A Department of Ecology Report

WASHINGTON STATE DEPARTMENT OF ECOLOGY

Restover Truck Stop Ground Water Monitoring February and April 1996

Summary

This progress report is one in a series describing the results of quarterly ground water sampling at Restover Truck Stop. This report describes the results of samples collected for benzene, toluene, ethylbenzene, and total xylenes (BTEX), as well as total petroleum hydrocarbons as gasoline (TPH-G), in February and April 1996. Ecology has conducted ground water sampling at this site from 1987 to the present.

To remediate soil and ground water contamination, a vapor extraction system (VES) was constructed in the summer of 1993. The VES operated steadily from February 1994 to June 1995. Since June 1995 the VES has been shut down to convert the system from carbon adsorption to biofiltration.

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. BTEX has not been detected in MW-8A since November 1994. In February, Model Toxic Control Act (MTCA) cleanup levels were exceeded in WDOE-6A for benzene, total xylene and TPH. In April, cleanup levels were exceeded for ethylbenzene and total xylene in WDOE-6A, as well as for TPH in WDOE-6A and MW-30. Benzene and toluene were not detected in well WDOE-6A in April due to high quantitation limits. I will work with the laboratory to achieve better analytical detection limits. Data review and laboratory reporting sheets are presented in Appendix A.

by Pamela B. Marti
October 1996

Waterbody No. WA-13-0030GW (Segment No. 06-13-03GW)
Ecology Report # 96-344

Results

Regularly sampled wells are listed in Table 1; locations of the wells sampled are shown in Figure 1. In February, samples were collected from nine wells. In April, five wells were sampled.

Field Observations

Depth-to-water measurements, purge volume, pH, specific conductance, and temperature results for both sample events are listed in Table 1. In February, depth-to-water in the upper aquifer ranged from 1.13 to 4.86 feet below ground surface. In April, depth-to-water ranged from 2.95 to 6.64 feet bgs. In February, water levels were five to six feet higher than at the same time the previous year.

Water purged from monitoring well WDOE-6A continues to have a strong hydrocarbon odor and cloudy appearance, while MW-30 continues to have a slight hydrocarbon odor. In February, a rust colored sediment was removed from the bottom of MW-30.

Analytical Results

Analytical results for BTEX and TPH-G, and MTCA ground water cleanup levels are shown in Table 2 for both sample events.

In February, samples were collected from nine monitoring wells: MW-8A, MW-9A, MW-15A, MW-20A, MW-30, MW-31, WDOE-6A, MW-12A, and MW-16. All four BTEX compounds were detected in WDOE-6A with a total estimated concentration of 61 µg/L. Low concentrations of benzene, ethylbenzene, and xylene were detected in MW-30 and MW-31. Low concentrations of TPH-G were detected in wells MW-8A, MW-30 and MW-31. TPH-G concentrations in well WDOE-6A was 2000 µg/L.

In April, samples were collected from monitoring wells: MW-8A, MW-20A MW-30, MW-31, and WDOE-6A. All four BTEX compounds were detected in MW-30 with a total estimated concentration of 19 µg/L. Ethylbenzene, and xylene were detected in WDOE-6A with a total concentration of 5900 µg/L. Benzene and toluene were not detected in this well due to high quantitation limits. Well WDOE-6A continues to show the highest volatile organics concentrations of the wells sampled. TPH-G concentrations in wells MW-30 and WDOE-6A were 1100 µg/L and 17,000 µg/L, respectively.

BTEX concentrations for select monitoring wells from May 1987 to April 1996 are listed in Table 3. Figure 3 shows BTEX concentrations for wells WDOE-6A and MW-8A for the same time period. Concentrations were relatively stable for both wells from August 1991 to February 1995. After February 1995, concentrations gradually decreased. In April 1996, high BTEX concentrations were detected in WDOE-6A. There is no apparent

explanation for this increase. The next sample round is scheduled for August, at which time additional data will be collected from this well.

Conclusions

1. Overall, BTEX concentrations appear to be decreasing. All four BTEX compounds have not been detected in well MW-8A since November 1994. However, April BTEX concentrations in WDOE-6A increased substantially, departing from the decreasing trend. There is no apparent explanation for this increase. The next sample round is scheduled for August, at which time additional data will be collected from this well.

2. In February, Model Toxic Control Act (MTCA) cleanup levels were exceeded in WDOE-6A for benzene, total xylene and TPH. In April, cleanup levels were exceeded for ethylbenzene and total xylene in WDOE-6A, as well as for TPH in WDOE-6A and MW-30. Benzene and toluene were not detected in well WDOE-6A in April due to high quantitation limits.

3. The vapor extraction system operated steadily from February 1994 to June 1995. Since June 1995 the VES has been shut down to convert the system from carbon adsorption to biofiltration. The monitoring period has been too short to determine whether the VES has improved the ground water quality.

Recommendations

1. Routine monitoring should continue to determine the effectiveness of contaminant removal by vapor extraction. Monitoring wells WDOE-6A, MW-8A, MW-9A, MW-20A, MW-30, and MW-31 should continue to be sampled for BTEX. The Restover supply well should also continue to be sampled annually for BTEX.

2. Wells MW-12A, MW-15A and MW-16 should continue to be sampled for as long as property access is granted. Historically, BTEX has been detected in MW-15A. More recently, a low concentration of benzene was detected in this well in August 1995. Based on the most current data these wells should continue to be sampled, but on an annual basis.

3. Continue to collect samples for total petroleum hydrocarbon as gasoline (TPH-G) analyses.

Methods

Ground Water Sampling

Ground water samples were collected from the upper and lower aquifers. The upper aquifer consists of recessional outwash. This unit is underlain by the Vashon Till, which is a regional aquitard, and advance outwash deposits which form a lower aquifer. In February, samples for benzene, toluene, ethylbenzene, and xylene (BTEX) and total petroleum hydrocarbons as gasoline (TPH-G) were collected from seven upper aquifer and two lower aquifer monitoring wells. April samples were collected from five upper aquifer monitoring wells. See Table 1 for a list of the regularly sampled wells. The sampled wells were near the vapor extraction system to help determine the effectiveness of remediation.

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 (VES) waste in the enclosed tank area. This waste will be transported and disposed of 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). All samples were analyzed by the Ecology/EPA Laboratory in Manchester.

Quality Assurance

In general the quality of the data is acceptable for use for both sample rounds. BTEX samples were analyzed using EPA Method 8021 (U.S. EPA, 1986) and WTPH-G samples were analyzed using Washington State Method WTPH-G (Ecology, 1994). All four BTEX compounds were reported as estimates for WDOE-6A in February, as well as for MW-30 in April. Total BTEX concentrations for these samples should be considered

estimates as qualified. Benzene and toluene were not detected in well WDOE-6A in April due to high quantitation limits.

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 MW-8A. Duplicate samples collected at MW-8A 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 RPDs of the duplicate samples for TPH-G in February was 5%.

In addition to field quality control samples, a matrix spike, a matrix spike duplicate and surrogate compound recoveries were performed in the laboratory. In February, the surrogate spike recovery was high (152%) for WDOE-6A. This high recovery was probably a result of interference from the high level of analytes in the sample. In April, the surrogate spike recovery was above the control limit of 150% for sample MW-30. Matrix spikes for BTEX and TPH-G were all within acceptable limits. Myrna McIntosh of the Manchester Laboratory conducted the quality assurance review, which has been included in Appendix A.

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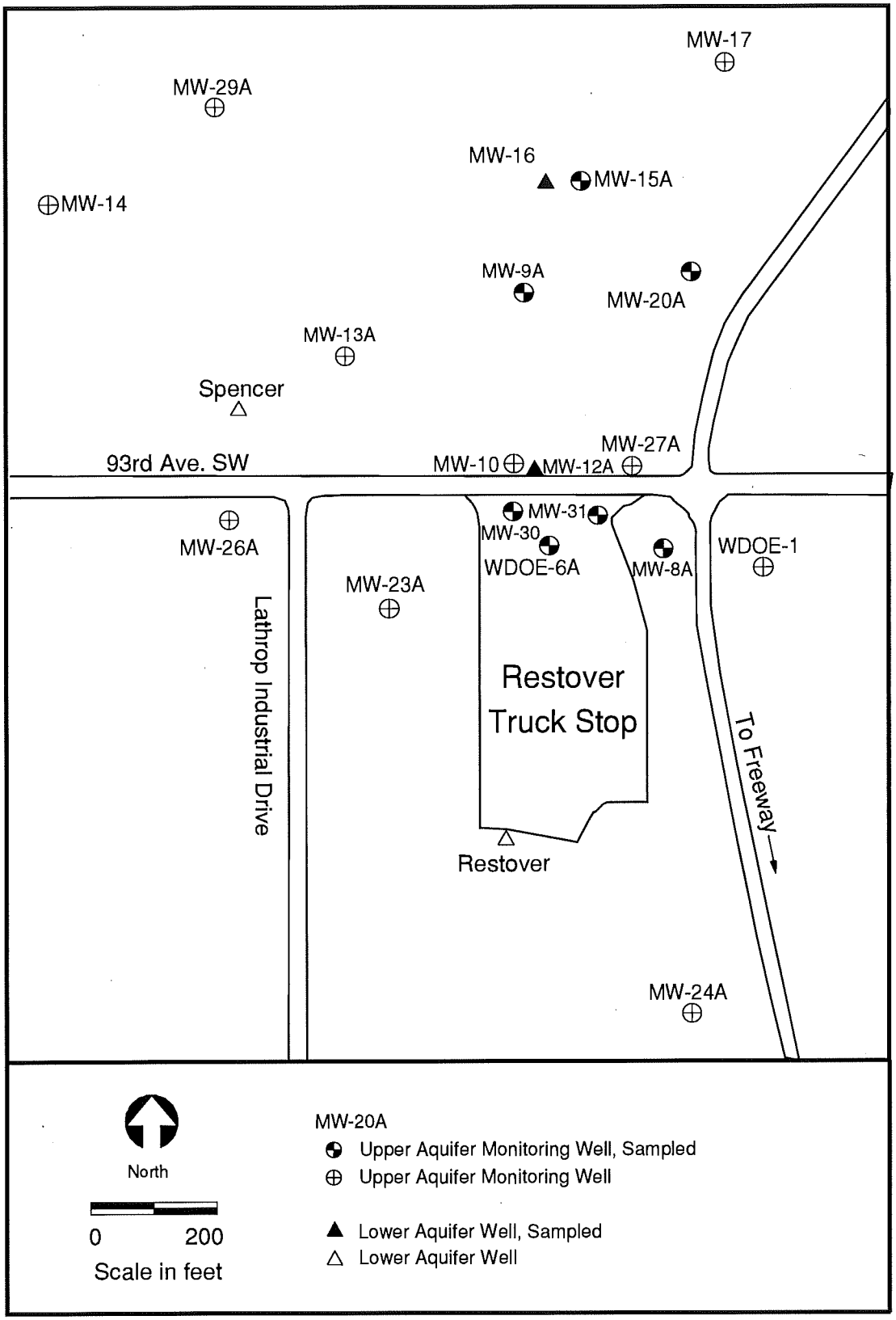


Figure 1: Well Locations, Restover Truck Stop

Table 1: Field Parameter Results for February 14 - 15 and April 30, 1996

Monitoring Well	Total Depth (Feet)	Aquifer	Depth to Water (Feet)	pH (standard units)	Specific Conductance (umhos/cm)	Temperature (°C)	Purge Volume (gallons)
February 1996							
MW-8A	21.10	Upper	4.35	5.8	39	10.7	25
MW-9A	16.23	Upper	2.8	5.4	115	10.6	8
MW-20A	13.95	Upper	1.2	6.1	41	9.8	7
MW-30	16.78	Upper	3.27	6.4	132	12.8	32
MW-31	13.47	Upper	4.15	5.7	86	11.6	6
WDOE-6A	21.68	Upper	4.86	6.7	141	13.5	11
MW-15A	15.80	Upper	1.13	5.6	80	9.8	8
MW-12A	50.43	Lower	8.9	6.0	115	12.8	21
MW-16	53.52	Lower	2.18	5.6	50	10.0	30
April 1996							
MW-8A	21.10	Upper	6.11	5.7	70	10.0	10
MW-20A	13.95	Upper	2.95	5.9	60	10.4	7
MW-30	16.78	Upper	5.11	6.3	163	12.9	23
MW-31	13.47	Upper	5.91	5.8	107	11.3	5
WDOE-6A	21.68	Upper	6.64	6.5	199	13.2	9

NM = Not Measured. Insufficient water to collect field parameters.

++ = No water level measurement collected.

Table 2: Analytical Results (ug/L) for February 14 - 15 and April 30, 1996

Well Number	Benzene	Toluene	Ethylbenzene	Total Xylene	Total BTEX	TPH-G
MTCA Cleanup Levels	5.0	40.0	30.0	20.0		(Total TPH) 1000.0
February 1996						
MW-8A	1.0 U	1.0 U	1.0 U	3.0 U	ND	210
MW-8B(dup)*	1.0 U	1.0 U	1.0 U	3.0 U	ND	220
MW-9A	1.0 U	1.0 U	1.0 U	3.0 U	ND	120 U
MW-20A	1.0 U	1.0 U	1.0 U	3.0 U	ND	120 U
MW-30	2.2	1.0 U	1.3	1.8	5.3	420
MW-31	5.1	1.0 U	1.0 U	2.0	7.1	240
WDOE-6A	5.7 J	4.2 J	15 J	35.7 J	60.7	2000
MW-15A	1.0 U	1.0 U	1.0 U	3.0 U	ND	120 U
MW-12A	1.0 U	1.0 U	1.0 U	3.0 U	ND	120 U
MW-16	1.0 U	1.0 U	1.0 U	3.0 U	ND	120 U
April 1996						
MW-8A	1.0 U	1.0 U	1.0 U	3.0 U	ND	120 U
MW-8B(dup)*	1.0 U	1.0 U	1.0 U	3.0 U	ND	120 U
MW-20A	1.0 U	1.0 U	1.0 U	3.0 U	ND	120 U
MW-30	3.7 J	1.0 J	4.5 J	10 J	19.2	1100
MW-31	1.0 U	1.0 U	1.0 U	3.0 U	ND	120 U
WDOE-6A	50 U	50 U	1100	4800	5900	17,000

U : Not detected at detection limit shown.

UJ: The analyte was not detected at or above the reported estimated result.

ND: Compounds Not Detected

* : MW-8B is a duplicate sample of MW-8A.

Table 3: Historical Restover Truck Stop BTEX Concentrations (ug/L)

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
Upper Aquifer												
WDOE-6A	6950	1180	5300	28000	7490	9870	5190	3460	2840	3830	2990	4784
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]
MW-15A	1433	NT	NT	ND	218	NT	285	122	NT	NT	NT	NT
MW-17	ND	ND	ND	ND	ND	NT	NT	ND	ND	NT	2.7	ND
MW-20A	126	NT	NT	NT	NT	20	1400	5	293	11	452	NT(Dry)
Lower Aquifer												
Restover	NT	NT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Spencer	ND	ND	NT	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-12	53	5	8	ND	4	ND	6	ND	NT	NT	NT	NT

Well Number	July 1993	November 1993	January 1994	April 1994	August 1994	November 1994	February 1995	April 1995	August 1995	October 1995	February 1996	April 1996
Upper Aquifer												
WDOE-6A	2620	3070	6360	5242	3214	4624	2120	1829	638	646	61	5900
MW-8A	30[2]	41[2]	36[2]	4[2]	8[1]	32[2]	ND	ND	ND	ND	ND	ND
MW-15A	NT	NT	NT	NT	NT	NT	ND	NT	2	NT	ND	NT
MW-17	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
MW-20A	162	NT(Dry)	ND	59	NT(Dry)	ND	ND	ND	18	NT(Dry)	ND	ND
MW-30	NT	NT(Dry)	NT(Dry)	2400	NT(Dry)	NT(Dry)	8	8	7	ND	5	19
MW-9A	NT	NT	NT(Dry)	366	NT	NT	ND	NT	1	NT	ND	NT
Lower Aquifer												
Restover	0.4	NT	ND	NT	NT	NT	NT	NT	ND	NT	NT	NT
Spencer	ND	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
MW-12	1.7	NT	NT	NT	NT	NT	1.1	NT	Well Abandoned			
MW-12A	-	-	-	-	-	-	-	-	0.5	NT	ND	NT

ND: Compound Not Detected

NT: Compound Not Tested

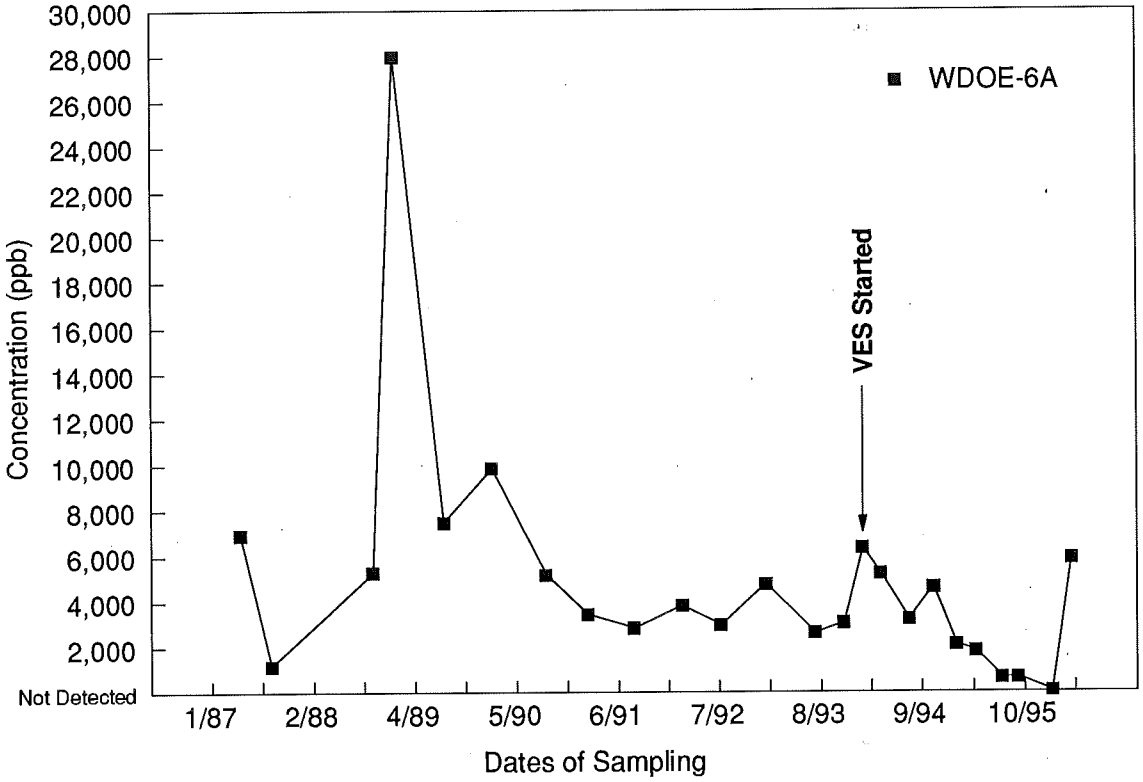
[1] : Value is based on one sample.

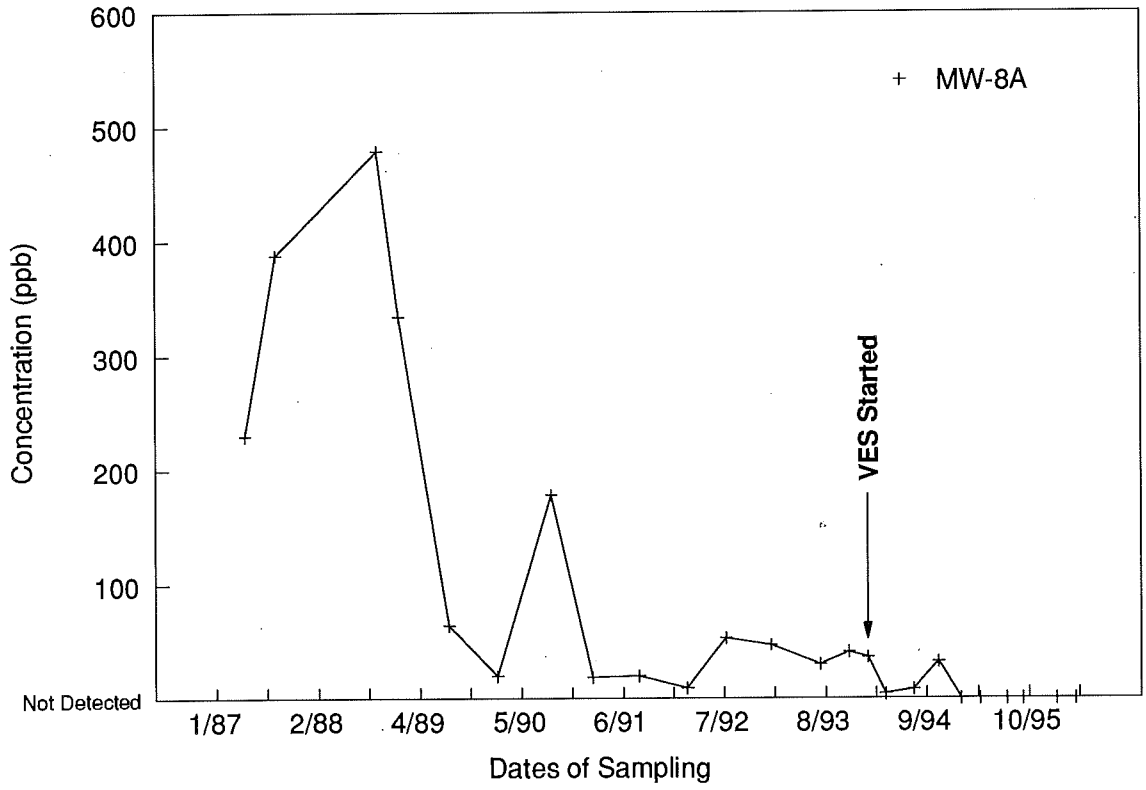
[2] : Value represents the mean of duplicate samples.

The upper and lower aquifers consist of recessional outwash and advance outwash, respectively. These units are separated by the Vashon Till which is a regional aquitard.

Figure 3

BTEX Concentrations in WDOE-6A and MW-8A from May 1987 to October 1995





APPENDIX A

Analytical Results
Restover Truck Stop
February 14–15, 1996 and April 30, 1996

STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

MANCHESTER ENVIRONMENTAL LABORATORY

7411 Beach Drive East • Port Orchard, Washington 98366-8204 • (206) 871-8860 • SCAN 871-8860

March 18, 1996

TO: Pam Marti, Project Officer

FROM: Myrna McIntosh, Chemist

SUBJECT: BTEX and WTPH-G analysis of Restover Truck Stop

Samples 96078105 - 96078114 were analyzed by Purge and TrapGC-PID for BTEX and Purge and Trap GC-FID for WTPH as gasoline.

The BTEX results for sample 96078110 were qualified as estimates because the surrogate spike recovery was high at 152%. This high recovery is probably a result of interference from the high level of analytes in this sample.

All other results are unqualified. Please call me at 360-871-8814 if you have any questions on this project.

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truckstop **LIMS Project ID:** 1108-96

Sample: BLN60445 **Method:** SW8020
Blank ID: BW6051 **Date Prepared:** 02/20/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 02/21/96 **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	**100**	**%**

Authorized By: M. McCollister Release Date: 3/11/96 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truckstop

LIMS Project ID: 1108-96

Sample: BLN60446
Blank ID: BW6052
Project Officer: Pam Marti

Date Prepared: 02/20/96
Date Analyzed: 02/21/96

Method: SW8020
Matrix: Water
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	**96**	**%**

Authorized By: M. McCulloch Release Date: 3/11/96

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truckstop **LIMS Project ID:** 1108-96

Sample: 96078105 **Date Received:** 02/16/96 **Method:** SW8020
Field ID: MW-31 **Date Prepared:** 02/20/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 02/21/96 **Units:** ug/L

Analyte	Result	Qualifier
Benzene	**5.1**	
Toluene	1.0	U
Ethylbenzene	1.0	U
m & p-Xylene	2.0	U
o-Xylene	**2.0**	

Surrogate Recoveries

1,4-Difluorobenzene	**102**	**%**

Authorized By: M. McCarthy Release Date: 3/11/96 Page: 1

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Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truckstop **LIMS Project ID:** 1108-96

Sample: 96078106
Field ID: MW-8A
Project Officer: Pam Marti

Date Received: 02/16/96
Date Prepared: 02/20/96
Date Analyzed: 02/21/96

Method: SW8020
Matrix: Water
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	**99**	%

Authorized By: _____ Release Date: 3/11/96

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Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truckstop **LIMS Project ID:** 1108-96

Sample: 96078107 **Date Received:** 02/16/96 **Method:** SW8020
Field ID: MW-8B **Date Prepared:** 02/20/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 02/21/96 **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	**98**	**%**

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Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truckstop **LIMS Project ID:** 1108-96

Sample: 96078108 **Date Received:** 02/16/96 **Method:** SW8020
Field ID: MW-20A **Date Prepared:** 02/20/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 02/21/96 **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	**98**	**%**

Authorized By: M. McCulloch Release Date: 3/11/96 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truckstop **LIMS Project ID:** 1108-96

Sample: 96078109 **Date Received:** 02/16/96 **Method:** SW8020
Field ID: MW-30 **Date Prepared:** 02/20/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 02/20/96 **Units:** ug/L

Analyte	Result	Qualifier
Benzene	**2.2**	
Toluene	1.0	U
Ethylbenzene	**1.3**	
m & p-Xylene	**1.8**	
o-Xylene	1.0	U

Surrogate Recoveries

1,4-Difluorobenzene	**126**	**%**

Authorized By: M. McCabe Release Date: 3/4/96 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truckstop **LIMS Project ID:** 1108-96

Sample: 96078110 **Date Received:** 02/16/96 **Method:** SW8020
Field ID: WDOE-6A **Date Prepared:** 02/20/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 02/21/96 **Units:** ug/L

Analyte	Result	Qualifier
Benzene	5.7	J
Toluene	4.2	J
Ethylbenzene	15	J
m & p-Xylene	29	J
o-Xylene	6.7	J

Surrogate Recoveries

1,4-Difluorobenzene	152	%

Comments: Sample results estimated due to high surrogate recovery. High recovery is probably a result of the higher level of analytes in this sample.

Authorized By: M. McCarthy Release Date: 3/11/96 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truckstop **LIMS Project ID:** 1108-96

Sample: 96078111 **Date Received:** 02/16/96 **Method:** SW8020
Field ID: MW-16 **Date Prepared:** 02/20/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 02/21/96 **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	**96**	**%**

Authorized By: _____ Release Date: 3/11/96 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truckstop **LIMS Project ID:** 1108-96

Sample: 96078111 (Matrix Spike - LMX1) **Date Received:** 02/16/96 **Method:** SW8020
Field ID: MW-16 **Date Prepared:** 02/20/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 02/21/96 **Units:** % Recovery

Analyte	Result	Qualifier
Benzene	102	
Toluene	102	
Ethylbenzene	102	
m & p-Xylene	103	
o-Xylene	103	

Authorized By: M. M. Chilcott Release Date: 3/11/96

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truckstop **LIMS Project ID:** 1108-96

Sample: 96078111 (Matrix Spike - LMX2) **Date Received:** 02/16/96 **Method:** SW8020
Field ID: MW-16 **Date Prepared:** 02/20/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 02/21/96 **Units:** % Recovery

Analyte	Result	Qualifier
Benzene	102	
Toluene	102	
Ethylbenzene	102	
m & p-Xylene	103	
o-Xylene	103	

Authorized By: M. McClusky Release Date: 3/11/96 Page: 3

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truckstop **LIMS Project ID:** 1108-96

Sample: 96078112 **Date Received:** 02/16/96 **Method:** SW8020
Field ID: MW-15A **Date Prepared:** 02/20/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 02/21/96 **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	**102**	**%**

Authorized By: M. McClintock Release Date: 3/11/96 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truckstop **LIMS Project ID:** 1108-96

Sample: 96078113 **Date Received:** 02/16/96 **Method:** SW8020
Field ID: MW-9A **Date Prepared:** 02/20/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 02/21/96 **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**	**%**

Authorized By: M. M. Carlson Release Date: 3/11/96 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truckstop **LIMS Project ID:** 1108-96

Sample: 96078114 **Date Received:** 02/16/96 **Method:** SW8020
Field ID: MW-12A **Date Prepared:** 02/20/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 02/21/96 **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**	**%**

Authorized By: _____ Release Date: 3/11/96

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Gasoline

Project Name: Restover Truckstop **LIMS Project ID:** 1108-96

Sample: BLN60445 **Method:** WTPH-G
Blank ID: BW6051 **Date Prepared:** 02/20/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 02/21/96 **Units:** mg/L

Analyte	Result	Qualifier
Gasoline	0.12	U
Surrogate Recoveries		
1,4-Difluorobenzene	**79**	**%**

Authorized By: _____ Release Date: 3/18/96 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Gasoline

Project Name: Restover Truckstop

LIMS Project ID: 1108-96

Sample: BLN60446
Blank ID: BW6052
Project Officer: Pam Marti

Date Prepared: 02/20/96
Date Analyzed: 02/21/96

Method: WTPH-G
Matrix: Water
Units: mg/L

Analyte	Result	Qualifier
Gasoline	0.12	U

Surrogate Recoveries

1,4-Difluorobenzene	77	%

Authorized By: [signature] Release Date: 3/18/96

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Gasoline

Project Name: Restover Truckstop **LIMS Project ID:** 1108-96

Sample: 96078105 **Date Received:** 02/16/96 **Method:** WTPH-G
Field ID: MW-31 **Date Prepared:** 02/20/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 02/21/96 **Units:** mg/L

Analyte	Result	Qualifier
Gasoline	**0.24**	
Surrogate Recoveries		
1,4-Difluorobenzene	**80**	%

Authorized By: M. W. Euster Release Date: 3/18/96 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Gasoline

Project Name: Restover Truckstop **LIMS Project ID:** 1108-96

Sample: 96078106 **Date Received:** 02/16/96 **Method:** WTPH-G
Field ID: MW-8A **Date Prepared:** 02/20/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 02/21/96 **Units:** mg/L

Analyte	Result	Qualifier
Gasoline	**0.21**	
Surrogate Recoveries		
1,4-Difluorobenzene	**84**	%

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Gasoline

Project Name: Restover Truckstop **LIMS Project ID:** 1108-96

Sample: 96078107 **Date Received:** 02/16/96 **Method:** WTPH-G
Field ID: MW-8B **Date Prepared:** 02/20/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 02/21/96 **Units:** mg/L

Analyte	Result	Qualifier
Gasoline	**0.22**	
Surrogate Recoveries		
1,4-Difluorobenzene	77	%

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Gasoline

Project Name: Restover Truckstop

LIMS Project ID: 1108-96

Sample: 96078108
Field ID: MW-20A
Project Officer: Pam Marti

Date Received: 02/16/96
Date Prepared: 02/20/96
Date Analyzed: 02/21/96

Method: WTPH-G
Matrix: Water
Units: mg/L

Analyte	Result	Qualifier
Gasoline	0.12	U

Surrogate Recoveries

1,4-Difluorobenzene	77	%

Authorized By: M. M. Rustad

Release Date: 3/18/96

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Gasoline

Project Name: Restover Truckstop **LIMS Project ID:** 1108-96

Sample: 96078109 **Date Received:** 02/16/96 **Method:** WTPH-G
Field ID: MW-30 **Date Prepared:** 02/20/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 02/20/96 **Units:** mg/L

Analyte	Result	Qualifier
Gasoline	**0.42**	
Surrogate Recoveries		
1,4-Difluorobenzene	**117**	**%**

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Gasoline

Project Name: Restover Truckstop

LIMS Project ID: 1108-96

Sample: 96078109 (Duplicate - LDP1)
Field ID: MW-30
Project Officer: Pam Marti

Date Received: 02/16/96
Date Prepared: 02/20/96
Date Analyzed: 02/20/96

Method: WTPH-G
Matrix: Water
Units: mg/L

Analyte	Result	Qualifier
Gasoline	**0.45**	
Surrogate Recoveries		
1,4-Difluorobenzene	**115**	%

Authorized By: M. J. Chilcote

Release Date: 3/18/96

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Gasoline

Project Name: Restover Truckstop **LIMS Project ID:** 1108-96

Sample: 96078110 **Date Received:** 02/16/96 **Method:** WTPH-G
Field ID: WDOE-6A **Date Prepared:** 02/20/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 02/21/96 **Units:** mg/L

Analyte	Result	Qualifier
Gasoline	**2.0**	
Surrogate Recoveries		
1,4-Difluorobenzene	**87**	**%**

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Gasoline

Project Name: Restover Truckstop **LIMS Project ID:** 1108-96

Sample: 96078111 **Date Received:** 02/16/96 **Method:** WTPH-G
Field ID: MW-16 **Date Prepared:** 02/20/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 02/21/96 **Units:** mg/L

Analyte	Result	Qualifier
Gasoline	0.12	U
Surrogate Recoveries		
1,4-Difluorobenzene	**76**	**%**

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Gasoline

Project Name: Restover Truckstop **LIMS Project ID:** 1108-96

Sample: 96078112 **Date Received:** 02/16/96 **Method:** WTPH-G
Field ID: MW-15A **Date Prepared:** 02/20/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 02/21/96 **Units:** mg/L

Analyte	Result	Qualifier
Gasoline	0.12	U
Surrogate Recoveries		
1,4-Difluorobenzene	77	%

Authorized By: M. M. Custard Release Date: 3/18/96 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Gasoline

Project Name: Restover Truckstop **LIMS Project ID:** 1108-96

Sample: 96078113 **Date Received:** 02/16/96 **Method:** WTPH-G
Field ID: MW-9A **Date Prepared:** 02/20/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 02/21/96 **Units:** mg/L

Analyte	Result	Qualifier
Gasoline	0.12	U
Surrogate Recoveries		
1,4-Difluorobenzene	78	%

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Gasoline

Project Name: Restover Truckstop **LIMS Project ID:** 1108-96

Sample: 96078114 **Date Received:** 02/16/96 **Method:** WTPH-G
Field ID: MW-12A **Date Prepared:** 02/20/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 02/21/96 **Units:** mg/L

Analyte	Result	Qualifier
Gasoline	0.12	U
Surrogate Recoveries		
1,4-Difluorobenzene	**80**	**%**

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Manchester Environmental Laboratory

7411 Beach Dr E, Port Orchard Washington 98366

CASE NARRATIVE

May 13, 1996

Subject: Restover Truck Stop
Samples: 96188020 - 96188025
Case No. 130296
Officer: Pam Marti
By: Myrna McIntosh
Organics Analysis Unit

BTEX and WTPH-G ANALYSIS

SUMMARY:

Samples 96188020 - 96188025 were analyzed on 5/3/96 through 5/6/96 for BTEX and WTPH-G. Sample 96188024 BTEX results were qualified as estimates because the surrogate recovery was above the control limit of 150%. These results may contain a high bias.

ANALYTICAL METHODS:

These compounds were analyzed using Manchester modification of the EPA Method 8021 purge-trap gas chromatography procedure with flame and photo ionization detection. Normal QA/QC procedures were performed on the samples.

BLANKS:

No analytes were detected in the blanks.

SURROGATES:

Sample 96188024 BTEX results were qualified as estimates because the surrogate recovery was above the control limit of 150%. These results may contain a high bias.

HOLDING TIMES:

The water samples were analyzed within the recommended 7 day holding time.

DUPLICATE SAMPLES AND MATRIX SPIKES:

All were within control 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	-	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.
E	-	This qualifier is used when the concentration of the associated value exceeds the known calibration range.
bold	-	The analyte was present in the sample. (Visual Aid to locate detected compound on report sheet.)

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Gasoline

Project Name: Restover Truckstop **LIMS Project ID:** 1302-96

Sample: BLN61416 **Method:** WTPH-G
Blank ID: BW6127A **Date Prepared:** 05/03/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 05/06/96 **Units:** mg/L

Analyte	Result	Qualifier
Gasoline	0.12	U
Surrogate Recoveries		
1,4-Difluorobenzene	85	%

Authorized By: _____ Release Date: 5/13/96 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Gasoline

Project Name: Restover Truckstop **LIMS Project ID:** 1302-96

Sample: 96188020 **Date Received:** 05/01/96 **Method:** WTPH-G
Field ID: MW-31 **Date Prepared:** 05/03/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 05/06/96 **Units:** mg/L

Analyte	Result	Qualifier
Gasoline	0.12	U
Surrogate Recoveries		
1,4-Difluorobenzene	**84**	**%**

Authorized By: _____ Release Date: 5/13/96 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Gasoline

Project Name: Restover Truckstop **LIMS Project ID:** 1302-96

Sample: 96188021
Field ID: MW-~~9A~~ 8A
Project Officer: Pam Marti

Date Received: 05/01/96
Date Prepared: 05/03/96
Date Analyzed: 05/06/96

Method: WTPH-G
Matrix: Water
Units: mg/L

Analyte	Result	Qualifier
Gasoline	0.12	U
Surrogate Recoveries		
1,4-Difluorobenzene	83	%

Authorized By: M. McCarthy Release Date: 5/13/96 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Gasoline

Project Name: Restover Truckstop

LIMS Project ID: 1302-96

Sample: 96188022
Field ID: MW-8B
Project Officer: Pam Marti

Date Received: 05/01/96
Date Prepared: 05/03/96
Date Analyzed: 05/03/96

Method: WTPH-G
Matrix: Water
Units: mg/L

Analyte	Result	Qualifier
Gasoline	0.12	U
Surrogate Recoveries		
1,4-Difluorobenzene	**83**	**%**

Authorized By: M. McCarthy Release Date: 5/13/96

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Gasoline

Project Name: Restover Truckstop **LIMS Project ID:** 1302-96

Sample: 96188022 (Duplicate - LDP1) **Date Received:** 05/01/96 **Method:** WTPH-G
Field ID: MW-8B **Date Prepared:** 05/03/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 05/03/96 **Units:** mg/L

Analyte	Result	Qualifier
Gasoline	0.13	
Surrogate Recoveries		
1,4-Difluorobenzene	84	%

Authorized By: M. McCarthy Release Date: 5/13/96

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Gasoline

Project Name: Restover Truckstop **LIMS Project ID:** 1302-96

Sample: 96188023
Field ID: MW-20A
Project Officer: Pam Marti

Date Received: 05/01/96
Date Prepared: 05/03/96
Date Analyzed: 05/06/96

Method: WTPH-G
Matrix: Water
Units: mg/L

Analyte	Result	Qualifier
Gasoline	0.12	U
Surrogate Recoveries		
1,4-Difluorobenzene	**82**	**%**

Authorized By: M. M. Carlson Release Date: 5/13/96 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Gasoline

Project Name: Restover Truckstop **LIMS Project ID:** 1302-96

Sample: 96188024 **Date Received:** 05/01/96 **Method:** WTPH-G
Field ID: MW-30 **Date Prepared:** 05/03/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 05/06/96 **Units:** mg/L

Analyte	Result	Qualifier
Gasoline	1.1	
Surrogate Recoveries		
1,4-Difluorobenzene	96	%

Authorized By: _____ Release Date: 5/13/96

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

TPH as Gasoline

Project Name: Restover Truckstop **LIMS Project ID:** 1302-96

Sample: 96188025
Field ID: WDOE-6A
Project Officer: Pam Marti

Date Received: 05/01/96
Date Prepared: 05/03/96
Date Analyzed: 05/06/96

Method: WTPH-G
Matrix: Water
Units: mg/L

Analyte	Result	Qualifier
Gasoline	17	
Surrogate Recoveries		
1,4-Difluorobenzene	101 %	

Authorized By: M. McCrost Release Date: 5/13/96 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truckstop

LIMS Project ID: 1302-96

Sample: BLN61417
Blank ID: BLN6127A
Project Officer: Pam Marti

Date Prepared: 05/03/96
Date Analyzed: 05/06/96

Method: SW8020
Matrix: Water
Units: ug/L

Analyte	Result	Qualifier
Benzene	1.0	U
Toluene	1.0	U
Ethylbenzene	1.0	U
Total Xylenes	3.0	U

Surrogate Recoveries

1,4-Difluorobenzene	102	%

Authorized By: _____ Release Date: 5/13/96

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truckstop **LIMS Project ID:** 1302-96

Sample: 96188020
Field ID: MW-31
Project Officer: Pam Marti

Date Received: 05/01/96
Date Prepared: 05/03/96
Date Analyzed: 05/06/96

Method: SW8020
Matrix: Water
Units: ug/L

Analyte	Result	Qualifier
Benzene	1.0	U
Toluene	1.0	U
Ethylbenzene	1.0	U
Total Xylenes	3.0	U

Surrogate Recoveries

1,4-Difluorobenzene	99	%

Authorized By: M. McCulloch Release Date: 5/13/96

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truckstop **LIMS Project ID:** 1302-96

Sample: 96188021
Field ID: MW~~-9A~~ 8A
Project Officer: Pam Marti

Date Received: 05/01/96
Date Prepared: 05/03/96
Date Analyzed: 05/03/96

Method: SW8020
Matrix: Water
Units: ug/L

Analyte	Result	Qualifier
Benzene	1.0	U
Toluene	1.0	U
Ethylbenzene	1.0	U
Total Xylenes	3.0	U

Surrogate Recoveries

1,4-Difluorobenzene	**97**	**%**

Authorized By: M. M. Chatfield Release Date: 5/13/96 Page: 1

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truckstop **LIMS Project ID:** 1302-96

Sample: 96188021 (Matrix Spike - LMX1) **Date Received:** 05/01/96 **Method:** SW8020
Field ID: MW-~~9A~~ 8A **Date Prepared:** 05/03/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 05/03/96 **Units:** % Recovery

Analyte	Result	Qualifier
Benzene	103	
Toluene	102	
Ethylbenzene	100	
Total Xylenes	96	

Surrogate Recoveries

1,4-Difluorobenzene	100	%

Authorized By: _____ Release Date: 5/13/96

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truckstop **LIMS Project ID:** 1302-96

Sample: 96188021 (Matrix Spike - LMX2) **Date Received:** 05/01/96 **Method:** SW8020
Field ID: MW-~~9A~~ 8A **Date Prepared:** 05/03/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 05/03/96 **Units:** % Recovery

Analyte	Result	Qualifier
Benzene	103	
Toluene	102	
Ethylbenzene	101	
Total Xylenes	96	

Surrogate Recoveries

1,4-Difluorobenzene	102	%

Authorized By: _____ Release Date: 5/13/96

Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truckstop **LIMS Project ID:** 1302-96

Sample: 96188022 **Date Received:** 05/01/96 **Method:** SW8020
Field ID: MW-8B **Date Prepared:** 05/03/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 05/06/96 **Units:** ug/L

Analyte	Result	Qualifier
Benzene	1.0	U
Toluene	1.0	U
Ethylbenzene	1.0	U
Total Xylenes	3.0	U

Surrogate Recoveries

1,4-Difluorobenzene	**97**	**%**

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truckstop **LIMS Project ID:** 1302-96

Sample: 96188023 **Date Received:** 05/01/96 **Method:** SW8020
Field ID: MW-20A **Date Prepared:** 05/03/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 05/06/96 **Units:** ug/L

Analyte	Result	Qualifier
Benzene	1.0	U
Toluene	1.0	U
Ethylbenzene	1.0	U
Total Xylenes	3.0	U

Surrogate Recoveries

1,4-Difluorobenzene	**96**	**%**

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truckstop **LIMS Project ID:** 1302-96

Sample: 96188024 **Date Received:** 05/01/96 **Method:** SW8020
Field ID: MW-30 **Date Prepared:** 05/03/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 05/03/96 **Units:** ug/L

Analyte	Result	Qualifier
Benzene	3.7	J
Toluene	1.0	J
Ethylbenzene	4.5	J
Total Xylenes	10	J

Surrogate Recoveries

1,4-Difluorobenzene	167	%

Comments: Analytes are estimated because the surrogate spike was out of the control limits of 50 - 150% recovery.

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Manchester Environmental Laboratory

Department of Ecology

Analysis Report for

Benzene, Ethylbenzene, Toluene, Xylenes

Project Name: Restover Truckstop **LIMS Project ID:** 1302-96

Sample: 96188025 **Date Received:** 05/01/96 **Method:** SW8020
Field ID: WDOE-6A **Date Prepared:** 05/03/96 **Matrix:** Water
Project Officer: Pam Marti **Date Analyzed:** 05/06/96 **Units:** ug/L

Analyte	Result	Qualifier
Benzene	50	U
Toluene	50	U
Ethylbenzene	**1100**	
Total Xylenes	**4800**	

Surrogate Recoveries

1,4-Difluorobenzene	**101**	**%**

Authorized By: M. McClintock Release Date: 5/13/96 Page: 1