



March 6, 2017  
Cardno 031160CX.Q171

Mr. Grant Yang  
Toxics Cleanup Program  
Washington State Department of Ecology  
Northwest Regional Office  
3190 160<sup>th</sup> Ave Southeast  
Bellevue, Washington 98008-5452

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**SUBJECT MW13B Groundwater Monitoring Memorandum**  
Former Mobil Station 99BLV (VCP No.: NW2892)  
1500 145<sup>th</sup> Place Southeast  
Bellevue, Washington

Mr. Yang:

At the request of ExxonMobil Environmental Services Company (EMES), on behalf of ExxonMobil Oil Corporation, Cardno has prepared this memorandum to summarize groundwater monitoring of well MW13B, conducted on January 9, 2017. The purpose of the work to monitor for the presence of groundwater in well MW13B. If groundwater was encountered, Cardno would measure DTW and attempt to collect low-flow groundwater samples for laboratory analyses for total petroleum hydrocarbons (TPH) as gasoline, TPH as diesel, TPH as motor oil, benzene, toluene, ethylbenzene, total xylenes, total lead, and dissolved lead. During the January 9, 2017 event, groundwater was encountered; however, samples could not be collected due to insufficient recharge.

Please contact Mr. Michael J. Miller, Cardno Project Manager for this site, at 206 575 1527, or Ms. Jennifer Sedlachek, EMES Project Manager for this site, at 714 964 4935, with questions.

Sincerely,

Chester Chiao  
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Cardno  
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Michael J. Miller  
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March 6, 2017  
Cardno 031160CX.Q171 Former Mobil Station 99BLV, Bellevue, Washington

**ENCLOSURE**

Cardno's *MW13B Groundwater Monitoring Memorandum*, dated March 6, 2017

cc: w/ enclosure  
Mr. John T. Margeson, Bank of America, N.A.  
Mr. Arne Swanson, Sunset Hill Memorial Park  
Ms. Joanne Bledsoe, Trust & Bel-East Partners, Inc.  
Mr. Jennifer Sedlachek, ExxonMobil Environmental Services Company (*Filed in project folder*)

March 6, 2017  
Cardno 031160CX.Q171

Ms. Jennifer Sedlachek  
ExxonMobil Environmental Services Company  
4096 Piedmont Avenue #194  
Oakland, California 94611

**SUBJECT      MW13B Groundwater Monitoring Memorandum**  
Former Mobil Station 99BLV (VCP No.: NW2892)  
1500 145<sup>th</sup> Place Southeast  
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Ms. Sedlachek:

At the request of ExxonMobil Environmental Services Company (EMES), on behalf of ExxonMobil Oil Corporation, Cardno performs environmental activities as the subject site. The purpose of this memorandum is to summarize groundwater monitoring activities at well MW13B conducted on January 9, 2017.

## BACKGROUND

In December 2014, Cardno conducted confirmation soil sampling to evaluate post-remediation soil conditions at the subject property and to fully characterize the site in accordance with the MTCA. Results indicated the historical remediation system had been effective in reducing residual hydrocarbons to concentrations less than the MTCA Method A Cleanup Levels except for groundwater samples collected from monitoring well MW13B. The results of the confirmation sampling were presented in Cardno's *Remedial Investigation and Soil Assessment Report (Remedial Investigation)*, dated May 28, 2015 (Cardno, 2015). In the *Remedial Investigation*, Cardno concluded that site characterization was complete and that soil and groundwater were protective of human health and the environment in accordance with the MTCA and requested an opinion from the Washington State Department of Ecology (Ecology) regarding the receipt of a no further action (NFA) determination.

In Ecology's *Re: Further Action at the Following Site: Mobil 99BLV*, dated November 13, 2015, Ecology indicated that site characterization was complete and cleanup levels and points of compliance were adequate to meet the substantive requirements of the MTCA (Ecology, 2015). Ecology indicated that further action was warranted based on the historical detections of TPHg and TPHd in groundwater collected from well MW13B. During subsequent discussions with the Ecology site manager, it was agreed upon that well MW13B would need to be monitored a minimum of four consecutive quarters to obtain an NFA determination. However, collecting groundwater samples from MW13B has historically been difficult due to the absence of groundwater, regardless of seasonal fluctuations or following heavy precipitation events. Sufficient volumes of groundwater for laboratory analysis have been collected from well MW13B twice since its installation in 1995 (May 2011 and March 2014; Table 1). Well MW13B is a 2-inch diameter well with a total depth of 26 feet bgs. The screening interval was constructed from 19 to 26 feet bgs with a 0.020-inch slot size. The DTW at MW13B has been measured at depths ranging between 19.67 and 24.70 feet bgs. Groundwater at the subject site is typically encountered at depths ranging from 50 to 60 feet bgs. A review of boring logs in the vicinity of MW13B indicates that blow counts, boring refusals, and soil descriptions are indicative of a semi-confining layer encountered at approximately 20 to 30 feet bgs (Cardno, 2015). Surface

infiltration from the nearby planter encounters the semi-confining layer and creates a small mound in the vicinity of MW13B. Boring logs in the vicinity of MW13B also indicate dry to moist soil conditions from 20 to 40 feet bgs, conditions not indicative of a continuous saturated aquifer above 50 feet bgs, and that the mounded infiltrated surface water is not hydraulically connected to the aquifer at the subject site.

## **SITE DESCRIPTION**

The property is located on the north side of Southeast 16<sup>th</sup> Street and east of 145<sup>th</sup> Place Southeast in Bellevue, King County, Washington (Plate 1). The area is comprised of commercial and residential properties. The King County Assessor tax parcel for the property which comprises the site is: 032405-9162, with a description of Township 24N; Range 05E; Section 03; Quarter-Quarter NENE. The property coordinates are: Latitude 47 Degrees, 35 Minutes, 47.8032 Seconds; Longitude -122 Degrees, 08 Minutes, 59.3124 Seconds (Google, 2017). The property contains an active strip mall consisting of a Quality Food Centers grocery store and other small shops and restaurants. Three USTs of varying size were reported on site and removed in December 1972. The size, content, and installation date for the three USTs is unknown (Ecology, 2014). Locations of the former station building and pump islands, groundwater monitoring wells, and off-site groundwater monitoring wells are shown on Plate 2.

## **GEOLOGY AND HYDROGEOLOGY**

The average groundwater gradient is generally to the southwest and groundwater is typically encountered at depths ranging from approximately 28 to 60 feet bgs (Cardno, 2015). The primary deep aquifer in the area of the study site is the Puget Aquifer. It is composed of undifferentiated glacial and interglacial deposits and is generally more than 400 feet thick (Vaccaro, 1998).

## **MW13B GROUNDWATER MONITORING**

On January 9, 2017, Cardno visited the site to measure DTW and attempted to collect groundwater samples from well MW13B using low-flow methodology Appendix A. Groundwater monitoring activities were performed in accordance with Cardno's standard field protocol (Appendix B). The initial DTW was measured at 24.55 feet bgs and the depth of the well was measured at 26.0 feet bgs. Well MW13B was initially purged at a rate of 200 milliliters per minute (mL/min) and then lowered to a rate of 150 mL/min. A total volume of approximately 0.53 gallon was purged from the well in a span of 12 minutes. Following purging, Cardno attempted to collect groundwater samples for laboratory analysis; however, there was insufficient groundwater after purging to 25.55 feet bgs. A DTW of 25.51 feet was measured after allowing the well to recharge for 30 minutes and was unable to provide sufficient volume for collection of groundwater samples.

## **CONCLUSIONS**

The results of this investigation are consistent with previous sampling events. Monitoring of well MW13B was conducted during the wet season when heavy precipitation events were frequent. However, a groundwater sample was not collected on January 9, 2017 due to insufficient volume in the well. A review of boring logs in the vicinity of well MW13B indicates that groundwater encountered in monitoring well MW13B is representative of a discontinuous perched layer. Thus, analytical results of TPHg and TPHd that exceeded the MTCA Method A Cleanup Levels in well MW13B are not representative of the groundwater conditions at the subject site. Furthermore, only two successful sampling events have occurred at monitoring well MW13B. Therefore, collecting four consecutive quarters of groundwater samples is not feasible at well MW13B.

## **RECOMMENDATIONS**

Cardno recommends submitting a copy of this memorandum to Ecology with a request for a meeting to discuss alternative remedial actions for monitoring well MW13B.

March 6, 2017  
Cardno 031160CX.Q171 Former Mobil Station 99BLV Bellevue, Washington



## LIMITATIONS

For any documents cited that were not generated by Cardno, the data taken from those documents is used "as is" and is assumed to be accurate. Cardno does not guarantee the accuracy of this data and makes no warranties for the referenced work performed nor the inferences or conclusions stated in these documents. This report and the works performed have been undertaken in good faith, with due diligence and with the expertise, experience capability and specialized knowledge necessary to perform the Work in a good and workmanlike manner and within all accepted standards pertaining to providers of environmental services, in Washington at the time of investigation. No soil engineering or geotechnical references are implied or should be inferred. The evaluation of the geologic conditions at the site for this investigation is made from a limited number of data points. Subsurface conditions may vary away from these data points.

Cardno appreciates the opportunity to provide assistance on this project. Please contact Mr. Michael J. Miller, Cardno Project Manager for this site, at 206 767 2360.

Sincerely,

A handwritten signature in black ink that reads "Chester Chiao".

Chester Chiao  
Staff Scientist  
Cardno  
Direct Line +1 206 394 7224  
Email: [chester.chiao@cardno.com](mailto:chester.chiao@cardno.com)

A handwritten signature in black ink that reads "Michael J. Miller".

Michael J. Miller  
Project Manager  
Cardno  
Direct Line +1 206 767 2360  
Email: [michael.miller@cardno.com](mailto:michael.miller@cardno.com)



## REFERENCES

- Cardno. May 28, 2015. *Remedial Investigation and Soil Assessment Report, Former Mobil Station 99BLV, 1500 145<sup>th</sup> Place Southeast, Bellevue, Washington.*
- Google Earth. May 04, 2013. Source: "1500 145<sup>th</sup> Place Southeast" Google Earth. Accessed February 16, 2014.
- Vaccaro, J. J., and others (Vaccaro). 1998. *Hydrogeologic Framework of the Puget Sound aquifer system, Washington and British Columbia*: USGS Professional Paper 1424-B, 82 p.
- Washington State Department of Ecology (Ecology). Integrated Site Information System <https://fortress.wa.gov/ecy/tcpwebreporting/TCPReportViewer.aspx?340390376>. EXXON STATION BEL-EAST SHOPPING CENTER. Accessed: March 20, 2014.
- Washington State Department of Ecology (Ecology). November 13, 2015. *Re: Further Action at the Following Site: Mobil 99BLV, 1500/1510 145<sup>th</sup> Place SE, Bellevue, WA.*

## ENCLOSURES

### Acronym List

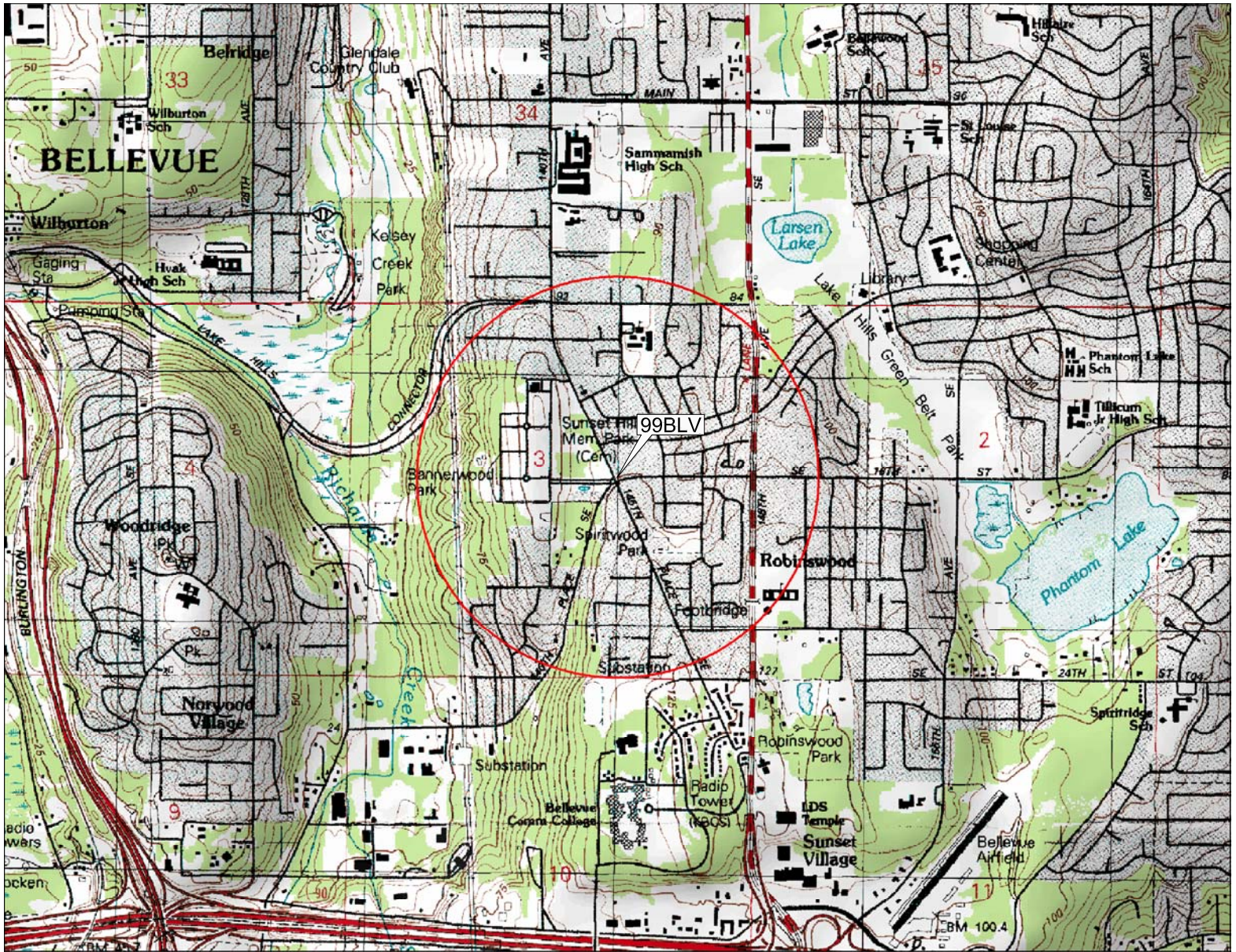
Plate 1	Site Location Map
Plate 2	Generalized Site Plan
Table 1	Cumulative Groundwater Analytical Results – MW13B
Appendix A	Daily Field Log
Appendix B	Field Protocol

March 6, 2017

Cardno 031160CX.Q171 Former Mobil Station 99BLV Bellevue, Washington

**ACRONYM LIST**

µg/L	Micrograms per liter	NAPL	Non-aqueous phase liquid
µs	Microsiemens	NEPA	National Environmental Policy Act
1,2-DCA	1,2-dichloroethane	NGVD	National Geodetic Vertical Datum
acfm	Actual cubic feet per minute	NPDES	National Pollutant Discharge Elimination System
AS	Air sparge	O&M	Operations and Maintenance
bgs	Below ground surface	ORP	Oxidation-reduction potential
BTEX	Benzene, toluene, ethylbenzene, and total xylenes	OSHA	Occupational Safety and Health Administration
CEQA	California Environmental Quality Act	OVA	Organic vapor analyzer
cfm	Cubic feet per minute	P&ID	Process & Instrumentation Diagram
COC	Chain of Custody	PAH	Polycyclic aromatic hydrocarbon
CPT	Cone Penetration (Penetrometer) Test	PCB	Polychlorinated biphenyl
DIPE	Di-isopropyl ether	PCE	Tetrachloroethene or perchloroethylene
DO	Dissolved oxygen	PID	Photo-ionization detector
DOT	Department of Transportation	PLC	Programmable logic control
DPE	Dual-phase extraction	POTW	Publicly owned treatment works
DTW	Depth to water	ppmv	Parts per million by volume
EDB	1,2-dibromoethane	PQL	Practical quantitation limit
EDC	1,2-dichloroethane	psi	Pounds per square inch
EPA	Environmental Protection Agency	PVC	Polyvinyl chloride
ESL	Environmental screening level	QA/QC	Quality assurance/quality control
ETBE	Ethyl tertiary butyl ether	RBSL	Risk-based screening levels
FID	Flame-ionization detector	RCRA	Resource Conservation and Recovery Act
fpm	Feet per minute	RL	Reporting limit
GAC	Granular activated carbon	scfm	Standard cubic feet per minute
gpd	Gallons per day	SSTL	Site-specific target level
gpm	Gallons per minute	STLC	Soluble threshold limit concentration
GWPTS	Groundwater pump and treat system	SVE	Soil vapor extraction
HVOC	Halogenated volatile organic compound	SVOC	Semivolatile organic compound
J	Estimated value between MDL and PQL (RL)	TAME	Tertiary amyl methyl ether
LEL	Lower explosive limit	TBA	Tertiary butyl alcohol
LPC	Liquid-phase carbon	TCE	Trichloroethene
LRP	Liquid-ring pump	TOC	Top of well casing elevation; datum is msl
LUFT	Leaking underground fuel tank	TOG	Total oil and grease
LUST	Leaking underground storage tank	TPHd	Total hydrocarbons as diesel
MCL	Maximum contaminant level	TPHg	Total hydrocarbons as gasoline
MDL	Method detection limit	TPHmo	Total hydrocarbons as motor oil
mg/kg	Milligrams per kilogram	TPHs	Total hydrocarbons as stoddard solvent
mg/L	Milligrams per liter	TRPH	Total recoverable hydrocarbons
mg/m <sup>3</sup>	Milligrams per cubic meter	UCL	Upper confidence level
MPE	Multi-phase extraction	USCS	Unified Soil Classification System
MRL	Method reporting limit	USGS	United States Geologic Survey
msl	Mean sea level	UST	Underground storage tank
MTBE	Methyl tertiary butyl ether	VCP	Voluntary Cleanup Program
MTCA	Model Toxics Control Act	VOC	Volatile organic compound
NAI	Natural attenuation indicators	VPC	Vapor-phase carbon

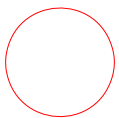


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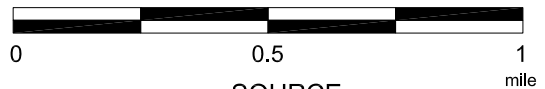
FN 0311600001

**EXPLANATION**



1/2-mile radius circle

**APPROXIMATE SCALE**



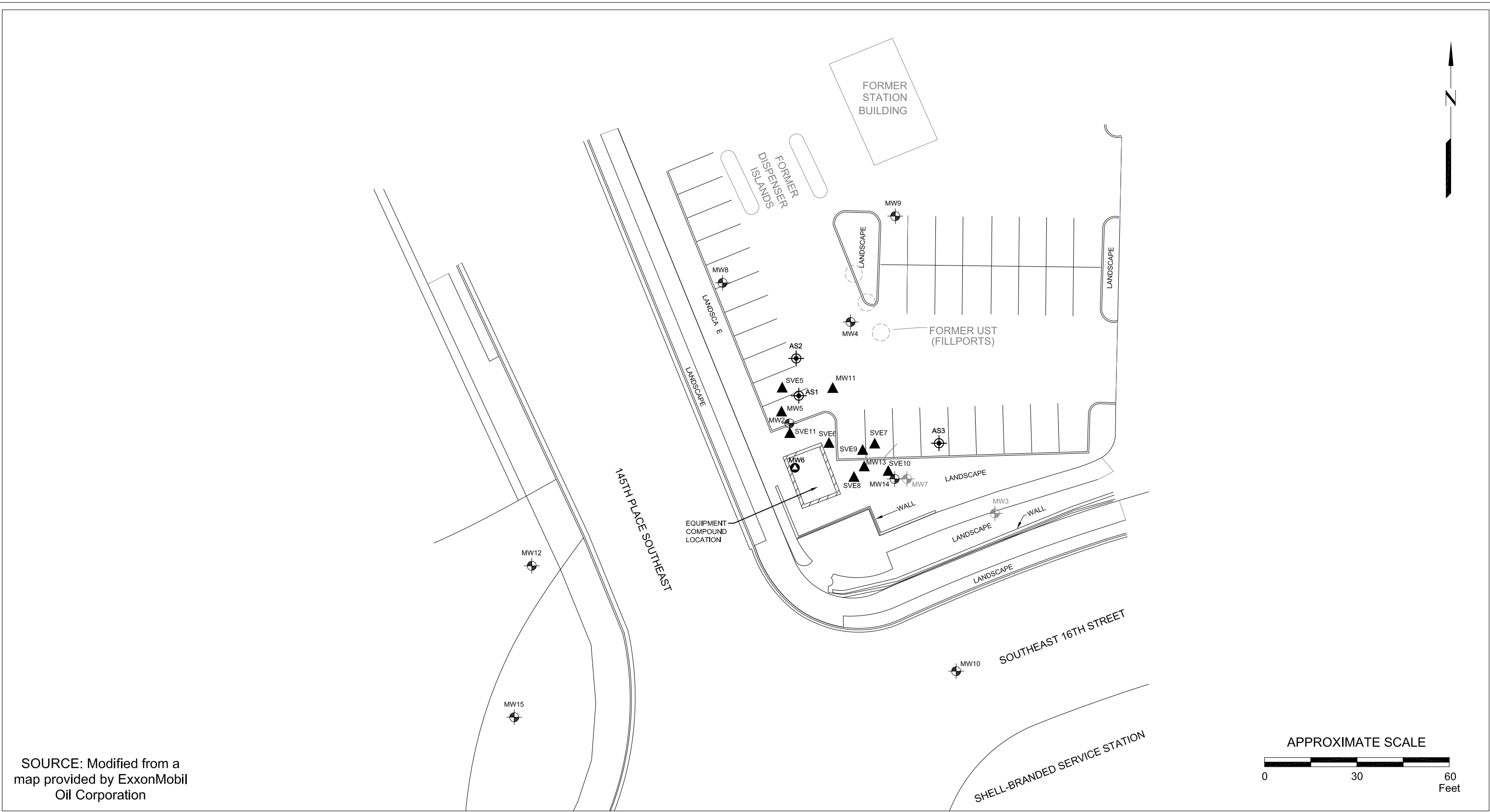
SOURCE:  
Modified from a map  
provided by  
DeLorme 3-D TopoQuads



**SITE LOCATION MAP**  
FORMER MOBIL STATION 99BLV  
1500 145th Place Southeast  
Bellevue, Washington

**PROJECT NO.**  
031160  
**PLATE**  
1  
RGH: 09/29/11





SOURCE: Modified from a map provided by ExxonMobil Oil Corporation

FN 0311600002



# GENERALIZED SITE PLAN

FORMER MOBIL STATION 99BLV  
1500 145th Place Southeast  
Bellevue, Washington

### EXPLANATION

- MW15 Groundwater Monitoring Well
- AS3 Air Sparging Well
- SVE11 Soil Vapor Extraction Well
- MW13A,B,C Vadose Zone Vapor Extraction Well Cluster
- MW7 Covered Groundwater Monitoring Well
- MW1 Destroyed Soil Vapor Extraction Well
- MW6 Dual Phase Extraction Well

### PROJECT NO.

031160

### PLATE

2

EJB:02/17/15

**TABLE 1**  
**CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - MW13B**

Former Mobil Station 99BLV  
 1500 145th Place Southeast  
 Bellevue, Washington

Page 1 of 3

Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	NAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHmo (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)	Total Pb (µg/L)	Diss Pb (µg/L)
Screened Interval 19-26 ft bgs \ Total Depth 26 ft bgs														
MW13B	06/21/95	NE	NM	--	--	--	--	--	--	--	--	--	--	--
MW13B	12/16/95	NE	NM	--	--	--	--	--	--	--	--	--	--	--
MW13B	03/14/96	NE	23.10	0.00	--	--	--	--	--	--	--	--	--	--
MW13B	06/19/96	NE	20.65	0.00	--	--	--	--	--	--	--	--	--	--
MW13B	12/23/96	NE	22.22	0.00	--	--	--	--	--	--	--	--	--	--
MW13B	03/03/97	NE	20.15	0.00	--	--	--	--	--	--	--	--	--	--
MW13B	06/23/97	NE	NM	--	--	--	--	--	--	--	--	--	--	--
MW13B	09/23/97	NE	NM	--	--	--	--	--	--	--	--	--	--	--
MW13B	12/22/97	NE	NM	--	--	--	--	--	--	--	--	--	--	--
MW13B	03/17/98	NE	NM	--	--	--	--	--	--	--	--	--	--	--
MW13B	04/21/98	NE	NM	--	--	--	--	--	--	--	--	--	--	--
MW13B	05/20/98	NE	NM	--	--	--	--	--	--	--	--	--	--	--
MW13B	06/25/98	NE	NM	--	--	--	--	--	--	--	--	--	--	--
MW13B	09/22/98	NE	NM	--	--	--	--	--	--	--	--	--	--	--
MW13B	12/22/98	NE	NM	--	--	--	--	--	--	--	--	--	--	--
MW13B	03/09/99	NE	NM	--	--	--	--	--	--	--	--	--	--	--
MW13B	05/27/99	NE	NM	--	--	--	--	--	--	--	--	--	--	--
MW13B	09/07/99	NE	NM	--	--	--	--	--	--	--	--	--	--	--
MW13B	11/19/99	NE	NM	--	--	--	--	--	--	--	--	--	--	--
MW13B	06/22/00	NE	NM	--	--	--	--	--	--	--	--	--	--	--
MW13B	10/30/01	NE	NM	--	--	--	--	--	--	--	--	--	--	--
MW13B	04/29/02	NE	Inaccessible	--	--	--	--	--	--	--	--	--	--	--
MW13B	02/19/03	NE	Inaccessible	--	--	--	--	--	--	--	--	--	--	--
MW13B	02/29/04	NE	NM	--	--	--	--	--	--	--	--	--	--	--
MW13B	10/12/04	NE	DRY	--	--	--	--	--	--	--	--	--	--	--
MW13B	01/28/05	NE	DRY	--	--	--	--	--	--	--	--	--	--	--
MW13B	07/08/05	NE	DRY	--	--	--	--	--	--	--	--	--	--	--
MW13B	01/25/06	NE	NM	--	--	--	--	--	--	--	--	--	--	--
MW13B	07/27/06	NE	DRY	--	--	--	--	--	--	--	--	--	--	--
MW13B	03/29/07	NE	NM	--	--	--	--	--	--	--	--	--	--	--
MW13B	06/20/07	NE	NM	--	--	--	--	--	--	--	--	--	--	--
MW13B	09/13/07	NE	NM	--	--	--	--	--	--	--	--	--	--	--
MW13B	11/30/07	NE	NM	--	--	--	--	--	--	--	--	--	--	--
MW13B	02/28/08	NE	NM	--	--	--	--	--	--	--	--	--	--	--
MW13B	06/20/08	NE	DRY	--	--	--	--	--	--	--	--	--	--	--
MW13B	09/03/08	NE	DRY	--	--	--	--	--	--	--	--	--	--	--
MTCA Method A Cleanup Levels						800/1,000 <sup>a</sup>	500	500	5	1,000	700	1,000	15	15

**TABLE 1**  
**CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - MW13B**

Former Mobil Station 99BLV  
 1500 145th Place Southeast  
 Bellevue, Washington

Page 2 of 3

Well ID	Sampling Date	Wellhead Elev (feet)	DTW (feet)	NAPL (feet)	GW Elev (feet)	TPHg (µg/L)	TPHd (µg/L)	TPHmo (µg/L)	B (µg/L)	T (µg/L)	E (µg/L)	X (µg/L)	Total Pb (µg/L)	Diss Pb (µg/L)
MW13B	11/03/08	NE	DRY	--	--	--	--	--	--	--	--	--	--	--
MW13B	03/03/09	NE	DRY	--	--	--	--	--	--	--	--	--	--	--
MW13B	05/21/09	NE	DRY	--	--	--	--	--	--	--	--	--	--	--
MW13B	08/05/09	NE	DRY	--	--	--	--	--	--	--	--	--	--	--
MW13B	11/23/09	NE	20.02	0.00	--	--	--	--	--	--	--	--	--	--
MW13B	03/22/10	NE	DRY	--	--	--	--	--	--	--	--	--	--	--
MW13B	06/16/10	NE	DRY	--	--	--	--	--	--	--	--	--	--	--
MW13B	09/02/10	NE	DRY	--	--	--	--	--	--	--	--	--	--	--
MW13B	10/20/10	NE	24.30	--	--	--	--	--	--	--	--	--	--	--
MW13B	01/31/11	NE	24.70	--	--	--	--	--	--	--	--	--	--	--
MW13B	05/25/11	327.45	24.06	0.00	303.39	<b>8,550</b>	<b>557</b>	<111	3.58	9.06	20.7	60.1	<b>34.3</b>	<5.00
MW13B	09/01/11	327.45	23.04	0.00	304.41	--b	--b	--b	<1.00	6.94	<1.00	541	--b	--b
MW13B	12/29/11	327.45	DRY	--	--	--	--	--	--	--	--	--	--	--
MW13B	06/14/12	327.45	NM	--	--	--	--	--	--	--	--	--	--	--
MW13B	03/19/13	327.45	DRY	--	--	--	--	--	--	--	--	--	--	--
MW13B	06/17/13	327.45	DRY	--	--	--	--	--	--	--	--	--	--	--
MW13B	10/30/13	327.45	DRY	--	--	--	--	--	--	--	--	--	--	--
MW13B	03/06/14	327.45	19.67	0.00	307.78	<b>2,860</b>	<b>1,030</b>	<93.5	2.60	9.44	28.6	65.7	12.1	7.70
MW13B	06/04/14	327.45	DRY	--	--	--	--	--	--	--	--	--	--	--
MW13B	01/09/17	327.45	24.55	0.00	302.90	--	--	--	--	--	--	--	--	--

MTCA Method A Cleanup Levels

800/1,000<sup>a</sup> 500 500 5 1,000 700 1,000 15 15

**TABLE 1**  
**CUMULATIVE GROUNDWATER ANALYTICAL RESULTS - MW13B**

Former Mobil Station 99BLV  
1500 145th Place Southeast  
Bellevue, Washington  
Page 3 of 3

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EXPLANATION:

Data collected before 10/30/01 were taken from prior consultants

ft bgs = Feet Below Ground Surface

µg/L = Micrograms per Liter

DTW = Depth to water in feet below top of casing

NAPL = Non-aqueous Phase Liquid thickness in feet

GW Elev = Groundwater elevation relative to top of casing elevation

Groundwater elevation corrected for presence of NAPL = (top of casing elevation - depth to water) + (NAPL\*0.75)

TPHg = Total Petroleum Hydrocarbons as Gasoline in accordance with Ecology Method NWTPH-Gx

TPHd and TPHmo = Total Petroleum Hydrocarbons as Diesel and Oil, respectively, in accordance with Ecology Method NWTPH-Dx

B = Benzene; T = Toluene; E = Ethylbenzene; X = Total Xylenes

BTEX = Aromatic compounds in accordance with EPA Method 8021B or 8260B, refer to laboratory reports

Total Pb = Total lead; Diss Pb = Dissolved lead

Total and dissolved lead analyses in accordance with EPA Method 7421, 6010B, or 6010C, refer to laboratory reports

NE = Not Established; NM = Not Measured; -- = Not Analyzed or Sampled

Shaded values equal or exceed MTCA Method A Cleanup Levels

a = TPHg cleanup level for groundwater is 800 µg/L if benzene is present, or 1,000 µg/L if benzene is not present

b = Analysis not performed due to insufficient sample volume

**APPENDIX A**  
**DAILY FIELD LOG**

**FIELD LOG**  
**PURGING & SAMPLING RECORD AND WELL EQUIPMENT STATUS**

**SITE:** ExxonMobil 99BLV                      **CARDNO #:** 031160  
**LOCATION:** 1500 145th Place Southeast Bellevue, Washington  
**FIELD CREW:** CC                                      **DATE:** 01/09/17                      Low-Flow Sampling

WELL #	MW13B						
TIME	DTW	PURGE VOLUME	Pump Rate (Q)	Temp	COND	pH	DO
hr:min	ft	mL	mL/min	deg C	µS/cm	unit	mg/L
				1 deg	3%	0.1	0.3
13:24	24.55						
13:27	24.73	600	200	15.20	0.704	5.87	2.27
13:30	25.31	1,110	170	14.76	0.692	5.92	2.15
13:33	25.35	1,560	150	14.58	0.700	5.94	2.15
13:36	25.55	2,010	150	14.52	0.698	5.97	2.13
13:39	DRY	--	--	--	--	--	--
14:09	25.51	--	--	--	--	--	--

Comments: Dry well. No longer able to pump water at 25.55 ft of depth to water. Unable to pump well with a purge rate of lower than 150 mL/min. DTW after 30 minutes of recharge was 25.51 feet.

SW	N/A	1 gal = 3.79L					
Total Purge Volume		2,010 mL		0.53 gal			

**APPENDIX B**  
**FIELD PROTOCOL**

**Cardno**  
**Groundwater Sampling Field Protocol – Low-flow Sampling**

The static water level and non-aqueous phase liquid (NAPL) level, if present, in each groundwater monitoring well that contained water and/or NAPL are measured with an interface probe accurate to the nearest 0.01 foot. To calculate groundwater elevations and evaluate groundwater gradient, depth to water (DTW) levels are subtracted from wellhead elevations.

Before water samples are collected from the groundwater monitoring wells, the wells are purged using a peristaltic or a down-well pump at rates not exceeding 1 liter per minute (L/min) until stabilization of the dissolved oxygen (DO), pH, conductivity, and temperature are obtained. Readings of these parameters are taken and recorded every three minutes while the water is purged, and DTW readings are collected every three minutes to ensure drawdown in the well is less than 0.33 feet. If drawdown occurs too quickly, the rate of withdrawal will be reduced.

Purging will continue until three consecutive readings indicate the following:

- Temperature has a change of less than  $\pm 1$  degree Celsius
- Conductivity has a change of less than  $\pm 3\%$
- pH has a change of less than  $\pm 0.10$
- DO has a change of less than  $\pm 10\%$  in concentrations (or less than  $\pm 0.3$  milligram per liter (mg/L) DO, whichever occurs first)

These are indicators of stabilized conditions.

Once groundwater conditions have stabilized, groundwater samples are carefully collected in 40-milliliter (ml) glass vials, which are filled so as to produce a positive meniscus. Each vial is preserved with hydrochloric acid, sealed with a cap containing a Teflon<sup>®</sup> septum, and subsequently examined for air bubbles to avoid headspace, which would allow volatilization to occur. Additional samples may be collected in other sampling containers. The samples are promptly transported in iced storage in a thermally insulated ice chest, accompanied by chain of custody documentation, to a state-certified laboratory.