A Department of Ecology Report

You & I Market
Groundwater Monitoring Results, March 2016: Data Summary Report

Abstract

The You & I Market is an active gas station and convenience store in the town of Pacific Beach, Washington. In 1997, during excavation of a nearby utility vault, workers noted a strong petroleum odor in the soils. Subsequent investigations documented weathered gasoline and diesel contamination exceeding Model Toxics Control Act (MTCA) Method A soil cleanup levels beneath and around the store's pump islands.

Final site characterization and initial cleanup activities began in 2011. To treat the site's contaminated soils and groundwater, chemical and biological oxidants and biological nutrients were injected into the subsurface in September 2011. Following the injections, the groundwater was monitored from September 2011 to February 2013. Groundwater data collected over the monitoring period indicated that while diesel concentrations decreased, concentrations of dissolved-phase gasoline increased. During the February 2013 monitoring event, benzene and TPH-G concentrations remained above the established cleanup levels for groundwater.

To assess current petroleum hydrocarbon concentrations in groundwater at You & I Market, the Department of Ecology collected groundwater samples from the six site monitoring wells in March 2016. Results confirm that the shallow aquifer beneath the site continues to be contaminated with gasoline-range petroleum hydrocarbons. BTEX and TPH-G concentrations exceeded (did not meet) their respective MTCA Method A cleanup levels in two of the sites monitoring wells (MW-1 and MW-2).

Dissolved-phase petroleum hydrocarbons have remained relatively stable since groundwater monitoring began in 2011, even though chemical and biological oxidants and biological nutrients were injected to enhance the biodegradation process. The analytical data collected in March 2016 are similar to those reported at the start of groundwater monitoring in March 2011. Based on this information, further source-area confirmation and control actions are needed to manage the continued contamination in groundwater beneath this site.

Publication No. 16-03-034 September 2016

Publication Information

This report is available on the Department of Ecology's website at https://fortress.wa.gov/ecy/publications/SummaryPages/1603034.html

Data and associated annual monitoring reports for this project are available at Ecology's Environmental Information Management (EIM) website www.ecy.wa.gov/eim/index.htm. Search Study ID: FS86125878.

Ecology's Activity Tracker Code for this study is 16-006.

Water Resource Inventory Area (WRIA) and 8-digit Hydrologic Unit Code (HUC) numbers for the study area:

- WRIA: 21
- HUC number: 17100102

Contact Information

Author: Pamela B. Marti, LHg
Environmental Assessment Program
P.O. Box 47600
Olympia, WA 98504-7600

Communications Consultant
Phone: (360) 407-6764

Washington State Department of Ecology - www.ecy.wa.gov

o Headquarters, Olympia	(360) 407-6000
o Northwest Regional Office, Bellevue	(425) 649-7000
o Southwest Regional Office, Olympia	(360) 407-6300
o Central Regional Office, Yakima	(509) 575-2490
o Eastern Regional Office, Spokane	(509) 329-3400

This report was prepared by a licensed hydrogeologist. A signed and stamped copy of the report is available upon request.

Accommodation Requests: To request ADA accommodation including materials in a format for the visually impaired, call Ecology at 360-407-6764. Persons with impaired hearing may call Washington Relay Service at 711. Persons with speech disability may call TTY at 877-833-6341.

Background

The You & I Market, formerly known as Joe's Market, is located at 51 Main Street in the town of Pacific Beach, Washington (Figure 1). The site has been identified by the Department of Ecology (Ecology) Toxics Cleanup Program as an active Leaking Underground Storage Tank (LUST) site. The Site name is listed as *You & I Market* with an Ecology Facility Site ID 86125878 and a Cleanup Site ID 7139. Its status is listed as cleanup started.

The You & I Market is an active gas station and convenience store, situated on a 0.29-acre parcel approximately 600 feet west of the Pacific Ocean at an elevation of approximately 40 feet above mean sea level.

In 1995, three underground storage tanks (USTs) that had contained leaded gasoline, unleaded gasoline, and diesel fuel were removed and replaced with two new USTs; one for storage of unleaded regular gasoline and a second, a split tank, for storage of premium unleaded and diesel fuel. At the time of the tank replacement, petroleum-contaminated soil was identified but was left in place (Ecology, 2010).

In 1997, during excavation of a nearby utility vault, workers noted a strong petroleum odor in the soils. Two follow-up field investigations were conducted (AEA, 1998 and NWT, 2000). Both investigations documented the presence of weathered gasoline and diesel contamination in soil beneath and around the pump islands in excess of the associated MTCA Method A cleanup levels. The petroleum contamination was observed to extend over 100 feet southeast of the pump island at depths of 4 to 9 feet below ground surface. Petroleum contamination was also encountered south of the USTs. The downgradient extent of the petroleum contamination off the site was not defined by these studies.

In 2009, the property owner hired Environmental Services Network to advance six borings to analyze soil and groundwater quality. Although there was no formal report, laboratory results confirmed the presence of gasoline-range hydrocarbons exceeding MTCA cleanup levels in soil and groundwater southeast of the pump island.

In 2010, during a heavy rainfall, fuel was reported to have bubbled up from the east side of the pump islands' concrete pad (Ecology, 2011). The fuel flowed into a storm drain a few hundred yards away from the subject site. This storm drain empties into Joe Creek, south of Pacific Beach and the site, which flows into the Pacific Ocean.

In February and March of 2011, another investigation was conducted to better define the extent of the contamination; at this time a network of six shallow monitoring wells was installed (Hart Crowser, 2013). During the investigation, petroleum contamination was identified up to 120 feet southeast (downgradient) of the pump island, consistent with the observed groundwater flow direction beneath the site.

In September 2011, chemical and biological oxidants and biological nutrients were injected to a depth of approximately 8 feet below ground surface at 70 locations across the site. These injections were intended to treat both the source area soil and the downgradient soil and groundwater contamination by stimulating biodegradation processes. Following these

injections, groundwater was monitored periodically from September 2011 to February 2013. The groundwater data indicated that while diesel concentrations decreased during the monitoring period, concentrations of dissolved-phase gasoline increased (Hart Crowser, 2013). During the February 2013 monitoring event, benzene and TPH-G concentrations remained above the established cleanup levels for groundwater.

Because the interim remedial action occurred over four years earlier, Ecology collected groundwater samples in March 2016 to assess current petroleum hydrocarbons concentrations in groundwater beneath the site. This data report summarizes and discusses the results.

The data for this project are available at Ecology's Environmental Information Management (EIM) website www.ecy.wa.gov/eim/index.htm. Search Study ID: FS86125878.

Method and Results

Ecology collected groundwater samples from the six site monitoring wells (MW-1 through MW-6) in March 2016. All wells were sampled in accordance with the site-specific Quality Assurance Project Plan (Marti, 2016) and Ecology's SOP EAP078 (Marti, 2014). Due to the presence of fine-grained sediments in the screened intervals and potentially low yield of the monitoring wells, each well was purged and sampled with a peristaltic pump using dedicated tubing. This is consistent with sample methods previously used at the site. The pump tubing intake was placed near the bottom of the screen and the wells purged at a rate of 0.25-liter/minute. Only well MW-6 exhibited minor drawdown while purging, the rest of the wells remained stable.

Samples were collected in clean laboratory-supplied bottles and submitted for analysis of benzene, toluene, ethylbenzene, and xylene (BTEX), and total petroleum hydrocarbons as gasoline and diesel (TPH-G and TPH-D) (Ecology, 1997). All samples were analyzed by Ecology's Manchester Environmental Laboratory. Results of these analyses are summarized in Table 1.

A field duplicate sample [MW-2 (dup)] was collected from well MW-2. The relative percent difference (RPD[1]) calculated for the duplicate sample results ranged from 0% to 15% for benzene, ethylbenzene, and TPH-G, meeting the data quality objectives of 30% established in the QAPP (Marti, 2016). Toluene and o-xylene duplicate results did not meet the DQOs, consequently these results have been qualified as estimates. The reporting limit for TPH-D had to be raised for samples collected from wells MW-1 and MW-2, due to the presence of significant amounts of gasoline. A transport blank was carried throughout the sample event. No analytes were detected in the transport blank.

[1] RPD is calculated as the difference between replicate sample results, divided by the replicate mean with the result expressed as a percentage. The RPD calculation provides a measure of the overall sampling and analytical precision. Precision estimates are influenced not only by the random error introduced by collection and measurement procedures, but also by the natural variability of the concentrations in the media being sampled.

Table 1: Sample Results for You & I Market, March 2016.

Field Measurements							Laboratory Analysis						
							MTCA Method A Cleanup Levels						
							5	1000	700	1000		800	500
Well ID	Well Depth (feet) TOC	Depth to Water (feet) TOC	pH (Std. Units)	SC (uS/ cm)	DO (mg/ L)	ORP (mV)	Benzene (ug/L)	Toluene (ug/L)	Ethyl Benzene (ug/L)	m,p-Xylene (ug/L)	o-Xylene (ug/L)	TPH-G (ug/L)	TPH-D (ug/L)
MW-1	10	4.76	6.8	500	0.02	-95	**42**	**58 J**	**1,500**	**3,200**	**88 J**	**30,000**	11,000 U
MW-2	10	4.25	6.7	472	0.03	-97	**110**	**21 J**	**290**	2 U	**12 J**	**2,200**	1,600 U
MW-2 (dup)	--	--	--	--	--	--	**94**	**6.4 J**	**250**	**4.4**	**6.4 J**	**2,200**	1,600 U
MW-3	10	2.94	6.8	265	0.05	-69	1 U	1 U	1 U	2 U	1 U	**170**	200 U
MW-4	10	3.26	6.7	108	0.04	162	1 U	1 U	1 U	2 U	1 U	70 U	140 U
MW-5	10	3.41	6.8	187	0.03	174	1 U	1 U	1 U	2 U	1 U	70 U	140 U
MW-6	10	1.01	6.7	270	0.05	38	1 U	1 U	1 U	2 U	1 U	70 U	140 U

TOC: Top of Casing SC: Specific Conductance DO: Dissolved Oxygen ORP: Oxidation Reduction Potential
U: Analyte was not detected at or above the reported value.
J: Analyte was positively identified. The associated numerical result is an estimate.
Bold: Analyte was detected. Shade: Values are greater than the MTCA cleanup levels.

During the March 2016 monitoring event, elevated concentrations of dissolved-phase BTEX and TPH-G were detected in wells MW-1 and MW-2. These wells are located adjacent to and immediately downgradient of the site's pump island (Figure 1). Groundwater samples collected from well MW-1 had the highest concentrations of petroleum related contaminants. Benzene, ethylbenzene, xylene, and TPH-G concentrations exceeded the MTCA Method A cleanup levels (Table 1). Only benzene and TPH-G exceeded the cleanup levels in samples collected from well MW-2. The 2016 results are consistent with historical data for these two monitoring locations (Table 2).

TPH-G was also detected at 170 ug/L in well MW-3, which is approximately 120 feet downgradient of the pump island. This is also consistent with previous site data (Table 2).

TPH-D was not detected in any of the sampled wells during the most recent groundwater monitoring event. Although the reporting limit was raised in 2016 for select TPH-D analysis, TPH-D has not been detected above standard reporting limits in any of the site wells since September 2011.

Petroleum hydrocarbons were not detected in wells MW-4, MW-5, and MW-6 during the March 2016 sample event, which is consistent with historical data for these monitoring locations (Table 2).

Project data collected since 2011 are presented in Figure 2 and Table 2.

Discussion and Conclusions

Water quality results from the March 2016 groundwater monitoring confirms the continued presence of gasoline-range petroleum hydrocarbons and fuel constituents in the shallow groundwater beneath You & I Market. Dissolved-phase BTEX and TPH-G concentrations continue to exceed (not meet) their respective MTCA Method A cleanup levels in two of the sites monitoring wells (MW-1 and MW-2).

Dissolved-phase petroleum hydrocarbons have remained relatively stable over the course of this project, despite the injection of chemical and biological oxidants and biologically nutrients in 2011. Groundwater contaminant concentrations from the 2016 monitoring are similar to those reported at the start of groundwater monitoring in March 2011.

Contaminated soils left in place during the 1995 tank replacement are a likely source of continued dissolved-phase petroleum hydrocarbons in shallow groundwater beneath the site. High petroleum concentrations detected in samples collected from well MW-1, along with the observation of hydrocarbons surfacing at the pump island in 2010, suggests a source-location in the immediate vicinity of the pump island. Further source-area confirmation and control actions are needed to manage the continued contamination at this site.

Recommendations

Based on the March 2016 monitoring results, the following recommendations are proposed:

- Further source-area delineation and control actions are needed to manage the continued petroleum contamination in groundwater beneath the site. The 2016 BTEX and TPH-G results indicate that concentrations have returned to levels observed prior to the interim remedial action. These results suggest the presence of a residual petroleum hydrocarbon source beneath the site.
- Any future groundwater monitoring should include an evaluation of the site's natural attenuation properties. Evaluation of geochemical conditions in groundwater beneath the site may help determine what, if any, additional remedial actions are needed once the source area has been confirmed.

References

AA Enviro Assessment Inc. (AEA), 1998. Underground Storage Tank Site Check and Site Assessment, January 1998.

Ecology, 1997. Analytical Methods for Petroleum Hydrocarbons. Toxics Cleanup Program, Washington State Department of Ecology, Olympia, WA. Publication No. 97-602. https://fortress.wa.gov/ecy/publications/SummaryPages/97602.html

Ecology, 2010. SEPA Environmental Checklist. February 19, 2010.

Ecology, 2011. Draft Cleanup Action Plan, You & I Market Site. Toxics Cleanup Program, Washington State Department of Ecology, Olympia, WA. August 2011.

Hart Crowser, 2013. Groundwater Summary Report; You & I Market, Pacific Beach, WA. April 11, 2013. Project #17800-33.

Marti, P., 2014. Standard Operating Procedure for Purging and Sampling Monitoring Wells plus Guidance on Collecting Samples for Volatiles and Other Organic Compounds, Version 2.0. Washington State Department of Ecology, Olympia, WA. SOP Number EAP078. www.ecy.wa.gov/programs/eap/quality.html

Marti, P., 2016. Quality Assurance Project Plan: You & I Market, Pacific Beach Groundwater Performance Monitoring. Washington State Department of Ecology, Olympia, WA. Publication No. 16-03-107. https://fortress.wa.gov/ecy/publications/SummaryPages/1603107.html

Northwest Testing Company (NWT), 2000. Environmental Site Characterization, November 21, 2000.

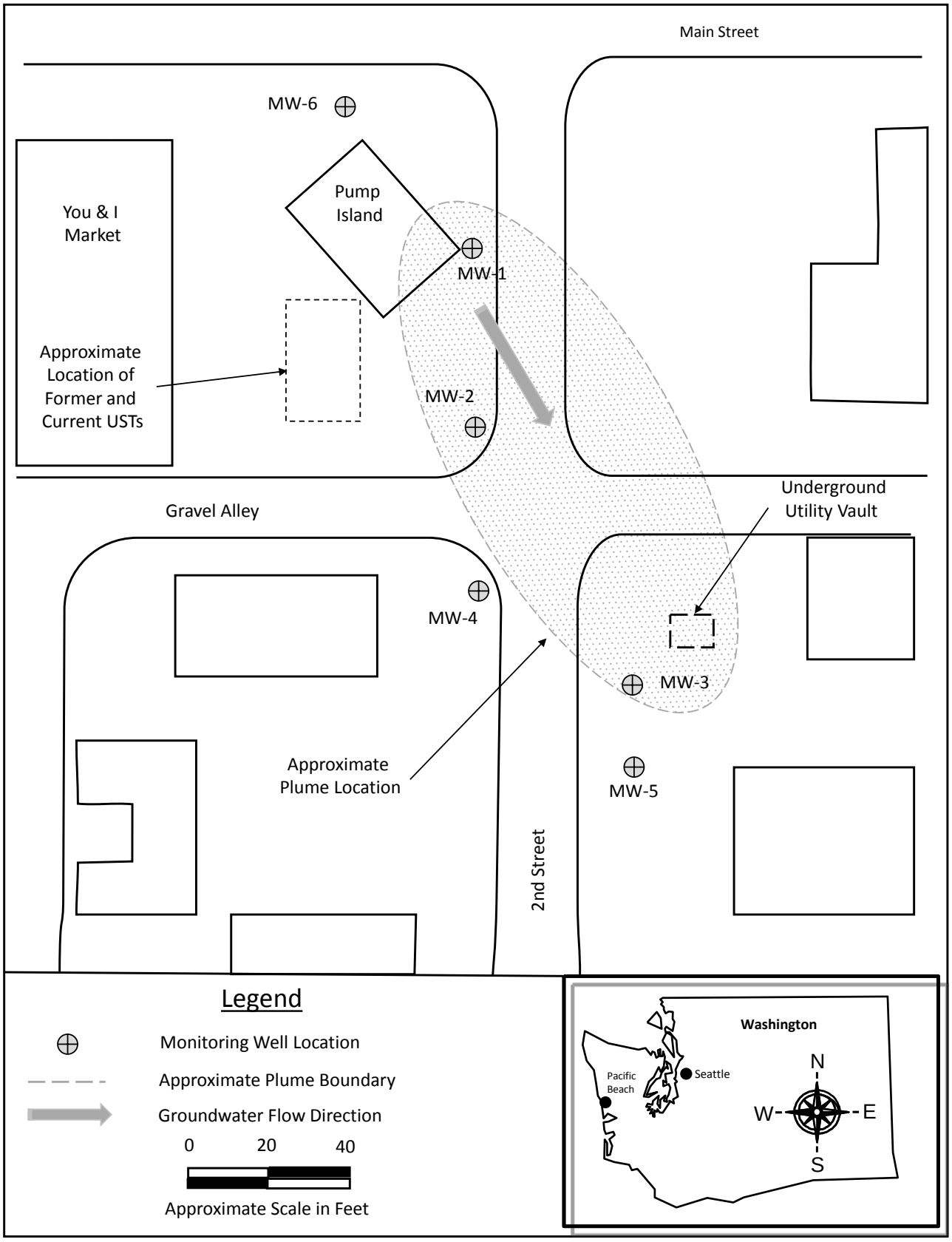
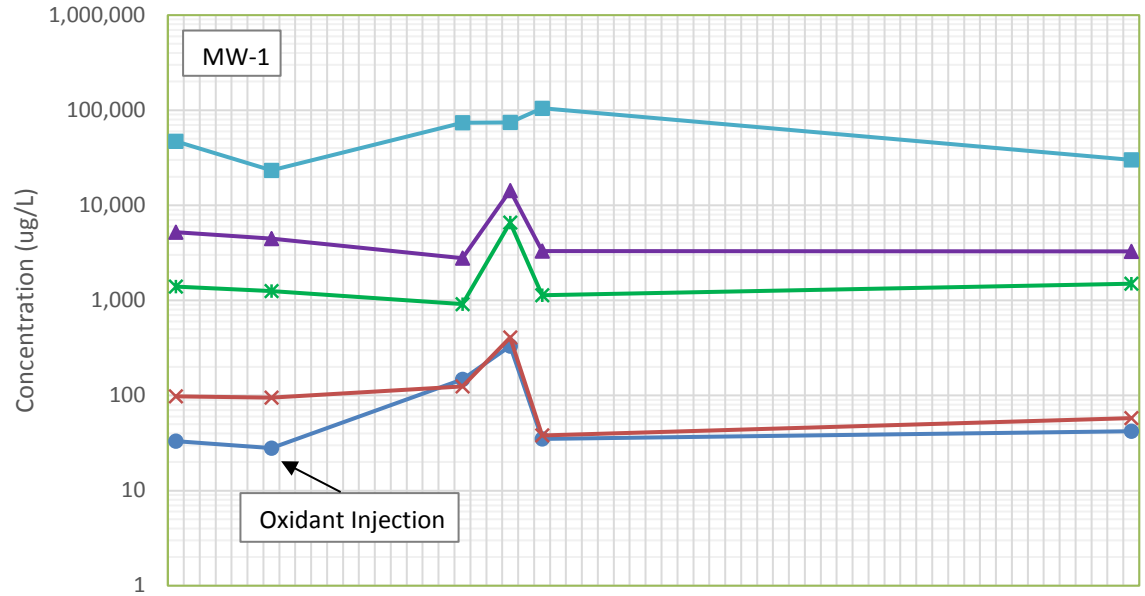
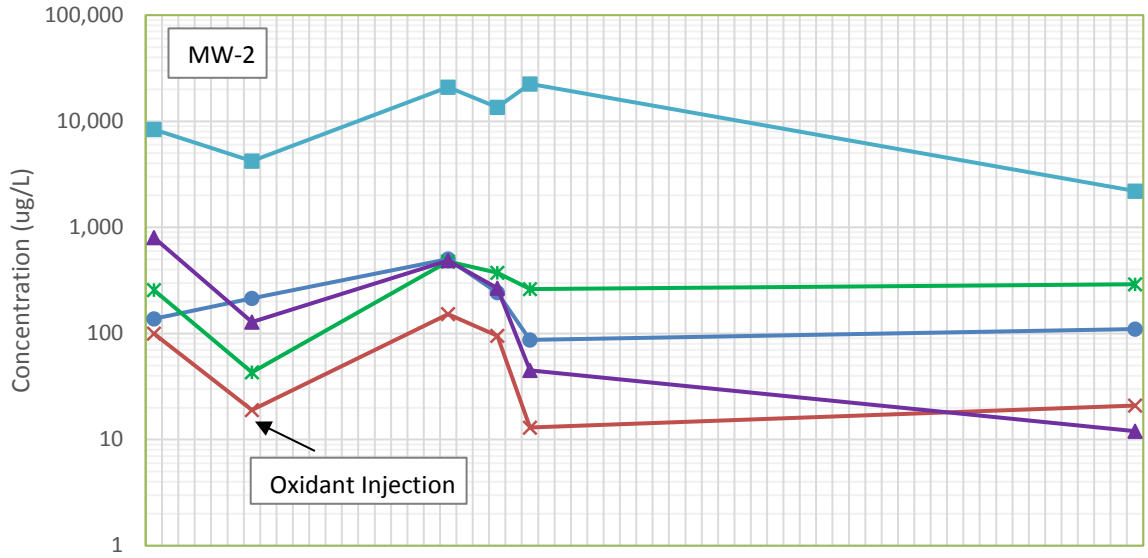


Figure 1. You & I Market Location and Site Details.



	Mar-11	Sep-11	Sep-12	Dec-12	Feb-13	Mar-16
Benzene	33	28	148	331	35	42
Toluene	98	95	125	407	38	58
Ethylbenzene	1,400	1,250	915	6,580	1,130	1,500
Xylene	5,220	4,460	2,780	14,300	3,290	3,288
TPH-G	47,200	23,330	74,000	74,400	105,000	30,000



	Mar-11	Sep-11	Sep-12	Dec-12	Feb-13	Mar-16
Benzene	137	214	502	243	87	110
Toluene	100	19	152	95	13	21
Ethylbenzene	256	43	477	373	262	290
Xylene	803	128	485	267	45	12
TPH-G	8,360	4,200	20,900	13,500	22,500	2,200

Figure 2. BTEX and TPH-G Results (ug/L) for Wells MW-1 and MW-2, March 2011 to March 2016.

Table 2. BTEX, TPH-G, and TPH-D Groundwater Results (ug/L), March 2011 to March 2016.

Well ID (TOC Elevation Feet)	Sample Date	Well Depth in Feet (TOC)	Depth to Water in Feet (below TOC)	MTCA Method A Cleanup Levels (ug/L)					
				5	1,000	700	1,000	800/1,000[a]	500
				Benzene	Toluene	Ethyl Benzene	Total Xylene	TPH-G	TPH-D
MW-1	3/11	10.0	3.02	**33**	**98**	**1,400**	**5,220**	**47,200**	**6,840**
(36.73)	9/11		6.17	**28**	**95**	**1,250**	**4,460**	**23,330**	**2,750**
	9/12		8.54	**148**	**125**	**915**	**2,780**	**74,000**	<200
	12/12		4.15	**331**	**407**	**6,580**	**14,300**	**74,400**	<200
	2/13		2.43	**35**	**38**	**1,130**	**3,290**	**105,000**	<200
	3/16		4.76	**42**	**58 J**	**1,500**	**3,288 J**	**30,000**	11,000 U
MW-2	3/11	10.0	2.49	**137**	**100**	**256**	**803**	**8,360**	**1,910**
(36.17)	9/11		5.71	**214**	**19**	**43**	**128**	**4,200**	**1,230**
	9/12		8.00	**502**	**152**	**477**	**485**	**20,900**	<200
	12/12		3.60	**243**	**95**	**373**	**267**	**13,500**	<200
	2/13		3.00	**87**	**13**	**262**	**45**	**22,500**	<200
	3/16		4.25	**110**	**21 J**	**290**	**12 J**	**2,200**	1,600 U
MW-3	3/11	10.0	1.37	<0.25	<1	<0.5	<1.5	**145**	<236
(34.27)	9/11		4.26	<0.2	<0.5	0.66	1.44	**120**	<120
	9/12		6.50	<1	<2	<1	<3	<100	<200
	12/12		2.10	<1	**2.5**	<1	<3	**849**	<200
	2/13		1.60	<1	<2	<1	<3	**890**	<200
	3/16		2.94	1 U	1 U	1 U	3 U	**170**	200 U
MW-4	3/11	10.0	1.43	<0.25	<1	<0.5	<1.5	<100	<236
(35.08)	9/11		4.66	<0.2	<0.5	<0.5	<1	<80	<100
	9/12		7.02	<1	<2	<1	<3	<100	<200
	12/12		2.40	<1	<2	<1	<3	<100	<200
	2/13		1.80	<1	<2	<1	<3	<100	<200
	3/16		3.26	1 U	1 U	1 U	3 U	70 U	140 U
MW-5	3/11	10.0	1.48	<0.25	<1	<0.5	<1.5	<100	<245
(34.00)	9/11		4.55	<0.2	<0.5	<0.5	<1	<80	<98
	9/12		6.75	<1	<2	<1	<3	<100	<200
	12/12		2.60	<1	<2	<1	<3	<100	<200
	2/13		1.85	<1	<2	<1	<3	<100	<200
	3/16		3.41	1 U	1 U	1 U	3 U	70 U	140 U
MW-6	3/11	10.0	0.15	<0.25	<1	<0.5	<1.5	<100	<236
(38.58)	9/11		4.67	<0.2	<0.5	<0.5	<1	<80	<98
	9/12		7.30	<1	<2	<1	<3	<100	<200
	12/12		1.01	<1	<2	<1	<3	<100	<200
	2/13		0.28	<1	<2	<1	<3	<100	<200
	3/16		1.01	1 U	1 U	1 U	3 U	70 U	140 U

TOC: Top of Casing
Elevation: Vertical Datum NAVD88. Vertical accuracy measure ± 10 ft (3 m).
a: MTCA Method A cleanup level for TPH-G is 1,000 ug/L if benzene is not detectable in groundwater.
U: Analyte was not detected at or above the reported value.
J: Analyte was positively identified. The associated numerical result is an estimate.
Bold: Analyte was detected.
Shade: Value is greater than the MTCA cleanup levels.