



Restover Truck Stop Ground Water Monitoring - January and July 1999

Summary

This progress report is one in a series describing the results of ground water sampling at Restover Truck Stop. This report describes the results of samples collected in January and July 1999 for benzene, toluene, ethylbenzene, and total xylenes (BTEX), as well as total petroleum hydrocarbons as gasoline (TPH-G). Ecology has conducted ground water sampling at this site from 1987 to the present. To remediate soil and ground water contamination, an Interim Action consisting of an air sparge/vapor extraction system (VES) was initiated in the summer of 1993. Operation of the VES was terminated in the fall of 1997, since BTEX concentrations had substantially decreased and continued operation of the system was no longer cost efficient. In the fall of 1998 and early 1999 the VES and most of the remaining monitoring wells were decommissioned.

Since monitoring began in 1987, BTEX concentrations have decreased substantially. Well WDOE-6A (Figure 1) is the only well in which BTEX concentrations continue to be elevated. In January, Model Toxic Control Act (MTCA) cleanup levels were exceeded in WDOE-6A for benzene, ethylbenzene and total xylene, as well as for TPH. In July, MTCA cleanup levels were exceeded in WDOE-6A for total xylene and TPH. Benzene and toluene were not detected in well WDOE-6A in July due to high quantitation limits.

Results

In January and July 1999 ground water samples were collected from four upper aquifer wells (Figure 1). The upper aquifer consists of recessional outwash. This unit is underlain by the Vashon Till, which is a regional aquitard, and advance outwash deposits that form a lower aquifer.

Field Observations

Depth-to-water measurements, purge volume, pH, specific conductance, and temperature results for both sample events are listed in Table 1. Water purged from monitoring well WDOE-6A continues to have a strong hydrocarbon odor and cloudy appearance. During initial purging, rust colored precipitate was removed from wells MW-30 and MW-8A. Sampling procedures are discussed in Appendix A.

Table 1. Summary of Field Parameters Results for January 20 and July 27, 1999.

<i>Monitoring Well</i>	<i>Total Depth (feet)</i>	<i>Depth to Water (feet)</i>	<i>pH (Standard Units)</i>	<i>Specific Conductance (umhos/cm)</i>	<i>Temperature (°C)</i>	<i>Purge Volume (gallons)</i>
<i>January 1999</i>						
MW-8A	21.01	5.86	5.8	70	10.3	10
MW-30	16.78	5.30	6.2	170	12.1	45
MW-31	13.47	5.83	5.7	115	12.3	10
WDOE-6A	21.68	6.38	6.2	160	12.5	7
<i>July 1999</i>						
MW-8A	21.01	12.55	5.7	135	10.9	6
MW-30	16.78	11.02	6.2	210	13.4	15
MW-31	13.47	12.23	5.7	145	13.1	0.5
WDOE-6A	21.68	13.04	6.1	201	12.7	6

Analytical Results

Analytical results for BTEX and TPH-G, as well as MTCA ground water cleanup standards, for both sample events are shown in Table 2. In January and July, samples were collected from monitoring wells MW-8A, MW-30, MW-31 and WDOE-6A. A duplicate sample (MW-6A) was collected from well WDOE-6A. Results for WDOE-6A listed in this memo represent the average concentration of the analytes detected. Discussion of quality assurance along with the laboratory reporting sheets for both sample rounds are presented in Appendix B.

Table 2. Analytical Results (µg/L) for January 20 and July 27, 1999.

<i>Monitoring Well</i>	<i>Benzene</i>	<i>Toluene</i>	<i>Ethylbenzene</i>	<i>Total Xylene</i>	<i>Total BTEX</i>	<i>TPH-G (Total TPH)</i>
MTCA Cleanup Std.	5.0	40.0	30.0	20.0		1000.0
<i>January 1999</i>						
MW-8A	1 U	1 U	5 U	3 U	5 U	260
MW-30	2.8	1 U	2 J	1.55 J	6.4	430
MW-31	1.1	1 U	5 U	3 U	1.1	120 U
WDOE-6A	29	15	76	300	420	7900
MW-6A (dup)*	27	14	74	289	404	7700
<i>July 1999</i>						
MW-8A	1 U	1 U	1 U	3 U	3 U	60 U
MW-30	1 U	1 U	1 U	3 U	3 U	60 U
MW-31	1.5	1 U	1 U	3 U	1.5	60 U
WDOE-6A	20 U	20 U	24	60 J	84 J	7700
MW-6A (dup)*	20 U	20 U	36	68 J	104 J	7400

U : The analyte was not detected at or above the reported value.

J : The analyte was positively identified. The associated numerical result is an estimate.

* : MW-6A is a duplicate sample of WDOE-6A.

In January, all four BTEX compounds were detected in WDOE-6A with an average total concentration of 412 µg/L. Benzene, ethylbenzene and total xylene were detected in MW-30 near the quantitation limit. TPH-G concentrations in wells MW-8, MW-30 and WDOE-6A were 260 µg/L, 430 µg/L and 7,800 µg/L, respectively.

In July, ethylbenzene and total xylene were detected in WDOE-6A with an estimated average total concentration of 94 µg/L. Benzene and toluene were not detected in this well during this round of sampling due to high quantitation limits. The average TPH-G concentration in well WDOE-6A was 7,550 µg/L.

Of the wells sampled over the monitoring period, WDOE-6A is the only well that continues to have volatile organic concentrations that exceed MTCA cleanup standards. Table 3 shows BTEX concentrations for select monitoring wells over the monitoring period from 1987 to 1999. Figure 2 shows BTEX concentrations for wells WDOE-6A and MW-8A for the same time period. Concentrations were relatively stable in both wells from August 1991 to February 1995. Since February 1995, BTEX concentrations in well WDOE-6A have been gradually decreasing. In April 1996, high BTEX concentrations were detected in this well. There is no apparent explanation for this increase. Overall, BTEX has not been detected in well MW-8A since February 1995. The decrease in BTEX concentrations in 1995 coincides with operation of the VES, which was initiated in the summer of 1993. Operation of the VES was terminated in the fall of 1997, since BTEX concentrations had substantially decreased. The VES and most of the remaining monitoring wells were decommissioned in the fall of 1998 and early 1999.

Conclusions

1. WDOE-6A is the only well that continues to have elevated BTEX concentrations. Since 1995, BTEX concentrations in this well have been gradually decreasing.
2. In January, Model Toxic Control Act (MTCA) cleanup levels were exceeded in WDOE-6A for benzene, ethylbenzene, total xylene, and TPH. In July, MTCA cleanup levels were exceeded in WDOE-6A for total xylene and TPH. Benzene, which typically exceeds MTCA cleanup levels in this well, was not detected during the July round of sampling due to high quantitation limits.

Recommendations

1. Monitoring wells WDOE-6A, MW-8A, MW-30, and MW-31, which are located on the Restover property, should continue to be sampled for BTEX and TPH-G.

References

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Washington State Department of Ecology. 1994. Manchester Environmental Laboratory - Laboratory Users Manual.

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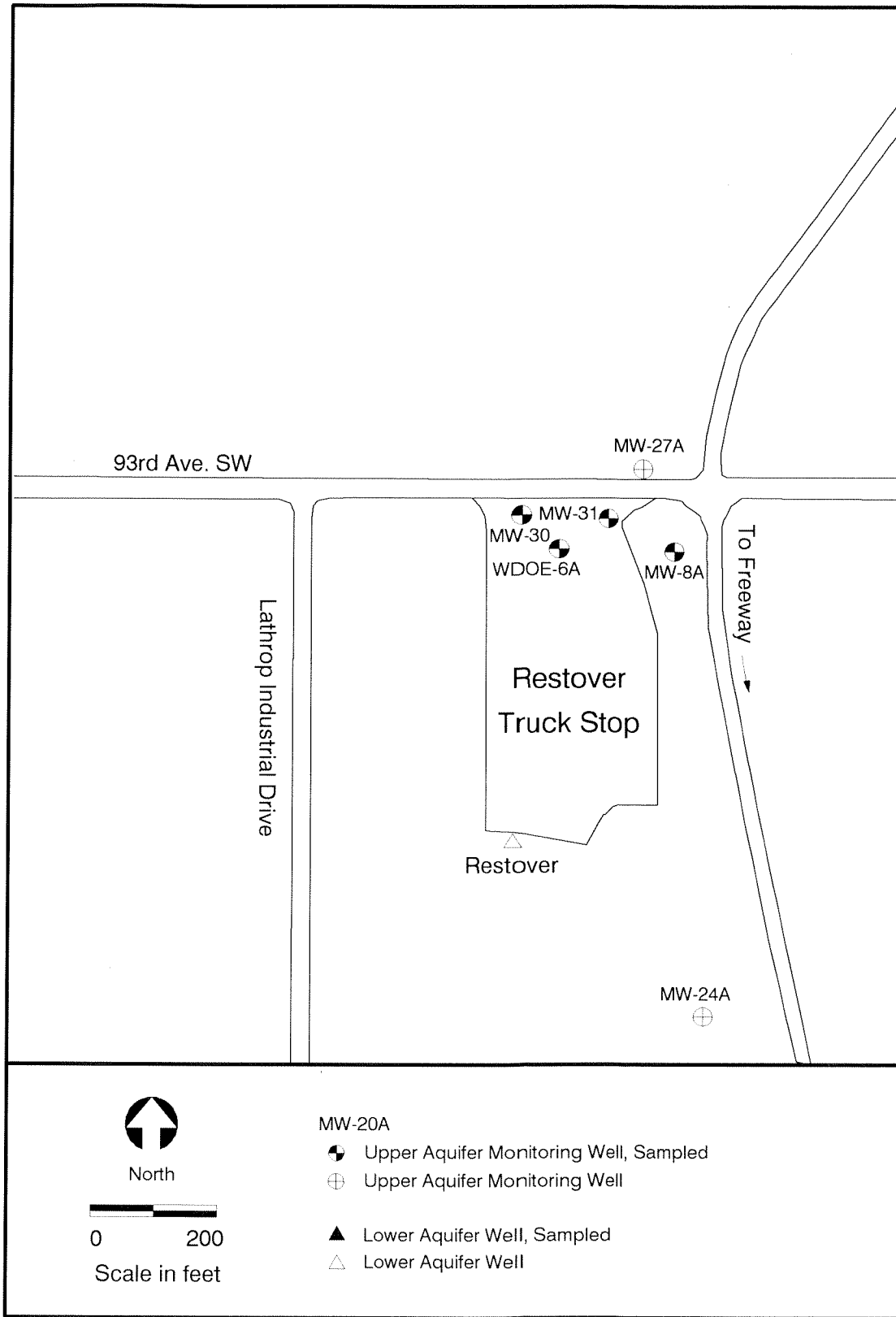


Figure 1: Well Locations, Restover Truck Stop

Table 3: Historical Restover Truck Stop BTEX Concentrations (ug/L) from May 1987 to July 1999

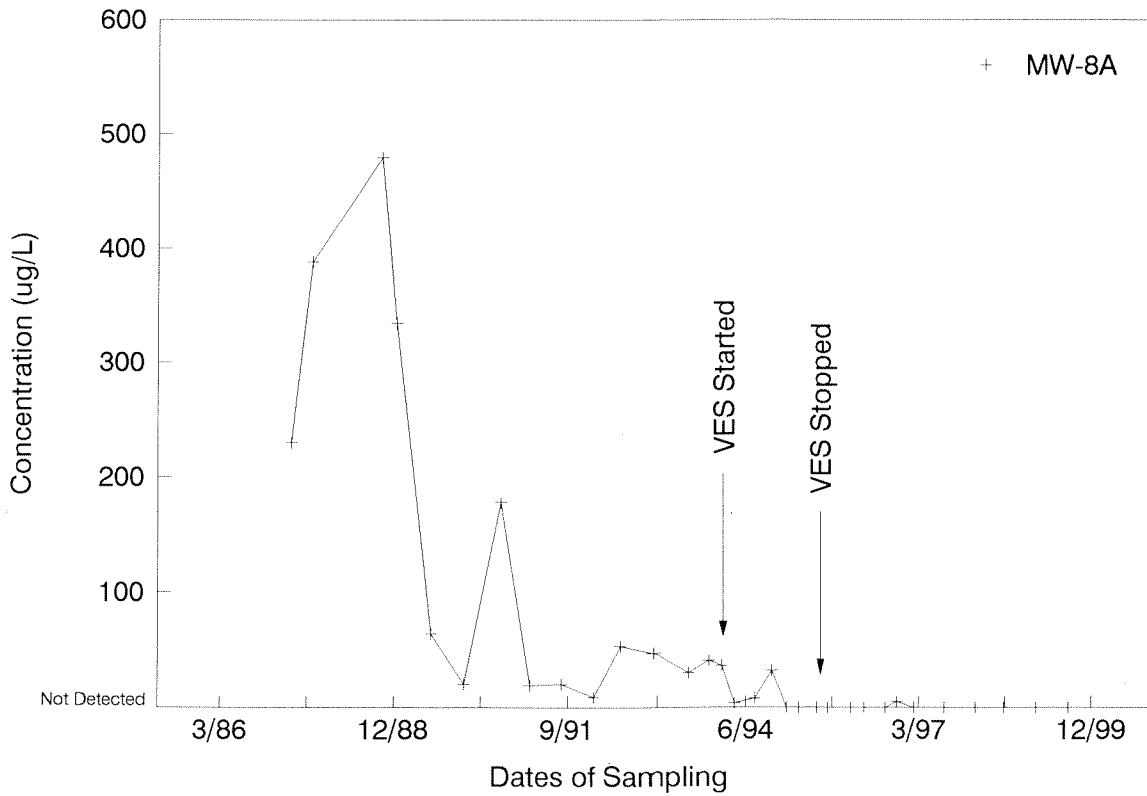
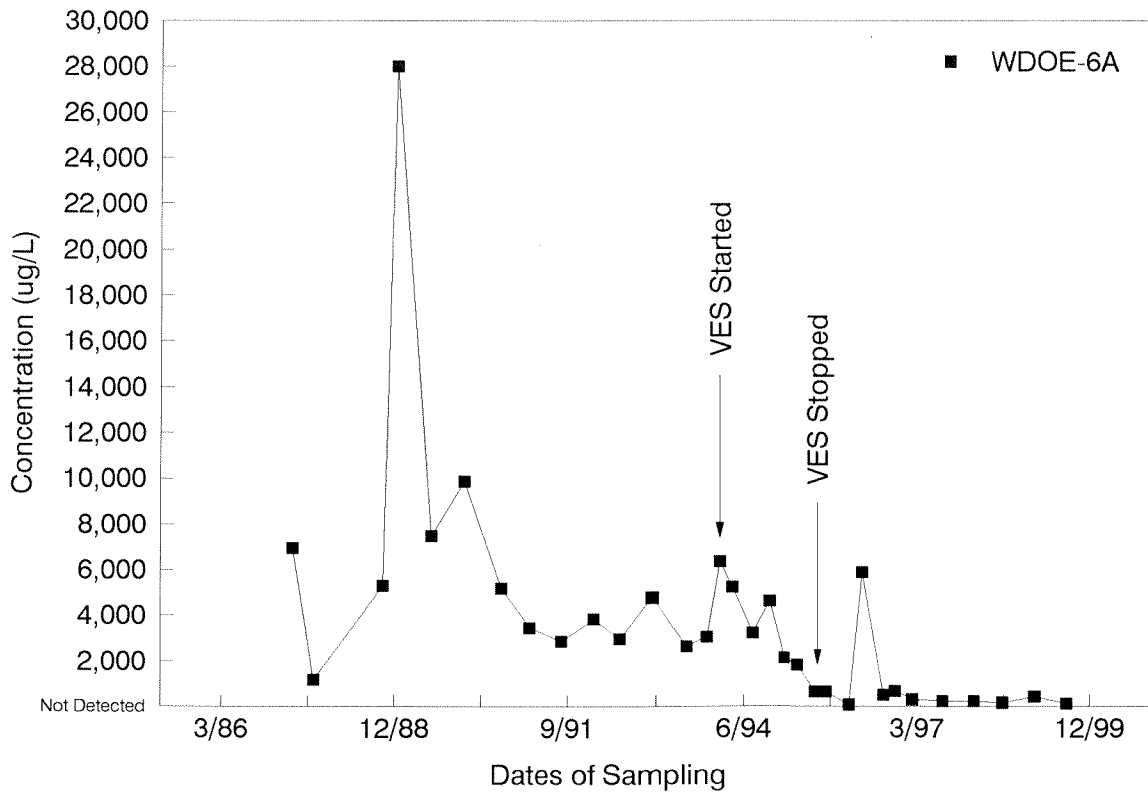
Well Number	May 1987	September 1987	October 1988	January 1989	July 1989	January 1990	August 1990	February 1991	August 1991	February 1992	July 1992	January 1993	July 1993	November 1993	January 1994	April 1994
Upper Aquifer																
WDOE-6A	6950	1180	5300	28000	7490	9870	5190	3460	2840	3830	2990	4784	2620	3070	6360	5242
MW-8A	230 ¹	388 ¹	479 ¹	334 ¹	64 ²	20 ²	178 ²	19 ²	20 ²	9 ²	53 ²	47 ²	30 ²	41 ²	36 ²	4 ²
MW-15A	1433	--	--	ND	218	--	285	122	--	--	--	--	--	--	--	--
MW-17	ND	ND	ND	ND	ND	--	ND	ND	ND	--	2.7	ND	--	--	--	--
MW-20A	126	--	--	--	--	20	1400	5	293	11	452	--(Dry)	162	--(Dry)	ND	59
MW-30	-	-	-	-	-	-	-	-	-	-	-	-	-	--(Dry)	--(Dry)	2400
MW-9A	727	--	--	--	--	--	--	--	--	--	--	--	--	--	--(Dry)	366
Lower Aquifer																
Restover	--	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.4	--	ND	--
Spencer	ND	ND	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--	--
MW-12	53	5	8	ND	4	ND	6	ND	--	--	--	--	1.7	--	--	--
Upper Aquifer																
WDOE-6A	3214	4624	2120	1829	638	646	61	5900	488 ²	664 ²	310 ²	212 ²	214 ²	158 ²	412 ²	92 ²
MW-8A	8 ¹	32 ²	ND	ND	ND	ND	ND	ND	ND	5	ND	ND	ND	ND	ND	ND
MW-15A	--	--	ND	--	2	--	ND	--	--	--	ND	--	--	--	Well Decommissioned	--
MW-17	--	--	--	--	--	--	--	--	--	--	--	--	--	--	Well Decommissioned	--
MW-20A	--(Dry)	ND	ND	ND	18	--(Dry)	ND	ND	1	6	ND	ND	ND	ND	Well Decommissioned	--
MW-30	--(Dry)	--(Dry)	8	8	7	ND	5	19	ND	1	ND	ND	2.5	ND	6.4	ND
MW-31	-	-	-	-	--(Dry)	--(Dry)	7.1	ND	--(Dry)	--(Dry)	ND	3.6	--	--(Dry)	1.1	1.5
MW-9A	--	--	ND	--	1	--	ND	--	--	--	ND	--	--	--	Well Decommissioned	--
Lower Aquifer																
Restover	--	--	--	--	ND	--	--	--	--	--	--	--	--	--	--	--
Spencer	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MW-12	--	--	1.1	--	Well Decommissioned	--	--	--	--	--	--	--	--	--	--	--
MW-12A	-	-	-	-	0.5	--	ND	--	--	--	ND	--	--	--	Well Decommissioned	--

ND: Compound Not Detected

¹: Value is based on one sample.

²: Value represents the mean of duplicate samples.

--: Compound Not Tested



BTEX Concentrations in WDOE-6A and MW-8A from May 1987 to July 1999

Figure 2

Appendix A

Methods

Ground Water Sampling

In January and July, samples for benzene, toluene, ethylbenzene, and xylene (BTEX) as well as total petroleum hydrocarbons as gasoline (TPH-G), were collected from four upper aquifer monitoring wells.

Prior to sampling, static water level measurements were obtained from monitoring wells using an electronic water level probe. The probe was rinsed with deionized water and wiped clean between measurements. Based on the purge volume, wells were purged with either a teflon bailer or submersible pump. Wells were purged until pH, specific conductance and temperature readings stabilized, and a minimum of three well volumes had been removed. Purge water was discharged onto the ground near each well, except for well WDOE-6A. Purge water from this well was collected in a 55-gallon barrel and stored with other vapor extraction system waste in the enclosed tank area. This waste will be transported and disposed in accordance with State of Washington regulations (Chapter 173-340-400 WAC).

Monitoring well samples were collected using decontaminated, bottom-emptying teflon bailers. Bailers were pre-cleaned with sequential washes of Liquinox®, hot tap water, 10% nitric acid, distilled-deionized water and pesticide-grade acetone. After cleaning, bailers were air-dried and wrapped in aluminum foil. Samples for BTEX and TPH-G analysis were collected free of headspace and preserved with 1:1 hydrochloric acid.

Chain-of-custody procedures were followed in accordance with Manchester Laboratory protocol (Ecology, 1994). The Ecology/EPA Laboratory in Manchester analyzed all samples.

Appendix B

Quality Assurance

In general the quality of the data is acceptable for use for both sample rounds. BTEX samples were analyzed using EPA method 8260 in January and EPA SW-846 Method 8020 in July (U.S. EPA, 1986), and TPH-G samples were analyzed using Washington State Method NWTPH-GX (Ecology, 1994). In July, benzene and toluene were not detected in well WDOE-6A or the duplicate sample MW-6A due to high quantitation limits. o-Xylene concentrations were also reported as estimates for these two samples. Total BTEX concentrations for these samples should be considered estimates as qualified.


Quality control samples collected in the field consisted of a blind field duplicate. Duplicate samples for BTEX and TPH-G were obtained from monitoring well WDOE-6A. Duplicate samples collected at WDOE-6A provide an estimate of combined sampling and laboratory precision. The numeric comparison of duplicate results is expressed as the relative percent difference or RPD. RPDs are the ratio of the difference and the mean of the duplicate results expressed as a percentage. The RPD for the January duplicate samples were within 7%. The RPD for the July duplicate samples were 30% for ethylbenzene, 13% for total xylene and 4% for TPH-G.

In addition to field quality control samples, a matrix spike, matrix spike duplicate and surrogate compound recoveries were performed in the laboratory. Most of the surrogate spike recoveries were within the control limits of 50-150%. Recoveries were not calculated in some cases where there was positive interference with 1,4-difluorobenzene. Matrix spikes for BTEX and TPH-G were within acceptable limits. Myrna Mandjikov, Karin Feddersen, and Bob Carrell of the Manchester Laboratory conducted the quality assurance review, which has been included in Appendix A.

Manchester Environmental Laboratory

7411 Beach Drive E, Port Orchard Washington 98366

February 5, 1999

Subject: **Restover Truck Stop**
Samples: 99038105 through 99038109
Project ID: 1044-99
Project Officer: Pam Marti
By: Karin Feddersen 

BTEX

SUMMARY:

Due to problems with the instrument normally used to analyze for BTEX compounds, these samples were analyzed for BTEX on the GC/MS. No extra charge was incurred.

The data is usable as reported.

ANALYTICAL METHODS:

Volatile organic compounds were analyzed using the Manchester Laboratory modification of the EPA Method 8260 purge-trap procedure and capillary Gas Chromatography with Mass Spectrometer (GC/MS) analysis. Routine QA/QC procedures were performed.

BLANKS:

No target compounds were detected in the laboratory blank.

SURROGATES:

Surrogate recoveries were within acceptable limits for all samples.

HOLDING TIMES:

The samples were analyzed within the recommended 14 day holding time.

MATRIX SPIKE AND MATRIX SPIKE DUPLICATE:

Aliquots of sample 99038105 were spiked and analyzed with the samples. All matrix spike recoveries were within acceptable limits.

DATA QUALIFIER CODES:

- U - The analyte was not detected at or above the reported value.
- J - The analyte was positively identified. The associated numerical value is an estimate.
- UJ - The analyte was not detected at or above the reported estimated result.
- REJ - The data are unusable for all purposes.
- NAF - Not analyzed for.
- N - There is evidence the analyte is present in the sample.
- NJ - There is evidence that the analyte is present. The associated numerical result is an estimate.
- E - This qualifier is used when the concentration of the associated value exceeds the known calibration range. The associated numerical result is an estimate.
- bold** - The analyte was present in the sample. (Visual Aid to locate detected compounds on report sheet.)

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truck Stop

LIMS Project ID: 1044-99

Sample: 99038105

Date Collected: 01/20/99

Method: SW8260

Field ID: MW-31

Date Prepared: 01/28/99

Matrix: Water

Project Officer: Pam Marti

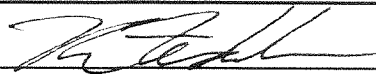
Date Analyzed: 01/28/99

Units: ug/L

Analyte	Result	Qualifier
Benzene	1.1	
Toluene	1	U
Ethylbenzene	5	U
m & p-Xylene	2	U
o-Xylene	1	U

Surrogate Recoveries

Toluene-D8	110	%
p-Bromofluorobenzene	97	%

Authorized By: 

Release Date: 2/5/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truck Stop

LIMS Project ID: 1044-99

Sample: 99038105 (Matrix Spike - LMX1) Date Collected: 01/20/99 Method: SW8260

Field ID: MW-31 Date Prepared: 01/28/99 Matrix: Water

Project Officer: Pam Marti Date Analyzed: 01/28/99 Units: % Recovery

Analyte	Result	Qualifier
---------	--------	-----------

Benzene	92	
Toluene	109	
Ethylbenzene	99	
m & p-Xylene	109	
o-Xylene	109	

Surrogate Recoveries

Toluene-D8	98	%
p-Bromofluorobenzene	95	%

Authorized By: 

Release Date: 2/5/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truck Stop

LIMS Project ID: 1044-99

Sample: 99038105 (Matrix Spike - LMX2) Date Collected: 01/20/99 Method: SW8260

Field ID: MW-31 Date Prepared: 01/28/99 Matrix: Water

Project Officer: Pam Marti


Date Analyzed: 01/28/99 Units: % Recovery

Analyte	Result	Qualifier
---------	--------	-----------

Benzene	99	
Toluene	115	
Ethylbenzene	104	
m & p-Xylene	113	
o-Xylene	115	

Surrogate Recoveries

Toluene-D8	103	%
p-Bromofluorobenzene	99	%

Authorized By: 

Release Date: 2/5/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truck Stop

LIMS Project ID: 1044-99

Sample: 99038106

Date Collected: 01/20/99

Method: SW8260

Field ID: MW-8A

Date Prepared: 01/28/99

Matrix: Water

Project Officer: Pam Marti

Date Analyzed: 01/28/99

Units: ug/L

Analyte	Result	Qualifier
Benzene	1	U
Toluene	1	U
Ethylbenzene	5	U
m & p-Xylene	2	U
o-Xylene	1	U

Surrogate Recoveries

Toluene-D8	102	%
p-Bromofluorobenzene	96	%

Authorized By: 

Release Date: 2/5/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truck Stop

LIMS Project ID: 1044-99

Sample: 99038107

Date Collected: 01/20/99

Method: SW8260

Field ID: MW-30

Date Prepared: 01/28/99

Matrix: Water

Project Officer: Pam Marti

Date Analyzed: 01/28/99

Units: ug/L

Analyte	Result	Qualifier
---------	--------	-----------

Benzene	2.8	
Toluene	1	U
Ethylbenzene	2	J
m & p-Xylene	1.4	J
o-Xylene	.15	J

Surrogate Recoveries

Toluene-D8	103	%
p-Bromofluorobenzene	97	%

Authorized By: 

Release Date: 2/5/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truck Stop

LIMS Project ID: 1044-99

Sample: 99038108

Date Collected: 01/20/99

Method: SW8260

Field ID: WDOE-6A

Date Prepared: 01/28/99

Matrix: Water

Project Officer: Pam Marti

Date Analyzed: 01/28/99

Units: ug/L

Analyte	Result	Qualifier
Benzene	29	
Toluene	15	
Ethylbenzene	76	
m & p-Xylene	237	
o-Xylene	63	

Surrogate Recoveries

Toluene-D8	104	%
p-Bromofluorobenzene	100	%

Authorized By: 

Release Date: 2/5/99

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Manchester Environmental Laboratory

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Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truck Stop

LIMS Project ID: 1044-99

Sample: 99038109

Date Collected: 01/20/99

Method: SW8260

Field ID: MW-6A

Date Prepared: 01/28/99

Matrix: Water

Project Officer: Pam Marti


Date Analyzed: 01/28/99

Units: ug/L

Analyte	Result	Qualifier
Benzene	27	
Toluene	14	
Ethylbenzene	74	
m & p-Xylene	227	
o-Xylene	62	

Surrogate Recoveries

Toluene-D8	101	%
p-Bromofluorobenzene	97	%

Authorized By: 

Release Date: 2/5/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truck Stop

LIMS Project ID: 1044-99

Lab ID: ODBW9028

Method: SW8260

QC Type: Laboratory Method Blank

Date Prepared: 01/28/99

Matrix: Water

Project Officer: Pam Marti

Date Analyzed: 01/28/99

Units: ug/L

Analyte	Result	Qualifier
Benzene	5	U
Toluene	1	U
Ethylbenzene	5	U
m & p-Xylene	2	U
o-Xylene	1	U

Surrogate Recoveries

Toluene-D8	110	%
p-Bromofluorobenzene	99	%

Authorized By: 

Release Date: 2/5/99

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Manchester Environmental Laboratory
7411 Beach DR E, Port Orchard Washington 98366

CASE NARRATIVE

January 28, 1999

Subject: Restover Truck Stop
Samples: 99038105 - 99038110
Case No. 104499
Officer: Pam Marti
By: M. Mandjikov *MM*

WTPH-G Analysis of the Restover Truck Stop Samples

SUMMARY:

Samples 99038105 – 99038110 were analyzed for gasoline.

All data are usable as reported. For any additional information concerning the TPH analysis portion of this project please call Myrna Mandjikov 360-871-8814. For sampling information please call Karin Feddersen 360-871-8829.

METHODS:

These samples were analyzed using purge and trap GC-FID. This method is a modification of EPA SW- 846 methods 8000, 8015, and 5030.

BLANKS:

No analytes of interest are detected in the blanks.

SURROGATES:

All surrogate recoveries are within the control limits of 50 – 150%.

DUPLICATE SAMPLE:

Sample 99038109 was diluted and duplicate aliquots were analyzed to provide a measure of the precision of this method. The relative percent difference between these duplicates is 4 %, which is acceptable for WTPH-G analysis.

HOLDING TIMES:

The sample was analyzed within the recommended holding time.

DATA QUALIFIERS:

Code Definition

- E Reported result is an estimate because it exceeds the calibration.
- J The analyte was positively identified. The associated numerical result is an estimate.
- N There is evidence the analyte is present in this sample.
- NJ There is evidence that the analyte is present. The associated numerical result is an estimate.
- NAF Not analyzed for.
- REJ The data are unusable for all purposes.
- U The analyte was not detected at or above the reported result.
- UU The analyte was not detected at or above the reported estimated result.
- Type** The analyte was present in the sample. Used as a visual aid to locate detected compounds on the report sheet.

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Volatile petroleum products

Project Name: Restover Truck Stop

LIMS Project ID: 1044-99

Sample: 99038105

Date Collected: 01/20/99

Method: NWTPH-GX

Field ID: MW-31

Matrix: Water

Project Officer: Pam Marti

Date Analyzed: 01/25/99

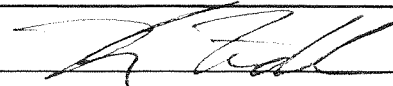
Units: mg/L

Analyte	Result	Qualifier
---------	--------	-----------

Gasoline	0.12	U
----------	------	---

Surrogate Recoveries

Benzene, 1,4-dibromo-2-methyl-	92	%
--------------------------------	----	---

Authorized By: 

Release Date: 1/29/99

Page:

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Volatile petroleum products

Project Name: Restover Truck Stop

LIMS Project ID: 1044-99

Sample: 99038106

Date Collected: 01/20/99

Method: NWTPH-GX

Field ID: MW-8A

Matrix: Water

Project Officer: Pam Marti

Date Analyzed: 01/25/99


Units: mg/L

Analyte	Result	Qualifier
---------	--------	-----------

Gasoline	0.26	
----------	------	--

Surrogate Recoveries

Benzene, 1,4-dibromo-2-methyl-	95	%
--------------------------------	----	---

Authorized By: 

Release Date: 1/29/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Volatile petroleum products

Project Name: Restover Truck Stop

LIMS Project ID: 1044-99

Sample: 99038107

Date Collected: 01/20/99

Method: NWTPH-GX

Field ID: MW-30

Matrix: Water

Project Officer: Pam Marti

Date Analyzed: 01/25/99


Units: mg/L

Analyte	Result	Qualifier
---------	--------	-----------

Gasoline	0.43	
----------	------	--

Surrogate Recoveries

Benzene, 1,4-dibromo-2-methyl-	91	%
--------------------------------	----	---

Authorized By: 

Release Date: 1/29/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Volatile petroleum products

Project Name: Restover Truck Stop

LIMS Project ID: 1044-99

Sample: 99038108

Date Collected: 01/20/99

Method: NWTPH-GX

Field ID: WDOE-6A

Matrix: Water

Project Officer: Pam Marti

Date Analyzed: 01/26/99


Units: mg/L

Analyte	Result	Qualifier
---------	--------	-----------

Gasoline	7.9	
----------	-----	--

Surrogate Recoveries

Benzene, 1,4-dibromo-2-methyl-	91	%
--------------------------------	----	---

Authorized By: 

Release Date: 1/29/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Volatile petroleum products

Project Name: Restover Truck Stop

LIMS Project ID: 1044-99

Sample: 99038109

Date Collected: 01/20/99

Method: NWTPH-GX

Field ID: MW-6A

Matrix: Water

Project Officer: Pam Marti

Date Analyzed: 01/26/99


Units: mg/L

Analyte	Result	Qualifier
---------	--------	-----------

Gasoline	7.7	
----------	-----	--

Surrogate Recoveries

Benzene, 1,4-dibromo-2-methyl-	93	%
--------------------------------	----	---

Authorized By: 

Release Date: 1/29/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Volatile petroleum products

Project Name: Restover Truck Stop

LIMS Project ID: 1044-99

Sample: 99038109 (Duplicate - LDP1)

Date Collected: 01/20/99

Method: NWTPH-GX

Field ID: MW-6A

Matrix: Water

Project Officer: Pam Marti

Date Analyzed: 01/26/99

Units: mg/L

Analyte	Result	Qualifier
---------	--------	-----------

Gasoline	7.5	
----------	-----	--

Surrogate Recoveries

Benzene, 1,4-dibromo-2-methyl-	95	%
--------------------------------	----	---

Authorized By: 

Release Date: 1/29/99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Volatile petroleum products

Project Name: Restover Truck Stop

LIMS Project ID: 1044-99

Lab ID: OMBW9021A

Method: NWTPH-GX

QC Type: Laboratory Method Blank

Matrix: Water

Project Officer: Pam Marti

Date Analyzed: 01/26/99

Units: mg/L

Analyte	Result	Qualifier
---------	--------	-----------

Gasoline	0.12	U
----------	------	---

Surrogate Recoveries

Benzene, 1,4-dibromo-2-methyl-	53	%
--------------------------------	----	---

Authorized By: 

Release Date: 1/29/99

Page: 1

Manchester Environmental Laboratory

7411 Beach Dr E, Port Orchard Washington 98366


CASE NARRATIVE

August 6, 1999

Subject: Restover Truck Stop Project

Sample(s): 99308000-04

Officer(s): Pam Marti

By: Bob Carrell 
Organics Analysis Unit

NWTPH-Gx and BTEX ANALYSES

ANALYTICAL METHOD: (NWTPH-Gx)

A portion of these water samples were purged, the analytes trapped then desorbed and analyzed by capillary gas chromatography using flame ionization detection (GC/FID) and photo-ionization detection (GC/PID) following Manchester Laboratory's standard operating procedure for the determination of total gasoline and BTEX respectively.

BLANKS:

No petroleum products were detected in the laboratory method blanks; hence, the blanks demonstrate the system was free from contamination.

HOLDING TIMES:

All samples were analyzed within the method holding times.

SURROGATES:

The 1,4-dibromo-2-methylbenzene and 1,4-difluorobenzene surrogates recoveries were generally acceptable, except in several cases where there was a positive interference with 1,4-difluorobenzene. In these cases, the 'NC' qualifier was used. Since the second surrogate recovery was good in all cases, no target analytes were qualified due to surrogate recoveries.

MATRIX SPIKING:

Duplicate VOA bottles of sample 99308001 were spiked with 10ng/mL of the BTEX compounds. Recoveries of these compounds were acceptable, ranging from 79% to 89%. Although the relative percent

differences (RPD's) were not calculated, the narrow range between the individual analytes in the MS/MSD indicate that these values should prove acceptable too.

COMMENTS:

The data is useable as qualified.

DATA QUALIFIER CODES

- U - The analyte was not detected at or above the reported result.
- J - The analyte was positively identified. The associated numerical result is an estimate.
- UJ - The analyte was not detected at or above the reported estimated result.
- REJ - The data are unusable for all purposes.
- NAF - Not analyzed for.
- N - For organic analytes there is evidence the analyte is present in this sample.
- NJ - There is evidence that the analyte is present. The associated numerical result is an estimate.
- NC - Not Calculated
- E - This qualifier is used when the concentration of the associated value exceeds the known calibration range.

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truck Stop

LIMS Project ID: 1627-99

Lab ID: OBW9217HC2

Method: SW8020

QC Type: Laboratory Method Blank

Date Prepared: 08/05/99

Matrix: Water

Project Officer: Pam Marti

Date Analyzed: 08/05/99

Units: ug/L

Analyte	Result	Qualifier
Benzene	1.0	U
Toluene	1.0	U
Ethylbenzene	1.0	U
m & p-Xylene	2.0	U
o-Xylene	1.0	U

Surrogate Recoveries

1,4-Difluorobenzene	97	%
Benzene, 1,4-dibromo-2-methyl-	100	%

Authorized By: *Barnett*

Release Date: 8-6-99

Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truck Stop

LIMS Project ID: 1627-99

Sample: 99308000

Date Collected: 07/27/99

Method: SW8020

Field ID: MW-31

Date Prepared: 08/05/99

Matrix: Water

Project Officer: Pam Marti

Date Analyzed: 08/05/99

Units: ug/L

Analyte	Result	Qualifier
Benzene	1.5	
Toluene	1.0	U
Ethylbenzene	1.0	U
m & p-Xylene	2.0	U
o-Xylene	1.0	U

Surrogate Recoveries

1,4-Difluorobenzene	89	%
Benzene, 1,4-dibromo-2-methyl-	88	%

Authorized By: *B. Anell*

Release Date: 8-6-99

Page:

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truck Stop

LIMS Project ID: 1627-99

Sample: 99308001

Date Collected: 07/27/99

Method: SW8020

Field ID: MW-8A

Date Prepared: 08/05/99

Matrix: Water

Project Officer: Pam Marti

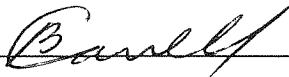
Date Analyzed: 08/05/99

Units: ug/L

Analyte	Result	Qualifier
Benzene	1.0	U
Toluene	1.0	U
Ethylbenzene	1.0	U
m & p-Xylene	2.0	U
o-Xylene	1.0	U

Surrogate Recoveries

1,4-Difluorobenzene	103	%
Benzene, 1,4-dibromo-2-methyl-	103	%

Authorized By: 

Release Date: 8-6-99

Page:

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truck Stop

LIMS Project ID: 1627-99

Sample: 99308001 (Matrix Spike - LMX1) Date Collected: 07/27/99

Method: SW8020

Field ID: MW-8A

Date Prepared: 08/05/99

Matrix: Water

Project Officer: Pam Marti

Date Analyzed: 08/05/99

Units: % Recovery

Analyte	Result	Qualifier
Benzene	79	
Toluene	81	
Ethylbenzene	86	
m & p-Xylene	83	
o-Xylene	84	

Surrogate Recoveries

1,4-Difluorobenzene	103	%
Benzene, 1,4-dibromo-2-methyl-	105	%

Authorized By: Banell

Release Date: 8-6-99

Page: 2

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truck Stop

LIMS Project ID: 1627-99

Sample: 99308001 (Matrix Spike - LMX2) Date Collected: 07/27/99 Method: SW8020

Field ID: MW-8A

Date Prepared: 08/05/99

Matrix: Water

Project Officer: Pam Marti

Date Analyzed: 08/05/99

Units: % Recovery

Analyte	Result	Qualifier
---------	--------	-----------

Benzene	80	
Toluene	89	
Ethylbenzene	85	
m & p-Xylene	84	
o-Xylene	83	

Surrogate Recoveries

1,4-Difluorobenzene	108	%
Benzene, 1,4-dibromo-2-methyl-	107	%

Authorized By: *Carroll*

Release Date: 8-6-99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truck Stop

LIMS Project ID: 1627-99

Sample: 99308002

Date Collected: 07/27/99

Method: SW8020

Field ID: MF-30

Date Prepared: 08/05/99

Matrix: Water

Project Officer: Pam Marti

Date Analyzed: 08/05/99

Units: ug/L

Analyte	Result	Qualifier
Benzene	1.0	U
Toluene	1.0	U
Ethylbenzene	1.0	U
m & p-Xylene	2.0	U
o-Xylene	1.0	U

Surrogate Recoveries

1,4-Difluorobenzene		NC
Benzene, 1,4-dibromo-2-methyl-	108	%

Authorized By: *Barrett*

Release Date: 8-6-99

Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truck Stop

LIMS Project ID: 1627-99

Sample: 99308003

Date Collected: 07/27/99

Method: SW8020

Field ID: WDOE-6A

Date Prepared: 08/05/99

Matrix: Water

Project Officer: Pam Marti

Date Analyzed: 08/05/99

Units: ug/L

Analyte	Result	Qualifier
Benzene	20	U
Toluene	20	U
Ethylbenzene	24	
m & p-Xylene	44	
o-Xylene	16	J

Surrogate Recoveries

1,4-Difluorobenzene		NC
Benzene, 1,4-dibromo-2-methyl-	103	%

Authorized By: *Barrell*

Release Date: 8-6-99

Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truck Stop

LIMS Project ID: 1627-99

Sample: 99308004

Date Collected: 07/27/99

Method: SW8020

Field ID: MW-6A

Date Prepared: 08/05/99

Matrix: Water

Project Officer: Pam Marti

Date Analyzed: 08/05/99

Units: ug/L

Analyte	Result	Qualifier
Benzene	20	U
Toluene	20	U
Ethylbenzene	36	
m & p-Xylene	52	
o-Xylene	16	J

Surrogate Recoveries

1,4-Difluorobenzene		NC
Benzene, 1,4-dibromo-2-methyl-	107	%

Authorized By: *Basell*

Release Date: 8-6-99

Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Volatile petroleum products

Project Name: Restover Truck Stop

LIMS Project ID: 1627-99

Lab ID: OBW9217HC3

Method: NWTPH-GX

QC Type: Laboratory Method Blank

Matrix: Water

Project Officer: Pam Marti

Date Analyzed: 08/05/99

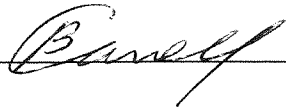
Units: mg/L

Analyte	Result	Qualifier
---------	--------	-----------

Gasoline	0.060	U
----------	-------	---

Surrogate Recoveries

1,4-Difluorobenzene	104	%
Benzene, 1,4-dibromo-2-methyl-	102	%

Authorized By: 

Release Date: 8-6-99

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Volatile petroleum products

Project Name: Restover Truck Stop

LIMS Project ID: 1627-99

Sample: 99308000

Date Collected: 07/27/99

Method: NWTPH-GX

Field ID: MW-31

Matrix: Water

Project Officer: Pam Marti

Date Analyzed: 08/05/99

Units: mg/L

Analyte	Result	Qualifier
---------	--------	-----------

Gasoline	0.060	U
----------	-------	---

Surrogate Recoveries

1,4-Difluorobenzene	90	%
Benzene, 1,4-dibromo-2-methyl-	83	%

Authorized By: *Barnes*

Release Date: 8-6-99

Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Volatile petroleum products

Project Name: Restover Truck Stop

LIMS Project ID: 1627-99

Sample: 99308001

Date Collected: 07/27/99

Method: NWTPH-GX

Field ID: MW-8A

Matrix: Water

Project Officer: Pam Marti

Date Analyzed: 08/05/99

Units: mg/L

Analyte	Result	Qualifier
---------	--------	-----------

Gasoline	0.060	U
----------	-------	---

Surrogate Recoveries

1,4-Difluorobenzene	104	%
Benzene, 1,4-dibromo-2-methyl-	88	%

Authorized By: *Barrell*

Release Date: 8-6-99

Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Volatile petroleum products

Project Name: Restover Truck Stop

LIMS Project ID: 1627-99

Sample: 99308002

Date Collected: 07/27/99

Method: NWTPH-GX

Field ID: MF-30

Matrix: Water

Project Officer: Pam Marti

Date Analyzed: 08/05/99


Units: mg/L

Analyte	Result	Qualifier
---------	--------	-----------

Gasoline	0.060	U
----------	-------	---

Surrogate Recoveries

1,4-Difluorobenzene		NC
Benzene, 1,4-dibromo-2-methyl-	96	%

Authorized By: 

Release Date: 8-6-99

Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Volatile petroleum products

Project Name: Restover Truck Stop

LIMS Project ID: 1627-99

Sample: 99308003

Date Collected: 07/27/99

Method: NWTPH-GX

Field ID: WDOE-6A

Matrix: Water

Project Officer: Pam Marti

Date Analyzed: 08/05/99


Units: mg/L

Analyte	Result	Qualifier
---------	--------	-----------

Gasoline	7.7	
----------	-----	--

Surrogate Recoveries

1,4-Difluorobenzene	102	%
Benzene, 1,4-dibromo-2-methyl-	98	%

Authorized By: 

Release Date: 8-6-99

Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Volatile petroleum products

Project Name: Restover Truck Stop

LIMS Project ID: 1627-99

Sample: 99308004

Date Collected: 07/27/99

Method: NWTPH-GX

Field ID: MW-6A

Matrix: Water

Project Officer: Pam Marti

Date Analyzed: 08/05/99

Units: mg/L

Analyte	Result	Qualifier
---------	--------	-----------

Gasoline	7.4	
----------	-----	--

Surrogate Recoveries

1,4-Difluorobenzene	107	%
Benzene, 1,4-dibromo-2-methyl-	98	%

Authorized By: *Carroll*

Release Date: 8-6-99

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