
QUARTERLY REPORT

JULY 1999

GROUNDWATER MONITORING

"Flying J – Milwaukie #2"

DEQ Site No. 03-93-0008

Delco Petroleum Company, LLC
17873 S.E. McLoughlin Boulevard
Milwaukie, Oregon 97267

August 4, 1999

Prepared For:

Delco Petroleum Company, LLC

14 Long Leaf Drive
Hamilton, New Jersey 08690
through NW Envirocon, Vancouver, WA

DEPT OF ENVIRONMENTAL QUALITY
RECEIVED

AUG 04 1999

NORTHWEST REGION

Prepared By:

Richard C. Kent, R.G.
GeoPro Geologic Services
Post Office Box 26
Battle Ground, WA 98604

Project Number 990621



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TABLE OF CONTENTS

	<u>Page</u>
1. INTRODUCTION.....	4
1.1. PURPOSE AND SCOPE OF WORK	4
1.2. LOCATION.....	4
2. PREVIOUS WORK.....	5
2.1. PREVIOUS REPORTS	5
2.2. ENVIRONMENTAL ASSESSMENTS	6
2.3. CLEANUP STANDARD EVALUATION REPORT	6
2.4. SUMMARY REPORT	7
2.5. QUARTERLY REPORTS.....	7
2.6. FREE PRODUCT	8
2.7. MONITOR WELL INSTALLATIONS	8
2.8. PREVIOUS GROUNDWATER LEVELS.....	10
2.9. PREVIOUS GROUNDWATER GRADIENT ESTIMATES.....	12
2.10. PREVIOUS GROUNDWATER SAMPLING RESULTS	13
3. JULY 1999 GROUNDWATER SAMPLING.....	15
3.1. GEOLOGY AND HYDROGEOLOGY	15
3.2. GROUNDWATER GRADIENTS	15
3.3. GROUNDWATER SAMPLING METHODOLOGY	17
3.4. LABORATORY ANALYSES.....	17
4. INTERPRETATIONS AND CONCLUSIONS	18
4.1. DEQ NOTICE OF VIOLATION.....	18
4.2. GROUNDWATER MONITORING	18
4.2.1. <i>Previous Groundwater Sampling</i>	18
4.2.2. <i>July 1999 Groundwater Sampling</i>	19
5. RECOMMENDATIONS	20
5.1. FURTHER WORK	20
6. LIMITATIONS	21

Table of Contents - *continued*

TABLES

Table 1 – PHASE III SOIL SAMPLING ANALYTICAL RESULTS.....	6
Table 2 – SUMMARY OF QUARTERLY REPORTS	7
Table 3 – MONITOR WELL INSTALLATION SUMMARY.....	9
Table 4 – PREVIOUS GROUNDWATER LEVELS (feet)	10
Table 5 – SUMMARY OF PREVIOUSLY REPORTED GROUNDWATER GRADIENTS	12
Table 6 – PREVIOUS GROUNDWATER SAMPLING ANALYSES (µg/l).....	13
Table 7 – MONITOR WELL ELEVATIONS AND STATIC WATER LEVELS.....	16
Table 8 – GROUNDWATER ANALYSIS RESULTS	17

FIGURES

Figure 1 – LOCATION MAP.....	22
Figure 2 – SITE MAP	23
Figure 3 – GROUNDWATER GRADIENT MAP: JULY 1999.....	24

CHARTS

Chart 1 – PREVIOUS GROUNDWATER LEVELS	11
Chart 2 – PREVIOUS GROUNDWATER ANALYSES (SELECTED WELLS).....	14
Chart 3 – JULY 1999 STATIC WATER ELEVATIONS	16

APPENDICES

Appendix A – JULY 1999 LABORATORY REPORT	
Appendix B – JULY 1999 WATER SAMPLE FIELD LOGS	
Appendix C – MONITOR WELL LOGS (MW-1 THROUGH MW-13)	
Appendix D – DEQ NOTICE OF CIVIL PENALTY (JUNE 7, 1999)	
Appendix E – WELL SURVEY SUMMARY BY BARBIERI & ASSOCIATES	

1. INTRODUCTION

1.1. PURPOSE AND SCOPE OF WORK

The purpose of this report is to summarize analysis of groundwater samples collected on July 23rd, 24th, and 25th, 1999 from ten (10) monitor wells and an on-site petroleum hydrocarbon separator treatment facility. Richard C. Kent, Registered Geologist of GeoPro Geologic Services ("Consultant"), was authorized by Delco Petroleum Company, LLC, 14 Long Leaf Drive, Hamilton, New Jersey 08690 ("Client" and "Landowner") to begin work on July 1, 1999.

This report has been prepared in partial response to a Notice of Violation, Department Order, and Assessment of Civil Penalty No. WMC/T-NWR-99-064 Clackamas County in the Matter of Devinder Dhillon and Delco Petroleum Co., LLC before the Environmental Quality Commission of the State of Oregon ("Order"). The resumption of quarterly groundwater sampling and reporting is required as stated in a cover letter to the Order by Certified Mail Z 440 760 423 dated June 7, 1999 from Mr. Langdon Marsh, Director of the Oregon Department of Environmental Quality ("DEQ") to Mr. Devinder Dhillon (see Appendix D).

Previous work is summarized in this report to allow convenient reference to prior investigation data. However, such summary information is not a replacement for work by others.

1.2. LOCATION

The Delco Petroleum Company, LLC service station at 17873 SE McLoughlin Boulevard, Milwaukie, Oregon 97267 ("Site") is a commercial property surrounded by other commercial properties within the SE/4 of the SW/4, Section 18, Township 2 South, Range 2 East (WM) in Clackamas County, Oregon (see Figure 1 - "Location Map"). The Site is Tax Lot 1700 adjacent to "Ed's Mufflers and Brakes" to the north and "Busters Restaurant" to the south on the west side of McLoughlin Boulevard (Oregon State Highway 99) (see Figure 2 - "Site Map"). The Site has also been referenced as "Milwaukie Fuel Stop", "Delco Company", and/or "Flying J". The Willamette River flows northerly approximately one-half mile west of the Site.

The Site is an active service station which is understood to contain one (1) abandoned diesel underground storage tank ("UST") with a nominal capacity of 8,000-gallons, and three (3) active gasoline UST's each with a nominal capacity of 12,000-gallons in a 'tank field' located in the north-central portion of the Site. The Site also contains a building with office and three (3) service bays for auto lubrication and oil changing, and, three (3) gasoline pump islands. Initial analysis of soil and groundwater samples collected from borings and monitor wells indicated groundwater contamination that exceeded cleanup levels due to apparent gasoline and/or diesel leakage from the UST's, piping, and/or associated facilities.

Apparently, three (3) or five (5) lube-oil USTs, removed during, or prior to, 1993, were located immediately north of existing Monitor Well MW-6. Groundwater for a pump treatment system is produced from Monitor Wells MW-7 and MW-8, located east and west, respectively, of the tank field. Sampling of the treatment system is done under a National Pollutant Discharge Elimination System ("NPDES") Permit No. 1500A, dated August 24, 1995 and expiring June 30, 2000.

2. PREVIOUS WORK

2.1. PREVIOUS REPORTS

Previous Site work has been summarized in the following available reports:

- “*Phase III Environmental Assessment Report*”, for Jiffy Lube, Milwaukie, OR, by Delta Environmental Consultants, Inc., Bellevue, WA, undated, 6pp., Figures, Tables, and Appendices.
- “*Cleanup Standards for Benzene, Toluene, Ethylbenzene, Xylene, and TPH per EPA Guidance Document EPA 910/9-91-036*”, for Eclipse Environmental Consulting, Richland, WA, by Columbia Energy & Environmental Services, Inc., Richland, WA, June 15, 1994, 5pp. and Tables.
- “*Third Quarterly Ground Water Monitoring Report*”, for Delco Company (formerly Flying J), by Northwest Envirocon, Inc., Vancouver, WA, June 15, 1995, 6pp. and Appendices.
- “*Fourth Quarterly Ground Water Monitoring Report*”, for Delco Company (formerly Flying J), by Northwest Envirocon, Inc., Vancouver, WA, June 22, 1995, 7pp. and Appendices.
- “*Fifth Quarterly Ground Water Monitoring Report*”, for Delco Company (formerly Flying J), by Northwest Envirocon, Inc., Vancouver, WA, October 18, 1995, 7pp. and Appendices.
- “*Delco Project Summary Report*”, for Delco Company (formerly Flying J), by Northwest Envirocon, Inc., Vancouver, WA, December 20, 1995, 6pp. and Appendices.
- “*Sixth Quarterly Ground Water Monitoring Report*”, for Delco Company (formerly Flying J), by Northwest Envirocon, Inc., Vancouver, WA, February 15, 1996, 7pp. and Appendices.
- “*Seventh Quarterly Ground Water Monitoring Report*”, for Delco Company (formerly Flying J), by Northwest Envirocon, Inc., Vancouver, WA, May 15, 1996, 7pp. and Appendices.
- “*Ground Water Monitoring Report*”, for Delco Company, by Northwest Envirocon, Inc., Vancouver, WA, September 30, 1996, 10pp. and data information.
- “*Eighth Quarterly Ground Water Monitoring Report*”, for Delco Company (formerly Flying J), by Northwest Envirocon, Inc., Vancouver, WA, November 8, 1996, 8pp. and Appendices.
- “*Ninth Quarterly Ground Water Monitoring Report*”, for Delco Company (formerly Flying J), by Northwest Envirocon, Inc., Vancouver, WA, February 21, 1997, 8pp. and Appendices.
- “*First Quarter 1998 Ground Water Monitoring Report*”, for Delco Company (formerly Flying J), by Northwest Envirocon, Inc., Vancouver, WA, February 12, 1998, 8pp. and Appendices.

2.2. ENVIRONMENTAL ASSESSMENTS

"Phase I" and "Phase II" Environmental Assessments were completed by Delta Environmental Consultants Inc. ("Delta"), 3150 Richards Road, Suite 100, Bellevue, Washington 98005 between May 12 and May 27, 1993. Phase I was completed to assess the historical and potential environmental impacts to the Site. Phase II involved drilling five soil borings to collect and analyze soil samples. The Site was known as "Jiffy Lube International Store #1012", located at 17869 SE McLoughlin Boulevard, Milwaukie, Oregon.

Between June 18 and June 21, 1993, Delta performed a "Phase III" Environmental Assessment as summarized in an undated report by Patricia A. Crump and Daniel S. Whitman of Delta. Phase III involved the drilling and installation of six-(6) groundwater monitoring wells: MW-1, MW-2, MW-3, MW-4, MW-5, and MW-6. Soil samples from the borings for the monitor wells were analyzed for BTEX and TPH. Groundwater samples collected from each monitor well were analyzed for BTEX, TPH, and TPH-G.

During Phase III, petroleum hydrocarbons were detected in soil samples from MW-1 through MW-4 at unknown depths and MW-5 at 5- to 6.5-feet. Benzene was detected in groundwater samples from wells MW-1 through MW-5. Toluene was detected in water samples from MW-1, MW-3, and MW-4. Ethylbenzene and xylenes were detected in all groundwater samples, but apparently exceeded DEQ action levels only in well MW-3. Apparently no constituents were detected in the water sample from well MW-6. Initial soil analytical results are summarized below in Table 1 – "Phase III Soil Sampling Analytical Results".

Table 1 – PHASE III SOIL SAMPLING ANALYTICAL RESULTS

Boring	Sample	Depth	Date	Analytical Test Results, mg/kg (ppm)								
				TPH-G	TPH-D	TPH-ID Gasoline	TPH-ID Diesel	TPH	B	T	E	X
MW-1	S-2	unk (5-6.5 ft?)	6/23/93	87	550	>20	<50	110	510	44	150	1,050
MW-2	S-1	unk (2.5-4 ft?)	6/23/93	29	1,200	>20	>50	1,100	23,000	320	9,800	40,470
MW-3	S-2	unk (5-6.5 ft?)	6/23/93	62	180	>20	>50	680	3,800	49,000	51,000	289,000
MW-4	S-2	unk(5-6.5 ft?)	6/23/93	<10		>20	>50	120	4,600	520	6,000	10,500
MW-5	S-2	5-6.5 ft	6/23/93	13		>20	<50	210	2,900	84	1,300	3,250
MW-6	S-2	7.5-9 ft	6/23/93	<10	23	>20	>50	160	<30	<30	<30	<30

Notes: "<" = Below Reporting Limit of laboratory, and may be accepted as practically non-detectable, or very low concentration and not; ND = Not Detected at or above reporting limit; TPH = Total Petroleum Hydrocarbons, TPH-G = gasoline-range hydrocarbons, TPH-D = diesel-range hydrocarbons, B=benzene, T=toluene, E=ethylbenzene, X=total xylenes; blank boxes = not analyzed.

Delta concluded from water level measurements taken during Phase III that the groundwater gradient was approximately 0.001-feet/foot between MW-1 and MW-5 in a west to northwest direction. Groundwater was encountered at approximately seven (7)-feet below ground surface during the drilling of the monitor wells. Silty sands essentially underlie the Site, with silty clay occurring at shallow depths.

2.3. CLEANUP STANDARD EVALUATION REPORT

The report titled "Cleanup Standards for Benzene, Toluene, Ethylbenzene, Xylene, and TPH per EPA Guidance Document EPA 910/9-91-036", completed by Columbia Energy & Environmental Services, Inc. ("Columbia") on June 15, 1994, concluded that "benzene groundwater concentration was the only compound to average above the EPA and Oregon cleanup levels". The calculations for groundwater risk exposures

apparently used "soil cleanup standards". Columbia infers that average TPH values "*showed Oregon compliance*" but "*specific locations ... need to be addressed for cleanup*".

Because the basis for concluding that benzene is the only compound of interest may be outdated guidance documents that may not be currently used by DEQ, this report by Columbia will not be further evaluated.

2.4. SUMMARY REPORT

A report was prepared by Northwest Envirocon, Inc. ("NWE") titled "Delco Project Summary Report" dated December 20, 1995. The purpose of the report was to summarize Site remediation activities from May 1993 through December 1995. The report notes that free product was recovered from July 1994 to January 1995, presumably from recovery wells MW-7 and MW-8, and was not observed at the treatment facility after January 1995. The report concludes that from June to December 1995, BTEX concentrations increased in monitor wells MW-1 and MW-5, while decreasing in other monitor wells.

2.5. QUARTERLY REPORTS

The following Table 2 – "Summary of Quarterly Reports" is a list of available prior monitoring reports.

Table 2 – SUMMARY OF QUARTERLY REPORTS

Report Title	Date of Report	Date of Groundwater Sampling	Monitor Wells Sampled
First Quarterly Ground Water Monitoring Report	August 14, 1994	July 18-19, 1994	MW-1 through MW-6
Third Quarterly Ground Water Monitoring Report	June 15, 1995	January 24, 1995	MW-1 through MW-6
Fourth Quarterly Ground Water Monitoring Report	June 22, 1995	June 20, 1995	MW-1, MW-2, MW-4, MW-5, MW-6, MW-9
Fifth Quarterly Ground Water Monitoring Report	October 18, 1995	September 29, 1995	MW-1, MW-2, MW-4, MW-5, MW-6, MW-9
Sixth Quarterly Ground Water Monitoring Report	February 15, 1996	February 15, 1996	MW-1, MW-2, MW-4, MW-5, MW-6, MW-9
Seventh Quarterly Ground Water Monitoring Report	May 15, 1996	April 26, 1996	MW-1, MW-2, MW-4, MW-5, MW-6, MW-9
Ground Water Monitoring Report	September 30, 1996	September 17-18, 1996	MW-11 through MW-13
Eighth Quarterly Ground Water Monitoring Report	November 8, 1996	October 29, 1996	MW-1, MW-2, MW-4, MW-5, MW-6, MW-9 through MW-13
Ninth Quarterly Ground Water Monitoring Report	February 21, 1997	January 15, 1997	MW-1, MW-2, MW-4, MW-5, MW-6, MW-9 through MW-13
First Quarter 1998 Ground Water Monitoring Report	February 12, 1998	January 27, 1998	MW-1, MW-2, MW-4, MW-5, MW-6, MW-9 through MW-13

2.6. FREE PRODUCT

As reported in the "Third Quarterly Ground Water Monitoring Report" by NWE dated June 15, 1995, free product was observed only in Monitor Well MW-3 during sampling on January 24, 1995. As stated in the report: *"Manual removal of free product from MW-3 was conducted on a weekly basis from July 19, 1994 to October 30, 1994; and biweekly from November 6, 1994 until January 24, 1995."* The free product *"smelled like gasoline, was dark brown-black in color"*, and was one (1)-inch thick in MW-3 on July 19, 1994. No measurable layer of free product was observed during sampling of MW-3 on October 2, 1994, after which *"residue"* was observed in the bailer during subsequent sampling events.

As reported in the "Fourth Quarterly Ground Water Monitoring Report" by NWE dated June 22, 1995, free product was observed only in Monitor Well MW-7 during sampling on June 20, 1995. As stated in the report: *"The bailed free product and ground water from MW-7 is stored in a 55-gallon drum on the site."*

No free product was reportedly observed in any monitor wells on and after September 29, 1995 (see Fifth Quarterly Ground Water Monitoring Report by NWE).

2.7. MONITOR WELL INSTALLATIONS

Thirteen (13) groundwater monitor wells have been installed in response to potential impact by petroleum hydrocarbons to groundwater following the initial Environmental Assessment Phases I through III as described above. Ten (10) monitoring wells are currently accessible for obtaining groundwater samples. Available well logs are included in Appendix C – "Monitor Well Logs (MW-1 through MW-13)".

Monitoring Well MW-3 was decommissioned on February 20, 1995 by Geo-Tech Explorations, Inc., Tualatin, Oregon as summarized in a letter to DEQ by Martin S. Burck, R.G. on March 24, 1995. The decommissioning was caused by site characterization excavation activities (apparently a backhoe or similar) which removed soil around MW-3 to a depth of four (4)- to five (5)-feet and destroyed the annular seal. The well was reportedly decommissioned by overdrilling and backfilling with bentonite per Oregon Department of Water Resources procedures. Monitor Well MW-7 was previously installed on January 27, 1995 as an anticipated monitoring location replacement for well MW-3.

Also on January 27, 1995, monitor wells MW-8 and MW-9 were installed at the Site. MW-7 and MW-8 are constructed with four (4)-inch PVC as production wells for the treatment facility. All other monitor wells are constructed with two (2)-inch PVC. One monitoring well, MW-11, was installed off-site in a down-gradient direction on August 17, 1996, to the northwest, on the "Ed's Muffler & Brakes" property.

The following Table 3 – “Monitor Well Installation Summary” includes reported well installation methods.

Table 3 - MONITOR WELL INSTALLATION SUMMARY

Monitor Well	Date Installed	Elevation (ft)	Total Depth (ft bgs)	SWL When Drilled	Casing & Screen Size	Screened Interval	Filter Pack	Annular Seal Bottom	General Lithology
MW-1	6/18/93	99.67	15.0	5.02	2-inch PVC	5-15 ft	10/20 4-15 ft	4 ft	clay
MW-2	6/18/93	98.79	14.0	4.2	2-inch PVC	4-14 ft	10/20: 3-14 ft	3 ft	clay
MW-3	6/18/93	98.57	15.0	4.0	2-inch PVC	5-15 ft	10/20: 4-15 ft	4 ft	clay, sandy silt
MW-4	6/18/93	99.30	15.0	4.76	2-inch PVC	5-15 ft	10/20: 4-15 ft	4 ft	clay, fn sand
MW-5	6/19/93	100.66	15.0	6.14	2-inch PVC	5-15 ft	10/20: 4-15 ft	4 ft	clay, fn sand
MW-6	6/19/93	100.29	14.5	5.71	2-inch PVC	5-14.5 ft	10/20: 3.5-14.5 ft	3.5 ft	silty fn sand
MW-7	1/27/95	98.96	19.0	unk	4-inch PVC	4-19 ft	10/20: 3-19 ft	unk (13?)	clayey silt, silty sand
MW-8	1/27/95	99.63	20.0	unk	4-inch PVC	5-20 ft	10/20: 3-20 ft	unk (14.5?)	clayey silt, silty sand
MW-9	1/27/95	99.72	15.0	unk	2-inch PVC	5-15 ft	10/20: 3-15 ft	unk (10?)	clayey silt
MW-10	8/12/96	98.77	15.0	9.0	2-inch PVC	10-15 ft	10/20: 8-15 ft	8 ft	gray clay
MW-11	8/12/96	99.98	15.0	9.0	2-inch PVC	10-15 ft	10/20: 8-15 ft	8 ft	gray clay
MW-12	8/12/96	100.54	15.0	9.0	2-inch PVC	10-15 ft	10/20: 8-15 ft	8 ft	gray clay
MW-13	8/12/96	100.11	15.0	9.0	2-inch PVC	10-15 ft	10/20: 8-15 ft	8 ft	gray clay

Notes:

Elevations are from report titled “Eighth Quarterly Ground Water Monitoring Report” dated November 8, 1996 by NWE for Delco. “SWL when drilled” for MW-1 through MW-6 was calculated from elevation shown on Delta construction well log minus water level measured two or three days after installation. “Annular seal bottom” in MW-1 through MW-6 calculated from top of PVC casing depth shown on well construction logs by Delta. First encounter of groundwater for MW-7 through MW-9 not recorded on available geologic logs by Martin S. Burck, OR R.G.. Data for MW-10 through MW-13 from driller’s well report since geologic logs are unavailable or missing.

2.8. PREVIOUS GROUNDWATER LEVELS

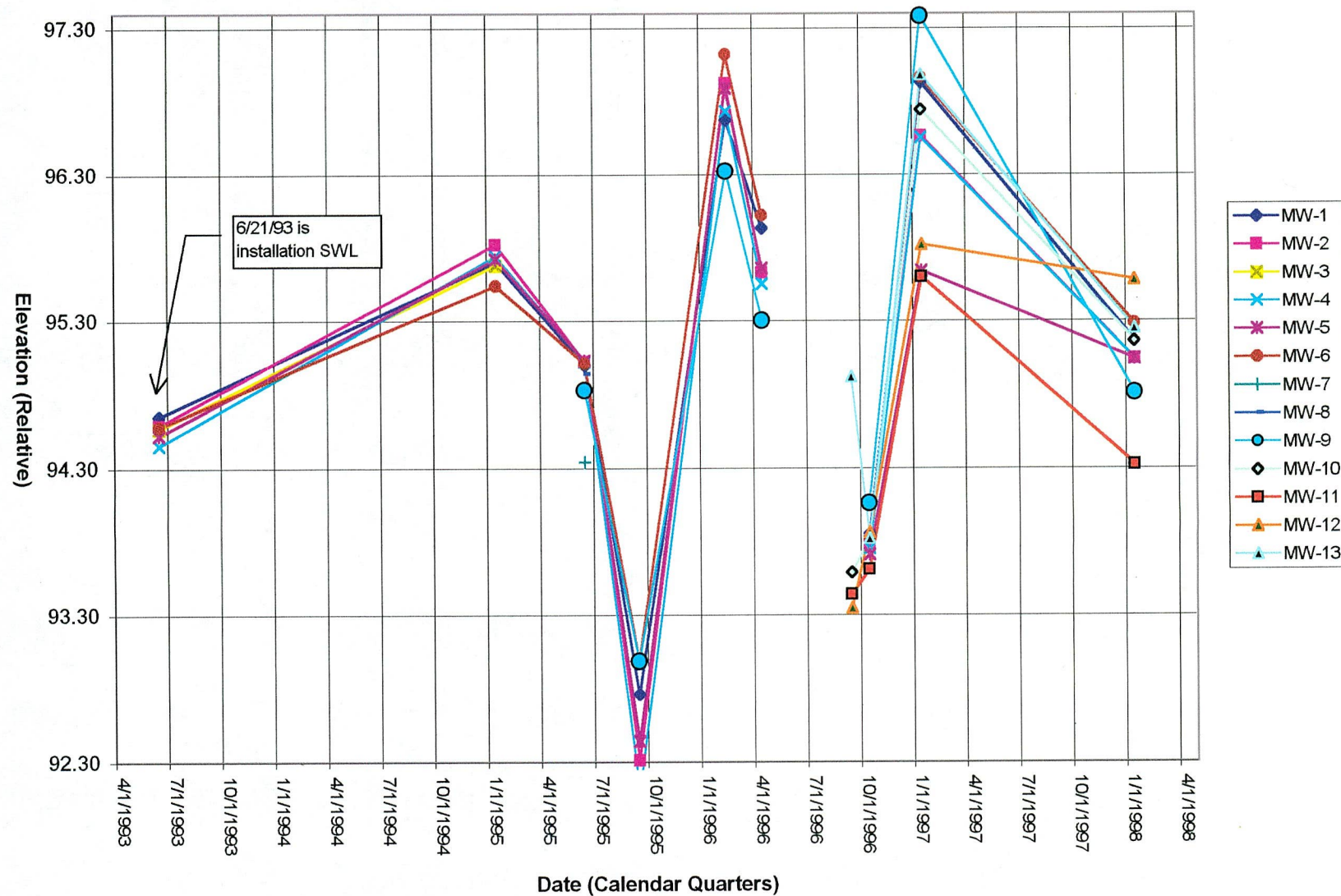
Groundwater levels appear to fluctuate as indicated in the following Table 4 – “Previous Groundwater Levels” and accompanying Chart 1 - “Previous Groundwater Levels”.

Table 4 – PREVIOUS GROUNDWATER LEVELS (feet)

Monitor Well	Date	SWL Below Casing	SWL Elevation	Monitor Well	Date	SWL Below Casing	SWL Elevation
MW-1	6/21/93	nr	94.65	MW-6	6/21/93	nr	94.58
	1/24/95	3.97	95.70		1/24/95	4.75	95.54
	6/20/95	4.67	95.00		6/20/95	5.28	95.01
	9/29/95	6.91	92.76		9/29/95	7.38	92.99
	2/15/96	3.00	96.67		2/15/96	3.17	97.12
	4/26/96	3.74	95.93		4/26/96	4.27	96.02
	10/29/96	5.82	93.85		10/29/96	6.47	93.82
	1/15/97	2.74	96.93		1/15/97	3.33	96.96
MW-2	1/27/98	4.51	95.16		1/27/98	5.01	95.28
	6/21/93	nr	94.59	MW-7	6/20/95	4.61	94.34
	1/24/95	2.97	95.82	MW-8	6/20/95	4.68	94.94
	6/20/95	3.77	95.02	MW-9	6/20/95	4.88	94.83
	9/29/95	6.48	92.31		9/29/95	6.73	92.99
	2/15/96	1.87	96.92		2/15/96	3.39	96.32
	4/26/96	3.16	95.63		4/26/96	4.42	95.30
	10/29/96	5.00	93.79		10/29/96	5.66	94.06
MW-3	1/15/97	2.23	96.56		1/15/97	2.34	97.38
	1/27/98	3.75	95.04		1/27/98	4.91	94.81
	6/21/93	nr	94.57	MW-10	9/18/96	5.18	93.59
	1/24/95	2.89	95.68		10/29/96	4.94	93.83
MW-4	6/21/93	nr	94.54		1/15/97	2.03	96.74
	1/24/95	3.56	95.74		1/27/98	3.61	95.16
	6/20/95	4.28	95.02	MW-11	9/18/96	6.54	93.44
	9/29/95	7.20	92.10		10/29/96	6.37	93.61
	2/15/96	2.57	96.73		1/15/97	4.38	95.60
	4/26/96	3.75	95.55		1/27/98	5.66	94.32
	10/29/96	5.55	93.75	MW-12	9/18/96	7.19	93.35
	1/15/97	2.75	96.55		10/29/96	6.68	93.86
MW-5	1/27/98	4.26	95.04		1/15/97	4.72	95.82
	6/21/93	nr	94.52		1/27/98	4.96	95.58
	1/24/95	4.94	95.72	MW-13	9/18/96	5.19	94.92
	6/20/95	5.63	95.03		10/29/96	6.29	93.82
	9/29/95	8.22	92.44		1/15/97	3.13	96.98
	2/15/96	3.77	96.89		1/27/98	4.86	95.25
	4/26/96	5.00	95.66				
	10/29/96	6.95	93.71				
	1/15/97	4.02	96.64				
	1/27/98	5.62	95.04				

Notes: SWL in feet below top of casing. Elevations from data in quarterly reports (not Barbieri survey of 7/27/99). "nr" = not reported.

Chart 1 - PREVIOUS GROUNDWATER LEVELS



2.9. PREVIOUS GROUNDWATER GRADIENT ESTIMATES

Previous groundwater gradient maps in quarterly reports indicate that the direction of groundwater flow may be variable as indicated in Chart 1 above and summarized in the following Table 5 – “Summary of Previously Reported Groundwater Gradients”.

Table 5 – SUMMARY OF PREVIOUSLY REPORTED GROUNDWATER GRADIENTS

Report Title	Date of Report	Date of Groundwater Measurement	Monitor Wells Measured	Reported Groundwater Flow Direction
First Quarterly Ground Water Monitoring Report	August 14, 1994	apparently July 18-19, 1994	apparently MW-1 through MW-6	not reported
Third Quarterly Ground Water Monitoring Report	June 15, 1995	January 24, 1995	MW-1 through MW-6	“virtually flat”
Fourth Quarterly Ground Water Monitoring Report	June 22, 1995	June 20, 1995	MW-1, MW-2, MW-4, MW-5, MW-6, MW-9	southeast
Fifth Quarterly Ground Water Monitoring Report	October 18, 1995	September 29, 1995	MW-1, MW-2, MW-4, MW-5, MW-6, MW-9	northwest
Sixth Quarterly Ground Water Monitoring Report	February 15, 1996	February 15, 1996	MW-1, MW-2, MW-4, MW-5, MW-6, MW-9	east and west
Seventh Quarterly Ground Water Monitoring Report	May 15, 1996	April 26, 1996	MW-1, MW-2, MW-4, MW-5, MW-6, MW-9	north and southeast
Ground Water Monitoring Report	September 30, 1996	September 17-18, 1996	MW-11 through MW-13	southeast
Eighth Quarterly Ground Water Monitoring Report	November 8, 1996	October 29, 1996	MW-1, MW-2, MW-4, MW-5, MW-6, MW-9 through MW-13	northwest
Ninth Quarterly Ground Water Monitoring Report	February 21, 1997	January 15, 1997	MW-1, MW-2, MW-4, MW-5, MW-6, MW-9 through MW-13	northwest
First Quarter 1998 Ground Water Monitoring Report	February 12, 1998	January 27, 1998	MW-1, MW-2, MW-4, MW-5, MW-6, MW-9 through MW-13	north

Notes:

Initial flow directions as reported in Environmental Assessment Phase III report are west-northwest.

2.10. PREVIOUS GROUNDWATER SAMPLING RESULTS

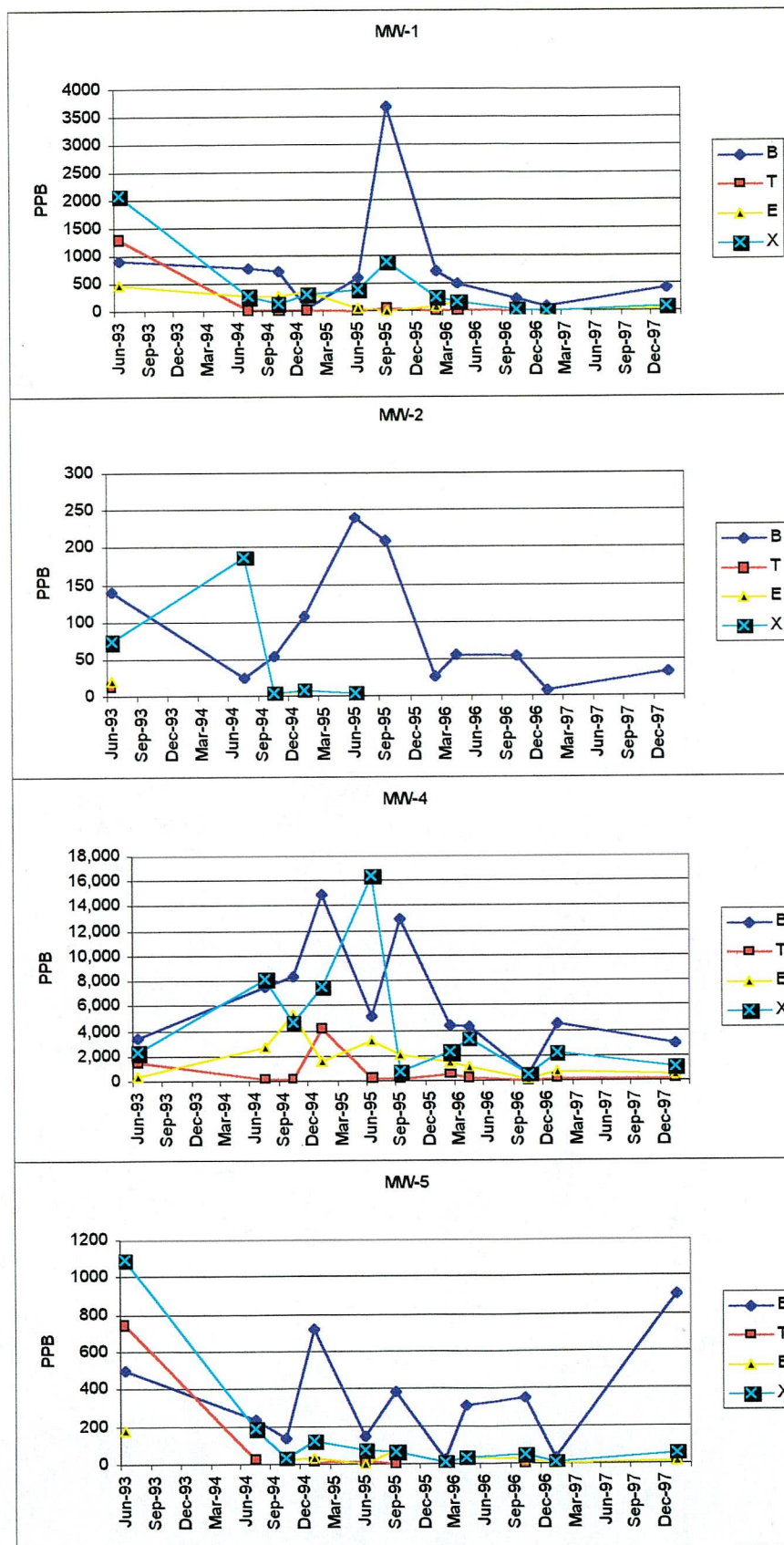
The results of previous groundwater sampling analyses are shown below in the Table 6 – “Previous Groundwater Sampling Analyses” and in Chart 2 – “Previous Groundwater Analyses (Selected Wells)”.

Table 6 - PREVIOUS GROUNDWATER SAMPLING ANALYSES (µg/l)

Monitor Well	Date Sampled	B	T	E	X	TPH Gas	Monitor Well	Date Sampled	B	T	E	X	TPH Gas
MW-1	6/22/93	910	1,300	470	2,090		MW-6	7/18/94	14	7	7	26	
	7/18/94	770	14	264	272			10/28/94	ND	ND	ND	ND	
	10/28/94	729	16	269	145			1/24/95	ND	ND	ND	ND	
	1/24/95	62	29	349	315			6/20/95	ND	ND	ND	ND	
	6/20/95	619	10	66	377			9/29/95	ND	ND	ND	ND	
	9/29/95	3,700	43	1,050	895			2/15/96	ND	ND	ND	ND	
	2/15/96	727	8	92	261			4/26/96	ND	ND	ND	ND	
	4/26/96	497	17	180	159			10/29/96	ND	ND	ND	ND	
	10/29/96	231	5	18	15			1/15/97	ND	ND	ND	ND	
	1/15/97	83	ND	9	13			1/27/98	ND	ND	ND	ND	
	1/27/98	411	11	66	82		MW-7	6/20/95	4,230	6,410	11,700	16,700	
MW-2	6/22/93	140	13	20	75			9/29/95	540	4	117	74	
	7/18/94	25	ND	ND	187			2/15/96	117	26	13	629	
	10/28/94	53	ND	4	4			4/26/96	276	31	70	309	
	1/24/95	108	ND	6	8			10/29/96	298	5	16	55	
	6/20/95	240	ND	ND	4			1/15/97	258	50	60	225	
	9/29/95	208	ND	ND	ND			1/27/98	309	121	315	1,560	
	2/15/96	26	ND	ND	ND		MW-8	6/20/95	2,830	312	253	2,830	
	4/26/96	56	ND	ND	ND			9/29/95	1,164	70	211	290	
	10/29/96	54	ND	ND	ND			2/15/96	384	38	111	496	
	1/15/97	9	ND	ND	ND			4/26/96	163	ND	41	208	
	1/27/98	34	ND	ND	ND			10/29/96	ND	ND	ND	ND	
MW-3	6/22/93	1,600	3,800	1,900	10,100			1/15/97	944	153	130	1,690	
	7/18/94	226	141	58	286			1/27/98	522	63	230	469	
	10/28/94	18,400	17,400	3,200	20,200		MW-9	6/20/95	ND	ND	ND	2	
	1/24/95	19,900	21,200	6,170	31,500			9/29/95	ND	ND	ND	ND	
MW-4	6/22/93	3,500	1,500	420	2,360			2/15/96	ND	ND	ND	ND	
	7/18/94	7,460	134	2,730	8,120			4/26/96	71	ND	12	9	
	10/28/94	8,400	161	5,320	4,724			10/29/96	ND	ND	ND	ND	
	1/24/95	14,900	4,200	1,630	7,500			1/15/97	55	ND	10	15	
	6/20/95	5,130	281	3,150	16,400			1/27/98	ND	ND	ND	ND	
	9/29/95	12,900	70	2,090	733		MW-10	9/18/96	ND	ND	ND	ND	ND
	2/15/96	4,490	522	1,500	2,390			10/29/96	ND	ND	ND	ND	
	4/26/96	4,330	257	1,160	3,320			1/15/97	ND	ND	ND	ND	
	10/29/96	490	15	123	442			1/27/98	ND	ND	ND	ND	
	1/15/97	4,540	149	739	2,210		MW-11	9/18/96	ND	ND	ND	ND	ND
	1/27/98	2,960	133	513	1,070			10/29/96	ND	ND	ND	ND	
MW-5	6/22/93	500	750	180	1,090			1/15/97	ND	ND	ND	ND	
	7/18/94	237	24	ND	187			1/27/98	ND	ND	ND	ND	
	10/28/94	141	ND	28	35		MW-12	9/18/96	ND	ND	ND	ND	ND
	1/24/95	726	10	36	125			10/29/96	ND	ND	ND	ND	
	6/20/95	150	18	4	70			1/15/97	ND	ND	ND	ND	
	9/29/95	386	3	75	63			1/27/98	ND	ND	ND	ND	
	2/15/96	23	ND	ND	9		MW-13	9/18/96	ND	ND	ND	ND	ND
	4/26/96	310	ND	34	30			10/29/96	ND	ND	ND	ND	
	10/29/96	350	2	23	49			1/15/97	ND	ND	ND	ND	
	1/15/97	33	ND	2	5			1/27/98	ND	ND	ND	ND	
	1/27/98	901	5	17	60								

Notes: ND = Not Detected at or above reporting limit; TPH-Gas = gasoline-range hydrocarbons, B=benzene, T=toluene, E=ethylbenzene, X=total xylenes; blank boxes = not analyzed. Lab Report date of 10/28/94 included in “Delco Project Summary Report” dated December 20, 1995 for Delco Company by Northwest Envirocon. Apparently this data was included in a “First” Quarterly report which is unavailable or missing.

Chart 2 – PREVIOUS GROUNDWATER ANALYSES (Selected Wells)



3. JULY 1999 GROUNDWATER SAMPLING

3.1. GEOLOGY AND HYDROGEOLOGY

The Site is within Pleistocene fine-grained facies of coarse sand to silt deposited by catastrophic floods.¹ The finer sediments are predominantly quartz and feldspar and also contain white mica. The coarser sediments are predominantly Columbia River Basalt fragments. Poorly defined beds of 1- to 3-feet thick have complex layering. Soil development commonly introduces significant clay in the upper 6- to 15-feet. The fine sediments are locally thick and extend upslope to elevation 300- to 350-feet. Local variations to shallow groundwater flow directions may occur due to changes in lithology and thickness of beds.

The northwest trending Oatfield Fault to the north and the sub-parallel Concord Fault to the south bound the Site. The faults are mapped (*ibid.*) as cutting through the youngest sediments, including the Pleistocene fine-grained facies.

The Site is generally at approximate elevation 100-feet mean sea level ("msl"). It is surrounded by gently sloping terrain toward the Willamette River, which flows northerly approximately one-half mile to the west. Wells within one-mile of the Site to the west include two monitoring wells, one industrial well, ten domestic wells (about 42-feet average depth), and one unused well (U.S. Geological Survey Water Resource Division). Most wells develop from basalt aquifers.²

3.2. GROUNDWATER GRADIENTS

A survey by Barbieri & Associates, Inc., 7017 NE Hwy 99, Suite 204, Vancouver, WA 98665 of selected monitor well PVC casing tops was completed on July 27, 1999 as reported July 30, 1999 (see Appendix E – "Well Survey Summary by Barbieri & Associates"). The survey was completed based on relative elevations and X-Y coordinates. A survey was completed because the "top of riser elevations" listed for the monitor wells in Appendix D of the report titled "Eighth Quarterly Ground Water Monitoring Report" dated November 8, 1996 by NWE for Delco cannot be verified (no reference to a completed survey in reports or attached documentation). An accurate survey of relative elevations is necessary to estimate groundwater flow and directions.

The groundwater flow direction is estimated to be north-northwesterly based on July 1999 static water level measurements (see Figure 3 – "Groundwater Gradient Map: July 1999"). The inferred groundwater gradient from Monitor Well MW-13 (4884.4892N, 5056.2117E) to Monitor Well MW-11 (5035.1486N, 4984.8006E) is approximately 0.63-feetV per 150.7-feetH, or 0.0042-feet per foot.

An isolated high groundwater peak occurs in the vicinity of Monitor Well MW-5. The cause of this high groundwater is unknown, however a zone of low permeability, such as, a clay lense could cause it. Others causes could be related to the tank field approximately twenty (20)-feet north of the well serving as a sump area; a leak in a water supply pipe; or possibly the well encountered a perched groundwater zone and is screened in multiple groundwater-bearing intervals.

¹ "Geologic Map of the Lake Oswego Quadrangle, Clackamas, Multnomah, and Washington Counties, Oregon", M.H. Beeson and Others, State of Oregon Department of Geology and Mineral Industries GMS-59, 1989, 1 Plate.

² NWE memo dated June 30, 1994.

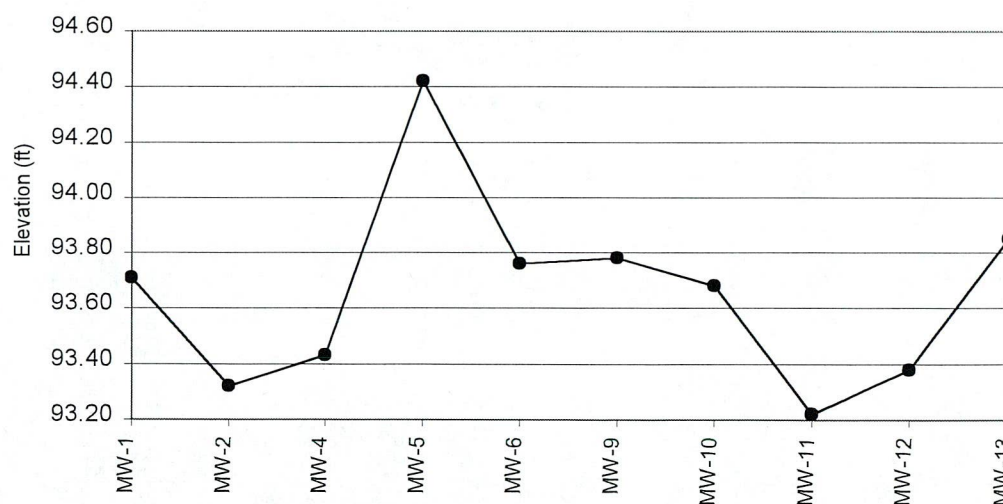
The following Table 7 – “Monitor Well Elevations and Static Water Levels” and Chart 3 – “July 1999 Static Water Elevations” summarize monitor well relative elevations at the top of the PVC casings and static water levels measured in July 1999.

Table 7 - MONITOR WELL ELEVATIONS AND STATIC WATER LEVELS

Surveyed by Barbieri & Associated, July 27, 1999

Monitor Well	Top of Casing Elevation (ft)	Date	SWL Feet BGS	SWL Elevation (ft)
MW-1	99.37	7/24/99	5.66	93.71
MW-2	98.51	7/24/99	5.18	93.32
MW-3	decommissioned			
MW-4	99.00	7/25/99	5.57	93.43
MW-5	100.41	7/25/99	5.99	94.42
MW-6	100.01	7/24/99	6.25	93.76
MW-7	recovery well			
MW-8	recovery well			
MW-9	99.42	7/23/99	5.64	93.78
MW-10	98.50	7/23/99	4.82	93.68
MW-11	99.64	7/24/99	6.42	93.22
MW-12	100.26	7/24/99	6.88	93.38
MW-13	99.85	7/23/99	6.00	93.85

Chart 3 – JULY 1999 STATIC WATER ELEVATIONS



3.3. GROUNDWATER SAMPLING METHODOLOGY

Prior to purging, the static water level was measured in each well. The monitor wells were purged of stagnant water in the casing and filter pack by hand bailing with a disposable bailer until the temperature, conductivity and pH reasonably stabilized, or approximately three well volumes were evacuated (see Appendix B - "Water Sample Field Logs"). Samples were collected with a disposable PVC bailer lowered below the water level which had reached approximately 80% of the static level as recorded prior to purging.

Water samples were placed in clear 40-milliliter vials (volatile organic analysis-VOA) and 1-liter amber glass containers. All sample containers were new (except containing a preservative prepared by the laboratory). Separate vials were used for water samples to be analyzed for gasoline and gasoline constituents (e.g. BTEX). Disposable latex gloves were used at all times during sampling. Closure of each sample container was accomplished with a plastic screw cap onto a Teflon faced septum, which was used to seal the bottle without headspace. Each sample bottle was then inverted and tapped to test for air bubbles. The bottles were labeled and placed in an ice chest with blu-ice for transport to the laboratory. All samples were accompanied from the field to laboratory by a signed and dated chain-of-custody and request for analysis. Two (2) VOA's and one (1) liter bottles were filled with groundwater from each monitor well and the treatment facility spigot for analysis.

3.4. LABORATORY ANALYSES

The following Table summarizes laboratory analysis for groundwater samples collected on July 23-25, 1999. The laboratory report is included in Appendix A - "July 1999 Laboratory Report". Analyses performed were at the request of DEQ.

Table 8 - GROUNDWATER ANALYSIS RESULTS

Monitor Well	NWTPH-Gx (µg/l)	NWTPH-Dx (mg/l)	Benzene (µg/l)	Toluene (µg/l)	Ethyl Benzene (µg/l)	Total Xylenes (µg/l)	MTBE (µg/l)
MW-1	2,330	ND	340	4.29	9.60	ND	112
MW-2	ND	ND	1.54	ND	ND	ND	113
MW-4	10,300	2.57 ³	2,910	ND	109	ND	ND
MW-5	118	ND	35.7	ND	ND	ND	ND
MW-6	ND	ND	ND	ND	ND	ND	ND
MW-9	ND	ND	ND	ND	ND	ND	ND
MW-10	ND	ND	ND	ND	ND	ND	ND
MW-11	ND	0.542	ND	ND	ND	ND	ND
MW-12	ND	ND	ND	ND	ND	ND	ND
MW-13	ND	ND	ND	ND	ND	ND	ND
Treatment Facility	ND	ND	ND	ND	ND	ND	ND

Notes: : ND = Not Detected at or above reporting limit; NWTPH-Gx = gasoline-range hydrocarbons, NWTPH-Dx = diesel-range hydrocarbons, B=benzene, T=toluene, E=ethylbenzene, X=total xylenes, MTBE = methyl tert-butyl ether (typical gasoline additive); blank boxes = not analyzed.

Gasoline hydrocarbons were analyzed per NWTPH-Gx Method and BTEX/MTBE were analyzed per EPA Method 8020A. Diesel and Heavy Range Hydrocarbons were analyzed per NWTPH-Dx Method. Total xylenes include m,p- and o-xylenes.

³ MW-4 Heavy Oil Hydrocarbons detected at 0.627 mg/l. All other well samples were ND for Heavy Oil Hydrocarbons.

Moderate sheen and diesel odors were observed during the sample collection at Monitor Well MW-4. No free product was observed during purging or sampling of any of the monitor wells.

4. INTERPRETATIONS AND CONCLUSIONS

4.1. DEQ NOTICE OF VIOLATION

This report has been prepared in partial response to a Notice of Violation, Department Order, and Assessment of Civil Penalty No. WMC/T-NWR-99-064 Clackamas County in the Matter of Devinder Dhillon and Delco Petroleum Co., LLC before the Environmental Quality Commission of the State of Oregon ("Order"). This report is the resumption of quarterly groundwater sampling and reporting as requested in a cover letter to the Order by Certified Mail Z 440 760 423 dated June 7, 1999 from Mr. Langdon Marsh, Director of the Oregon Department of Environmental Quality ("DEQ") to Mr. Devinder Dhillon.

4.2. GROUNDWATER MONITORING

4.2.1. Previous Groundwater Sampling

Nine (9) quarterly monitoring reports and three (3) supplemental reports were briefly reviewed and summarized in this report. The reports on prior investigations include sampling events from July 18, 1994 through January 27, 1998.

Thirteen (13) groundwater monitor wells have been installed in response to potential impact by petroleum hydrocarbons to groundwater following initial Environmental Assessment Phases I through III. Ten (10) monitoring wells are currently accessible for obtaining groundwater samples from a shallow groundwater horizon (15 to 20-feet total depth bgs). Monitoring Well MW-3 was decommissioned on February 20, 1995.

On January 27, 1995, monitor wells MW-7 and MW-8 were installed and constructed with four (4)-inch PVC as production wells for the on-Site treatment facility. All other monitor wells are constructed with two (2)-inch PVC. One monitoring well, MW-11, was installed off-site in a down-gradient direction on August 17, 1996, to the northwest, on the "Ed's Muffler & Brakes" property.

The monitor wells are essentially in a configuration representing five (5) upgradient (MW-1, MW-6, MW-9, MW-10, and MW-13), and two (2) downgradient locations (MW-11, MW-12) relative to the suspected contaminant release location at or near the existing USTs. Monitor wells MW-2, MW-4, MW-5, MW-7 and MW-8 are basically located within the suspected contaminant release location of the existing USTs.

No free product was reported in any monitor wells on and after September 29, 1995 (Fifth Quarterly Ground Water Monitoring Report by NWE).

Based on previous reports, groundwater levels have fluctuated approximately four (4)-feet. The groundwater gradient direction has been variable, but generally in a north to northwest direction.

Previous groundwater sampling had detected high concentrations of gasoline constituents BTEX in wells MW-1, MW-2, MW-4, MW-5, MW-7, and MW-8; all of which, except MW-1, are located in the proximity of the suspected contaminant release location. Previous groundwater sampling had detected lower concentrations of BTEX in monitor wells MW-6 (only at time of installation) and MW-9. BTEX had not been detected in monitor wells MW-10, MW-11, MW-12 or MW-13.

4.2.2. July 1999 Groundwater Sampling

Static water levels vary over a foot within the Site, but are generally within one-half foot. The groundwater direction of flow is estimated to be north-northwesterly based on July 1999 static water level measurements. The inferred groundwater gradient from Monitor Well MW-13 (upgradient) to Monitor Well MW-11 (downgradient) is approximately 0.0042-feet per foot.

A groundwater high peak occurs in the vicinity of Monitor Well MW-5. The cause of the high groundwater is unknown, however a zone of low permeability, such as, a clay lense could cause it. Others causes could be related to the tank field approximately twenty (20)-feet north of the well serving as a sump area; a leak in a water supply pipe; or possibly the well encountered a perched groundwater zone and is screened in multiple groundwater-bearing intervals.

The July 1999 groundwater sampling event resulted in gasoline-range hydrocarbons being detected in samples from monitor wells MW-1, MW-2, MW-4, and MW-5. MTBE, a typical gasoline additive, was detected in samples from MW-1 and MW-2. Concentrations of benzene above 5 µg/l (ppb) were detected in samples from MW-1, MW-2, MW-4, and MW-5. Toluene was detected in a sample from one (1) monitor well (MW-1) at 4.29 µg/l. Ethylbenzene was detected in two (2) well samples: 9.60 µg/l (MW-1) and 109 µg/l (MW-4). Total xylenes were not detected in any well samples.

A low concentration of diesel-range hydrocarbons (2.57 mg/l) was detected in the groundwater sample from monitor well MW-4. Moderate sheen and diesel odors were observed during the sample collection of Monitor Well MW-4. No free product or sheen was observed during purging or sampling of any other monitor wells.

The results of analyzing groundwater samples from MW-2, MW-4, and MW-5 in July 1999 indicate that previous leakage from the gasoline USTs, pipelines, or associated facilities, and possibly the diesel UST, are potential sources of contamination to shallow groundwater.

The potential source of contaminants detected in the groundwater sample from the upgradient monitor well MW-1 cannot be identified. The analysis of groundwater samples collected from monitor well MW-13, located approximately thirty (30)-feet southwest of MW-1, has resulted in non-detection since September 18, 1996.

5. RECOMMENDATIONS

5.1. FURTHER WORK

It is recommended that further quarterly groundwater sampling work be performed following a DEQ review of this report and accompanying documentation. It is recommended that a meeting be sought with DEQ representatives as soon as feasible to discuss the interpretations and conclusions of this report.

It is recommended that future groundwater sampling of monitor well MW-6 not be performed because no analyzed constituents have been detected since July 18, 1994. The purpose or location is redundant with respect to adjacent monitor well MW-13 which is located nearby in an upgradient direction to the potential source of contamination .

It is planned to excavate the gasoline and diesel USTs in the near future. After excavation, the purpose of Monitor Wells MW-4, MW-7 and MW-8 should be reviewed since the source of potential contamination will be removed.

6. LIMITATIONS

This report is restricted to an investigation which has included the review of previous work involving underground storage tanks which contained known or suspected hazardous products identified either by the property owner(s), historical records, or previous reports. Such records and investigations have been relied upon in good faith, however, no responsibility is accepted for errors or omissions of previous work. Drilling services were performed under separate agreement with the landowner and Consultant makes no claim of responsibility for services provided by drilling services or others.

It is possible that exploration or sampling by others failed to reveal the presence of hazardous materials at areas where hazardous materials were assumed, suspected or expected to exist. Client understands that third-party failures to discover contaminated or hazardous materials through appropriate and mutually agreed-upon sampling techniques does not guarantee that such materials do not exist at the Site. Similarly, a Site which in fact is unaffected by contaminated or hazardous materials at the time of exploration or sampling, may later, due to natural causes or human intervention, become contaminated. Consultant is not responsible for failing to locate groundwater monitoring wells which have not discovered hazardous materials at the time of this report or in the future.

This report should not be construed as presenting a value to the Site nor the condition as to construction capabilities. In the event of changes in future development plans as understood at the time of this report, the conclusions and recommendations made herein shall be invalid until given the opportunity to review and modify this report in writing.

Services were performed, findings obtained, and recommendations prepared in a manner generally exercised by members of the profession under similar conditions at the time services were rendered. This warranty is in lieu of all other warranties, either expressed or implied. Findings apply only to present conditions, and opinions expressed are subject to revision when additional or new information is submitted in writing. This report has been prepared for the landowner(s) or landowner's agents and Consultant shall not accept liability or responsibility for detachment, partial use or separation by third parties and such use shall be at user's sole risk.

Portions of an Agreement to perform professional services for the Client may or may not be disclosed in this report. Final approval of environmental investigations and remediation is authorized only by appropriate governmental agencies.

Respectfully submitted,



Richard C. Kent, R.G.
Professional Geologist

Figure 1 - LOCATION MAP

Source: U.S.G.S. Topographic Map, Gladstone Quadrangle, 1:24,000

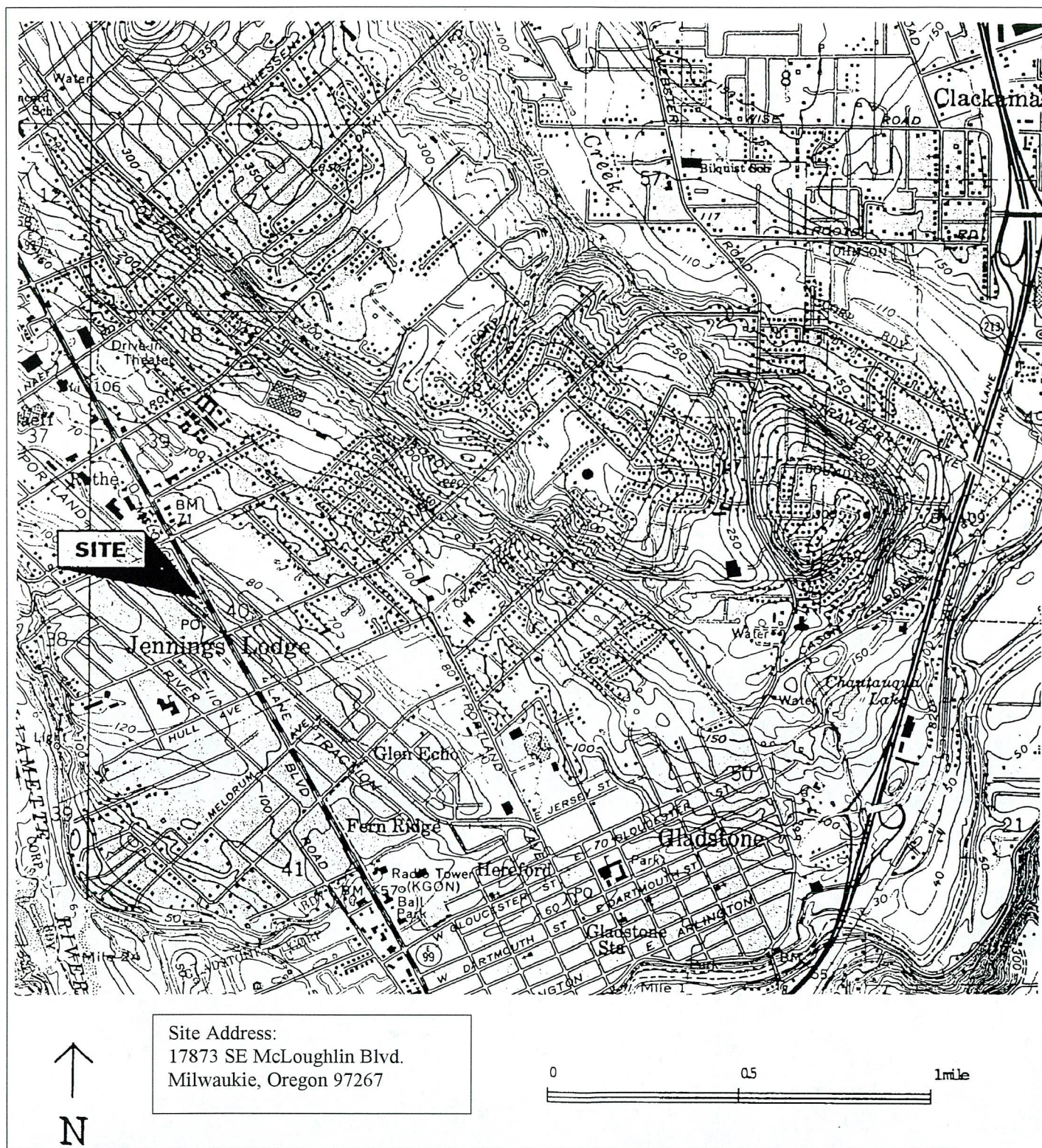
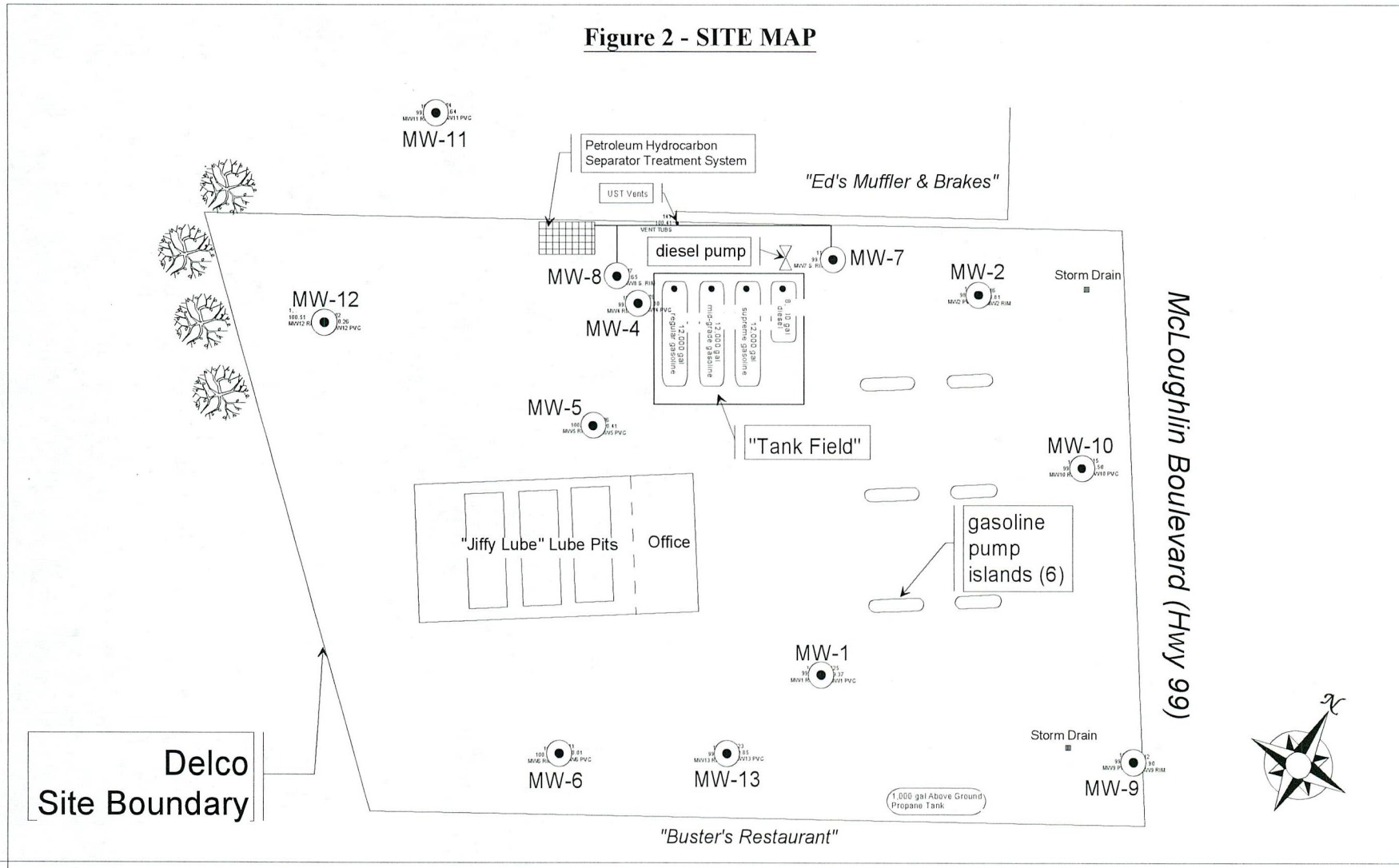


Figure 2 - SITE MAP



GeoPro Geologic Services
Battle Ground, WA

August 4, 1999

Project No. 990621

Legend



Monitor Well Location

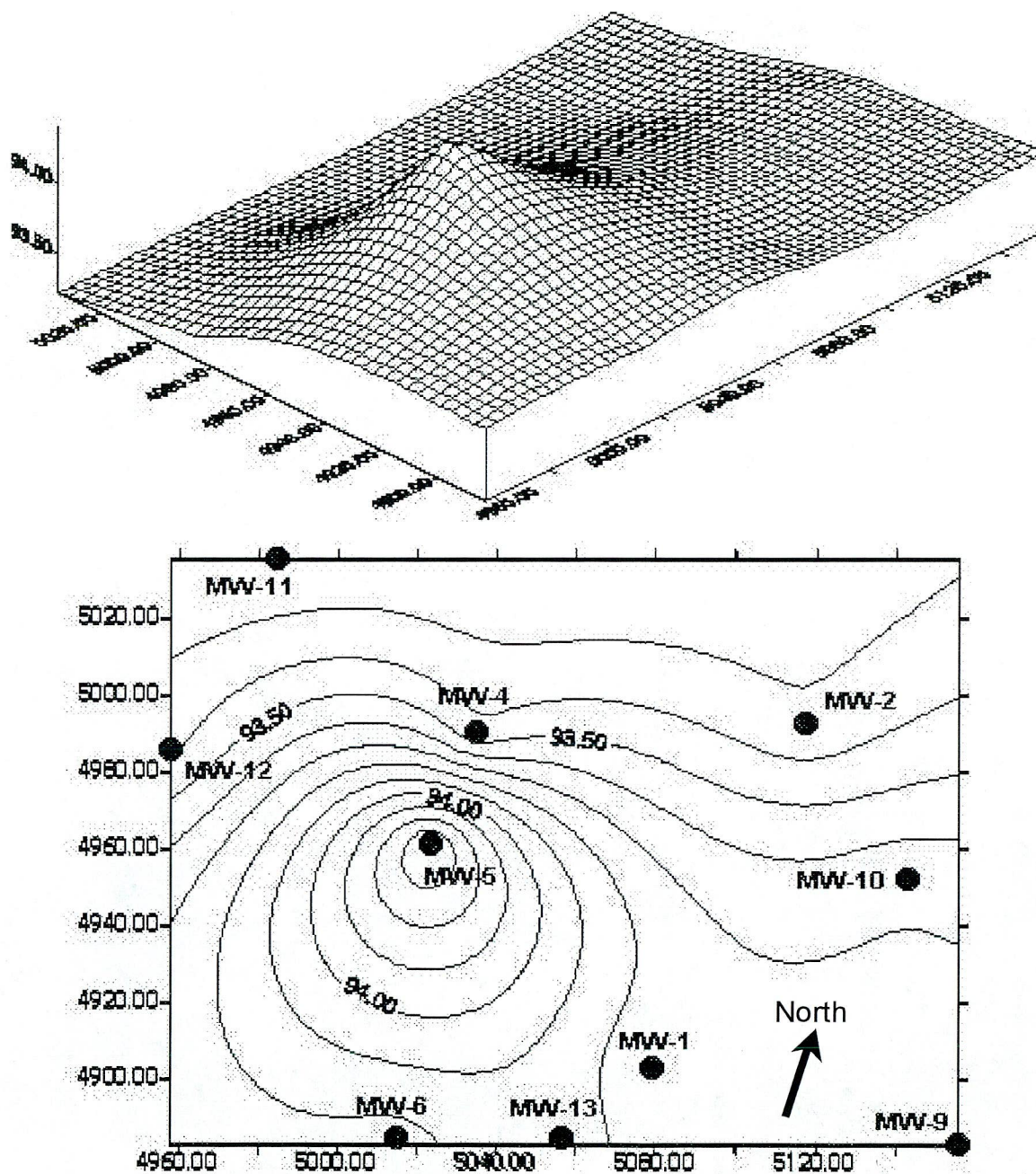
APPROXIMATE SCALE



SITE MAP

DELCO PETROLEUM CO. LLC
17873 SE McLoughlin Blvd.
Milwaukie, OR

Figure 3 – GROUNDWATER GRADIENT MAP: JULY 1999



1

¹ Grid used in Figure 3 from Barbieri survey; relative elevations.

APPENDIX A

JULY 1999

LABORATORY

REPORT



Seattle 16939 120th Avenue NE, Suite 101, Bothell, WA 98011 9508
425.420.9200 fax 425.420.9210
Spokane East 11115 Montgomery, Suite B, Spokane, WA 99206-4776
509.924.9200 fax 509.924.9299
Portland 9405 SW Nimbus Avenue, Beaverton, OR 97008-7132
503.906.9200 fax 503.906.9210
Bend 28337 E Maple Avenue, Suite F-1, Bend, OR 97701-5711
541.383.9210 fax 541.382.7588

GeoPro
P.O. Box 26
Battle Ground, WA 98604

Project: Deleo Groundwater
Project Number: 990621
Project Manager: Richard Kent

Sampled: 7/23/99 to 7/25/99
Received: 7/26/99
Reported: 8/4/99 10:03

ANALYTICAL REPORT FOR SAMPLES:

Sample Description	Laboratory Sample Number	Sample Matrix	Date Sampled
MW-1	P907456-01	Water	7/24/99
MW-2	P907456-02	Water	7/25/99
MW-4	P907456-03	Water	7/25/99
MW-5	P907456-04	Water	7/25/99
MW-6	P907456-05	Water	7/24/99
MW-7/8 Separator	P907456-06	Water	7/25/99
MW-9	P907456-07	Water	7/23/99
MW-10	P907456-08	Water	7/23/99
MW-11	P907456-09	Water	7/24/99
MW-12	P907456-10	Water	7/24/99
MW-13	P907456-11	Water	7/23/99



Seattle 18939 120th Avenue NE, Suite 101, Redmond, WA 98071-9508
425.420.9200 fax 425.420.9210
Spokane East 11115 Montgomery, Suite B, Spokane, WA 99208-4776
509.824.9200 fax 509.824.9290
Portland 9405 SW Nimbus Avenue, Beaverton, OR 97008 7132
503.806.9200 fax 503.806.9210
Bend 20332 Empire Avenue, Suite F 1, Bend, OR 97701-5711
541.383.9310 fax 541.862.7588

GeoPro	Project: Delco Groundwater	Sampled: 7/23/99 to 7/25/99
P.O. Box 26	Project Number: 990621	Received: 7/26/99
Battle Ground, WA 98604	Project Manager: Richard Kent	Reported: 8/4/99 10:03

Gasoline Hydrocarbons per NW TPH-Gx Method and BTEX/MTBE per EPA Method 8020A
North Creek Analytical - Portland

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-1				P907456-01			Water	
Benzene	0790809	7/29/99	7/29/99		2.50	340	ug/l	
Toluene	"	"	"		2.50	4.29	"	
Ethylbenzene	"	"	"		2.50	9.60	"	
Xylenes (total)	"	"	"		5.00	ND	"	
Methyl tert-butyl ether	"	"	"		10.0	112	"	2
Gasoline Range Hydrocarbons	"	"	"		400	2330	"	
Surrogate: 4-BFB (FID)	"	"	"	50.0-150		108	%	
Surrogate: 4-BFB (PID)	"	"	"	75.0-125		105	"	
MW-2				P907456-02			Water	
Gasoline Range Hydrocarbons	0790749	7/28/99	7/28/99		80.0	ND	ug/l	
Surrogate: 4-BFB (FID)	"	"	"	50.0-150		113	%	
Benzene	0790809	7/29/99	7/29/99		1.00	1.54	ug/l	
Toluene	"	"	"		1.00	ND	"	
Ethylbenzene	"	"	"		1.00	ND	"	
Xylenes (total)	"	"	"		2.00	ND	"	
Methyl tert-butyl ether	"	"	"		4.00	113	"	2
Surrogate: 4-BFB (PID)	"	"	"	75.0-125		96.2	%	
MW-4				P907456-03			Water	
Benzene	0890002	8/2/99	8/2/99		25.0	2910	ug/l	
Toluene	"	"	"		25.0	ND	"	
Ethylbenzene	"	"	"		25.0	109	"	
Xylenes (total)	"	"	"		50.0	ND	"	
Methyl tert-butyl ether	"	"	"		100	ND	"	
Gasoline Range Hydrocarbons	"	"	"		4000	10300	"	
Surrogate: 4-BFB (FID)	"	"	"	50.0-150		96.2	%	
Surrogate: 4-BFB (PID)	"	"	"	75.0-125		101	"	



Seattle 18839 120th Avenue NE, Suite 101, Redmond, WA 98011-9608
425.470.9200 fax 425.420.9210
Spokane East 11115 Montgomery, Suite B, Spokane, WA 99206-4776
509.924.9200 fax 509.924.9290
Portland 9405 SW Nimbus Avenue, Beaverton, OR 97008-7132
503.906.9200 fax 503.906.9210
Bend 20332 Empire Avenue, Suite 1-1, Bend, OR 97701-5711
541.388.9310 fax 541.382.7888

GeoPro	Project: Delco Groundwater	Sampled: 7/23/99 to 7/25/99
P.O. Box 26	Project Number: 990621	Received: 7/26/99
Battle Ground, WA 98604	Project Manager: Richard Kent	Reported: 8/4/99 10:03

**Gasoline Hydrocarbons per NW TPH-Gx Method and BTEX/MTBE per EPA Method 8020A
North Creek Analytical - Portland**

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-5				P907456-04			Water	
Benzene	0790809	7/29/99	7/29/99		0.500	35.7	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Methyl tert-butyl ether	"	"	"		2.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	118	"	
Surrogate: 4-BFB (FID)	"	"	"	50.0-150		92.6	%	
Surrogate: 4-BFB (PID)	"	"	"	75.0-125		93.6	"	
MW-6				P907456-05			Water	
Benzene	0790749	7/28/99	7/28/99		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Methyl tert-butyl ether	"	"	"		2.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB (FID)	"	"	"	50.0-150		103	%	
Surrogate: 4-BFB (PID)	"	"	"	75.0-125		86.2	"	
MW-7/8 Separator				P907456-06			Water	
Benzene	0790749	7/28/99	7/28/99		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Methyl tert-butyl ether	"	"	"		2.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB (FID)	"	"	"	50.0-150		104	%	
Surrogate: 4-BFB (PID)	"	"	"	75.0-125		87.8	"	
MW-9				P907456-07			Water	
Benzene	0790749	7/28/99	7/28/99		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Methyl tert-butyl ether	"	"	"		2.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB (FID)	"	"	"	50.0-150		96.8	%	
Surrogate: 4-BFB (PID)	"	"	"	75.0-125		83.0	"	

North Creek Analytical - Portland

*Refer to end of report for text of notes and definitions.

Sara McClurg
Sara McClurg, Project Manager

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Page 3 of 11



Seattle 18039 120th Avenue NE, Suite 101, Redmond, WA 98011-9906
425.420.9200 fax 425.420.9210
Spokane East 11115 Montgomery, Suite II, Spokane, WA 99206 4776
509.824.9200 fax 509.824.9290
Portland 9405 SW Nimbus Avenue, Beaverton, OR 97008 7132
503.806.9200 fax 503.806.9210
Hend 20332 Empire Avenue, Suite I-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7588

GeoPro	Project: Delco Groundwater	Sampled: 7/23/99 to 7/25/99
P.O. Box 26	Project Number: 990621	Received: 7/26/99
Battle Ground, WA 98604	Project Manager: Richard Kent	Reported: 8/4/99 10:03

**Gasoline Hydrocarbons per NW TPH-Gx Method and BTEX/MTBE per EPA Method 8020A
North Creek Analytical - Portland**

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-10				P907456-08			Water	
Benzene	0790749	7/28/99	7/28/99		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Methyl tert-butyl ether	"	"	"		2.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB (FID)	"	"	"	50.0-150		102	%	
Surrogate: 4-BFB (PID)	"	"	"	75.0-125		87.6	"	
MW-11				P907456-09			Water	
Benzene	0790749	7/28/99	7/28/99		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Methyl tert-butyl ether	"	"	"		2.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB (FID)	"	"	"	50.0-150		108	%	
Surrogate: 4-BFB (PID)	"	"	"	75.0-125		90.6	"	
MW-12				P907456-10			Water	
Benzene	0790809	7/29/99	7/29/99		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Methyl tert-butyl ether	"	"	"		2.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB (FID)	"	"	"	50.0-150		95.8	%	
Surrogate: 4-BFB (PID)	"	"	"	75.0-125		95.0	"	
MW-13				P907456-11			Water	
Benzene	0790749	7/28/99	7/28/99		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Methyl tert-butyl ether	"	"	"		2.00	ND	"	
Gasoline Range Hydrocarbons	"	"	"		80.0	ND	"	
Surrogate: 4-BFB (FID)	"	"	"	50.0-150		107	%	
Surrogate: 4-BFB (PID)	"	"	"	75.0-125		92.2	"	

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Sara McClurg
Sara McClurg, Project Manager

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Page 4 of 11



Seattle 10939 120th Avenue NE, Suite 101, Bothell, WA 98011-9509
425.420.9200 fax 425.420.9210
Spokane East 11115 Montanway, Suite B, Spokane, WA 99206-4776
509.824.9200 fax 509.824.9290
Portland 9405 SW Nimbus Avenue, Beaverton, OR 97008-7132
503.806.9200 fax 503.806.9210
Bend 20332 Empire Avenue, Suite 1-1, Bend, OR 97701-5211
541.385.9310 fax 541.882.7888

GeoPro	Project: Deleo Groundwater	Sampled: 7/23/99 to 7/25/99
P.O. Box 26	Project Number: 990621	Received: 7/26/99
Battle Ground, WA 98604	Project Manager: Richard Kent	Reported: 8/4/99 10:03

**Diesel and Heavy Range Hydrocarbons per NWTH-Dx Method
North Creek Analytical - Portland**

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
MW-1				P907456-01			Water	
Diesel Range Organics	0790712	7/27/99	7/28/99		0.250	ND	mg/l	
Heavy Oil Range Hydrocarbons	"	"	"		0.500	ND	"	
Surrogate: 1-Chlorooctadecane	"	"	"	50.0-150		84.5	%	
MW-2				P907456-02			Water	
Diesel Range Organics	0790821	7/29/99	7/29/99		0.250	ND	mg/l	
Heavy Oil Range Hydrocarbons	"	"	"		0.500	ND	"	
Surrogate: 1-Chlorooctadecane	"	"	"	50.0-150		81.0	%	
MW-4				P907456-03			Water	
Diesel Range Organics	0790821	7/29/99	7/29/99		0.250	2.57	mg/l	3
Heavy Oil Range Hydrocarbons	"	"	"		0.500	0.627	"	
Surrogate: 1-Chlorooctadecane	"	"	"	50.0-150		104	%	
MW-5				P907456-04			Water	
Diesel Range Organics	0790821	7/29/99	7/29/99		0.250	ND	mg/l	
Heavy Oil Range Hydrocarbons	"	"	"		0.500	ND	"	
Surrogate: 1-Chlorooctadecane	"	"	"	50.0-150		105	%	
MW-6				P907456-05			Water	
Diesel Range Organics	0790712	7/27/99	7/28/99		0.250	ND	mg/l	
Heavy Oil Range Hydrocarbons	"	"	"		0.500	ND	"	
Surrogate: 1-Chlorooctadecane	"	"	"	50.0-150		94.6	%	
MW-7/8 Separator				P907456-06			Water	
Diesel Range Organics	0790821	7/29/99	7/29/99		0.250	ND	mg/l	
Heavy Oil Range Hydrocarbons	"	"	"		0.500	ND	"	
Surrogate: 1-Chlorooctadecane	"	"	"	50.0-150		105	%	
MW-9				P907456-07			Water	
Diesel Range Organics	0790712	7/27/99	7/28/99		0.250	ND	mg/l	
Heavy Oil Range Hydrocarbons	"	"	"		0.500	ND	"	
Surrogate: 1-Chlorooctadecane	"	"	"	50.0-150		49.5	%	4
MW-10				P907456-08			Water	
Diesel Range Organics	0790712	7/27/99	7/28/99		0.250	ND	mg/l	
Heavy Oil Range Hydrocarbons	"	"	"		0.500	ND	"	
Surrogate: 1-Chlorooctadecane	"	"	"	50.0-150		99.6	%	

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Sara McClurg
Sara McClurg, Project Manager

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Page 5 of 11



Seattle 16900 120th Avenue NE, Suite 101, Bothell, WA 98011 9608
425.420.9200 fax 425.420.9210
Spokane East 11115 Montgomery, Suite B, Spokane, WA 99206-4776
509.924.9200 fax 509.924.9290
Portland 9400 SW Nimbus Avenue, Beaverton, OR 97008-7132
503.906.9200 fax 503.906.9210
Boon 20332 Empire Avenue, Suite F 1, Bend, OR 97701 5711
541.389.9310 fax 541.389.7580

GeoPro	Project: Delco Groundwater	Sampled: 7/23/99 to 7/25/99
P.O. Box 26	Project Number: 990621	Received: 7/26/99
Battle Ground, WA 98604	Project Manager: Richard Kent	Reported: 8/4/99 10:03

**Diesel and Heavy Range Hydrocarbons per NWTPH-Dx Method
North Creek Analytical - Portland**

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
<u>MW-11</u>				<u>P907456-09</u>			<u>Water</u>	
Diesel Range Organics	0790712	7/27/99	7/28/99		0.250	0.542	mg/l	5
Heavy Oil Range Hydrocarbons	"	"	"		0.500	ND	"	
Surrogate: 1-Chlorooctadecane	"	"	"	50.0-150		95.5	%	
<u>MW-12</u>				<u>P907456-10</u>			<u>Water</u>	
Diesel Range Organics	0790712	7/27/99	7/28/99		0.250	ND	mg/l	
Heavy Oil Range Hydrocarbons	"	"	"		0.500	ND	"	
Surrogate: 1-Chlorooctadecane	"	"	"	50.0-150		99.0	%	
<u>MW-13</u>				<u>P907456-11</u>			<u>Water</u>	
Diesel Range Organics	0790712	7/27/99	7/28/99		0.250	ND	mg/l	
Heavy Oil Range Hydrocarbons	"	"	"		0.500	ND	"	
Surrogate: 1-Chlorooctadecane	"	"	"	50.0-150		111	%	



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425 420 9200 fax 425 420 9210
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509 924 9200 fax 509 924 9290
Portland 9405 SW Nimbus Avenue, Desvotion, OR 97008 7132
503 906 9200 fax 503 906 9210
Bend 20832 Eagle Avenue, Suite F-1, Bend, OR 97701 5711
541 383 8310 fax 541 382 7588

GeoPro	Project: Deleo Groundwater	Sampled: 7/23/99 to 7/25/99
P.O. Box 26	Project Number: 990621	Received: 7/26/99
Battle Ground, WA 98604	Project Manager: Richard Kent	Reported: 8/4/99 10:03

**Gasoline Hydrocarbons per NW TPH-Gx Method and BTEX/MTBE per EPA Method 8020A/Quality Control
North Creek Analytical - Portland**

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0790749										
Blank										
0790749-BLK1										
Benzene	7/28/99			ND	ug/l	0.500				
Toluene	"			ND	"	0.500				
Ethylbenzene	"			ND	"	0.500				
Xylenes (total)	"			ND	"	1.00				
Methyl tert-butyl ether	"			ND	"	2.00				
Gasoline Range Hydrocarbons	"			ND	"	80.0				
Surrogate: 4-BFB (FID)	"	50.0		50.1	"	50.0-150	100			
Surrogate: 4-BFB (PID)	"	50.0		40.7	"	75.0-125	81.4			
LCS										
0790749-BS1										
Gasoline Range Hydrocarbons	7/28/99	1250		1150	ug/l	50.0-150	92.0			
Surrogate: 4-BFB (FID)	"	50.0		62.1	"	50.0-150	124			
LCS										
0790749-BS2										
Benzene	7/28/99	20.0		17.0	ug/l	69.0-138	85.0			
Toluene	"	20.0		17.6	"	61.0-141	88.0			
Ethylbenzene	"	20.0		18.4	"	53.0-151	92.0			
Xylenes (total)	"	60.0		56.5	"	62.0-144	94.2			
Methyl tert-butyl ether	"	20.0		18.2	"	60.0-140	91.0			
Surrogate: 4-BFB (PID)	"	50.0		44.7	"	75.0-125	89.4			
Duplicate										
0790749-DUP1 P907456-01										
Gasoline Range Hydrocarbons	7/28/99		2210	2140	ug/l			50.0	3.22	
Surrogate: 4-BFB (FID)	"	50.0		99.2	"	50.0-150	198			1
Duplicate										
0790749-DUP2 P907456-02										
Gasoline Range Hydrocarbons	7/28/99		ND	ND	ug/l			50.0		
Surrogate: 4-BFB (FID)	"	50.0		52.0	"	50.0-150	104			
Matrix Spike										
0790749-MS1 P907456-03										
Benzene	7/28/99	20.0	1620	1140	ug/l	67.0-130	NR			6.3
Toluene	"	20.0	22.5	46.4	"	76.0-124	120			
Ethylbenzene	"	20.0	119	122	"	75.0-126	15.0			6
Xylenes (total)	"	60.0	68.1	123	"	75.0-126	91.5			
Surrogate: 4-BFB (PID)	"	50.0		77.2	"	75.0-125	154			1

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*Refer to end of report for text of notes and definitions.

Sara McClurg
Sara McClurg, Project Manager

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Page 7 of 11



Seattle 18930 120th Avenue NE, Suite 101, Redmond, WA 98073-8508
425.420.8200 fax 425.420.8210
Spokane Last 11115 Montgomery, Suite B, Spokane, WA 99206 4776
509.924.9200 fax 509.924.9200
Portland 9405 SW Nimbus Avenue, Beaverton, OR 97008 7132
503.606.9200 fax 503.906.9210
Bend 20332 Empire Avenue, Suite 1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7888

Geol'tro	Project: Deleo Groundwater	Sampled: 7/23/99 to 7/25/99
P.O. Box 26	Project Number: 990621	Received: 7/26/99
Battle Ground, WA 98604	Project Manager: Richard Kent	Reported: 8/4/99 10:03

**Gasoline Hydrocarbons per NW TPII-Gx Method and BTEX/MTBE per EPA Method 8020A/Quality Control
North Creek Analytical - Portland**

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Matrix Spike Dup	0790749-MSD1		P907456-03							
Benzene	7/28/99	20.0	1620	1150	ug/l	67.0-130	NR	13.0		6.1E
Toluene	"	20.0	22.5	40.1	"	76.0-124	88.0	15.0	30.8	7
Ethylbenzene	"	20.0	119	126	"	75.0-126	35.0	13.0	80.0	6
Xylenes (total)	"	60.0	68.1	120	"	75.0-126	86.5	13.0	5.62	
Surrogate: 4-BFB (PID)	"	50.0		85.0	"	75.0-125	170			1

Batch: 0790809	Date Prepared: 7/29/99	Extraction Method: EPA 5030
Blank	0790809-BLK1	
Benzene	7/29/99	ND ug/l 0.500
Toluene	"	ND " 0.500
Ethylbenzene	"	ND " 0.500
Xylenes (total)	"	ND " 1.00
Methyl tert-butyl ether	"	ND " 2.00
Gasoline Range Hydrocarbons	"	ND " 80.0
Surrogate: 4-BFB (FID)	" 50.0	48.0 " 50.0-150 96.0
Surrogate: 4-BFB (PID)	" 50.0	48.1 " 75.0-125 96.2

LCS	0790809-BS1	
Gasoline Range Hydrocarbons	7/29/99	1250 1160 ug/l 50.0-150 92.8
Surrogate: 4-BFB (FID)	" 50.0	61.3 " 50.0-150 123
LCS	0790809-BS2	
Benzene	7/29/99	20.0 19.3 ug/l 69.0-138 96.5
Toluene	"	20.0 19.1 " 61.0-141 95.5
Ethylbenzene	"	20.0 19.2 " 53.0-151 96.0
Xylenes (total)	"	60.0 58.6 " 62.0-144 97.7
Methyl tert-butyl ether	"	20.0 17.8 " 60.0-140 89.0
Surrogate: 4-BFB (PID)	" 50.0	49.4 " 75.0-125 98.8

Batch: 0890002	Date Prepared: 8/2/99	Extraction Method: EPA 5030
Blank	0890002-BLK1	
Benzene	8/2/99	ND ug/l 0.500
Toluene	"	ND " 0.500
Ethylbenzene	"	ND " 0.500
Xylenes (total)	"	ND " 1.00
Methyl tert-butyl ether	"	ND " 2.00
Gasoline Range Hydrocarbons	"	ND " 80.0
Surrogate: 4-BFB (FID)	" 50.0	48.5 " 50.0-150 97.0

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Sara M. Clurg
Sara McClurg, Project Manager

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Page 8 of 11



Seattle 10938 12TH AVENUE NE, SUITE 101, DUNSMITH, WA 98004-3000
425.420.9200 fax 425.420.9210
Spokane East 11115 Montgomery, Suite B, Spokane, WA 99206 4775
509.924.9200 fax 509.924.9290
Portland 9405 SW Naitoph Avenue, Beaverton, OR 97008 7132
503.906.8200 fax 503.806.9210
Bend 20332 Linnite Avenue, Suite 1-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7588

GeoPro	Project: Deleo Groundwater	Sampled: 7/23/99 to 7/25/99
P.O. Box 26	Project Number: 990621	Received: 7/26/99
Battle Ground, WA 98604	Project Manager: Richard Kent	Reported: 8/4/99 10:03

**Gasoline Hydrocarbons per NW TPH-Gx Method and BTEX/MTBE per EPA Method 8020A/Quality Control
North Creek Analytical - Portland**

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Blank (continued)	0890002-BLK1									
Surrogate: 4-BFB (PID)	8/2/99	50.0		50.7	ug/l	75.0-125	101			
LCS	0890002-BS1									
Gasoline Range Hydrocarbons	8/2/99	1250		1320	ug/l	50.0-150	106			
Surrogate: 4-BFB (PID)	"	50.0		63.8	"	50.0-150	128			
LCS	0890002-BS2									
Benzene	8/2/99	20.0		19.9	ug/l	69.0-138	99.5			
Toluene	"	20.0		19.4	"	61.0-141	97.0			
Ethylbenzene	"	20.0		20.2	"	53.0-151	101			
Xylenes (total)	"	60.0		61.2	"	62.0-144	102			
Methyl tert-butyl ether	"	20.0		18.7	"	60.0-140	93.5			
Surrogate: 4-BFB (PID)	"	50.0		51.2	"	75.0-125	102			



Seattle 10939 120th Avenue NE, Suite 101, Bonich, WA 98011-1500
425.420.9200 fax 425.420.9210
Spokane East 11115 Montgomery, Suite B, Spokane, WA 99206-4776
509.924.9200 fax 509.924.9290
Portland 9405 SW Nimbus Avenue, Beaverton, OR 97008-7132
503.906.8200 fax 503.906.8210
Bend 20332 Empire Avenue, Suite 1-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7688

GeoPro
P.O. Box 26
Battle Ground, WA 98604

Project: Delco Groundwater
Project Number: 990621
Project Manager: Richard Kent

Sampled: 7/23/99 to 7/25/99
Received: 7/26/99
Reported: 8/4/99 10:03

**Diesel and Heavy Range Hydrocarbons per NWTPH-Dx Method/Quality Control
North Creek Analytical - Portland**

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0790712										
Blank										
Diesel Range Organics	7/28/99			ND	mg/l	0.250				
Heavy Oil Range Hydrocarbons	"			ND	"	0.500				
Surrogate: 1-Chlorooctadecane	"	0.100		0.109	"	50.0-150	109			
LCS										
Diesel Range Organics	7/28/99	2.51		2.03	mg/l	50.0-150	80.9			
Heavy Oil Range Hydrocarbons	"	1.03		1.07	"	50.0-150	104			
Surrogate: 1-Chlorooctadecane	"	0.100		0.0840	"	50.0-150	84.0			
LCS Dup										
Diesel Range Organics	7/27/99	2.51		2.61	mg/l	50.0-150	104	50.0	25.0	
Heavy Oil Range Hydrocarbons	"	1.03		1.25	"	50.0-150	121	50.0	15.1	
Surrogate: 1-Chlorooctadecane	"	0.100		0.0975	"	50.0-150	97.5			
Batch: 0790821										
Blank										
Diesel Range Organics	7/29/99			ND	mg/l	0.250				
Heavy Oil Range Hydrocarbons	"			ND	"	0.500				
Surrogate: 1-Chlorooctadecane	"	0.100		0.0915	"	50.0-150	91.5			
LCS										
Diesel Range Organics	7/29/99	2.57		1.93	mg/l	50.0-150	75.1			
Heavy Oil Range Hydrocarbons	"	1.02		0.830	"	50.0-150	81.4			
Surrogate: 1-Chlorooctadecane	"	0.100		0.0985	"	50.0-150	98.5			
LCS Dup										
Diesel Range Organics	7/29/99	2.57		2.00	mg/l	50.0-150	77.8	50.0	3.53	
Heavy Oil Range Hydrocarbons	"	1.02		0.865	"	50.0-150	84.8	50.0	4.09	
Surrogate: 1-Chlorooctadecane	"	0.100		0.0980	"	50.0-150	98.0			

Sara McClurg
Sara McClurg, Project Manager



Seattle 18939 120th Avenue NE, Suite 101, Bothell, WA 98011-9508
425.490.9200 fax 425.490.9210
Spokane East 11115 Montgomery, Suite B, Spokane, WA 99206 4776
509.924.9200 fax 509.924.9290
Portland 9406 SW Mindus Avenue, Beaverton, OR 97008 7132
503.806.9200 fax 503.806.9210
Bend 20302 Empire Avenue, Suite E-1, Bend, OR 97701-5711
541.383.9310 fax 541.382.7558

GcoPro	Project: Deleo Groundwater	Sampled: 7/23/99 to 7/25/99
P.O. Box 26	Project Number: 990621	Received: 7/26/99
Battle Ground, WA 98604	Project Manager: Richard Kent	Reported: 8/4/99 10:03

Notes and Definitions

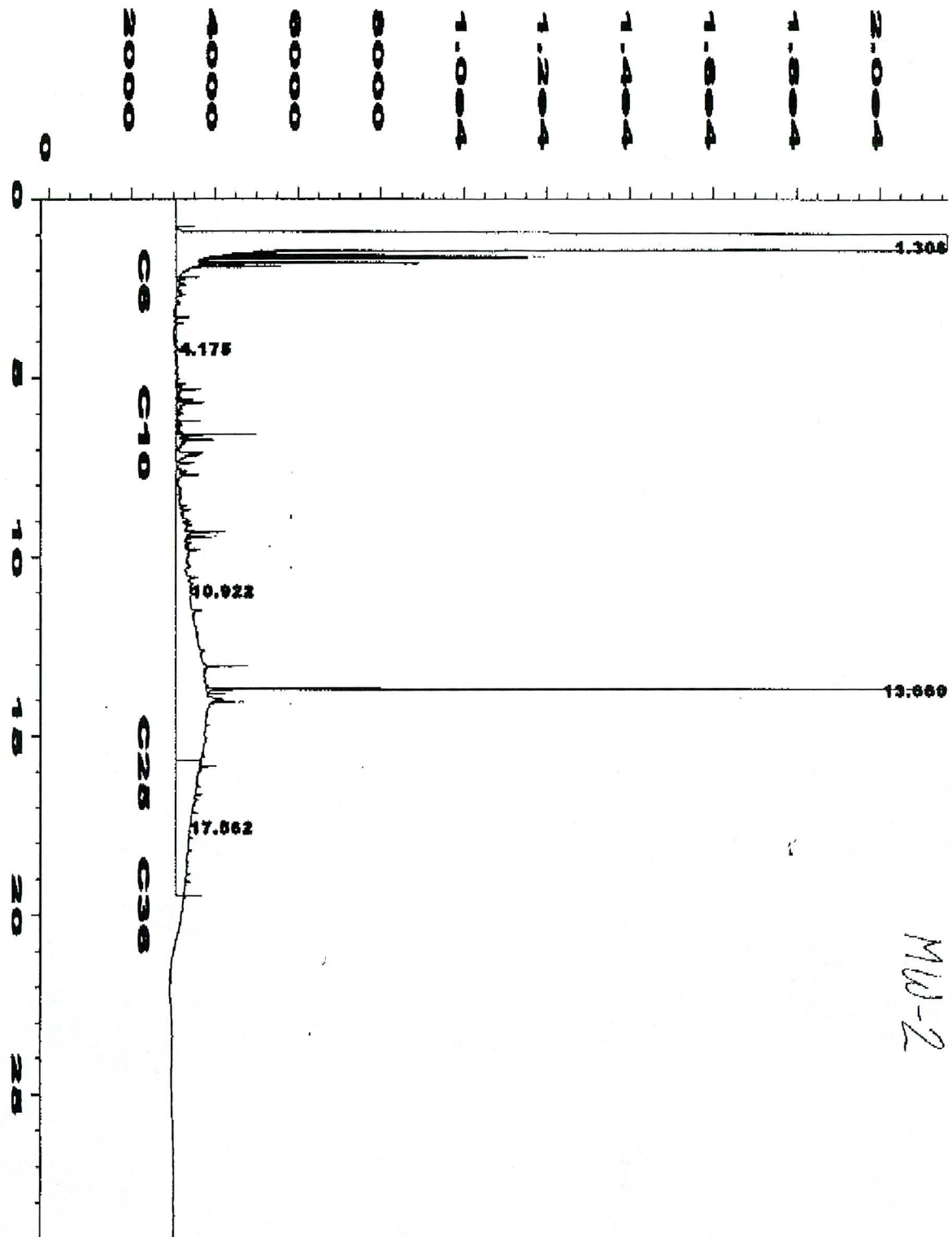
#	Note
E	Estimated value. The reported value exceeds the calibration range of the analysis.
1	The surrogate recovery for this sample cannot be accurately quantified due to interference from coeluting organic compounds present in the sample.
2	Analyte hit confirmed by GC/MS.
3	Detected hydrocarbons appear to be due to overlap of gasoline as well as some late diesel-range hydrocarbons that may be from biogenic interference.
4	Surrogate recovery is outside control limits due to matrix interference.
5	Detected hydrocarbons in the diesel range do not have a distinct diesel pattern and may be due to heavily weathered diesel or possibly biogenic interference.
6	The RPD and/or percent recovery for this QC spike sample cannot be accurately calculated due to the high concentration of analyte already present in the sample.
7	The spike recovery, and or RPD, for this QC sample is outside of established control limits. Review of associated batch QC indicates the recovery for this analyte does not represent an out-of-control condition for the batch.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
Recov.	Recovery
RPD	Relative Percent Difference

North Creek Analytical - Portland

Sara McClurg
Sara McClurg, Project Manager

Page 11 of 11

North Creek Analytical, Inc.
Environmental Laboratory Network



Data File Name : C:\HPCHEM\2\DATA\B072899C\071R0101.D

Operator : LQN

Instrument : DUAL FID2

Sample Name : 907456-2

Run Time Bar Code:

Acquired on : 29 Jul 99 08:05 PM

Report Created on: 29 Jul 99 08:46 PM

Last Recalib on : 23 JUL 99 05:16 PM

Multiplier : 1

Page Number : 1

Vial Number : 71

Injection Number : 1

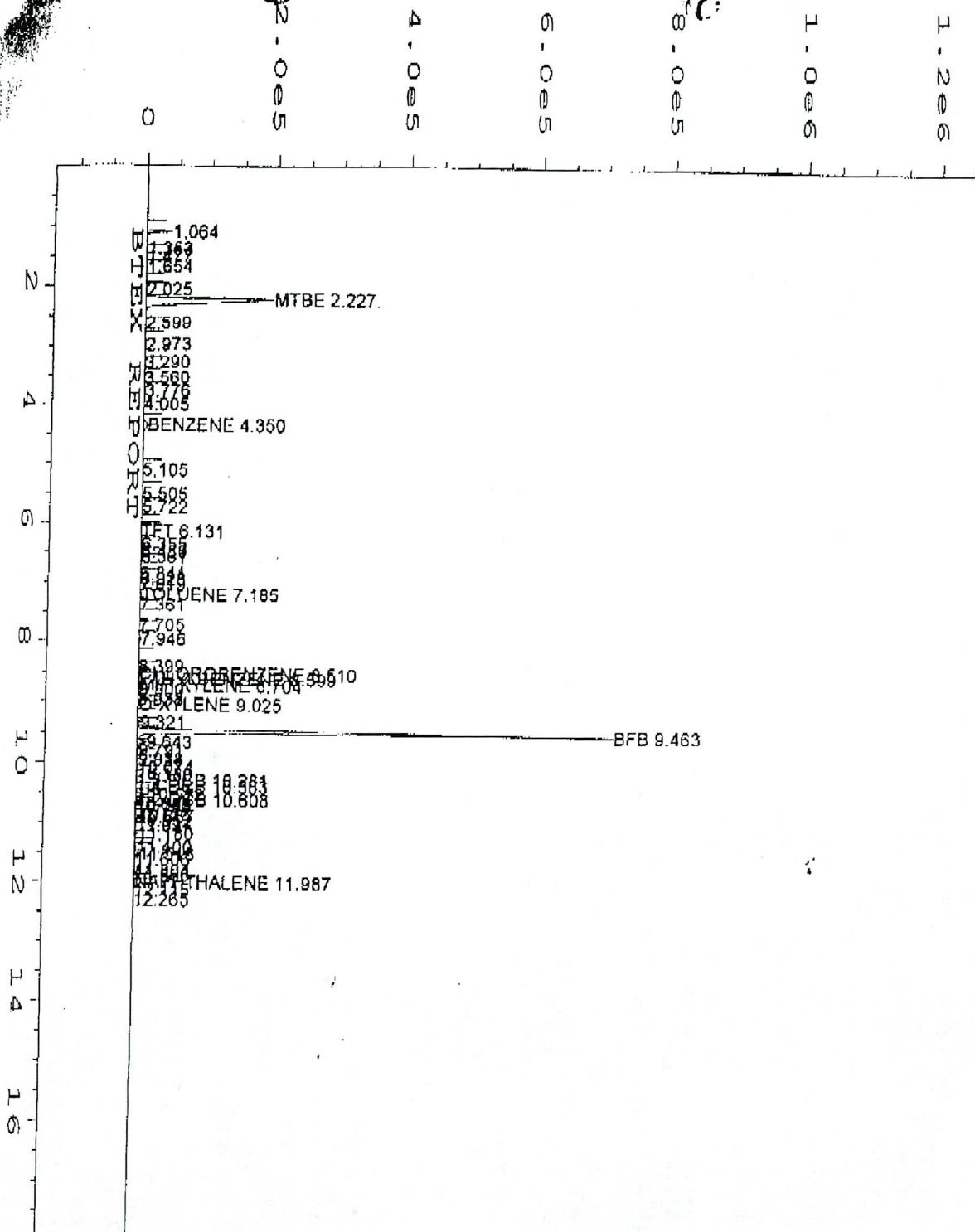
Sequence Line : 1

Instrument Method: ENWTPHD.MTH

Analysis Method : ENWTPHDR.MTH

Sample Amount : 0

ISTD Amount :



Data File Name : C:\HPCHEM\3\DATA\s072999\007R0101.D

Operator : ctp

Instrument : VOLSGC3

Sample Name : p907456-02rel

Run Time Bar Code:

Acquired on : 29 Jul 99 11:13 AM

Report Created on: 29 Jul 99 11:31 AM

Last Recalib on : 20 JUL 99 03:53 PM

Multiplier : 1

Sample Info : Geo Pro

2.5mls

Page Number : 1

Vial Number : 7

Injection Number : 1

Sequence Line : 1

Instrument Method: NWCAS-G3.MTH

Analysis Method : ORGAS-G3.MTH

Sample Amount : 0

ISTD Amount :

nw g/btex/mtbe

MW-2



ncaTM
North Creek Analytical, Inc.
Environmental Laboratory Network
www.ncalabs.com

COC 99723

18939 120th Avenue N.E., Suite 101, Bothell, WA 98011-9508
East 11115 Montgomery, Suite B, Spokane, WA 98206-4776
9405 S.W. Nimbus Avenue, Beaverton, OR 97008-7132
20332 Empire Avenue, Suite F-1, Bend, OR 97701-5711

(425) 420-9200 FAX 420-9210
(509) 924-9200 FAX 924-9290
(503) 906-9200 FAX 906-9210
(541) 383-9310 FAX 382-7588



CHAIN OF CUSTODY REPORT

Work Order #:

CLIENT: GEOPRO GEOLOGIC SERVICES				INVOICE TO: DELCO PETROLEUM CO., LLC				TURNAROUND REQUEST in Business Days* Organic & Inorganic Analyses ☐ 10 ☐ 7 ☐ 5 ☐ 4 ☐ 3 ☐ 2 ☐ 1 ☐ <1 ☒ STD. ☐ 4 ☐ 3 ☐ 2 ☐ 1 ☐ <1 PETROLEUM HYDROCARBON ANALYSES ☒ STD. ☐ 4 ☐ 3 ☐ 2 ☐ 1 ☐ <1 OTHER Please Specify *Turnaround Requests less than standard may incur Rush Charges.															
REPORT TO: ATTN: RICHARD KENT				17873 SE McLOUGHLIN BLVD.																			
ADDRESS: P.O. BOX 26				MILWAUKIE, OR 97267																			
PHONE: 360-666-1465 FAX:				503-654-9812																			
PROJECT NAME: DELCO GROUNDWATER				P.O. NUMBER: GROUNDWATER SAMPLING																			
PROJECT NUMBER: 990621				REQUESTED ANALYSES																			
SAMPLED BY: RCK																							
CLIENT SAMPLE IDENTIFICATION		SAMPLING DATE/TIME		NUTPH-6M BTX/MTBE		NUTPH-DX		PH				MATRIX (W, S, O)		# OF CONT.		COMMENTS		NCA WO ID					
1. MW-1		7/24/99: 1350		X		X						W		3		2 VOA, 1L							
2. MW-2		7/24/99: 1545		X		X						W		3									
3. MW-4		7/25/99: 1440		X		X						W		3									
4. MW-5		7/25/99: 1330		X		X						W		3									
5. MW-6		7/24/99: 1235		X		X						W		3									
6. MW-7/8 Separator		7/25/99: 1517		X		X		X				W		3									
7. MW-9		7/23/99: 1845		X		X						W		3									
8. MW-10		7/23/99: 1530		X		X						W		3									
9. MW-11		7/24/99: 1745		X		X						W		3									
10. MW-12		7/24/99: 1650		X		X						W		3									
11. MW-13		7/23/99: 1605		X		X						W		3									
12.																							
13.																							
14.																							
15.																							
RELINQUISHED BY:				DATE: 7/26/99				RECEIVED BY:				DATE:											
PRINT NAME: RICHARD KENT				FIRM: GEOPRO				TIME: 1252				PRINT NAME:				FIRM:				TIME:			
RELINQUISHED BY:				DATE:				RECEIVED BY:				DATE:											
PRINT NAME:				FIRM:				TIME:				PRINT NAME:				FIRM:				TIME:			
ADDITIONAL REMARKS:																TEMP:		PAGE OF					

APPENDIX B

JULY 1999 WATER SAMPLE FIELD LOGS

GeoPro Geologic Services

Post Office Box 26
Battle Ground, WA 98604
(360) 666-1465

WATER SAMPLE FIELD LOG

Project Name: Delco Petroleum Groundwater Sampling Project Number: 990621
Project Location: 17873 SE McLoughlin Blvd., Milwaukie, Oregon 97267
Client: Delco Petroleum Co., LLC

DATE: 7/24/99	WELL NO.: MW-1
Time Sample Collected: 1350	SAMPLE NO.: MW-1
COC/RFA Number: 99723	Sampler: rck
Well as-built depth (ft): 15	Well depth when sampled (ft): 15
Well install date: 6/18/93	Depth to bottom of aquifer seal (ft): 1.8
Casing inside diameter (inches): 2	Elevation: 99.37
WELL PURGE INFORMATION	
Pre-purge static water level (ft): 5.66	Pre-purge volume of water in casing & annulus (gals): 5.7
Filter pack thickness (inches): 6	Total amount purged (gals): 7.5
No. of 55-gal drums used for purged water: <1	☒ Purge by bailer ☐ Purge by pump
SAMPLE COLLECTION INFORMATION	
Sample Collection Method: The monitor well was purged of stagnant water in the casing and filter by hand bailing with a disposable bailer until the temperature, conductivity and pH reasonably stabilized or approximately three well volumes were evacuated. Samples were collected with a disposable PVC bailer lowered below the water level which had reached approximately 80% of the static level as recorded prior to purging. Water samples were placed in septum-capped 40-milliliter vials (volatile organic analysis-VOA) and/or 1 or ½-liter amber glass containers. The containers were filled to prevent air-entrapment, sealed with Teflon septums as appropriate, labeled, and placed in an ice chest with blu-ice for transport to the laboratory.	
Other Comments: traffic box seal loose, water in traffic box, moderately slow recharge, traffic cover ID 54772.	
SWL at time of sample collection: 7.28 ft.	Other:
Sample temperature: 68.9 °F	Sample color: lt gray
Sample conductance: 4.87×10^{-2}	Sample turbidity: slight
Sample pH: 7.66	Sample odor: none

Analysis Requested:

NWTPH-Gx/BTEX/MTBE, NWTPH-Dx

FIELD DATA

Bail No.	Time	Gals. Purged	Temp °F	Cond $\times 10^{-2}$	pH	Turbidity	Comment
5	1325	1.40	70.6	4.65	7.63	v. slight	lt gray
15	1330	4.20	66.6	4.51	7.40	v. slight	lt gray
25	1339	7.00	66.3	4.32	7.77	slight	lt gray
29	1340	7.50	-	-	-	-	

Purged Volume Example

One purged volume is the water contained within the filter pack (annulus) and the casing ("standing water"). Bail approximately 3 purged volumes of water prior to collecting a sample. For example, calculate one purged volume using the following conversions:
2" Sch-40 PVC casing = 0.163 gallons per foot (4" casing is 0.653 gallons per foot). Assume filter pack w/6" annulus (8" hole) has 30% porosity, then $1.5 \text{ gals/ft} \times 0.30 = 0.45 \text{ gals/ft}$ in annulus. A 4" PVC in 10.25" hole, annulus of 6.25", is 1.55 gals/ft .

2" DATA: ABOVE SEAL: Volume in 2" PVC in 8" hole = 0 ft above seal $\times 0.163 \text{ gals/ft} = 0 \text{ gals}$.

BELOW SEAL: Volume [in 2" PVC in 8" hole] = $9.34 \text{ ft below seal} \times 0.163 \text{ gals/ft} + [\text{annulus}] 9.34 \text{ ft. below seal} \times 0.45 \text{ gals/ft} = 5.725 \text{ gals}$.

Bailer Volume Example

Bailer dimensions are 1.5" ID x 36" long. $1.5" = 0.092 \text{ gals/ft}$. 3 ft bailer = 0.28 gals/bail, or about ¼ gal/bail. e.g. 10 ft of water in monitor well $\times 0.363 \text{ gals/ft} = 3.63 \text{ gallons per volume}$ (assume no water above aquifer seal). $3.63 \times 3 = 11 \text{ gals.} = 3 \text{ purged volumes}$. 11 gals. $\times 1 \text{ bail/0.28 gals} = \text{about } 40 \text{ bails}$ (excluding water above aquifer seal).

NOTE: all references on this Field Log to dimensions and volumes are approximations.

GeoPro Geologic Services

Post Office Box 26
Battle Ground, WA 98604
(360) 666-1465

WATER SAMPLE FIELD LOG

Project Name: Delco Petroleum Groundwater Sampling Project Number: 990621
Project Location: 17873 SE McLoughlin Blvd., Milwaukie, Oregon 97267
Client: Delco Petroleum Co., LLC

DATE: 7/24/99	WELL NO.: MW-2
Time Sample Collected: 1445	SAMPLE NO.: MW-2
COC/RFA Number: 99723	Sampler: rck
Well as-built depth (ft): 14	Well depth when sampled (ft): 14
Well install date: 6/18/93	Depth to bottom of aquifer seal (ft): 3.5
Casing inside diameter (inches): 2	Elevation: 98.51

WELL PURGE INFORMATION

Pre-purge static water level (ft): 5.18	Pre-purge volume of water in casing & annulus (gals): 5.41
Filter pack thickness (inches): 6	Total amount purged (gals): 8
No. of 55-gal drums used for purged water: <1	☒ Purge by bailer ☐ Purge by pump

SAMPLE COLLECTION INFORMATION

Sample Collection Method:

The monitor well was purged of stagnant water in the casing and filter by hand bailing with a disposable bailer until the temperature, conductivity and pH reasonably stabilized or approximately three well volumes were evacuated. Samples were collected with a disposable PVC bailer lowered below the water level which had reached approximately 80% of the static level as recorded prior to purging. Water samples were placed in septum-capped 40-milliliter vials (volatile organic analysis-VOA) and/or 1 or ½-liter amber glass containers. The containers were filled to prevent air-entrapment, sealed with Teflon septums as appropriate, labeled, and placed in an ice chest with blu-ice for transport to the laboratory.

Other Comments: water in traffic box; top of PVC cut at angle

SWL at time of sample collection: 5.28 ft.	Other:
Sample temperature: 64.6 °F	Sample color: v. lt gray
Sample conductance: 2.89×10^{-2}	Sample turbidity: v. slight
Sample pH: 7.87	Sample odor: none

Analysis Requested:

NWTPH-Gx/BTEX/MTBE, NWTPH-Dx

FIELD DATA

Bail No.	Time	Gals. Purged	Temp °F	Cond $\times 10^{-2}$	pH	Turbidity	Comment
5	1521	1.40	68.0	3.67	7.75	v. slight	lt gray
15	1527	4.20	64.8	3.20	7.84	v. slight	lt gray
25	1535	7.00	64.8	3.06	7.94	v. slight	lt gray
30	-	8.00	64.6	2.87	7.87	v. slight	lt gray

Purged Volume Example

One purged volume is the water contained within the filter pack (annulus) and the casing ("standing water"). Bail approximately 3 purged volumes of water prior to collecting a sample. For example, calculate one purged volume using the following conversions:
2" Sch-40 PVC casing = 0.163 gallons per foot (4" casing is 0.653 gallons per foot). Assume filter pack w/6" annulus (8" hole) has 30% porosity, then 1.5 gals/ft $\times$ 0.30 = 0.45 gals/ft in annulus. A 4" PVC in 10.25" hole, annulus of 6.25", is 1.55 gals/ft.

2" DATA: ABOVE SEAL: Volume in 2" PVC in 8" hole = 0 ft above seal $\times$ 0.163 gals/ft = 0 gals.

BELOW SEAL: Volume [in 2" PVC in 8" hole] = 8.82 ft below seal $\times$ 0.163 gals/ft + [annulus] 8.82 ft. below seal $\times$ 0.45 gals/ft = 5.41 gals.

Bailer Volume Example

Bailer dimensions are 1.5" ID $\times$ 36" long. 1.5" = 0.092 gals/ft. 3 ft bailer = 0.28 gals/bail, or about ¼ gal/bail. e.g. 10 ft of water in monitor well $\times$ 0.363 gals/ft = 3.63 gallons per volume (assume no water above aquifer seal). 3.63 $\times$ 3 = 11 gals. = 3 purged volumes. 11 gals. $\times$ 1 bail/0.28 gals = about 40 bails (excluding water above aquifer seal).

NOTE: all references on this Field Log to dimensions and volumes are approximations.

GeoPro Geologic Services

Post Office Box 26
Battle Ground, WA 98604
(360) 666-1465

WATER SAMPLE FIELD LOG

Project Name: Delco Petroleum Groundwater Sampling

Project Number: 990621

Project Location: 17873 SE McLoughlin Blvd., Milwaukie, Oregon 97267

Client: Delco Petroleum Co., LLC

DATE: 7/25/99	WELL NO.: MW-4
Time Sample Collected: 1440	SAMPLE NO.: MW-4
COC/RFA Number: 99723	Sampler: rck
Well as-built depth (ft): 15	Well depth when sampled (ft): 15
Well install date: 6/18/93	Depth to bottom of aquifer seal (ft): 3.5
Casing inside diameter (inches): 2	Elevation: 99.00
WELL PURGE INFORMATION	
Pre-purge static water level (ft): 5.571	Pre-purge volume of water in casing & annulus (gals): 5.78
Filter pack thickness (inches): 6	Total amount purged (gals): 8
No. of 55-gal drums used for purged water: <1	☒ Purge by bailer ☐ Purge by pump
SAMPLE COLLECTION INFORMATION	
Sample Collection Method: The monitor well was purged of stagnant water in the casing and filter by hand bailing with a disposable bailer until the temperature, conductivity and pH reasonably stabilized or approximately three well volumes were evacuated. Samples were collected with a disposable PVC bailer lowered below the water level which had reached approximately 80% of the static level as recorded prior to purging. Water samples were placed in septum-capped 40-milliliter vials (volatile organic analysis-VOA) and/or 1 or ½-liter amber glass containers. The containers were filled to prevent air-entrapment, sealed with Teflon septums as appropriate, labeled, and placed in an ice chest with blu-ice for transport to the laboratory.	
Other Comments: sheen on purge water after first bail; strong diesel odor from wellhead; no free product visible; water in traffic box	
SWL at time of sample collection: 5.826 ft.	Other:
Sample temperature: 69.1 °F	Sample color: lt gray
Sample conductance: 3.19×10^{-2}	Sample turbidity: slight
Sample pH: 3.21	Sample odor: moderate diesel

Analysis Requested:

NWTPH-Gx/BTEX/MTBE, NWTPH-Dx

FIELD DATA

Bail No.	Time	Gals. Purged	Temp °F	Cond $\times 10^{-2}$	pH	Turbidity	Comment
5	1407	1.40	74.2	3.37	8.74	v. slight	lt gray, diesel odor
15	1417	4.20	74.1	3.47	8.86	v. slight	lt gray, diesel odor
25	1425	7.00	70.3	3.26	9.01	v. slight	lt gray, diesel odor
30	1429	8.00	68.6	3.10	8.89	v. slight	lt gray, diesel odor

Purged Volume Example

One purged volume is the water contained within the filter pack (annulus) and the casing ("standing water"). Bail approximately 3 purged volumes of water prior to collecting a sample. For example, calculate one purged volume using the following conversions:

2" Sch-40 PVC casing = 0.163 gallons per foot (4" casing is 0.653 gallons per foot). Assume filter pack w/6" annulus (8" hole) has 30% porosity, then $1.5 \text{ gals/ft} \times 0.30 = 0.45 \text{ gals/ft}$ in annulus. A 4" PVC in 10.25" hole, annulus of 6.25", is 1.55 gals/ft .

2" DATA: ABOVE SEAL: Volume in 2" PVC in 8" hole = 0 ft above seal $\times 0.163 \text{ gals/ft} = 0 \text{ gals}$.

BELOW SEAL: Volume [in 2" PVC in 8" hole] = $9.429 \text{ ft below seal} \times 0.163 \text{ gals/ft} + [\text{annulus}] 9.429 \text{ ft. below seal} \times 0.45 \text{ gals/ft} = 5.78 \text{ gals}$.

Bailer Volume Example

Bailer dimensions are 1.5" ID x 36" long. $1.5" = 0.092 \text{ gals/ft}$. 3 ft bailer = 0.28 gals/bail, or about ¼ gal/bail. e.g. 10 ft of water in monitor well $\times 0.363 \text{ gals/ft} = 3.63 \text{ gallons per volume}$ (assume no water above aquifer seal). $3.63 \times 3 = 11 \text{ gals.} = 3 \text{ purged volumes}$. 11 gals. $\times 1 \text{ bail/0.28 gals} = \text{about } 40 \text{ bails}$ (excluding water above aquifer seal).

NOTE: all references on this Field Log to dimensions and volumes are approximations.

GeoPro Geologic Services

Post Office Box 26
Battle Ground, WA 98604
(360) 666-1465

WATER SAMPLE FIELD LOG

Project Name: Delco Petroleum Groundwater Sampling Project Number: 990621
Project Location: 17873 SE McLoughlin Blvd., Milwaukie, Oregon 97267
Client: Delco Petroleum Co., LLC

DATE: 7/25/99	WELL NO.: MW-5
Time Sample Collected: 1330	SAMPLE NO.: MW-5
COC/RFA Number: 99723	Sampler: rck
Well as-built depth (ft): 15	Well depth when sampled (ft): 15
Well install date: 6/19/93	Depth to bottom of aquifer seal (ft): 3.5
Casing inside diameter (inches): 2	Elevation: 100.41

WELL PURGE INFORMATION

Pre-purge static water level (ft): 5.99	Pre-purge volume of water in casing & annulus (gals): 5.5
Filter pack thickness (inches): 6	Total amount purged (gals): 7
No. of 55-gal drums used for purged water: <1	☒ Purge by bailer ☐ Purge by pump

SAMPLE COLLECTION INFORMATION

Sample Collection Method:

The monitor well was purged of stagnant water in the casing and filter by hand bailing with a disposable bailer until the temperature, conductivity and pH reasonably stabilized or approximately three well volumes were evacuated. Samples were collected with a disposable PVC bailer lowered below the water level which had reached approximately 80% of the static level as recorded prior to purging. Water samples were placed in septum-capped 40-milliliter vials (volatile organic analysis-VOA) and/or 1 or ½-liter amber glass containers. The containers were filled to prevent air-entrapment, sealed with Teflon septums as appropriate, labeled, and placed in an ice chest with blu-ice for transport to the laboratory.

Other Comments: OR WRD ID metal tag in traffic box: 54776; water in traffic box

SWL at time of sample collection: 6.915 ft.	Other:
Sample temperature: 70.9 °F	Sample color: lt gray
Sample conductance: 2.56×10^{-2}	Sample turbidity: v. slight
Sample pH: 8.76	Sample odor: none

Analysis Requested:

NWTPH-Gx/BTEX/MTBE, NWTPH-Dx

FIELD DATA

Bail No.	Time	Gals. Purged	Temp °F	Cond $\times 10^{-2}$	pH	Turbidity	Comment
5	1249	1.40	71.5	2.22	8.42	clear	
15	1258	4.20	69.3	2.07	8.61	clear	
25	1316	7.00	69.7	2.11	8.84	v. slight	lt gray

Purged Volume Example

One purged volume is the water contained within the filter pack (annulus) and the casing ("standing water"). Bail approximately 3 purged volumes of water prior to collecting a sample. For example, calculate one purged volume using the following conversions:
2" Sch-40 PVC casing = 0.163 gallons per foot (4" casing is 0.653 gallons per foot). Assume filter pack w/6" annulus (8" hole) has 30% porosity, then $1.5 \text{ gals/ft} \times 0.30 = 0.45 \text{ gals/ft}$ in annulus. A 4" PVC in 10.25" hole, annulus of 6.25", is 1.55 gals/ft .

2" DATA: ABOVE SEAL: Volume in 2" PVC in 8" hole = 0 ft above seal $\times 0.163 \text{ gals/ft} = 0 \text{ gals}$.

BELOW SEAL: Volume [in 2" PVC in 8" hole] = $9.01 \text{ ft below seal} \times 0.163 \text{ gals/ft} + [\text{annulus}] 9.01 \text{ ft. below seal} \times 0.45 \text{ gals/ft} = 5.5 \text{ gals}$.

Bailer Volume Example

Bailer dimensions are 1.5" ID x 36" long. $1.5" = 0.092 \text{ gals/ft}$. 3 ft bailer = 0.28 gals/bail, or about ¼ gal/bail. e.g. 10 ft of water in monitor well $\times 0.363 \text{ gals/ft} = 3.63 \text{ gallons per volume}$ (assume no water above aquifer seal). $3.63 \times 3 = 11 \text{ gals.} = 3 \text{ purged volumes.}$ 11 gals. $\times 1 \text{ bail/0.28 gals} = \text{about } 40 \text{ bails}$ (excluding water above aquifer seal).

NOTE: all references on this Field Log to dimensions and volumes are approximations.

GeoPro Geologic Services

Post Office Box 26
Battle Ground, WA 98604
(360) 666-1465

WATER SAMPLE FIELD LOG

Project Name: Delco Petroleum Groundwater Sampling Project Number: 990621
Project Location: 17873 SE McLoughlin Blvd., Milwaukie, Oregon 97267
Client: Delco Petroleum Co., LLC

DATE: 7/24/99	WELL NO.: MW-6
Time Sample Collected: 1235	SAMPLE NO.: MW-6
COC/RFA Number: 99723	Sampler: rck
Well as-built depth (ft): 14.5	Well depth when sampled (ft): 14.5
Well install date: 6/19/93	Depth to bottom of aquifer seal (ft): 3.5
Casing inside diameter (inches): 2	Elevation: 100.01
WELL PURGE INFORMATION	
Pre-purge static water level (ft): 6.251	Pre-purge volume of water in casing & annulus (gals): 5.01
Filter pack thickness (inches): 6	Total amount purged (gals): 7.0
No. of 55-gal drums used for purged water: <1	☒ Purge by bailer ☐ Purge by pump
SAMPLE COLLECTION INFORMATION	
Sample Collection Method: The monitor well was purged of stagnant water in the casing and filter by hand bailing with a disposable bailer until the temperature, conductivity and pH reasonably stabilized or approximately three well volumes were evacuated. Samples were collected with a disposable PVC bailer lowered below the water level which had reached approximately 80% of the static level as recorded prior to purging. Water samples were placed in septum-capped 40-milliliter vials (volatile organic analysis-VOA) and/or 1 or ½-liter amber glass containers. The containers were filled to prevent air-entrapment, sealed with Teflon septums as appropriate, labeled, and placed in an ice chest with blu-ice for transport to the laboratory.	
Other Comments: traffic cover full of water	
SWL at time of sample collection: 7.391 ft.	Other:
Sample temperature: 63.1 °F	Sample color: med gray
Sample conductance: 2.16×10^{-2}	Sample turbidity: moderate
Sample pH: 7.24	Sample odor: none

Analysis Requested:

NWTPH-Gx/BTEX/MTBE, NWTPH-Dx

FIELD DATA

Bail No.	Time	Gals. Purged	Temp °F	Cond $\times 10^{-2}$	pH	Turbidity	Comment
5	1220	1.40	67.9	2.48	7.47	v. slight	yel brn
15	1225	4.20	63.5	2.36	7.13	moderate	gray
25	1231	7.00	63.3	2.23	7.35	moderate	gray

Purged Volume Example

One purged volume is the water contained within the filter pack (annulus) and the casing ("standing water"). Bail approximately 3 purged volumes of water prior to collecting a sample. For example, calculate one purged volume using the following conversions:

2" Sch-40 PVC casing = 0.163 gallons per foot (4" casing is 0.653 gallons per foot). Assume filter pack w/6" annulus (8" hole) has 30% porosity, then $1.5 \text{ gals/ft} \times 0.30 = 0.45 \text{ gals/ft}$ in annulus. A 4" PVC in 10.25" hole, annulus of 6.25", is 1.55 gals/ft .

2" DATA: ABOVE SEAL: Volume in 2" PVC in 8" hole = 0 ft above seal $\times 0.163 \text{ gals/ft} = 0 \text{ gals}$.

BELOW SEAL: Volume [in 2" PVC in 8" hole] = $8.749 \text{ ft below seal} \times 0.163 \text{ gals/ft} + [\text{annulus}] 8.749 \text{ ft. below seal} \times 0.45 \text{ gals/ft} = 5.01 \text{ gals}$.

Bailer Volume Example

Bailer dimensions are 1.5" ID x 36" long. $1.5" = 0.092 \text{ gals/ft}$. 3 ft bailer = 0.28 gals/bail, or about ¼ gal/bail. e.g. 10 ft of water in monitor well $\times 0.363 \text{ gals/ft} = 3.63 \text{ gallons per volume}$ (assume no water above aquifer seal). $3.63 \times 3 = 11 \text{ gals.} = 3 \text{ purged volumes}$. 11 gals. $\times 1 \text{ bail}/0.28 \text{ gals} = \text{about } 40 \text{ bails}$ (excluding water above aquifer seal).

NOTE: all references on this Field Log to dimensions and volumes are approximations.

GeoPro Geologic Services

Post Office Box 26
Battle Ground, WA 98604
(360) 666-1465

WATER SAMPLE FIELD LOG

Project Name: Delco Petroleum Groundwater Sampling

Project Number: 990621

Project Location: 17873 SE McLoughlin Blvd., Milwaukie, Oregon 97267

Client: Delco Petroleum Co., LLC

DATE: 7/23/99	WELL NO.: MW-9
Time Sample Collected: 1845	SAMPLE NO.: MW-9
COC/RFA Number: 99723	Sampler: rck
Well as-built depth (ft): 15	Well depth when sampled (ft): 15
Well install date: 1/27/95	Depth to bottom of aquifer seal (ft): 3
Casing inside diameter (inches): 2	Elevation: 99.42

WELL PURGE INFORMATION

Pre-purge static water level (ft): 5.641	Pre-purge volume of water in casing & annulus (gals): 5.74
Filter pack thickness (inches): 6	Total amount purged (gals): 8.5
No. of 55-gal drums used for purged water: <1	☒ Purge by bailer ☐ Purge by pump

SAMPLE COLLECTION INFORMATION

Sample Collection Method:

The monitor well was purged of stagnant water in the casing and filter by hand bailing with a disposable bailer until the temperature, conductivity and pH reasonably stabilized or approximately three well volumes were evacuated. Samples were collected with a disposable PVC bailer lowered below the water level which had reached approximately 80% of the static level as recorded prior to purging. Water samples were placed in septum-capped 40-milliliter vials (volatile organic analysis-VOA) and/or 1 or ½-liter amber glass containers. The containers were filled to prevent air-entrapment, sealed with Teflon septums as appropriate, labeled, and placed in an ice chest with blu-ice for transport to the laboratory.

Other Comments: traffic box filled with bentonite, cleaned out; very slow recharge

SWL at time of sample collection: 10.91 ft.	Other:
Sample temperature: 68.2 °F	Sample color: med. gray
Sample conductance: 2.82×10^{-2}	Sample turbidity: moderate
Sample pH: 8.18	Sample odor: none

Analysis Requested:

NWTPH-Gx/BTEX/MTBE, NWTPH-Dx

FIELD DATA

Bail No.	Time	Gals. Purged	Temp °F	Cond $\times 10^{-2}$	pH	Turbidity	Comment
5	1637	1.40	68.9	3.64	7.93	clear	
15	1643	4.20	66.2	3.36	7.95	clear	
25	1654	7.00	67.0	3.34	7.90	slight	med gray
31	-	8.5	-	-	-	-	-

Purged Volume Example

One purged volume is the water contained within the filter pack (annulus) and the casing ("standing water"). Bail approximately 3 purged volumes of water prior to collecting a sample. For example, calculate one purged volume using the following conversions:
2" Sch-40 PVC casing = 0.163 gallons per foot (4" casing is 0.653 gallons per foot). Assume filter pack w/6" annulus (8" hole) has 30% porosity, then 1.5 gals/ft $\times$ 0.30 = 0.45 gals/ft in annulus. A 4" PVC in 10.25" hole, annulus of 6.25", is 1.55 gals/ft.

2" DATA: ABOVE SEAL: Volume in 2" PVC in 8" hole = 0 ft above seal $\times$ 0.163 gals/ft = 0 gals.

BELOW SEAL: Volume [in 2" PVC in 8" hole] = 9.36 ft below seal $\times$ 0.163 gals/ft + [annulus] 9.36 ft. below seal $\times$ 0.45 gals/ft = 5.74 gals.

Bailer Volume Example

Bailer dimensions are 1.5" ID $\times$ 36" long. 1.5" = 0.092 gals/ft. 3 ft bailer = 0.28 gals/bail, or about ¼ gal/bail. e.g. 10 ft of water in monitor well $\times$ 0.363 gals/ft = 3.63 gallons per volume (assume no water above aquifer seal). 3.63 $\times$ 3 = 11 gals. = 3 purged volumes. 11 gals. $\times$ 1 bail/0.28 gals = about 40 bails (excluding water above aquifer seal).

NOTE: all references on this Field Log to dimensions and volumes are approximations.

GeoPro Geologic Services

Post Office Box 26
Battle Ground, WA 98604
(360) 666-1465

WATER SAMPLE FIELD LOG

Project Name: Delco Petroleum Groundwater Sampling Project Number: 990621
Project Location: 17873 SE McLoughlin Blvd., Milwaukie, Oregon 97267
Client: Delco Petroleum Co., LLC

DATE: 7/23/99	WELL NO.: MW-10
Time Sample Collected: 1530	SAMPLE NO.: MW-10
COC/RFA Number: 99723	Sampler: rck
Well as-built depth (ft): 15	Well depth when sampled (ft): 15
Well install date: 8/12/96	Depth to bottom of aquifer seal (ft): 8
Casing inside diameter (inches): 2	Elevation: 98.50
WELL PURGE INFORMATION	
Pre-purge static water level (ft): 4.821	Pre-purge volume of water in casing & annulus (gals): 4.89
Filter pack thickness (inches): 8	Total amount purged (gals): 9.8
No. of 55-gal drums used for purged water: <1	☒ Purge by bailer ☐ Purge by pump
SAMPLE COLLECTION INFORMATION	
Sample Collection Method: The monitor well was purged of stagnant water in the casing and filter by hand bailing with a disposable bailer until the temperature, conductivity and pH reasonably stabilized or approximately three well volumes were evacuated. Samples were collected with a disposable PVC bailer lowered below the water level which had reached approximately 80% of the static level as recorded prior to purging. Water samples were placed in septum-capped 40-milliliter vials (volatile organic analysis-VOA) and/or 1 or ½-liter amber glass containers. The containers were filled to prevent air-entrapment, sealed with Teflon septums as appropriate, labeled, and placed in an ice chest with blu-ice for transport to the laboratory.	
Other Comments: OR WRD No. L04479 metal tag in traffic box; water in traffic box; traffic box stamped ID 90055	
SWL at time of sample collection: 5.14 ft.	Other:
Sample temperature: 72.3 °F	Sample color: v. lt yellow brn
Sample conductance: 2.31×10^{-2}	Sample turbidity: v. slight
Sample pH: 9.18	Sample odor: none

Analysis Requested:

NWTPH-Gx/BTEX/MTBE, NWTPH-Dx

FIELD DATA

Bail No.	Time	Gals. Purged	Temp °F	Cond $\times 10^{-2}$	pH	Turbidity	Comment
5	1504	1.40	74.2	2.48	9.57	slight	lt gray
15	1511	4.20	79.8	2.31	9.09	v. slight	lt gray
25	1515	7.00	78.0	2.26	9.39	moderate	lt gray
35	1524	9.80	71.9	2.44	9.16	slight	lt gray

Purged Volume Example

One purged volume is the water contained within the filter pack (annulus) and the casing ("standing water"). Bail approximately 3 purged volumes of water prior to collecting a sample. For example, calculate one purged volume using the following conversions:
2" Sch-40 PVC casing = 0.163 gallons per foot (4" casing is 0.653 gallons per foot). Assume filter pack w/6" annulus (8" hole) has 30% porosity, then $1.5 \text{ gals/ft} \times 0.30 = 0.45 \text{ gals/ft}$ in annulus. A 4" PVC in 10.25" hole, annulus of 6.25", is 1.55 gals/ft.

2" DATA: ABOVE SEAL: Volume in 2" PVC in 8" hole = 3.72 ft above seal $\times$ 0.163 gals/ft = 0.6 gals.

BELOW SEAL: Volume [in 2" PVC in 8" hole] = 7 ft below seal $\times$ 0.163 gals/ft + [annulus] 7 ft. below seal $\times$ 0.45 gals/ft = 4.89 gals.

Bailer Volume Example

Bailer dimensions are 1.5" ID $\times$ 36" long. $1.5" = 0.092 \text{ gals/ft}$. 3 ft bailer = 0.28 gals/bail, or about ¼ gal/bail. e.g. 10 ft of water in monitor well $\times$ 0.363 gals/ft = 3.63 gallons per volume (assume no water above aquifer seal). $3.63 \times 3 = 11 \text{ gals.} = 3 \text{ purged volumes.}$ 11 gals. $\times$ 1 bail/0.28 gals = about 40 bails (excluding water above aquifer seal).

NOTE: all references on this Field Log to dimensions and volumes are approximations.

GeoPro Geologic Services

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WATER SAMPLE FIELD LOG

Project Name: Delco Petroleum Groundwater Sampling Project Number: 990621
Project Location: 17873 SE McLoughlin Blvd., Milwaukie, Oregon 97267
Client: Delco Petroleum Co., LLC

DATE: 7/24/99	WELL NO.: MW-11
Time Sample Collected: 1745	SAMPLE NO.: MW-11
COC/RFA Number: 99723	Sampler: rck
Well as-built depth (ft): 15	Well depth when sampled (ft): 15
Well install date: 8/12/96	Depth to bottom of aquifer seal (ft): 8
Casing inside diameter (inches): 2	Elevation: 99.64
WELL PURGE INFORMATION	
Pre-purge static water level (ft): 6.421	Pre-purge volume of water in casing & annulus (gals): 4.3
Filter pack thickness (inches): 8	Total amount purged (gals): 7.0
No. of 55-gal drums used for purged water: <1	☒ Purge by bailer ☐ Purge by pump
SAMPLE COLLECTION INFORMATION	
Sample Collection Method: The monitor well was purged of stagnant water in the casing and filter by hand bailing with a disposable bailer until the temperature, conductivity and pH reasonably stabilized or approximately three well volumes were evacuated. Samples were collected with a disposable PVC bailer lowered below the water level which had reached approximately 80% of the static level as recorded prior to purging. Water samples were placed in septum-capped 40-milliliter vials (volatile organic analysis-VOA) and/or 1 or ½-liter amber glass containers. The containers were filled to prevent air-entrapment, sealed with Teflon septums as appropriate, labeled, and placed in an ice chest with blu-ice for transport to the laboratory.	
Other Comments: traffic cover stamped MW 11 90056; metal tag in traffic box OR DWR ID L04488; very slow recharge	
SWL at time of sample collection: 11.16 ft.	Other:
Sample temperature: 65.1 °F	Sample color: v. lt yel brn
Sample conductance: 3.22×10^{-2}	Sample turbidity: slight
Sample pH: 8.10	Sample odor: none

Analysis Requested:

NWTPH-Gx/BTEX/MTBE, NWTPH-Dx

FIELD DATA

Bail No.	Time	Gals. Purged	Temp °F	Cond $\times 10^{-2}$	pH	Turbidity	Comment
5	1727	1.40	66.5	3.30	8.24	slight	yel brn
15	1734	4.20	64.3	3.22	7.97	slight	yel brn
25	1738	7.00	64.0	3.24	8.05	slight	yel brn

Purged Volume Example

One purged volume is the water contained within the filter pack (annulus) and the casing ("standing water"). Bail approximately 3 purged volumes of water prior to collecting a sample. For example, calculate one purged volume using the following conversions:
2" Sch-40 PVC casing = 0.163 gallons per foot (4" casing is 0.653 gallons per foot). Assume filter pack w/6" annulus (8" hole) has 30% porosity, then 1.5 gals/ft $\times$ 0.30 = 0.45 gals/ft in annulus. A 4" PVC in 10.25" hole, annulus of 6.25", is 1.55 gals/ft.

2" DATA: ABOVE SEAL: Volume in 2" PVC in 8" hole = 1.58 ft above seal $\times$ 0.163 gals/ft = 0.257 gals.

BELOW SEAL: Volume [in 2" PVC in 8" hole] = 7 ft below seal $\times$ 0.163 gals/ft + [annulus] 7 ft. below seal $\times$ 0.45 gals/ft = 4.29 gals.

Bailer Volume Example

Bailer dimensions are 1.5" ID $\times$ 36" long. 1.5" = 0.092 gals/ft. 3 ft bailer = 0.28 gals/bail, or about ¼ gal/bail. e.g. 10 ft of water in monitor well $\times$ 0.363 gals/ft = 3.63 gallons per volume (assume no water above aquifer seal). 3.63 $\times$ 3 = 11 gals. = 3 purged volumes. 11 gals. $\times$ 1 bail/0.28 gals = about 40 bails (excluding water above aquifer seal).

NOTE: all references on this Field Log to dimensions and volumes are approximations.

GeoPro Geologic Services

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WATER SAMPLE FIELD LOG

Project Name: Delco Petroleum Groundwater Sampling Project Number: 990621
Project Location: 17873 SE McLoughlin Blvd., Milwaukie, Oregon 97267
Client: Delco Petroleum Co., LLC

DATE: 7/24/99	WELL NO.: MW-12
Time Sample Collected: 1650	SAMPLE NO.: MW-12
COC/RFA Number: 99723	Sampler: rck
Well as-built depth (ft): 15	Well depth when sampled (ft): 15
Well install date: 8/12/96	Depth to bottom of aquifer seal (ft): 8
Casing inside diameter (inches): 2	Elevation: 100.26
WELL PURGE INFORMATION	
Pre-purge static water level (ft): 6.88	Pre-purge volume of water in casing & annulus (gals): 4.47
Filter pack thickness (inches): 8	Total amount purged (gals): 7.0
No. of 55-gal drums used for purged water: <1	☒ Purge by bailer ☐ Purge by pump
SAMPLE COLLECTION INFORMATION	
Sample Collection Method: The monitor well was purged of stagnant water in the casing and filter by hand bailing with a disposable bailer until the temperature, conductivity and pH reasonably stabilized or approximately three well volumes were evacuated. Samples were collected with a disposable PVC bailer lowered below the water level which had reached approximately 80% of the static level as recorded prior to purging. Water samples were placed in septum-capped 40-milliliter vials (volatile organic analysis-VOA) and/or 1 or ½-liter amber glass containers. The containers were filled to prevent air-entrapment, sealed with Teflon septums as appropriate, labeled, and placed in an ice chest with blu-ice for transport to the laboratory.	
Other Comments: OR DWR metal tag in traffic box ID L04489; traffic box dry; very slow recharge	
SWL at time of sample collection: 8.56 ft.	Other:
Sample temperature: 65.1 °F	Sample color: v. pale yel brn
Sample conductance: 2.76×10^{-2}	Sample turbidity: v. slight
Sample pH: 8.24	Sample odor: none

Analysis Requested:

NWTPH-Gx/BTEX/MTBE, NWTPH-Dx

FIELD DATA

Bail No.	Time	Gals. Purged	Temp °F	Cond $\times 10^{-2}$	pH	Turbidity	Comment
5	1628	1.40	65.7	2.73	8.29	moderate	yel brn
15	1634	4.20	62.9	2.64	8.13	slight mod.	yel brn
25	1638	7.00	62.2	2.67	8.11	v. slight	yel brn

Purged Volume Example

One purged volume is the water contained within the filter pack (annulus) and the casing ("standing water"). Bail approximately 3 purged volumes of water prior to collecting a sample. For example, calculate one purged volume using the following conversions:
2" Sch-40 PVC casing = 0.163 gallons per foot (4" casing is 0.653 gallons per foot). Assume filter pack w/6" annulus (8" hole) has 30% porosity, then $1.5 \text{ gals/ft} \times 0.30 = 0.45 \text{ gals/ft}$ in annulus. A 4" PVC in 10.25" hole, annulus of 6.25", is 1.55 gals/ft .

2" DATA: ABOVE SEAL: Volume in 2" PVC in 8" hole = $1.12 \text{ ft above seal} \times 0.163 \text{ gals/ft} = 0.18 \text{ gals}$.

BELOW SEAL: Volume [in 2" PVC in 8" hole] = $7 \text{ ft below seal} \times 0.163 \text{ gals/ft} + [\text{annulus}] 7 \text{ ft. below seal} \times 0.45 \text{ gals/ft} = 4.47 \text{ gals}$.

Bailer Volume Example

Bailer dimensions are 1.5" ID x 36" long. $1.5" = 0.092 \text{ gals/ft}$. 3 ft bailer = 0.28 gals/bail, or about ¼ gal/bail. e.g. 10 ft of water in monitor well $\times 0.363 \text{ gals/ft} = 3.63 \text{ gallons per volume}$ (assume no water above aquifer seal). $3.63 \times 3 = 11 \text{ gals.} = 3 \text{ purged volumes}$. 11 gals. $\times 1 \text{ bail}/0.28 \text{ gals} = \text{about } 40 \text{ bails}$ (excluding water above aquifer seal).

NOTE: all references on this Field Log to dimensions and volumes are approximations.

GeoPro Geologic Services

Post Office Box 26
Battle Ground, WA 98604
(360) 666-1465

WATER SAMPLE FIELD LOG

Project Name: Delco Petroleum Groundwater Sampling Project Number: 990621
Project Location: 17873 SE McLoughlin Blvd., Milwaukie, Oregon 97267
Client: Delco Petroleum Co., LLC

DATE: 7/23/99	WELL NO.: MW-13
Time Sample Collected: 1605	SAMPLE NO.: MW-13
COC/RFA Number: 99723	Sampler: rck
Well as-built depth (ft): 15	Well depth when sampled (ft): 15
Well install date: 8/12/96	Depth to bottom of aquifer seal (ft): 8
Casing inside diameter (inches): 2	Elevation: 99.85
WELL PURGE INFORMATION	
Pre-purge static water level (ft): 6.00	Pre-purge volume of water in casing & annulus (gals): 5.52
Filter pack thickness (inches): 8	Total amount purged (gals): 7.0
No. of 55-gal drums used for purged water: <1	☒ Purge by bailer ☐ Purge by pump
SAMPLE COLLECTION INFORMATION	
Sample Collection Method: The monitor well was purged of stagnant water in the casing and filter by hand bailing with a disposable bailer until the temperature, conductivity and pH reasonably stabilized or approximately three well volumes were evacuated. Samples were collected with a disposable PVC bailer lowered below the water level which had reached approximately 80% of the static level as recorded prior to purging. Water samples were placed in septum-capped 40-milliliter vials (volatile organic analysis-VOA) and/or 1 or ½-liter amber glass containers. The containers were filled to prevent air-entrapment, sealed with Teflon septums as appropriate, labeled, and placed in an ice chest with blu-ice for transport to the laboratory.	
Other Comments: OR DWR ID metal tag in traffic boc L04487; top of traffic box stamped MW-13 90058	
SWL at time of sample collection: 6.14 ft.	Other:
Sample temperature: 68.8 °F	Sample color: clear
Sample conductance: 2.58×10^{-2}	Sample turbidity: v. slight
Sample pH: 8.28	Sample odor: none

Analysis Requested:

NWTPH-Gx/BTEX/MTBE, NWTPH-Dx

FIELD DATA

Bail No.	Time	Gals. Purged	Temp °F	Cond $\times 10^{-2}$	pH	Turbidity	Comment
5	1747	1.40	82.1	2.91	8.40	slight	yel brn
15	1752	4.20	71.7	2.72	8.40	slight	reddish brn
25	1759	7.00	69.8	2.59	8.31	clear	

Purged Volume Example

One purged volume is the water contained within the filter pack (annulus) and the casing ("standing water"). Bail approximately 3 purged volumes of water prior to collecting a sample. For example, calculate one purged volume using the following conversions:

2" Sch-40 PVC casing = 0.163 gallons per foot (4" casing is 0.653 gallons per foot). Assume filter pack w/6" annulus (8" hole) has 30% porosity, then $1.5 \text{ gals/ft} \times 0.30 = 0.45 \text{ gals/ft}$ in annulus. A 4" PVC in 10.25" hole, annulus of 6.25", is 1.55 gals/ft .

2" DATA: ABOVE SEAL: Volume in 2" PVC in 8" hole = 0 ft above seal $\times 0.163 \text{ gals/ft} = 0 \text{ gals}$.

BELOW SEAL: Volume [in 2" PVC in 8" hole] = 9 ft below seal $\times 0.163 \text{ gals/ft} +$ [annulus] 9 ft. below seal $\times 0.45 \text{ gals/ft} = 5.52 \text{ gals}$.

Bailer Volume Example

Bailer dimensions are 1.5" ID x 36" long. $1.5" = 0.092 \text{ gals/ft}$. 3 ft bailer = 0.28 gals/bail, or about ¼ gal/bail. e.g. 10 ft of water in monitor well $\times 0.363 \text{ gals/ft} = 3.63 \text{ gallons per volume}$ (assume no water above aquifer seal). $3.63 \times 3 = 11 \text{ gals.} = 3 \text{ purged volumes}$. 11 gals. $\times 1 \text{ bail}/0.28 \text{ gals} = \text{about } 40 \text{ bails}$ (excluding water above aquifer seal).

NOTE: all references on this Field Log to dimensions and volumes are approximations.

APPENDIX C

MONITOR WELL LOGS

(MW-1 through MW-13)

PROJECT NAME/LOCATION:	Project Number	43-93-011	Boring Number	MW-1
Jiffy Lube Internation Store #1012 17869 S.E.McLoughlin Boulevard Milwaukie, OR	Con-tractor	Geotech Explorations	Drilling Method	6 1/4" Hollow Stem Auger
	Driller	Mike Reneker	Drilling Rig	B-61
	Start	8:36 a.m. 06/18/93	Completed	9:16 a.m. 06/18/93
Landowner: Flying J Corporation	Surface Elev.	-----	Logged By	Mark Underhill

Sample		Blow Count	Sample		Depth Scale 1" = 4'	Descriptions of Materials and Conditions	Observations	
Type	No.		Interval (ft)	Recovery (in.)			Instrument: Units:	Comments
					0	Asphalt Concrete and Gravel Base		
					1	-----		
SS	1	4 9 8	2.5-4.0	6	2	GRAVELY SILT; dark grey, damp	0	
SS	2	1 1 1	5.0-6.5	6	3			
					4			
SS	3	3 6 7	7.5-9.0	6	5	GRAVELY SILT; dark grey, damp	0	
					6			
SS	4	3 3 5	10.0-11.5	6	7	GRAVELY SILT; dark grey, damp	0	
					8			
SS	5	0 2 4	12.5-14.0	6	9	MEDIUM GREY CLAY; trace silt, damp	0	
					10			
SS	6	5 9 12	15.0-16.5	6	11	DARK GREY CLAY; trace silt, damp	0	
					12			
					13	DARK GREY CLAY; trace silt, damp	0	
					14			
					15	DARK GREY FINE-MEDIUM SAND; wet	0	
					16			
					17	End of Soil Boring at 16.5 feet below ground surface. Monitoring Well MW-1 installed.		
					18			
					19			
					20			
					21			
					22			
					23			

BOREHOLE WATER LEVEL DATA			
Date	06/18/93		
Time	9:25 a.m.		
GWL	7.0 feet		
Casing Depth	15.0 feet		



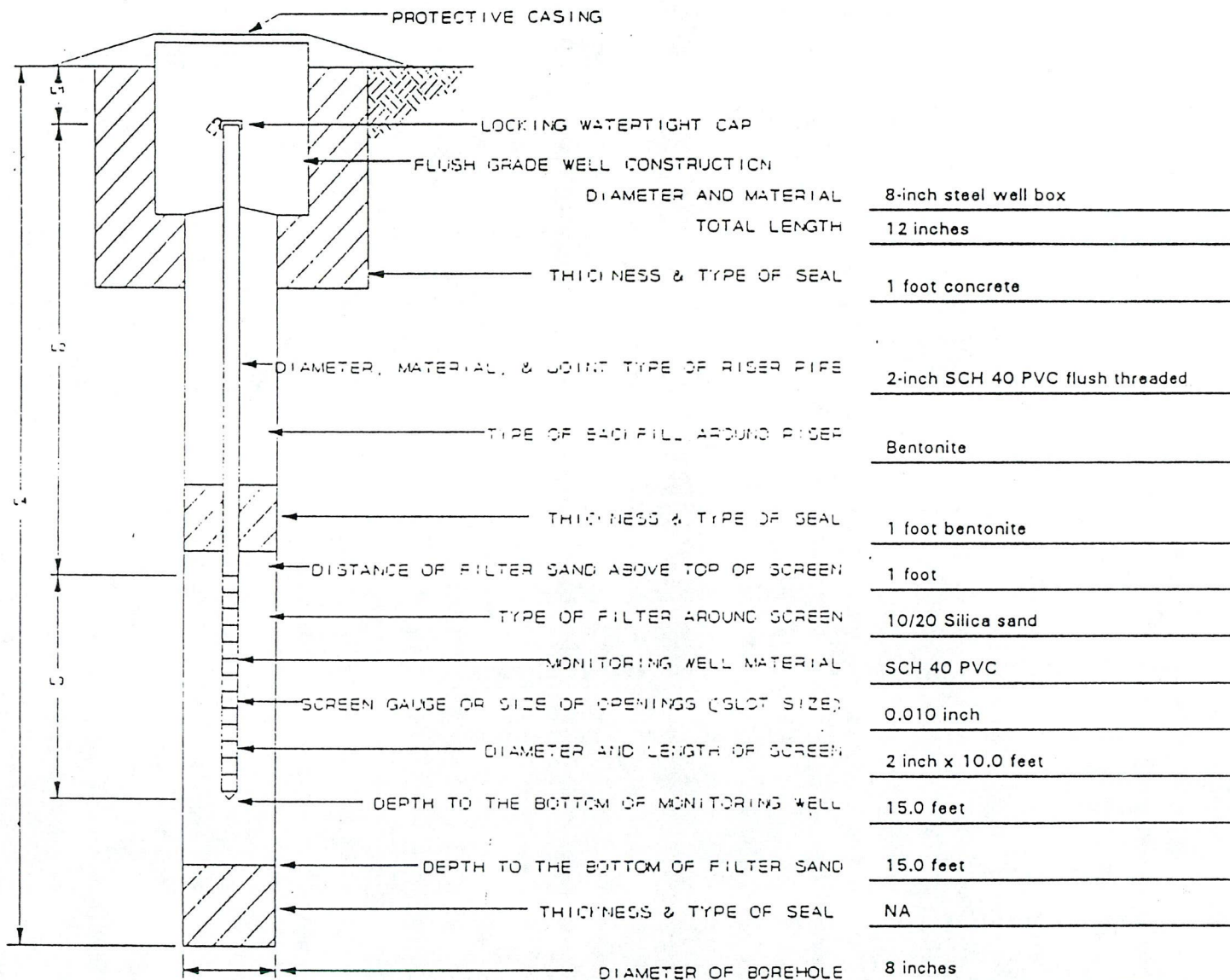
INSTALLATION OF FLUSH GRADE MONITORING WELL

Project Jiffy Lube International
17869 S.E. McLoughlin Blvd.
Milwaukie, OR

Delta No. 43-92-011

Monitoring Well No. MW-1

Elevations:
 Top of Riser: 99.67
 Ground Level: ----



L1 = --- FT
 L2 = 2.8 FT
 L3 = 10.0 FT
 L4 = 16.5 FT

Installation Completed

Date: 06/18/93

Time: 9:25 a.m.



Monitoring Well Water Level Measurements		
Date	Time	Water Level*
06/21/93	5:58 p.m.	94.65 feet

* Measure Point Top of casing

PROJECT NAME/LOCATION:	Project Number	43-93-011	Boring Number	MW-2
Jiffy Lube International Store #1012 17869 S.E. McLoughlin Boulevard Milwaukie, OR	Contractor	Geotech Exploration	Drilling Method	6 1/4" Hollow Stem Auger
	Driller	Mike Reneker	Drilling Rig	B-61
	Start	10:23 a.m. 06/18/93	Completed	11:16 p.m. 06/18/93
Landowner: Flying J Corporation	Surface Elev.	----	Logged By	Mark Underhill

Sample		Blow Count	Sample		Depth Scale 1" = 4'	Descriptions of Materials and Conditions	Observations		
Type	No.		Interval (ft)	Recovery (in.)			Instrument:	hNu	Comments
							Units:	ppm	
					0	Asphalt Concrete and Gravel Base			
					1				
SS	1	2 5 6	2.5-4.0	6	2	SILTY CLAY; dark grey, damp		30	
					3				
SS	2	1 3 1	5.0-6.5	6	4				
					5	CLAY; trace silt, dark grey, damp		0	
					6				
SS	3	2 6 8	7.5-9	6	7	CLAY; trace silt, medium grey, moist-damp		0	
					8				
					9				
SS	4	2 3 3	10.0-11.0	6	10	CLAY; trace silt, dark grey, moist		0	
					11				
SS	5	2 3 6	12.5-14.0	6	12	CLAY; trace organics, moist		0	
					13				
					14				
SS	6	N/A	15.0-16.5	6	15	3" heave-no sample recovered		0	
					16	End of boring at 16.5 feet below ground surface. Monitoring Well MW-2 installed.			
					17				
					18				
					19				
					20				
					21				
					22				
					23				

BOREHOLE WATER LEVEL DATA

Date	06/18/93		
Time	11:25 a.m.		
GWL	7.0 feet		
Casing Depth	14.0 feet		



Delta
Environmental
Consultants, Inc.

INSTALLATION OF FLUSH GRADE MONITORING WELL

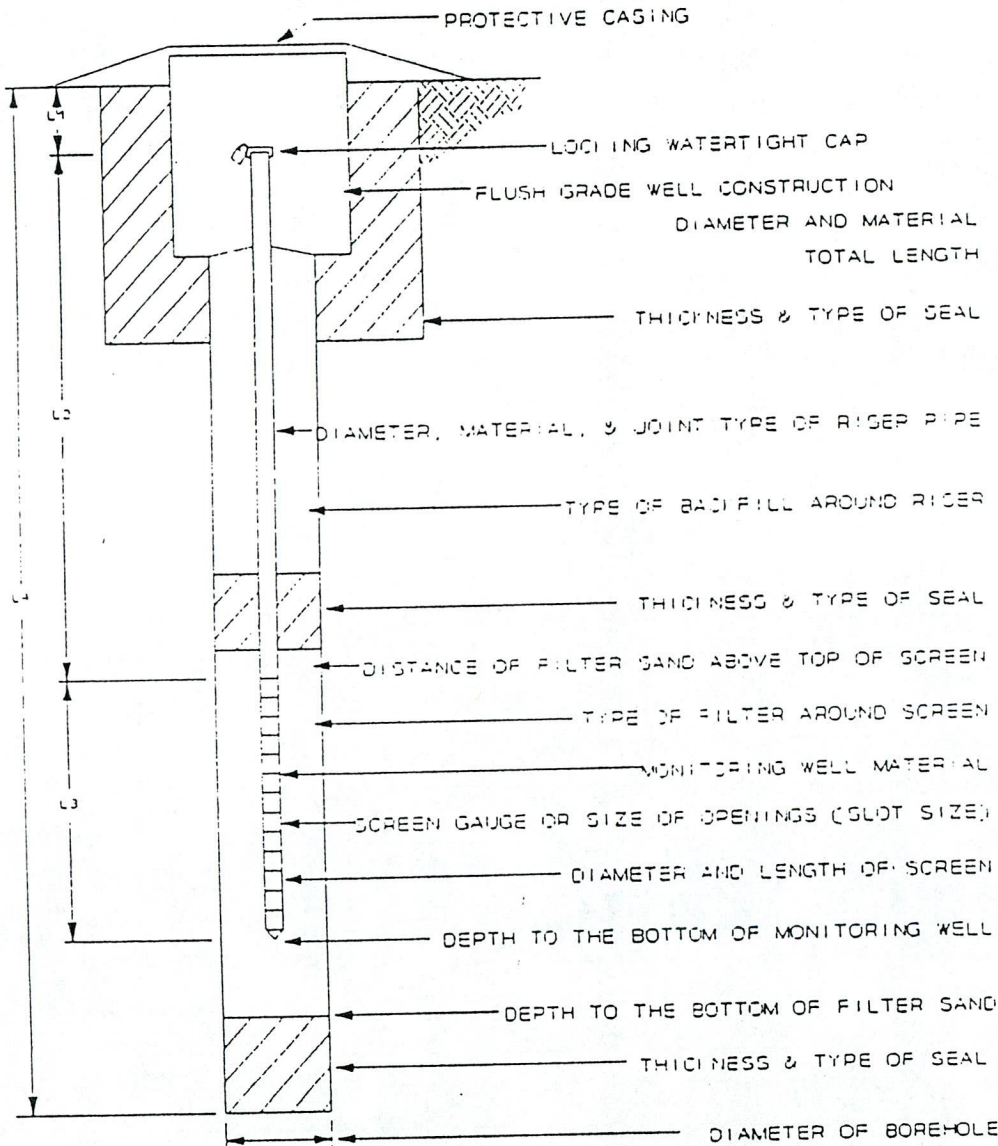
Project Jiffy Lube International
17869 S.E. McLoughlin Blvd.
Milwaukie, OR

Monitoring Well No. MW-2

Elevations:
 Top of Riser: 98.79

Delta No. 43-92-011

Ground Level: ----



8-inch steel well box

12 inches

1 foot concrete

2-inch SCH 40 PVC flush threaded

Bentonite

1 foot bentonite

1 foot

10/20 Silica sand

SCH 40 PVC

0.010 inch

2 inch x 10 feet

14.0 feet

14.0 feet

NA

8 inches

L1 = ---- FT
 L2 = 4.5 FT
 L3 = 10.0 FT
 L4 = 15.5 FT

Installation Completed

Date: 06/18/93

Time: 11:25 a.m.



Monitoring Well Water Level Measurements		
Date	Time	Water Level*
06/21/93	6:17 p.m.	94.59 feet

* Measure Point Top of casing

PROJECT NAME/LOCATION:	Project Number	43-93-011	Boring Number	MW-3
Jiffy Lube International Store #1012 17869 S.E. McLoughlin Boulevard Milwaukie, OR	Contractor	Geotech Exploration	Drilling Method	6 1/4" Hollow Stem Auger
	Driller	Mike Reneker	Drilling Rig	B-61
	Start	10:58a.m. 05/27/93	Completed	11:25 p.m. 05/27/93
Landowner: Flying J Corporation	Surface Elev.	----	Logged By	Mark Underhill

Sample		Blow Count	Sample		Depth Scale 1" = 4'	Descriptions of Materials and Conditions	Observations		
Type	No.		Interval (ft)	Recovery (in.)			Instrument: Units:	hNu ppm	Comments
					0	Asphalt Concrete and Gravel Base			
					1				
SS	1	1 3 2	2.5-4.0	6	2				
					3	SANDY SILT; medium grey, damp		173 ppm	
					4				
SS	2	3 2 4	5.0-6.5	6	5	CLAYEY SILT; dark grey, moist		259 ppm	
					6				
					7				
SS	3	1 2 1	7.5-9.0	6	8	CLAY; trace silt, medium grey, damp		57 ppm	
					9				
SS	4	1 2 1	10.0-11.0	6	10	CLAY; trace silt, dark grey, damp		0	
					11				
					12				
SS	5	6 9 46	12.5-14.0	6	13	SANDY SILT; dark grey, wet		0	
					14				
SS	6	6 4 7	15.0-16.5	6	15	SAND; dark grey, fine-medium sand, wet		0	
					16	End of boring at 16.5 feet below ground surface. Monitoring Well MW-3 installed.			
					17				
					18				
					19				
					20				
					21				
					22				
					23				

BOREHOLE WATER LEVEL DATA

Date	06/18/93		
Time	1:55 p.m.		
GWL	7.0 feet		
Casing Depth	15.0 feet		

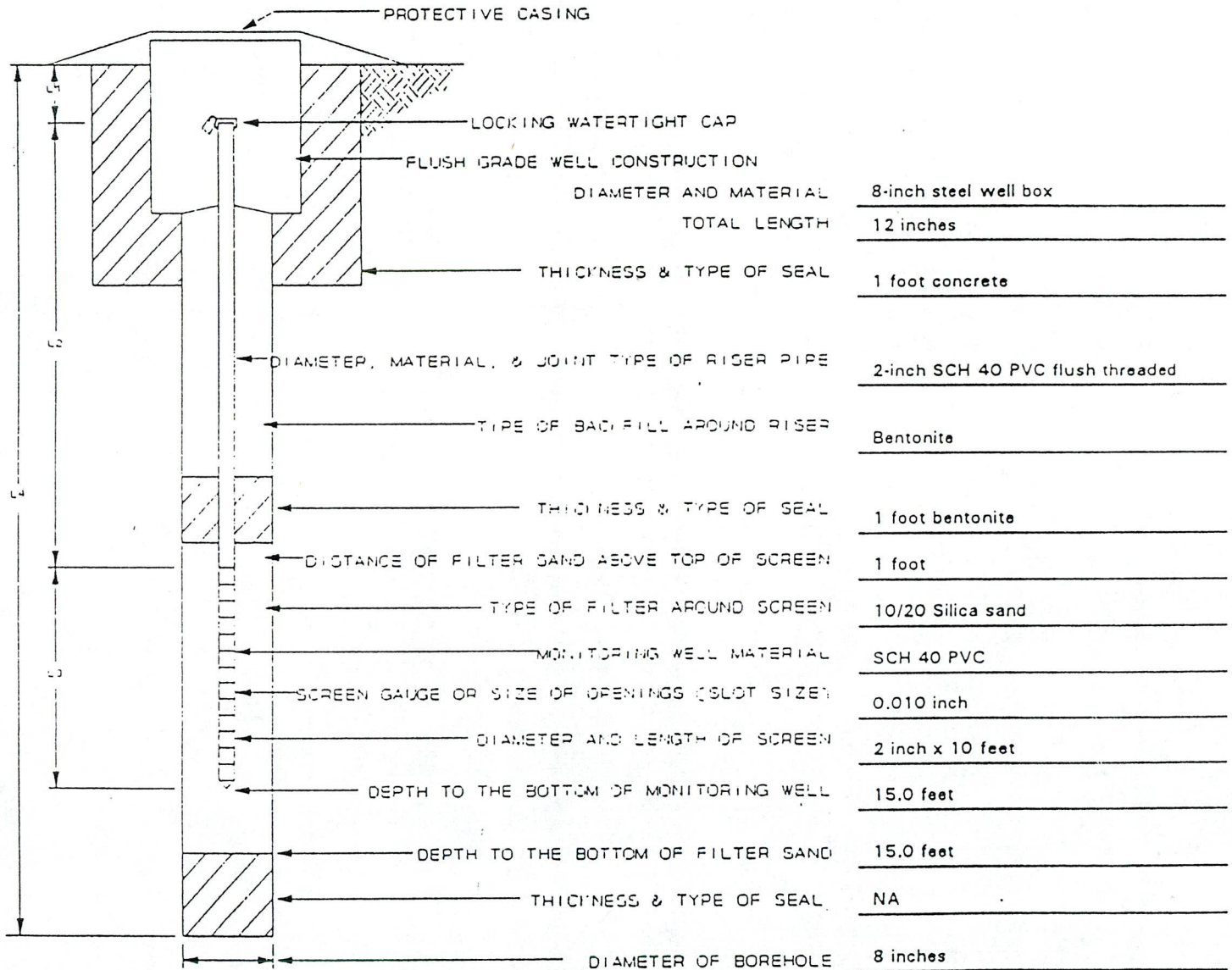


Delta
Environmental
Consultants, Inc.

INSTALLATION OF FLUSH GRADE MONITORING WELL

Project Jiffy Lube International
17869 S.E. McLoughlin Blvd.
Milwaukie, OR
Delta No. 43-92-011

Monitoring Well No. MW-3
Elevations:
Top of Riser: 98.57
Ground Level: ----



L1 = ---- FT
L2 = 4.5 FT
L3 = 10.0 FT
L4 = 16.5 FT

Installation Completed

Date: 06/18/93

Time: 1:55 p.m.



Monitoring Well Water Level Measurements		
Date	Time	Water Level*
06/21/93	5:13 p.m.	94.57 feet

* Measure Point Top of casing

PROJECT NAME/LOCATION:					Project Number	43-93-011	Boring Number	MW-4
Jiffy Lube Internation Store #1012 17869 S.E.McLoughlin Boulevard Milwaukie, OR					Con-tractor	Geotech Explorations	Drilling Method	6 1/4" Hollow Stem Auger
					Driller	Mike	Drilling Rig	B-61
					Start	2:45 p.m. 06/18/93	Completed	3:23 p.m. 06/18/93
Landowner: Flying J Corporation					Surface Elev.	-----	Logged By	Mark Underhill
Sample		Blow Count	Sample		Depth Scale 1" = 4'	Descriptions of Materials and Conditions	Observations	
Type	No.		Interval (ft)	Recovery (in.)			Instrument: Units:	bNu ppm
SS	1	6 5 3	2.5-4.0	6	0	Asphalt Concrete and Gravel Base		
					1			
					2			
SS	2	4 3 1	5.0-6.5	6	3	SILTY CLAY; dark grey, damp	33 ppm	
					4			
					5			
SS	3	2 4 5	7.5-9.0	6	7			
					8	CLAY; trace silt with organics, medium grey, moist	2.5 ppm	
					9			
SS	4	3 4 5	10.0-11.0	6	10	CLAY; trace silt, dark grey, moist	0	
					11			
					12			
SS	5	6 4 5	12.5-14.0	6	13	FINE-MEDIUM SAND; dark grey, wet	0	
					14			
					15			
SS	6	3 5 8	15.0-16.5	6	16	FINE-MEDIUM SAND; dark grey, wet	0	
					17	End of Soil Boring at 16.5 feet below ground surface. Monitoring Well MW-4 installed.		
					18			
					19			
					20			
					21			
					22			
					23			

BOREHOLE WATER LEVEL DATA

Date	06/18/93		
Time	3:35 p.m.		
GWL	7.0 feet		
Casing Depth	15.0 feet		



Delta
Environmental
Consultants, Inc.

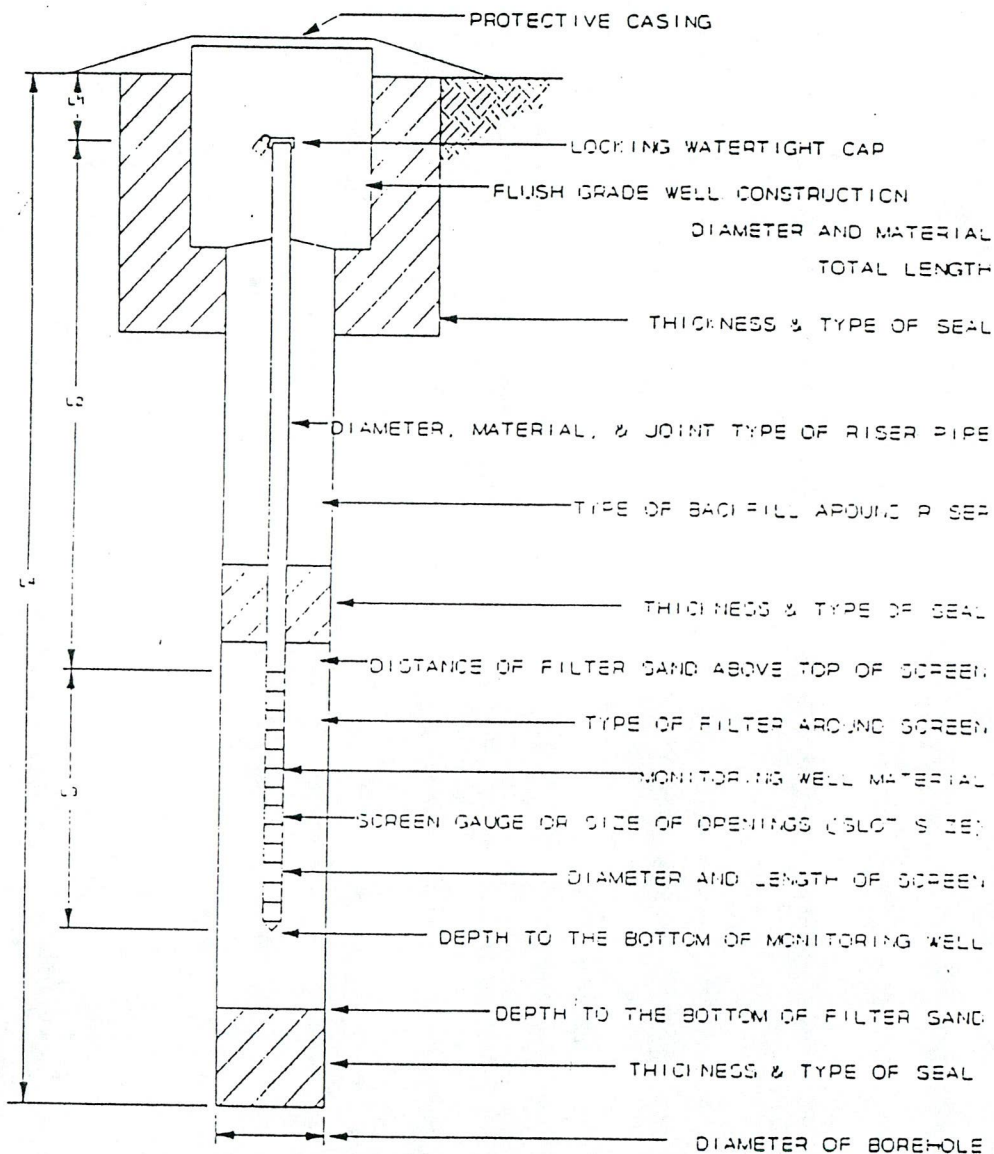
INSTALLATION OF FLUSH GRADE MONITORING WELL

Project Jiffy Lube International
17869 S.E. McLoughlin Blvd.
Milwaukie, OR

Delta No. 43-92-011

Monitoring Well No. MW-4

Elevations:
 Top of Riser: 99.30
 Ground Level: ----



8-inch steel well box
12 inches
1 foot concrete
2-inch SCH 40 PVC flush threaded
Bentonite
1 foot bentonite
1 foot
10/20 Silica sand
SCH 40 PVC
0.010 inch
2 inch x 10 feet
15.0 feet
15.0 feet
NA
8 inches

L1 = ---- FT
 L2 = 4.5 FT
 L3 = 10.0 FT
 L4 = 16.5 FT

Installation Completed

Date: 06/18/93

Time: 3:35 p.m.



Monitoring Well Water Level Measurements		
Date	Time	Water Level*
06/21/93	5:09 p.m.	94.54 feet

* Measure Point Top of casing

PROJECT NAME/LOCATION:	Project Number	43-93-011	Boring Number	MW-5
Jiffy Lube International Store #1012 17869 S.E. McLoughlin Boulevard Milwaukie, OR	Contractor	Geotech Exploration	Drilling Method	6 1/4" Hollow Stem Auger
	Driller	Mike Reneker	Drilling Rig	B-61
	Start	9:00 a.m. 06/19/93	Completed	9:37 a.m. 06/19/93
Landowner: Flying J Corporation	Surface Elev.	----	Logged By	Mark Underhill

Sample		Blow Count	Sample		Depth Scale 1" = 4'	Descriptions of Materials and Conditions	Observations	
Type	No.		Interval (ft)	Recovery (in.)			Instrument: Units:	Comments
					0	Asphalt Concrete and Gravel Base		
					1			
SS	1	5 9 5	2.5-4.0	6	2			
					3	SILT; trace clay, dark grey, damp	0	
					4			
SS	2	2 3 5	5.0-6.5	6	5	CLAYEY SILT; dark grey, damp	0	
					6			
SS	3	2 3 4	7.5-9.0	6	7	SILTY CLAY; medium grey, moist	0	
					8			
					9			
SS	4	5 5 5	10.0-11.0	6	10	CLAY; trace silt, dark grey, moist	0	
					11			
					12			
SS	5	2 5 10	12.5-14.0	6	13	FINE-MEDIUM SAND; trace organics, dark grey/brown, wet	0	
					14			
SS	6	5 7 4	15.0-16.5	6	15	FINE-MEDIUM SAND; dark grey, wet	0	
					16	End of boring at 16.5 feet below ground surface. Monitoring Well MW-5 installed.		
					17			
					18			
					19			
					20			
					21			
					22			
					23			

BOREHOLE WATER LEVEL DATA			
Date	06/19/93		
Time	9:45 a.m.		
GWL	7.0 feet		
Casing Depth	15.0 feet		



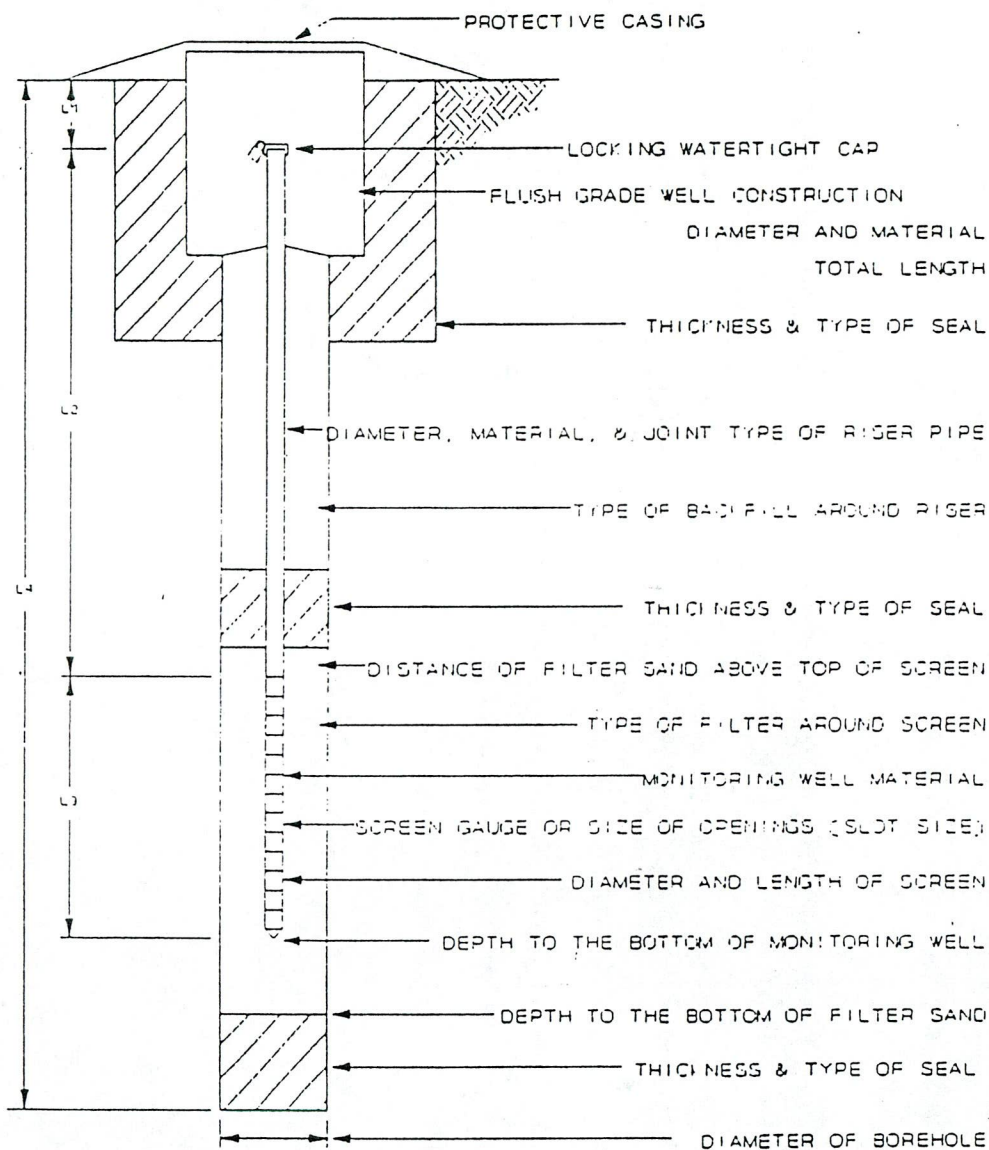
INSTALLATION OF FLUSH GRADE MONITORING WELL

Project Jiffy Lube International
17869 S.E. McLoughlin Blvd.
Milwaukie, OR

Delta No. 43-92-011

Monitoring Well No. MW-5

Elevations:
 Top of Riser: 100.66
 Ground Level: ----



8-inch steel well box
12 inches
1 foot concrete
2-inch SCH 40 PVC flush threaded
Bentonite
1 foot bentonite
1 foot
10/20 Silica sand
SCH 40 PVC
0.010 inch
2 inch x 10 feet
15.0 feet
15.0 feet
NA
8 inches

L1 = ---- FT
 L2 = 4.5 FT
 L3 = 10.0 FT
 L4 = 16.5 FT

Installation Completed

Date: 06/19/93

Time: 9:45 a.m.



Monitoring Well Water Level Measurements		
Date	Time	Water Level*
06/21/93	5:05 p.m.	94.52 feet

* Measure Point Top of casing

PROJECT NAME/LOCATION:	Project Number	43-93-011	Boring Number	MW-6
Jiffy Lube International Store #1012 17869 S.E. McLoughlin Boulevard Milwaukie, OR	Contractor	Geotech Exploration	Drilling Method	6 1/4" Hollow Stem Auger
	Driller	Mike Reneker	Drilling Rig	B-61
	Start	11:05 a.m. 06/19/93	Completed	11:56 a.m. 06/19/93
Landowner: Flying J Corporation	Surface Elev.	----	Logged By	Mark Underhill

Sample		Blow Count	Sample		Depth Scale 1" = 4'	Descriptions of Materials and Conditions	Observations	
Type	No.		Interval (ft)	Recovery (in.)			Instrument: hNu Units: ppm	Comments
SS	1	4 6 18	2.5-4.0	6	0	Asphalt Concrete and Gravel Base		
					1			
					2			
					3	SANDY SILT; dark grey, damp	0	
					4			
SS	2	3 5 6	7.5-9.0	6	5			
					6			
					7	SILT CLAY; trace organics, medium grey, damp	0	
SS	3	2 4 5	10.0-11.0	6	8			
					9			
					10	SILTY SAND; medium grey, moist	0	
SS	4	3 7 10	12.5-14.0	6	11			
					12			
					13	FINE-MEDIUM SAND; dark grey, wet	0	
SS	5	3 2 3	15.0-16.5	6	14			
					15	FINE-MEDIUM SAND; dark grey, wet	0	
					16	End of boring at 16.5 feet below ground surface. Monitoring Well MW-6 installed.		
					17			
					18			
					19			
					20			
					21			
					22			
					23			

BOREHOLE WATER LEVEL DATA			
Date	06/19/93		
Time	12:05 p.m.		
GWL	7.0 feet		
Casing Depth	14.5 feet		

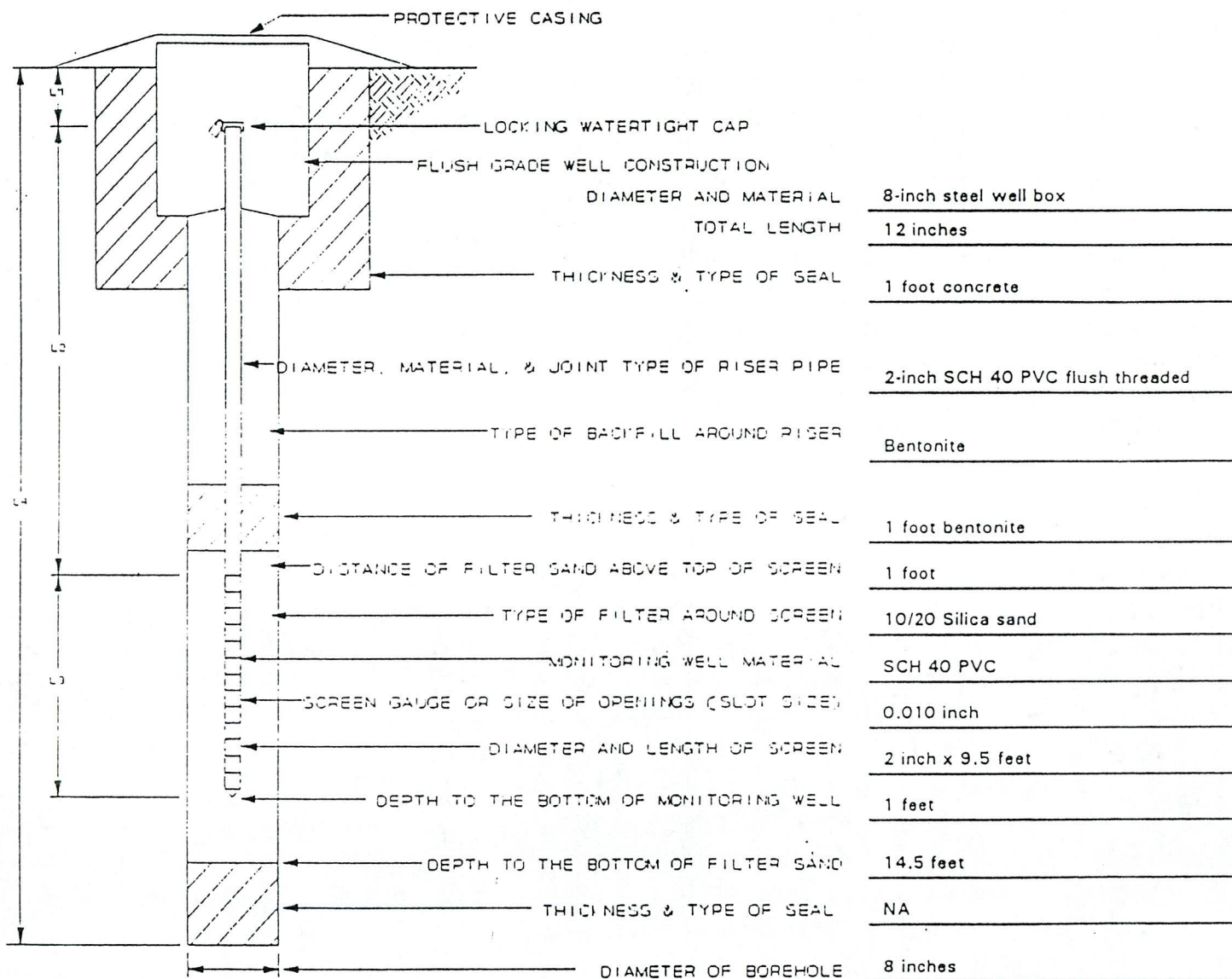


Delta
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Consultants, Inc.

INSTALLATION OF FLUSH GRADE MONITORING WELL

Project Jiffy Lube International
17869 S.E. McLoughlin Blvd.
Milwaukie, OR
 Delta No. 43-92-011

Monitoring Well No. MW-6
 Elevations:
 Top of Riser: 100.29
 Ground Level: ----



L1 = ---- FT
 L2 = 4.5 FT
 L3 = 10.0 FT
 L4 = 15.5 FT

Installation Completed

Date: 06/19/93

Time: 12:05 p.m.



Monitoring Well Water Level Measurements		
Date	Time	Water Level*
06/21/93	5:53 p.m.	94.58 feet

* Measure Point Top of casing

SOIL BORING LOG AND WELL CONSTRUCTION

DELCO Service Station
17873 S.E. McLoughlin
Milwaukie, Oregon

Boring Number

MW-7

Page Number

1 of 1

Drilling Contractor

Tank - Liners, Inc.

Drilling Method

Hollow-Stem-Auger

Start (Date - Time)

1/27/95 - 8:50

Finish (Date - Time)

1/27/95 - 9:30

Elevation (Surface / Top of Well Casing)

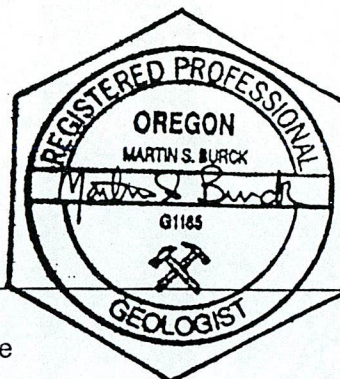
not available

Logged By

Martin S. Burck R.G.

Sample Number	Blow Count (per 6 inches)	Sample Recovery (inches)	Depth (feet) Sample Interval	Sample Description and Subsurface Conditions	Monitoring Well Construction Diagram
MW-7-5	2 for 24"	12	0	Asphalt and Gravel Base (Boulders)	
			5	Silty Sand, grey, very wet, medium grained, some clay and gravel, may be fill material or interbedded (?), (SW)	
				Clayey Silt, grey, wet-saturated, (ML)	
			10		
			15	Silty Sand, grey, saturated, (SM)	
				Based on Drilling Change	
			20		
			25		

Total Depth 19 feet



Auger Dimensions:

12" O.D., 6 5/8" I.D.

Casing:

4" I.D., Sched. 40 PVC

Comments: * Based on approximate msl elevation.
ND = Not Detected, NA = Not Available

SOIL BORING LOG AND WELL CONSTRUCTION

DELCO Service Station
17873 S.E. McLoughlin
Milwaulkie, Oregon

Boring Number

MW-8

Page Number

1 of 1

Drilling Contractor

Tank - Liners, Inc.

Drilling Method

Hollow-Stem-Auger

Start (Date - Time)

1/27/95 - 10:15

Finish (Date - Time)

1/27/95 - 11:30

Elevation (Surface / Top of Well Casing)

not available

Logged By

Martin S. Burck R.G.

Sample Number	Blow Count (per 6 inches)	Sample Recovery (inches)	Depth (feet) Sample Interval	Sample Description and Subsurface Conditions	Monitoring Well Construction Diagram
			0	Asphalt and Gravel Base	
MW-8-5	3 for 24"	12	5	Clayey Silt, grey, wet-saturated, (ML)	
MW-8-10	5 for 24"	12	10	Clayey Silt, grey, wet-saturated, (ML)	
			15	Based on Drilling Change	
			15	Silty Sand, grey, saturated, (SM)	
			20	Total Depth 20 feet	
			25		

Comments: * Based on approximate msl elevation.
ND = Not Detected, NA = Not Available

Auger Dimensions:
12" O.D., 6 5/8" I.D.

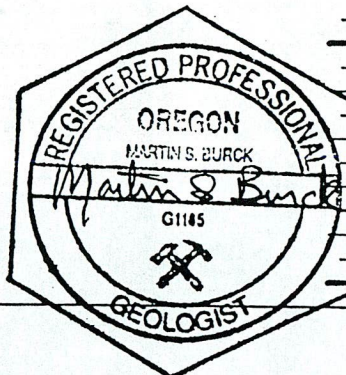
Casing:
4" I.D., Sched. 40 PVC

SOIL BORING LOG AND WELL CONSTRUCTION

DELCO Service Station
17873 S.E. McLoughlin
Milwaukie, Oregon

Boring Number	MW-9	Page Number	1 of 1
Drilling Contractor	Tank - Liners, Inc.	Drilling Method	Hollow-Stem-Auger
Start (Date - Time)	1/27/95 - 14:00	Finish (Date - Time)	1/27/95 - 14:53
Elevation (Surface / Top of Well Casing)	not available	Logged By	Martin S. Burck R.G.

Sample Number	Blow Count (per 6 inches)	Sample Recovery (inches)	Depth (feet) Sample Interval	Sample Description and Subsurface Conditions	Monitoring Well Construction Diagram
			0	Asphalt and Gravel Base	
			5	Silty Gravelly Sand, (Fill Material) dark brown, moist, pebbles, cobbles and boulders, (SW)	
MW-9-5	3 for 24"	18		Clayey Silt, dark brown, moist-wet, (ML)	
MW-9-10	7 for 24"	18	10	Clayey Silt, dark brown, saturated, (ML)	
MW-9-15	6 for 24"	24	15	Clayey Silt, grey/tan, saturated, (ML)	
				Total Depth 15 feet	
			20		
			25		



Auger Dimensions:
8" O.D., 4.25" I.D.
Casing:
2" I.D., Sched. 40 PVC

Comments: * Based on approximate msl elevation.
ND = Not Detected, NA = Not Available

Start Card # 90057

WELL NO. *M. 12*

(6) LOCATION OF WELL By legal description

Well Location: County Chickasaw
Township 2S (N or S) Range 2E (E or W) Section 18
1. SE 1/4 of SW 1/4 of above section.
2. Street address of well location 17223 SE McDouglin
millerville, OR 97267
3. Tax lot number of well location 1700
4. ATTACH MAP WITH LOCATION IDENTIFIED.

☒ New construction ☐ Repair ☐ Recondition
☐ Conversion ☐ Deepening ☐ Abandonment

☐ Rotary Air ☐ Rotary Mud ☐ Cable

☒ Hollow Stem Auger ☐ Other _____

7 ft. below land surface. Date 8/2/54
Artesian Pressure lb/sq. in. Date

(8) WATER BEARING ZONES:

Special Standards ☐ Yes ☒ No

Depth of completed well 15 ft. Depth at which water was first found _____

8 ft.
TO -
15 ft.

Land surface

- Water-tight cover
- Surface flush vault

-Locking cap

Casing
diameter 2" in.

Welded Threaded Glued

Liner
diameter _____ in.

Welded Threaded Glued

-Well seal:
Material Bent Lign

Amount 4 Bags

Borehole diameter: 10 in.

— — —
Bentonite plug at least 2 ft. thick

101-107-100-101-102-103-104-105-106-107-108-109-110-111-112-113-114-115-116-117-118-119-120-121-122-123-124-125-126-127-128-129-130-131-132-133-134-135-136-137-138-139-140-141-142-143-144-145-146-147-148-149-150-151-152-153-154-155-156-157-158-159-160-161-162-163-164-165-166-167-168-169-170-171-172-173-174-175-176-177-178-179-180-181-182-183-184-185-186-187-188-189-190-191-192-193-194-195-196-197-198-199-200-201-202-203-204-205-206-207-208-209-210-211-212-213-214-215-216-217-218-219-220-221-222-223-224-225-226-227-228-229-230-231-232-233-234-235-236-237-238-239-240-241-242-243-244-245-246-247-248-249-250-251-252-253-254-255-256-257-258-259-260-261-262-263-264-265-266-267-268-269-270-271-272-273-274-275-276-277-278-279-280-281-282-283-284-285-286-287-288-289-290-291-292-293-294-295-296-297-298-299-300-301-302-303-304-305-306-307-308-309-310-311-312-313-314-315-316-317-318-319-320-321-322-323-324-325-326-327-328-329-330-331-332-333-334-335-336-337-338-339-340-341-342-343-344-345-346-347-348-349-350-351-352-353-354-355-356-357-358-359-360-361-362-363-364-365-366-367-368-369-370-371-372-373-374-375-376-377-378-379-380-381-382-383-384-385-386-387-388-389-390-391-392-393-394-395-396-397-398-399-400-401-402-403-404-405-406-407-408-409-410-411-412-413-414-415-416-417-418-419-420-421-422-423-424-425-426-427-428-429-430-431-432-433-434-435-436-437-438-439-440-441-442-443-444-445-446-447-448-449-450-451-452-453-454-455-456-457-458-459-460-461-462-463-464-465-466-467-468-469-470-471-472-473-474-475-476-477-478-479-480-481-482-483-484-485-486-487-488-489-490-491-492-493-494-495-496-497-498-499-500-501-502-503-504-505-506-507-508-509-510-511-512-513-514-515-516-517-518-519-520-521-522-523-524-525-526-527-528-529-530-531-532-533-534-535-536-537-538-539-540-541-542-543-544-545-546-547-548-549-550-551-552-553-554-555-556-557-558-559-560-561-562-563-564-565-566-567-568-569-570-571-572-573-574-575-576-577-578-579-580-581-582-583-584-585-586-587-588-589-590-591-592-593-594-595-596-597-598-599-600-601-602-603-604-605-606-607-608-609-610-611-612-613-614-615-616-617-618-619-620-621-622-623-624-625-626-627-628-629-630-631-632-633-634-635-636-637-638-639-640-641-642-643-644-645-646-647-648-649-650-651-652-653-654-655-656-657-658-659-660-661-662-663-664-665-666-667-668-669-670-671-672-673-674-675-676-677-678-679-680-681-682-683-684-685-686-687-688-689-690-691-692-693-694-695-696-697-698-699-700-701-702-703-704-705-706-707-708-709-710-711-712-713-714-715-716-717-718-719-720-721-722-723-724-725-726-727-728-729-730-731-732-733-734-735-736-737-738-739-740-741-742-743-744-745-746-747-748-749-750-751-752-753-754-755-756-757-758-759-760-761-762-763-764-765-766-767-768-769-770-771-772-773-774-775-776-777-778-779-780-781-782-783-784-785-786-787-788-789-790-791-792-793-794-795-796-797-798-799-800-801-802-803-804-805-806-807-808-809-810-811-812-813-814-815-816-817-818-819-820-821-822-823-824-825-826-827-828-829-830-831-832-833-834-835-836-837-838-839-840-841-842-843-844-845-846-847-848-849-850-851-852-853-854-855-856-857-858-859-860-861-862-863-864-865-866-867-868-869-870-871-872-873-874-875-876-877-878-879-880-881-882-883-884-885-886-887-888-889-890-891-892-893-894-895-896-897-898-899-900-901-902-903-904-905-906-907-908-909-910-911-912-913-914-915-916-917-918-919-920-921-922-923-924-925-926-927-928-929-930-931-932-933-934-935-936-937-938-939-940-941-942-943-944-945-946-947-948-949-950-951-952-953-954-955-956-957-958-959-960-961-962-963-964-965-966-967-968-969-970-971-972-973-974-975-976-977-978-979-980-981-982-983-984-985-986-987-988-989-990-991-992-993-994-995-996-997-998-999-1000-1001-1002-1003-1004-1005-1006-1007-1008-1009-1010-1011-1012-1013-1014-1015-1016-1017-1018-1019-1020-1021-1022-1023-1024-1025-1026-1027-1028-1029-1030-1031-1032-1033-1034-1035-1036-1037-1038-1039-1040-1041-1042-1043-1044-1045-1046-1047-1048-1049-1050-1051-1052-1053-1054-1055-1056-1057-1058-1059-1060-1061-1062-1063-1064-1065-1066-1067-1068-1069-1070-1071-1072-1073-1074-1075-1076-1077-1078-1079-1080-1081-1082-1083-1084-1085-1086-1087-1088-1089-1090-1091-1092-1093-1094-1095-1096-1

Screen material *PVC*

interval(s): 10125
From 121 To 151

From 10 To 15
Slot size 210

Filter pack:

Material SILICA SAND
Size _____ in.

☐ Pump ☐ Bailer ☐ Air compressor ☐ Flowing Artesian

Permcability_____Yield_____GPM_____

Conductivity _____ PH _____

Temperature of water _____ °F/C Depth artesian flow found _____ ft.

Was water analysis done? ☐ Yes ☐ No

By whom?

Depth of strata to be analyzed. From _____ ft. to _____ ft.

Remarks:

Name of supervising Geologist/Engineer Robert J. H. H. H.

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.

Signed Pick D. McCall MWC Number 10326
Date 8-18-96

(bonded) Monitor Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

Signed [Signature] MWC Number 10084
Date 8-19-96

Date started 8-12-96 Completed 8-12-96

Start Card # 90058

(1) OWNER/PROJECT:

WELL NO. *M. 12 13*

Name Quendler Whitten Address 14 Long Leaf Dr
City Hamlet Ga State GA Zip 38690

(2) TYPE OF WORK:

☒ New construction ☐ Repair ☐ Recondition
☐ Conversion ☐ Deepening ☐ Abandonment

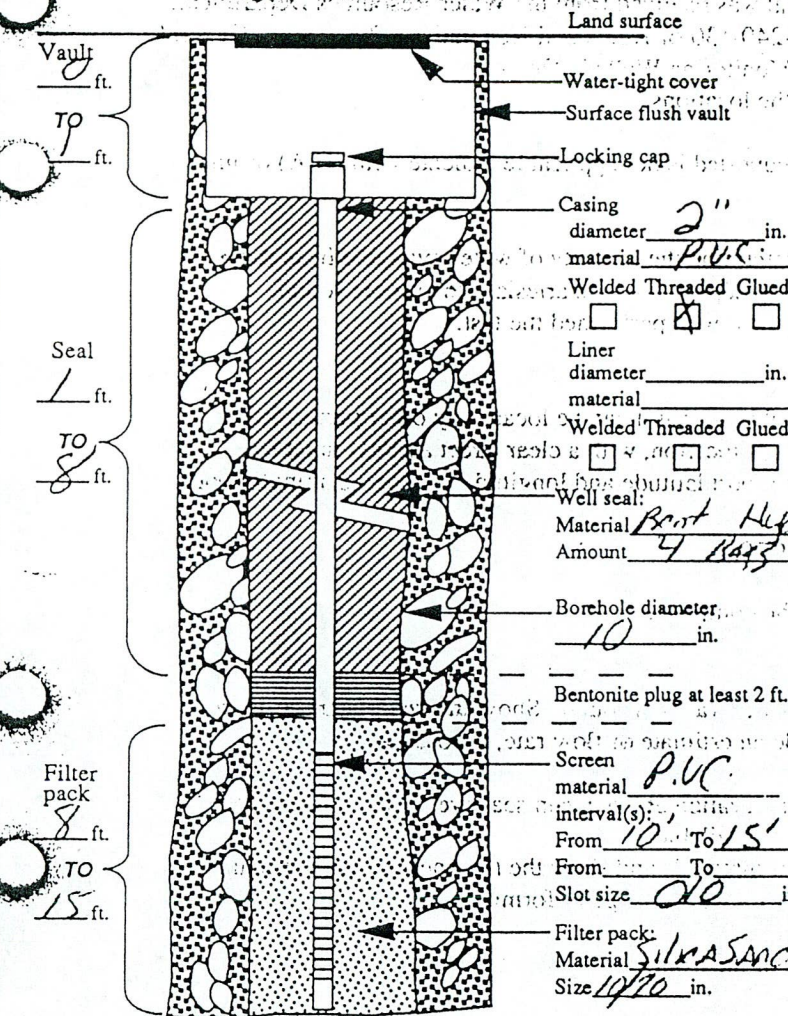
(3) DRILLING METHOD

☐ Rotary Air ☐ Rotary Mud ☐ Cable

☒ Hollow Stem Auger ☐ Other _____

(4) BORE HOLE CONSTRUCTION

Special Standards ☐ Yes ☒ No Depth of completed well 15 ft.



(5) WELL TEST:

☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Permeability _____ Yield _____ GPM

Conductivity _____ PH _____

Temperature of water _____ °F/C Depth artesian flow found _____ ft.

Was water analysis done? ☐ Yes ☐ No

By whom? _____

Depth of strata to be analyzed. From _____ ft. to _____ ft.

Remarks: _____

Name of supervising Geologist/Engineer Robert M. Anderson

(6) LOCATION OF WELL By legal description

Well Location: County Clackamas
Township 25 (N or S) Range 2E (E or W) Section 18
1. SE 1/4 of SW 1/4 of above section.
2. Street address of well location 17873 SE McClellan
Milwaukie OR 97127
3. Tax lot number of well location 1700
4. ATTACH MAP WITH LOCATION IDENTIFIED.

(7) STATIC WATER LEVEL:

9 Ft. below land surface. Date 8/2/48
Artesian Pressure lb/sq. in. Date

(8) WATER BEARING ZONES:

Depth at which water was first found more than 5 ft (b)

From	To	Est. Flow Rate	SWL
8'5"	9'	2000	9'
9'	10'	2000	
10'	11'	2000	
11'	12'	2000	
12'	13'	2000	
13'	14'	2000	
14'	15'	2000	
15'	16'	2000	
16'	17'	2000	
17'	18'	2000	
18'	19'	2000	
19'	20'	2000	
20'	21'	2000	
21'	22'	2000	
22'	23'	2000	
23'	24'	2000	
24'	25'	2000	
25'	26'	2000	
26'	27'	2000	
27'	28'	2000	
28'	29'	2000	
29'	30'	2000	
30'	31'	2000	
31'	32'	2000	
32'	33'	2000	
33'	34'	2000	
34'	35'	2000	
35'	36'	2000	
36'	37'	2000	
37'	38'	2000	
38'	39'	2000	
39'	40'	2000	
40'	41'	2000	
41'	42'	2000	
42'	43'	2000	
43'	44'	2000	
44'	45'	2000	
45'	46'	2000	
46'	47'	2000	
47'	48'	2000	
48'	49'	2000	
49'	50'	2000	
50'	51'	2000	
51'	52'	2000	
52'	53'	2000	
53'	54'	2000	
54'	55'	2000	
55'	56'	2000	
56'	57'	2000	
57'	58'	2000	
58'	59'	2000	
59'	60'	2000	
60'	61'	2000	
61'	62'	2000	
62'	63'	2000	
63'	64'	2000	
64'	65'	2000	
65'	66'	2000	
66'	67'	2000	
67'	68'	2000	
68'	69'	2000	
69'	70'	2000	
70'	71'	2000	
71'	72'	2000	
72'	73'	2000	
73'	74'	2000	
74'	75'	2000	
75'	76'	2000	
76'	77'	2000	
77'	78'	2000	
78'	79'	2000	
79'	80'	2000	
80'	81'	2000	
81'	82'	2000	
82'	83'	2000	
83'	84'	2000	
84'	85'	2000	
85'	86'	2000	
86'	87'	2000	
87'	88'	2000	
88'	89'	2000	
89'	90'	2000	
90'	91'	2000	
91'	92'	2000	
92'	93'	2000	
93'	94'	2000	
94'	95'	2000	
95'	96'	2000	
96'	97'	2000	
97'	98'	2000	
98'	99'	2000	
99'	100'	2000	

(9) WELL LOG:

Ground elevation 4250 ft

[illegible]

Date started 8-12-96 Completed 8-12-96

(unbonded) Monitor Well Constructor Certification: I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.

Signed Rick D. Mohr MWC Number 10576
Date 8-18-96

(bonded) Monitor Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

Signed _____ MWC Number _____
Date _____

APPENDIX D

DEQ NOTICE OF CIVIL PENALTY (JUNE 7, 1999)

CERTIFIED MAIL Z 440 760 423

June 7, 1999

Devinder Dhillon
Delco Petroleum Co., LLC
14 Long Leaf Drive
Hamilton, NJ 08690

Re: Notice of Assessment of
Civil Penalty
No. WMC/T-NWR-99-064
Clackamas County

Dear Mr. Dhillon:

In March of 1995 you registered as the permittee of underground storage tanks (USTs) located at 17873 S.E. McLaughlin Boulevard in Milwaukie, Oregon, although you had been associated with the site through Delco Petroleum for the preceding year. At that time, the tanks were known to have released gasoline, contaminating groundwater at the site. Oregon law requires quarterly groundwater sampling, analysis, and reporting at sites with known groundwater contamination. In June 1994, your contractor Northwest Envirocon installed groundwater monitoring wells at the site and began sampling the wells. The first three sampling events took place on schedule. However, no sampling was done in April 1995, or July 1996. Between October 1996 and April 1999 each of the wells should have been sampled eleven times. Only three out of the eleven required sampling events were actually performed.

As the permittee of the tanks you are legally responsible, along with Delco Petroleum as owner and operator, for investigating groundwater contamination from your tanks. Quarterly sampling is required to protect human health and the environment by assessing the nature and extent of contamination and monitoring the movement of contaminated groundwater.

You are liable for a civil penalty assessment because you violated Oregon environmental law. In the enclosed Notice, I have assessed a civil penalty of \$32,087 against you and Delco, together. In determining the amount of the penalty, I used the procedures set forth in Oregon Administrative Rule (OAR) 340-12-045. The Department's findings and civil penalty determination are attached to the Notice as Exhibit 1. The majority of the penalty is the economic benefit you gained by not paying for the required monitoring.



811 SW Sixth Avenue
Portland, OR 97204-1390
(503) 229-5696
TDD (503) 229-6993
DEQ-1

In addition to the civil penalty, the enclosed Order requires you to do the following:

- Resume quarterly groundwater sampling and reporting
- Submit a Corrective Action Plan for the site
- If you plan to upgrade the site, submit a work plan for the upgrade.

Appeal procedures are outlined in Section VI of the Notice. If you fail to either pay or appeal the penalty within twenty (20) days, a Default Order will be entered against you and the Order will become final and enforceable.

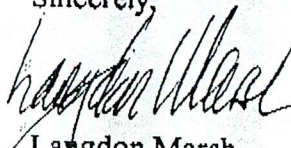
If you wish to discuss this matter, or if you believe there are mitigating factors which the Department might not have considered in assessing the civil penalty, you may request an informal discussion by attaching your request to your appeal. Your request to discuss this matter with the Department will not waive your right to a contested case hearing.

I look forward to your cooperation in complying with Oregon environmental law in the future. However, if any additional violations occur, you may be assessed additional civil penalties.

Copies of referenced rules are enclosed. Also enclosed is a copy of the Department's internal management directive regarding civil penalty mitigation for Supplemental Environmental Projects (SEPs). If you are interested in having a portion of the civil penalty fund an SEP, you should review the enclosed SEP directive. Exceptional pollution prevention could result in partial penalty mitigation.

If you have any questions about this action, please contact Roger Dilts with the Department's Enforcement Section in Portland at 229-5692 or toll-free at 1-800-452-4011, enforcement extension 5692.

Sincerely,


Langdon Marsh
Director

e:\winword\delco\dhillon\cvr\trdhillon
Enclosures

cc: Robert Williams, Northwest Region, DEQ
Waste Management and Cleanup Division, DEQ
Oregon Department of Justice
U.S. Environmental Protection Agency
Environmental Quality Commission
Clackamas County District Attorney

1 BEFORE THE ENVIRONMENTAL QUALITY COMMISSION
2 OF THE STATE OF OREGON

3 IN THE MATTER OF:
4 DEVINDER DHILLON
5 and DELCO PETROLEUM CO., LLC,
6 Respondents.

) NOTICE OF VIOLATION,
) DEPARTMENT ORDER, AND
) ASSESSMENT OF CIVIL
) PENALTY
) No. WMC/T-NWR-99-064
) CLACKAMAS COUNTY

7 I. AUTHORITY

8 This Notice of Violation, Department Order, and Assessment of Civil Penalty (Notice and
9 Order) is issued by the Department of Environmental Quality (Department or DEQ) pursuant to
10 Oregon Revised Statutes (ORS) 466.810, ORS Chapter 183, and Oregon Administrative Rules
11 (OAR) Chapter 340, Divisions 11 and 12.

12 II. FINDINGS

13 1. Respondent Devinder Dhillon (Dhillon) was the permittee of underground storage
14 tank systems (USTs) storing petroleum, a regulated substance, located at 17873 S.E. McLoughlin
15 Boulevard, Milwaukie, Oregon, (the site), between March 30, 1995, and December 23, 1998, and
16 has been the permittee of such USTs since January 20, 1999.

17 2. Respondent Delco Petroleum Co., LLC, (Delco) is and at all relevant times was,
18 an Oregon limited liability company.

19 3. During or about May 1994 Respondent Delco became the owner of the site and
20 owned the site at all relevant times.

21 4. During or about May 1994 Respondent Delco began operating a retail service
22 station at the site, under the name "Milwaukie Fuel Stop," and operated the station at all relevant
23 times.

24 5. In January 1993 the previous owners discovered gasoline contamination of the
25 subsurface at the site. During site assessment in July 1993, gasoline contamination of
26 groundwater at the site was discovered.

27 ///

6. Monitoring wells showed that groundwater was contaminated by gasoline beyond the confines of the tank excavation.

7. The site is a "facility" as defined at ORS 465.200(12).

8. Pursuant to OAR 340-122-0240, Respondent Dhillon, as the permittee, had and continues to have, the responsibility for conducting an investigation of the nature, magnitude, and extent of groundwater contamination at the site. OAR 340-122-0240(2)(c)(A) requires quarterly groundwater monitoring for such investigations.

9. Pursuant to OAR 340-122-0240, Respondent Delco, as the owner and operator of the site, had and continues to have, the responsibility for conducting an investigation of the nature, magnitude, and extent of groundwater contamination at the site. OAR 340-122-0240(2)(c)(A) requires quarterly groundwater monitoring for such investigations.

10. Respondent Dhillon failed to sample, analyze, and report results for required quarterly groundwater monitoring events for April 1995, July 1996, April 1997, July 1997, October 1997, April 1998, July 1998, October 1998, January 1999, and April 1999.

11. Respondent Delco failed to sample, analyze, and report results for required quarterly groundwater monitoring events for April 1995, July 1996, April 1997, July 1997, October 1997, April 1998, July 1998, October 1998, January 1999, and April 1999.

III. VIOLATION

Based upon the Findings above, Respondents each violated Oregon's laws and rules as follows:

Respondents violated OAR 340-122-0240 by failing to investigate the nature, magnitude, and extent of groundwater contamination according to OAR 340-122-0242, *now at* OAR 340-122-0240(2)(c)(A). Specifically, Respondents failed to monitor groundwater contamination on a quarterly basis and submit the results to the Department. This is a Class I violation pursuant to OAR 340-012-0067(1)(e).

///

///

IV. DEPARTMENT ORDER

Based upon the foregoing FINDINGS AND VIOLATIONS, Respondents are hereby ORDERED TO:

1. Immediately initiate actions necessary to correct all of the above cited violations and come into full compliance with Oregon's laws and rules.
2. Within thirty days of receipt of this Order, resume collection, analysis, and reporting of groundwater monitoring samples from all groundwater monitoring wells at the site (including any off-site wells installed for the purpose of investigating the site) and continue such monitoring on a quarterly basis until informed in writing by the Department that the schedule may be modified. The wells must be sampled for benzene, toluene, ethylbenzene, and xylene, and analyzed by approved methods. Each quarterly report must include a determination of the groundwater flow direction, and data used in making such determination.
3. Within sixty days of receipt of this Order, submit a written Corrective Action Plan (CAP) that meets the requirements of OAR 340-122-0250.
4. If Respondents plan to upgrade the site, Respondents must submit a written work plan for excavation, upgrade, and contaminated soil removal at least thirty days before work begins. The work plan must include a discussion of how groundwater remediation will proceed following over-excavation of the tank cavity, as well as a map of proper scale showing the proposed excavation area and the groundwater contamination area.

V. ASSESSMENT OF CIVIL PENALTIES

The Department imposes a penalty of \$32,087 upon Respondents Devinder Dhillon and Delco Petroleum Co., LLC, for the violation in Section III, above.

The findings and determination of Respondents' civil penalty pursuant to OAR 340-012-045 are attached and incorporated as Exhibit No. 1.

VI. OPPORTUNITY FOR CONTESTED CASE HEARING

This Notice and Order shall become final unless Respondents request, in writing, a hearing before the Environmental Quality Commission. **The request must be received by the**

1 Department's Rules Coordinator within 20 days from the date Respondents receive this
2 Notice and Order, and must be accompanied by a written "Answer" to the allegations
3 contained in this Notice and Order.

4 In the written Answer, Respondents shall admit or deny each allegation of fact contained
5 in this notice, and shall affirmatively allege any and all affirmative claims or defenses to violations
6 and assessment of any civil penalty that Respondents may have and the reasoning in support
7 thereof. Except for good cause shown:

- 8 1. Factual matters not controverted shall be presumed admitted;
- 9 2. Failure to raise a claim or defense shall be presumed to be a waiver of such claim
10 or defense;
- 11 3. New matters alleged in the Answer shall be presumed to be denied unless admitted
12 in subsequent pleading or stipulation by the Department or Commission.

13 Send the request for hearing and Answer to: **DEQ Rules Coordinator, Office of the**
14 **Director, 811 S.W. Sixth Avenue, Portland, Oregon 97204.** Following receipt of a request for
15 hearing and an Answer, Respondents will be notified of the date, time and place of the hearing.

16 If Respondents fail to file a timely request for hearing and Answer, the Notice and Order
17 shall become a final and enforceable Order of the Environmental Quality Commission by
18 operation of law without any further action or proceeding. If the Order becomes final by
19 operation of law, the right to judicial review, if any, is outlined within ORS 183.480.

20 Failure to appear at a scheduled hearing or meet a required deadline may result in a
21 dismissal of the request for hearing and also an entry of a Default Order.

22 The Department's case file at the time the Notice and Order was issued may serve as the
23 record for purposes of entering the Default Order.

24 VII. OPPORTUNITY FOR INFORMAL DISCUSSION

25 In addition to filing a request for a contested case hearing, Respondents may also request
26 an informal discussion with the Department by attaching a written request to the hearing request
27 and Answer.

VIII. PAYMENT OF CIVIL PENALTY

The civil penalty is due and payable ten (10) days after the Order imposing the civil penalty becomes final by operation of law or on appeal. Respondents may pay the penalty before that time. Respondents' check or money order in the amount of \$32,087 should be made payable to "State Treasurer, State of Oregon" and sent to the **Business Office, Department of Environmental Quality, 811 S.W. Sixth Avenue, Portland, Oregon 97204.**

Date

6-7-99

Langdon Marsh, Director

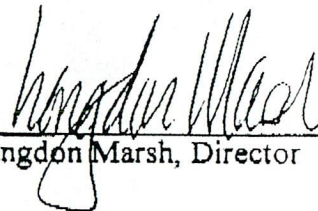


EXHIBIT 1
WMC/T-NWR-99-064

**FINDINGS AND DETERMINATION OF RESPONDENT'S CIVIL PENALTY
PURSUANT TO OREGON ADMINISTRATIVE RULE (OAR) 340-12-045**

VIOLATION: Failure to conduct and submit reports of quarterly groundwater monitoring.

CLASSIFICATION: This is a Class I violation pursuant to OAR 340-012-0067(1)(e).

MAGNITUDE: The magnitude of the violation is moderate, pursuant to OAR 340-012-0045(1)(a)(B), because there is no selected magnitude for this violation.

CIVIL PENALTY FORMULA: The formula for determining the amount of penalty of each violation is:
$$BP + [(0.1 \times BP) \times (P + H + O + R + C)] + EB$$

"BP" is the base penalty which is \$3,000 for a Class I, moderate magnitude violation in the matrix listed in OAR 340-12-042(1).

"P" is Respondent's prior significant action(s) and receives a value of 0, because Respondent has no prior significant actions.

"H" is the past history of Respondent in taking all feasible steps or procedures necessary to correct any prior significant action(s) and receives a value of 0, because Respondent has no prior significant actions.

"O" is whether or not the violation was a single occurrence or was repeated or continuous during the period of the violation and receives a value of 2, because the violation was repeated.

"R" is the cause of the violation and receives a value of 2, because Respondents' failure to conduct groundwater monitoring was negligent. The Department issued a Notice of Noncompliance to Respondents on October 15, 1997, for failing to submit quarterly groundwater monitoring reports and requesting that quarterly monitoring resume. Respondents conducted a sampling on January 27, 1998, then failed to conduct further sampling. Respondents failed to take reasonable action to ensure that quarterly groundwater monitoring was done.

"C" is Respondent's cooperativeness in correcting the violation and receives a value of 2, because Respondents did not take reasonable efforts to correct the violation.

"EB" is the approximate dollar sum of the economic benefit that the Respondents gained through noncompliance, and receives a value of \$27,287. Respondents avoided the costs of sampling, analyzing, and reporting the results of ten quarterly groundwater monitoring events. The total cost avoided is estimated to be \$38,880. The economic benefit realized by Respondents, as calculated by the EPA BEN computer model pursuant to OAR 340-012-0045(1)(c)(F)(iii), is \$27,287.

PENALTY CALCULATION:

$$\begin{aligned}\text{Penalty} &= \text{BP} + [(0.1 \times \text{BP}) \times (\text{P} + \text{H} + \text{O} + \text{R} + \text{C})] + \text{EB} \\ &= \$3,000 + [(0.1 \times \$3,000) \times (0 + 0 + 2 + 2 + 2)] + \$27,287 \\ &= \$3,000 + [\$300 \times 6] + \$27,287 \\ &= \$3,000 + \$1,800 + \$27,287 \\ &= \$32,087\end{aligned}$$

Pursuant to OAR 340-012-0045(1)(c)(F)(iv), for purposes of determining the maximum penalty allowed, where a violation has extended over more than one day, the Department may treat the violation as extending over as many days as necessary to recover the economic benefit of noncompliance. In this case, the Department treats the violation as extending over the quarterly sampling events that were due in April, July, and October 1998, and January 1999.

APPENDIX E

WELL SURVEY SUMMARY BY BARBIERI & ASSOCIATES

BARBIERI & ASSOCIATES, INC.
7017 NE HWY 99 SUITE 204
VANCOUVER, WA. 98665
360-695-1001
Fri Jul 30 14:17:25 1999

PROJECT: C:\PROJIFF.pro

Point Coordinates Listing

Point	North	East	Elev	Name
1	5000.0000	5000.0000	100.00	MAG WEST
2	5000.0000	5155.5700	99.09	MAG EAST
3	5011.4592	4928.3490	*	
100	5000.0000	5155.5740	99.08	CKBS
101	4985.9317	4957.8054	100.51	MW12 RIM
102	4985.9264	4957.7929	100.26	MW12 PVC
103	5034.9547	4984.7244	99.80	MW11 RIM
104	5035.1486	4984.8006	99.64	MW11 PVC
105	4961.6531	5023.3084	100.75	MW5 RIM
106	4961.3219	5023.3794	100.41	MW5 PVC
107	4996.5026	5029.1640	99.65	MW8 S. RIM
108	4990.0388	5034.2069	99.50	MW4 RIM
109	4990.2710	5034.4790	99.00	MW4 PVC
110	4884.2271	5014.6438	100.28	MW6 RIM
111	4884.6778	5014.8186	100.01	MW6 PVC
112	4882.4065	5155.4990	99.90	MW9 RIM
113	4882.8403	5155.4432	99.42	MW9 PVC
114	4951.5571	5142.8629	99.15	MW10 RIM
115	4951.8577	5142.9787	98.50	MW10 PVC
116	4991.8741	5117.7147	98.81	MW2 RIM
117	4992.2711	5117.6229	98.51	MW2 PVC
118	5000.7117	5081.4178	99.10	MW7 S. RIM
119	4947.5015	4979.3594	101.16	BLD
120	4950.1359	5047.6845	101.20	BLD
121	5000.0000	4999.9960	100.00	CKBS
122	4884.4892	5056.1585	99.99	MW13 RIM
123	4884.8889	5056.2117	99.85	MW13 PVC
124	4903.3638	5078.9954	99.99	MW1 RIM
125	4903.1689	5079.4649	99.37	MW1 PVC
126	5000.0000	4999.9879	98.48	CKBS
127	4993.5840	5143.8186	98.05	CB
128	4885.6397	5139.2591	98.97	CB
129	4920.3333	5122.9234	99.68	PUMP ILNS
130	4919.9110	5111.6408	99.79	PUMP ILNS
131	4919.5452	5103.9790	99.85	PUMP ILNS
132	4919.0961	5090.5965	99.99	PUMP ILNS
133	4945.0011	5089.5648	99.72	PUMP ILNS
134	4945.4819	5102.8827	99.62	PUMP ILNS
135	4945.7730	5110.5543	99.59	PUMP ILNS
136	4946.2725	5121.8965	99.44	PUMP ILNS
137	4972.1976	5120.8638	99.20	PUMP ILNS
138	4971.7217	5109.5914	99.27	PUMP ILNS
139	4971.4617	5101.7954	99.38	PUMP ILNS
141	5009.2147	5043.9798	100.41	VENT TUBS
142	5011.8025	5043.1874	100.37	ED MUFF.WALL
143	5009.9629	5124.5200	99.18	ED MUFF BLD COR
144	5007.4654	5152.6002	98.60	5/8"IR
145	4912.9467	5054.1351	100.62	PK
146	5000.0000	5155.5700	99.11	CKBS
147	4917.7346	5048.9604	101.38	BLD
148	4915.0700	4980.6164	100.99	BLD
149	4870.9168	4968.5950	98.70	5/8" IR
150	4867.5422	5158.0749	97.69	5/8" IR