

**2018 Annual Groundwater Monitoring Report
North Marina Bayside/ABW
Everett, Washington**

October 24, 2018

Prepared for

Port of Everett
Everett, Washington



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2018 Annual Groundwater Monitoring Report North Marina Bayside/ABW Everett, Washington

This document was prepared by, or under the direct supervision of, the technical professionals noted below.

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Project Coordinator: tam

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LIST OF ABBREVIATIONS AND ACRONYMS

Bayside/ABW.....	North Marina Bayside Marine/American Boiler Works
°C.....	degrees Celsius
Ecology.....	Washington State Department of Ecology
EPA.....	US Environmental Protection Agency
FeAs.....	iron-arsenic
ft.....	foot/feet
LAI.....	Landau Associates, Inc.
µg/L.....	micrograms per liter
µS/cm.....	microsiemens per centimeter
mg/L.....	milligrams per liter
mV.....	millivolt
MTCA.....	Model Toxics Control Act
NFA.....	no further action
Port.....	Port of Everett
PVC.....	polyvinylchloride
Site.....	North Marina Bayside Marine/American Boiler Works
TOC.....	Top of Casing
VCP.....	voluntary cleanup program

1.0 INTRODUCTION

This report summarizes the field activities and analytical results for the annual groundwater quality monitoring events completed in June 2018 at the North Marina Bayside Marine/American Boiler Works site (Bayside/ABW Site or Site) in Everett, Washington (Figure 1).

1.1 Background

Cleanup at the Site was completed through the Washington State Department of Ecology (Ecology) Voluntary Cleanup Program (VCP) in 2015 as described in the Investigation and Cleanup Report (Landau Associates, Inc. [LAI] 2015). Ecology issued a no further action (NFA) determination in October 2015 (Ecology 2015). The NFA and associated environmental covenant require confirmational groundwater monitoring for a period of 5 years in order to demonstrate that concentrations of arsenic in groundwater are above the Model Toxics Control Act (MTCA) Method A cleanup level only where reducing conditions are present, and that concentrations of arsenic in groundwater meet the cleanup level at the downgradient point of compliance (monitoring well P-27). The four monitoring wells identified for groundwater monitoring consist of wells HWA-MW1, HWA-MW2, P-26, and P-27.

As documented in the 2017 monitoring report, monitoring well P-27 and replacement monitoring well P-27B (which was installed in mid-March 2016 in the immediate vicinity of monitoring well P-27) were damaged during ongoing redevelopment activities at the Site and at the adjacent Everett Shipyard site. The damaged wells were decommissioned in May of 2017 (LAI 2018). With approval from Ecology, monitoring well P-27B was replaced with P-27C, which was installed in June 2018 in the immediate vicinity of monitoring well P-27B. The well locations are shown on Figure 2.

1.2 Site Description

The Site is located on the eastern portion of the Port of Everett (Port) Waterfront Place Central Redevelopment Area and is approximately 3 acres in size. The Site is generally bounded by 13th Street/Port Gardner Way followed by a boatyard to the north, West Marine View Drive followed by railroad tracks to the east, 14th Street followed by the former Everett Shipyard site to the south, and undeveloped land and a boat storage yard to the west. Port Gardner Bay and a marina are located to the southwest of the Site. The eastern portion of the Bayside Marine/ABW VCP Site consists of the former ABW Plant I leasehold. The western portion of the Site consists of a portion of the former Everett Bayside Marine Leasehold. The eastern portion of the site is now owned by American Classic Homes and the western half is owned by the Port including a portion leased for development. Redevelopment is occurring across the Site.

2.0 FIELD ACTIVITIES

This section describes installation of replacement well P-27C and groundwater monitoring activities conducted in June 2018.

2.1 Replacement Well (P-27C) Installation

Replacement well P-27C was installed on June 22, 2018 using direct-push technology. The well was installed within an approximate 10-foot (ft) radius of the original P-27 and subsequent P-27B replacement well locations (Figure 2). The location for P-27C was determined prior to installation and was agreed upon by the Port and Ecology to limit potential damage associated with ongoing construction activities at the Site and to ensure accessibility once construction activities are completed. The well was installed using the same construction specifications as P-27B and the well log is included in Appendix A.

Monitoring well P-27C was developed prior to sampling by surging the sand pack and surrounding formation using a Wattera™ foot valve fitted with a plastic surge block. During development, temperature (degrees celcius [°C]), pH, and conductivity (millisiemens) were measured using a field meter and visual observations for turbidity were recorded. Approximately 10 gallons of purge water was removed from P-27C and stored onsite in a 55-gallon, steel drum. Disposal of the purge water is being coordinated per the Port's direction. The well was allowed to equilibrate prior to sampling.

2.2 Routine Groundwater Monitoring Activities

Described below are the activities conducted on an annual basis as part of the confirmational groundwater monitoring plan prescribed for the Site by Ecology. Monitoring activities conducted in June 2018 include water level measurements, groundwater sampling and analysis, and quality assurance.

2.2.1 Water Level Measurements

Static water levels were measured prior to groundwater sampling at each of the four wells (HWA-MW1, HWA-MW2, P-26, and P-27C). The depth to groundwater was measured to the nearest 0.01 ft from the top of the north side of the polyvinylchloride (PVC) casing to groundwater using an electric water level indicator. Depth to water measurements at each well were converted to groundwater elevations using surveyed elevations for the top of the PVC casing. The surveyed top of casing (TOC) elevation for P-27 was used to generate groundwater elevations for P-27C as the TOC elevation for P-27C was not surveyed.

2.2.2 Groundwater Sampling

The groundwater samples were collected with a peristaltic pump using low-flow groundwater sampling procedures. Prior to collecting samples, depth to groundwater was measured at each location. The wells were then purged and field parameters (temperature in °C; conductivity

[microsiemens per centimeter { $\mu\text{S}/\text{cm}$ }); dissolved oxygen [milligrams per liter { mg/L }); pH; and oxygen reduction potential [millivolts { mV })] were recorded every 3 minutes until stabilization objectives were achieved.

2.2.3 Groundwater Analysis

In accordance with the Confirmational Monitoring Plan (Appendix C; Ecology 2015), samples were collected and analyzed for dissolved arsenic, nitrate, sulfate, and methane at each monitoring well. Samples for dissolved arsenic analysis were field-filtered using a 0.45-micron single-use groundwater filter. Samples were submitted to ALS Environmental laboratory in Everett, Washington. Samples were also tested for ferrous iron in the field using a Hach® iron field testing kit.

2.2.4 Quality Assurance

Field and laboratory control samples were used to evaluate data precision, accuracy, representativeness, completeness, and comparability of the analytical results. The quality control samples included collection and analysis of one field duplicate for each analysis performed and analysis of a laboratory duplicate. The field duplicate was collected from monitoring well HWA-MW1 and identified on the chain-of-custody as 'DUP'.

Validation of the analytical data was performed by LAI following the guidelines in the appropriate sections of the US Environmental Protection Agency (EPA) Contract Laboratory Program National Functional Guidelines for Organic and Inorganic Data Review (EPA 1999; 2004), and included evaluation of the following:

- Chain-of-Custody records
- Holding times
- Laboratory method blanks
- Blank spikes/laboratory control samples
- Field duplicate results
- Completeness
- Overall assessment of data quality.

Based on the validation, all of the data were determined to be acceptable for use. No qualification of the data was necessary. However, the dissolved arsenic reporting limit was raised by the laboratory to address background contamination in the associated method blank. The adjusted reporting limit is less than the cleanup level.

3.0 2018 GROUNDWATER MONITORING RESULTS

This section presents the results of the 2018 annual groundwater monitoring event, which consists of groundwater elevation data and groundwater quality data.

3.1 Groundwater Levels

Groundwater elevations calculated using water level measurements collected from each monitoring well were used to evaluate groundwater flow direction at the Site. The calculated groundwater elevations are presented in Table 1. Groundwater elevation contours were plotted using the calculated groundwater elevations and are shown on Figure 3. The contours indicate the groundwater at the Site generally flows to the west, consistent with previous monitoring events at the Site.

3.2 Groundwater Quality

The 2018 annual monitoring event was completed on June 28, 2018. The analytical results are summarized in Table 2 and the laboratory analytical report is included in Appendix B. Groundwater samples were analyzed for dissolved arsenic, methane, nitrate, and sulfate at all sample locations. In addition, samples were tested at all locations for ferrous iron using a field test kit.

Arsenic was detected in samples from monitoring wells HWA-MW1, HWA-MW2, and P-26, at the same concentration of 18 micrograms per liter ($\mu\text{g/L}$), which exceeds the cleanup level ($5 \mu\text{g/L}$). Consistent with Site groundwater monitoring data from previous sampling events, the detected concentrations of dissolved arsenic in these wells were within the range of previously detected concentrations. Dissolved arsenic was not detected at downgradient well P-27C. As previously stated, the dissolved arsenic reporting limit was raised to $4.0 \mu\text{g/L}$ by the laboratory to address background contamination in the associated method blank. The adjusted reporting limit is less than the cleanup level and is less than the concentration of dissolved arsenic detected at well P-27B during the 2017 monitoring event.

The annual 2018 groundwater data indicate that conditions are naturally reduced at the Site, which is consistent with previous Site data. Conditions that are at least iron-reducing will release arsenic due to reduction (solubilization) of iron-arsenic (FeAs) complexes. Site data indicate that Site conditions are not only iron-reducing, based on the detection of ferrous iron at all monitoring locations, but also indicate nitrate reduction (nitrate was not detected in any of the samples), and sulfate reduction (i.e. conditions are more strongly reducing than required for solubilization of FeAs), based on the low detected concentrations of sulfate (less than 0.26 mg/L to 3.2 mg/L) in three of the four Site monitoring wells. In addition, methane was detected in all of the groundwater samples, indicating that conditions are also methanogenic (methane producing), which is also indicative of highly reducing conditions.

4.0 SUMMARY OF 2018 MONITORING RESULTS

Concentrations of dissolved arsenic detected in groundwater at the Site during routine monitoring completed in 2018 are generally consistent with previous sampling data, with detected concentrations of dissolved arsenic below the cleanup level at the downgradient well (P-27C). During the 2017 monitoring event, dissolved arsenic was detected at a concentration exceeding the cleanup level at the downgradient well (6.2 µg/L at P-27B) for the first time since the confirmational monitoring program began in 2016. The anomalous result was suspected to be due to material entering the well when it was damaged and not likely representative of an increase in dissolved arsenic concentrations at this location. The damaged well was decommissioned and replaced in 2018. The results from the 2018 monitoring event are consistent with historical data and indicate that dissolved arsenic concentrations meet the cleanup level at the point of compliance.

The maximum detected concentration of dissolved arsenic during the 2018 monitoring event (18 µg/L) is equal to the maximum detected concentrations during monitoring completed in 2017 (18 µg/L) and below the maximum concentration detected during monitoring in 2016 (23 µg/L). Concentrations of dissolved arsenic are stable and generally decreasing. Data from 2014 and 2015 monitoring events are included in Appendix C.

Site data continue to support the conclusion that elevated concentrations of arsenic are present due to reducing conditions and are unrelated to Site releases. Ferrous iron and methane were detected in all four samples during the 2018 event; nitrate was not detected in any of the samples. Sulfate was either not detected or detected at low concentrations in all but the downgradient well. This trend supports the conclusion that elevated arsenic concentrations at the Site are associated with reducing conditions.

5.0 CONCLUSIONS

Based on the results of 2018 groundwater monitoring, Site groundwater does not pose a threat to human health and the environment. Because groundwater at the Site is not used as drinking water, the pathway of concern is a release to marine surface water. With the exception of the anomalous result during the 2017 monitoring event, dissolved arsenic was not detected at concentrations greater than the cleanup level in any of the nine groundwater samples collected from the downgradient monitoring well P-27/P-27B/P-27C between March of 2014 and June of 2018, indicating that there is no complete pathway to surface water.

In accordance with the NFA and environmental covenant, compliance monitoring and reporting will continue to be conducted on an annual basis until 2020.

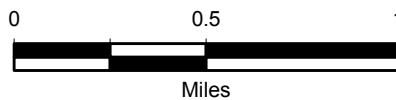
6.0 USE OF THIS REPORT

This document has been prepared for the exclusive use of the Port of Everett and Ecology for specific application to the North Marina Bayside/ABW Project. No other party is entitled to rely on the information, conclusions, and recommendations included in this document without the express written consent of the Port and Landau Associates. Further, the reuse of information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by the Port and Landau Associates, shall be at the user's sole risk. Landau Associates warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as this project. We make no other warranty, either express or implied.

7.0 REFERENCES

- Ecology. 2015a. Letter: Re: No Further Action at the following Site: North Marina Bayside ABW, 1332 West Marine View Drive, Everett, WA 98201. From Washington State Department of Ecology, to Elise Gronewald, Port of Everett. October 1.
- EPA. 1999. USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review. Edited by Office of Emergency and Remedial Response. Washington, DC: US Environmental Protection Agency.
- EPA. 2004. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. Edited by Office of Superfund Remediation and Technology Innovation: US Environmental Protection Agency.
- LAI. 2015. Environmental Investigation and Cleanup Documentation, American Boiler Works/Bayside Marine Site, Everett, Washington. Landau Associates, Inc. April 27.
- LAI. 2018. 2017 Annual Groundwater Monitoring Report, North Marina Bayside/ABW, Everett, Washington. Landau Associates, Inc. February 1.

G:\Projects\147\037\030\04\02\018 Annual Monitoring Report\F01_ViaMap.mxd 8/16/2018 NAD 1983 StatePlane Washington North FIPS 4601 Feet



Data Source: Esri 2012






North Marina
 ABW/Bayside Marine VCP Site
 Port of Everett, Washington

Vicinity Map

Figure
1



Legend

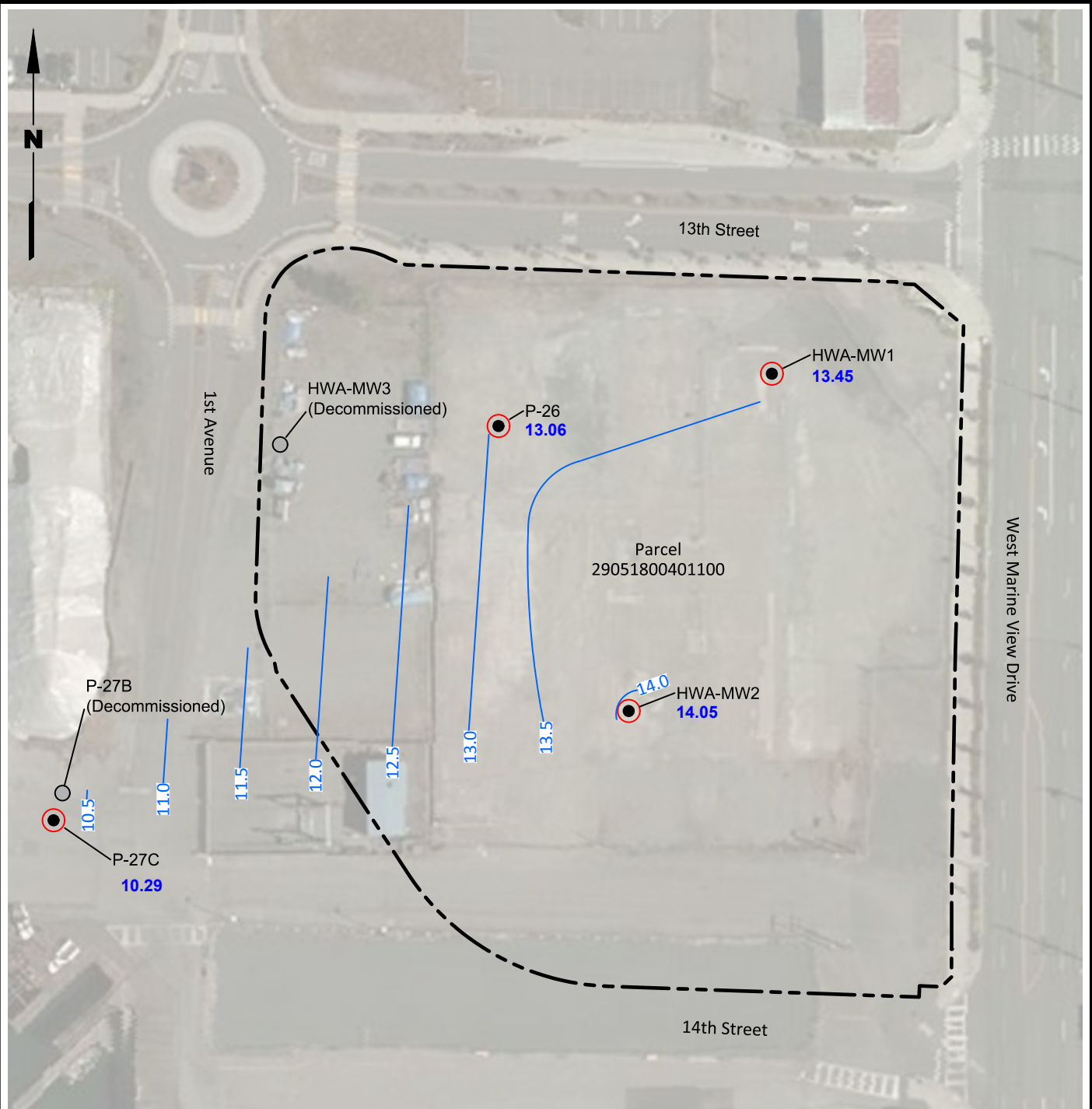
-  Decommissioned May 19, 2017
-  Monitoring Well Network (P-27C replaced P-27B)
-  Snohomish County Parcel Line / Area of Groundwater Use Restriction

Note






1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.



Source: ©Bing Imagery, 2015; Snohomish County GIS (parcel data);



Legend

-  Decommissioned May 19, 2017
-  Monitoring Well Network (P-27C replaced P-27B)
- 11.29**
 Groundwater Elevation (feet, MLLW)
- 11.5**
 Approximate Groundwater Elevation Contour
-  Snohomish County Parcel Line / Area of Groundwater Use Restriction

Note

1. Groundwater data was collected June 28, 2018.
2. MLLW = Mean Lower Low Water
3. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.



Source: ©Bing Imagery, 2015; Snohomish County GIS (parcel data);



North Marina
ABW/Bayside Marine VCP Site
Port of Everett, Washington

**Groundwater Flow Contours
June 28, 2018**

Figure
3

Table 1
Groundwater Elevation Summary
North Marina Bayside/ABW Site
Everett, Washington

Well ID	Date	TOC Elevation (ft)	GW Depth (ft)	GW Elevation
HWA-MW1	3/29/2016	17.45	1.82	15.63
	6/13/2016		4.40	13.05
	9/20/2016		4.92	12.53
	11/29/2016		1.02	16.43
	5/16/2017		1.87	15.58
	6/28/2018		4.00	13.45
HWA-MW2	3/29/2016	17.50	1.80	15.70
	6/13/2016		4.13	13.37
	9/20/2016		4.62	12.88
	11/29/2016		2.08	15.42
	5/16/2017		2.00	15.50
	6/28/2018		3.45	14.05
P-26	3/29/2016	17.22	2.78	14.44
	6/13/2016		4.41	12.81
	9/20/2016		5.98	11.24
	11/29/2016		2.08	15.14
	5/16/2017		2.84	14.38
	6/28/2018		4.16	13.06
P-27B	3/29/2016	15.24	4.30	10.94
	6/13/2016		4.97	10.27
	9/20/2016		5.20	10.04
	11/29/2016		3.63	11.61
	5/16/2017		3.95	11.29
P-27C (a)	6/28/2018	15.24	4.95	10.29

Abbreviations and Acronyms:

ft = foot/feet
 GW = groundwater
 ID = identification
 TOC = Top of Casing

Notes:

(a) P-27C installed within immediate vicinity of P-27B, which was decommissioned after the 2017 monitoring event. P-27C was installed to replace P-27B as the point of compliance downgradient of the Site.

Table 2
Groundwater Monitoring Results
North Marina Bayside/ABW Site
Everett, Washington

Sample Location	Sample Date (a)	Sample Type	Laboratory Sample ID	EPA 200.8	RSK-175	EPA 300.0		Hach Kit
				Dissolved Arsenic	Methane	Nitrate	Sulfate	Ferrous Iron
				µg/L	mg/L			
Site Cleanup Level:				5	NA	NA	NA	NA
HWA-MW1	03/29/2016	N	EV16030229-03	22	3.0 J	0.15 U	1.8	2.5
HWA-MW1	03/29/2016	FD	EV16030229-02	21	3.9 J	0.15 U	1.8	2.5
HWA-MW1	6/13/2016	N	EV16060085-05	36	3.6	0.15 U	0.26 U	1.8
HWA-MW1	6/13/2016	FD	EV16060085-02	35	3.3	0.15 U	0.26 U	1.8
HWA-MW1	9/20/2016	N	EV16090134-02	35	3.8	0.15 U	13	2.0
HWA-MW1	9/20/2016	FD	EV16090134-01	34	4.0	0.15 U	13	2.0
HWA-MW1	11/29/2016	N	EV16110191-04	24	2.1	0.15 U	2.3	3.2
HWA-MW1	11/29/2016	FD	EV16110191-02	24	1.9	0.15 U	2.7	3.2
HWA-MW1	5/16/2017	N	EV17050101-04	18	0.38	0.15 UJ	3.3	2.0
HWA-MW1	5/16/2017	FD	EV17050101-03	18	0.38	0.54 J	3.3	NM
HWA-MW1	6/28/2018	N	EV18060181-04	18	0.42	0.15 U	3.4	3.3
HWA-MW1	6/28/2018	FD	EV18060181-01	18	0.63	0.15 U	3.2	3.3
HWA-MW2	03/29/2016	N	EV16030229-04	9.8	31	0.15 U	0.26 U	1.5
HWA-MW2	6/13/2016	N	EV16060085-03	11	5.1	0.15 U	0.26 U	1.0
HWA-MW2	9/20/2016	N	EV16090134-04	24	4.8	0.15 U	0.26 U	2.6
HWA-MW2	11/29/2016	N	EV16110191-03	15	8.3	0.15 U	0.26 U	2.4
HWA-MW2	5/16/2017	N	EV17050101-02	10	7.8	0.15 U	0.26 U	0.0
HWA-MW2	6/28/2018	N	EV18060181-03	18	4.7	0.15 U	0.34	2.4
P-26	03/29/2016	N	EV16030229-01	18	10	0.15 U	0.26 U	2.0
P-26	6/13/2016	N	EV16060085-04	7.2	5.9	0.15 U	0.26 U	1.4
P-26	9/20/2016	N	EV16090134-03	2.8	3.5	0.15 U	0.26 U	1.8
P-26	11/29/2016	N	EV16110191-05	23	2.3	0.15 U	0.26 U	2.0
P-26	5/16/2017	N	EV17050101-05	18	1.6	0.15 U	0.26 U	3.4
P-26	6/28/2018	N	EV18060181-05	18	1.3	0.15 U	0.26 U	4.6

Table 2
Groundwater Monitoring Results
North Marina Bayside/ABW Site
Everett, Washington

Sample Location	Sample Date (a)	Sample Type	Laboratory Sample ID	EPA 200.8	RSK-175	EPA 300.0		Hach Kit
				Dissolved Arsenic	Methane	Nitrate	Sulfate	Ferrous Iron
				µg/L	mg/L			
Site Cleanup Level:				5	NA	NA	NA	NA
P-27B	03/29/2016	N	EV16030229-05	1.2	3.1	0.15 U	17	0.5
P-27B	6/13/2016	N	EV16060085-01	1.3	1.8	0.15 U	2.6	1.2
P-27B	9/20/2016	N	EV16090134-05	1.5	4.3	0.15 U	0.26 U	3.0
P-27B	11/29/2016	N	EV16110191-01	2.2	0.010 U	0.74	16	0.8
P-27B	5/16/2017	N	EV17050101-01	6.2	0.21	8.2	120	0.0
P-27C (c)	6/28/2018	N	EV18060181-02	4.0 U	0.30	0.15 U	220	4.4

Notes:

- U = The compound was not detected at the reported concentration.
- UJ = The analyte was analyzed for but was not detected. The reported quantitation limit 'is approximate and may be inaccurate or imprecise.
- J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
- Bold** = detected compound
- Green Box** = detected concentration is greater than Site Cleanup Level

Abbreviations and Acronyms:

- EPA = United States Environmental Protection Agency
- FD = field duplicate
- ID = identification
- µg/L = microgram per liter
- mg/L = milligram per liter
- NA = not applicable
- N = primary sample
- NM = not measured

- (a) Sampling frequency changed from quarterly to annually beginning 2017.
- (b) The arsenic reporting limit was raised during the June 2018 analysis by the laboratory to address background contamination in the associated method blank.
- (c) P-27C installed within immediate vicinity of P-27B, which was decommissioned after the 2017 monitoring event. P-27C was installed to replace P-27B as the point of compliance downgradient of the Site.

Monitoring Well Installation Log for P-27C As-Built

As-Built Well Completion Form

Exploration No.: P27-C

Well No. (If different than Expl. No.): _____

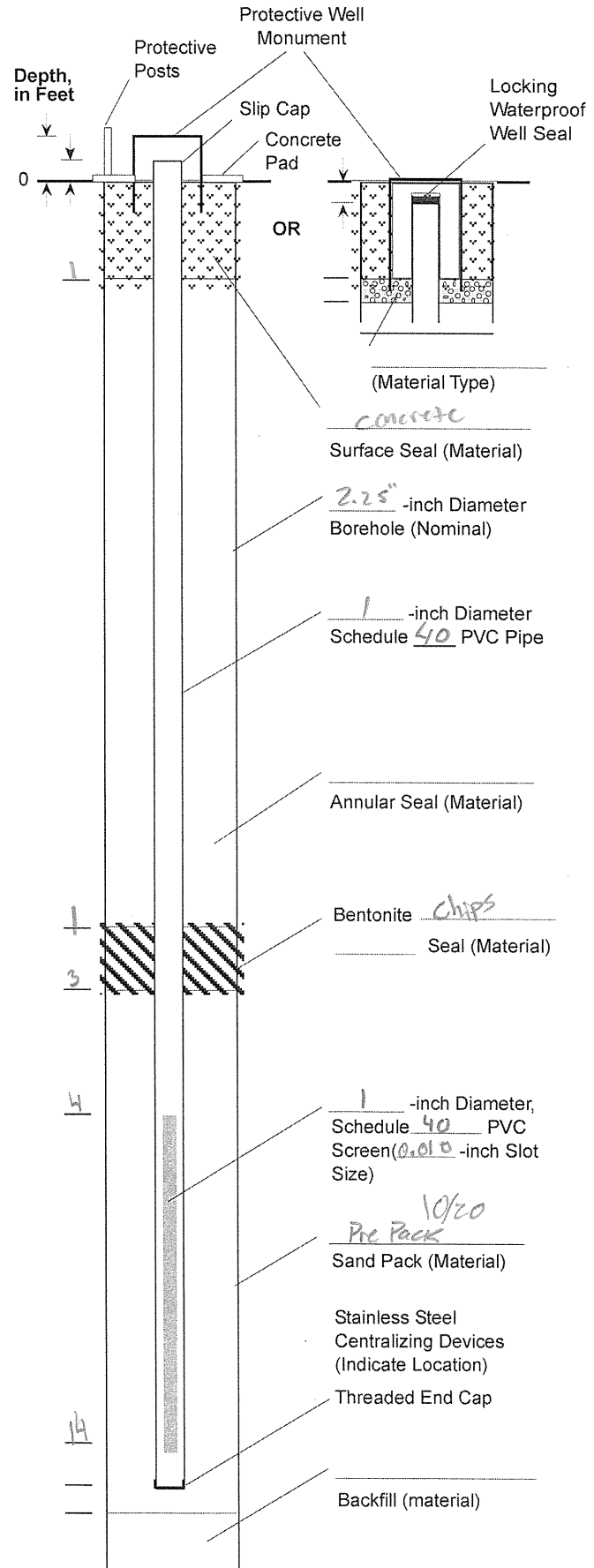
Client/Owner: POE Project No.: 147037.030.043
 Project Name: ABW
 Drilling Co.: ESN
 LAI Rep(s): DSB
 Installation Start Date: 6/22/18 Hour: 0915
 Installation Finish Date: 6/22/18 Hour: 0950
 Well Type: Single Nested Clustered

BORING AND WELL DIMENSIONS AND INSTALLATION DETAILS

DOE Unique Well No.: BJR 696
 Number of Pipes in Boring: 1
 Boring Diameter at Top of Hole: 2.25"
 Does Diameter of Hole Change? No
 Boring Diameter at First Step Down: _____
 Depth of First Step Down: _____
 Boring Diameter at Second Step Down: _____
 Depth of Second Step Down: _____
 Well Completion Date: 6/22/18
 Elevation of Well Cover: _____
 Elevation of Top of Well Pipe: _____
 Depth to Water: 4.91
 Date: 6/22/18 Time: 0950

MATERIALS USED

<u>1</u>	Sacks of <u>10/20</u> Sand
<u>2</u>	Sacks of <u>Quickcrete</u> Concrete/Cement
<u>0</u>	Sacks of _____ Grout Mix Used
<u>0.5</u>	Sacks of Bentonite Chips
<u>4</u>	Feet of <u>1</u> -inch PVC Blank Casing
<u>10</u>	Feet of <u>1</u> -inch PVC Slotted Screen
<u>1</u>	Threaded End Cap
<u>1</u>	Waterproof Well Seal/Slip Cap
<u>1</u>	Flush Mount/Aboveground Protective Monument
<u>0</u>	Protective Posts



Laboratory Data Reports



July 9, 2018

Ms. Kathryn Hartley
Landau Associates, Inc.
130 - 2nd Ave. S.
Edmonds, WA 98020

Dear Ms. Hartley,

On June 28th, 5 samples were received by our laboratory and assigned our laboratory project number EV18060181. The project was identified as your ABW Marine GW - 147037.030.043. The sample identification and requested analyses are outlined on the attached chain of custody record.

No abnormalities or nonconformances were observed during the analyses of the project samples.

Please do not hesitate to call me if you have any questions or if I can be of further assistance.

Sincerely,

ALS Laboratory Group

Rick Bagan
Laboratory Director



CERTIFICATE OF ANALYSIS

CLIENT: Landau Associates, Inc. DATE: 7/9/2018
130 - 2nd Ave. S. ALS JOB#: EV18060181
Edmonds, WA 98020 ALS SAMPLE#: EV18060181-01
CLIENT CONTACT: Kathryn Hartley DATE RECEIVED: 06/28/2018
CLIENT PROJECT: ABW Marine GW - 147037.030.043 COLLECTION DATE: 6/28/2018 9:00:00 AM
CLIENT SAMPLE ID DUP WDOE ACCREDITATION: C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Methane	RSK-175	0.63	0.010	1	MG/L	07/05/2018	CCN
Nitrate	EPA-300.0	U	0.15	1	MG/L	06/29/2018	JMJ
Sulfate	EPA-300.0	3.2	1.3	5	MG/L	06/29/2018	JMJ
Arsenic (Dissolved)	EPA-200.8	18	4.0	1	UG/L	07/02/2018	RAL

U - Analyte analyzed for but not detected at level above reporting limit.

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE:	7/9/2018
CLIENT CONTACT:	Kathryn Hartley	ALS JOB#:	EV18060181
CLIENT PROJECT:	ABW Marine GW - 147037.030.043	ALS SAMPLE#:	EV18060181-02
CLIENT SAMPLE ID	P-27C-180628	DATE RECEIVED:	06/28/2018
		COLLECTION DATE:	6/28/2018 9:50:00 AM
		WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Methane	RSK-175	0.30	0.010	1	MG/L	07/05/2018	CCN
Nitrate	EPA-300.0	U	0.15	1	MG/L	06/29/2018	JMJ
Sulfate	EPA-300.0	220	26	100	MG/L	06/29/2018	JMJ
Arsenic (Dissolved)	EPA-200.8	U	4.0	1	UG/L	07/02/2018	RAL

U - Analyte analyzed for but not detected at level above reporting limit.

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE:	7/9/2018
CLIENT CONTACT:	Kathryn Hartley	ALS JOB#:	EV18060181
CLIENT PROJECT:	ABW Marine GW - 147037.030.043	ALS SAMPLE#:	EV18060181-03
CLIENT SAMPLE ID	HWA-MW2-180628	DATE RECEIVED:	06/28/2018
		COLLECTION DATE:	6/28/2018 10:40:00 AM
		WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Methane	RSK-175	4.7	0.050	5	MG/L	07/05/2018	CCN
Nitrate	EPA-300.0	U	0.15	1	MG/L	06/29/2018	JMJ
Sulfate	EPA-300.0	0.34	0.26	1	MG/L	06/29/2018	JMJ
Arsenic (Dissolved)	EPA-200.8	18	4.0	1	UG/L	07/02/2018	RAL

U - Analyte analyzed for but not detected at level above reporting limit.

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE:	7/9/2018
CLIENT CONTACT:	Kathryn Hartley	ALS JOB#:	EV18060181
CLIENT PROJECT:	ABW Marine GW - 147037.030.043	ALS SAMPLE#:	EV18060181-04
CLIENT SAMPLE ID	HWA-MW1-180628	DATE RECEIVED:	06/28/2018
		COLLECTION DATE:	6/28/2018 11:25:00 AM
		WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Methane	RSK-175	0.42	0.010	1	MG/L	07/05/2018	CCN
Nitrate	EPA-300.0	U	0.15	1	MG/L	06/29/2018	JMJ
Sulfate	EPA-300.0	3.4	1.3	5	MG/L	06/29/2018	JMJ
Arsenic (Dissolved)	EPA-200.8	18	4.0	1	UG/L	07/02/2018	RAL

U - Analyte analyzed for but not detected at level above reporting limit.

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE:	7/9/2018
CLIENT CONTACT:	Kathryn Hartley	ALS JOB#:	EV18060181
CLIENT PROJECT:	ABW Marine GW - 147037.030.043	ALS SAMPLE#:	EV18060181-05
CLIENT SAMPLE ID	P-26-180628	DATE RECEIVED:	06/28/2018
		COLLECTION DATE:	6/28/2018 12:00:00 PM
		WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Methane	RSK-175	1.3	0.010	1	MG/L	07/05/2018	CCN
Nitrate	EPA-300.0	U	0.15	1	MG/L	06/29/2018	JMJ
Sulfate	EPA-300.0	U	0.26	1	MG/L	06/29/2018	JMJ
Arsenic (Dissolved)	EPA-200.8	18	4.0	1	UG/L	07/02/2018	RAL

U - Analyte analyzed for but not detected at level above reporting limit.



CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE: 7/9/2018 ALS SDG#: EV18060181 WDOE ACCREDITATION: C601
CLIENT CONTACT:	Kathryn Hartley	
CLIENT PROJECT:	ABW Marine GW - 147037.030.043	

LABORATORY BLANK RESULTS

MBLK-R319213 - Batch R319213 - Water by RSK-175

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Methane	RSK-175	U	MG/L	0.010	07/05/2018	CCN

U - Analyte analyzed for but not detected at level above reporting limit.

MBLK-319123 - Batch R319123 - Water by EPA-300.0

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Nitrate	EPA-300.0	U	MG/L	0.15	06/29/2018	JMJ
Sulfate	EPA-300.0	U	MG/L	0.26	06/29/2018	JMJ

U - Analyte analyzed for but not detected at level above reporting limit.

MB-062818W - Batch 129976 - Water by EPA-200.8

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Arsenic (Dissolved)	EPA-200.8	U	UG/L	4.0	06/29/2018	RAL

U - Analyte analyzed for but not detected at level above reporting limit.



CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE:	7/9/2018
CLIENT CONTACT:	Kathryn Hartley	ALS SDG#:	EV18060181
CLIENT PROJECT:	ABW Marine GW - 147037.030.043	WDOE ACCREDITATION:	C601

LABORATORY CONTROL SAMPLE RESULTS

ALS Test Batch ID: R319213 - Water by RSK-175

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS		ANALYSIS DATE	ANALYSIS BY
					MIN	MAX		
Methane - BS	RSK-175	93.8			80	120	07/05/2018	CCN
Methane - BSD	RSK-175	91.9	2		80	120	07/05/2018	CCN

ALS Test Batch ID: R319123 - Water by EPA-300.0

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS		ANALYSIS DATE	ANALYSIS BY
					MIN	MAX		
Nitrate - BS	EPA-300.0	94.0			80	120	06/29/2018	JMJ
Nitrate - BSD	EPA-300.0	96.5	3		80	120	06/29/2018	JMJ
Sulfate - BS	EPA-300.0	105			80	120	06/29/2018	JMJ
Sulfate - BSD	EPA-300.0	95.5	9		80	120	06/29/2018	JMJ

ALS Test Batch ID: 129976 - Water by EPA-200.8

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS		ANALYSIS DATE	ANALYSIS BY
					MIN	MAX		
Arsenic (Dissolved) - BS	EPA-200.8	102			89.1	110	06/29/2018	RAL
Arsenic (Dissolved) - BSD	EPA-200.8	96.4	5		89.1	110	06/29/2018	RAL

APPROVED BY

Laboratory Director



- Seattle/Edmonds (425) 778-0907
- Tacoma (253) 926-2493
- Spokane (509) 327-9737
- Portland (503) 542-1080

Chain-of-Custody Record

Date 6/28/18
Page 1 of 1

EV18060181

Project Name		Project No.		Testing Parameters	
ABW Marine G-W		147037.030.043			
Project Location/Event		Port of Everett / Annual G-W Sampling			
Sampler's Name		Devan Brandt			
Project Contact		Kathryn Hartley			
Send Results To		Kathryn Hartley, Dani Sargenson & Stephanie Renaldo			
Sample I.D.	Date	Time	Matrix	No. of Containers	Observations/Comments
1 DWP	6/28/18	0900	AQ	4	X Allow water samples to settle, collect aliquot from clear portion ___ NWTPH-Dx - run acid wash silica gel cleanup ___ Analyze for EPH if no specific product identified VOC/BTEX/NPH (soil): ___ non-preserved ___ preserved w/methanol ___ preserved w/sodium bisulfate ___ Freeze upon receipt X Dissolved metal water samples field filtered Other <u>Nitrates Have Short Hold Time</u> <u>- Bill POE (Elise Gronewald)</u>
2 P-276-180628		0950	AQ	4	
3 HWA-MW2-180628		1040	AQ	4	
4 HWA-MW1-180628		1125	AQ	4	
5 P-26-180628		1200	AQ	4	

Turnaround Time
 Standard
 Accelerated

Disolved As (EPA 200.8)
 Nitrate/sulfate (EPA 300.0)
 Methane (BSK-175)

Special Shipment/Handling or Storage Requirements	Method of Shipment

Relinquished by	Received by
Signature <u>[Signature]</u>	Signature <u>[Signature]</u>
Printed Name <u>Devan Brandt</u>	Printed Name <u>Devan Brandt</u>
Company <u>LAI</u>	Company <u>LAI</u>
Date <u>6/28/18</u> Time <u>1311</u>	Date <u>6/28/18</u> Time <u>1311</u>

Relinquished by	Received by
Signature <u>[Signature]</u>	Signature <u>[Signature]</u>
Printed Name <u>Devan Brandt</u>	Printed Name <u>Devan Brandt</u>
Company <u>LAI</u>	Company <u>LAI</u>
Date <u>6/28/18</u> Time <u>1311</u>	Date <u>6/28/18</u> Time <u>1311</u>

ALS ENVIRONMENTAL

Sample Receiving Checklist

Client: J.A.I. (Jandau)

ALS Job #: EV18060181

Project: ABW Marine

Received Date: 28 June 2018 Received Time: 1311

By: RB

Type of shipping container: Cooler Box Other

Shipped via: FedEx Ground UPS Mail Courier Hand Delivered
FedEx Express

Were custody seals on outside of shipping container?

	<u>Yes</u>	<u>No</u>	<u>N/A</u>
	_____	<input checked="" type="checkbox"/>	_____

If yes, how many? _____ Where? _____
Custody seal date: _____ Seal name: _____

Was Chain of Custody properly filled out (ink, signed, dated, etc.)?

	<u>Yes</u>	<u>No</u>	<u>N/A</u>
	<input checked="" type="checkbox"/>	_____	_____

Did all bottles have labels?

	<u>Yes</u>	<u>No</u>	<u>N/A</u>
	<input checked="" type="checkbox"/>	_____	_____

Did all bottle labels and tags agree with Chain of Custody?

	<u>Yes</u>	<u>No</u>	<u>N/A</u>
	<input checked="" type="checkbox"/>	_____	_____

Were samples received within hold time?

	<u>Yes</u>	<u>No</u>	<u>N/A</u>
	<input checked="" type="checkbox"/>	_____	_____

Did all bottles arrive in good condition (unbroken, etc.)?

	<u>Yes</u>	<u>No</u>	<u>N/A</u>
	<input checked="" type="checkbox"/>	_____	_____

Was sufficient amount of sample sent for the tests indicated?

	<u>Yes</u>	<u>No</u>	<u>N/A</u>
	<input checked="" type="checkbox"/>	_____	_____

Was correct preservation added to samples?

	<u>Yes</u>	<u>No</u>	<u>N/A</u>
	<input checked="" type="checkbox"/>	_____	_____

If no, Sample Control added preservative to the following:

Sample Number	Reagent	Analyte
_____	_____	_____
_____	_____	_____
_____	_____	_____

Were VOA vials checked for absence of air bubbles?

	<u>Yes</u>	<u>No</u>	<u>N/A</u>
	<input checked="" type="checkbox"/>	_____	_____

Bubbles present in sample #: None

Temperature of cooler upon receipt: 4.3°C on ice

<input checked="" type="radio"/> Cold	<input type="radio"/> Cool	<input type="radio"/> Ambient	<input type="radio"/> N/A
---------------------------------------	----------------------------	-------------------------------	---------------------------

Explain any discrepancies: _____

Was client contacted? _____ Who was called? _____ By whom? _____ Date: _____

Outcome of call: _____

Groundwater Monitoring Data 2014-2015

**GROUNDWATER ANALYTICAL DATA (2014-2015)
NORTH MARINA ABW/BAYSIDE MARINE VCP SITE
PORT OF EVERETT, WASHINGTON**

Sample ID Laboratory ID Date Collected	Preliminary Cleanup Level (a)	P-26 7/24/2014	P-26 8/18/2014	P-26 9/3/2014	P-26 ZN28F 12/3/2014	P-26 ZZ75C 3/10/2015	P-27 YC90A 3/13/2014	Dup of P-27 DUP-1 YC90B 3/13/2014	P-27 7/24/2014	P-27 9/3/201	P-27 ZN28A 12/3/2014	Dup of P-27 DUP1 ZN28B 12/3/2014	P-27 AC91A/ZZ75G 3/26/2015	Dup of P-27 DUP-2 ZZ75F 3/10/2015	HWA-MW1 7/24/2014	HWA-MW1 8/18/2014	HWA-MW1 9/3/2014	HWA-MW1 ZN28D 12/3/2014
DISSOLVED METALS (µg/L) Method SW6000-7000																		
Arsenic	5	15	9.8	6.3	18.6	12.8	0.5 U	0.6	1 U	1 U	3.0		1.7	64	77	91	65.1	
Cadmium		1 U		1 U	0.1 U	0.1 U	0.1 U	0.1 U	1 U	1 U	0.1 U		0.1 U	1 U		1 U	0.1 U	
Chromium	240,000	2 U		2 U	2	1			2 U	2 U	1 U		0.5 U	2.1		2.2	3	
Copper	2.4	2 U		2 U	0.5	0.5 U	0.5 U	0.6	2 U	2 U	0.8		0.5	2 U		2 U	0.7	
Lead		1 U		1 U	0.1 U	0.1 U	0.1 U	0.1 U	1 U	1 U	0.1 U		0.1 U	1 U		1 U	0.1 U	
Mercury		0.2 U		0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.2 U	0.2 U	0.1 U		0.1 U	0.2 U		0.2 U	0.1 U	
Silver																		
Zinc	81	2.5 U		5.7	4 U	4 U	4 U	5	2.5 U	8.2	5		4 U	2.5 U		7.6	8	
NWTPH-Dx (mg/L)																		
Diesel-Range	0.5	0.14		0.18	0.10 U	0.10 U	0.13 U	0.11 U	0.13 U	0.13 U	0.10 U		0.10 U	0.15		0.13	0.10 U	
Motor Oil-Range	0.5	0.25 U		0.25 U	0.20 U	0.20 U	0.27 U	0.23 U	0.25 U	0.25 U	0.20 U		0.20 U	0.25 U		0.25 U	0.20 U	
NWTPH-Gx (mg/kg)																		
Gasoline-Range	0.8										0.25 U	0.25 U	0.25 U	0.25 U				
DISSOLVED GASES (µg/L) RSK-175																		
Methane					8980	15100					503	536	5780				15000	
CONVENTIONALS (mg/L) Method EPA300.0																		
Nitrate			0.18	0.19	0.1 U	0.1				0.15 U	0.1 U		0.1 U		0.15 U	0.27	0.1	
Sulfate			0.26 U	0.37	0.1 U	0.2				0.58	9.1		4.1		0.26 U	0.26 U	0.5	
Field Parameters																		
pH		6.42	7.01	7.14	6.71	6.04	6.39	6.33	7.05	7.21	7.3		6.37	6.59	6.87	6.8	6.74	
Conductance (µS/cm)		1112	989	968	4.59	404	856	856	3430	481	460		421	1259	1204	968	736	
Temperature (°C)		18.3	17.6	20.7	13.07	11.94	11.79	11.79	18.5	20.2	10.9		11.54	20.6	17.9	22.7	11.93	
Dissolved Oxygen (mg/l)		3	0.33	0.39	0.49	4.41	1.92	1.92	0.23	0.63	0.95		1.19	0.27	0.54	0.39	0.51	
ORP (mV)			95	120	-92.2	-82	-84.7	-84.7		39	-42.6		-28		50	49	-114.6	
Ferrous Iron (mg/L)			1.2	1	1.2	1.8				0.4	1.5		1.4		1.6	1.5	1.6	
Turbidity (NTU)					87.87	12.3	2.57	2.57			0.27		1.66				1.72	

**GROUNDWATER ANALYTICAL DATA (2014-2015)
NORTH MARINA ABW/BAYSIDE MARINE VCP SITE
PORT OF EVERETT, WASHINGTON**

Sample ID Laboratory ID Date Collected	Preliminary Cleanup Level (a)	Dup of HWA-MW1		Dup of HWA-MW1		HWA-MW2 7/24/2014	HWA-MW2 9/3/2014	HWA-MW2 12/3/2014	HWA-MW2 3/10/2015	HWA-MW3 7/24/2014	HWA-MW3 9/3/2014	HWA-MW3 12/3/2014	HWA-MW3 3/10/2015
		DUP2 ZN28E 12/3/2014	HWA-MW1 ZZ75B 3/10/2015	DUP-1 ZZ75A 3/10/2015	HWA-MW2 ZN28G 12/3/2014								
DISSOLVED METALS (µg/L) Method SW6000-7000													
Arsenic	5	66.3	51.5	52.5	2.7	8.2	9.6	8.1	2.1	1 U	2.4	3.2	
Cadmium		0.1 U	0.1 U	0.1 U	1 U	1 U	0.1 U	0.1 U	1 U	1 U	0.1 U	0.1 U	
Chromium	240,000	2	1.8	1.8	2.1	2.8	2	1.4	2 U	2 U	1	1.1	
Copper	2.4	0.7	0.8	0.7	2 U	2 U	0.6	0.5 U	2 U	2 U	0.6	0.5	
Lead		0.2	0.1 U	0.1 U	1 U	1 U	0.1 U	0.1 U	1 U	1 U	0.1 U	0.1 U	
Mercury		0.1 U	0.1 U	0.1 U	0.2 U	0.2 U	0.1 U	0.1 U	0.2 U	0.2 U	0.1 U	0.1 U	
Silver													
Zinc	81	8	4	4 U	2.5 U	13	4	4 U	2.5 U	10	6	4 U	
NWTPH-Dx (mg/L)													
Diesel-Range	0.5	0.10 U	0.10 U	0.10 U	0.22	0.14	0.10 U	0.10 U	0.13 U	0.13 U	0.10 U	0.10 U	
Motor Oil-Range	0.5	0.20 U	0.20 U	0.20 U	0.25 U	0.25 U	0.20 U	0.20 U	0.25 U	0.25 U	0.20 U	0.20 U	
NWTPH-Gx (mg/kg)													
Gasoline-Range	0.8												
DISSOLVED GASES (µg/L) RSK-175													
Methane		14000	17700	16900			13300	25200			3480	9550	
CONVENTIONALS (mg/L) Method EPA300.0													
Nitrate		0.1	0.1 U	0.1 U		0.61	0.1 U	0.1 U		0.17	0.1 U	0.1 U	
Sulfate		0.4	0.2	0.3		0.26 U	0.1 U	0.8		0.26 U	0.1	0.5	
Field Parameters													
pH		6.75	6.19		6.42	6.38	6.15	6.22	6.71	7.13	6.82	6.78	
Conductance (µS/cm)		736	663		1400	847	389	326	1031	938	406	334	
Temperature (°C)		11.94	11.95		17.7	20.5	13.23	11.46	15.4	17	11.87	11.09	
Dissolved Oxygen (mg/l)		0.52	5.05		0.21	0.66	0.36	2.37	0.26	0.41	0.54	1.54	
ORP (mV)		-114.6	-105			75	-13.8	-70		143	-63.5	-80	
Ferrous Iron (mg/L)		1.6	1.4			0.6	5	1.8		1.7	1.8	1.4	
Turbidity (NTU)		2.05	8.82				104.2	62.1			26.7	70.9	

Box indicates exceedance of cleanup level.
 Bold indicates detected value.
 ND = Not Detected
 µg/L = micrograms per liter
 mg/L = milligrams per liter
 mg/kg = milligrams per kilogram

U = Indicates the compound was undetected
 UJ = The analyte was not detected in the sample; the reported sample detection limit is an estimate.