



July 20, 2011  
Project 101.00173.00010

Mr. Tom Middleton  
Washington Department of Ecology  
P.O. Box 47775  
Olympia, Washington 98504-7775

**Re: Quarterly Groundwater Sampling Report – June 2011 Event  
Former Arco Service Station #0855, Longview, Washington**

Dear Mr. Middleton:

On behalf of Wakefield Family LLC (property owner), SLR International Corp (SLR) has prepared this report to present the results of the quarterly groundwater sampling activities conducted in June 2011 at the above-referenced site. The former Arco Service Station #0855 property (the property) is located at 4603 Ocean Beach Highway, near the western end of Longview, Washington (see Figure 1). The purposes of the groundwater sampling program are to assess the effectiveness of the current deep groundwater recovery operations and the 2007 site remedial action (soil excavation and shallow groundwater extraction), and to monitor the migration and attenuation of the petroleum hydrocarbon concentrations in the shallow groundwater-bearing unit and the deep aquifer over time.

## **BACKGROUND**

After completing the 2007 remedial action at the property, quarterly groundwater sampling results in 2007 and 2008 showed that the samples from all of the shallow groundwater monitoring wells, except MW-10, and from all of the deep groundwater monitoring wells, except DMW-4, DMW-5, DMW-9, and DMW-10, contained petroleum hydrocarbon concentrations below the Model Toxics Control Act (MTCA) Method A groundwater cleanup levels for four consecutive quarters (SLR, 2008a; SLR, 2008b; and SLR, 2008c). To remediate the remaining impacted groundwater in the deep aquifer, a deep groundwater recovery well (RW-1) was installed and a recovery/treatment system has been operating since June 2009 (SLR, 2009). After activating the system, the current groundwater sampling program has consisted of conducting annual sampling events (collect samples from all of the shallow and deep monitoring wells) in September, and conducting quarterly sampling events (collect samples from shallow well MW-10 and from deep wells DMW-5, DMW-9, and DMW-10) in December, March, and June. Based on the groundwater sampling results in September and December 2009 and March and June 2010, the samples from shallow monitoring well MW-10 contained petroleum hydrocarbon concentrations below the Method A cleanup levels for four consecutive quarters (SLR, 2009; SLR, 2010a; SLR, 2010b; and SLR, 2010c). Therefore, MW-10 was eliminated from the future quarterly groundwater sampling events.



## JUNE 2011 SAMPLING EVENT

SLR personnel conducted the groundwater sampling activities on June 16, 2011. On June 15<sup>th</sup>, SLR deactivated the deep groundwater recovery/treatment system so that the deep aquifer would be under non-pumping static conditions at the time of sampling.

Immediately prior to sampling, SLR measured the depths to groundwater in all of the shallow groundwater monitoring wells (MW-5, MW-8, MW-9, MW-10, MW-11, MW-12, MW-13, and MW-14), all of the deep groundwater monitoring wells (DMW-3, DMW-4, DMW-5, DMW-6, DMW-7, DMW-8, DMW-9, and DMW-10), and the deep groundwater recovery well (RW-1) by using an electronic water level probe. The depth to groundwater measurements were converted to groundwater elevations by using the results of previous well elevation surveys conducted by Gibbs and Olson, Inc., of Longview, Washington. The depths to groundwater in the shallow wells ranged from 2.37 to 6.40 feet below the tops of the well casings. The groundwater elevations in the shallow wells ranged from 2.73 to 5.91 feet above the NAVD 88 datum. The depths to groundwater in the deep wells ranged from 4.10 to 6.75 feet below the tops of the well casings. The groundwater elevations in the deep wells ranged from 2.40 to 2.56 feet above the NAVD 88 datum. The groundwater elevations in the shallow and deep wells were inconsistent and could not be used to determine general shallow or deep groundwater flow directions beneath the site area. The groundwater monitoring data from the June 2011 sampling event, as well as from the previous groundwater sampling events, are presented in Table 1. The groundwater elevations in the shallow and deep wells on June 16, 2011, are shown on Figures 2 and 3, respectively.

SLR personnel collected groundwater samples from deep wells DMW-5, DMW-9, and DMW-10 for laboratory analysis. SLR purged the wells by using a peristaltic pump with dedicated tubing at a flow rate of approximately 0.33 liters per minute. During purging, field parameters of temperature, conductivity, dissolved oxygen (DO), pH, and oxidation-reduction potential were measured every three to five minutes. Each groundwater sample was collected following the stabilization of the field parameter measurements. The purge water was pumped through the groundwater treatment system at the site.

The groundwater samples were submitted to Friedman & Bruya, Inc. (F&B) in Seattle, Washington, for analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX) by EPA Method 8021B, and gasoline-range organics (GRO) by Ecology Method NWTPH-Gx. The analytical results indicated that the samples from wells DMW-9 and DMW-10 contained benzene concentrations [87 and 27 micrograms per liter ( $\mu\text{g/L}$ ), respectively] that exceeded the MTCA Method A groundwater cleanup level (5  $\mu\text{g/L}$ ). The sample from well DMW-5 did not contain a benzene concentration greater than the method reporting limit (MRL). None of the samples contained toluene, ethylbenzene, total xylenes, or GRO concentrations greater than the MRLs or the Method A cleanup levels. The groundwater sample analytical results from the June 2011 event, as well as

from the previous sampling events, are presented in Table 2. The benzene and GRO concentrations in the June 2011 samples are shown on Figure 3. A copy of the laboratory analytical report is attached.

## CONCLUSIONS

The 2008 groundwater sampling results from the shallow wells indicated that the 2007 remediation activities effectively removed the source of the shallow groundwater contamination and extracted most of the impacted shallow groundwater (SLR, 2008a; SLR, 2008b; and SLR, 2008c). In October 2008, the remaining petroleum hydrocarbon concentrations in the shallow groundwater that exceeded the MTCA Method A cleanup levels only occurred in one localized area (near well MW-10). Based on the quarterly groundwater sampling results from September 2009 through September 2010 (SLR, 2009; SLR, 2010a; SLR, 2010b; SLR, 2010c; and SLR, 2010d), the hydrocarbon concentrations near MW-10 have decreased to below the Method A cleanup levels due to natural attenuation.

The 2008 groundwater sampling results from the deep wells showed that the 2007 remediation activities had limited short-term effects on the deep groundwater concentrations (SLR, 2008a; SLR, 2008b; and SLR, 2008c). However, the petroleum hydrocarbon concentrations were decreasing with distance away from the primary source area (the former dispenser island area) due to natural attenuation. To actively remediate the impacted deep groundwater, a deep groundwater recovery/treatment system has been operating since June 2009. Based on the groundwater sampling results from December 2009 through March 2011 (SLR, 2010a; SLR, 2010b; SLR, 2010c; SLR, 2010d; SLR, 2011a; and SLR, 2011b), as well as the June 2011 sampling results, the benzene and GRO concentrations in the deep groundwater are decreasing due to the operation of the system. At the source area well (DMW-9), the benzene and GRO concentrations in March 2011 were 3,213 and 7,900 µg/L, respectively, less than the concentrations in October 2008 (the last sampling event prior to activating the deep groundwater recovery/treatment system). In June 2011, the benzene concentration (87 µg/L) at DMW-9 exceeded the MTCA Method A cleanup level; however, the GRO concentration (700 µg/L) was below the Method A cleanup level (800 µg/L) for the third consecutive quarter.

If you have any questions, please contact me at (425) 471-0479 or mstaton@slrcorp.com.

Sincerely,

SLR International Corp



Michael D. Staton, L.G.  
Principal Geologist

Mr. Tom Middleton  
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Attachments: Limitations  
References  
Tables 1 and 2  
Figures 1 through 3  
Laboratory Analytical Report

cc: Kurt Peterson, Cascadia Law Group PLLC (4 copies)

## **LIMITATIONS**

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The services reflected in this report were performed consistent with generally accepted professional consulting principals and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This information is solely for the use of our client unless otherwise noted. Any reliance on this information by a third party is at such party's sole risk.

Opinions and recommendations contained herein apply to conditions existing when services were performed and are intended only for the client, purposes, location, timeframes, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, nor the use of segregated portions of this report.

## REFERENCES

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- SLR. 2008a. *Remedial Action Report, Former Arco Service Station #0855, 4603 Ocean Beach Highway, Longview, Washington*. July 21.
- SLR. 2008b. *Quarterly Groundwater Sampling Report – July 2008 Event, Former Arco Service Station #0855, Longview, Washington*. August 29.
- SLR. 2008c. *Quarterly Groundwater Sampling Report – September/October 2008 Event, Former Arco Service Station #0855, Longview, Washington*. October 29.
- SLR. 2009. *Deep Groundwater Remediation System Installation and Performance Report, Former Arco Service Station #0855, Longview, Washington*. November 4.
- SLR. 2010a. *Quarterly Groundwater Sampling Report – December 2009 Event, Former Arco Service Station #0855, Longview, Washington*. January 9.
- SLR. 2010b. *Quarterly Groundwater Sampling Report – March 2010 Event, Former Arco Service Station #0855, Longview, Washington*. April 5.
- SLR. 2010c. *Quarterly Groundwater Sampling Report – June 2010 Event, Former Arco Service Station #0855, Longview, Washington*. July 20.
- SLR. 2010d. *Groundwater Sampling Report – September 2010 Event, Former Arco Service Station #0855, Longview, Washington*. October 25.
- SLR. 2011a. *Groundwater Sampling Report – December 2010 Event, Former Arco Service Station #0855, Longview, Washington*. January 4.
- SLR. 2011b. *Groundwater Sampling Report – March 2011 Event, Former Arco Service Station #0855, Longview, Washington*. May 23.

**Table 1**  
**Groundwater Monitoring Data**  
**Former Arco Service Station #0855**  
**Longview Washington**

Well Number	Top of Casing Elevation <sup>a</sup> (feet)	Date Measured	Depth to Groundwater <sup>b</sup> (feet)	Free Product Thickness (feet)	Groundwater Elevation (feet)
<b>Shallow Monitoring Wells</b>					
MW-1	8.34	03/27/00	4.36	NP	3.98
		05/23/00	5.20	NP	3.14
		07/20/00	5.55	NP	2.79
		10/18/00	5.41	NP	2.93
		01/18/01	4.81	NP	3.53
		04/18/01	4.58	NP	3.76
		07/17/01	5.54	NP	2.80
		10/18/01	5.26	NP	3.08
		01/16/02	4.45	NP	3.89
		07/09/03	5.80	NP	2.54
	8.25 <sup>c</sup>	05/25/05	4.12	NP	4.13
		12/07/05	3.77	NP	4.48
		08/16/06	6.58	NP	1.67
		Well abandoned in September 2007.			
MW-2	8.76	03/27/00	3.61	NP	5.15
		05/23/00	4.64	NP	4.12
		07/20/00	5.06	NP	3.70
		10/18/00	5.19	NP	3.57
		01/18/00	3.96	NP	4.80
		04/18/01	3.83	NP	4.93
		07/17/01	5.08	NP	3.68
		10/18/01	4.83	NP	3.93
		01/16/02	3.71	NP	5.05
		07/09/03	5.36	NP	3.40
	8.89 <sup>c</sup>	05/25/05	4.15	NP	4.74
		12/07/05	4.09	NP	4.80
		08/16/06	5.96	NP	2.93
		Well abandoned in September 2007.			
MW-3	8.78	03/27/00	5.61	NP	3.17
		05/23/00	6.46	NP	2.32
		07/20/00	7.05	NP	1.73
		10/18/00	6.84	NP	1.94
		01/18/01	6.37	NP	2.41
		04/18/01	5.46	NP	3.32
		07/17/01	6.93	NP	1.85
		10/18/01	6.47	NP	2.31
		01/16/01	4.83	NP	3.95
		07/09/03	6.72	0.02	2.08*
	8.58 <sup>c</sup>	05/25/05	4.65	Film	3.93
		12/07/05	4.45	0.01	4.14*
		08/16/06	6.91	0.24	1.86*
		Well abandoned in September 2007.			

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Well Number	Top of Casing Elevation <sup>a</sup> (feet)	Date Measured	Depth to Groundwater <sup>b</sup> (feet)	Free Product Thickness (feet)	Groundwater Elevation (feet)
<b>Shallow Monitoring Wells (continued)</b>					
MW-4	8.78	11/15/00	6.88	NP	1.90
		01/18/01	6.78	NP	2.00
		04/18/01	6.90	NP	1.88
		07/17/01	7.50	NP	1.28
		10/18/01	6.92	NP	1.86
		01/16/02	6.15	NP	2.63
	8.69°	07/09/03	7.04	NP	1.74
		05/25/05	6.24	NP	2.45
		12/07/05	5.70	NP	2.99
		08/16/06	6.84	NP	1.85
		Well abandoned in September 2007.			
MW-5	8.78	11/15/00	6.54	NP	2.24
		01/18/01	6.07	NP	2.71
		04/18/01	5.46	NP	3.32
		07/17/01	6.79	NP	1.99
		10/18/01	6.50	NP	2.28
		01/16/02	5.49	NP	3.29
		07/09/03	6.86	NP	1.92
	8.67°	05/25/05	5.64	NP	3.03
		12/07/05	5.53	NP	3.14
		08/16/06	6.28	NP	2.39
		12/11/07	4.64	NP	4.03
		03/11/08	4.90	NP	3.77
		07/01/08	5.33	NP	3.34
		09/30/08	6.17	NP	2.50
		09/02/09	7.08	NP	1.59
		12/15/09	4.63	NP	4.04
		03/18/10	4.85	NP	3.82
		06/15/10	4.84	NP	3.83
		09/14/10	6.87	NP	1.80
		12/14/10	3.03	NP	5.64
		03/16/11	2.80	NP	5.87
		06/16/11	5.66	NP	3.01
MW-6	8.21	11/15/00	6.15	NP	2.06
		01/18/01	5.85	NP	2.36
		04/18/01	5.70	NP	2.51
		07/17/01	6.02	NP	2.19
		10/18/01	6.03	NP	2.18
		01/16/02	5.80	NP	2.41
		07/09/03	6.16	NP	2.05
	8.11°	05/25/05	4.00	NP	4.11
		12/07/05	5.70	NP	2.41
		08/16/06	6.40	NP	1.71
		Well destroyed in November 2007.			



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Well Number	Top of Casing Elevation <sup>a</sup> (feet)	Date Measured	Depth to Groundwater <sup>b</sup> (feet)	Free Product Thickness (feet)	Groundwater Elevation (feet)
<b>Shallow Monitoring Wells (continued)</b>					
MW-7	8.45	11/15/00	6.52	NP	1.93
		01/18/01	6.24	NP	2.21
		04/18/01	5.98	NP	2.47
		07/17/01	6.44	NP	2.01
		10/18/01	6.39	NP	2.06
		01/16/02	6.31	NP	2.14
	8.26 <sup>c</sup>	07/09/03	7.00	NP	1.45
		05/25/05	5.61	NP	2.65
		12/07/05	6.36 <sup>d</sup>	NP	1.90
		08/16/06	6.40	NP	1.86
		Well abandoned in September 2007.			
MW-8	6.45	05/25/05	4.50	NP	1.95
		12/07/05	3.69	NP	2.76
		08/16/06	4.67	NP	1.78
		12/11/07	3.55	NP	2.90
		03/11/08	3.51	NP	2.94
		07/01/08	4.03	NP	2.42
		09/30/08	4.19	NP	2.26
		09/02/09	4.55	NP	1.90
		12/15/09	3.31	NP	3.14
		03/18/10	3.05	NP	3.40
		06/15/10	2.48	NP	3.97
		09/14/10	4.32	NP	2.13
		12/14/10	2.70	NP	3.75
		03/16/11	2.15	NP	4.30
		06/16/11	2.37	NP	4.08
MW-9	9.43	05/25/05	4.66	NP	4.77
		12/07/05	4.59	NP	4.84
		08/16/06	5.23	NP	4.20
		12/11/07	4.52	NP	4.91
		03/11/08	4.65	NP	4.78
		07/01/08	5.06	NP	4.37
		09/30/08	5.08	NP	4.35
		09/02/09	5.20	NP	4.23
		12/15/09	4.51	NP	4.92
		03/18/10	4.64	NP	4.79
		06/15/10	4.72	NP	4.71
		09/14/10	4.94	NP	4.49
		12/14/10	4.66	NP	4.77
		03/16/11	3.91	NP	5.52
		06/16/11	4.83	NP	4.60
MW-10	9.52	05/25/05	10.30	NP	-0.78
		12/07/05	5.90	NP	3.62
		08/16/06	7.18	NP	2.34
		12/11/07	4.22	NP	5.30
		03/11/08	6.02	NP	3.50
		07/01/08	6.53	NP	2.99
		09/30/08	4.51	NP	5.01
		09/02/09	7.76	NP	1.76
		12/15/09	5.97	NP	3.55
		03/18/10	8.14	NP	1.38
		06/15/10	5.15	NP	4.37
		09/14/10	7.88	NP	1.64
		12/14/10	3.42	NP	6.10
		03/16/11	3.54	NP	5.98
		06/16/11	6.40	NP	3.12

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Well Number	Top of Casing Elevation <sup>a</sup> (feet)	Date Measured	Depth to Groundwater <sup>b</sup> (feet)	Free Product Thickness (feet)	Groundwater Elevation (feet)
<b>Shallow Monitoring Wells (continued)</b>					
MW-11	8.16	12/07/05	3.87	NP	4.29
		08/16/06	6.10	NP	2.06
		12/11/07	3.51	NP	4.65
		03/11/08	4.86	NP	3.30
		07/01/08	5.61	NP	2.55
		09/30/08	6.56	NP	1.60
		09/02/09	7.52	NP	0.64
		12/15/09	4.35	NP	3.81
		03/18/10	4.17	NP	3.99
		06/15/10	4.22	NP	3.94
		09/14/10	6.28	NP	1.88
		12/14/10	1.86	NP	6.30
		03/16/11	2.59	NP	5.57
		06/16/11	5.43	NP	2.73
MW-12	8.21	12/11/07	2.69	NP	5.52
		03/11/08	4.25	NP	3.96
		07/01/08	5.20	NP	3.01
		09/30/08	5.85	NP	2.36
		09/02/09	6.33	NP	1.88
		12/15/09	3.09	NP	5.12
		03/18/10	3.46	NP	4.75
		06/15/10	3.65	NP	4.56
		09/14/10	5.65	NP	2.56
		12/14/10	1.45	NP	6.76
		03/16/11	1.90	NP	6.31
		06/16/11	4.77	NP	3.44
MW-13	9.03	12/11/07	1.10	NP	7.93
		03/11/08	1.53	NP	7.50
		07/01/08	3.53	NP	5.50
		09/30/08	4.73	NP	4.30
		09/02/09	7.04	NP	1.99
		12/15/09	2.24	NP	6.79
		03/18/10	1.48	NP	7.55
		06/15/10	1.65	NP	7.38
		09/14/10	5.80	NP	3.23
		12/14/10	1.48	NP	7.55
		03/16/11	1.45	NP	7.58
		06/16/11	3.12	NP	5.91
MW-14	8.39	12/11/07	1.50	NP	6.89
		03/11/08	3.85	NP	4.54
		07/01/08	4.27	NP	4.12
		09/30/08	6.44	NP	1.95
		09/02/09	6.93	NP	1.46
		12/15/09	1.77	NP	6.62
		03/18/10	1.65	NP	6.74
		06/15/10	1.78	NP	6.61
		09/14/10	6.23	NP	2.16
		12/14/10	1.37	NP	7.02
		03/16/11	1.41	NP	6.98
		06/16/11	4.77	NP	3.62

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Well Number	Top of Casing Elevation <sup>a</sup> (feet)	Date Measured	Depth to Groundwater <sup>b</sup> (feet)	Free Product Thickness (feet)	Groundwater Elevation (feet)
<b>Deep Monitoring Wells</b>					
DMW-1	8.55	12/07/05	6.73	NP	1.82
		08/16/06	6.28	NP	2.27
		Well abandoned in September 2007.			
DMW-2	8.29	12/07/05	6.10	NP	2.19
		08/16/06	6.71	NP	1.58
		Well abandoned in September 2007.			
DMW-3	6.66	12/07/05	12.15 <sup>d</sup>	NP	-5.49
		08/16/06	4.55	NP	2.11
		12/11/07	4.60	NP	2.06
		03/11/08	5.68	NP	0.98
		07/01/08	5.52	NP	1.14
		09/30/08	5.03	NP	1.63
		09/02/09	5.19	NP	1.47
		12/15/09	4.71	NP	1.95
		03/18/10	4.55	NP	2.11
		06/15/10	4.42	NP	2.24
		09/14/10	5.01	NP	1.65
		12/14/10	4.36	NP	2.30
		03/16/11	3.95	NP	2.71
		06/16/11	4.10	NP	2.56
DMW-4	8.55	12/07/05	6.30	NP	2.25
		08/16/06	7.12	NP	1.43
		12/11/07	6.08	NP	2.47
		03/11/08	6.54	NP	2.01
		07/01/08	6.41	NP	2.14
		09/30/08	6.91	NP	1.64
		09/02/09	7.13	NP	1.42
		12/15/09	6.26	NP	2.29
		03/18/10	6.43	NP	2.12
		06/15/10	6.11	NP	2.44
		09/14/10	6.97	NP	1.58
		12/14/10	5.18	NP	3.37
		03/16/11	5.55	NP	3.00
		06/16/11	6.11	NP	2.44
DMW-5	8.14	12/07/05	5.88	NP	2.26
		08/16/06	6.57	NP	1.57
		12/11/07	5.75	NP	2.39
		03/11/08	6.14	NP	2.00
		07/01/08	5.01	NP	3.13
		09/30/08	6.52	NP	1.62
		09/02/09	6.75	NP	1.39
		12/15/09	5.87	NP	2.27
		03/18/10	6.03	NP	2.11
		06/15/10	5.68	NP	2.46
		09/14/10	6.55	NP	1.59
		12/14/10	4.80	NP	3.34
		03/16/11	5.17	NP	2.97
		06/16/11	5.69	NP	2.45

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Well Number	Top of Casing Elevation <sup>a</sup> (feet)	Date Measured	Depth to Groundwater <sup>b</sup> (feet)	Free Product Thickness (feet)	Groundwater Elevation (feet)
<b>Deep Monitoring Wells (continued)</b>					
DMW-6	9.15	08/16/06	7.74	NP	1.41
		12/11/07	6.68	NP	2.47
		03/11/08	7.15	NP	2.00
		07/01/08	7.04	NP	2.11
		09/30/08	7.53	NP	1.62
		09/02/09	7.79	NP	1.36
		12/15/09	6.89	NP	2.26
		03/18/10	7.06	NP	2.09
		06/15/10	6.74	NP	2.41
		09/14/10	7.59	NP	1.56
		12/14/10	5.79	NP	3.36
		03/16/11	6.18	NP	2.97
		06/16/11	6.75	NP	2.40
DMW-7	8.12	08/16/06	6.68	NP	1.44
		12/11/07	5.68	NP	2.44
		03/11/08	6.11	NP	2.01
		07/01/08	6.02	NP	2.10
		09/30/08	6.61	NP	1.51
		09/02/09	6.74	NP	1.38
		12/15/09	5.85	NP	2.27
		03/18/10	5.93	NP	2.19
		06/15/10	5.82	NP	2.30
		09/14/10	6.55	NP	1.57
		12/14/10	5.27	NP	2.85
		03/16/11	5.15	NP	2.97
		06/16/11	5.70	NP	2.42
DMW-8	9.09	08/16/06	7.65	NP	1.44
		12/11/07	6.60	NP	2.49
		03/11/08	7.06	NP	2.03
		07/01/08	6.97	NP	2.12
		09/30/08	7.48	NP	1.61
		09/02/09	7.69	NP	1.40
		12/15/09	6.80	NP	2.29
		03/18/10	6.81	NP	2.28
		06/15/10	6.55	NP	2.54
		09/14/10	7.50	NP	1.59
		12/14/10	6.52	NP	2.57
		03/16/11	6.26	NP	2.83
		06/16/11	6.60	NP	2.49
DMW-9	8.86	12/11/07	5.39	NP	3.47
		03/11/08	6.84	NP	2.02
		07/01/08	6.85	NP	2.01
		09/30/08	7.20	NP	1.66
		09/02/09	7.44	NP	1.42
		12/15/09	6.54	NP	2.32
		03/18/10	6.69	NP	2.17
		06/15/10	6.39	NP	2.47
		09/14/10	7.23	NP	1.63
		12/14/10	5.66	NP	3.20
		03/16/11	5.87	NP	2.99
		06/16/11	6.39	NP	2.47

**Table 1**  
**Groundwater Monitoring Data**  
**Former Arco Service Station #0855**  
**Longview Washington**

Well Number	Top of Casing Elevation <sup>a</sup> (feet)	Date Measured	Depth to Groundwater <sup>b</sup> (feet)	Free Product Thickness (feet)	Groundwater Elevation (feet)
Deep Monitoring Wells (continued)					
DMW-10	8.38	12/11/07	4.91	NP	3.47
		03/11/08	6.35	NP	2.03
		07/01/08	6.24	NP	2.14
		09/30/08	6.75	NP	1.63
		09/02/09	6.99	NP	1.39
		12/15/09	6.09	NP	2.29
		03/18/10	6.25	NP	2.13
		06/15/10	5.91	NP	2.47
		09/14/10	6.77	NP	1.61
		12/14/10	5.02	NP	3.36
		03/16/11	5.38	NP	3.00
		06/16/11	5.92	NP	2.46
Deep Recovery Well					
RW-1	8.08	09/02/09	6.69	NP	1.39
		12/15/09	5.78	NP	2.30
		03/18/10	5.96	NP	2.12
		06/15/10	5.60	NP	2.48
		12/14/10	4.70	NP	3.38
		03/16/11	5.06	NP	3.02
		06/16/11	5.61	NP	2.47
NOTES: NP = Free product was not present. <sup>a</sup> Top of well casing elevations were surveyed relative to NAVD 88 datum. <sup>b</sup> Measurements in feet below top of well casing. <sup>c</sup> Top of casing (TOC) elevation was re-surveyed in May 2005. <sup>d</sup> Water in well was under pressure and rising when the cap was removed. The water level was recorded after the well cap was off for over 2 hours. * Groundwater elevation corrected for product thickness by using the equation: Groundwater elevation = TOC elevation - depth to groundwater + (product thickness x 0.80).					

**Table 2**  
**Groundwater Sample Analytical Results - Petroleum Hydrocarbons**  
**Former Arco Service Station #0855**  
**Longview, Washington**

Well Number	Sample Date	Benzene <sup>a</sup> (µg/L)	Toluene <sup>a</sup> (µg/L)	Ethylbenzene <sup>a</sup> (µg/L)	Total Xylenes <sup>a</sup> (µg/L)	GRO <sup>b</sup> (µg/L)	DRO <sup>c</sup> (µg/L)
MTCA Method A Cleanup Levels <sup>d</sup>		5	1,000	700	1,000	800	500
Shallow Monitoring Wells							
MW-1	03/27/00	ND	ND	ND	ND	ND	ND
	05/23/00	ND	ND	ND	ND	ND	NA
	07/20/00	ND	ND	ND	ND	ND	NA
	10/18/00	ND	ND	1.61	ND	404	NA
	01/18/01	ND	ND	ND	ND	95.6	NA
	04/18/01	ND	ND	ND	ND	NA	NA
	07/17/01	ND	2.63	1.46	ND	386	NA
	10/18/01	ND	ND	ND	ND	ND	NA
	01/16/02	ND	ND	ND	ND	104	NA
	07/09/03	<0.50	<0.50	<0.50	<1.0	<50	<250
	05/25/05	<1.0	<1.0	<1.0	<2.0	<100	<50
	11/30/05	<1.0	<1.0	<1.0	<3.0	<100	<50
Well abandoned in September 2007.							
MW-2	03/27/00	6.89	49.5	599	2,490	17,100	ND
	05/23/00	26.2	16.2	614	1,770	13,200	NA
	07/20/00	11.9	11.8	304	330	7,220	NA
	10/18/00	3.67	1.23	13.9	7.55	743	NA
	01/18/00	ND	ND	41.1	5.62	691	NA
	04/18/01	ND	ND	8.73	ND	NA	NA
	07/17/01	ND	1.26	14	ND	430	NA
	10/18/01	2.11	ND	3.64	ND	304	NA
	01/16/02	1.16	0.81	37.1	6.71	370	NA
	07/09/03	0.86	<0.50	6.43	1.28	131	<250
	05/30/05	<1.0	<1.0	<1.0	<2.0	<100	52
	12/01/05	<1.0	<1.0	<1.0	<3.0	120	<50
Well abandoned in September 2007.							
MW-3	03/07/00	7,520	12,900	2,780	14,500	93,700	ND
	05/23/00	4,710	8,330	2,280	11,200	65,200	NA
	07/20/00	10,700	22,600	3,160	17,400	145,000	NA
	10/18/00	12,900	33,000	4,890	26,700	179,000	NA
	01/18/01	9,380	17,200	3,940	20,230	121,000	NA
	04/18/01	7,700	15,300	3,430	16,990	NA	NA
	07/17/01	10,100	21,400	4,120	20,900	940,000	NA
	10/18/01	7,200	19,700	3,340	17,300	139,000	NA
	01/16/02	13,600	26,600	3,920	20,800	177,000	NA
	07/09/03	11,800	20,100	4,560	21,200	124,000	3,750
	05/25/05	Not sampled due to presence of free product.					
	11/28/05	Not sampled due to presence of free product.					
Well abandoned in September 2007.							

**Table 2**  
**Groundwater Sample Analytical Results - Petroleum Hydrocarbons**  
**Former Arco Service Station #0855**  
**Longview, Washington**

Well Number	Sample Date	Benzene <sup>a</sup> (µg/L)	Toluene <sup>a</sup> (µg/L)	Ethylbenzene <sup>a</sup> (µg/L)	Total Xylenes <sup>a</sup> (µg/L)	GRO <sup>b</sup> (µg/L)	DRO <sup>c</sup> (µg/L)
<b>MTCA Method A Cleanup Levels<sup>d</sup></b>		<b>5</b>	<b>1,000</b>	<b>700</b>	<b>1,000</b>	<b>800</b>	<b>500</b>
<b>Shallow Monitoring Wells (continued)</b>							
MW-4	11/15/00	1,310	53.6	2,430	7,250	45,500	NA
	01/18/01	1,130	ND	2,030	2,764	29,400	NA
	04/18/01	1,280	ND	1,700	2,591	NA	NA
	07/17/01	1,610	35	2,870	1,870	34,900	NA
	10/18/01	1,040	ND	2,300	1,320	33,000	NA
	01/16/02	733	ND	920	948	19,300	NA
	07/09/03	906	39.1	1,350	156	14,100	798
	05/24/05	310	2.90	410	185 <sup>e</sup>	9,600	2,300
	12/01/05	990	140	1,100	1,353 <sup>e</sup>	11,000	2,900 <sup>f</sup>
	Well abandoned in September 2007.						
MW-5	11/15/00	ND	ND	ND	ND	ND	NA
	01/18/01	ND	ND	ND	ND	786	NA
	04/18/01	9.42	ND	6.76	10.1	NA	NA
	07/17/01	1.83	1.16	1.90	3.28	694	NA
	10/18/01	3.05	1.39	1.48	1.45	647	NA
	01/16/02	52.3	3.82	48	24.9	2,800	NA
	07/09/03	1.26	0.99	1.54	4.64	615	<250
	05/24/05	<1.0	<1.0	<1.0	<2.0	460	120
	11/28/05	<1.0	<1.0	<1.0	<3.0	420	230 <sup>f</sup>
	12/11/07	<1.0	<1.0	<1.0	<3.0	140	<50
	03/11/08	<1.0	<1.0	<1.0	<3.0	<100	<50
	07/02/08	<1.0	<1.0	<1.0	<3.0	<100	<50
	10/02/08	<1.0	<1.0	<1.0	<3.0	<100	NA
	09/03/09	<1.0	<1.0	<1.0	<3.0	<100	NA
	09/14/10	<1.0	<1.0	<1.0	<3.0	<100	NA
	Well destroyed in November 2007.						
MW-6	11/15/00	ND	ND	ND	ND	131	NA
	01/18/01	ND	ND	ND	ND	732	NA
	04/18/01	ND	ND	ND	ND	NA	NA
	07/17/01	ND	1.35	1.33	5.79	892	NA
	10/18/01	ND	ND	2.60	5.48	1,000	NA
	01/16/02	ND	0.72	1.58	2.78	810	NA
	07/09/03	<0.50	0.53	1.15	4.84	462	958
	05/25/05	<1.0	<1.0	<1.0	<2.0	370	270
	11/28/05	<1.0	<1.0	<1.0	<1.0	NA	<1.0
	Well destroyed in November 2007.						
MW-7	11/15/00	ND	ND	ND	1.35	113	NA
	01/18/01	ND	ND	ND	ND	242	NA
	04/18/01	ND	ND	ND	ND	NA	NA
	07/17/01	ND	ND	ND	ND	275	NA
	10/18/01	ND	ND	ND	ND	286	NA
	01/16/02	ND	ND	ND	ND	362	NA
	07/09/03	<0.50	<0.50	<0.50	1.48	232	2,050
	05/25/05	<1.0	<1.0	<1.0	<2.0	<100	220
	11/30/05	<1.0	<1.0	<1.0	<3.0	<100	140
	Well abandoned in September 2007.						

**Table 2**  
**Groundwater Sample Analytical Results - Petroleum Hydrocarbons**  
**Former Arco Service Station #0855**  
**Longview, Washington**

Well Number	Sample Date	Benzene <sup>a</sup> (µg/L)	Toluene <sup>a</sup> (µg/L)	Ethylbenzene <sup>a</sup> (µg/L)	Total Xylenes <sup>a</sup> (µg/L)	GRO <sup>b</sup> (µg/L)	DRO <sup>c</sup> (µg/L)
<b>MTCA Method A Cleanup Levels<sup>d</sup></b>		<b>5</b>	<b>1,000</b>	<b>700</b>	<b>1,000</b>	<b>800</b>	<b>500</b>
<b>Shallow Monitoring Wells (continued)</b>							
MW-8	05/25/05	<1.0	<1.0	<1.0	<3.0	<100	<70
	11/29/05	<1.0	<1.0	<1.0	<3.0	<100	<50
	12/11/07	<1.0	<1.0	<1.0	<3.0	<100	<50
	03/11/08	<1.0	<1.0	<1.0	<3.0	<100	<50
	07/01/08	<1.0	<1.0	<1.0	<3.0	<100	<50
	10/01/08	<1.0	<1.0	<1.0	<3.0	<100	NA
	09/03/09	<1.0	<1.0	<1.0	<3.0	<100	NA
	09/14/10	<1.0	<1.0	<1.0	<3.0	<100	NA
MW-9	05/25/05	<1.0	<1.0	<1.0	<3.0	<100	<50
	11/28/05	<1.0	<1.0	<1.0	<3.0	<100	<50
	12/11/07	<1.0	<1.0	<1.0	<3.0	<100	<50
	03/11/08	<1.0	<1.0	<1.0	<3.0	<100	<50
	07/02/08	<1.0	<1.0	<1.0	<3.0	<100	<50
	10/02/08	<1.0	<1.0	<1.0	<3.0	<100	NA
	09/03/09	<1.0	<1.0	<1.0	<3.0	<100	NA
	09/14/10	<1.0	<1.0	<1.0	<3.0	<100	NA
MW-10	05/25/05	45	<1.0	110	<2.0	1,000	1,200
	11/30/05	31	<1.0	110	<3.0	1,400	1,000 <sup>f</sup>
	12/11/07	9.0	3.0	65	<3.0	3,100	1,000 <sup>g</sup>
	03/11/08	16	2.0	40	<3.0	3,000	1,200 <sup>g</sup>
	07/03/08	18	2.0	53	41	2,500	1,100 <sup>g</sup>
	10/02/08	<1.0	<1.0	<1.0	<3.0	1,300	NA
	09/03/09	<1.0	<1.0	2.0	<3.0	200	NA
	12/15/09	3.0	<1.0	11	<3.0	310	NA
	03/18/10	<1.0	<1.0	<1.0	<3.0	<100	NA
	06/15/10	<1.0	<1.0	<1.0	<3.0	170	NA
	09/14/10	<1.0	<1.0	<1.0	<3.0	180	NA
MW-11	12/05/05	<1.0	<1.0	<1.0	<3.0	<100	<50
	12/11/07	<1.0	<1.0	<1.0	<3.0	<100	<50
	03/11/08	<1.0	<1.0	<1.0	<3.0	<100	<50
	07/02/08	<1.0	<1.0	<1.0	<3.0	<100	<50
	10/02/08	<1.0	<1.0	<1.0	<3.0	<100	NA
	09/03/09	<1.0	<1.0	<1.0	<3.0	<100	NA
	09/14/10	<1.0	<1.0	<1.0	<3.0	<100	NA



**Table 2**  
**Groundwater Sample Analytical Results - Petroleum Hydrocarbons**  
**Former Arco Service Station #0855**  
**Longview, Washington**

Well Number	Sample Date	Benzene <sup>a</sup> (µg/L)	Toluene <sup>a</sup> (µg/L)	Ethylbenzene <sup>a</sup> (µg/L)	Total Xylenes <sup>a</sup> (µg/L)	GRO <sup>b</sup> (µg/L)	DRO <sup>c</sup> (µg/L)
<b>MTCA Method A Cleanup Levels<sup>d</sup></b>		<b>5</b>	<b>1,000</b>	<b>700</b>	<b>1,000</b>	<b>800</b>	<b>500</b>
<b>Shallow Monitoring Wells (continued)</b>							
MW-12	12/11/07	<1.0	<1.0	<1.0	<3.0	<100	<50
	03/11/08	<1.0	<1.0	<1.0	<3.0	<100	<50
	07/02/08	<1.0	<1.0	<1.0	<3.0	<100	<50
	10/02/08	<1.0	<1.0	<1.0	<3.0	<100	NA
	09/03/09	<1.0	<1.0	<1.0	<3.0	<100	NA
	09/14/10	<1.0	<1.0	<1.0	<3.0	<100	NA
MW-13	12/11/07	<1.0	<1.0	<1.0	<3.0	<100	<50
	03/11/08	<1.0	<1.0	<1.0	<3.0	<100	<50
	07/03/08	<1.0	<1.0	<1.0	<3.0	<100	<50
	10/02/08	<1.0	<1.0	<1.0	<3.0	<100	NA
	09/03/09	<1.0	<1.0	<1.0	<3.0	<100	NA
	09/14/10	<1.0	<1.0	<1.0	<3.0	<100	NA
MW-14	12/11/07	<1.0	<1.0	<1.0	<3.0	<100	<50
	03/11/08	<1.0	<1.0	<1.0	<3.0	<100	50
	07/02/08	<1.0	<1.0	<1.0	<3.0	<100	<50
	10/01/08	<1.0	<1.0	<1.0	<3.0	<100	NA
	09/03/09	<1.0	<1.0	<1.0	<3.0	<100	NA
	09/14/10	<1.0	<1.0	<1.0	<3.0	<100	NA
<b>Deep Monitoring Wells</b>							
DMW-1	12/07/05	<b>4,000</b>	160	<b>1,100</b>	<b>4,090<sup>e</sup></b>	<b>22,000</b>	<b>2,900<sup>f</sup></b>
	08/17/06	<b>4,100</b>	<1.0	<b>520</b>	<b>841<sup>e</sup></b>	<b>16,000</b>	<b>930<sup>f</sup></b>
Well abandoned in September 2007.							
DMW-2	12/07/05	<b>11</b>	<1.0	40	46 <sup>f</sup>	270	<50
	08/16/06	<b>10</b>	<1.0	5.6	<3.0	<100	<50
Well abandoned in September 2007.							
DMW-3	12/07/05	<1.0	<1.0	<1.0	<3.0	<50	<50
	08/17/06	<1.0	<1.0	<1.0	<3.0	<100	<50
	12/11/07	<1.0	<1.0	<1.0	<3.0	<100	<50
	03/11/08	<1.0	<1.0	<1.0	<3.0	<100	<50
	07/02/08	<1.0	<1.0	<1.0	<3.0	<100	<50
	10/01/08	<1.0	<1.0	<1.0	<3.0	<100	NA
	09/03/09	<1.0	<1.0	<1.0	<3.0	<100	NA
	09/14/10	<1.0	<1.0	<1.0	<3.0	<100	NA
DMW-4	12/05/05	<b>56</b>	<1.0	<1.0	<3.0	230	<50
	08/17/06	<b>5.7</b>	<1.0	<1.0	<3.0	210	<50
	12/11/07	<b>27</b>	3.0	2.0	4.0	260	<50
	03/11/08	<b>6.0</b>	<1.0	<1.0	<3.0	230	68 <sup>g</sup>
	07/02/08	<1.0	<1.0	<1.0	<3.0	<100	<50
	10/02/08	<1.0	<1.0	<1.0	<3.0	<100	NA
	09/03/09	<1.0	<1.0	<1.0	<3.0	<100	NA
	09/14/10	<1.0	1.2	<1.0	3.3	<100	NA

**Table 2**  
**Groundwater Sample Analytical Results - Petroleum Hydrocarbons**  
**Former Arco Service Station #0855**  
**Longview, Washington**

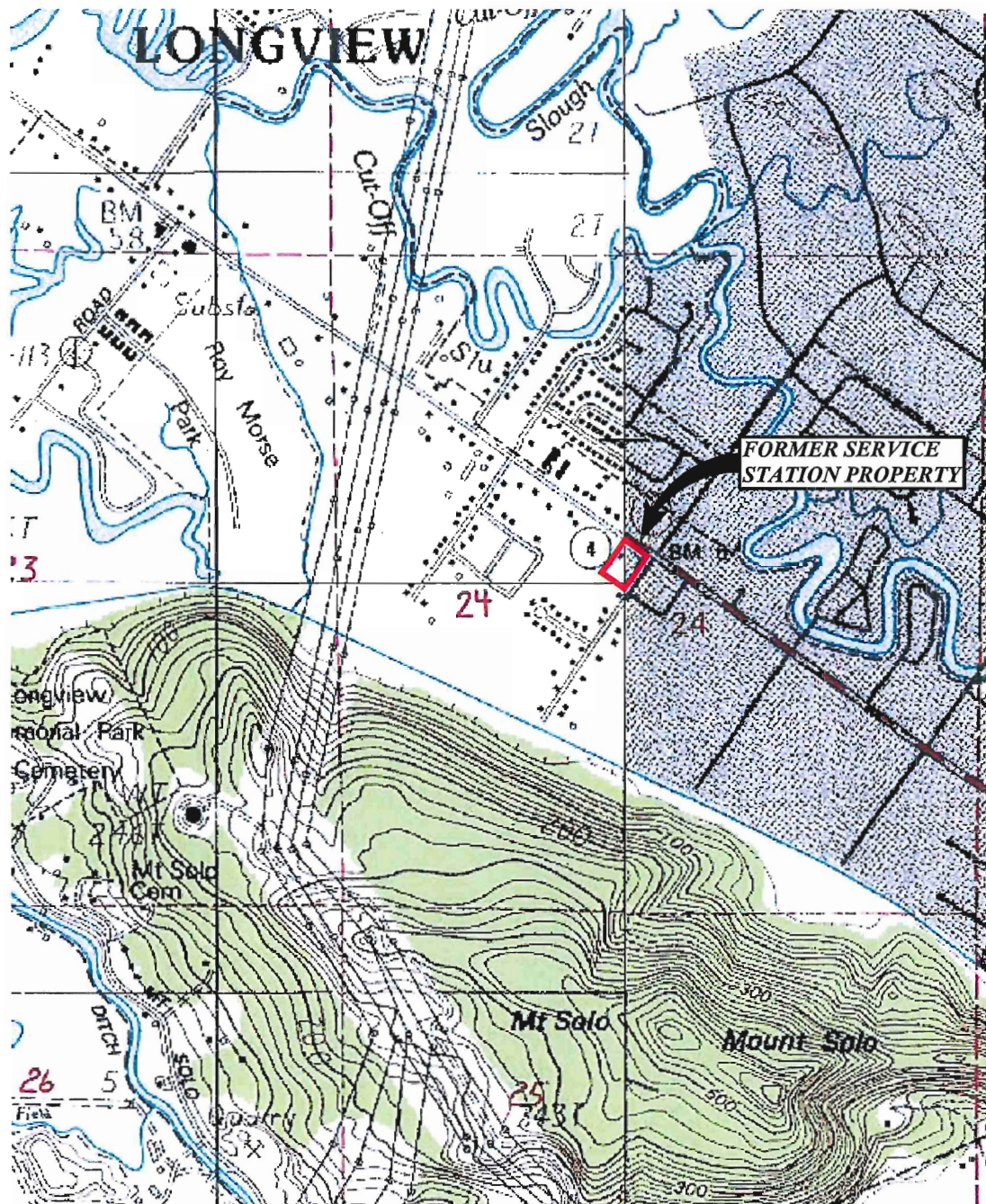
Well Number	Sample Date	Benzene <sup>a</sup> (µg/L)	Toluene <sup>a</sup> (µg/L)	Ethylbenzene <sup>a</sup> (µg/L)	Total Xylenes <sup>a</sup> (µg/L)	GRO <sup>b</sup> (µg/L)	DRO <sup>c</sup> (µg/L)
<b>MTCA Method A Cleanup Levels<sup>d</sup></b>		<b>5</b>	<b>1,000</b>	<b>700</b>	<b>1,000</b>	<b>800</b>	<b>500</b>
<b>Deep Monitoring Wells (continued)</b>							
DMW-5	12/05/05	36	<1.0	<1.0	<3.0	130	<50
	08/17/06	74	<1.0	<1.0	<3.0	170	<50
	12/11/07	41	<1.0	<1.0	<3.0	100	<50
	03/11/08	10	<1.0	<1.0	<3.0	<100	<50
	07/02/08	1.0	<1.0	<1.0	<3.0	<100	<50
	10/01/08	42	<1.0	<1.0	<3.0	110	NA
	09/03/09	<1.0	<1.0	<1.0	<3.0	<100	NA
	12/15/09	1.0	<1.0	<1.0	<3.0	<100	NA
	03/18/10	13	<1.0	<1.0	<3.0	<100	NA
	06/15/10	13	<1.0	<1.0	<3.0	<100	NA
	09/14/10	<1.0	<1.0	<1.0	<3.0	<100	NA
	12/14/10	9.0	<1.0	<1.0	<3.0	<100	NA
	03/16/11	11	<1.0	<1.0	<3.0	<100	NA
	06/16/11	<1.0	<1.0	<1.0	<3.0	<100	NA
DMW-6	08/16/06	<1.0	<1.0	<1.0	<3.0	<100	<50
	12/11/07	<1.0	<1.0	<1.0	<3.0	<100	<50
	03/11/08	<1.0	<1.0	<1.0	<3.0	<100	<50
	07/02/08	<1.0	<1.0	<1.0	<3.0	<100	<50
	10/02/08	<1.0	<1.0	<1.0	<3.0	<100	NA
	09/03/09	<1.0	<1.0	<1.0	<3.0	<100	NA
	09/14/10	<1.0	<1.0	<1.0	<3.0	<100	NA
DMW-7	08/16/06	<1.0	<1.0	<1.0	<3.0	<100	<50
	12/11/07	<1.0	<1.0	<1.0	<3.0	<100	<50
	03/11/08	<1.0	<1.0	<1.0	<3.0	<100	<50
	07/01/08	<1.0	<1.0	<1.0	<3.0	<100	<50
	10/01/08	<1.0	<1.0	<1.0	<3.0	<100	NA
	09/03/09	<1.0	<1.0	<1.0	<3.0	<100	NA
	09/14/10	<1.0	<1.0	<1.0	<3.0	<100	NA
DMW-8	08/16/06	<1.0	<1.0	<1.0	<3.0	<100	<50
	12/11/07	<1.0	<1.0	<1.0	<3.0	<100	<50
	03/11/08	<1.0	<1.0	<1.0	<3.0	<100	<50
	07/02/08	<1.0	<1.0	<1.0	<3.0	<100	<50
	10/02/08	<1.0	<1.0	<1.0	<3.0	<100	NA
	09/03/09	<1.0	<1.0	<1.0	<3.0	<100	NA
	09/14/10	<1.0	<1.0	<1.0	<3.0	<100	NA

**Table 2**  
**Groundwater Sample Analytical Results - Petroleum Hydrocarbons**  
**Former Arco Service Station #0855**  
**Longview, Washington**

Well Number	Sample Date	Benzene <sup>a</sup> (µg/L)	Toluene <sup>a</sup> (µg/L)	Ethylbenzene <sup>a</sup> (µg/L)	Total Xylenes <sup>a</sup> (µg/L)	GRO <sup>b</sup> (µg/L)	DRO <sup>c</sup> (µg/L)
<b>MTCA Method A Cleanup Levels<sup>d</sup></b>		<b>5</b>	<b>1,000</b>	<b>700</b>	<b>1,000</b>	<b>800</b>	<b>500</b>
<b>Deep Monitoring Wells (continued)</b>							
DMW-9	12/11/07	<b>6,100</b>	<b>1,900</b>	<b>970</b>	<b>3,100</b>	<b>27,000</b>	<b>600<sup>g</sup></b>
	03/11/08	<b>3,000</b>	150	380	880	<b>13,000</b>	450 <sup>g</sup>
	07/03/08	<b>3,600</b>	3.0	320	610	<b>9,500</b>	<b>520<sup>g</sup></b>
	10/02/08	<b>3,300</b>	4.0	140	270	<b>8,600</b>	NA
	09/03/09	<b>2,800</b>	4.0	320	<b>1,100</b>	<b>14,000</b>	NA
	12/15/09	<b>980</b>	2.0	<1.0	<b>1,100</b>	<b>5,300</b>	NA
	03/18/10	<b>190</b>	<1.0	10	200	<b>1,600</b>	NA
	06/15/10	<b>50</b>	<1.0	9.1	60	630	NA
	09/14/10	<b>210</b>	<1.0	5.2	120	<b>1,000</b>	NA
	12/14/10	3.3	<1.0	1.3	9.8	320	NA
	03/16/11	<b>14</b>	<1.0	2.0	3.7	310	NA
	06/16/11	<b>87</b>	<1.0	<1.0	33	700	NA
DMW-10	12/11/07	<b>60</b>	4.0	88	130	750	53 <sup>g</sup>
	03/11/08	<b>75</b>	4.0	140	120	<b>1,000</b>	74 <sup>g</sup>
	07/02/08	<b>89</b>	6.0	160	130	<b>1,100</b>	68 <sup>g</sup>
	10/01/08	<b>90</b>	5.0	120	25	<b>820</b>	NA
	09/03/09	<b>9.0</b>	<1.0	2.0	<3.0	<100	NA
	12/15/09	<b>20</b>	<1.0	13	7.0	150	NA
	03/18/10	<b>41</b>	<1.0	21	13	310	NA
	06/15/10	<b>34</b>	2.3	14	12	340	NA
	09/14/10	<b>12</b>	<1.0	<1.0	<3.0	<100	NA
	12/14/10	<b>32</b>	1.7	7.1	11	120	NA
	03/16/11	<b>27</b>	1.2	8.2	11	220	NA
	06/16/11	<b>27</b>	1.8	<1.0	9.9	130	NA

NOTES: Values in bold exceed the MTCA Method A cleanup levels.  
All concentrations in micrograms per liter (µg/L).  
ND = Not detected above the laboratory method reporting limit (MRL).  
NA = Not analyzed.

<sup>a</sup> Benzene, toluene, ethylbenzene, and total xylenes (BTEX) by EPA Method 8021B or EPA Method 8260B.  
<sup>b</sup> Gasoline-range organics (GRO) by Ecology Method NWTPH-Gx.  
<sup>c</sup> Diesel-range organics (DRO) by Ecology Method NWTPH-Dx.  
<sup>d</sup> Chapter 173-340 WAC, Model Toxics Control Act (MTCA) Cleanup Regulation, Method A Cleanup Levels. Amended February 12, 2001.  
<sup>e</sup> Total xylenes calculated by using the formula: total xylenes concentration = (m, p-xylene concentration) + (o-xylene concentration).  
<sup>f</sup> The laboratory reported that the DRO concentration is due to overlap from the gasoline range.  
<sup>g</sup> The laboratory reported that the pattern of chromatogram peaks from the sample were not indicative of diesel.



WASHINGTON

SOURCE: USGS 7.5 Minute Quadrangles Kelso, 1970 Contour Interval 20 Feet and  
Abernathy Mtn., 1986 Contour Interval 20 Feet.



22118 20th AVE SE  
BUILDING G, SUITE 202  
BOTHELL, WA 98021

T: 425-402-8800  
F: 425-402-8488

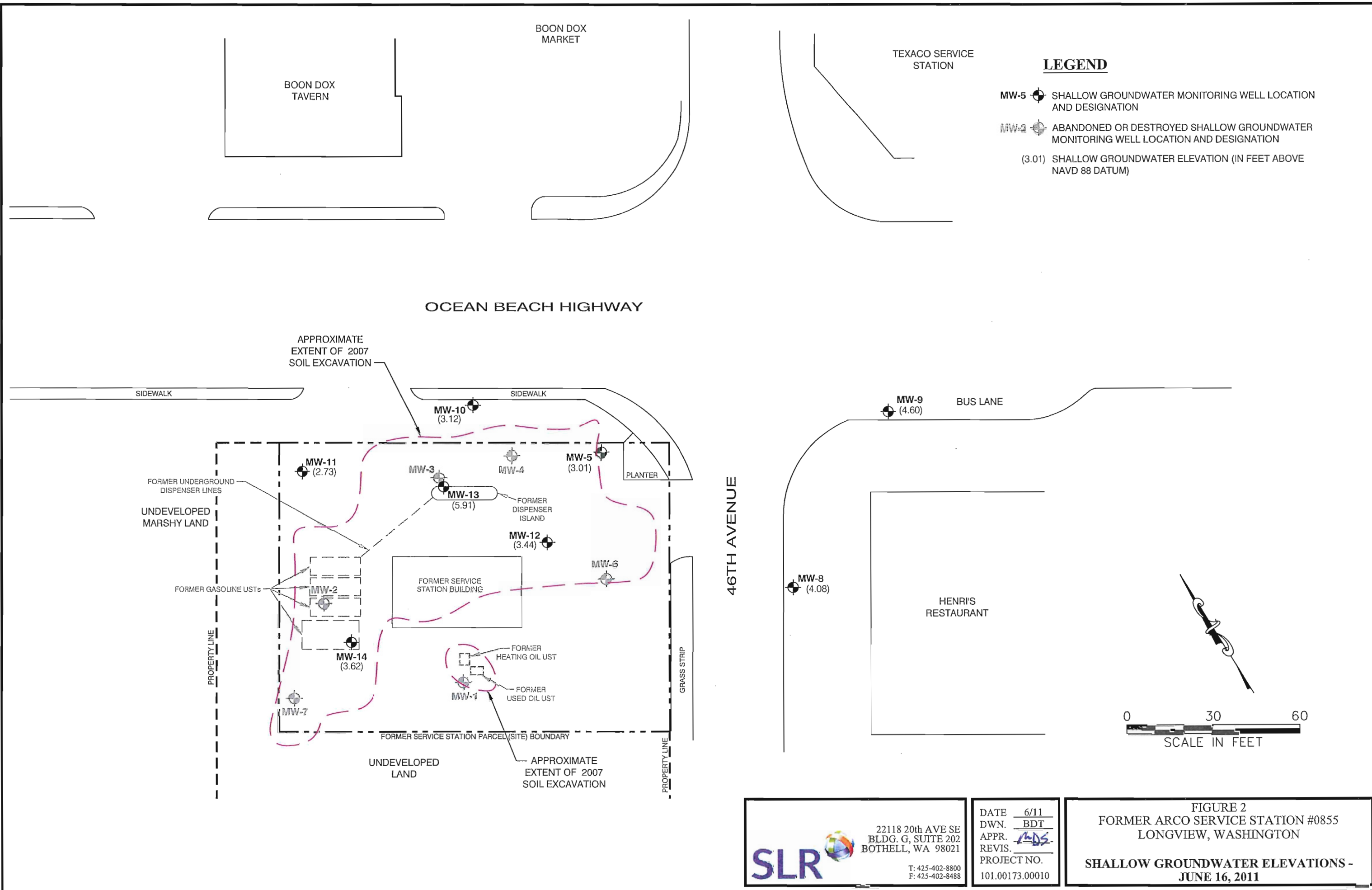
DATE 01/10  
DWN. BDT  
APPR.  
REVIS.  
PROJECT NO.  
101.00173.00010

FIGURE 1  
FORMER ARCO SERVICE STATION #0855  
LONGVIEW, WASHINGTON

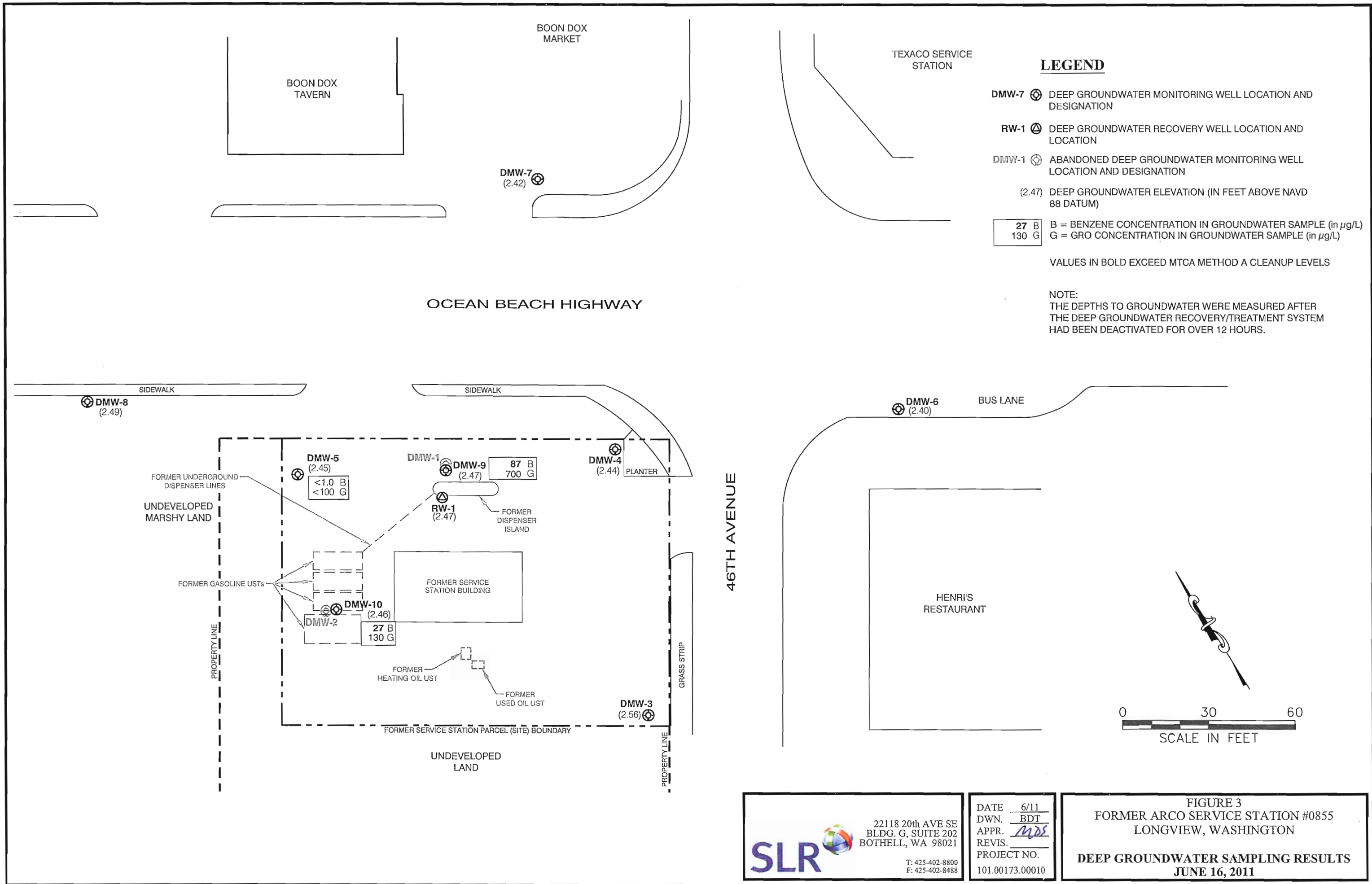
PROPERTY LOCATION MAP



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C:\DRIVE\_E\clients\SLR\101101.00173.0001012-03.dwg, 6/30/2011 5:40:16 PM, BDT



FRIEDMAN & BRUYA, INC.

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ENVIRONMENTAL CHEMISTS

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June 22, 2011

Mike Staton, Project Manager  
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Bothell, WA 98021

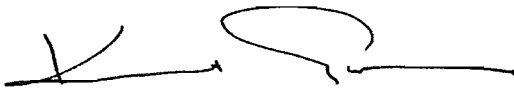
Dear Mr. Staton:

Included are the results from the testing of material submitted on June 17, 2011 from the Former Arco 0855 Longview, WA 101.00173.00010, F&BI 106255 project. There are 4 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

A handwritten signature in black ink, appearing to be 'Kurt Johnson', with a stylized flourish at the end.

Kurt Johnson  
Project Manager

Enclosures  
SLR0622R.DOC

# FRIEDMAN & BRUYA, INC.

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## ENVIRONMENTAL CHEMISTS

### CASE NARRATIVE

This case narrative encompasses samples received on June 17, 2011 by Friedman & Bruya, Inc. from the SLR International Corp. Former Arco 0855 Longview, WA 101.00173.00010, F&BI 106255 project. Samples were logged in under the laboratory ID's listed below.

<u>Laboratory ID</u>	<u>SLR International Corp.</u>
106255-01	DMW10-0611
106255-02	DMW5-0611
106255-03	DMW9-0611

All quality control requirements were acceptable.



FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 06/22/11

Date Received: 06/17/11

Project: Former Arco 0855 Longview, WA 101.00173.00010, F&BI 106255

Date Extracted: 06/20/11

Date Analyzed: 06/20/11

**RESULTS FROM THE ANALYSIS OF WATER SAMPLES  
FOR BENZENE, TOLUENE, ETHYLBENZENE,  
XYLENES AND TPH AS GASOLINE  
USING EPA METHOD 8021B AND NWTPH-Gx**

Results Reported as ug/L (ppb)

<u>Sample ID</u> Laboratory ID	<u>Benzene</u>	<u>Toluene</u>	<u>Ethyl</u> <u>Benzene</u>	<u>Total</u> <u>Xylenes</u>	<u>Gasoline</u> <u>Range</u>	<u>Surrogate</u> <u>(% Recovery)</u> (Limit 50-150)
DMW10-0611 106255-01	27	1.8	<1	9.9	130	107
DMW5-0611 106255-02	<1	<1	<1	<3	<100	103
DMW9-0611 106255-03	87	<1	<1	33	700	129
Method Blank 01-1107 MB	<1	<1	<1	<3	<100	103

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: 06/22/11

Date Received: 06/17/11

Project: Former Arco 0855 Longview, WA 101.00173.00010, F&BI 106255

**QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES  
FOR BENZENE, TOLUENE, ETHYLBENZENE,  
XYLENES, AND TPH AS GASOLINE  
USING EPA METHOD 8021B AND NWTPH-Gx**

Laboratory Code: 106255-02 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	Relative Percent Difference (Limit 20)
Benzene	ug/L (ppb)	<1	<1	nm
Toluene	ug/L (ppb)	<1	<1	nm
Ethylbenzene	ug/L (ppb)	<1	<1	nm
Xylenes	ug/L (ppb)	<3	<3	nm
Gasoline	ug/L (ppb)	<100	<100	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	ug/L (ppb)	50	117	72-119
Toluene	ug/L (ppb)	50	104	71-113
Ethylbenzene	ug/L (ppb)	50	111	72-114
Xylenes	ug/L (ppb)	150	104	72-113
Gasoline	ug/L (ppb)	1,000	104	70-119

### **Data Qualifiers & Definitions**

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

A1 - More than one compound of similar molecule structure was identified with equal probability.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for this range fell outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte indicated may be due to carryover from previous sample injections.

d - The sample was diluted. Detection limits may be raised due to dilution.

ds - The sample was diluted. Detection limits are raised due to dilution and surrogate recoveries may not be meaningful.

dv - Insufficient sample was available to achieve normal reporting limits and limits are raised accordingly.

fb - Analyte present in the blank and the sample.

fc - The compound is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. The variability is attributed to sample inhomogeneity.

ht - Analysis performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of normal control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.

j - The result is below normal reporting limits. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The analyte result in the laboratory control sample is out of control limits. The reported concentration should be considered an estimate.

jr - The rpd result in laboratory control sample associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the compound indicated is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received in a container not approved by the method. The value reported should be considered an estimate.

pr - The sample was received with incorrect preservation. The value reported should be considered an estimate.

ve - Estimated concentration calculated for an analyte response above the valid instrument calibration range. A dilution is required to obtain an accurate quantification of the analyte.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

