2019 Annual Groundwater Monitoring Report
North Marina Bayside/ABW
Everett, Washington

October 18, 2019

Prepared for

Port of Everett
Everett, Washington

LANDAU ASSOCIATES

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2019 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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Senior Associate; Quality Reviewer

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LANDAU ASSOCIATES

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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
ORP .....oxygen reduction potential
Port ..... Port of Everett
PVC..... polyvinylchloride
RL .....reporting limit
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 2019 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. Due to continued construction at the Site during 2019, the well casing for P-27C was raised to match the new construction grade. The modification to P-27C was conducted immediately after the 2019 monitoring event and is described below in Section 2.2.

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 recently developed 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, which is now owned by American Classic Homes. The western portion of the Site consists of a portion of the former Everett Bayside Marine Leasehold, which is owned by the Port and leased for redevelopment as a hotel. Redevelopment is occurring across the Waterfront Place Central Redevelopment Area, including at the Site.

2.0 FIELD ACTIVITIES

This section describes modifications to well P-27C and groundwater monitoring activities conducted in June 2019.

2.1 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 2019 include water level measurements, groundwater sampling and analysis, and quality assurance.

2.1.1 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 TOC elevation for P-27 was used to generate groundwater elevations for P-27C as the TOC elevation for P-27C was not surveyed prior to the 2019 sampling event.

2.1.2 Groundwater Sampling

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 degrees Celcius [°C]; conductivity [microsiemens per centimeter {µS/cm}]; dissolved oxygen [milligrams per liter {mg/L}]; pH; and oxygen reduction potential [ORP; millivolts {mV}]) were recorded every 3 minutes until stabilization objectives were achieved.

2.1.3 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.

2.1.4 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.

2.2 Well (P-27C) Modification

Well P-27C was modified on June 26, 2019, after the groundwater sampling event on June 18, 2019. The well was assessed prior to sampling and was found to be intact and did not require repair. The well required modification due to construction activities in the surrounding area. The top of well casing was raised approximately 4 feet (ft) to meet the new grade of the landscape planter bed in which the well is now located. The top of casing (TOC) elevation was surveyed immediately following modification, and the new TOC elevation is included in Appendix A.

3.0 2019 GROUNDWATER MONITORING RESULTS

This section presents the results of the 2019 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 2019 annual monitoring event was completed on June 18, 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 Hach field test kit.

Arsenic was detected in samples from monitoring wells HWA-MW1, HWA-MW2, and P-26, at concentrations ranging from 12 to 17 micrograms per liter (µg/L), which exceed the cleanup level (5 µg/L). The detected concentrations of dissolved arsenic in these wells were within the range of previously detected concentrations, with the exception of the concentration detected at HWA-MW1 (12 µg/L), which is the lowest concentration detected at that location. Dissolved arsenic was not detected at downgradient well P-27C.

The annual 2019 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 conditions are not only iron-reducing, based on the detection of ferrous iron at all monitoring locations, but also indicate 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 0.32mg/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 2019 MONITORING RESULTS

Concentrations of dissolved arsenic detected in groundwater at the Site during routine monitoring completed in 2019 are generally consistent with previous sampling data, with no detection of dissolved arsenic above the laboratory reporting limit (RL) at the downgradient well (P-27C). The results from the 2019 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 2019 monitoring event (17 µg/L) is below the maximum detected concentrations during monitoring completed in 2017 and 2018 (18 µg/L). Concentrations of dissolved arsenic are stable or 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 in all four samples during the 2019 event; nitrate was not detected in two (HWA-MW2 and P-26) of the four wells. Sulfate was either not detected or detected at low concentrations in all but the downgradient well. Sulfate concentrations have generally been highest at P-27C. This trend, in conjunction with the low dissolved arsenic concentration at P-27C (not detected above laboratory reporting limits), supports the conclusion that elevated arsenic concentrations at the Site are associated with reducing conditions, and reducing conditions sufficiently dissipate by the time groundwater migrates to the P-27C vicinity for groundwater to achieve the Site cleanup standard for arsenic.

5.0 CONCLUSIONS

Based on the results of 2019 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 ten groundwater samples collected from the downgradient monitoring well P-27/P-27B/P-27C between March of 2014 and June of 2019, 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. 2015. 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.

Data Source: Esri 2012

G:\Projects\147\037\030\041\F01 VicMap.mxd 7/25/2019 NAD 1983 StatePlane Washington North FIPS 4601 Feet

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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.

0 80 160

Scale in Feet

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

LANDAU ASSOCIATES, INC. | G:\Projects\147\037\030\041\F02-F03 GroundwaterLocations.dwg (A) "Figure 2" 7/25/2019

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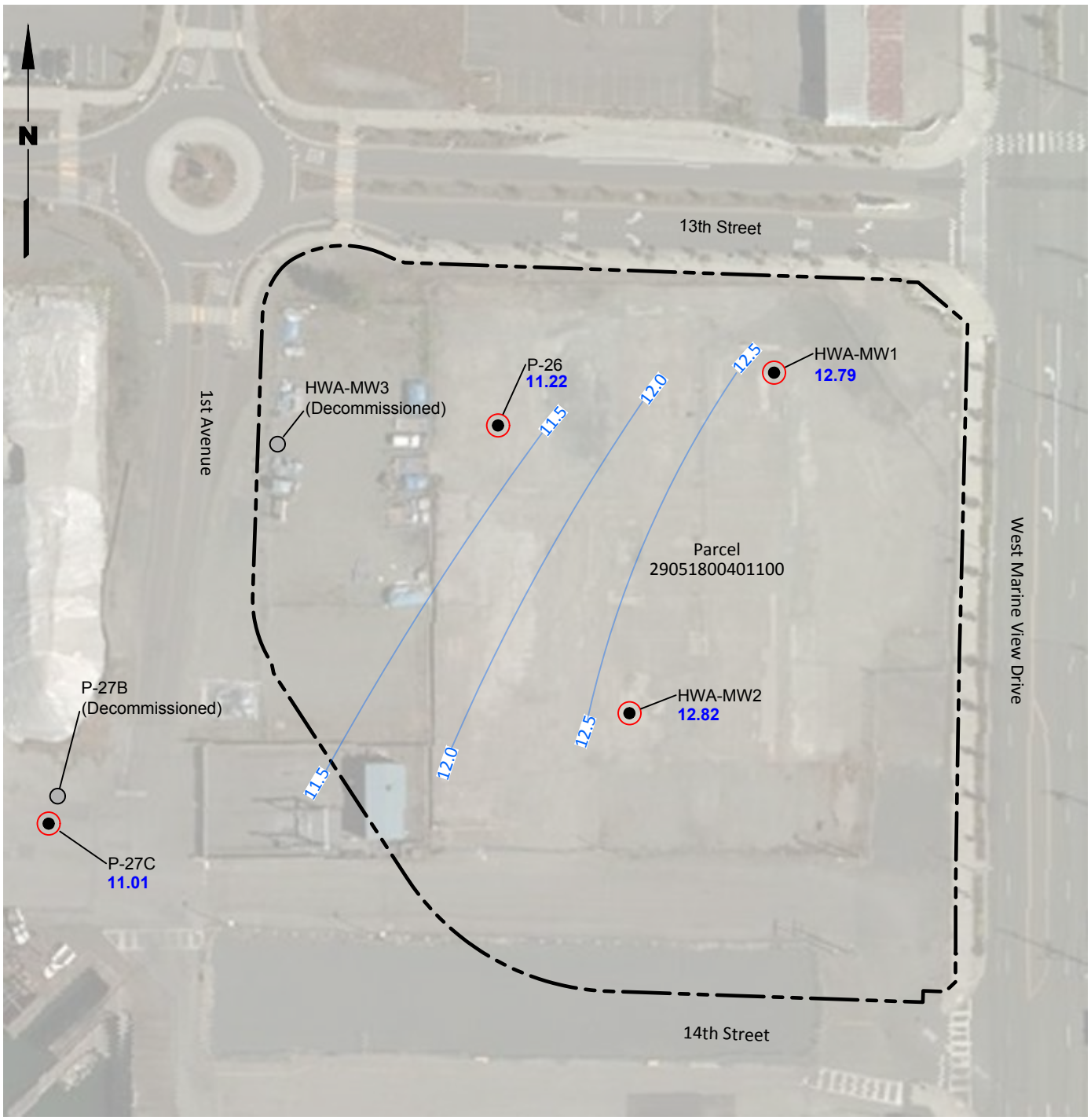
North Marina
ABW/Bayside Marine VCP Site
Port of Everett, Washington

Groundwater Monitoring Locations

Figure 2



Legend

- Decommissioned May 19, 2017
- Monitoring Well Network (P-27C replaced P-27B)
- 11.01 — 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 18, 2019.
2. MLLW = Mean Lower Low Water
3. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

0 80 160
Scale in Feet

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

LANDAU ASSOCIATES, INC. | G:\Projects\147\037\030\041\F02-F03 GroundwaterLocations.dwg (A) "Figure 3" 7/29/2019

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

Groundwater Flow Contours
June 18, 2019

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
	6/18/2019		4.66	12.79
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
	6/18/2019		4.68	12.82
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
	6/18/2019		6.00	11.22
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
	6/18/2019		4.23	11.01

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. Groundwater elevation was measured after June 2019 modifications.

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 J**	0.15 U	**3.4**	**3.3**
HWA-MW1	6/28/2018	FD	EV18060181-01	**18**	**0.63 J**	0.15 U	**3.2**	**3.3**
HWA-MW1	6/18/2019	N	EV19060126-05	**12**	**2.0**	0.15 U	0.26 U	**4.4**
HWA-MW1	6/18/2019	FD	EV19060126-01	**12**	**1.7**	**0.27**	0.26 U	**4.4**
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**
HWA-MW2	6/18/2019	N	EV19060126-03	**17**	**4.3**	0.15 U	**0.32**	**4.4**

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-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**
P-26	6/18/2019	N	EV19060126-04	**14**	**3.2**	0.15 U	0.26 U	**5.0**
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 (b)	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**
P-27C	6/18/2019	N	EV19060126-02	1.0 U	**0.21**	**0.18**	**100**	**3.0**

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

(a) Sampling frequency changed from quarterly to annually beginning 2017.
(b) The arsenic reporting limit was raised 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.

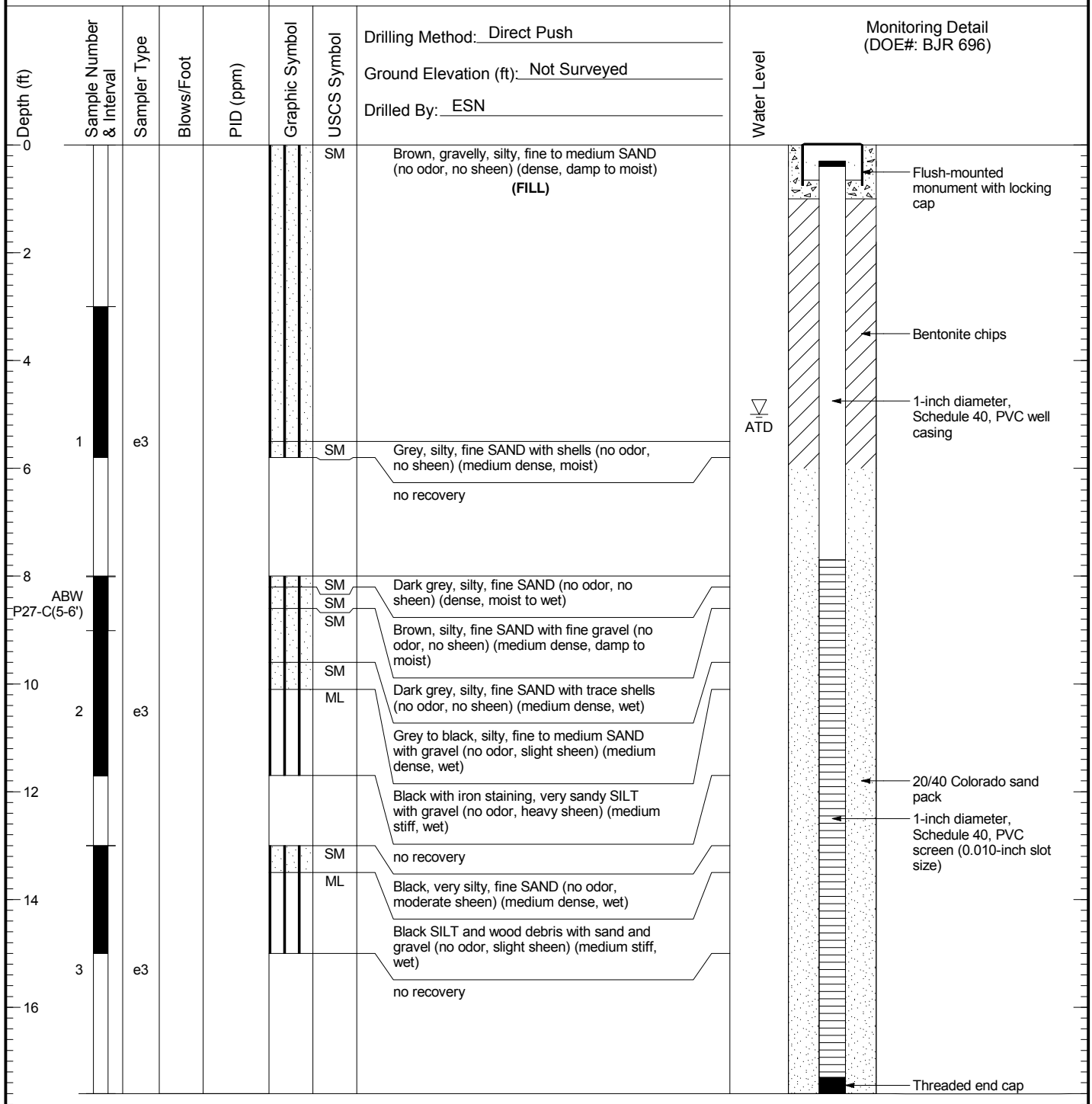
Abbreviations and Acronyms:

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

APPENDIX A

Revised Monitoring Well Installation Log for P-27C

P-27C



Boring Completed 06/22/18
Total Depth of Boring = 17.6 ft.

Monitoring Completed 06/22/18
Elevation at Top of Monitoring Casing = 18.35 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

0147037.010.011 7/29/19 N:\PROJECTS\147037.010.011.GPJ WELL LOG

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American Boiler Works/Bayside Marine Site Everett, Washington	Log of Monitoring P-27C	Figure A

APPENDIX B

Laboratory Data Report

June 26, 2019

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

Dear Ms. Hartley,

On June 18th, 5 samples were received by our laboratory and assigned our laboratory project number EV19060126. The project was identified as your ABW Marine - 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

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE: ALS JOB#: ALS SAMPLE#:	6/26/2019 EV19060126 EV19060126-01
CLIENT CONTACT:	Kathryn Hartley	DATE RECEIVED:	06/18/2019
CLIENT PROJECT:	ABW Marine - 147037.030.043	COLLECTION DATE:	6/18/2019 10:00:00 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	**1.7**	0.010	1	MG/L	06/25/2019	CCN
Nitrate	EPA-300.0	**0.27**	0.15	1	MG/L	06/20/2019	SMH
Sulfate	EPA-300.0	U	0.26	1	MG/L	06/20/2019	SMH
Arsenic (Dissolved)	EPA-200.8	**12**	1.0	1	UG/L	06/25/2019	RAL

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

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE: ALS JOB#: ALS SAMPLE#:	6/26/2019 EV19060126 EV19060126-02
CLIENT CONTACT:	Kathryn Hartley	DATE RECEIVED:	06/18/2019
CLIENT PROJECT:	ABW Marine - 147037.030.043	COLLECTION DATE:	6/18/2019 10:20:00 AM
CLIENT SAMPLE ID	P-27C-190618	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Methane	RSK-175	**0.21**	0.010	1	MG/L	06/25/2019	CCN
Nitrate	EPA-300.0	**0.18**	0.15	1	MG/L	06/20/2019	SMH
Sulfate	EPA-300.0	**100**	2.6	10	MG/L	06/19/2019	SMH
Arsenic (Dissolved)	EPA-200.8	U	1.0	1	UG/L	06/25/2019	RAL

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

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE: ALS JOB#: ALS SAMPLE#:	6/26/2019 EV19060126 EV19060126-03
CLIENT CONTACT:	Kathryn Hartley	DATE RECEIVED:	06/18/2019
CLIENT PROJECT:	ABW Marine - 147037.030.043	COLLECTION DATE:	6/18/2019 11:25:00 AM
CLIENT SAMPLE ID	HWA-MW2-190618	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Methane	RSK-175	**4.3**	0.020	2	MG/L	06/25/2019	CCN
Nitrate	EPA-300.0	U	0.15	1	MG/L	06/20/2019	SMH
Sulfate	EPA-300.0	**0.32**	0.26	1	MG/L	06/20/2019	SMH
Arsenic (Dissolved)	EPA-200.8	**17**	1.0	1	UG/L	06/25/2019	RAL

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

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ALS Group USA, Corp dba ALS Environmental

ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE: ALS JOB#: ALS SAMPLE#:	6/26/2019 EV19060126 EV19060126-04
CLIENT CONTACT:	Kathryn Hartley	DATE RECEIVED:	06/18/2019
CLIENT PROJECT:	ABW Marine - 147037.030.043	COLLECTION DATE:	6/18/2019 12:10:00 PM
CLIENT SAMPLE ID	P-26-190618	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Methane	RSK-175	**3.2**	0.020	2	MG/L	06/25/2019	CCN
Nitrate	EPA-300.0	U	0.15	1	MG/L	06/20/2019	SMH
Sulfate	EPA-300.0	U	0.26	1	MG/L	06/20/2019	SMH
Arsenic (Dissolved)	EPA-200.8	**14**	1.0	1	UG/L	06/25/2019	RAL

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

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE: ALS JOB#: ALS SAMPLE#:	6/26/2019 EV19060126 EV19060126-05
CLIENT CONTACT:	Kathryn Hartley	DATE RECEIVED:	06/18/2019
CLIENT PROJECT:	ABW Marine - 147037.030.043	COLLECTION DATE:	6/18/2019 1:00:00 PM
CLIENT SAMPLE ID	HWA-MW1-190618	WDOE ACCREDITATION:	C601

SAMPLE DATA RESULTS

ANALYTE	METHOD	RESULTS	REPORTING LIMITS	DILUTION FACTOR	UNITS	ANALYSIS DATE	ANALYSIS BY
Methane	RSK-175	**2.0**	0.010	1	MG/L	06/25/2019	CCN
Nitrate	EPA-300.0	U	0.15	1	MG/L	06/20/2019	SMH
Sulfate	EPA-300.0	U	0.26	1	MG/L	06/20/2019	SMH
Arsenic (Dissolved)	EPA-200.8	**12**	1.0	1	UG/L	06/25/2019	RAL

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

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ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE: ALS SDG#: WDOE ACCREDITATION:	6/26/2019 EV19060126 C601
CLIENT CONTACT:	Kathryn Hartley		
CLIENT PROJECT:	ABW Marine - 147037.030.043		

LABORATORY BLANK RESULTS

MBLK-R341235 - Batch R341235 - Water by RSK-175

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Methane	RSK-175	U	MG/L	0.010	06/25/2019	CCN

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

MBLK-R341327 - Batch R341327 - Water by EPA-300.0

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Sulfate	EPA-300.0	U	MG/L	0.26	06/19/2019	SMH

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

MBLK-R341328 - Batch R341328 - Water by EPA-300.0

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Nitrate	EPA-300.0	U	MG/L	0.15	06/20/2019	SMH
Sulfate	EPA-300.0	U	MG/L	0.26	06/20/2019	SMH

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

MB-062419W - Batch 142406 - Water by EPA-200.8

ANALYTE	METHOD	RESULTS	UNITS	REPORTING LIMITS	ANALYSIS DATE	ANALYSIS BY
Arsenic (Dissolved)	EPA-200.8	U	UG/L	1.0	06/25/2019	RAL

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

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

CERTIFICATE OF ANALYSIS

CLIENT:	Landau Associates, Inc. 130 - 2nd Ave. S. Edmonds, WA 98020	DATE: ALS SDG#: WDOE ACCREDITATION:	6/26/2019 EV19060126 C601
CLIENT CONTACT:	Kathryn Hartley		
CLIENT PROJECT:	ABW Marine - 147037.030.043		

LABORATORY CONTROL SAMPLE RESULTS

ALS Test Batch ID: R341235 - Water by RSK-175

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Methane - BS	RSK-175	**96.3**			80	120	06/25/2019	CCN
Methane - BSD	RSK-175	**95.5**	**1**		80	120	06/25/2019	CCN

ALS Test Batch ID: R341327 - Water by EPA-300.0

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Sulfate - BS	EPA-300.0	**104**			80	120	06/19/2019	SMH
Sulfate - BSD	EPA-300.0	**99.0**	**4**		80	120	06/19/2019	SMH

ALS Test Batch ID: R341328 - Water by EPA-300.0

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Nitrate - BS	EPA-300.0	**96.5**			80	120	06/20/2019	SMH
Nitrate - BSD	EPA-300.0	**92.5**	**4**		80	120	06/20/2019	SMH
Sulfate - BS	EPA-300.0	**103**			80	120	06/20/2019	SMH
Sulfate - BSD	EPA-300.0	**99.0**	**3**		80	120	06/20/2019	SMH

ALS Test Batch ID: 142406 - Water by EPA-200.8

SPIKED COMPOUND	METHOD	%REC	RPD	QUAL	LIMITS MIN	LIMITS MAX	ANALYSIS DATE	ANALYSIS BY
Arsenic (Dissolved) - BS	EPA-200.8	**99.5**			89.1	110	06/25/2019	RAL
Arsenic (Dissolved) - BSD	EPA-200.8	**99.2**	**0**		89.1	110	06/25/2019	RAL

APPROVED BY

Laboratory Director

ADDRESS 8620 Holly Drive, Suite 100, Everett, WA 9820 | PHONE 425-356-2600 | FAX 425-356-2626
ALS Group USA, Corp dba ALS Environmental

ALS ENVIRONMENTAL

Sample Receiving Checklist

Client: Landau ALS Job #: EV1906012G

Project: ABW Marine 147037.030.043

Received Date: 6/18/19 Received Time: 13:46 By: [illegible]

Type of shipping container: Cooler X Box ____ Other ____

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

	Yes	No	N/A
Were custody seals on outside of shipping container?	____	X	____
If yes, how many? ____ Where? ____			
Custody seal date: ____ Seal name: ____			
Was Chain of Custody properly filled out (ink, signed, dated, etc.)?	X	____	____
Did all bottles have labels?	X	____	____
Did all bottle labels and tags agree with Chain of Custody?	X	____	____
Were samples received within hold time?	X	____	____
Did all bottles arrive in good condition (unbroken, etc.)?	X	____	____
Was sufficient amount of sample sent for the tests indicated?	X	____	____
Was correct preservation added to samples?	X	____	____

If no, Sample Control added preservative to the following:

Sample Number	Reagent	Analyte

Were VOA vials checked for absence of air bubbles?	X	____	____
Bubbles present in sample #: none.			

Temperature of cooler upon receipt: 14.0 °C on Ice (Cold) Cool Ambient N/A

Explain any discrepancies: ____

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

Outcome of call: ____

EV1906012G

Chain-of-Custody Record

LANDAU ASSOCIATES

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

Date 6/18/19
Page 1 of 1

Turnaround Time:
Standard X
Accelerated _____

Project Name ABW Marine Project No. 147037.030.043
Project Location/Event Port of Everett / Annual GW June 2019
Sampler's Name Devan Brandt
Project Contact Kathryn Hartley
Send Results To ~~Kathryn Hartley~~, Dani Jorgenson & Stephanie Renando

Special Handling Requirements:

Shipment Method: Drop off
Stored on ice: (Yes) / No

	Sample I.D.	Date	Time	Matrix	No. of Containers	Dissolved As (EPA 200.8)	Nitrate/Sulfate (EPA 300.0)	Methane (RSK-175)	Observations/Comments
1	DUP	6/18/19	1000	AQ	4	X	X	X	
2	P-27C-190618		1020	AQ	4	X	X	X	
3	HWA-MW2-190618		1125	AQ	4	X	X	X	
4	P-26-190618		1210	AQ	4	X	X	X	
5	HWA-MW1-190618		1300	AQ	4	X	X	X	

Testing Parameters

___ Allow water samples to settle, collect aliquot from clear portion ☐

___ NWTPH-Dx - Acid wash cleanup ☐
- Silica gel cleanup ☐

X Dissolved metal samples were field filtered

Other - Bill POE (Elise Gronewald)

Nitrates have short Hold Time

Relinquished by	Received by	Relinquished by	Received by
Signature	Signature	Signature	Signature
Printed Name Devan Brandt	Printed Name Glen Perry	Printed Name	Printed Name
Company LAI	Company ALS	Company	Company
Date 6/18/19 Time 1346	Date 6/18/19 Time 1346	Date Time	Date Time

WHITE COPY - Laboratory YELLOW COPY - Project File PINK COPY - Client Representative

10/2018

APPENDIX C

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 DUP2 ZN28E 12/3/2014	HWA-MW1 ZZ75B 3/10/2015	Dup of HWA-MW1 DUP-1 ZZ75A 3/10/2015	HWA-MW2 7/24/2014	HWA-MW2 9/3/2014	HWA-MW2 ZN28G 12/3/2014	HWA-MW2 ZZ75D 3/10/2015	HWA-MW3 7/24/2014	HWA-MW3 9/3/2014	HWA-MW3 ZN28C 12/3/2014	HWA-MW3 ZZ75E 3/10/2015
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.