of an in-situ soil vapor extraction (SVE) system. Remedial system monitoring was performed monthly.

METHODS

Remedial System Monitoring

PACIFIC performed field monitoring and maintenance of the SVE systems to maintain optimum performance of the system while adhering to operational requirements of Puget Sound Air Pollution Control Agency (PSAPCA) Notice of Construction Number 4505, dated September 30, 1992. The permit allows for a maximum air discharge of 15 pounds per day (lbs/day) of total volatile hydrocarbons (TVH).

Field monitoring of the SVE system consisted of measuring the velocity of vapor flow, the applied vacuum, and the TVH concentration from each vapor extraction well and for the initial and final system configuration. To obtain individual well TVH concentrations, a sample pump was utilized to withdraw a vapor sample through monitoring ports located on each individual well. The vapor sample was then monitored with a flame-ionization detector (FID).

Velocity measurements were obtained through the individual monitoring ports with a Kurz Instruments Model 491 thermal anemometer in feet per minute (ft/min). The flow rate in cubic feet per minute (CFM) was calculated from the flow velocity. Individual vacuum readings were obtained from vacuum gauges located on each individual well. Initial and final system TVH concentrations were monitored through the discharge stack using a FID.

Air bag samples of the system effluent were collected during this monitoring period were analyzed for TVH and BTEX by EPA Method 8015/8020. Analytical results are included in Attachment A. Routine maintenance of the system was also performed during each monitoring event.

FINDINGS

The SVE system operated during the monitoring period with the exception of 26 days in July and August 1995 when the system was shut down manually by unauthorized personnel. TVH concentrations obtained with an FID for the individual wells throughout the monitoring period ranged from a high of > 10,000 parts per million (ppm) for Wells VE-1 and VE-2, to a low of 90 ppm in Well VE-4. Approximately 798 pounds of total volatile hydrocarbons have been removed by the SVE system since start-up. The total mass removed between monitoring events is approximated by calculating an average mass removal rate from the TVH analytical results and flow rates observed at the start and end of the monitoring period. The soil vapor extraction data evaluation is included as Table 1. Individual SVE well monitoring data is included as Table 2.

All four SVE wells (VE-1 through VE-4) remained open during the entire monitoring period.

CONCLUSIONS

Monitoring results indicate that the SVE system has operated within the PSAPCA emission guidelines throughout the monitoring period.

November 28, 1995

Page 3

PACIFIC appreciates the opportunity to be of continuing service to ARCO. Please call if you have any questions concerning the contents of this report.

Sincerely,

Pacific Environmental Group, Inc.



Les Brewer
Staff Geologist



Eric Larsen
Project Manager

Attachments: Table 1 - Soil Vapor Extraction Data Evaluation
Table 2 - Soil Vapor Extraction Monitoring Data
Figure 1 - Site Map
Attachment A - Laboratory Analytical Methods and Reports
Chain-of-Custody Documentation

TABLE 1
SOIL VAPOR EXTRACTION DATA EVALUATION

ARCO Service Station 6175
3910 South 320th Street
Federal Way, Washington

Sample Date	t (days)	td (days)	TVH (ppm)	Flow Rate (cfm)	TVH (lbs/day)	Net TVH (lb)	Total TVH (lb)	Total TVH (gallons)
3/22/95	0	0	37.1	34	0.4	0	0	0
4/21/95	30	0	520*	39	6.7	201	201	30
6/29/95	69	58	193	133	7.5	82	283	42
7/18/95	19	0	523	79	10.9	207	490	73
8/20/95	33	26	48.7	54	7.1	49	539	81
9/12/95	23	0	467	81	6.6	151	690	103
9/25/95	13	0	325	39	8.3	109	798	120

Average Daily Removal Rate (lbs)	7.8
Total Mass Removed (lbs)	798
Total Gallons Removed	120

t = time of period since last sampling
td = down time during period since last sampling
TVH = total volatile hydrocarbons
ppm = parts per million
cfm = cubic feet per minute
lb/day = pounds per day
Net = since last period only
Total = since beginning of operation
* = value obtained from FID reading

TABLE 2
SOIL VAPOR EXTRACTION MONITORING DATA

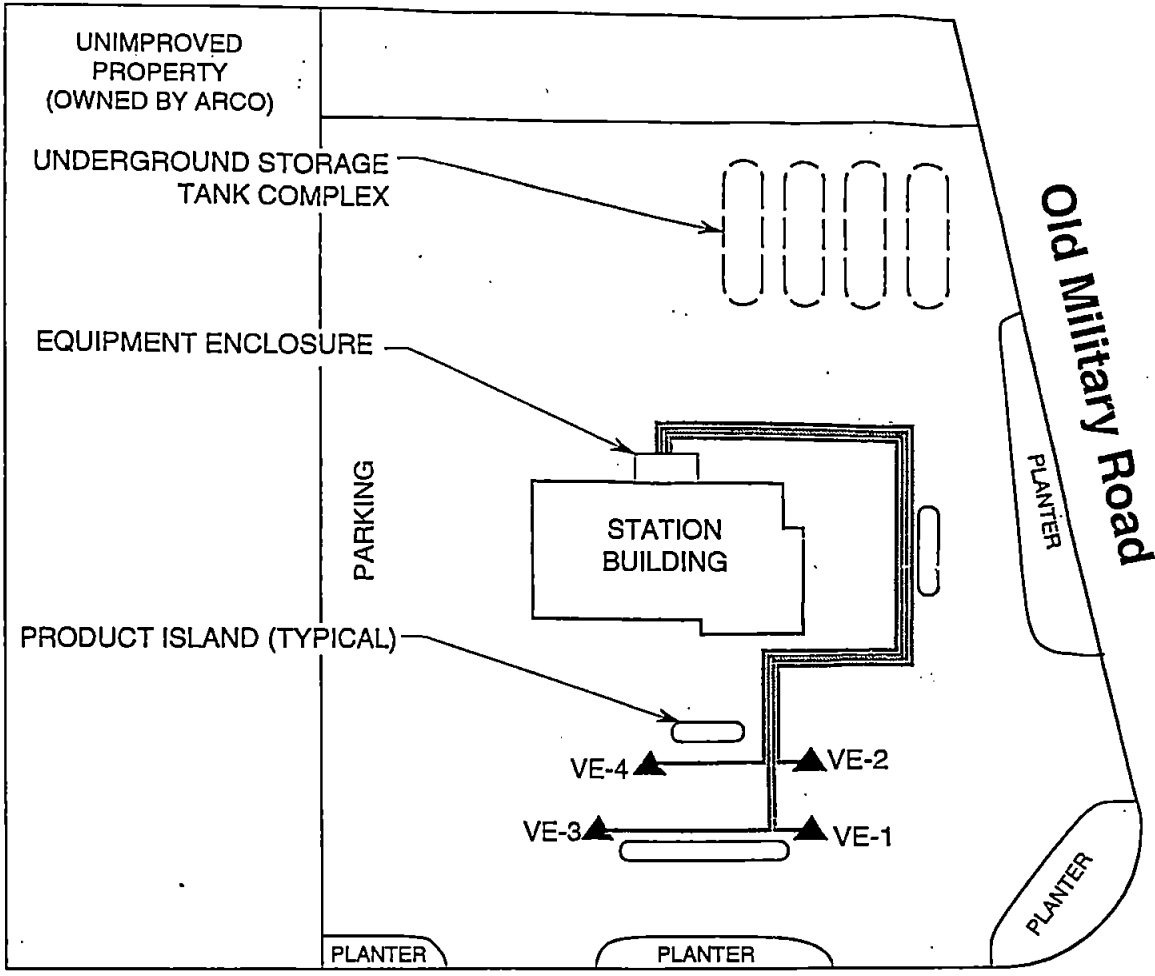
ARCO Service Station 6175
3910 South 320th Street
Federal Way, Washington

Sample Point	Sample Date	On/Off	Vapor Concentration (ppm*)	Vacuum (in H ₂ O)	Flow Rate (CFM)	Mass Removal Rate (lb/day)
VE-1	03/22/95	On	>10,000	47.0	130.9	428.2
	04/21/95	On	>1,000	**	NC	NC
	06/29/95	On	18,911	11.5	4.4	27.0
	07/18/95	On	6,117	10.5	6.5	13.1
	08/20/95	On	3,750	15.0	1.1	1.3
	09/12/95	On	1,850	25.5	2.2	1.3
	09/25/95	On	1,130	28	2.2	0.8
VE-2	03/22/95	On	>10,000	46.0	130.9	428.2
	04/21/95	On	**	**	NC	NC
	06/29/95	On	21,687	11.5	6.5	46.4
	07/18/95	On	8,637	9.5	10.9	30.8
	08/20/95	On	6,700	14.5	4.4	9.6
	09/12/95	On	3,500	25.0	12.0	13.7
	09/25/95	On	2,900	28.0	8.7	8.3
VE-3	03/22/95	On	100	48.0	131	4.3
	04/21/95	On	**	**	NC	NC
	06/29/95	On	18,710	11.5	2.2	13.4
	07/18/95	On	8,474	11.5	2.2	6.0
	08/20/95	On	5,770	15.0	0.0	0.0
	09/12/95	On	2,700	26.5	0.0	0.0
	09/25/95	On	2,200	28.0	0.0	0.0
VE-4	03/22/95	On	90	47.0	131	3.9
	04/21/95	On	>1,000	**	NC	NC
	06/29/95	On	16,308	11.5	2.2	11.6
	07/18/95	On	7,532	12.0	0.0	0.0
	08/20/95	On	4,500	15.0	0.0	0.0
	09/12/95	On	2,500	27.0	0.0	0.0
	09/25/95	On	2,300	28.0	0.0	0.0

TABLE 2
SOIL VAPOR EXTRACTION MONITORING DATA

ARCO Service Station 6175
3910 South 320th Street
Federal Way, Washington

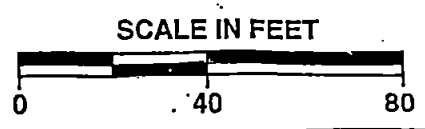
Sample Point	Sample Date	On/Off	Vapor Concentration (ppm*)	Vacuum (in H ₂ O)	Flow Rate (CFM)	Mass Removal Rate (lb/day)
Effluent	03/22/95	On	90	NM	34	1.0
	04/21/95	On	280	10	35	3.2
	06/29/95	On	151	15.5	133	6.5
	07/18/95	On	389	20.5	79	10.0
	08/20/95	On	230	20.5	54	4.1
	09/12/95	On	240	30.0	81	6.4
	09/25/95	On	800	33.0	49	12.8
<p>* = measurement obtained in the field using a flame-ionization detector</p> <p>** = measurement not possible due to the presence of water in the below grade piping.</p> <p>NM = not measured</p> <p>NC = not calculable</p> <p>ppm = parts per million</p> <p>cfm = cubic feet per minute</p> <p>lb/day = pounds per day</p>						



South 320th Street

LEGEND

- VE-3 ▲ SOIL VAPOR EXTRACTION WELL LOCATION AND DESIGNATION
- └─┘ SOIL VAPOR EXTRACTION BELOW GRADE CONVEYANCE PIPING



PACIFIC ENVIRONMENTAL GROUP, INC.

ARCO SERVICE STATION #6175
3910 South 320th Street
Auburn, Washington

SITE MAP

FIGURE:
1
PROJECT:
530-009.4A

ATTACHMENT A
LABORATORY ANALYTICAL METHODS AND REPORTS
CHAIN-OF-CUSTODY DOCUMENTATION

ATTACHMENT A

Laboratory Analytical Methods

Analysis for TPH-gasoline was performed according to method WTPH-G. Benzene, toluene, ethylbenzene, and xylenes analysis was performed in accordance with EPA Method 8020/602. A methanol solvent extraction was used for the TPH analysis with final detection by gas chromatography using a flame-ionization detector. A headspace or purge and trap technique was utilized for BTEX analysis. Final detection was by gas chromatography using a photoionization detector.



September 5, 1995

Service Request No.: B950638

Les Brewer
Pacific Environmental Group, Inc.
4020 148th Avenue NE, Suite B
Redmond, WA 98052

Re: ARCO #6175 - Auburn/Project #530-009.5B

Dear Les:

Attached are the results of the sample(s) submitted to our laboratory on August 21, 1995. Preliminary results were transmitted via facsimile on September 5, 1995. For your reference, these analyses have been assigned our service request number B950638.

All analyses were performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and CAS is not responsible for use of less than the complete report. Results only apply to samples analyzed.

Please call if you have any questions.

Respectfully submitted,

Columbia Analytical Services, Inc.

A handwritten signature in black ink, appearing to read "Colin B. Elliott".

Colin B. Elliott
Laboratory Manager

Columbia Analytical Services, Inc.

A handwritten signature in black ink, appearing to read "Dave Cogan".

Dave Cogan
Quality Assurance Coordinator

CBE/bdr

Page 1 of 6

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Pacific Environmental Group
Project: ARCO #6175 - Auburn
Sample Matrix: Air

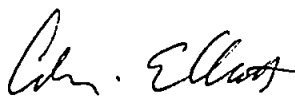
Service Request: B950638
Date Collected: 8/20/95
Date Received: 8/21/95
Date Extracted: NA
Date Analyzed: 8/22/95

BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015

Sample Name: EFFL
Lab Code: B950638-01

	MRLs		Results	
	ug/L	uL/L (ppmv)	ug/L	uL/L (ppmv)
Benzene	0.05	0.02	0.13	0.04
Toluene	0.05	0.01	3.68	0.98
Ethylbenzene	0.05	0.01	2.42	0.56
Total Xylenes	0.05	0.01	32.6	7.50
TPH	2	0.5	199	48.7

Approved By: _____



Date: _____

9/5/95

4A/102194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Pacific Environmental Group
Project: ARCO #6175 - Auburn
Sample Matrix: Air

Service Request: B950638
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 8/22/95

BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015

Sample Name: Method Blank
Lab Code: B950638-MB

	MRLs		Results	
	ug/L	uL/L (ppmv)	ug/L	uL/L (ppmv)
Benzene	0.05	0.02	ND	ND
Toluene	0.05	0.01	ND	ND
Ethylbenzene	0.05	0.01	ND	ND
Total Xylenes	0.05	0.01	ND	ND
TPH	2	0.5	ND	ND

Approved By: _____

Ch. Elliott

Date: _____

9/5/95

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Pacific Environmental Group
Project: ARCO #6175 - Auburn
Sample Matrix: Air

Service Request: B950638
Date Collected: 8/20/95
Date Received: 8/21/95
Date Extracted: NA
Date Analyzed: 8/22/95

Duplicate Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015
ug/L

Sample Name: EFFL
Lab Code: B950638-01

Analyte	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	CAS RPD Acceptance Limit
Benzene	0.05	0.13	0.14	0.14	7	30
Toluene	0.05	3.68	3.87	3.78	5	30
Ethylbenzene	0.05	2.42	2.49	2.46	3	30
Total Xylenes	0.05	32.6	33.9	33.3	4	30
Total Petroleum Hydrocarbons	2	199	209	204	5	30

Approved By: _____

Alan Elliott

Date: 9/5/95

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Pacific Environmental Group
Project: ARCO #6175 - Auburn
LCS Matrix: Air

Service Request: B950638
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 8/22/95

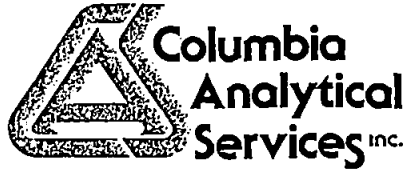
Laboratory Control Sample Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015
ug/L

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Benzene	34	35	103	60-137
Toluene	41	42	102	56-130
Ethylbenzene	34	35	103	55-130
Total Petroleum Hydrocarbons	2,240	2520	113	53-135

Approved By: _____
LCS/102194

Cole Elliott

Date: 9/15/95



September 19, 1995

Service Request No.: B950694

Les Brewer
Pacific Environmental Group, Inc.
4020 148th Avenue NE, Suite B
Redmond, WA 98052

Re: **ARCO #6175 - Auburn, Military Road/Project #530-009.5B**

Dear Les:

Attached are the results of the sample(s) submitted to our laboratory on September 13, 1995. For your reference, these analyses have been assigned our service request number B950694.

All analyses were performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and CAS is not responsible for use of less than the complete report. Results only apply to samples analyzed.

Please call if you have any questions.

Respectfully submitted,

Columbia Analytical Services, Inc.

A handwritten signature in black ink, appearing to read "Colin B. Elliott", written in a cursive style.

Colin B. Elliott
Laboratory Manager

CBE/bdr

Page 1 of 6

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Pacific Environmental Group
Project: ARCO #6175 - Auburn, Military Road
Sample Matrix: Air

Service Request: B950694
Date Collected: 9/12/95
Date Received: 9/13/95
Date Extracted: NA
Date Analyzed: 9/15/95

BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015

Sample Name: EFFL
Lab Code: B950694-01

	MRLs		Results	
	ug/L	uL/L (ppmv)	ug/L	uL/L (ppmv)
Benzene	0.05	0.02	12.3	3.86
Toluene	0.05	0.01	66.3	17.6
Ethylbenzene	0.05	0.01	12.6	2.9
Total Xylenes	0.05	0.01	112	25.8
TPH	2	0.5	1910	467

Approved By: _____

Ch. Elliott

Date: _____

9/20/95

4A/102194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Pacific Environmental Group
Project: ARCO #6175 - Auburn, Military Road
Sample Matrix: Air

Service Request: B950694
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 9/15/95

BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015

Sample Name: Method Blank
Lab Code: B950694-MB

	MRLs		Results	
	ug/L	uL/L (ppmv)	ug/L	uL/L (ppmv)
Benzene	0.05	0.02	ND	ND
Toluene	0.05	0.01	ND	ND
Ethylbenzene	0.05	0.01	ND	ND
Total Xylenes	0.05	0.01	ND	ND
TPH	2	0.5	3	0.6

Approved By: _____

Ch. Elliott

Date: 9/20/95

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Pacific Environmental Group
Project: ARCO #6175 - Auburn, Military Road
LCS Matrix: Air

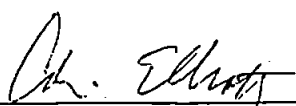
Service Request: B950694
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 9/15/95

Laboratory Control Sample Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015
ug/L

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Benzene	34	32	94	60-137
Toluene	41	37	90	56-130
Ethylbenzene	34	30	88	55-130
Total Petroleum Hydrocarbons	2,240	3160	(a)141	53-135

(a) Outside of acceptance limits. Sample could not be re-analyzed within the recommended maximum holding time.

Approved By: _____
LCS/102194



Date: 9/20/95



October 10, 1995

Service Request No.: B950742

Thomas Redd
Pacific Environmental Group, Inc.
4020 148th Avenue NE, Suite B
Redmond, WA 98052

Re: **ARCO #6175 - Auburn/Project #530-009.5A**

Dear Thomas:

Attached are the results of the sample(s) submitted to our laboratory on September 26, 1995. For your reference, these analyses have been assigned our service request number B950742.

All analyses were performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and CAS is not responsible for use of less than the complete report. Results only apply to samples analyzed.

Please call if you have any questions.

Respectfully submitted,

Columbia Analytical Services, Inc.

A handwritten signature in cursive script, appearing to read "Colin B. Elliott".

Colin B. Elliott
Laboratory Manager

Columbia Analytical Services, Inc.

A handwritten signature in cursive script, appearing to read "Dave Cogan".

Dave Cogan
Quality Assurance Coordinator

CBE/bdr

Page 1 of 6

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Pacific Environmental Group
Project: ARCO #6175 - Auburn
Sample Matrix: Air

Service Request: B950742
Date Collected: 9/25/95
Date Received: 9/26/95
Date Extracted: NA
Date Analyzed: 9/27/95

BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015

Sample Name: Effl
Lab Code: B950742-01

	MRLs		Results	
	ug/L	uL/L (ppmv)	ug/L	uL/L (ppmv)
Benzene	0.05	0.02	9.24	2.89
Toluene	0.05	0.01	49.8	13.2
Ethylbenzene	0.05	0.01	8.49	1.96
Total Xylenes	0.05	0.01	111	25.6
TPH	2	0.5	1330	325

Approved By: *Patricia Elliott*

Date: 10/10/95

4A/102194

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Pacific Environmental Group
Project: ARCO #6175 - Auburn
Sample Matrix: Air

Service Request: B950742
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 9/27/95

BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015

Sample Name: Method Blank
Lab Code: B950742-MB

	MRLs		Results	
	ug/L	uL/L (ppmv)	ug/L	uL/L (ppmv)
Benzene	0.05	0.02	ND	ND
Toluene	0.05	0.01	ND	ND
Ethylbenzene	0.05	0.01	ND	ND
Total Xylenes	0.05	0.01	ND	ND
TPH	2	0.5	4	1.0

Approved By: _____

John Elliott

Date: _____

10/10/95

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Pacific Environmental Group
Project: ARCO #6175 - Auburn
Sample Matrix: Air

Service Request: B950742
Date Collected: 9/25/95
Date Received: 9/26/95
Date Extracted: NA
Date Analyzed: 9/27/95

Duplicate Summary
 BTEX and TPH as Gasoline
 EPA Methods 5030/8020/Modified 8015
 ug/L

Sample Name: Effl
Lab Code: B950742-01

Analyte	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	CAS RPD Acceptance Limit
Benzene	0.05	9.24	9.10	9.17	2	30
Toluene	0.05	49.8	50.7	50.3	2	30
Ethylbenzene	0.05	8.49	8.26	8.4	3	30
Total Xylenes	0.05	111	117	114	5	30
Total Petroleum Hydrocarbons	2	1330	1360	1345	2	30

Approved By: _____

Col. Elliott

Date: 10/10/95

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Pacific Environmental Group
Project: ARCO #6175 - Auburn
LCS Matrix: Air

Service Request: B950742
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 9/27/95

Laboratory Control Sample Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/Modified 8015
ug/L

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits
Benzene	34	33	97	60-137
Toluene	41	38	93	56-130
Ethylbenzene	34	32	94	55-130
Total Petroleum Hydrocarbons	2,240	1940	87	53-135

Approved By: _____

C. Elliott

Date: _____

10/10/95

LCS102194

