APPENDIX A
PRE-DESIGN INVESTIGATION REPORT

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List of Attachments

1 INTRODUCTION

This Pre-design Investigation (PDI) Report summarizes pre-design investigations that informed remedial design in Port Gamble Bay, Washington, as generally described in the accompanying *Engineering Design Report*. Under the terms of Consent Decree 13-2-02720-0, Pope Resources, LP/Olympic Property Group, LLC (PR/OPG) developed and Washington State Department of Ecology (Ecology) approved the *Remedial Design and Adaptive Management Work Plan* (RD Work Plan; Anchor QEA 2014), including amendments, addressing data gaps to support remedial design and permitting activities. The results of the sampling and analysis activities described herein were completed in accordance with the *Dredge Material Management Program Sampling and Analysis Plan* (DMMP SAP), *Data Gaps Investigation Sampling and Analysis Plan* (Data Gaps SAP), and *Quality Assurance Project Plan* (QAPP) that were appended (Appendices A, B, and C, respectively) to the RD Work Plan (Anchor QEA 2014), as approved by Ecology.

1.1 Overview of Pre-design Investigation Data

PDI sampling and other Site investigations occurred from May to September 2014, and included the following activities:

- Surveys of Site physical conditions, including bathymetry
- Porewater sampling and analysis, including diffusive gradient thin sheet (DGT) in situ passive sampling to characterize surface and shallow subsurface porewater hydrogen sulfide concentrations
- Intertidal and subtidal sediment sampling including geoprobe and diver-deployed Mudmole™ coring, sediment physical and chemical analyses, DMMP characterization, dredging elutriate testing, and surface sediment natural recovery sampling (chemical and bioassay analyses)
- Eelgrass (*Zostera marina*) and habitat surveys in sediment management area (SMA)-1 and SMA-2

1.2 Organization of the Pre-design Investigation Report

The remainder of this PDI Report consists of four attachments, organized as follows:

- **Attachment A-1 – Physical Surveys:** summarizes test pit observations, visual surveys,

and high-definition bathymetric surveys

- **Attachment A-2 – Porewater Data Report:** summarizes porewater sampling and analysis using DGT samplers and water quality monitoring probes
- **Attachment A-3 – Soil and Sediment Data Report:** summarizes bank soil direct-push sampling, intertidal sediment direct-push sampling, subsurface sediment coring, and surface sediment grab sampling
- **Attachment A-4 – Eelgrass and Habitat Survey Report:** summarizes the eelgrass and habitat survey that was performed to inform cleanup actions in the intertidal and shallow subtidal areas of SMA-1 and SMA-2

2 REFERENCES

Anchor QEA, LLC, 2014. *Remedial Design and Adaptive Management Work Plan*. Prepared for Pope Resources LP and Olympic Property Group LLC and Washington State Department of Ecology. May.

ATTACHMENT A-1
PHYSICAL SURVEYS

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1 INTRODUCTION

This Physical Survey Report summarizes test pit observations, visual surveys, and high-definition bathymetric surveys that informed remedial design in Port Gamble Bay, Washington, as generally described in the accompanying *Engineering Design Report*. The sampling and analysis activities described herein were completed in accordance with the *Data Gaps Investigation Sampling and Analysis Plan* and *Quality Assurance Project Plan* that were appended (Appendices B and C, respectively) to the *Remedial Design and Adaptive Management Work Plan* (Anchor QEA 2014), as approved by the Washington State Department of Ecology.

2 TEST PITS AND VISUAL SURVEYS

Anchor QEA conducted a field investigation in August 2014 to estimate the number of piles requiring demolition by excavating test pits and performing a visual survey in an accessible high-density pile area of sediment management area (SMA)-2 (the "Pile Removal Pilot Demonstration Area" on Figure A-1-1). The test pits and visual survey were used to provide detailed analysis of a representative demolition area, and to understand the contribution of buried, degraded, and/or cut piles to the total pile counts.

Three shallow test pits were excavated from between the visible rows of piles; the results are summarized in Table A-1-1. In addition, a detailed visual inspection of the beach area (approximately 7,000 square feet) was performed. During the inspection, a number of pile stubs were observed that had been cut or broken at mudline, which would not be counted in aerial photographs or in high definition bathymetric surveys. Many of the pile stubs were immediately adjacent to standing piles and were likely replaced by the standing piles during historical maintenance. The results are summarized in Table A-1-2. Combining the test pits and the visual inspection, a total pile density of 1 pile every 24 square feet was estimated, with approximately 40% visible (i.e., extending above mudline) and approximately 60% buried at or below the mudline.

3 HIGH RESOLUTION BATHYMETRIC SURVEYS

A high-resolution bathymetric survey of accessible areas of SMA-1 and SMA-2 was performed by eTrac on August 27, 2014. The results of the survey are shown in Figure A-1-1. From the high-resolution point-cloud data, piles counts were automated in AutoCAD. Results are shown on Figures A-1-2 and A-1-3.

4 REFERENCES

Anchor QEA, LLC, 2014. *Remedial Design and Adaptive Management Work Plan*. Prepared for Pope Resources LP and Olympic Property Group LLC and Washington State Department of Ecology. May.

TABLES

Table A-1-1
Summary of Test Pit Surveys between Pile Rows

Test Pit	Width (feet)	Length (feet)	Depth (feet)	Substrate	Buried Piles/Timbers
TP-1	4	20	2	Riprap (south (waterward) half), sand/shells (north half)	Found one approximately 8-inch-diameter creosote-treated pile with top buried 18 inches below surface
TP-2	4	20	2	Riprap (south 1/4), sand/shells (north 3/4)	Found one approximately 12-inch-diameter creosote-treated pile with top buried 12 inches below surface Found two approximately 3-inch by 10-inch creosote-treated timbers (old cross-member?) with buried 1 foot and 6 inches below surface
TP-3	4	4	2	Sand/shells	Found one approximately 3-inch by 10-inch creosote-treated timbers (old cross-members?) with buried just below the surface

Table A-1-2
Summary of Beach Area Visual Pile Survey

Row	Total Approximate Distance (feet)	Intertidal						Subtidal						
		Concrete Encased Pile	Extended Pile Stub	Pile Stub at Mudline	Approximate Distance (feet)	Piles per Foot	Feet per Pile	Concrete Encased Pile	Extended Pile Stub	Pile Stub at Waterline	Piles In/Near Row Associated With Dock	Approximate Distance (feet)	Piles per Foot	Feet per Pile
1	78	4	5	0	40	0.23	4.4	1	8	1	0	38	0.26	3.8
2	82	7	1	2	41	0.24	4.1	1	7	1	0	41	0.22	4.6
3	93	5	1	5	42	0.26	3.8	1	7	1	0	51	0.18	5.7
4	91	5	1	4	43	0.23	4.3	2	5	3	0	48	0.21	4.8
5	94	5	0	3	44	0.18	5.5	1	3	2	7	50	0.26	3.8
6	94	9	0	6	43	0.35	2.9	0	7	0	5	51	0.24	4.3
7	96	6	1	6	42	0.31	3.2	0	4	0	5	54	0.17	6.0

FIGURES

K:\Projects\0388-Pope Resources\Port Gamble Sediment Cleanup RI-FS\0388-WK-011 (Piling removal figure).dwg A-1-1

Dec 02, 2014 1:48pm chewett

SOURCE: Aerial image from Bing Maps. Basemap by Triad Associates. Bathymetry by eTrac, dated August 27, 2014
HORIZONTAL DATUM: Washington State Plane North, NAD83, U.S. Feet.
VERTICAL DATUM: Mean Lower Low Water (MLLW).
NOTES:
All creosote-treated piles to be extracted per the specifications or as approved by Ecology.

LEGEND:

- Mean High Water Line
- Approximate Pile Location
- Existing Contours (5' Interval)

0 200
Scale in Feet

ANCHOR QEA

Figure A-1-1
Bathymetric Contour and Pile Count Data
Attachment A-1: Physical Surveys
Port Gamble Bay Cleanup

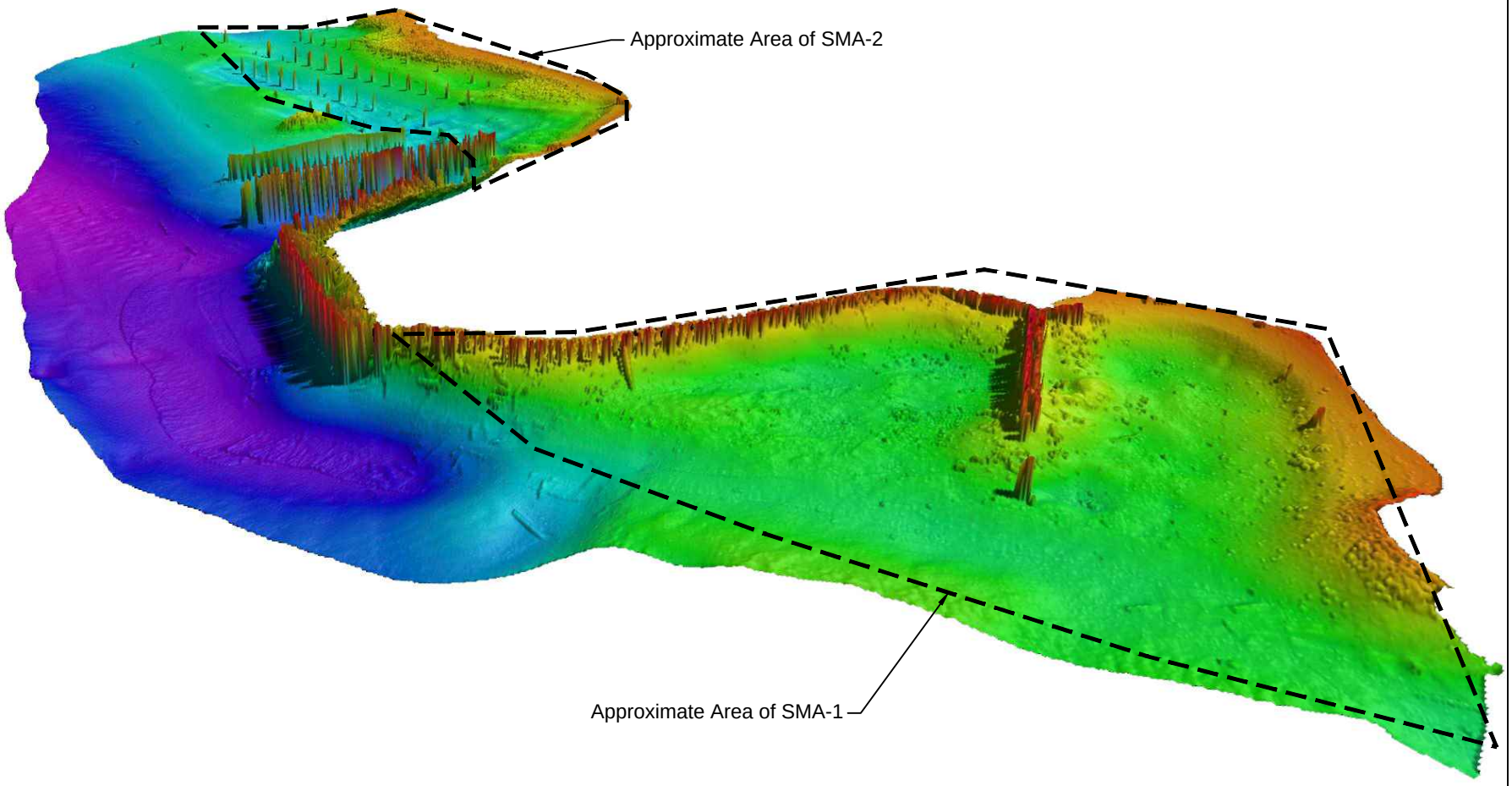

Image by eTrac

Figure A-1-2
Multibeam Survey and Pile Analysis Data Point Cloud Image
Attachment A-1: Physical Surveys
Port Gamble Bay Cleanup

ANCHOR QEA

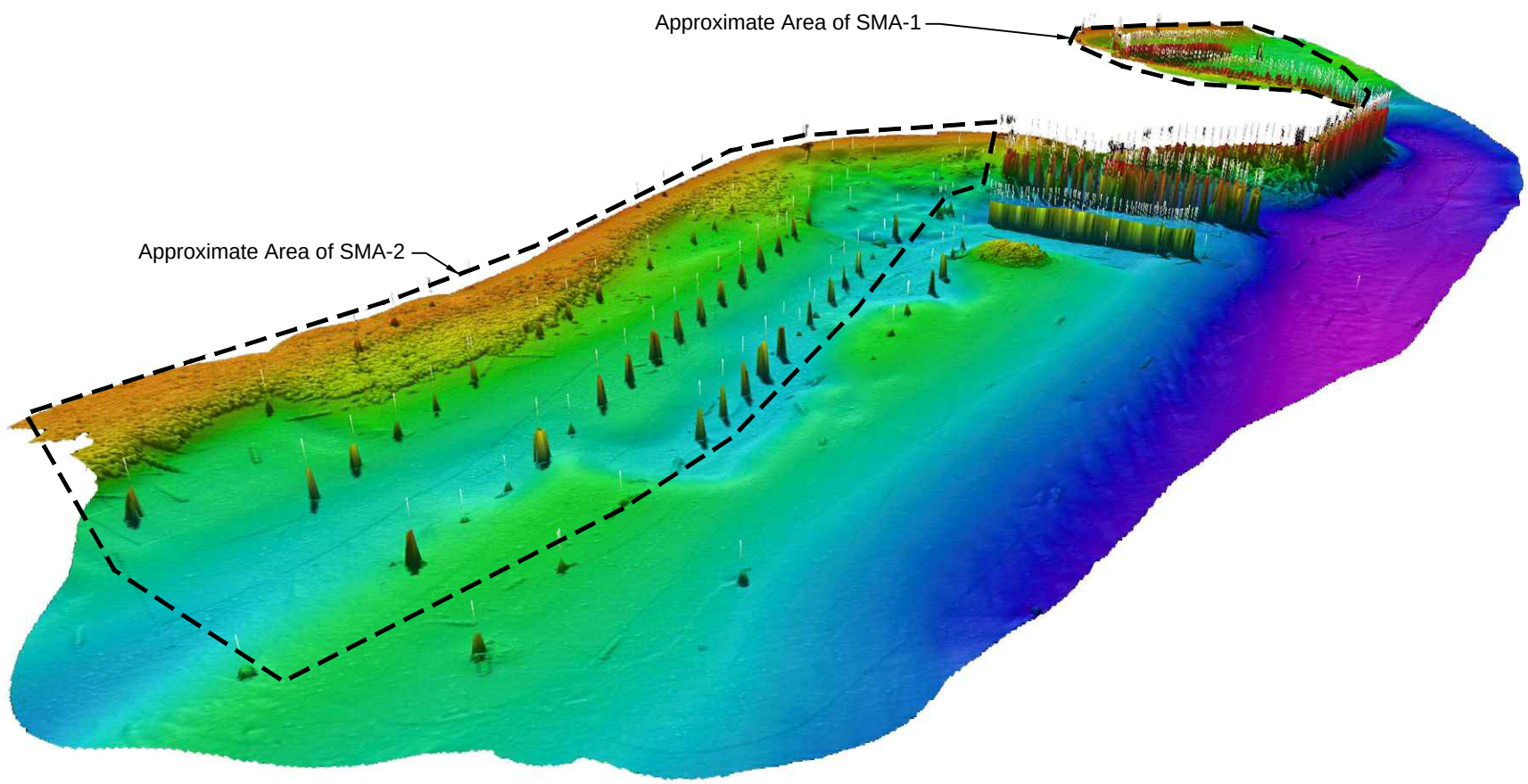

Image by eTrac

Figure A-1-3
Multibeam Survey and Pile Analysis Data Point Cloud Image
Attachment A-1: Physical Surveys
Port Gamble Bay Cleanup

ATTACHMENT A-2
POREWATER DATA REPORT

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LIST OF ACRONYMS AND ABBREVIATIONS

Data Gaps SAP	*Data Gaps Investigation Sampling and Analysis Plan*
DGT	diffusive gradient in thin film
Ecology	Washington State Department of Ecology
H_2S	hydrogen sulfide
mg/L	milligrams per liter
mm	millimeters
QAPP	*Quality Assurance Project Plan*
RD Work Plan	*Remedial Design and Adaptive Management Work Plan*
SMA	sediment management area

1 INTRODUCTION

This Porewater Data Report summarizes sediment porewater investigations that informed remedial design in Port Gamble Bay, Washington, as generally described in the accompanying *Engineering Design Report*. The sampling and analysis activities described herein were completed in accordance with both the *Data Gaps Investigation Sampling and Analysis Plan* (Data Gaps SAP) and *Quality Assurance Project Plan* (QAPP) that were appended (Appendices B and C, respectively) to the *Remedial Design and Adaptive Management Work Plan* (RD Work Plan; Anchor QEA 2014), as approved by the Washington State Department of Ecology (Ecology).

In situ sampling probes were used to collect sediment porewater data along six transects located within sediment management area (SMA)-1 and SMA-2. Three types of in situ samplers were used to evaluate porewater data at each station:

- Passive diffusive gradient in thin film (DGT) gel samplers to obtain reliable tidal-average concentrations of in situ porewater hydrogen sulfide (H_2S) concentrations; in situ DGT samplers remained in the sediment for 24 to 48 hours (Figures A-2-1 through A-2-6)
- Water quality probes to measure pH, temperature, salinity, and redox potential; water quality probes remained in the sediment for 24 to 48 hours to measure tidal variations in porewater (Figure A-2-7)
- A sulfide probe to measure instantaneous sulfide concentrations as often as practicable and for comparison with data obtained from the in situ DGT gel samplers

2 POREWATER SAMPLING AND ANALYSIS

Porewater sampling and processing methods are described in detail in the Ecology-approved Data Gaps SAP. A summary of processing methods is provided in this section; deviations from the Data Gaps SAP are provided in Section 3.

2.1 DGT Sampling and Analysis

Upon retrieval of the in situ DGT gel sampler, the sampling assembly was removed from the sediment and the DGT piston was flushed with deionized water, sealed in a clean plastic bag, and shipped to the laboratory for analysis. The accumulated sulfide in the DGT gel was measured using purge-and-trap followed by the colorimetric method (methylene blue) (Teasdale et al. 1999), which in turn was used to calculate porewater concentrations based on diffusive flux relationships (Anchor QEA 2014).

The flux to DGT equals the mass (M) accumulated by the binding gel divided by the area of the sampling window and the exposure time t:

$$F = M/(At)$$

Porewater concentrations of sulfide were calculated using Fick's first diffusion law:

$$C_{DGT} = \frac{F * \Delta g}{D} = \frac{M * \Delta g}{DAt}$$

where:

Δg = the thickness of the diffusion layer and D is the diffusion coefficient of sulfide in the diffusion gel

In each transect, DGT piston devices with three diffusion layer thickness (i.e., amount of preloaded gel in the piston) were deployed in one of the surface and subsurface depths to evaluate (or calibrate) the accuracy of porewater concentrations measured by DGT. The results of the three different diffusion layer thickness were not consistent, indicating that the H_2S in the porewater is not fully sustained and porewater concentrations are underestimated by DGT measurements, which is further discussed in Section 3.1.

2.2 Water Quality Probe Monitoring

Water quality probes were co-located with some of the DGT samplers. Deviations from the Data Gaps SAP are described in Section 3.2.

2.3 Periodic Sulfide Probe Measurements

Periodic measurements of porewater hydrogen sulfide concentrations using sulfide probes were performed as practicable on ebbing tides to verify data obtained from the in situ DGT gel samplers. Diver-assisted sulfide probe deployment commenced on May 28, 2014, and resulted in three successful in situ readings from Transect A locations (A4 shallow and A5 shallow and deep; Figure A-2-1; Table A-2-1). At all three of these locations, the in situ probe measurements during the ebb tide sampling were similar to the in situ DGT values for that same station, corroborating the accuracy of the in situ DGT data. However, at the next attempted station, the glass filament probe sensor broke, interrupting further concurrent in situ data collection efforts.

When the sulfide probe was repaired, the divers attempted to redeploy the probe following procedures described in the Data Gaps SAP. However, even after multiple attempts, additional problems with the probes and associated wiring/metering equipment were encountered, precluding successful in situ redeployment of the sulfide probes. Therefore, no further in situ porewater sulfide probe measurements were obtained.

In a further attempt to collect additional porewater sulfide probe measurements, a modified ex situ approach was implemented. During ebb tides, divers advanced shallow (3-foot) cores at target stations. The cores had ports that allowed the tip of the sulfide probe to be inserted into the sediments ex situ. However, these ex situ measurements proved highly variable and did not stabilize during the measurement period. Moreover, the final ex situ probe readings did not correlate ($r^2 < 0.2$; regression) with the in situ DGT values for that same station. Because of the much higher quality of the in situ DGT method compared to sulfide probe measurements, as discussed in the Data Gaps SAP and supporting references, the ex situ sulfide probe data were rejected for use in remedial design but are presented in Table A-2-1 for completeness.

Additional deviations from the Data Gaps SAP are described in Section 3.3.

3 DEVIATIONS FROM THE SAMPLING AND ANALYSIS PLAN

This section details deviations from the Data Gaps SAP for the in situ DGT sampling, water quality probe measurements, and instantaneous sulfide probe measurements.

3.1 In Situ DGT Sampling Deviations

Coarse sediments (e.g., gravel and cobble) present at target location B1 precluded deployment of an in situ DGT gel sampler at this station. In addition, the surface DGT gel samples at locations C1 and D2 shallow were both damaged during diver retrieval, and these locations were therefore not submitted for sulfide analysis.

3.2 Water Quality Probe Monitoring Deviations

Due to fouling and calibration issues encountered when deploying water quality probes at transects C and D, no water quality measurements were collected at these locations. However, no evidence of fouling or meter instability was observed at the other transect locations (A, B, E, and F).

3.3 Periodic Sulfide Probe Measurement Deviations

As discussed in Section 2.3, the ex situ sulfide probe measurements proved to be imprecise, likely as a result of probe and/or meter instability and variable sampling methods. In addition, several targeted sample locations were either impracticable for deployment due to the sediment matrix (e.g., riprap). Because of the much higher quality of the in situ DGT method compared to sulfide probe measurements, the ex situ sulfide probe data were rejected for use in remedial design.

4 POREWATER RESULTS

Validated in situ DGT sampling results and water quality probe measurements are summarized in this section.

4.1 In Situ DGT Results

A summary of all DGT surface and subsurface results is included in Table A-2-2; Figures A-2-1 through A-2-6 present the data. Consistent with the RD Work Plan and Data Gaps SAP, DGT results were calibrated by deploying three different thicknesses of gel (1.98 millimeters [mm], 0.78 mm, and 0.39 mm) at one station along each transect to verify the accuracy of diffusion calculations. Based on previous porewater sulfide measurements collected in SMA-1 and SMA-2, 1.96 mm gels were deployed in SMA-1, while 0.78 mm gels were deployed in SMA-2. While sulfide concentrations at most of the calibration locations were not detected using any of the gel thicknesses (i.e., reflecting the very low porewater sulfide concentrations present at most of the sampling locations), at locations where sulfide was detected, calculated porewater H_2S concentrations for the different gel thicknesses agreed within a factor of approximately two, providing support for the accuracy of these data. However, the calibration data also suggested that sulfide in porewater is not fully sustained by desorption from sediment. Therefore, porewater concentrations of sulfide are under-estimated by DGT measurements (e.g., up to roughly 50%). Correction for gel thickness to reflect this potential low bias was not applied, as there was not a consistent trend observed in the data.

In SMA-1 (transects A and B), 28 DGTs were deployed. The highest porewater H_2S concentrations in SMA-1 were detected at both surface and subsurface depths from station B6a (5.9 and 4.5 mg/L, respectively), located in a high-concentration wood chip deposit within the planned dredge prism (Figures A-2-1 and A-2-4). Porewater H_2S was also detected at the surface of station A5 (0.1 mg/L) and at the surface and subsurface at station B4 (0.4 and 0.9 mg/L, respectively). At all other stations, H_2S concentrations were not detected above the reporting limits. All SMA-1 DGT analyses are summarized in Table A-2-2 and presented in Figures A-2-1 and A-2-4.

In SMA-2 (transects C through F), 58 DGTs were deployed, including 28 surface samples and 30 subsurface samples. Surface sediment porewater H_2S concentrations in SMA-2 ranged from non-detect (19 samples) to a maximum of 2.2 mg/L. Subsurface sediment porewater H_2S concentrations ranged from non-detect (16 samples) to a maximum of 7.9 mg/L. The highest subsurface sediment porewater H_2S concentration (7.9 mg/L) was detected at station F4, located below a high density eelgrass bed (greater than 90% areal coverage). All SMA-2 DGT analyses are summarized in Table A-2-2; surface sampling data are presented in Figures A-2-2 through A-2-3, and subsurface data are presented in Figures A-2-5 and A-2-6.

4.2 Water Quality Probe Results

Water quality probe data for Transects A, B, E, and F are summarized in Tables A-2-3 through A-2-6, respectively.

5 REFERENCES

Anchor QEA, LLC, 2014. *Remedial Design and Adaptive Management Work Plan*. Prepared for Pope Resources LP and Olympic Property Group LLC and Washington State Department of Ecology. May.

Teasdale, Hayward S., and W. Davison, 1999. In situ, high-resolution measurement of dissolved sulfide using diffusive gradients in thin-films with computer-imaging densitometry. *Analytical Chemistry* 71:2186-2191.

TABLES

Table A-2-1
Periodic In Situ and Ex Situ Hydrogen Sulfide Readings

Station	Coordinates		H_2S (mg/L)				
	North	West	Depth (inches)	Date	Time	In Situ	Ex Situ
Transect A							
A2	47° 51.411	122° 34.882	6	27-Jun	12:20	--	**R** (0.1)
			20			--	--
A3	47° 51.413	122° 34.874	6	27-Jun	13:02	--	**R** (0.12)
			20			--	--
A4	47° 51.416	122° 34.870	6	28-May	15:07	**0.43**	--
			20			--	--
A5	47° 51.428	122° 34.853	6	28-May	15:14	**0.23**	--
			24			**0.15**	--
Transect B							
B2	47° 51.385	122° 34.855	6	27-Jun	12:54	--	**R** (0.13)
			20			--	--
B3	47° 51.388	122° 34.838	6	27-Jun	12:32	--	**R** (0.26)
			20			--	**R** (0.1)
B4	47° 51.390	122° 34.833	6	27-Jun	11:00	--	**R** (2.7)
			20			--	**R** (2.97)
B5	47° 51.396	122° 34.819	6	27-Jun	11:15	--	**R** (0.87)
			20			--	**R** (0.1)
B6	47° 51.402	122° 34.812	6	26-Jun	11:12	--	**R** (0.21)
			24			--	**R** (0.3)
B6a*	47° 51.402	122° 34.812	6	26-Jun	11:23	--	**R** (3)
			24			--	**R** (65.5)
B7	47° 51.406	122° 34.781	6	27-Jun	11:45	--	**R** (2.07)
			20			--	**R** (0.06)
Transect C							
C3	47° 51.277	122° 34.813	6	16-Jul	12:07	--	**R** (31.8)
			20			--	**R** (65.4)
C4	47° 51.276	122° 34.812	6	16-Jul	12:17	--	**R** (2.52)
			20			--	**R** (10.8)
C5	47° 51.274	122° 34.811	6	16-Jul	12:33	--	**R** (4.37)
			20			--	**R** (9.72)
C6	47° 51.272	122° 34.809	6	16-Jul	12:45	--	**R** (2.77)
			20			--	**R** (7.23)
C7	47° 51.270	122° 34.808	6	16-Jul	13:05	--	**R** (3.98)
			20			--	**R** (3.43)
C8	47° 51.263	122° 34.802	6	16-Jul	13:35	--	**R** (25.9)
			20			--	**R** (33.5)
Transect D							
D3	47° 51.268	122° 34.846	6	11-Jul	11:00	--	**R** (0.19)
			20			--	**R** (0.07)
D4	47° 51.265	122° 34.843	6	11-Jul	11:50	--	**R** (1.45)
			20			--	**R** (5.09)
D5	47° 51.252	122° 34.830	6	11-Jul	11:15	--	**R** (1.23)
			20			--	**R** (2.93)
D6	47° 51.238	122° 34.815	6	11-Jul	11:10	--	**R** (14.1)
			24			--	**R** (1.02)

Table A-2-1
Periodic In Situ and Ex Situ Hydrogen Sulfide Readings

Station	Coordinates		H_2S (mg/L)				
	North	West	Depth (inches)	Date	Time	In Situ	Ex Situ
Transect E							
E3	47° 51.173	122° 34.904	6	30-Jun	12:35	--	**R** (6.87)
			20			--	**R** (24.8)
E4	47° 51.173	122° 34.900	6	30-Jun	13:26	--	**R** (30.6)
			20			--	**R** (12.4)
E5	47° 51.173	122° 34.888	6	30-Jun	13:10	--	**R** (16.8)
			20			--	**R** (56.2)
E6	47° 51.173	122° 34.852	6	30-Jun	13:00	--	**R** (14.9)
			24			--	**R** (35.7)
Transect F							
F3	47° 51.144	122° 34.894	6	30-Jun	13:53	--	**R** (1.31)
			20			--	**R** (0.98)
F4	47° 51.144	122° 34.890	6	30-Jun	14:00	--	**R** (1.36)
			20			--	**R** (32)
F5	47° 51.144	122° 34.870	6	30-Jun	14:30	--	**R** (0.45)
			20			--	**R** (55)
F6	47° 51.150	122° 34.852	6	30-Jun	14:45	--	**R** (2.07)
			24			--	**R** (14.4)

Notes:

-- = no readings collected

H_2S = hydrogen sulfide

mg/L = milligrams per liter

R = Rejected reading as described in the Engineering Design Report, Appendix A - Attachment 2; rejected value in parenthesis

Table A-2-2
Summary of Direct In Situ and Ex Situ Hydrogen Sulfide Readings

SMA	Station ID	Coordinates[1]		Hydrogen Sulfide Concentration (mg/L)	
		Latitiude	Longitude	Surface[2]	Subsurface[3]
Transect A					
SMA-1	A1	47.856733	-122.581517	0.25 U	0.25 U
	A2	47.856850	-122.581367	0.25 U	0.25 U
	A3	47.856883	-122.581233	0.25 U	0.25 U
	A4	47.856933	-122.581167	0.25 U	0.25 U
	A5	47.857133	-122.580883	**0.1**	0.10 U
	A6	47.857200	-122.580617	0.25 U	0.25 U
	A7	47.857367	-122.580383	0.25 U	0.25 U
Transect B					
SMA-1	B2	47.856417	-122.580917	0.25 U	0.25 U
	B3	47.856467	-122.580633	0.25 U	0.25 U
	B4	47.856500	-122.580550	**0.4**	**0.9**
	B5	47.856600	-122.580317	0.25 U	0.25 U
	B6	47.856583	-122.580067	0.25 U	0.25 U
	B6a*	47.856700	-122.580200	**5.9**	**4.5**
	B7	47.856767	-122.579683	0.25 U	0.25 U
Transect C					
SMA-2	C1	47.854783	-122.580350	--	0.10 U
	C2	47.854667	-122.580250	0.10 U	**2.2**
	C3	47.854617	-122.580217	**1.1**	**1.5**
	C4	47.854600	-122.580200	**0.22**	**0.25**
	C5	47.854567	-122.580183	**2.2**	**0.53**
	C6	47.854533	-122.580150	**1.4**	0.10 U
	C7	47.854500	-122.580133	**0.16**	**0.96**
	C8	47.854383	-122.580033	**0.47**	**0.65**
	C9	47.854217	-122.579900	0.10 U	0.10 U
Transect D					
SMA-2	D1	47.854567	-122.580833	0.10 U	**1**
	D2	47.854550	-122.580850	--	**0.39**
	D3	47.854467	-122.580767	0.10 U	**2.7**
	D4	47.854417	-122.580717	0.10 U	**2.1**
	D5	47.854200	-122.580500	0.10 U	0.10 U
	D6	47.853967	-122.580250	**2**	0.10 U
	D7	47.853650	-122.579833	0.10 U	**0.28**
Transect E					
SMA-2	E1	47.852883	-122.581967	0.25 U	0.25 U
	E2	47.852883	-122.581833	0.25 U	0.25 U
	E3	47.852883	-122.581733	0.25 U	0.25 U
	E4	47.852883	-122.581667	0.10 U	**0.67**
	E5	47.852883	-122.581467	0.25 U	**4.1**
	E6	47.852883	-122.580867	**1.2**	**6.3**
	E7	47.852883	-122.580167	0.25 U	0.25 U

Table A-2-2
Summary of Direct In Situ and Ex Situ Hydrogen Sulfide Readings

SMA	Station ID	Coordinates[1]		Hydrogen Sulfide Concentration (mg/L)	
		Latitiude	Longitude	Surface[2]	Subsurface[3]
Transect F					
SMA-2	F1	47.852400	-122.582100	0.25 U	0.25 U
	F2	47.852400	-122.581783	0.25 U	**3.3**
	F3	47.852400	-122.581567	0.25 U	0.25 U
	F4	47.852400	-122.581500	0.25 U	**7.9**
	F5	47.852400	-122.581167	**2**	**1.3**
	F6	47.852500	-122.580867	0.25 U	**0.87**
	F7	47.852400	-122.580217	0.25 U	0.25 U

Notes:

Bold = detected above reporting limit

DGT = diffusive gradient in thin film

mg/L = milligrams per liter

* = station collected from within the pre-defined dredge area

U = not detected above reporting limit

-- = concentration not measured

1 = horizontal datum is NAD83

2 = surface depth is approximately 0.5 foot

3 = subsurface depth is approximately 2 feet

Table A-2-3

Porewater Water Quality Measurements – Transect A

Station ID	Coordinates[1]		Parameter	Surface[2]			Subsurface[3]		
	Latitiude	Longitude		Min	Max	Average	Min	Max	Average
A1	47.856733	-122.581517	Temperature (°C)	12.33	20.02	14.43	13.98	15.02	14.89
			pH (SU)	7.42	7.88	7.6	7.36	7.72	7.45
			ORP (mV)	59	279	148	-241	169	-42
			Salinity (ppt)	0.11	33.68	26.95	0.19	33.2	31.69
A2	47.856850	-122.581367	Temperature (°C)	11.61	15.89	12.42	12.39	13.09	12.52
			pH (SU)	7.22	7.92	7.45	7.5	7.68	7.55
			ORP (mV)	-279	199	22	-618	-11	-430
			Salinity (ppt)	0.05	14.09	9.88	0.16	0.5	0.31
A3	47.856883	-122.581233	Temperature (°C)	11.35	14.62	11.76	11.27	11.63	11.33
			pH (SU)	7.46	7.8	7.58	7.52	7.8	7.59
			ORP (mV)	-354	34	-94	-374	34	-272
			Salinity (ppt)	14.7	23.82	17.25	15.13	29.87	22.42
A4	47.856933	-122.581167	Temperature (°C)	11.18	12.95	11.45	10.98	13.15	11.06
			pH (SU)	7.51	7.87	7.65	7.55	7.84	7.62
			ORP (mV)	-138	55	28	-414	-31	-279
			Salinity (ppt)	13.79	14.41	13.93	13.71	27.37	13.8
A5	47.857133	-122.580883	Temperature (°C)	10.85	12.39	11.08	10.56	12.58	10.59
			pH (SU)	7.49	8.05	7.6	7.51	7.97	7.62
			ORP (mV)	-364	85	-229	-429	-191	-356
			Salinity (ppt)	28.75	29.53	29.16	28.87	29.05	28.97
A6	47.857200	-122.580617	Temperature (°C)	10.94	12.05	11.07	10.73	11.5	10.74
			pH (SU)	7.63	8.07	7.86	7.53	8.14	7.61
			ORP (mV)	78	128	111	-124	70	21
			Salinity (ppt)	25.6	28.77	28.13	27.02	28.62	28.21
A7	47.857367	-122.580383	Temperature (°C)	10.86	12.25	11.08	10.62	11.76	10.64
			pH (SU)	7.69	8.14	7.88	7.65	8.18	7.74
			ORP (mV)	48	217	108	-77	141	70
			Salinity (ppt)	25.41	29.67	29.4	10.62	11.76	29.32

Notes:

1 = horizontal datum is NAD83

2 = surface depth is approximately 0.5 foot

3 = subsurface depth is approximately 2 feet

°C = degrees Celsius

SU = Standard Units

min = minimum

max = maximum

mV = millivolts

ppt = parts per thousand

Table A-2-4

Porewater Water Quality Measurements – Transect B

Station ID	Coordinates[1]		Parameter	Surface[2]			Subsurface[3]		
	Latitiude	Longitude		Min	Max	Average	Min	Max	Average
B2	47.856417	-122.580917	Temperature (°C)	11.18	11.63	11.36	11.2	11.57	11.38
			pH (SU)	7.43	8.09	7.76	4.22	7.84	5.55
			ORP (mV)	-328	267	-50	-618	-117	-345
			Salinity (ppt)	31.23	32.29	32.08	0.07	31.7	11.41
B3	47.856467	-122.580633	Temperature (°C)	11.25	11.68	11.32	11.11	11.32	11.14
			pH (SU)	7.46	7.97	7.58	7.35	7.7	7.51
			ORP (mV)	-241	268	209	-416	-13	-381
			Salinity (ppt)	0.05	4.54	0.56	0.06	15.13	5.84
B4	47.8565	-122.58055	Temperature (°C)	10.97	11.33	11.05	10.7	11.09	10.74
			pH (SU)	7.24	8.07	7.51	7.04	7.31	7.12
			ORP (mV)	-340	44	-55	-401	-263	-380
			Salinity (ppt)	0.03	16.42	10.51	0.14	21.47	13.05
B5	47.8566	-122.580317	Temperature (°C)	10.59	11.22	10.68	10.34	10.55	10.37
			pH (SU)	7.47	7.99	7.65	7.41	7.61	7.46
			ORP (mV)	-27	97	46	-398	52	-240
			Salinity (ppt)	14.15	28.31	23.37	14.72	28.58	25.37
B6a*	47.856583	-122.580067	Temperature (°C)	10.46	10.74	10.62	10.26	11.91	10.3
			pH (SU)	7.04	8	7.61	7.01	7.62	7.04
			ORP (mV)	-386	21	-207	-390	-216	-385
			Salinity (ppt)	0.06	14.71	11.7	14.06	25.61	17.09
B7	47.856767	-122.579683	Temperature (°C)	10.52	11.69	10.68	10.56	10.99	10.65
			pH (SU)	7.48	7.91	7.58	7.62	7.87	7.68
			ORP (mV)	-193	117	46	-492	25	-361
			Salinity (ppt)	28.73	30.36	30.04	29.28	29.39	29.33

Notes:

1 = horizontal datum is NAD83

2 = surface depth is approximately 0.5 foot

3 = subsurface depth is approximately 2 feet

°C = degrees Celsius

SU = Standard Units

min = minimum

max = maximum

mV = millivolts

ppt = parts per thousand

* = station collected from within the pre-defined dredge area

Table A-2-5

Porewater Water Quality Measurements – Transect E

Station ID	Coordinates[1]		Parameter	Surface[2]			Subsurface[3]		
	Latitiude	Longitude		Min	Max	Average	Min	Max	Average
E1	47.852883	-122.581967	Temperature (°C)	14.67	16.86	15.37	14.14	14.94	14.19
			pH (SU)	7.23	7.61	7.41	7.27	7.61	7.34
			ORP (mV)	-359	59	-73	-361	289	-87
			Salinity (ppt)	0.16	26.8	26.13	26.83	27.21	27.05
E2	47.852883	-122.581833	Temperature (°C)	14.06	17.59	14.78	13.84	14.51	13.9
			pH (SU)	7.07	8.75	7.42	7.2	7.79	7.42
			ORP (mV)	-65	184	92	-293	63	-162
			Salinity (ppt)	0	15.98	14.13	13.72	20.02	15.56
E3	47.852883	-122.580867	Temperature (°C)	13.92	21.12	14.49	13.4	14.13	13.44
			pH (SU)	7.37	10.08	7.51	7.4	7.71	7.57
			ORP (mV)	-441	-232	-400	-400	-360	-394
			Salinity (ppt)	0	15.08	1.4	0.02	15.96	7.31
E4	47.852883	-122.581667	Temperature (°C)	13.75	14.28	13.97	12.71	13.75	12.74
			pH (SU)	6.96	7.77	7.27	6.76	7.01	6.86
			ORP (mV)	-308	139	-160	-373	-315	-360
			Salinity (ppt)	29.03	30.53	30.19	28.51	32.86	31.22
E5	47.852883	-122.581833	Temperature (°C)	13.22	14.11	13.37	12.32	13.49	12.35
			pH (SU)	7.21	7.99	7.51	6.94	7.83	7.04
			ORP (mV)	-358	63	-182	-376	-233	-372
			Salinity (ppt)	13.88	27.21	20.95	5.31	28.07	23.65
E6	47.852883	-122.580867	Temperature (°C)	12.5	13.08	12.6	11.52	24.64	12.9
			pH (SU)	7.37	8.06	7.62	7.05	8.25	7.27
			ORP (mV)	-334	58	-178	-382	-39	-339
			Salinity (ppt)	29.22	29.37	29.26	0.11	29.82	25.92
E7	47.852883	-122.581667	Temperature (°C)	12.77	13.44	12.84	12.07	12.97	12.1
			pH (SU)	7.43	7.98	7.69	7.38	7.79	7.43
			ORP (mV)	-58	231	110	-452	109	-362
			Salinity (ppt)	28.55	28.85	28.61	28.35	28.69	28.63

Notes:

1 = horizontal datum is NAD83

2 = surface depth is approximately 0.5 foot

3 = subsurface depth is approximately 2 feet

°C = degrees Celsius

SU = Standard Units

min = minimum

max = maximum

mV = millivolts

ppt = parts per thousand

Table A-2-6
Porewater Water Quality Measurements – Transect F

Station ID	Coordinates[1]		Parameter	Surface[2]			Subsurface[3]		
	Latitiude	Longitude		Min	Max	Average	Min	Max	Average
F1	47.8524	-122.5821	Temperature (°C)	13.96	17.25	14.77	13.82	15.99	14.15
			pH (SU)	6.71	7.57	7.08	6.39	6.73	6.67
			ORP (mV)	-85	336	240	-462	-410	-438
			Salinity (ppt)	0.09	0.15	0.11	0.24	12.2	4.44
F2	47.8524	-122.581167	Temperature (°C)	13.75	14.75	14.11	13.33	14.45	13.56
			pH (SU)	6.67	7.64	6.99	6.32	6.68	6.36
			ORP (mV)	-411	68	-57	-167	78	-95
			Salinity (ppt)	0.18	14.84	9.51	0.92	32.97	17.86
F3	47.8524	-122.581567	Temperature (°C)	13.5	14.42	13.71	12.98	13.61	13.11
			pH (SU)	7.12	8.06	7.27	7.03	8.19	7.1
			ORP (mV)	-371	28	-258	-389	-84	-376
			Salinity (ppt)	0.06	15.86	9.1	0.14	17.65	12.65
F4	47.8524	-122.5821	Temperature (°C)	13.04	14.73	13.38	12.42	12.93	12.47
			pH (SU)	6.93	8.39	7.02	6.89	7.08	6.98
			ORP (mV)	-371	28	-258	-382	-364	-375
			Salinity (ppt)	18.15	33.51	31.03	31.5	36	35
F5	47.8524	-122.581167	Temperature (°C)	12.76	13.97	12.9	11.84	12.71	11.87
			pH (SU)	7.14	8.21	7.35	7.02	8.16	7.1
			ORP (mV)	-368	-11	-271	-384	-140	-376
			Salinity (ppt)	0.03	0.5	0.08	0.04	13.55	1.38
F6	47.8524	-122.581567	Temperature (°C)	12.62	13.14	12.69	12.08	12.88	12.16
			pH (SU)	7.37	7.86	7.49	7.37	7.44	7.43
			ORP (mV)	-383	220	-155	-442	71	-392
			Salinity (ppt)	28.96	29.15	29.05	28.48	29.08	28.7

Notes:

1 = horizontal datum is NAD83

2 = surface depth is approximately 0.5 foot

3 = subsurface depth is approximately 2 feet

°C = degrees Celsius

SU = Standard Units

min = minimum

max = maximum

mV = millivolts

ppt = parts per thousand

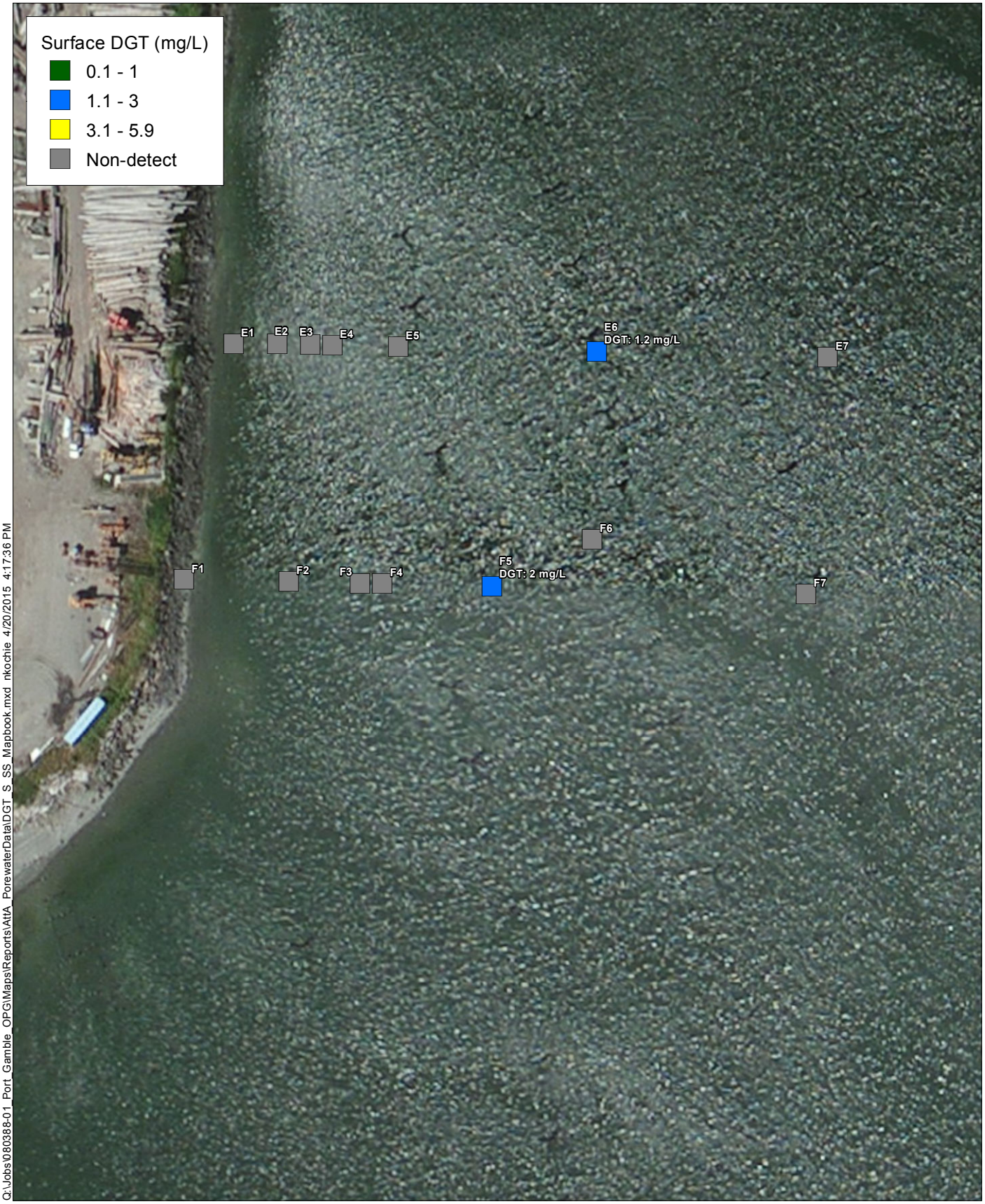
FIGURES

ANCHOR QEA

Feet
0 50 100

Figure A-2-1
SMA 1: Surface Porewater Hydrogen Sulfide Results
Attachment A-2: Porewater Data Report
Port Gamble Bay Cleanup Site

Figure A-2-2
SMA 2 NE: Surface Porewater Hydrogen Sulfide Results
Attachment A-2: Porewater Data Report
Port Gamble Bay Cleanup Site



ANCHOR QEA

Feet
0 50 100

Figure A-2-3
SMA 2 SW: Surface Porewater Hydrogen Sulfide Results
Attachment A-2: Porewater Data Report
Port Gamble Bay Cleanup Site

Figure A-2-4
SMA 1: Subsurface Porewater Hydrogen Sulfide Results
Attachment A-2: Porewater Data Report
Port Gamble Bay Cleanup Site

Figure A-2-5
SMA 2 NE: Subsurface Porewater Hydrogen Sulfide Results
Attachment A-2: Porewater Data Report
Port Gamble Bay Cleanup Site

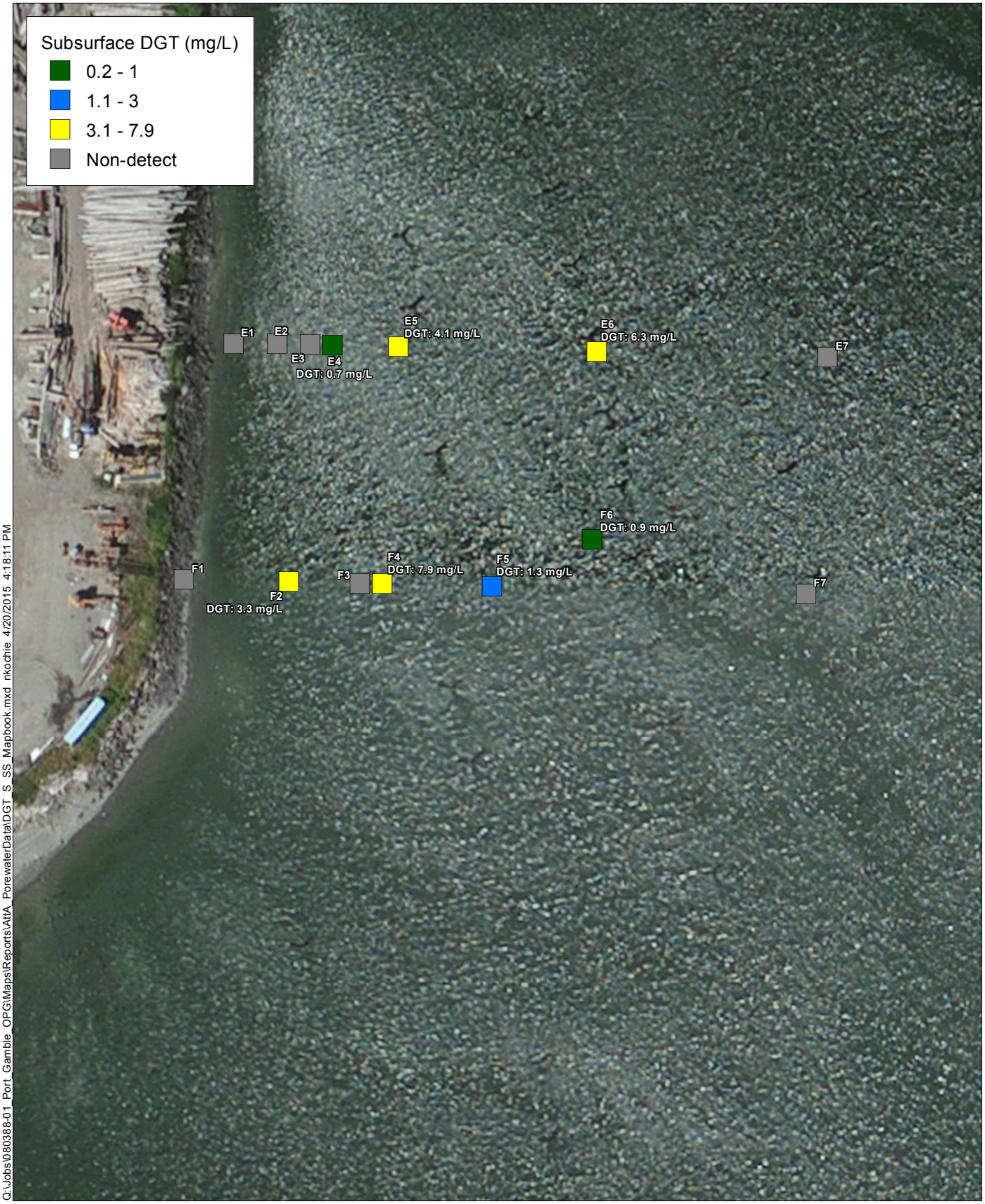


Figure A-2-6
SMA 2 SW: Subsurface Porewater Hydrogen Sulfide Results
Attachment A-2: Porewater Data Report
Port Gamble Bay Cleanup Site

Figure A-2-7
SMA-1 and SMA 2: Porewater Water Quality Measurement Locations
Attachment A-2: Porewater Data Report
Port Gamble Bay Cleanup Site

ATTACHMENT A-3
SOIL AND SEDIMENT DATA REPORT

TABLE OF CONTENTS

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LIST OF ACRONYMS AND ABBREVIATIONS

Bay	Port Gamble Bay
Data Gaps SAP	Data Gaps Investigation Sampling and Analysis Plan
DMMP SAP	Dredge Material Management Program Sampling and Analysis Plan
DMMU	Dredge Material Management Unit
DRET	Dredge Elutriate Testing
Ecology	Washington State Department of Ecology
MLLW	mean lower low water
QAPP	Quality Assurance Project Plan
RD Work Plan	Remedial Design and Adaptive Management Work Plan
SMA	sediment management area
TVS	total volatile solids

1 INTRODUCTION

This Soil and Sediment Data Report summarizes soil and sediment investigations that informed remedial design in Port Gamble Bay (the Bay), Washington, as generally described in the accompanying *Engineering Design Report*. The sampling and analysis activities described herein were completed in accordance with the *Dredge Material Management Program Sampling and Analysis Plan* (DMMP SAP), *Data Gaps Investigation Sampling and Analysis Plan* (Data Gaps SAP), and *Quality Assurance Project Plan* (QAPP) that were appended (Appendices A, B, and C, respectively) to the *Remedial Design and Adaptive Management Work Plan* (RD Work Plan; Anchor QEA 2014), as approved by the Washington State Department of Ecology (Ecology). This Soil and Sediment Data Report summarizes bank soil direct push sampling, intertidal sediment direct push sampling, subsurface sediment coring, and surface sediment grab sampling.

2 SAMPLING AND PROCESSING

This section describes the sampling and processing of bank soil and intertidal sediment, subtidal subsurface sediment, and subtidal surface grab samples. Sampling and processing methods are detailed in the DMMP SAP and Data Gaps SAP, which are Appendices A and B, respectively, of the RD Work Plan (Anchor QEA 2014).

2.1 Bank Soil and Intertidal Sediment Sampling and Processing

Direct push (Geoprobe®) equipment was used to collect subsurface bank soil and subsurface intertidal sediments from the locations shown on Figure A-3-1. Bank soil and intertidal direct push borings were advanced in sediment management area (SMA)-1 and SMA-2 and processed on the adjacent uplands. As-collected bank soil and intertidal sediment sampling location coordinates are presented in Table A-3-1. Each boring was logged by using the Unified Soil Classification System as a guideline before being composited and submitted for analyses. Logging included soil type, density/consistency of soil, color, and other characteristics. The direct push logs are provided in Attachment A-3-1.

2.2 Subtidal Sediment Sampling and Processing

Subtidal sediment cores were collected using a Mudmole® coring system at the locations shown on Figure A-3-2. A total of 17 cores were advanced to delineate the vertical extent of wood (DMMP Core) and 4 cores were advanced for the purpose of confirming the boundary of sediment removal areas (Cap Confirmation Core) within SMA-1 and SMA-2. As-collected coordinates are presented in Table A-3-2. In accordance with the DMMP SAP and Data Gaps SAP, each core was logged in the same manner as the boring samples before being composited and submitted for analyses at ARI. The Mudmole core logs are provided in Attachment A-3-2. During processing, an aliquot of sediments was composited from a subset of DMMP Cores from SMA-1 and SMA-2 to evaluate the potential for nitrogen release.

2.3 Surface Sediment Sampling and Processing

Surface sediment grab samples were collected using a modified Van Veen sampler deployed from the *R/V Carolyn Dow* sampling vessel at the locations shown on Figure A-3-3. The as-collected coordinates are presented in Table A-3-3. In accordance with the Data Gaps SAP,

grab samples were described in a similar manner to the borings and cores before being composited and submitted for bioassay testing at ENVIRON bioassay laboratory in Port Gamble, Washington. The field collection forms are presented in Attachment A-3-3.

3 DEVIATIONS FROM THE SAMPLING AND ANALYSIS PLANS

This section describes deviations from the DMMP SAP and Data Gaps SAP.

3.1 Bank Soil and Intertidal Sediment Deviations

Due to conditions encountered in the field, three targeted intertidal direct push locations could not be accessed; accordingly, no borings were collected at these locations.

3.2 Subtidal Sediment Sampling Deviations

To better define the depth of wood waste in the Bay, two additional DMMP cores were collected: core PG-PDI-SC-20 was collected in SMA-1, and core PG-PDI-SC-21 was collected in SMA-2. The additional locations were submitted for physical and chemical analyses in accordance with the DMMP SAP.

3.3 Surface Sediment Deviations

No deviations occurred during surface sediment sampling activities.

4 RESULTS

This section summarizes results of the bank soil and intertidal sediment analyses, subtidal coring analyses, and surface sediment bioassay testing.

4.1 Bank Soil and Intertidal Sediment Results

Bank soil and intertidal samples were processed and submitted for analytical testing in accordance with the Data Gaps SAP. Upon review of preliminary analytical data for intertidal sediment samples collected from the 0- to 2-foot and 2- to 3-foot intervals, additional archived 3- to 4-foot interval samples were also submitted for analysis, in accordance with the Data Gaps SAP. The bank soil and intertidal sediment results are presented in Table A-3-4.

4.2 Subtidal Sediment Results

Subtidal sediment cores were collected for the multiple purposes defined in the DMMP SAP and Data Gaps SAP. This section describes the results of the chemical analysis and bioassay testing.

4.2.1 DMMP SAP Subtidal Results

In accordance with the DMMP SAP, subtidal core intervals were processed and submitted to define the extent of wood and collect data to inform potential disposal or reuse designs. Table A-3-5 presents the DMMP SAP subtidal core interval analytical chemistry results. Table A-3-6 presents a summary of total volatile solids (TVS) result by interval converted to mean lower low water (MLLW) elevations to inform the engineering design.

Following review of preliminary analytical results with the Dredge Material Management Office, archived sediments were composited by the laboratory into three prospective Dredge Material Management Units (DMMUs) and submitted for the additional DMMP-required chemical analyses and bioassay testing to inform a suitability determination. The results of the prospective DMMU chemical analyses compared to DMMP screening levels are presented in Table A-3-7. A summary of the dispersive and non-dispersive DMMP results

are presented in Tables A-3-8 and A-3-9, respectively, and the full DMMP Bioassay Report is included in Attachment A-3-4.

4.2.2 Data Gaps SAP Subtidal Sediment Results

As described in the Data Gaps SAP, four Mudmole cores (CAP Confirmation Cores) were advanced to refine the extent of wood waste in SMA-1 and SMA-2. The cores were submitted for TVS analysis, which is presented in Table A-3-10. One CAP Confirmation Core location, PG-PDI-SC-18, resulted in TVS concentrations in excess of the CAP defined cleanup level. Therefore, the PG-PDI-SC-18 TVS result intervals are converted to MLLW elevations in Table A-3-6.

4.2.3 Data Gaps SAP Subtidal Sediment DRET Results

Aliquots of sediments collected from a subset of subsurface sample intervals within SMA-1 and SMA-2 were composited into one sample for each SMA and submitted for Dredge Elutriate Testing (DRET) for various forms of nitrogen. The results of the DRET testing are presented in Table A-3-11.

4.3 Surface Sediment Results

Surface sediments were collected from within SMA-3, SMA-4, and SMA-5 for sediment bioassays and to provide a sediment chemistry baseline for evaluation of future sediment recovery. Sediment chemistry baseline samples collected from within SMA-3, SMA-4, and SMA-5 are evaluated and reported in the *Operations, Maintenance, and Monitoring Plan*, provided as Appendix F to the *Engineering Design Report*.

4.3.1 Bioassay Recovery

Bioassay recovery was evaluated by resampling surface sediment at seven locations that previously exceeded larval development bioassay criteria within SMA-3 and SMA-4. Sediments were tested using the larval resuspension method. A summary of the bioassay testing results is presented in Table A-3-12 and the full report is included in Attachment A-3-5.

5 DATA QUALITY AND USABILITY

Analytical results were submitted for validation as required in the RD Work Plan QAPP. Some qualifications were made as a result of validation but no data were rejected. All data were determined to be usable for the purpose of informing remedial design. Data validation and laboratory reports are included in Attachments A-3-6 and Attachment A-3-7, respectively.

6 REFERENCES

Anchor QEA, LLC, 2014. *Remedial Design and Adaptive Management Work Plan*. Prepared for Pope Resources LP and Olympic Property Group LLC and Washington State Department of Ecology. May 2014.

TABLES

Table A-3-1
As-collected Bank Soil and Intertidal Sediment Sampling Location Coordinates

Location ID	Easting	Northing
PG-PDI-IT-SMU1-B1	1211219.498	317323.6388
PG-PDI-IT-SMU1-B2	1211292.66	317271.0998
PG-PDI-IT-SMU1-I1	1211465.813	317610.2812
PG-PDI-IT-SMU1-I2	1211338.806	317494.8973
PG-PDI-IT-SMU1-I3	1211331.803	317407.5474
PG-PDI-IT-SMU2-B1	1211497.184	317177.1148
PG-PDI-IT-SMU2-B2	1211718.787	317106.2199
PG-PDI-IT-SMU3-B1	1211708.156	316770.0533
PG-PDI-IT-SMU3-B2	1211534.537	316707.6275
PG-PDI-IT-SMU3-B3	1211394.793	316627.5493
PG-PDI-IT-SMU3-B4	1211260.757	316554.404
PG-PDI-IT-SMU3-B5	1211144.078	316343.941
PG-PDI-IT-SMU3-I1	1211746.552	316713.7253
PG-PDI-IT-SMU3-I2	1211575.054	316639.5089
PG-PDI-IT-SMU3-I3	1211445.395	316574.2846
PG-PDI-IT-SMU3-I4	1211284.844	316465.8682
PG-PDI-IT-SMU3-I5	1211181.735	316354.1243
PG-PDI-IT-SMU4-B1	1211086.77	316202.0295
PG-PDI-IT-SMU4-B2	1211036.837	315859.77
PG-PDI-IT-SMU4-I1	1211172.862	316200.1243
PG-PDI-IT-SMU4-I2	1211200.179	315853.353
PG-PDI-IT-SMU4-I3	1211169.443	316013.4239
PG-PDI-IT-SMU5-B1	1211000.761	315694.2555
PG-PDI-IT-SMU5-B2	1210885.292	315599.1521
PG-PDI-IT-SMU5-I1	1211143.437	315648.327
PG-PDI-IT-SMU5-I2	1211094.332	315548.574
PG-PDI-IT-SMU5-I3	1211014.286	315545.7007

Notes:

1. Washington State Plane, North American Datum 83 North Zone, US Survey Feet

Table A-3-2
As-collected Subsurface Core Coordinates, Core Purpose, and SMA Area

SMA Area	Core ID	Easting	Northing	Purpose
SMA-1	PG-PDI-SC-01	1211661.043	317513.008	DMMP SAP Core
	PG-PDI-SC-02	1211557.99	317451.604	DMMP SAP Core
	PG-PDI-SC-03	1211470.485	317362.159	DMMP SAP Core
	PG-PDI-SC-04	1211601.229	317362.459	DMMP SAP Core
	PG-PDI-SC-20	1211579.635	317401.018	DMMP SAP Core
	PG-PDI-SC-16	1211491.062	317507.677	Data Gaps SAP Core
	PG-PDI-SC-17	1211737.885	317569.082	Data Gaps SAP Core
SMA-2	PG-PDI-SC-05	1211571.68	316566.244	DMMP SAP Core
	PG-PDI-SC-06	1211503.085	316515.891	DMMP SAP Core
	PG-PDI-SC-07	1211386.312	316481.722	DMMP SAP Core
	PG-PDI-SC-08	1211415.598	316433.172	DMMP SAP Core
	PG-PDI-SC-21	1211520.678	316528.428	DMMP SAP Core
	PG-PDI-SC-09	1211338.192	316426.831	DMMP SAP Core
	PG-PDI-SC-10	1211227.548	316285.788	DMMP SAP Core
	PG-PDI-SC-11	1211225.001	316226.342	DMMP SAP Core
	PG-PDI-SC-12	1211228.755	316117.657	DMMP SAP Core
	PG-PDI-SC-13	1211339.082	316078.524	DMMP SAP Core
	PG-PDI-SC-14	1211355.789	315945.011	DMMP SAP Core
	PG-PDI-SC-15	1211250.462	315966.809	DMMP SAP Core
	PG-PDI-SC-18	1211640.474	316606.021	Data Gaps SAP Core
	PG-PDI-SC-19	1211247.201	315802.815	Data Gaps SAP Core

Notes:

1. Washington State Plane, North American Datum 83 North Zone, US Survey Feet

SMA = Sediment Management Area

DMMP = Dredge Material Management Program

SAP = Sampling and Analysis Plan

Table A-3-3

As-collected Bioassay Recovery Coordinates and SMA Areas

SMA Area	Station	Easting	Northing
SMA-4	PGSS-29	1210493.088	308615.340
	BW-12	1210649.066	308621.565
	BW-18	1210996.742	307610.050
SMA-3	BW-11	1213496.932	309622.064
	BW-15	1212507.781	308614.857
	BW-16	1213493.101	308628.900
	BW-19	1212456.506	307658.084

Notes:

1. Washington State Plane, North American Datum 83 North Zone, US Survey Feet

Table A-3-4
Bank Soil and Intertidal Sediment Results

	Location ID	PG-PDI-IT-SMU1B-COMP	PG-PDI-IT-SMU1-COMP	PG-PDI-IT-SMU1-COMP	PG-PDI-IT-SMU1-COMP	PG-PDI-IT-SMU2B-COMP	PG-PDI-IT-SMU3B-COMP	PG-PDI-IT-SMU3-COMP
	Sample ID	PG-PDI-IT-SMU1-B-COMP-140709	PG-PDI-IT-SMU1-I-0-2-COMP-140711	PG-PDI-IT-SMU1-I-2-3-COMP-140711	PG-PDI-IT-SMU1-3-4-COMP	PG-PDI-IT-SMU2-B-COMP-140709	PG-PDI-IT-SMU3-B-COMP-140709	PG-PDI-IT-SMU3-I-0-2-COMP-140711
	Sample Date	07/09/2014	07/11/2014	07/11/2014	07/11/2014	07/09/2014	07/09/2014	07/11/2014
	Depth	--	0 - 2 ft	2 - 3 ft	3 - 4 ft	--	--	0 - 2 ft
	Sample Type	N	N	N	N	N	N	N
	Matrix	SE	SE	SE	SE	SE	SE	SE
	X	1211292.66	1211338.806	1211338.806	1211338.806	1211718.787	1211394.793	1211445.395
	Y	317271.0998	317494.8973	317494.8973	317494.8973	317106.2199	316627.5493	316574.2846
	Site-specific Criteria							
Conventional Parameters (pct)								
Ash content	--	**98.73**	**99.38**	**99.44**	**99.02**	**99.3**	**98.1**	**98.29**
Total organic carbon	--	**1.35 J**	**0.273 J**	**0.279 J**	--	**0.302 J**	**0.606 J**	**0.584 J**
Total solids	--	**90.96**	**87.09**	**87.84**	**87.73**	**94.18**	**92.86**	**80.2**
Total volatile solids/organic matter	15	**1.27**	**0.62**	**0.56**	**0.98**	**0.7**	**1.9**	**1.71**
Grain Size (pct)								
Gravel	--	**38.1**	**27.2**	**40**	--	**34**	**48.2**	**52**
Sand, very coarse	--	**9.8**	**17.6**	**18.2**	--	**7.3**	**4.8**	**6.1**
Sand, coarse	--	**11**	**18.7**	**16.6**	--	**10.2**	**6.7**	**9.8**
Sand, medium	--	**19.5**	**24.1**	**17.1**	--	**26.1**	**17.4**	**16.7**
Sand, fine	--	**10.4**	**8.9**	**6.1**	--	**14.9**	**12.9**	**8.2**
Sand, very fine	--	**3.6**	**1.5**	**1.2**	--	**2.8**	**3.6**	**2**
Silt, coarse	--	**3.6**	2.2 U	0.8 U	--	**1.1**	**1.8**	**2.7**
Silt, medium	--	**1.2**	2.2 U	0.8 U	--	**1**	**1.2**	**0.5**
Silt, fine	--	**0.9**	2.2 U	0.8 U	--	**0.8**	**1**	**0.5**
Silt, very fine	--	**0.6**	2.2 U	0.8 U	--	**0.7**	**0.7**	**0.3**
Total fines (Reported, not calculated)	--	**7.7**	**2.2**	**0.8**	--	**4.7**	**6.3**	**5.2**
Clay, coarse	--	**0.6**	2.2 U	0.8 U	--	**0.5**	**0.5**	**0.3**
Clay, medium	--	**0.3**	2.2 U	0.8 U	--	**0.3**	**0.4**	**0.1**
Clay, fine	--	**0.6**	2.2 U	0.8 U	--	**0.4**	**0.8**	**0.6**
Metals (mg/kg)								
Cadmium	3	0.5 U	**0.4**	0.5 U	0.6 U	**0.2**	**0.3**	**0.3**
Polycyclic Aromatic Hydrocarbons (µg/kg)								
2-Methylnaphthalene	--	**6**	4.7 U	**7.7**	**77 J**	4.8 U	**14**	**22**
Acenaphthene	--	**3.2 J**	**2.6 J**	**9.8**	**540 J**	4.8 U	**24**	**45**
Acenaphthylene	--	**11**	**7.4**	**7.2**	**13 J**	4.8 U	**12**	**20**
Anthracene	--	**9.9**	**36**	**14**	**1400**	4.8 U	**36**	**38**
Benzo(a)anthracene	--	**9.8**	**38**	**16**	**2300**	4.8 U	**58**	**43**
Benzo(a)pyrene	--	**8.9**	**41**	**16**	**1900**	**3.1 J**	**60**	**40**
Benzo(b,j,k)fluoranthenes	--	**27**	**69**	**41**	**2900**	**4.6 J**	**190**	**100**
Benzo(g,h,i)perylene	--	**12**	**33**	**13**	**860**	**3.7 J**	**56**	**30**
Chrysene	--	**18**	**53**	**24**	**2000**	**3.9 J**	**160**	**67**
Dibenzo(a,h)anthracene	--	**2.8 J**	**5**	4.7 U	**270**	4.8 U	**11**	**5.7**
Fluoranthene	--	**47**	**120**	**62**	**5700**	**4.3 J**	**190**	**300**
Fluorene	--	**5.4**	**8.4**	**9.1**	**850 J**	4.8 U	**25**	**40**
Indeno(1,2,3-c,d)pyrene	--	**8**	**23**	**8.8**	**780**	4.8 U	**40**	**19**
Naphthalene	--	**44**	**11**	**72**	**120 J**	**3.9 J**	**15**	**200**
Phenanthrene	--	**44**	**80**	**37**	**5400**	**5.3**	**130**	**130**
Pyrene	--	**42**	**130**	**68**	**4100**	**5.8**	**200**	**300**

Table A-3-4
Bank Soil and Intertidal Sediment Results

	Location ID	PG-PDI-IT-SMU1B-COMP	PG-PDI-IT-SMU1-COMP	PG-PDI-IT-SMU1-COMP	PG-PDI-IT-SMU1-COMP	PG-PDI-IT-SMU2B-COMP	PG-PDI-IT-SMU3B-COMP	PG-PDI-IT-SMU3-COMP
	Sample ID	PG-PDI-IT-SMU1-B-COMP-140709	PG-PDI-IT-SMU1-I-0-2-COMP-140711	PG-PDI-IT-SMU1-I-2-3-COMP-140711	PG-PDI-IT-SMU1-3-4-COMP	PG-PDI-IT-SMU2-B-COMP-140709	PG-PDI-IT-SMU3-B-COMP-140709	PG-PDI-IT-SMU3-I-0-2-COMP-140711
	Sample Date	07/09/2014	07/11/2014	07/11/2014	07/11/2014	07/09/2014	07/09/2014	07/11/2014
	Depth	--	0 - 2 ft	2 - 3 ft	3 - 4 ft	--	--	0 - 2 ft
	Sample Type	N	N	N	N	N	N	N
	Matrix	SE	SE	SE	SE	SE	SE	SE
	X	1211292.66	1211338.806	1211338.806	1211338.806	1211718.787	1211394.793	1211445.395
	Y	317271.0998	317494.8973	317494.8973	317494.8973	317106.2199	316627.5493	316574.2846
	Site-specific Criteria							
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	16	**13.84 J**	**55.03**	**23.055**	**2545**	**4.319 J**	**91.5**	**57.44**
Dioxin Furans (ng/kg)								
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	**0.88 J**	**0.149 J**	0.0752 U	**0.271 J**	0.0593 U	**0.314 J**	**0.654 J**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	**3.13**	**0.388 J**	**0.182 J**	**0.426 J**	**0.304 J**	**1.26**	**2.74**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**3**	**0.431 J**	**0.145 J**	**0.279 J**	**0.223 J**	**1.36**	**1.66**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**14.6**	**1.23**	**0.523 J**	**0.893 J**	**4.07**	**20.2**	**15.9**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**5.64**	**1.13**	0.279 U	**0.58 J**	**0.927 J**	**4.55**	**5.56**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	**235**	**11.8**	**15.6**	**12.5**	**27.7**	**222**	**183**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	**1830**	**92.5**	**170**	**105**	**137**	**1480**	**1700**
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	**135 J**	**6.7 J**	**3.37 J**	**18.8 J**	**24.1 J**	**28.7 J**	**37.4 J**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	**93.6**	**8.28 J**	**2.78 J**	**12.2 J**	**10.5 J**	**28.1 J**	**40.3 J**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	**285 J**	**21.9 J**	**8.16 J**	**14 J**	**202 J**	**895 J**	**194**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	**392**	**40.8**	**42.7**	**60.2**	**50.4**	**869**	**852**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	**3.3**	**0.552 J**	**0.17 J**	**0.39 J**	**0.19 J**	**0.819 J**	**1.26**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	**1.6**	**0.508 J**	**0.148 J**	**0.39 J**	**0.215 J**	**0.658 J**	**0.885 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	**1.63**	**0.605 J**	0.0554 U	**0.299 J**	**0.141 J**	**0.813 J**	**0.824 J**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	**2.4 J**	**1.37**	**0.157 J**	**0.566 J**	**0.373 J**	**2.72**	**1.72**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**2.43**	**0.62 J**	**0.0752 J**	**0.309 J**	**0.52 J**	**2.68**	**1.4**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	**0.726 J**	**0.198 J**	0.0614 U	**0.37 J**	**0.136 J**	**1.62 J**	**0.341 J**
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**1.65 J**	**0.659 J**	**0.149 J**	**0.386 J**	**0.831 J**	**4.89**	**2.07**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	**69.3**	**1130**	**1.61**	**8.39**	**17.4**	**206**	**54.2**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	**3.93**	**0.352 J**	**0.12 J**	**0.368 J**	**0.478 J**	**4.07**	**1.91**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	**190**	**5.41**	**7.42**	**13**	**15.3**	**295**	**112**
Total Tetrachlorodibenzofuran (TCDF)	--	**64.2 J**	**9.33 J**	**3.28 J**	**6.33**	**5.12 J**	**24.8 J**	**25.3 J**
Total Pentachlorodibenzofuran (PeCDF)	--	**33.5 J**	**6.92 J**	**0.845**	**4.45 J**	**6.45 J**	**38.7 J**	**21.5 J**
Total Hexachlorodibenzofuran (HxCDF)	--	**91.2 J**	**8.34 J**	**2.12 J**	**5.03 J**	**25.4 J**	**242 J**	**74.5 J**
Total Heptachlorodibenzofuran (HpCDF)	--	**214**	**1140 J**	**4.85**	**11.8 J**	**46.4 J**	**574**	**176 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	5	**11.6099 J**	**12.803633 J**	**0.597816 J**	**1.42368 J**	**1.61087 J**	**10.57474 J**	**9.59355 J**

Table A-3-4
Bank Soil and Intertidal Sediment Results

	Location ID	PG-PDI-IT-SMU3-COMP	PG-PDI-IT-SMU3-COMP	PG-PDI-IT-SMU4B-COMP	PG-PDI-IT-SMU4-COMP	PG-PDI-IT-SMU4-COMP	PG-PDI-IT-SMU4-COMP	PG-PDI-IT-SMU5B-COMP
	Sample ID	PG-PDI-IT-SMU3-I-2-3-COMP-140711	PG-PDI-IT-SMU3-3-4-COMP	PG-PDI-IT-SMU4-B-COMP-140710	PG-PDI-IT-SMU4-I-0-2-COMP-140710	PG-PDI-IT-SMU4-I-2-3-COMP-140710	PG-PDI-IT-SMU4-3-4-COMP	PG-PDI-IT-SMU55-B-COMP-140710
	Sample Date	07/11/2014	07/10/2014	07/10/2014	07/10/2014	07/10/2014	07/10/2014	07/10/2014
	Depth	2 - 3 ft	3 - 4 ft	--	0 - 2 ft	2 - 3 ft	3 - 4 ft	--
	Sample Type	N	N	N	N	N	N	FD
	Matrix	SE	SE	SE	SE	SE	SE	SE
	X	1211445.395	1211445.395	1211036.837	1211169.443	1211169.443	1211169.443	1211000.761
	Y	316574.2846	316574.2846	315859.77	316013.4239	316013.4239	316013.4239	315694.2555
	Site-specific Criteria							
Conventional Parameters (pct)								
Ash content	--	94.33	90.83	97.82	98.65	94.4	92.96	97.77
Total organic carbon	--	1.91 J	--	1.24 J	0.814 J	1.66 J	--	3.9 J
Total solids	--	70.44	62.02	89.76	80.22	74.31	65.72	90.47
Total volatile solids/organic matter	15	5.67	9.17	2.18	1.35	5.6	7.04	2.23
Grain Size (pct)								
Gravel	--	11.3	--	36.2	23.7	22.2	--	41.1
Sand, very coarse	--	17.9	--	2.3	7	9.4	--	7
Sand, coarse	--	15.6	--	5.3	9.7	11.2	--	11.6
Sand, medium	--	32.8	--	22.7	18.4	20.7	--	19.4
Sand, fine	--	14	--	24.8	19.9	17.4	--	9.7
Sand, very fine	--	4.9	--	4.5	8.1	8.1	--	2.9
Silt, coarse	--	3.5 U	--	0.1	6.5	3.2	--	1.6
Silt, medium	--	3.5 U	--	1.3	1.9	2.6	--	1.4
Silt, fine	--	3.5 U	--	0.8	1.3	1.7	--	1.4
Silt, very fine	--	3.5 U	--	0.5	0.8	1	--	1.1
Total fines (Reported, not calculated)	--	3.5	--	4.2	13.3	10.9	--	8.3
Clay, coarse	--	3.5 U	--	0.5	0.7	0.7	--	1
Clay, medium	--	3.5 U	--	0.3	0.7	0.5	--	0.6
Clay, fine	--	3.5 U	--	0.5	1.5	1.3	--	1.1
Metals (mg/kg)								
Cadmium	3	0.7 U	0.7	0.5	0.4	0.4	0.7	0.5
Polycyclic Aromatic Hydrocarbons (µg/kg)								
2-Methylnaphthalene	--	130	120 J	3.7 J	10	26	150 J	19
Acenaphthene	--	180	72 J	4.7 U	16	55	70 J	17
Acenaphthylene	--	160	82 J	5.1	19	35	48 J	23
Anthracene	--	180	7000	2.5 J	35	94	200	28
Benzo(a)anthracene	--	200	590	4.1 J	26	55	110	61
Benzo(a)pyrene	--	120	310	4.7	20	48	48	120
Benzo(b,j,k)fluoranthenes	--	320	950	13	43	110	140	240
Benzo(g,h,i)perylene	--	88	130	7.6	18	40	34	79
Chrysene	--	330	1600	9.6	33	76	130	130
Dibenzo(a,h)anthracene	--	11	32	4.7 U	3.4 J	6.9	5.8	22
Fluoranthene	--	900	2100	17	160	490	850	88
Fluorene	--	180	700 J	4.7 U	18	63	99 J	12
Indeno(1,2,3-c,d)pyrene	--	46	110	4.1 J	12	22	22	70
Naphthalene	--	1900	350 J	15	120	290	350 J	36
Phenanthrene	--	600	1700	17	75	180	330	69
Pyrene	--	1800	1400	17	160	340	600	220

Table A-3-4
Bank Soil and Intertidal Sediment Results

	Location ID	PG-PDI-IT-SMU3-COMP	PG-PDI-IT-SMU3-COMP	PG-PDI-IT-SMU4B-COMP	PG-PDI-IT-SMU4-COMP	PG-PDI-IT-SMU4-COMP	PG-PDI-IT-SMU4-COMP	PG-PDI-IT-SMU5B-COMP
	Sample ID	PG-PDI-IT-SMU3-I-2-3-COMP-140711	PG-PDI-IT-SMU3-3-4-COMP	PG-PDI-IT-SMU4-B-COMP-140710	PG-PDI-IT-SMU4-I-0-2-COMP-140710	PG-PDI-IT-SMU4-I-2-3-COMP-140710	PG-PDI-IT-SMU4-3-4-COMP	PG-PDI-IT-SMU55-B-COMP-140710
	Sample Date	07/11/2014	07/10/2014	07/10/2014	07/10/2014	07/10/2014	07/10/2014	07/10/2014
	Depth	2 - 3 ft	3 - 4 ft	--	0 - 2 ft	2 - 3 ft	3 - 4 ft	--
	Sample Type	N	N	N	N	N	N	FD
	Matrix	SE	SE	SE	SE	SE	SE	SE
	X	1211445.395	1211445.395	1211036.837	1211169.443	1211169.443	1211169.443	1211000.761
	Y	316574.2846	316574.2846	315859.77	316013.4239	316013.4239	316013.4239	315694.2555
	Site-specific Criteria							
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	16	**181**	**494.2**	**7.151 J**	**28.77 J**	**68.15**	**77.08**	**160.6**
Dioxin Furans (ng/kg)								
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	**0.7 J**	**1.31**	**3.97**	**0.511 J**	**0.699 J**	**1.44**	**9.79**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	**2.74**	**4.95**	**29.2**	**2.02**	**3.52**	**8.34**	**133**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**3**	**4.79**	**12.3**	**0.96 J**	**2.2**	**4.25**	**23.2**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**12.3**	**59**	**310**	**8.65**	**23.4**	**116**	**768**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**5.22**	**20**	**149**	**2.96**	**5.57**	**13.7**	**373**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	**455**	**699**	**1610**	**50.1**	**163**	**456**	**1450**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	**4700 J**	**7580 J**	**9130 J**	**273**	**974**	**1980**	**1140**
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	**242 J**	**108**	**82.2**	**32.8 J**	**56.4 J**	**103**	**317**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	**131 J**	**112**	**219**	**36.9 J**	**69.5 J**	**111**	**873**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	**376**	**591**	**2460 J**	**124**	**390 J**	**477**	**6290 J**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	**3150**	**4190**	**2670**	**138**	**348**	**964**	**2360**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	**3.3**	**4.05**	**3.38**	**1.69**	**3.49**	**9.59**	**5.81**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	**2.5**	**3.48**	**2.98**	**1.22**	**2.26**	**5.66 J**	**5.55**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	**1.5 J**	**2.55 J**	**2.15**	**1**	**2.24**	**6.99**	**5.07**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	**4.55 J**	**6.65 J**	**6.26 J**	**2.05 J**	**4.36**	**7.75 J**	**11 J**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**1.96**	**3.12 J**	**7.22**	**1.18**	**2.91**	**5.83**	**11.4**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	**0.619 J**	**0.947 J**	**1.32 J**	**0.32 J**	**0.844 J**	**2.64 J**	**3.41 J**
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**1.91**	**3.61 J**	**11.6**	**1.38**	**5.27**	**13.4**	**18.6**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	**43.8**	**61.2**	**209**	**23.5**	**42.3**	**134**	**355**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	**2.88**	**3.73**	**8.59**	**1.15**	**2.89**	**3.94**	**7.68**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	**138**	**192**	**256**	**37.8**	**69.4**	**115**	**283**
Total Tetrachlorodibenzofuran (TCDF)	--	**69.6 J**	**55.8**	**50.4 J**	**36.3 J**	**71.8 J**	**107**	**122 J**
Total Pentachlorodibenzofuran (PeCDF)	--	**31.8 J**	**60 J**	**106 J**	**24 J**	**105 J**	**397**	**205 J**
Total Hexachlorodibenzofuran (HxCDF)	--	**70.6 J**	**113 J**	**291 J**	**32.8 J**	**132 J**	**457 J**	**616 J**
Total Heptachlorodibenzofuran (HpCDF)	--	**159 J**	**198**	**535**	**48.7**	**112 J**	**342**	**918**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	5	**13.7191 J**	**27.317 J**	**105.1041 J**	**5.62734 J**	**12.15812 J**	**35.9307 J**	**284.4732 J**

Table A-3-4
Bank Soil and Intertidal Sediment Results

	Location ID	PG-PDI-IT-SMU5B-COMP	PG-PDI-IT-SMU5-COMP	PG-PDI-IT-SMU5-COMP	PG-PDI-IT-SMU5-COMP
	Sample ID	PG-PDI-IT-SMU5-B-COMP-140710	PG-PDI-IT-SMU5-0-2-COMP-140710	PG-PDI-IT-SMU5-2-3-COMP-140710	PG-PDI-IT-SMU5-3-4-COMP
	Sample Date	07/10/2014	07/10/2014	07/10/2014	07/10/2014
	Depth	--	0 - 2 ft	2 - 3 ft	3 - 4 ft
	Sample Type	N	N	N	N
	Matrix	SE	SE	SE	SE
	X	1211000.761	1211094.332	1211094.332	1211094.332
	Y	315694.2555	315548.5741	315548.5741	315548.5741
	Site-specific Criteria				
Conventional Parameters (pct)					
Ash content	--	**98.2**	**96.98**	**91.83**	**93.34**
Total organic carbon	--	**2.27 J**	**1.33 J**	**1.3 J**	--
Total solids	--	**88.18**	**74.57**	**63.47**	**61.93**
Total volatile solids/organic matter	15	**1.8**	**3.02**	**8.17**	**6.66**
Grain Size (pct)					
Gravel	--	**39.4**	**6.9**	**19.6**	--
Sand, very coarse	--	**8**	**4.4**	**2.4**	--
Sand, coarse	--	**11.6**	**4.6**	**2.7**	--
Sand, medium	--	**19.5**	**10.7**	**7**	--
Sand, fine	--	**9.7**	**39.1**	**38.1**	--
Sand, very fine	--	**3.3**	**20.3**	**17.9**	--
Silt, coarse	--	**2.1**	**6.7**	**6**	--
Silt, medium	--	**1.5**	**2**	**1.8**	--
Silt, fine	--	**1.4**	**1.2**	**1.2**	--
Silt, very fine	--	**1**	**1**	**0.8**	--
Total fines (Reported, not calculated)	--	**8.5**	**14.1**	**12.3**	--
Clay, coarse	--	**0.9**	**0.9**	**0.7**	--
Clay, medium	--	**0.6**	**0.7**	**0.6**	--
Clay, fine	--	**0.9**	**1.6**	**1.3**	--
Metals (mg/kg)					
Cadmium	3	0.5 U	**0.5**	**0.4**	**0.6**
Polycyclic Aromatic Hydrocarbons (µg/kg)					
2-Methylnaphthalene	--	**9 J**	**48**	**36**	**53 J**
Acenaphthene	--	**31**	**54**	**58**	**69 J**
Acenaphthylene	--	**8.7 J**	**150**	**200**	**54 J**
Anthracene	--	**16**	**94**	**71**	**68**
Benzo(a)anthracene	--	**18**	**64**	**36**	**34**
Benzo(a)pyrene	--	**23**	**70**	**69**	**60**
Benzo(b,j,k)fluoranthenes	--	**50**	**110**	**130**	**140**
Benzo(g,h,i)perylene	--	**31**	**73**	**54**	**34**
Chrysene	--	**39**	**72**	**63**	**59**
Dibenzo(a,h)anthracene	--	**8.4 J**	**7.2**	**8.2**	**7.3**
Fluoranthene	--	**40**	**370**	**220**	**200**
Fluorene	--	**13 J**	**58**	**48**	**71 J**
Indeno(1,2,3-c,d)pyrene	--	**14 J**	**34**	**32**	**30**
Naphthalene	--	**24**	**770**	**480**	**310 J**
Phenanthrene	--	**48**	**360**	**250**	**190**
Pyrene	--	**59**	**740**	**490**	**460**

Table A-3-4
Bank Soil and Intertidal Sediment Results

	Location ID	PG-PDI-IT-SMU5B-COMP	PG-PDI-IT-SMU5-COMP	PG-PDI-IT-SMU5-COMP	PG-PDI-IT-SMU5-COMP
	Sample ID	PG-PDI-IT-SMU5-B-COMP-140710	PG-PDI-IT-SMU5-0-2-COMP-140710	PG-PDI-IT-SMU5-2-3-COMP-140710	PG-PDI-IT-SMU5-3-4-COMP
	Sample Date	07/10/2014	07/10/2014	07/10/2014	07/10/2014
	Depth	--	0 - 2 ft	2 - 3 ft	3 - 4 ft
	Sample Type	N	N	N	N
	Matrix	SE	SE	SE	SE
	X	1211000.761	1211094.332	1211094.332	1211094.332
	Y	315694.2555	315548.5741	315548.5741	315548.5741
	Site-specific Criteria				
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	16	**32.43 J**	**92.24**	**90.25**	**81.72**
Dioxin Furans (ng/kg)					
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	**8.87**	**0.329 J**	**0.238 J**	**0.287 J**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	**107**	**0.623 J**	**0.304 J**	**0.196 J**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**17.9**	**0.444 J**	**0.179 J**	0.0752 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**565**	**1.41**	**0.408 J**	0.259 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	**251**	**0.841 J**	0.358 U	**0.178 J**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	**867**	**20**	3.13 U	2 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	**1030**	**148**	18.8 U	8.79 U
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	**279**	**13.6 J**	**8.06 J**	**5.29 J**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	**721**	**12.3 J**	**6 J**	**4.26**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	**4840 J**	**24.7**	**6.49 J**	**5.55 J**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	**1540**	**102**	**8.3 J**	**4.05 J**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	**4.79**	**1.14**	**1.01**	**0.657 J**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	**5.16 J**	**0.59 J**	**0.407 J**	**0.349 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	**4.19**	**0.586 J**	**0.354 J**	0.24 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	**10.7 J**	**0.625 J**	**0.253 J**	**0.2 J**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**9.15**	**0.46 J**	**0.282 J**	**0.285 J**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	**2.69 J**	**0.218 J**	0.05 U	0.0752 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	**14.9**	**0.442 J**	**0.244 J**	**0.107 J**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	**297**	**3.23**	**0.588 J**	0.549 U
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	**6.53**	**0.258 J**	0.0654 U	**0.0495 J**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	**234**	**5.05**	0.585 U	0.57 U
Total Tetrachlorodibenzofuran (TCDF)	--	**112 J**	**29 J**	**27.6 J**	**12.5 J**
Total Pentachlorodibenzofuran (PeCDF)	--	**162 J**	**10.5 J**	**8.23 J**	**4.94 J**
Total Hexachlorodibenzofuran (HxCDF)	--	**514 J**	**7.5 J**	**2.69 J**	**2.43 J**
Total Heptachlorodibenzofuran (HpCDF)	--	**763 J**	**8.2**	**0.932 J**	**1.07 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	5	**216.9793 J**	**1.984295 J**	**0.94317475 J**	**0.707284 J**

Table A-3-4
Bank Soil and Intertidal Sediment Results

Notes:
Detected concentration is greater than Site-Specific Criteria
Non-detected concentration is above one or more identified screening levels
Bold = Detected result
-- = results not reported or not applicable

cPAH = carcinogenic polycyclic aromatic hydrocarbon
FD = field duplicate
J = Estimated value
mg/kg = milligrams per kilogram
N = normal field sample
ng/kg = nanograms per kilogram
pct = percent
PAH = polycyclic aromatic hydrocarbons
SE = sediment matrix
TEQ = toxic equivalency
U = Compound analyzed, but not detected above detection limit
µg/kg = micrograms per kilogram
UJ = Compound analyzed, but not detected above estimated detection limit
Totals are calculated as the sum of all detected results and half of the reporting limit of undetected results (U=1/2). If all results are not detected, the highest reporting limit value is reported as the sum.
Total cPAH TEQ (7 minimum CAEPA 2005) calculation includes benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene and indeno(1,2,3-c,d)pyrene.
Per MTCA cleanup Regulation, Table 708-2 "Toxicity Equivalency Factors for Minimum Required Carcinogenic Polyaromatic Hydrocarbons (cPAHs) under WAC 173-340-708(e).
Dioxin TEQ values were calculated with 2005 World Health Organization (WHO) TEF values for mammals.
USEPA Stage 2B and/or Stage 4 data validation was completed by Laboratory Data Consultants (LDC).

Table A-3-5
DMMP SAP Subtidal Core Interval Analytical Results

				Location ID	PG-PDI-SC-01	PG-PDI-SC-01	PG-PDI-SC-01	PG-PDI-SC-01	PG-PDI-SC-01	PG-PDI-SC-01	PG-PDI-SC-02	PG-PDI-SC-02	PG-PDI-SC-02
				Sample ID	PG-PDI-SC-01-0-2-20140721	PG-PDI-SC-01-2-4-20140721	PG-PDI-SC-01-4-6-20140721	PG-PDI-SC-01-6-8-20140721	PG-PDI-SC-01-8-9.2-20140721	PG-PDI-SC-01-9.2-9.9-20140721	PG-PDI-SC-02-0-2-20140721	PG-PDI-SC-02-10.3-12-20140721	PG-PDI-SC-02-2-4-20140721
				Sample Date	07/21/2014	07/21/2014	07/21/2014	07/21/2014	07/21/2014	07/21/2014	07/21/2014	07/21/2014	07/21/2014
				Depth	0 - 2 ft	2 - 4 ft	4 - 6 ft	6 - 8 ft	8 - 9.2 ft	9.2 - 9.9 ft	0 - 2 ft	10.3 - 12 ft	2 - 4 ft
				Sample Type	N	N	N	N	N	N	N	N	N
				Matrix	SE	SE	SE	SE	SE	SE	SE	SE	SE
				X	1211663	1211663	1211663	1211663	1211663	1211663	1211558	1211558	1211558
				Y	317518	317518	317518	317518	317518	317518	317452	317452	317452
	Site-Specific Criteria	DMMP SL	DMMP BT	DMMP ML									
Conventional Parameters (mg/kg)													
Ammonia as nitrogen	--	--	--	--	**8.83**	**1.66**	**6.93**	**15.7**	**22.4**	**15.7**	**0.55**	**2.54**	**0.71**
Sulfide	--	--	--	--	**471**	**87.1**	1.22 U	1.26 U	**4.33**	**--**	**73.7**	**1.83**	**81.8**
Conventional Parameters (pct)													
Ash content	--	--	--	--	**83.6**	**99.24**	**98.4**	**98.07**	**97.49**	**98.63**	**51.98**	**99.64**	**44.42**
Total organic carbon	--	--	--	--	**7.66 J**	**0.248 J**	**0.741 J**	**0.591 J**	**1.41 J**	**1.4 J**	**17.2 J**	**0.094 J**	**14.1 J**
Total solids	--	--	--	--	**43.82**	**84.15**	**81.3**	**78.3**	**74.27**	**80.85**	**26.64**	**84.94**	**39.04**
Total solids (preserved)	--	--	--	--	**49.17**	**78.93**	**80.95**	**79.39**	**74.58**	**--**	**33.91**	**81.89**	**32.75**
Total volatile solids/organic matter	15	--	--	--	**16.4**	**0.76**	**1.6**	**1.93**	**2.51**	**1.37**	**48.02**	**0.36**	**55.58**
Grain Size (pct)													
Gravel	--	--	--	--	**13.2**	**8.9**	**3.7**	**5.1**	**11.6**	**10.7**	**57.3**	**1.6**	**61.2**
Sand, very coarse	--	--	--	--	**4.5**	**3**	**2.6**	**1.8**	**1.5**	**2.2**	**4.5**	**3.6**	**4.1**
Sand, coarse	--	--	--	--	**8**	**6.4**	**6.8**	**3.7**	**3.4**	**8.4**	**5.8**	**12.8**	**6.1**
Sand, medium	--	--	--	--	**19.5**	**29.1**	**35.2**	**22.9**	**18.8**	**30.9**	**7.9**	**36.7**	**9**
Sand, fine	--	--	--	--	**18.6**	**24.7**	**22.5**	**20.4**	**15.5**	**19.3**	**6**	**32**	**9.4**
Sand, very fine	--	--	--	--	**11.1**	**18.1**	**13.8**	**20.7**	**20.1**	**12.8**	**3.5**	**9.9**	**3.6**
Silt, coarse	--	--	--	--	**8.2**	**3.4**	**6.2**	**10**	**11.8**	**5.4**	**1.8**	3.5 U	6.7 U
Silt, medium	--	--	--	--	**3.7**	**1.7**	**2.4**	**5.1**	**4.6**	**3**	**3.6**	3.5 U	6.7 U
Silt, fine	--	--	--	--	**3**	**1.1**	**1.5**	**2.4**	**2.7**	**1.5**	**1.8**	3.5 U	6.7 U
Silt, very fine	--	--	--	--	**2.2**	**0.8**	**1.3**	**1.9**	**2.4**	**1.5**	**1**	3.5 U	6.7 U
Clay, coarse	--	--	--	--	**1.6**	**0.7**	**1.1**	**1.6**	**2.1**	**1.2**	**0.6**	3.5 U	6.7 U
Clay, medium	--	--	--	--	**1.5**	**0.6**	**0.8**	**1.8**	**1.6**	**1.1**	**0.4**	3.5 U	6.7 U
Clay, fine	--	--	--	--	**5**	**1.5**	**2.2**	**2.8**	**3.7**	**2.3**	**5.9**	3.5 U	6.7 U
Total fines (Reported, not calculated)	--	--	--	--	**25.1**	**9.8**	**15.4**	**25.6**	**29**	**15.8**	**15.1**	**3.5**	**6.7**
Polycyclic Aromatic Hydrocarbons (µg/kg)													
2-Methylnaphthalene	--	670	--	1900	**65**	**5.7**	**2.8 J**	**5.2**	**25**	14 U	**26 J**	4.8 U	**47 J**
Acenaphthene	--	500	--	2000	**170**	**3.4 J**	4.8 U	4.9 U	14 U	14 U	**75**	**2.7 J**	**270**
Acenaphthylene	--	560	--	1300	**53**	5 U	4.8 U	4.9 U	14 U	14 U	**25 J**	4.8 U	49 U
Anthracene	--	960	--	13000	**140 J**	**6.3 J**	4.8 UJ	4.9 UJ	14 UJ	14 UJ	**250 J**	4.8 UJ	**350 J**
Benzo(a)anthracene	--	1300	--	5100	**180 J**	**5.8 J**	4.8 UJ	4.9 UJ	14 UJ	14 UJ	**400 J**	4.8 UJ	**410 J**
Benzo(a)pyrene	--	1600	--	3600	**160**	**4.5 J**	4.8 U	4.9 U	14 U	14 U	**300**	4.8 U	**180**
Benzo(b,j,k)fluoranthenes	--	--	--	--	**380**	**11**	4.8 U	4.9 U	14 U	14 U	**620**	4.8 U	**440**
Benzo(g,h,i)perylene	--	670	--	3200	**54**	5 U	4.8 U	4.9 U	14 U	14 U	**140**	4.8 U	**82**
Chrysene	--	1400	--	21000	**350**	**10**	4.8 U	4.9 U	14 U	14 U	**460**	4.8 U	**470**
Dibenzo(a,h)anthracene	--	230	--	1900	48 UJ	5 UJ	4.8 UJ	4.9 UJ	14 UJ	14 UJ	**38 J**	4.8 UJ	49 UJ
Fluoranthene	--	1700	4600	30000	**660 J**	**41 J**	**2.5 J**	4.9 UJ	14 UJ	14 UJ	**720 J**	4.8 UJ	**1700 J**
Fluorene	--	540	--	3600	**140 J**	**4.9 J**	4.8 UJ	4.9 UJ	14 UJ	14 UJ	**120 J**	4.8 UJ	**260 J**
Indeno(1,2,3-c,d)pyrene	--	600	--	4400	**41 J**	5 U	4.8 U	4.9 U	14 U	14 U	**100**	4.8 U	**55**
Naphthalene	--	2100	--	2400	**580**	**20**	4.8 U	**3.4 J**	14 U	14 U	**160**	**17**	**190**

Table A-3-5
DMMP SAP Subtidal Core Interval Analytical Results

					Location ID	PG-PDI-SC-01	PG-PDI-SC-01	PG-PDI-SC-01	PG-PDI-SC-01	PG-PDI-SC-01	PG-PDI-SC-01	PG-PDI-SC-02	PG-PDI-SC-02	PG-PDI-SC-02
					Sample ID	PG-PDI-SC-01-0-2-20140721	PG-PDI-SC-01-2-4-20140721	PG-PDI-SC-01-4-6-20140721	PG-PDI-SC-01-6-8-20140721	PG-PDI-SC-01-8-9.2-20140721	PG-PDI-SC-01-9.2-9.9-20140721	PG-PDI-SC-02-0-2-20140721	PG-PDI-SC-02-10.3-12-20140721	PG-PDI-SC-02-2-4-20140721
					Sample Date	07/21/2014	07/21/2014	07/21/2014	07/21/2014	07/21/2014	07/21/2014	07/21/2014	07/21/2014	07/21/2014
					Depth	0 - 2 ft	2 - 4 ft	4 - 6 ft	6 - 8 ft	8 - 9.2 ft	9.2 - 9.9 ft	0 - 2 ft	10.3 - 12 ft	2 - 4 ft
					Sample Type	N	N	N	N	N	N	N	N	N
					Matrix	SE	SE	SE	SE	SE	SE	SE	SE	SE
					X	1211663	1211663	1211663	1211663	1211663	1211663	1211558	1211558	1211558
					Y	317518	317518	317518	317518	317518	317518	317452	317452	317452
	Site-Specific Criteria	DMMP SL	DMMP BT	DMMP ML										
Phenanthrene	--	1500	--	21000		**320 J**	**15 J**	4.8 UJ	**3.3 J**	14 UJ	14 UJ	**390 J**	4.8 UJ	**550 J**
Pyrene	--	2600	11980	16000		**1000**	**68**	4.8 U	4.9 U	**16**	14 U	**950**	4.8 U	**1800**
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	16	--	--	--		**226 J**	**6.78 J**	4.8 UJ	4.9 UJ	14 UJ	14 UJ	**420.4 J**	4.8 UJ	**277.65 J**
Dioxin Furans (ng/kg)														
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--		**0.576 J**	0.0869 U	**0.179 J**	0.0337 U	**0.141 J**	0.0337 U	**0.479 J**	0.0552 U	**0.297 J**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--		**1.28**	0.0948 U	0.115 U	0.0516 U	0.0617 U	0.0614 U	**1.47**	0.0966 U	**0.737 J**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--		**1.26 J**	0.105 U	0.0716 U	0.0694 U	0.0677 U	0.0693 U	**1.31**	0.144 U	**0.793 J**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--		**7.42**	0.17 U	0.0657 U	0.0714 U	0.0697 U	0.0614 U	**6.62**	0.201 U	**4.7**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--		**2.77**	0.111 U	0.151 U	0.145 U	0.0935 U	0.0634 U	**2.4**	0.136 U	**1.45**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--		**330**	3.56 U	1.34 U	0.986 U	1.32 U	1.2 U	**309**	1.87 U	**190**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	--	--	--		**4630**	32.2 UJ	7.23 U	6.37 U	8.55 U	6.92 U	**3080**	9.72 U	**1870**
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--		**58.7 J**	**0.584 J**	**1.2 J**	**0.74 J**	**0.759 J**	**0.365 J**	**66.3 J**	**0.339 J**	**19.2 J**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--		**38.1 J**	**0.725 J**	**0.891 J**	**0.284 J**	**0.189 J**	**0.285 J**	**38.8**	**0.869 J**	**17.3 J**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--		**248 J**	**2.3 J**	**1.92 J**	**1.04 J**	**1.38 J**	**1.49 J**	**164**	**2.67 J**	**85.1 J**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--		**2220**	**14.1 J**	**3.75 J**	**2.88 J**	**3.79 J**	**3.25 J**	**1800**	**5.37 J**	**982**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	--	--	--		**2.3 J**	0.079 U	**0.0896 J**	**0.0794 J**	**0.0796 J**	**0.0634 J**	**1.92**	0.0315 U	**1.04 J**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--		**1.12**	0.105 U	0.0816 U	0.0437 U	0.0478 U	0.0733 U	**0.788 J**	0.0315 U	**0.458 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--		**1.04 J**	**0.105 J**	**0.0478 J**	**0.0675 J**	0.0478 U	0.0436 U	**0.861 J**	0.0335 U	**0.522 J**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--		**1.55**	**0.626 J**	0.0358 U	0.0298 U	0.0338 U	0.0297 U	**1.04**	0.0414 U	**0.743 J**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--		**0.879 J**	**0.13 J**	**0.0517 J**	**0.0298 J**	0.0338 U	0.0297 U	**0.756 J**	0.0394 U	**0.466 J**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	--	--	--		**0.645 J**	0.0494 U	0.0438 U	0.0337 U	0.0398 U	0.0376 U	**0.301 J**	0.0473 U	**0.299 J**
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--		**1.04 J**	**0.14 J**	0.0378 U	0.0298 U	0.0358 U	**0.0337 J**	**0.624 J**	0.0414 U	**0.655 J**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	--	--	--		**22.9**	**5.68**	**0.133 J**	**0.0536 J**	**0.0716 J**	**0.0713 J**	**19.8**	**0.065 J**	**11.4**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	--	--	--		**1.63**	0.0691 U	0.0637 U	0.0377 U	0.0498 U	0.0535 U	**1.18**	0.0631 U	**0.775 J**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	--	--	--		**94.6**	**6.63**	0.105 U	0.0933 U	0.0896 U	0.097 U	**86.9**	0.118 U	**39.5**
Total Tetrachlorodibenzofuran (TCDF)	--	--	--	--		**37.9 J**	**0.504 J**	**1.41 J**	**1.41 J**	**1.5 J**	**0.892 J**	**30.9 J**	**0.162 J**	**14.8 J**
Total Pentachlorodibenzofuran (PeCDF)	--	--	--	--		**20.2 J**	**0.54 J**	**0.213 J**	**0.17 J**	**0.0813 J**	**0.181 J**	**16.1 J**	0.0335 U	**10.5 J**
Total Hexachlorodibenzofuran (HxCDF)	--	--	--	--		**44.5 J**	**1.88 J**	**0.116 J**	**0.0304 J**	0.0398 U	**0.1 J**	**32.8 J**	0.0473 U	**17.6 J**
Total Heptachlorodibenzofuran (HpCDF)	--	--	--	--		**81.6**	**6.54**	**0.133 J**	**0.0526 J**	**0.072 J**	**0.0707 J**	**73.1 J**	**0.0642 J**	**36.1 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	5	10	--	--		**8.95068 J**	**0.3210095 J**	**0.29592775 J**	**0.1000545 J**	**0.21526294 J**	**0.08748755 J**	**7.97791 J**	**0.1272887 J**	**4.81354 J**

Table A-3-5
DMMP SAP Subtidal Core Interval Analytical Results

					Location ID	PG-PDI-SC-02	PG-PDI-SC-02	PG-PDI-SC-02	PG-PDI-SC-03	PG-PDI-SC-03	PG-PDI-SC-03	PG-PDI-SC-03	PG-PDI-SC-03	PG-PDI-SC-04
					Sample ID	PG-PDI-SC-02-4-6-20140721	PG-PDI-SC-02-6-8-20140721	PG-PDI-SC-02-8-10.3-20140721	PG-PDI-SC-03-0-4-20140721	PG-PDI-SC-03-11-13-20140721	PG-PDI-SC-03-4-7-20140721	PG-PDI-SC-03-7-9-20140721	PG-PDI-SC-03-9-11-20140721	PG-PDI-SC-04-0-2-20140721
					Sample Date	07/21/2014	07/21/2014	07/21/2014	07/21/2014	07/21/2014	07/21/2014	07/21/2014	07/21/2014	07/21/2014
					Depth	4 - 6 ft	6 - 8 ft	8 - 10.3 ft	0 - 4 ft	11 - 13 ft	4 - 7 ft	7 - 9 ft	9 - 11 ft	0 - 2 ft
					Sample Type	N	N	N	N	N	N	N	N	N
					Matrix	SE	SE	SE	SE	SE	SE	SE	SE	SE
					X	1211558	1211558	1211558	1211470	1211470	1211470	1211470	1211470	1211601
					Y	317452	317452	317452	317362	317362	317362	317362	317362	317362
	Site-Specific Criteria	DMMP SL	DMMP BT	DMMP ML										
Conventional Parameters (mg/kg)														
Ammonia as nitrogen	--	--	--	--		3.28	9.54	14.9	0.4	2.7	24.2	16.6	2.69	4.19
Sulfide	--	--	--	--		176	284	741	373	1.16 U	607	53.4	1.19 U	228
Conventional Parameters (pct)														
Ash content	--	--	--	--		61.06	65.24	53.56	89.57	99.58	76.96	93	99.48	91.63
Total organic carbon	--	--	--	--		17.7 J	16 J	17 J	4.87 J	0.162 J	14.7 J	2.76 J	0.218 J	3.08 J
Total solids	--	--	--	--		31.41	34.25	34.19	57.12	85.57	39.27	64.2	85.46	53.41
Total solids (preserved)	--	--	--	--		31.51	33.42	30.37	46.89	84.94	32.6	69.27	84.03	60.65
Total volatile solids/organic matter	15	--	--	--		38.94	34.76	46.44	10.43	0.42	23.04	7	0.52	8.37
Grain Size (pct)														
Gravel	--	--	--	--		52.5	24.3	19.8	26.7	7.2	26.7	9.6	5.5	7.3
Sand, very coarse	--	--	--	--		5.7	8.2	10.3	13.2	4.3	9.3	8.8	4.6	3.8
Sand, coarse	--	--	--	--		8.3	14.4	14.1	8.8	9.2	15.9	13.6	10.1	8.1
Sand, medium	--	--	--	--		12.1	16.9	22.9	13.5	25.2	18.8	26.6	23	23.6
Sand, fine	--	--	--	--		11.6	15.9	17.6	15.5	27.1	20.8	23.7	29.3	27.1
Sand, very fine	--	--	--	--		3.9	6.5	4.9	6.6	15.1	7.2	8.4	15.7	13.6
Silt, coarse	--	--	--	--		6 U	1.2	1.3	5.4	5.5	1.3 U	2.8	5.4	5.2
Silt, medium	--	--	--	--		6 U	2.4	1.8	2.2	2	1.3 U	1.5	2.2	2.2
Silt, fine	--	--	--	--		6 U	1.7	1	2.1	1	1.3 U	1	0.9	1.8
Silt, very fine	--	--	--	--		6 U	1.5	0.7	1.5	0.7	1.3 U	0.7	0.8	1.6
Clay, coarse	--	--	--	--		6 U	1.1	0.4	0.8	0.6	1.3 U	0.6	0.6	1.2
Clay, medium	--	--	--	--		6 U	0.2	0.1	0.6	0.5	1.3 U	0.5	0.6	1.1
Clay, fine	--	--	--	--		6 U	5.6	5.1	3.2	1.3	1.3 U	2	1.2	3.5
Total fines (Reported, not calculated)	--	--	--	--		6	13.7	10.4	15.8	11.8	1.3	9.2	11.8	16.6
Polycyclic Aromatic Hydrocarbons (µg/kg)														
2-Methylnaphthalene	--	670	--	1900		33 J	120	200	150	4.9 U	210	210	3.4 J	27
Acenaphthene	--	500	--	2000		62	280	960	430	4.9 U	360	720	5.9	50
Acenaphthylene	--	560	--	1300		48 U	74	80 J	170	4.9 U	160	130	4.9 U	31
Anthracene	--	960	--	13000		140 J	400 J	580 J	560 J	4.9 UJ	510 J	580 J	9.4 J	78 J
Benzo(a)anthracene	--	1300	--	5100		260 J	310 J	830 J	1000 J	4.9 UJ	1200 J	1300 J	10 J	86 J
Benzo(a)pyrene	--	1600	--	3600		150	450	360	820	4.9 U	810	680	3.1 J	78
Benzo(b,j,k)fluoranthenes	--	--	--	--		420	1200	1100	3500	4.9 U	2000	1600	9	180
Benzo(g,h,i)perylene	--	670	--	3200		93	190	140	350	4.9 U	400	230	4.9 U	46
Chrysene	--	1400	--	21000		300	1100	1000	2600	4.9 U	1900	1400	11	160
Dibenzo(a,h)anthracene	--	230	--	1900		25 J	88 J	100 UJ	92 J	4.9 UJ	110 J	68 J	4.9 UJ	11 J
Fluoranthene	--	1700	4600	30000		760 J	2200 J	1900 J	13000 J	4.9 UJ	2500 J	2300 J	93 J	320 J
Fluorene	--	540	--	3600		75 J	340 J	740 J	700 J	4.9 UJ	450 J	760 J	9.6 J	54 J
Indeno(1,2,3-c,d)pyrene	--	600	--	4400		64	180	110	290	4.9 U	330	190	4.9 U	34
Naphthalene	--	2100	--	2400		170	860	1300	760	4.9 U	1400	1500	4.3 J	260

Table A-3-5
DMMP SAP Subtidal Core Interval Analytical Results

				Location ID	PG-PDI-SC-02	PG-PDI-SC-02	PG-PDI-SC-02	PG-PDI-SC-03	PG-PDI-SC-03	PG-PDI-SC-03	PG-PDI-SC-03	PG-PDI-SC-03	PG-PDI-SC-04
				Sample ID	PG-PDI-SC-02-4-6-20140721	PG-PDI-SC-02-6-8-20140721	PG-PDI-SC-02-8-10.3-20140721	PG-PDI-SC-03-0-4-20140721	PG-PDI-SC-03-11-13-20140721	PG-PDI-SC-03-4-7-20140721	PG-PDI-SC-03-7-9-20140721	PG-PDI-SC-03-9-11-20140721	PG-PDI-SC-04-0-2-20140721
				Sample Date	07/21/2014	07/21/2014	07/21/2014	07/21/2014	07/21/2014	07/21/2014	07/21/2014	07/21/2014	07/21/2014
				Depth	4 - 6 ft	6 - 8 ft	8 - 10.3 ft	0 - 4 ft	11 - 13 ft	4 - 7 ft	7 - 9 ft	9 - 11 ft	0 - 2 ft
				Sample Type	N	N	N	N	N	N	N	N	N
				Matrix	SE	SE	SE	SE	SE	SE	SE	SE	SE
				X	1211558	1211558	1211558	1211470	1211470	1211470	1211470	1211470	1211601
				Y	317452	317452	317452	317362	317362	317362	317362	317362	317362
	Site-Specific Criteria	DMMP SL	DMMP BT	DMMP ML									
Phenanthrene	--	1500	--	21000	**210 J**	**1100 J**	**1200 J**	**3500 J**	4.9 UJ	**1100 J**	**1500 J**	**64 J**	**180 J**
Pyrene	--	2600	11980	16000	**850**	**2100**	**1600**	**9900**	4.9 U	**4800**	**2800**	**72**	**680**
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	16	--	--	--	**229.9 J**	**638.8 J**	**579 J**	**1334.2 J**	4.9 UJ	**1193 J**	**1009.8 J**	**5.6 J**	**110.7 J**
Dioxin Furans (ng/kg)													
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--	**0.539 J**	**1 J**	**0.974 J**	**0.434 J**	0.0374 U	**1.16 J**	**0.655 J**	**0.141 J**	**0.312 J**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--	**1.52**	**3.35 J**	**2.34**	**1.38 J**	0.0631 U	**3.12 J**	**1.61**	0.0465 U	**0.794 J**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	**1.57**	**2.82 J**	**1.45**	**1.17 J**	0.0591 U	**3.35 J**	**1.2**	0.0446 U	**0.659 J**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	**14.9**	**17.2**	**8.48**	**7.36 J**	0.0611 U	**20.4**	**4.88**	0.0426 U	**4.12**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	**3.55**	**5.28 J**	**2.78**	**2.73 J**	0.067 U	**5.32 J**	**1.59**	0.0988 U	**1.27**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--	**513**	**481**	**153**	**234**	0.786 U	**736**	**160**	0.915 U	**108**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	--	--	--	**5160**	**4750**	**1290**	**2130**	4.42 U	**7800**	**1440**	5.58 U	**920**
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--	**56 J**	**245**	**116 J**	**35.4 J**	**0.157 J**	**136 J**	**102 J**	**0.353 J**	**23.9 J**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--	**40.8 J**	**146 J**	**66.3 J**	**35.7 J**	**0.0841 J**	**115 J**	**54.5**	**0.193 J**	**22.2 J**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	**204 J**	**300 J**	**162 J**	**138 J**	**0.726 J**	**417 J**	**103**	**0.983 J**	**64.8**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--	**2010**	**2410**	**681**	**1210 J**	**2.37 J**	**4850**	**928**	**2.83 J**	**571**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	--	--	--	**2.61 J**	**5.2 J**	**4.3**	**2.01 J**	0.0197 U	**4.71 J**	**2.33**	0.0194 U	**1.12 J**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--	**1.19**	**2.13 J**	**1.86**	**1.16 J**	0.0394 U	**1.93 J**	**1.14 J**	0.0407 UJ	**0.585 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--	**1.54**	**2.42 J**	**1.86**	**0.839 J**	0.0453 U	**2.25 J**	**1.03 J**	0.0329 U	**0.503 J**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	**1.76**	**1.89 J**	**1.45**	**1.56 J**	0.0256 U	**2.65 J**	**1.27**	0.0233 U	**0.655 J**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	**1.13**	**1.55 J**	**1.33**	**1.07 J**	**0.0236 J**	**1.68 J**	**0.917 J**	0.0233 U	**0.543 J**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	**0.415 J**	**0.489 J**	0.267 UJ	**0.395 J**	0.0335 U	**0.484 J**	0.23 UJ	0.0271 U	0.165 UJ
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	**1.77**	**1.8 J**	**1.68**	**1.51 J**	0.0296 U	**3.03 J**	**1.11**	0.0233 U	**0.704 J**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	--	--	--	**43.6**	**44.5**	**36.8**	**20.6 J**	0.0355 U	**64.5**	**20.4**	0.0213 U	**11.8**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	--	--	--	**1.72**	**1.64 J**	**0.695 J**	**1.54 J**	0.0611 U	**3.13 J**	**0.698 J**	0.0349 U	**0.641 J**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	--	--	--	**142**	**104**	**29.8**	**72.2**	0.132 U	**190**	**29.8**	0.0795 U	**32.8**
Total Tetrachlorodibenzofuran (TCDF)	--	--	--	--	**48.7 J**	**73.4 J**	**86 J**	**32.8 J**	**0.166 J**	**65.8 J**	**42.9 J**	**0.161 J**	**16.9 J**
Total Pentachlorodibenzofuran (PeCDF)	--	--	--	--	**30.1 J**	**48.5 J**	**32.8 J**	**17.6 J**	0.0453 U	**56.7 J**	**20.5 J**	**0.0404 J**	**12.5 J**
Total Hexachlorodibenzofuran (HxCDF)	--	--	--	--	**61.7 J**	**70.6 J**	**56.1 J**	**36.1 J**	**0.0246 J**	**93.6 J**	**34.8 J**	0.0271 U	**20.6 J**
Total Heptachlorodibenzofuran (HpCDF)	--	--	--	--	**119 J**	**122 J**	**73.4**	**72.8 J**	0.0611 U	**201 J**	**50.9 J**	0.0349 U	**36.7 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	5	10	--	--	**12.501 J**	**15.4904 J**	**8.38904 J**	**7.10306 J**	**0.0798718 J**	**19.6086 J**	**6.20132 J**	**0.19062043 J**	**3.68005 J**

Table A-3-5
DMMP SAP Subtidal Core Interval Analytical Results

					Location ID	PG-PDI-SC-04	PG-PDI-SC-04	PG-PDI-SC-04	PG-PDI-SC-20	PG-PDI-SC-20	PG-PDI-SC-20	PG-PDI-SC-05	PG-PDI-SC-05	PG-PDI-SC-05
					Sample ID	PG-PDI-SC-04-2-4-20140721	PG-PDI-SC-04-4-6-20140721	PG-PDI-SC-04-6-8-20140721	PG-PDI-SC-20-0-2-20140724	PG-PDI-SC-20-2-4-20140724	PG-PDI-SC-20-4-6-20140724	PG-PDI-SC-05-0-2-20140722	PG-PDI-SC-05-10-12-20140722	PG-PDI-SC-05-12-14-20140722
					Sample Date	07/21/2014	07/21/2014	07/21/2014	07/24/2014	07/24/2014	07/24/2014	07/22/2014	07/22/2014	07/22/2014
					Depth	2 - 4 ft	4 - 6 ft	6 - 8 ft	0 - 2 ft	2 - 4 ft	4 - 6 ft	0 - 2 ft	10 - 12 ft	12 - 14 ft
					Sample Type	N	N	N	N	N	N	N	N	N
					Matrix	SE	SE	SE	SE	SE	SE	SE	SE	SE
					X	1211601	1211601	1211601	1211580	1211580	1211580	1211551	1211551	1211551
					Y	317362	317362	317362	317401	317401	317401	316564	316564	316564
	Site-Specific Criteria	DMMP SL	DMMP BT	DMMP ML										
Conventional Parameters (mg/kg)														
Ammonia as nitrogen	--	--	--	--	3.2	2.23	1.88	5.89 J	0.14 UJ	0.73 J	22.1	54.8	46
Sulfide	--	--	--	--	14.6	1.78	1.18 U	1780	24.1	1.21 U	2720	99.3	289
Conventional Parameters (pct)														
Ash content	--	--	--	--	98.74	99.36	--	67.79	93.1	99.53	82.66	72.13	74.93
Total organic carbon	--	--	--	--	0.914 J	0.464 J	--	8.41 J	1.67 J	0.096 J	17.4 J	26.1 J	16.3 J
Total solids	--	--	--	--	81.15	82.28	85.37	38.78	69.1	85.33	39.35	32.86	43.74
Total solids (preserved)	--	--	--	--	79.91	82.51	83.54	54.7	61.48	81.48	37.83	34.88	46.55
Total volatile solids/organic matter	15	--	--	--	1.26	0.64	--	32.21	6.9	0.47	17.34	27.87	25.07
Grain Size (pct)														
Gravel	--	--	--	--	3.8	2	--	17.1	4.2	2.8	23.1	14	7.7
Sand, very coarse	--	--	--	--	2.9	3.2	--	6.5	2.9	3.4	8.9	10.7	6.9
Sand, coarse	--	--	--	--	4.5	5.4	--	10	8.3	7.7	10.4	12.5	9.1
Sand, medium	--	--	--	--	18.6	18.6	--	20.6	32	26.9	8.7	13.4	14.6
Sand, fine	--	--	--	--	30.7	31.6	--	17.7	33.6	35.3	8.6	13.2	24.3
Sand, very fine	--	--	--	--	25.2	24.9	--	8.5	10.9	15.7	8.1	7	13.1
Silt, coarse	--	--	--	--	5.7	5.7	--	4.9	4.4	3.4	6.6	3.6	5.3
Silt, medium	--	--	--	--	2.6	2.7	--	4.1	0.8	1.3	8.2	6.6	5.3
Silt, fine	--	--	--	--	1.3	1.4	--	2.6	0.6	0.7	4.5	4.9	3.5
Silt, very fine	--	--	--	--	1.1	1.1	--	1.7	0.5	0.7	2.9	3	2.7
Clay, coarse	--	--	--	--	0.8	0.8	--	1	0.4	0.5	1.8	2	1.7
Clay, medium	--	--	--	--	0.8	0.8	--	0.8	0.1	0.4	2	1.6	1.1
Clay, fine	--	--	--	--	1.9	1.8	--	4.7	1.3	1.1	6.1	7.4	4.7
Total fines (Reported, not calculated)	--	--	--	--	14.2	14.4	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)														
2-Methylnaphthalene	--	670	--	1900	14 U	3.2 J	--	220	29	15 U	370 J	650 J	450 J
Acenaphthene	--	500	--	2000	14 U	4.6 U	--	250 J	35 J	15 UJ	660	650 J	470 J
Acenaphthylene	--	560	--	1300	14 U	4.6 U	--	140	12 J	15 U	320 J	820 J	760
Anthracene	--	960	--	13000	14 UJ	4.6 UJ	--	350 J	47 J	15 UJ	540 J	740 J	500 J
Benzo(a)anthracene	--	1300	--	5100	14 UJ	4.6 UJ	--	580 J	25 J	15 UJ	1100 J	560 J	490 UJ
Benzo(a)pyrene	--	1600	--	3600	14 U	4.6 U	--	350	16	15 U	500	970 U	490 U
Benzo(b,j,k)fluoranthenes	--	--	--	--	14 U	4.6 U	--	1200	42	15 U	2100	970 U	490 U
Benzo(g,h,i)perylene	--	670	--	3200	14 U	4.6 U	--	230	13 J	15 U	490 U	970 U	490 U
Chrysene	--	1400	--	21000	14 U	4.6 U	--	1000	29	15 U	2100	770 J	390 J
Dibenzo(a,h)anthracene	--	230	--	1900	14 UJ	4.6 UJ	--	49 J	14 UJ	15 UJ	490 UJ	970 UJ	490 UJ
Fluoranthene	--	1700	4600	30000	13 J	4.6 UJ	--	1900	160	15 U	7100	2300	1700
Fluorene	--	540	--	3600	14 UJ	4.6 UJ	--	300 J	32 J	15 UJ	540 J	600 J	500 J
Indeno(1,2,3-c,d)pyrene	--	600	--	4400	14 U	4.6 U	--	180	8.9 J	15 U	490 U	970 U	490 U
Naphthalene	--	2100	--	2400	14 J	4.6 U	--	1300 J	240 J	15 UJ	3400	9600	8000

Table A-3-5
DMMP SAP Subtidal Core Interval Analytical Results

				Location ID	PG-PDI-SC-04	PG-PDI-SC-04	PG-PDI-SC-04	PG-PDI-SC-20	PG-PDI-SC-20	PG-PDI-SC-20	PG-PDI-SC-05	PG-PDI-SC-05	PG-PDI-SC-05
				Sample ID	PG-PDI-SC-04-2-4-20140721	PG-PDI-SC-04-4-6-20140721	PG-PDI-SC-04-6-8-20140721	PG-PDI-SC-20-0-2-20140724	PG-PDI-SC-20-2-4-20140724	PG-PDI-SC-20-4-6-20140724	PG-PDI-SC-05-0-2-20140722	PG-PDI-SC-05-10-12-20140722	PG-PDI-SC-05-12-14-20140722
				Sample Date	07/21/2014	07/21/2014	07/21/2014	07/24/2014	07/24/2014	07/24/2014	07/22/2014	07/22/2014	07/22/2014
				Depth	2 - 4 ft	4 - 6 ft	6 - 8 ft	0 - 2 ft	2 - 4 ft	4 - 6 ft	0 - 2 ft	10 - 12 ft	12 - 14 ft
				Sample Type	N	N	N	N	N	N	N	N	N
				Matrix	SE	SE	SE	SE	SE	SE	SE	SE	SE
				X	1211601	1211601	1211601	1211580	1211580	1211580	1211551	1211551	1211551
				Y	317362	317362	317362	317401	317401	317401	316564	316564	316564
	Site-Specific Criteria	DMMP SL	DMMP BT	DMMP ML									
Phenanthrene	--	1500	--	21000	**10 J**	4.6 UJ	--	**1100 J**	**98 J**	15 UJ	**1700 J**	**2800 J**	**2300 J**
Pyrene	--	2600	11980	16000	**19**	4.6 U	--	**3200 J**	**190 J**	15 UJ	**4900 J**	**4700 J**	**2000 J**
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	16	--	--	--	14 UJ	4.6 UJ	--	**560.9 J**	**24.58 J**	15 UJ	**890 J**	**694.2 J**	**346.9 J**
Dioxin Furans (ng/kg)													
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--	0.0496 U	**0.149 J**	--	**0.684 J**	**0.197 J**	0.0474 U	**1.21**	**2.4**	**0.984 J**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--	0.0952 U	0.0413 U	--	**1.71**	**0.237 J**	0.0474 U	**5.61**	**4.8**	**1.65**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	0.107 U	0.0511 U	--	**1.54**	**0.175 J**	0.0632 U	**11.2**	**2.2**	**0.876 J**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	0.306 U	0.0649 U	--	**8.44**	**0.692 J**	0.0652 U	**35.2**	**4.72**	**1.46**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	0.0833 U	0.0551 U	--	**2.93**	**0.313 J**	0.0672 U	**10.9**	**3.54**	**1.35**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--	**13.2**	0.867 U	--	**363**	**12.8**	0.387 U	**2870**	**55.4**	**9.98**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	--	--	--	**149**	4.62 U	--	**3540**	**92.6**	2.36 U	**32000 J**	**413**	43 U
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--	**1.28 J**	**0.584 J**	--	**136 J**	**11 J**	**0.338 J**	**415 J**	**258 J**	**122 J**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--	**1.11 J**	**0.225 J**	--	**101 J**	**6.56**	**0.0903 J**	**412 J**	**177**	**83.2 J**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	**4.17 J**	**0.897 J**	--	**251**	**14.1 J**	**0.239 J**	**1540**	**143**	**76.9 J**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--	**28.5 J**	**2.65 J**	--	**2480**	**55.7 J**	**0.924 J**	**21700 J**	**166 J**	**35.2**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	--	--	--	**0.117 J**	**0.0275 J**	--	**3.13**	**0.327 J**	**0.0494 J**	**5.03**	**15.4**	**7.32**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--	0.0675 UJ	0.0275 U	--	**1.48 J**	**0.167 J**	0.0474 U	**2.24**	**5.92**	**2.77**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--	0.0516 U	0.0315 U	--	**1.19 J**	**0.148 J**	0.0494 U	**2.31 J**	**5.21**	**2.06**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0.0417 U	0.0295 U	--	**1.57 J**	**0.14 J**	0.0296 U	**4.27 J**	**3.07 J**	**1.72 J**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0.0417 U	0.0275 U	--	**1.15**	**0.171 J**	0.0277 U	**2.25**	**2.57**	**0.966 J**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0.0536 U	0.0374 U	--	**0.481 J**	**0.0718 J**	0.0415 U	**0.895 J**	**0.567 J**	**0.203 J**
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0.0496 U	0.0334 U	--	**1.71 J**	**0.195 J**	0.0296 U	**2.01 J**	**2.77 J**	**0.663 J**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	--	--	--	**1.38 J**	**0.153 J**	--	**39.1**	**3.01**	0.111 U	**115**	**48.2**	**3.25**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	--	--	--	**0.0833 J**	0.0472 U	--	**1.57**	0.0658 U	0.0929 U	**8.42**	**0.542 J**	**0.179 J**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	--	--	--	**7.63**	0.057 U	--	**70.4**	**2.3**	0.125 U	**631**	**29.9**	**1.96 J**
Total Tetrachlorodibenzofuran (TCDF)	--	--	--	--	**1.63 J**	**0.538 J**	--	**46.9 J**	**6.25 J**	**0.458 J**	**96.9 J**	**339 J**	**152 J**
Total Pentachlorodibenzofuran (PeCDF)	--	--	--	--	**0.572 J**	**0.0709 J**	--	**26.4 J**	**2.9 J**	**0.0333 J**	**51.9 J**	**94 J**	**33.6 J**
Total Hexachlorodibenzofuran (HxCDF)	--	--	--	--	**1.3 J**	**0.126 J**	--	**53.8 J**	**5.4 J**	0.0415 U	**152 J**	**40.2 J**	**8.3 J**
Total Heptachlorodibenzofuran (HpCDF)	--	--	--	--	**4.29 J**	**0.247 J**	--	**114 J**	**7.61 J**	**0.11 J**	**503**	**71.1**	**4.66 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	5	10	--	--	**0.3206195 J**	**0.19928505 J**	--	**10.01032 J**	**0.878789 J**	**0.07998825 J**	**54.4792 J**	**13.59859 J**	**4.932028 J**

Table A-3-5
DMMP SAP Subtidal Core Interval Analytical Results

				Location ID	PG-PDI-SC-05	PG-PDI-SC-05	PG-PDI-SC-05	PG-PDI-SC-05	PG-PDI-SC-05	PG-PDI-SC-05	PG-PDI-SC-05	PG-PDI-SC-06	PG-PDI-SC-06
				Sample ID	PG-PDI-SC-05-14-16-20140722	PG-PDI-SC-05-16-18.5-20140722	PG-PDI-SC-05-18.5-20-20140722	PG-PDI-SC-05-2-4-20140722	PG-PDI-SC-05-4-6-20140722	PG-PDI-SC-05-6-8-20140722	PG-PDI-SC-05-8-10-20140722	PG-PDI-SC-06-0-4-20140722	PG-PDI-SC-06-10-14-20140722
				Sample Date	07/22/2014	07/22/2014	07/22/2014	07/22/2014	07/22/2014	07/22/2014	07/22/2014	07/22/2014	07/22/2014
				Depth	14 - 16 ft	16 - 18.5 ft	18.5 - 20 ft	2 - 4 ft	4 - 6 ft	6 - 8 ft	8 - 10 ft	0 - 4 ft	10 - 14 ft
				Sample Type	N	N	N	N	N	N	N	N	N
				Matrix	SE	SE	SE	SE	SE	SE	SE	SE	SE
				X	1211551	1211551	1211551	1211551	1211551	1211551	1211551	1211503	1211503
				Y	316564	316564	316564	316564	316564	316564	316564	316516	316516
	Site-Specific Criteria	DMMP SL	DMMP BT	DMMP ML									
Conventional Parameters (mg/kg)													
Ammonia as nitrogen	--	--	--	--	26	49.7	6.61	69.4	75.2	73.8	60.6	6.31	7.74
Sulfide	--	--	--	--	76.1	3.08	10.3	907	3550	652	202	12700 J	123 J
Conventional Parameters (pct)													
Ash content	--	--	--	--	92.18	90.49	99.19	73.95	79.33	81.76	78.69	46.55	32.62
Total organic carbon	--	--	--	--	12.8 J	7.71 J	1.79 J	6.78 J	22.8 J	21.3 J	36.6 J	26.7 J	32.2 J
Total solids	--	--	--	--	58.81	63.12	83.59	34.76	32.91	30.87	31.06	33.76	28.22
Total solids (preserved)	--	--	--	--	55.88	64.87	80.01	37.09	40.46	32.26	33.33	29.63	24.82
Total volatile solids/organic matter	15	--	--	--	7.82	9.51	0.81	26.05	20.67	18.24	21.31	53.45	67.38
Grain Size (pct)													
Gravel	--	--	--	--	2.6	7.7	13.7	41.7	31.5	6.7	17.5	27.2	36.9
Sand, very coarse	--	--	--	--	3.3	2.6	4.7	7.7	10	6.6	7.1	10.1	15.8
Sand, coarse	--	--	--	--	5.1	3.4	8.3	10.4	12	9.9	8.6	11.8	15.9
Sand, medium	--	--	--	--	8.3	14.7	22.3	8.3	11	12.5	12	16.1	13.3
Sand, fine	--	--	--	--	38.2	44.9	38.1	7.6	10.8	12.3	11.9	10.9	8.6
Sand, very fine	--	--	--	--	23.7	15	9.7	5.1	6.1	7.1	6.1	4.2	3.8
Silt, coarse	--	--	--	--	5	4.9	3.3 U	2.1	0.7	13.8	14.4	1.2	5.6 U
Silt, medium	--	--	--	--	3.7	1.6	3.3 U	4.7	4.2	8.1	4.9	4.9	5.6 U
Silt, fine	--	--	--	--	2.3	1	3.3 U	3.4	3.4	3.9	5	3	5.6 U
Silt, very fine	--	--	--	--	2.1	0.9	3.3 U	2.1	2.4	4.7	2.8	1.9	5.6 U
Clay, coarse	--	--	--	--	1.4	0.7	3.3 U	1.2	1.3	2.4	1.3	1.8	5.6 U
Clay, medium	--	--	--	--	1.1	0.3	3.3 U	1	1.2	3.3	1.3	0.9	5.6 U
Clay, fine	--	--	--	--	3.2	2.3	3.3 U	4.6	5.3	8.7	7.2	6.1	5.6 U
Total fines (Reported, not calculated)	--	--	--	--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)													
2-Methylnaphthalene	--	670	--	1900	710	150	3.7 J	400 J	5800	1300	490	1700	670
Acenaphthene	--	500	--	2000	1100	210	4.3 J	900	14000	3900	590	2800	1200
Acenaphthylene	--	560	--	1300	770	140 U	4.6 U	490 U	1100 U	430 J	560	1300	620
Anthracene	--	960	--	13000	620 J	410 J	6.6 J	670 J	4800 J	1800 J	610 J	1100 J	1100 J
Benzo(a)anthracene	--	1300	--	5100	350 J	280 J	4.5 J	670 J	3800 J	1000 J	460 J	600 J	470 J
Benzo(a)pyrene	--	1600	--	3600	220	200	4.4 J	380 J	1300	570	410	330 J	580 U
Benzo(b,j,k)fluoranthenes	--	--	--	--	520	420	7.9	1100	3400	1000	780	950	270 J
Benzo(g,h,i)perylene	--	670	--	3200	170	110 J	2.8 J	490 U	1100 U	420 J	310	500 UJ	580 UJ
Chrysene	--	1400	--	21000	430	460	4.7	1400	3800	1300	560	1100	490 J
Dibenzo(a,h)anthracene	--	230	--	1900	140 UJ	140 UJ	4.6 UJ	490 UJ	1100 UJ	500 UJ	150 UJ	500 UJ	580 UJ
Fluoranthene	--	1700	4600	30000	3000	840	28	4000	31000	6300	2200	3900	4900
Fluorene	--	540	--	3600	910 J	200 J	6.4 J	690 J	9500 J	2900 J	550 J	1700 J	1200 J
Indeno(1,2,3-c,d)pyrene	--	600	--	4400	140 U	140 U	4.6 U	490 U	1100 U	500 U	160	500 UJ	580 UJ
Naphthalene	--	2100	--	2400	8100	900	28	1800	12000	7500	8000	18000	6100

Table A-3-5
DMMP SAP Subtidal Core Interval Analytical Results

					Location ID	PG-PDI-SC-05	PG-PDI-SC-05	PG-PDI-SC-05	PG-PDI-SC-05	PG-PDI-SC-05	PG-PDI-SC-05	PG-PDI-SC-05	PG-PDI-SC-06	PG-PDI-SC-06
					Sample ID	PG-PDI-SC-05-14-16-20140722	PG-PDI-SC-05-16-18.5-20140722	PG-PDI-SC-05-18.5-20-20140722	PG-PDI-SC-05-2-4-20140722	PG-PDI-SC-05-4-6-20140722	PG-PDI-SC-05-6-8-20140722	PG-PDI-SC-05-8-10-20140722	PG-PDI-SC-06-0-4-20140722	PG-PDI-SC-06-10-14-20140722
					Sample Date	07/22/2014	07/22/2014	07/22/2014	07/22/2014	07/22/2014	07/22/2014	07/22/2014	07/22/2014	07/22/2014
					Depth	14 - 16 ft	16 - 18.5 ft	18.5 - 20 ft	2 - 4 ft	4 - 6 ft	6 - 8 ft	8 - 10 ft	0 - 4 ft	10 - 14 ft
					Sample Type	N	N	N	N	N	N	N	N	N
					Matrix	SE	SE	SE	SE	SE	SE	SE	SE	SE
					X	1211551	1211551	1211551	1211551	1211551	1211551	1211551	1211503	1211503
					Y	316564	316564	316564	316564	316564	316564	316564	316516	316516
	Site-Specific Criteria	DMMP SL	DMMP BT	DMMP ML										
Phenanthrene	--	1500	--	21000		3100 J	470 J	14 J	1700 J	25000 J	7700 J	2600 J	5000 J	2800 J
Pyrene	--	2600	11980	16000		3900 J	860 J	38 J	3400 J	29000 J	7100 J	3100 J	4000 J	4500 J
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	16	--	--	--		325.3 J	288.6 J	6.147 J	620 J	2168 J	833 J	563.1 J	546 J	426.9 J
Dioxin Furans (ng/kg)														
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--		0.988 J	0.341 J	0.0393 U	1.07 J	1.49	6.06	4.58	7.9	0.871 J
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--		1.81	0.919 J	0.0785 J	4.31	6.25	19.9	10.9	21	1.37
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--		1.03	0.611 J	0.055 U	5.86	11.5	25.9	5.26	7.68	0.686 J
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--		1.86	0.925 J	0.053 U	28.3	62.6	86.4	12.6	51.7	1.19
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--		1.63	0.923 J	0.179 J	8.58	19.4 J	30.2	7.53	24.5	0.955 J
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--		11.8	6.61 U	1.53 U	1510	3950	6920	139	457	10 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	--	--	--		54.2	25.8 U	9.88 U	17200 J	44400 J	76600 J	808	3530	38.1 U
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--		56.9 J	24.1 J	0.672 J	183 J	133 J	725	850 J	380 J	135 J
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--		52.6	21.8 J	0.868 J	169 J	133	501	462	365 J	71.3 J
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--		54.6	21.9 J	1.82 J	808	1980 J	3410	293	624	48.7 J
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--		45.9	21.4 J	5.2 J	12200	24000	30300	438	2550	22 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	--	--	--		6.76	1.45	0.0844 J	3.09	6.38	25.6	26.2	22.5 J	5.81
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--		3.16	0.95 J	0.0589 J	1.54	3.19	12.3	10.5	10.2	2.56
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--		2.33	0.796 J	0.0844 J	1.67	2.91	10.4	9.4	7.75	1.41
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--		3.22	0.939 J	0.0275 J	2.96 J	2.78	13.6 J	6.84 J	11.8 J	2.44 J
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--		1.58	0.619 J	0.0334 U	1.86	5.59	7.67	4.46	5.49	0.768 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	--	--	--		0.379 J	0.351 J	0.0491 U	0.59 J	1.05 J	2 J	1.02 J	1.18 J	0.0499 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--		1.16 J	0.585 J	0.0373 U	1.88 J	2.86 J	10.4 J	4.21 J	5.01 J	0.485 J
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	--	--	--		4.58	1.73	0.112 J	72.9	177	308	70.5	94.3	7.86
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	--	--	--		0.323 J	0.369 J	0.0471 J	4.8	11.3	20.3	2.21	3.08	0.0837 U
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	--	--	--		2.33	1.23 J	0.275 U	329	843	1390	240	139	3.66
Total Tetrachlorodibenzofuran (TCDF)	--	--	--	--		131 J	28 J	1.75 J	49.9 J	88.4 J	495 J	534 J	515 J	117 J
Total Pentachlorodibenzofuran (PeCDF)	--	--	--	--		36.3 J	9.83 J	0.383 J	50.8 J	67.1 J	176 J	152 J	123 J	26.1 J
Total Hexachlorodibenzofuran (HxCDF)	--	--	--	--		13.9 J	5.01 J	0.0265 J	113 J	280 J	359 J	84.1 J	124 J	7.29 J
Total Heptachlorodibenzofuran (HpCDF)	--	--	--	--		6.15 J	2.38 J	0.159	282 J	743	1280	221 J	222 J	8.59 J
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	5	10	--	--		5.537689 J	2.225879 J	0.17648125 J	32.3749 J	74.8806 J	145.506 J	27.8585 J	51.1615 J	4.1125265 J

Table A-3-5
DMMP SAP Subtidal Core Interval Analytical Results

					Location ID	PG-PDI-SC-06	PG-PDI-SC-06	PG-PDI-SC-06	PG-PDI-SC-06	PG-PDI-SC-06	PG-PDI-SC-06	PG-PDI-SC-07	PG-PDI-SC-07	PG-PDI-SC-07
					Sample ID	PG-PDI-SC-06-14-18-20140722	PG-PDI-SC-06-18-20-20140722	PG-PDI-SC-06-4-6-20140722	PG-PDI-SC-06-6-8-20140722	PG-PDI-SC-06-8-10-20140722	PG-PDI-SC-56-18-20-20140722	PG-PDI-SC-07-0-2-20140724	PG-PDI-SC-07-10-12-20140724	PG-PDI-SC-07-12-14-20140724
					Sample Date	07/22/2014	07/22/2014	07/22/2014	07/22/2014	07/22/2014	07/22/2014	07/24/2014	07/24/2014	07/24/2014
					Depth	14 - 18 ft	18 - 20 ft	4 - 6 ft	6 - 8 ft	8 - 10 ft	18 - 20 ft	0 - 2 ft	10 - 12 ft	12 - 14 ft
					Sample Type	N	N	N	N	N	FD	N	N	N
					Matrix	SE	SE	SE	SE	SE	SE	SE	SE	SE
					X	1211503	1211503	1211503	1211503	1211503	1211503	1211386	1211386	1211386
					Y	316516	316516	316516	316516	316516	316516	316482	316482	316482
	Site-Specific Criteria	DMMP SL	DMMP BT	DMMP ML										
Conventional Parameters (mg/kg)														
Ammonia as nitrogen	--	--	--	--		12.4	3.13	12.1	11.4	9.24	3.18	9.65 J	4.51 J	1.52 J
Sulfide	--	--	--	--		81.2 J	3.41 J	2990 J	3600 J	3590 J	1.37 UJ	712 J	1.37 J	22 J
Conventional Parameters (pct)														
Ash content	--	--	--	--		86.05	99.07	34.69	27.3	45.81	99.05	68.65	98.81	99.33
Total organic carbon	--	--	--	--		5.74 J	0.331 J	22.7 J	38.5 J	28.8 J	0.58 J	27.1 J	0.513 J	0.181 J
Total solids	--	--	--	--		61.55	81.54	25.36	21.98	33.32	81.25	30.34	86.81	91.01
Total solids (preserved)	--	--	--	--		46.84	79.27	23.15	21.16	31.17	72.59	32.68	79.35	86.15
Total volatile solids/organic matter	15	--	--	--		13.95	0.93	65.31	72.7	54.19	0.95	31.35	1.19	0.67
Grain Size (pct)														
Gravel	--	--	--	--		7.3	1	25.4	32.3	37.3	1.3	14	4.4	33.9
Sand, very coarse	--	--	--	--		3.3	3.5	15.2	10.8	10.8	2.9	7.7	6.9	8.4
Sand, coarse	--	--	--	--		6.5	8.7	12.6	11.3	11	8.9	12	11.9	8.7
Sand, medium	--	--	--	--		18.5	24.1	11.2	10.2	10.1	24.4	14.1	23.8	17.6
Sand, fine	--	--	--	--		32.8	42.2	7.2	6.6	6.7	42.6	13.3	32.8	20.2
Sand, very fine	--	--	--	--		14.3	11.9	3.1	3.3	3.4	12	10.6	11.3	6.7
Silt, coarse	--	--	--	--		4	2.8	6.7	4.9	3.2	2.6	8.1	2.6	0.9
Silt, medium	--	--	--	--		3.3	1.3	3.3	3.9	4.2	1	7.2	1.7	0.8
Silt, fine	--	--	--	--		2.4	0.8	2.5	2.8	3.4	0.9	3.3	1.2	0.5
Silt, very fine	--	--	--	--		1.8	0.8	2.3	1.7	1.8	0.7	2.1	0.9	0.6
Clay, coarse	--	--	--	--		1.6	0.7	1.5	1.6	1.3	0.7	1.1	0.8	0.5
Clay, medium	--	--	--	--		1.2	0.6	0.9	0.8	0.6	0.6	0.7	0.7	0.4
Clay, fine	--	--	--	--		3	1.6	8.2	9.7	6.1	1.5	5.9	1.2	0.8
Total fines (Reported, not calculated)	--	--	--	--		--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)														
2-Methylnaphthalene	--	670	--	1900		210	14 U	2000	920	880	14 U	620	15 U	4.9 U
Acenaphthene	--	500	--	2000		290	14 U	2600	590	530	14 U	1100 J	15 UJ	4.9 UJ
Acenaphthylene	--	560	--	1300		90 J	14 U	2200	1300	2000	14 U	760	15 U	4.9 U
Anthracene	--	960	--	13000		230 J	14 UJ	1700 J	730 J	700 J	14 UJ	420 J	15 UJ	4.9 UJ
Benzo(a)anthracene	--	1300	--	5100		170 J	14 UJ	560 J	490 UJ	490 UJ	14 UJ	180 J	15 UJ	4.9 UJ
Benzo(a)pyrene	--	1600	--	3600		120 J	14 U	340 J	490 U	490 U	14 U	110 J	15 U	4.9 U
Benzo(b,j,k)fluoranthenes	--	--	--	--		250	14 U	700	490 U	490 U	14 U	290	15 U	4.9 U
Benzo(g,h,i)perylene	--	670	--	3200		150 UJ	14 UJ	280 J	490 UJ	490 UJ	14 UJ	150	15 U	4.9 U
Chrysene	--	1400	--	21000		180	14 U	580	490 U	490 U	14 U	270	15 U	4.9 U
Dibenzo(a,h)anthracene	--	230	--	1900		150 UJ	14 UJ	490 UJ	490 UJ	490 UJ	14 UJ	150 UJ	15 UJ	4.9 UJ
Fluoranthene	--	1700	4600	30000		770	14 U	6900	2600	2600	14 U	2200	15 U	4.9 U
Fluorene	--	540	--	3600		280 J	14 UJ	2400 J	750 J	650 J	14 UJ	810 J	15 UJ	4.9 UJ
Indeno(1,2,3-c,d)pyrene	--	600	--	4400		150 UJ	14 UJ	490 UJ	490 UJ	490 UJ	14 UJ	150 U	15 U	4.9 U
Naphthalene	--	2100	--	2400		1100	8.9 J	29000	19000	21000	23	8500 J	9.2 J	4.9 UJ

Table A-3-5
DMMP SAP Subtidal Core Interval Analytical Results

					Location ID	PG-PDI-SC-06	PG-PDI-SC-06	PG-PDI-SC-06	PG-PDI-SC-06	PG-PDI-SC-06	PG-PDI-SC-06	PG-PDI-SC-07	PG-PDI-SC-07	PG-PDI-SC-07
					Sample ID	PG-PDI-SC-06-14-18-20140722	PG-PDI-SC-06-18-20-20140722	PG-PDI-SC-06-4-6-20140722	PG-PDI-SC-06-6-8-20140722	PG-PDI-SC-06-8-10-20140722	PG-PDI-SC-56-18-20-20140722	PG-PDI-SC-07-0-2-20140724	PG-PDI-SC-07-10-12-20140724	PG-PDI-SC-07-12-14-20140724
					Sample Date	07/22/2014	07/22/2014	07/22/2014	07/22/2014	07/22/2014	07/22/2014	07/24/2014	07/24/2014	07/24/2014
					Depth	14 - 18 ft	18 - 20 ft	4 - 6 ft	6 - 8 ft	8 - 10 ft	18 - 20 ft	0 - 2 ft	10 - 12 ft	12 - 14 ft
					Sample Type	N	N	N	N	N	FD	N	N	N
					Matrix	SE	SE	SE	SE	SE	SE	SE	SE	SE
					X	1211503	1211503	1211503	1211503	1211503	1211503	1211386	1211386	1211386
					Y	316516	316516	316516	316516	316516	316516	316482	316482	316482
	Site-Specific Criteria	DMMP SL	DMMP BT	DMMP ML										
Phenanthrene	--	1500	--	21000		**640 J**	14 UJ	**9000 J**	**4300 J**	**4100 J**	14 UJ	**2800 J**	**8 J**	4.9 UJ
Pyrene	--	2600	11980	16000		**850 J**	**9.1 J**	**6700 J**	**2900 J**	**5000 J**	**7.6 J**	**2700 J**	**11 J**	4.9 UJ
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	16	--	--	--		**178.8 J**	14 UJ	**520.8 J**	490 UJ	490 UJ	14 UJ	**174.7 J**	15 UJ	4.9 UJ
Dioxin Furans (ng/kg)														
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--		**0.408 J**	0.0422 U	**4.57**	**3.02**	**2.55**	0.0415 U	**3.01**	**0.132 J**	0.0395 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--		**0.711 J**	0.0441 U	**9.63**	**6.72**	**5.38**	0.0553 U	**9.32**	**0.165 J**	0.0435 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--		0.369 U	0.0633 U	**4.41**	**3.92**	**2.45**	0.0672 U	**5.89**	**0.112 J**	0.0573 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--		**0.59 J**	0.0672 U	**10**	**6.74**	**4.55**	0.0692 U	**26.7**	**0.177 J**	0.0593 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--		0.532 U	0.0672 U	**6.21**	**5.04**	**3.53**	0.0711 U	**9.36**	**0.208 J**	0.0613 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--		4.06 U	0.841 U	**105**	**39.1**	**26.7**	1.39 U	**350**	1.67 U	0.666 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	--	--	--		10.3 U	4.71 U	**598**	**180**	**118**	7.63 U	**2940**	7.52 U	3.38 U
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--		**16.1 J**	**0.485 J**	**566**	**772 J**	**376 J**	**0.631 J**	**1120 J**	**1.54 J**	**0.313 J**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--		**11.8 J**	**0.542 J**	**320 J**	**430**	**199 J**	**0.948 J**	**582 J**	**1.69 J**	**0.0658 J**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--		**12.5 J**	**0.955 J**	**237 J**	**224**	**132**	**2.03 J**	**509**	**2.7 J**	**0.657 J**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--		**8.9 J**	**2.54 J**	**251**	**89.7**	**52.5**	**4.35 J**	**2090**	**4.63 J**	**2.09 J**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	--	--	--		**1.87**	0.0288 U	**25.5**	**17.3**	**16.8**	0.0316 U	**17.3**	**0.132 J**	0.0296 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--		**0.978 J**	0.048 U	**9.46**	**6.14**	**7.36**	0.0494 U	**7.43**	**0.159 J**	**0.0514 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--		**0.835 J**	0.0518 U	**8.92**	**6.08**	**5.5**	0.0613 U	**6.38**	**0.0864 J**	0.0514 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--		**1**	0.0345 U	**6.52 J**	**3.81 J**	**3.59 J**	0.0395 U	**6.52 J**	**0.116 J**	0.0356 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--		**0.62 J**	0.0288 U	**4.76**	**2.97**	**2.55**	0.0375 U	**3.86**	**0.122 J**	**0.0316 J**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	--	--	--		**0.179 J**	0.0384 U	**1.04 J**	**0.821 J**	**0.592 J**	0.0553 U	**1.07 J**	**0.112 J**	0.0494 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--		**0.614 J**	0.0307 U	**4.95 J**	**3.27 J**	**2.45 J**	0.0435 U	**5.02 J**	**0.124 J**	0.0356 U
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	--	--	--		**2.78**	0.0883 U	**90.6**	**56.7**	**8.79**	0.13 U	**78.8**	**0.324 J**	0.081 U
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	--	--	--		**0.169 J**	0.0729 U	**1.57**	**0.694 J**	**0.362 J**	0.0988 U	**2.66 J**	**0.108 J**	0.0593 U
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	--	--	--		**1.46 J**	0.211 U	**125**	**29.4**	**6.79**	0.237 U	**119**	**0.32 J**	0.14 U
Total Tetrachlorodibenzofuran (TCDF)	--	--	--	--		**33.8 J**	**0.586 J**	**531 J**	**367 J**	**368**	**0.474 J**	**370 J**	**3.11 J**	**1.76 J**
Total Pentachlorodibenzofuran (PeCDF)	--	--	--	--		**10.9 J**	0.0518 U	**167 J**	**110 J**	**109 J**	0.0613 U	**137 J**	**1.01 J**	**0.0509**
Total Hexachlorodibenzofuran (HxCDF)	--	--	--	--		**5.79 J**	**0.0338 J**	**92.5 J**	**56.4 J**	**30.6 J**	**0.0708 J**	**146 J**	**0.838 J**	**0.0314 J**
Total Heptachlorodibenzofuran (HpCDF)	--	--	--	--		**3.4 J**	**0.0889 J**	**192**	**91.3**	**14.8 J**	**0.185 J**	**224 J**	**0.511 J**	**0.0814 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	5	10	--	--		**1.982963 J**	0.0441 U	**25.6874 J**	**17.16306 J**	**13.847957 J**	0.0553 U	**27.2712 J**	**0.451884 J**	**0.0748765 J**

Table A-3-5
DMMP SAP Subtidal Core Interval Analytical Results

	Site-Specific Criteria	DMMP SL	DMMP BT	DMMP ML	Location ID	PG-PDI-SC-07	PG-PDI-SC-07	PG-PDI-SC-07	PG-PDI-SC-07	PG-PDI-SC-08	PG-PDI-SC-08	PG-PDI-SC-08	PG-PDI-SC-08	PG-PDI-SC-08
					Sample ID	PG-PDI-SC-07-2-4-20140724	PG-PDI-SC-07-4-6-20140724	PG-PDI-SC-07-6-8-20140724	PG-PDI-SC-07-8-10-20140724	PG-PDI-SC-08-0-2-20140722	PG-PDI-SC-08-11-13-20140722	PG-PDI-SC-08-2-4-20140722	PG-PDI-SC-08-4-7-20140722	PG-PDI-SC-08-7-9-20140722
					Sample Date	07/24/2014	07/24/2014	07/24/2014	07/24/2014	07/22/2014	07/22/2014	07/22/2014	07/22/2014	07/22/2014
					Depth	2 - 4 ft	4 - 6 ft	6 - 8 ft	8 - 10 ft	0 - 2 ft	11 - 13 ft	2 - 4 ft	4 - 7 ft	7 - 9 ft
					Sample Type	N	N	N	N	N	N	N	N	N
					Matrix	SE	SE	SE	SE	SE	SE	SE	SE	SE
					X	1211386	1211386	1211386	1211386	1211388	1211388	1211388	1211388	1211388
					Y	316482	316482	316482	316482	316501	316501	316501	316501	316501
Conventional Parameters (mg/kg)														
Ammonia as nitrogen	--	--	--	--		0.58 J	6.44 J	16.6 J	12.8 J	1.79	7.72	10.1	14.8	9.06
Sulfide	--	--	--	--		289 J	219 J	60.7 J	193 J	57.1 J	2.46 J	445 J	170 J	11.2 J
Conventional Parameters (pct)														
Ash content	--	--	--	--		57.24	51.22	62.34	74.29	44.51	--	51.02	84.35	99.25
Total organic carbon	--	--	--	--		22 J	27.5 J	21.9 J	17.3 J	40.2 J	--	13.7 J	3.28 J	0.265 J
Total solids	--	--	--	--		28.74	31.29	32.67	47.39	27.87	84.94	36.58	66.11	83.1
Total solids (preserved)	--	--	--	--		34.58	29.77	31.09	42.89	31.76	84.35	39.26	50.51	83.16
Total volatile solids/organic matter	15	--	--	--		42.76	48.78	37.66	25.71	55.49	--	48.98	15.65	0.75
Grain Size (pct)														
Gravel	--	--	--	--		18	19	20.4	13.7	12.7	--	25.8	27.6	4.5
Sand, very coarse	--	--	--	--		9.6	16	12.5	7.9	11.1	--	6.3	4.6	6.9
Sand, coarse	--	--	--	--		11.2	20.2	15	12.3	16.5	--	10.4	7.6	13.4
Sand, medium	--	--	--	--		13.8	15.7	13.5	18.4	17.3	--	12.7	14	25.8
Sand, fine	--	--	--	--		10.5	9.1	10.6	20.4	12.8	--	11.4	16.8	33.6
Sand, very fine	--	--	--	--		6.3	2.7	6.3	8.3	8.5	--	8.2	6.8	8.5
Silt, coarse	--	--	--	--		8.3	3.3	3.9	2.2	3.8	--	4	9.9	2.3
Silt, medium	--	--	--	--		7.8	4	4.9	4	5.3	--	7.3	3.8	1.1
Silt, fine	--	--	--	--		4	2.2	3.6	3.2	2.7	--	3.9	2.4	0.9
Silt, very fine	--	--	--	--		2.1	1.4	2.1	2.7	1.5	--	2.2	1.4	0.6
Clay, coarse	--	--	--	--		1.2	0.9	1.5	1.8	0.1 U	--	1.7	1	0.6
Clay, medium	--	--	--	--		0.8	0.7	1.2	1.6	1.4	--	1	0.6	0.6
Clay, fine	--	--	--	--		6.5	5	4.5	3.4	6.3	--	5.1	3.5	1.3
Total fines (Reported, not calculated)	--	--	--	--		--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)														
2-Methylnaphthalene	--	670	--	1900		460	150	150 U	44 J	660	--	1600	54 J	4.2 J
Acenaphthene	--	500	--	2000		570 J	160 J	150 UJ	50 UJ	1000	--	3600	130	4.6 U
Acenaphthylene	--	560	--	1300		570	200	150 U	27 J	1100	--	460	59 U	4.6 U
Anthracene	--	960	--	13000		490 J	320 J	150 UJ	43 J	310 J	--	2100 J	140 J	4.6 UJ
Benzo(a)anthracene	--	1300	--	5100		250 J	290 J	150 UJ	33 J	77 J	--	1700 J	100 J	4.6 UJ
Benzo(a)pyrene	--	1600	--	3600		180	240	150 U	32 J	140 U	--	830	62	2.6 J
Benzo(b,j,k)fluoranthenes	--	--	--	--		400	420	150 U	62	71 J	--	2200	140	4.6 U
Benzo(g,h,i)perylene	--	670	--	3200		200	210	150 U	38 J	83 J	--	420 J	37 J	4.6 UJ
Chrysene	--	1400	--	21000		310	280	150 U	42 J	110 J	--	2500	110	4.6 U
Dibenzo(a,h)anthracene	--	230	--	1900		49 UJ	42 J	150 UJ	50 UJ	140 UJ	--	94 J	59 UJ	4.6 UJ
Fluoranthene	--	1700	4600	30000		1800	1200	110 J	130	1600	--	6800	400	8.7
Fluorene	--	540	--	3600		530 J	270 J	150 UJ	36 J	730 J	--	3200 J	120 J	4.6 UJ
Indeno(1,2,3-c,d)pyrene	--	600	--	4400		100	120	150 U	50 U	140 UJ	--	280 J	59 UJ	4.6 UJ
Naphthalene	--	2100	--	2400		7600 J	3000 J	150 J	300 J	12000	--	7800	310	11

Table A-3-5
DMMP SAP Subtidal Core Interval Analytical Results

					Location ID	PG-PDI-SC-07	PG-PDI-SC-07	PG-PDI-SC-07	PG-PDI-SC-07	PG-PDI-SC-08	PG-PDI-SC-08	PG-PDI-SC-08	PG-PDI-SC-08	PG-PDI-SC-08
					Sample ID	PG-PDI-SC-07-2-4-20140724	PG-PDI-SC-07-4-6-20140724	PG-PDI-SC-07-6-8-20140724	PG-PDI-SC-07-8-10-20140724	PG-PDI-SC-08-0-2-20140722	PG-PDI-SC-08-11-13-20140722	PG-PDI-SC-08-2-4-20140722	PG-PDI-SC-08-4-7-20140722	PG-PDI-SC-08-7-9-20140722
					Sample Date	07/24/2014	07/24/2014	07/24/2014	07/24/2014	07/22/2014	07/22/2014	07/22/2014	07/22/2014	07/22/2014
					Depth	2 - 4 ft	4 - 6 ft	6 - 8 ft	8 - 10 ft	0 - 2 ft	11 - 13 ft	2 - 4 ft	4 - 7 ft	7 - 9 ft
					Sample Type	N	N	N	N	N	N	N	N	N
					Matrix	SE	SE	SE	SE	SE	SE	SE	SE	SE
					X	1211386	1211386	1211386	1211386	1211388	1211388	1211388	1211388	1211388
					Y	316482	316482	316482	316482	316501	316501	316501	316501	316501
	Site-Specific Criteria	DMMP SL	DMMP BT	DMMP ML										
Phenanthrene	--	1500	--	21000		2100 J	1400 J	100 J	180 J	2200 J	--	6400 J	340 J	10 J
Pyrene	--	2600	11980	16000		3000 J	1900 J	140 J	200 J	2100 J	--	9600 J	590 J	11 J
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	16	--	--	--		260.55 J	330 J	150 UJ	46.92 J	99.9 J	--	1282.4 J	93 J	3.543 J
Dioxin Furans (ng/kg)														
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--		4.99	1.66 J	0.636 J	0.693 J	2.81	--	2.29	0.401 J	0.0506 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--		15.5	3.55	1.59	1.49	6.22	--	5.39	0.595 J	0.0599 J
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--		10.8	1.83	0.646 J	0.649 J	4.12	--	2.63	0.282 U	0.0824 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--		26.5	4.46	1.18	1.15	13.2	--	5	0.391 J	0.0861 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--		14.1	2.74	1.08 J	0.933 J	6.21	--	3.45	0.419 U	0.11 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--		240	31.6	5.68	6.2	135	--	58.8	2.54 U	0.953 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	--	--	--		1600	164	12.7 U	17.3 U	1040	--	471	9.71 U	5.15 U
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--		1340	213 J	31.2 J	45.8 J	553 J	--	286 J	19.5 J	0.846 J
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--		858 J	108 J	24.7 J	23 J	319 J	--	184	11.4 J	0.646 J
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--		609	89.2	22.6 J	17.9 J	294	--	147	9.35 J	1.21 J
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--		1100	113 J	11.1 J	11.9 J	690 J	--	353 J	6.21 J	2.39 J
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	--	--	--		30.2	8.93	2.91	2.54	17.9	--	15.2	1.44	0.107 J
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--		14.4 J	5.27	2.2	2.02 J	6.41	--	6.63	0.812 J	0.0599 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--		10.9	3.68	1.64	1.37	4.86	--	4.75 J	0.512 J	0.0655 J
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--		14.7 J	6.37 J	3.19 J	3.86	3.33 J	--	5.12 J	0.762 J	0.0655 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--		7.25	2.61 J	1.54	1.53	2.55	--	2.48	0.407 J	0.0936 J
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	--	--	--		1.58 J	0.425 J	0.301 J	0.28 J	1.02 J	--	0.512 J	0.0694 J	0.0618 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--		6.56 J	1.69 J	1.23 J	1.07	2.45 J	--	1.6 J	0.306 J	0.0487 U
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	--	--	--		72.2	16.7	7.16	11.7	25.6	--	10.5	1.57	0.27 U
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	--	--	--		2.53 J	0.499 J	0.341 J	0.432 J	1.31 J	--	0.463 J	0.0813 J	0.12 U
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	--	--	--		68.5	9.49 J	2.82	4.96	43.3	--	13	0.718 J	0.318 U
Total Tetrachlorodibenzofuran (TCDF)	--	--	--	--		577 J	166 J	47.6 J	42.4 J	341 J	--	295 J	27.8 J	1.93 J
Total Pentachlorodibenzofuran (PeCDF)	--	--	--	--		193 J	55.1 J	24.7 J	18.1 J	96.3 J	--	73.6 J	7.55 J	0.392 J
Total Hexachlorodibenzofuran (HxCDF)	--	--	--	--		137 J	30.8 J	13.6 J	12.9 J	58.1 J	--	23 J	3.25 J	0.381 J
Total Heptachlorodibenzofuran (HpCDF)	--	--	--	--		165 J	29 J	8.75	13.4 J	70.8 J	--	18.1	2 J	0.325 J
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	5	10	--	--		39.00885 J	9.917637 J	4.126261 J	4.043203 J	17.70239 J	--	13.74593 J	1.5774349 J	0.1560687 J

Table A-3-5
DMMP SAP Subtidal Core Interval Analytical Results

				Location ID	PG-PDI-SC-08	PG-PDI-SC-08	PG-PDI-SC-21	PG-PDI-SC-21	PG-PDI-SC-21	PG-PDI-SC-21	PG-PDI-SC-21	PG-PDI-SC-21	PG-PDI-SC-21
				Sample ID	PG-PDI-SC-08-9-11-20140722	PG-PDI-SC-58-7-9-20140722	PG-PDI-SC-21-0-2-20140725	PG-PDI-SC-21-10-12-20140725	PG-PDI-SC-21-12-14-20140725	PG-PDI-SC-21-14-16-20140725	PG-PDI-SC-21-16-18-20140725	PG-PDI-SC-21-18-20-20140725	PG-PDI-SC-21-20-22-20140725
				Sample Date	07/22/2014	07/22/2014	07/25/2014	07/25/2014	07/25/2014	07/25/2014	07/25/2014	07/25/2014	07/25/2014
				Depth	9 - 11 ft	7 - 9 ft	0 - 2 ft	10 - 12 ft	12 - 14 ft	14 - 16 ft	16 - 18 ft	18 - 20 ft	20 - 22 ft
				Sample Type	N	FD	N	N	N	N	N	N	N
				Matrix	SE	SE	SE	SE	SE	SE	SE	SE	SE
				X	1211388	1211388	1211521	1211521	1211521	1211521	1211521	1211521	1211521
				Y	316501	316501	316528	316528	316528	316528	316528	316528	316528
	Site-Specific Criteria	DMMP SL	DMMP BT	DMMP ML									
Conventional Parameters (mg/kg)													
Ammonia as nitrogen	--	--	--	--	6.53	8.15	7.3 J	6.73	5.16	6.33	11	2.87	2.68
Sulfide	--	--	--	--	4.09 J	20.3 J	3490	698	118	691	737	32	27.6
Conventional Parameters (pct)													
Ash content	--	--	--	--	99.21	98.89	82.33	44.08	47.76	36.21	43.4	98.79	99.05
Total organic carbon	--	--	--	--	0.084 J	0.266 J	9.92 J	47.1 J	42.7 J	44.7 J	26.8 J	0.714 J	0.539 J
Total solids	--	--	--	--	86.74	94.54	38.36	26.9	23.2	24.2	26.22	80.25	81.33
Total solids (preserved)	--	--	--	--	85.01	80.41	40.3	26.31	26.51	24.99	23.71	79.83	80.73
Total volatile solids/organic matter	15	--	--	--	0.79	1.11	17.67	55.92	52.24	63.79	56.6	1.21	0.95
Grain Size (pct)													
Gravel	--	--	--	--	25.4	15.2	12	46	40	51.7	45.1	3.8	5.7
Sand, very coarse	--	--	--	--	10.2	5	12	13.3	14.3	11	14.8	2.5	2.6
Sand, coarse	--	--	--	--	11.1	11.1	12.2	10.9	14.3	12.5	10.8	7.2	7.4
Sand, medium	--	--	--	--	19.3	22	19.9	7.6	10	9.2	8.7	22.2	22.2
Sand, fine	--	--	--	--	23.3	28	18	4.5	5.4	4.6	6.4	42.6	44
Sand, very fine	--	--	--	--	6.7	6.5	8.3	1.5	2.4	1.9	2.5	12.1	11.3
Silt, coarse	--	--	--	--	0.9	8.8	4.7	6.3	0.6	9 U	0.9	3.5	1.8
Silt, medium	--	--	--	--	0.6	0.9	4.3	2.2	2.1	9 U	2.2	1.5	1.1
Silt, fine	--	--	--	--	0.5	0.6	1.8	1.3	2.2	9 U	1.3	1.1	0.8
Silt, very fine	--	--	--	--	0.4	0.4	1.1	0.8	1	9 U	0.8	0.8	0.7
Clay, coarse	--	--	--	--	0.4	0.3	0.8	0.5	0.6	9 U	0.4	0.6	0.6
Clay, medium	--	--	--	--	0.3	0.2	0.4	0.2	2.3	9 U	0.2	0.6	0.5
Clay, fine	--	--	--	--	1	1	4.6	5	4.9	9 U	5.9	1.5	1.4
Total fines (Reported, not calculated)	--	--	--	--	--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)													
2-Methylnaphthalene	--	670	--	1900	4.8 U	14 U	330	290	200 J	370	100 J	48 U	14 U
Acenaphthene	--	500	--	2000	4.8 U	14 U	560 J	210 J	150 J	340 J	130 J	48 UJ	14 U
Acenaphthylene	--	560	--	1300	4.8 U	14 U	270	570	290	610	120 J	48 U	14 U
Anthracene	--	960	--	13000	4.8 UJ	14 UJ	270 J	300 J	160 J	310 J	140 J	48 UJ	14 U
Benzo(a)anthracene	--	1300	--	5100	4.8 UJ	14 UJ	130 J	88 J	240 UJ	110 J	150 UJ	48 UJ	14 U
Benzo(a)pyrene	--	1600	--	3600	4.8 U	14 U	110	90 J	240 U	90 J	150 U	48 U	14 U
Benzo(b,j,k)fluoranthenes	--	--	--	--	4.8 U	14 U	220	80 J	240 U	180	150 U	48 U	14 U
Benzo(g,h,i)perylene	--	670	--	3200	4.8 UJ	14 UJ	130	150 J	240 UJ	160 J	150 UJ	48 UJ	14 U
Chrysene	--	1400	--	21000	4.8 U	14 U	210	100 J	240 U	130	110 J	48 U	14 U
Dibenzo(a,h)anthracene	--	230	--	1900	4.8 UJ	14 UJ	49 UJ	150 UJ	240 UJ	99 UJ	150 UJ	48 UJ	14 U
Fluoranthene	--	1700	4600	30000	4.8 U	7.8 J	1100	1100	590	1200	480	48 U	14 U
Fluorene	--	540	--	3600	4.8 UJ	14 UJ	430 J	260 J	190 J	480 J	140 J	48 UJ	14 U
Indeno(1,2,3-c,d)pyrene	--	600	--	4400	4.8 UJ	14 UJ	64	150 UJ	240 UJ	67 J	150 UJ	48 UJ	14 U
Naphthalene	--	2100	--	2400	4.8 U	12 J	4300 J	6100 J	4900 J	9400 J	1200 J	48 UJ	14 U

Table A-3-5
DMMP SAP Subtidal Core Interval Analytical Results

				Location ID	PG-PDI-SC-08	PG-PDI-SC-08	PG-PDI-SC-21	PG-PDI-SC-21	PG-PDI-SC-21	PG-PDI-SC-21	PG-PDI-SC-21	PG-PDI-SC-21	PG-PDI-SC-21
				Sample ID	PG-PDI-SC-08-9-11-20140722	PG-PDI-SC-58-7-9-20140722	PG-PDI-SC-21-0-2-20140725	PG-PDI-SC-21-10-12-20140725	PG-PDI-SC-21-12-14-20140725	PG-PDI-SC-21-14-16-20140725	PG-PDI-SC-21-16-18-20140725	PG-PDI-SC-21-18-20-20140725	PG-PDI-SC-21-20-22-20140725
				Sample Date	07/22/2014	07/22/2014	07/25/2014	07/25/2014	07/25/2014	07/25/2014	07/25/2014	07/25/2014	07/25/2014
				Depth	9 - 11 ft	7 - 9 ft	0 - 2 ft	10 - 12 ft	12 - 14 ft	14 - 16 ft	16 - 18 ft	18 - 20 ft	20 - 22 ft
				Sample Type	N	FD	N	N	N	N	N	N	N
				Matrix	SE	SE	SE	SE	SE	SE	SE	SE	SE
				X	1211388	1211388	1211521	1211521	1211521	1211521	1211521	1211521	1211521
				Y	316501	316501	316528	316528	316528	316528	316528	316528	316528
	Site-Specific Criteria	DMMP SL	DMMP BT	DMMP ML									
Phenanthrene	--	1500	--	21000	4.8 UJ	**11 J**	**1400 J**	**1600 J**	**890 J**	**1600 J**	**340 J**	48 UJ	14 U
Pyrene	--	2600	11980	16000	4.8 UJ	**8.9 J**	**1500 J**	**1800 J**	**730 J**	**1900 J**	**580 J**	48 UJ	14 U
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	16	--	--	--	4.8 UJ	14 UJ	**155.95 J**	**122.8 J**	240 UJ	**131.95 J**	**106.1 J**	48 UJ	14 U
Dioxin Furans (ng/kg)													
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--	0.0449 U	0.0554 U	**2.33 J**	**0.69 J**	**1.22 J**	**1.5**	**0.511 J**	0.0659 U	0.0439 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--	0.0449 U	0.0727 U	**5.58**	**1.22**	**1.72**	**1.96**	**0.671 J**	0.0399 U	0.0579 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	0.0566 U	0.155 U	**3.89**	**0.688 J**	**1.03**	**1.34**	0.301 U	0.0439 U	0.0699 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	0.0585 U	0.161 U	**17.1**	**1.45**	**1.32 J**	**2.06**	0.571 U	0.0459 U	0.0699 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	0.0585 U	0.164 U	**6.29**	**1.11**	**1.26**	**1.88 J**	0.513 U	0.0719 U	0.0719 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--	0.62 U	0.639 U	**332**	8.99 U	5.06 U	**18.3**	2.99 U	0.503 U	0.391 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	--	--	--	3.92 U	2.78 U	**2900**	36.9 U	8.92 U	17.8 U	9.69 U	2.94 U	3.26 U
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--	**0.181 J**	**1.31 J**	**372 J**	**49.5 J**	**129 J**	**194 J**	**22.8 J**	**0.715 J**	**0.465 J**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--	**0.361 J**	**0.396 J**	**221**	**35.2 J**	**76.2**	**126 J**	**15.8 J**	**0.645 J**	**0.24 J**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	**0.782 J**	**0.995 J**	**307**	**28.3 J**	**42.7 J**	**107 J**	**14.3 J**	**0.841 J**	**0.228 J**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--	**2.12 J**	**1.96 J**	**2010**	**24.8 J**	**10.2 J**	**30.5 J**	**6.42 J**	**1.38 J**	**1.29 J**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	--	--	--	0.0254 U	**0.115 J**	**13.2**	**4.9**	**9.54**	**12.7**	**3.6**	**0.114 J**	0.0439 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--	0.0468 U	0.113 U	**5.43**	**2.81**	**3.05**	**3.95**	**1.59**	0.122 U	0.0359 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--	0.0527 U	0.0784 U	**4.35**	**1.38**	**2.2**	**2.74**	**1.01**	0.0619 U	0.0439 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0.0312 U	0.0421 U	**4.59 J**	**4.86 J**	**2.12**	**1.4 J**	**1.48**	**0.0758 J**	0.0279 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0.0312 U	0.0421 U	**3.07**	**1.35 J**	**1.18**	**0.988 J**	**0.669 J**	0.114 U	0.0279 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0.041 U	0.0631 U	**0.932 J**	**0.207 J**	**0.459 J**	**0.25 J**	**0.144 J**	0.0459 U	0.0359 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0.0332 U	0.0478 U	**2.09 J**	**0.608 J**	**0.802 J**	**0.604 J**	**0.335 J**	**0.0758 J**	0.0279 U
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	--	--	--	0.0351 U	0.212 U	**52.9**	**6.7**	**4.33**	**1.61**	**2.75**	0.206 U	0.0459 U
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	--	--	--	0.0683 U	0.155 U	**2.78**	**0.243 J**	**0.473 J**	**0.128 J**	**0.112 J**	0.0599 U	0.0539 U
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	--	--	--	0.189 U	0.382 U	**105**	**2.31**	**2.62**	**0.674 J**	**0.741 J**	0.0978 U	0.14 U
Total Tetrachlorodibenzofuran (TCDF)	--	--	--	--	**0.381 J**	**1.73 J**	**204 J**	**86 J**	**183 J**	**244 J**	**63.7 J**	**1.66 J**	**0.422 J**
Total Pentachlorodibenzofuran (PeCDF)	--	--	--	--	0.0527 U	**0.236 J**	**85.5 J**	**23.5 J**	**36.8 J**	**45.7 J**	**15.4 J**	**0.784 J**	0.0439 U
Total Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0.041 U	**0.129 J**	**93.7 J**	**12.3 J**	**9.31 J**	**7.96 J**	**5.01 J**	**0.741 J**	0.0359 U
Total Heptachlorodibenzofuran (HpCDF)	--	--	--	--	0.0683 U	**0.212 J**	**144 J**	**8.21**	**5.33 J**	**2.16 J**	**3.19 J**	**0.206 J**	**0.0467 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	5	10	--	--	0.0449 U	**0.1282643 J**	**19.2724 J**	**4.046208 J**	**5.538054 J**	**6.7259522 J**	**2.2699958 J**	**0.11095517 J**	0.0579 U

Table A-3-5
DMMP SAP Subtidal Core Interval Analytical Results

					Location ID	PG-PDI-SC-21	PG-PDI-SC-21	PG-PDI-SC-21	PG-PDI-SC-21	PG-PDI-SC-21	PG-PDI-SC-09	PG-PDI-SC-09	PG-PDI-SC-09	PG-PDI-SC-09
					Sample ID	PG-PDI-SC-21-2-4-20140725	PG-PDI-SC-21-4-6-20140725	PG-PDI-SC-21-6-8-20140725	PG-PDI-SC-21-8-10-20140725	PG-PDI-SC-71-20-22-20140725	PG-PDI-SC-09-0-2-20140722	PG-PDI-SC-09-2-4-20140722	PG-PDI-SC-09-4-6-20140722	PG-PDI-SC-09-6-8-20140722
					Sample Date	07/25/2014	07/25/2014	07/25/2014	07/25/2014	07/25/2014	07/22/2014	07/22/2014	07/22/2014	07/22/2014
					Depth	2 - 4 ft	4 - 6 ft	6 - 8 ft	8 - 10 ft	20 - 22 ft	0 - 2 ft	2 - 4 ft	4 - 6 ft	6 - 8 ft
					Sample Type	N	N	N	N	FD	N	N	N	N
					Matrix	SE	SE	SE	SE	SE	SE	SE	SE	SE
					X	1211521	1211521	1211521	1211521	1211521	1211572	1211572	1211572	1211572
					Y	316528	316528	316528	316528	316528	316566	316566	316566	316566
	Site-Specific Criteria	DMMP SL	DMMP BT	DMMP ML										
Conventional Parameters (mg/kg)														
Ammonia as nitrogen	--	--	--	--		15 J	10.9	7.11	7.2	2.86	3.89	7.4	4.55	3.38
Sulfide	--	--	--	--		6130	1020	773	852	15.5	731 J	28.9 J	2.83 J	1.62 J
Conventional Parameters (pct)														
Ash content	--	--	--	--		81.75	59.61	46.89	44.79	99.02	85.02	88.89	98	99.26
Total organic carbon	--	--	--	--		5.09 J	28 J	24.1 J	47.1 J	0.354 J	24.1 J	5.99 J	0.402 J	0.171 J
Total solids	--	--	--	--		41.79	32.15	33.26	30.56	80.85	38	50.04	77.65	84.42
Total solids (preserved)	--	--	--	--		39.27	30.42	29.19	27.5	79.12	39.69	60.46	81.18	82.53
Total volatile solids/organic matter	15	--	--	--		18.25	40.39	53.11	55.21	0.98	14.98	11.11	2	0.74
Grain Size (pct)														
Gravel	--	--	--	--		26.2	23	49.7	51.9	2.8	11.8	8	11.8	18.2
Sand, very coarse	--	--	--	--		11.3	11.3	10.1	10.4	3	8.9	6.2	10.4	2.1
Sand, coarse	--	--	--	--		9	13.1	10.9	10.2	7.7	12.7	10.4	11.4	4.1
Sand, medium	--	--	--	--		11.3	14.5	11.3	9.9	23.2	14.4	17	18.2	12.7
Sand, fine	--	--	--	--		9.4	10.7	6.3	6.8	44.7	15.3	25.6	27.8	41
Sand, very fine	--	--	--	--		5.9	4.4	2.6	2.8	11.5	11.5	13	12	13
Silt, coarse	--	--	--	--		10.6	4.7	9 U	8 U	2.1	6.1	2.1	1.8	3.1
Silt, medium	--	--	--	--		5.4	4.8	9 U	8 U	1.1	6.2	5.2	2	1.6
Silt, fine	--	--	--	--		2.7	3.2	9 U	8 U	0.8	3.3	3.4	1.2	1
Silt, very fine	--	--	--	--		1.7	2.2	9 U	8 U	0.7	2.1	2.2	0.8	0.8
Clay, coarse	--	--	--	--		0.9	1.1	9 U	8 U	0.6	1.5	2.3	0.9	0.7
Clay, medium	--	--	--	--		1	0.9	9 U	8 U	0.5	1	1.4	0.6	0.5
Clay, fine	--	--	--	--		4.5	6.1	9 U	8 U	1.4	5.3	3.2	1.1	1.1
Total fines (Reported, not calculated)	--	--	--	--		--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)														
2-Methylnaphthalene	--	670	--	1900		330	890	440	370	14 U	370	94 J	15 U	4.6 J
Acenaphthene	--	500	--	2000		650 J	1400 J	480 J	330 J	14 UJ	540	140 J	15 U	5 U
Acenaphthylene	--	560	--	1300		200	700	580	630	14 U	330	77 J	15 U	5 U
Anthracene	--	960	--	13000		550 J	680 J	370 J	260 J	14 UJ	340 J	85 J	15 UJ	5 UJ
Benzo(a)anthracene	--	1300	--	5100		1400 J	320 J	160 J	250 UJ	14 UJ	200 J	85 J	15 UJ	5 UJ
Benzo(a)pyrene	--	1600	--	3600		1000	260	300	250 U	14 U	160	74 J	15 U	5 U
Benzo(b,j,k)fluoranthenes	--	--	--	--		2300	620	580	250 U	14 U	350	80 J	15 U	5 U
Benzo(g,h,i)perylene	--	670	--	3200		390	220 J	210 J	180 J	14 UJ	100 J	140 UJ	15 UJ	5 UJ
Chrysene	--	1400	--	21000		2400	430	350	250 U	14 U	420	110 J	15 U	5 U
Dibenzo(a,h)anthracene	--	230	--	1900		100 J	250 UJ	250 UJ	250 UJ	14 UJ	140 UJ	140 UJ	15 UJ	5 UJ
Fluoranthene	--	1700	4600	30000		1300	2200	1300	1200	14 U	1300	310	13 J	5 U
Fluorene	--	540	--	3600		490 J	1000 J	390 J	360 J	14 UJ	420 J	110 J	15 UJ	5 UJ
Indeno(1,2,3-c,d)pyrene	--	600	--	4400		350	250 UJ	250 UJ	250 UJ	14 UJ	140 UJ	140 UJ	15 UJ	5 UJ
Naphthalene	--	2100	--	2400		2600 J	9800 J	6800 J	6000 J	14 UJ	4500	930	7.9 J	3.4 J

Table A-3-5
DMMP SAP Subtidal Core Interval Analytical Results

					Location ID	PG-PDI-SC-21	PG-PDI-SC-21	PG-PDI-SC-21	PG-PDI-SC-21	PG-PDI-SC-21	PG-PDI-SC-09	PG-PDI-SC-09	PG-PDI-SC-09	PG-PDI-SC-09
					Sample ID	PG-PDI-SC-21-2-4-20140725	PG-PDI-SC-21-4-6-20140725	PG-PDI-SC-21-6-8-20140725	PG-PDI-SC-21-8-10-20140725	PG-PDI-SC-71-20-22-20140725	PG-PDI-SC-09-0-2-20140722	PG-PDI-SC-09-2-4-20140722	PG-PDI-SC-09-4-6-20140722	PG-PDI-SC-09-6-8-20140722
					Sample Date	07/25/2014	07/25/2014	07/25/2014	07/25/2014	07/25/2014	07/22/2014	07/22/2014	07/22/2014	07/22/2014
					Depth	2 - 4 ft	4 - 6 ft	6 - 8 ft	8 - 10 ft	20 - 22 ft	0 - 2 ft	2 - 4 ft	4 - 6 ft	6 - 8 ft
					Sample Type	N	N	N	N	FD	N	N	N	N
					Matrix	SE	SE	SE	SE	SE	SE	SE	SE	SE
					X	1211521	1211521	1211521	1211521	1211521	1211572	1211572	1211572	1211572
					Y	316528	316528	316528	316528	316528	316566	316566	316566	316566
	Site-Specific Criteria	DMMP SL	DMMP BT	DMMP ML										
Phenanthrene	--	1500	--	21000		**1400 J**	**3200 J**	**1800 J**	**1500 J**	14 UJ	**1500 J**	**380 J**	**11 J**	5 UJ
Pyrene	--	2600	11980	16000		**2000 J**	**3100 J**	**1600 J**	**1900 J**	14 UJ	**1300 J**	**320 J**	**14 J**	5 UJ
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	16	--	--	--		**1439 J**	**383.3 J**	**402.5 J**	250 UJ	14 UJ	**233.2 J**	**105.6 J**	15 UJ	5 UJ
Dioxin Furans (ng/kg)														
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--		**2.98**	**7.15**	**33.1**	**2.51**	**0.0956 J**	**2.96**	**1.05**	0.0492 U	**0.138 J**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--		**12.4**	**24.2**	**49.8**	**5.67**	0.0498 U	**8.48**	**3.46**	0.0768 U	0.0598 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--		**16.9**	**16.3**	**4.35**	**4.69**	0.0677 U	**5.13**	**2.16**	0.0945 U	0.0738 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--		**62.2**	**68.9**	**32.6**	**7.22**	0.0697 U	**22.8**	**6.89**	**0.116 J**	0.0778 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--		**19.3**	**36.1**	**17.5**	**6.39**	0.0717 U	**9.86**	**4.04**	0.102 U	0.0798 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--		**3880**	**973**	**166**	**31.8**	0.333 U	**207**	**63.5**	1.36 U	0.646 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	--	--	--		**42600 J**	**6770 J**	**759**	40.4 U	3.35 U	**1360**	**423**	7.24 U	3.89 U
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--		**309 J**	**1400**	**803 J**	**496**	**0.403 J**	**726 J**	**258 J**	**2.35 J**	**0.271 J**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--		**308**	**927 J**	**451**	**447**	0.0498 U	**502**	**220 J**	**1.55 J**	**0.0566 J**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--		**1900**	**1040**	**409 J**	**334 J**	**0.272 J**	**494 J**	**190**	**1.84 J**	**0.422 J**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--		**24100 J**	**4480**	**440**	**60.9 J**	**1.26 J**	**929**	**324 J**	**4.03 J**	**2 J**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	--	--	--		**11.4**	**29.8**	**11.9**	**18.1**	0.0359 U	**15.3**	**4.52**	**0.136 J**	0.0279 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--		**5.1 J**	**14.1**	**4.89**	**6.2**	0.0359 U	**6.61**	**2.63 J**	0.106 U	0.0479 U
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--		**4.63**	**12.6**	**3.78**	**4.56**	0.0518 U	**5.9**	**2.35**	**0.0748 J**	0.0518 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--		**7.42 J**	**14.9 J**	**3.17 J**	**2.35 J**	0.0299 U	**4.51 J**	**1.87 J**	0.0453 U	0.0359 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--		**3.51**	**8.84**	**2.45**	**1.87**	0.0438 U	**3.52**	**1.72 J**	**0.0453 J**	0.0359 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	--	--	--		**1.11 J**	**2.25 J**	**0.587 J**	**0.436 J**	0.0398 U	**0.749 J**	**0.556 J**	0.0669 U	0.0459 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--		**2.96 J**	**11.2 J**	**2.52 J**	**1.3 J**	0.0319 U	**4.28 J**	**1.83 J**	**0.061 J**	0.0379 U
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	--	--	--		**134**	**260**	**35.3**	**5**	0.0498 U	**52**	**14.1**	0.169 U	0.0399 U
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	--	--	--		**10.7**	**8.63**	**1.21**	**0.345 J**	0.0478 U	**1.61**	**0.66 J**	0.0925 U	0.0718 U
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	--	--	--		**636**	**474**	**58**	**2.14**	0.108 U	**53.2**	**15**	0.217 U	0.199 U
Total Tetrachlorodibenzofuran (TCDF)	--	--	--	--		**163 J**	**517 J**	**235 J**	**344 J**	**0.447 J**	**289 J**	**87.3 J**	**3.04 J**	**0.182 J**
Total Pentachlorodibenzofuran (PeCDF)	--	--	--	--		**93.8 J**	**216 J**	**77.3 J**	**84 J**	**0.0516 J**	**115 J**	**41.1 J**	**0.95 J**	0.0518 U
Total Hexachlorodibenzofuran (HxCDF)	--	--	--	--		**179 J**	**321 J**	**53.3 J**	**17.3 J**	**0.0428 J**	**106 J**	**29.6 J**	**0.301 J**	0.0459 U
Total Heptachlorodibenzofuran (HpCDF)	--	--	--	--		**608 J**	**732**	**96 J**	**8.1 J**	**0.0502 J**	**142 J**	**36.9**	**0.169 J**	0.0718 U
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	5	10	--	--		**82.6198 J**	**68.9715 J**	**93.9586 J**	**14.347752 J**	**0.1510002 J**	**23.05326 J**	**8.5665 J**	**0.14752105 J**	**0.20153535 J**

Table A-3-5
DMMP SAP Subtidal Core Interval Analytical Results

					Location ID	PG-PDI-SC-09	PG-PDI-SC-10	PG-PDI-SC-10	PG-PDI-SC-10	PG-PDI-SC-10	PG-PDI-SC-11	PG-PDI-SC-11	PG-PDI-SC-11	PG-PDI-SC-11
					Sample ID	PG-PDI-SC-09-8-9.5-20140722	PG-PDI-SC-10-0-4-20140723	PG-PDI-SC-10-4-6-20140723	PG-PDI-SC-10-6-8-20140723	PG-PDI-SC-10-8-10-20140723	PG-PDI-SC-11-0-2-20140723	PG-PDI-SC-11-2-4-20140723	PG-PDI-SC-11-4-6-20140723	PG-PDI-SC-11-6-8-20140723
					Sample Date	07/22/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014
					Depth	8 - 9.5 ft	0 - 4 ft	4 - 6 ft	6 - 8 ft	8 - 10 ft	0 - 2 ft	2 - 4 ft	4 - 6 ft	6 - 8 ft
					Sample Type	N	N	N	N	N	N	N	N	N
					Matrix	SE	SE	SE	SE	SE	SE	SE	SE	SE
					X	1211572	1211228	1211228	1211228	1211228	1211225	1211225	1211225	1211225
					Y	316566	316286	316286	316286	316286	316226	316226	316226	316226
	Site-Specific Criteria	DMMP SL	DMMP BT	DMMP ML										
Conventional Parameters (mg/kg)														
Ammonia as nitrogen	--	--	--	--		2.39	35.7	13	13.2	8.42	44.9	33.7	4.71	3.13
Sulfide	--	--	--	--		--	623	1.95	1.36	1.13 U	1360	375	1.86	1.19 U
Conventional Parameters (pct)														
Ash content	--	--	--	--		--	87.38	99.38	99.36	99.32	80.03	93.04	99.35	99.56
Total organic carbon	--	--	--	--		--	11.4	0.339	0.157	0.115	3.54	2.94	0.243	0.241
Total solids	--	--	--	--		89.14	50.18	81.32	82.61	86.75	43.8	58.71	81.23	81.41
Total solids (preserved)	--	--	--	--		--	51.12	80.7	80.17	84.87	45.06	60.63	80.66	81.13
Total volatile solids/organic matter	15	--	--	--		--	12.62	0.62	0.64	0.68	19.97	6.96	0.65	0.44
Grain Size (pct)														
Gravel	--	--	--	--		--	8.7	11.1	8.2	48	7.7	15.4	6.4	9.3
Sand, very coarse	--	--	--	--		--	4.5	3	3.9	8.5	4.8	2.5	2.3	3.6
Sand, coarse	--	--	--	--		--	6.2	4.2	4.6	3.9	6.6	3.6	3.2	4.1
Sand, medium	--	--	--	--		--	12.8	7.5	8.5	6.6	7.8	7.9	7.8	8.2
Sand, fine	--	--	--	--		--	19.4	47.4	50.5	18.6	10.4	33.8	50	48.6
Sand, very fine	--	--	--	--		--	12	17.8	16.7	7.2	12.7	16.9	21	17.1
Silt, coarse	--	--	--	--		--	11.7	4.6	3.2	3.2	20	5	3.6	3.6
Silt, medium	--	--	--	--		--	9	1.5	1.4	0.8	11.5	5	1.7	1.5
Silt, fine	--	--	--	--		--	4.7	0.8	0.8	0.7	5.8	2.9	1	1.2
Silt, very fine	--	--	--	--		--	2.9	0.5	0.5	0.5	3.3	1.8	0.7	0.6
Clay, coarse	--	--	--	--		--	2.2	0.5	0.5	0.5	2.2	1.3	0.6	0.5
Clay, medium	--	--	--	--		--	1.6	0.4	0.4	0.4	1.9	1.2	0.5	0.5
Clay, fine	--	--	--	--		--	4.1	0.8	0.7	1.1	5.3	2.8	1.3	1.2
Total fines (Reported, not calculated)	--	--	--	--		--	--	--	--	--	--	--	--	--
Polycyclic Aromatic Hydrocarbons (µg/kg)														
2-Methylnaphthalene	--	670	--	1900		--	66	14 U	14 U	15 U	140	84	14 U	14 U
Acenaphthene	--	500	--	2000		--	81	14 U	14 U	15 U	240	96	14 U	14 U
Acenaphthylene	--	560	--	1300		--	50 J	14 U	14 U	15 U	200	98	14 U	14 U
Anthracene	--	960	--	13000		--	68 J	14 UJ	14 UJ	15 UJ	190 J	62 J	14 UJ	14 UJ
Benzo(a)anthracene	--	1300	--	5100		--	62 J	14 UJ	14 UJ	15 UJ	130 J	39 J	14 UJ	14 UJ
Benzo(a)pyrene	--	1600	--	3600		--	58	14 U	14 U	15 U	110	32 J	14 U	14 U
Benzo(b,j,k)fluoranthenes	--	--	--	--		--	130	14 U	14 U	15 U	290	84	14 U	14 U
Benzo(g,h,i)perylene	--	670	--	3200		--	43 J	14 U	14 U	15 U	100	38 J	14 U	14 U
Chrysene	--	1400	--	21000		--	130	14 U	14 U	15 U	210	110	14 U	14 U
Dibenzo(a,h)anthracene	--	230	--	1900		--	50 UJ	14 UJ	14 UJ	15 UJ	99 UJ	48 UJ	14 UJ	14 UJ
Fluoranthene	--	1700	4600	30000		--	360	14 U	14 U	15 U	860	300	14 U	14 U
Fluorene	--	540	--	3600		--	81 J	14 UJ	14 UJ	15 UJ	210 J	85 J	14 UJ	14 UJ
Indeno(1,2,3-c,d)pyrene	--	600	--	4400		--	50 U	14 U	14 U	15 U	99 U	48 U	14 U	14 U
Naphthalene	--	2100	--	2400		--	680	14 U	14 U	15 U	1800	800	14 U	14 U

Table A-3-5
DMMP SAP Subtidal Core Interval Analytical Results

					Location ID	PG-PDI-SC-09	PG-PDI-SC-10	PG-PDI-SC-10	PG-PDI-SC-10	PG-PDI-SC-10	PG-PDI-SC-11	PG-PDI-SC-11	PG-PDI-SC-11	PG-PDI-SC-11
					Sample ID	PG-PDI-SC-09-8-9.5-20140722	PG-PDI-SC-10-0-4-20140723	PG-PDI-SC-10-4-6-20140723	PG-PDI-SC-10-6-8-20140723	PG-PDI-SC-10-8-10-20140723	PG-PDI-SC-11-0-2-20140723	PG-PDI-SC-11-2-4-20140723	PG-PDI-SC-11-4-6-20140723	PG-PDI-SC-11-6-8-20140723
					Sample Date	07/22/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014
					Depth	8 - 9.5 ft	0 - 4 ft	4 - 6 ft	6 - 8 ft	8 - 10 ft	0 - 2 ft	2 - 4 ft	4 - 6 ft	6 - 8 ft
					Sample Type	N	N	N	N	N	N	N	N	N
					Matrix	SE	SE	SE	SE	SE	SE	SE	SE	SE
					X	1211572	1211228	1211228	1211228	1211228	1211225	1211225	1211225	1211225
					Y	316566	316286	316286	316286	316286	316226	316226	316226	316226
	Site-Specific Criteria	DMMP SL	DMMP BT	DMMP ML										
Phenanthrene	--	1500	--	21000	--	**280 J**	14 UJ	14 UJ	15 UJ	**750 J**	**330 J**	14 UJ	14 UJ	
Pyrene	--	2600	11980	16000	--	**380 J**	14 UJ	14 UJ	15 UJ	**1000 J**	**360 J**	14 UJ	14 UJ	
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	16	--	--	--	--	**83.5 J**	14 UJ	14 UJ	15 UJ	**164 J**	**50.2 J**	14 UJ	14 UJ	
Dioxin Furans (ng/kg)														
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--	--	**1.28**	0.0634 U	0.0579 U	0.0411 U	**1.38 J**	**1 J**	**0.159 J**	0.0456 U	
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--	--	**4.49**	0.0575 U	0.0559 U	0.0567 U	**5.29**	**3.13**	**0.0299 J**	0.0436 U	
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	--	**2.54**	0.0793 U	0.0699 U	0.0684 U	**3.58**	**1.58**	0.0537 U	0.0634 U	
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	--	**17.6**	0.0813 U	0.0699 U	0.0723 U	**20**	**12**	0.0557 U	0.0634 U	
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	--	**5.74**	0.0833 U	0.0719 U	0.0743 U	**6.69**	**4.82**	**0.0896 J**	**0.0535 J**	
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--	--	**181**	0.759 U	0.328 U	0.242 U	**373**	**102**	0.34 U	0.339 U	
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	--	--	--	--	**1510**	5.94 U	2.1 U	1.86 U	**3420**	**664**	2.35 U	4.03 U	
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--	--	**159**	**0.419 J**	**0.235 J**	**0.27 J**	**251 J**	**181 J**	**0.429 J**	**0.237 J**	
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--	--	**98.7**	**0.115 J**	0.0559 U	**0.0454 J**	**159 J**	**153 J**	**0.0808 J**	**0.0428 J**	
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	--	**221**	**0.316 J**	**0.207 J**	0.0743 U	**324**	**236 J**	**0.306 J**	**0.278 J**	
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--	--	**799**	**3.33 J**	**0.809 J**	**0.76 J**	**2260**	**418**	**0.948 J**	**1.38 J**	
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	--	--	--	--	**5.69**	0.0575 U	0.0679 U	0.0371 U	**6.48**	**3.9**	0.0398 U	0.0416 U	
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--	--	**2.63**	**0.0634 J**	**0.0799 J**	0.0528 U	**3.2**	**1.88**	**0.0975 J**	0.0456 U	
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--	--	**2.8**	0.0496 U	0.0759 U	0.0684 U	**2.91**	**1.75**	0.0756 U	0.0535 U	
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	--	**3.32 J**	0.0357 U	0.046 U	0.0371 U	**3.71 J**	**1.73 J**	0.0378 U	0.0317 U	
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	--	**2.11**	0.0317 U	**0.0579 J**	0.0352 U	**2.22 J**	**1.36**	**0.0458 J**	**0.0278 J**	
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	--	**0.577 J**	0.0456 U	0.0619 U	0.0528 U	**0.689 J**	**0.361 J**	0.0498 U	0.0396 U	
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	--	**3.01 J**	0.0357 U	0.046 U	0.0391 U	**3.01 J**	**1.82 J**	0.0378 U	0.0317 U	
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	--	--	--	--	**34.8**	**0.117 J**	**0.0939 J**	**0.0665 J**	**41.6**	**22.5**	**0.0995 J**	**0.0714 J**	
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	--	--	--	--	**1.39**	0.0515 U	0.0839 U	0.0841 U	**2.01**	**0.871 J**	0.0697 U	0.0456 U	
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	--	--	--	--	**41.9**	**0.182 J**	0.168 U	0.186 U	**93.2**	**27.4**	0.129 U	0.107 U	
Total Tetrachlorodibenzofuran (TCDF)	--	--	--	--	--	**98.3 J**	**0.315 J**	**0.631 J**	**0.405 J**	**113 J**	**66.7 J**	**0.567 J**	**0.32 J**	
Total Pentachlorodibenzofuran (PeCDF)	--	--	--	--	--	**63.2 J**	**0.107 J**	**0.542 J**	**0.0505 J**	**66.9 J**	**41.5 J**	**0.206 J**	0.0535 U	
Total Hexachlorodibenzofuran (HxCDF)	--	--	--	--	--	**71.4 J**	0.0456 U	**0.232 J**	**0.0538 J**	**76.6 J**	**43.9 J**	**0.195 J**	**0.103 J**	
Total Heptachlorodibenzofuran (HpCDF)	--	--	--	--	--	**88.1 J**	**0.322 J**	**0.0935 J**	**0.0661 J**	**128 J**	**54.9 J**	**0.0989 J**	**0.116 J**	
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	5	10	--	--	--	**13.38507 J**	**0.0984651 J**	**0.1014857 J**	**0.0833694 J**	**17.49696 J**	**8.92963 J**	**0.23385035 J**	**0.07826655 J**	

Table A-3-5
DMMP SAP Subtidal Core Interval Analytical Results

					Location ID	PG-PDI-SC-11	PG-PDI-SC-12	PG-PDI-SC-12	PG-PDI-SC-12	PG-PDI-SC-12	PG-PDI-SC-12	PG-PDI-SC-12	PG-PDI-SC-13	PG-PDI-SC-13
					Sample ID	PG-PDI-SC-11-8-10-20140723	PG-PDI-SC-12-0-2-20140723	PG-PDI-SC-12-10-11.5-20140723	PG-PDI-SC-12-11.5-12-20140723	PG-PDI-SC-12-2-4-20140723	PG-PDI-SC-12-4-6-20140723	PG-PDI-SC-12-6-10-20140723	PG-PDI-SC-13-0-2-20140723	PG-PDI-SC-13-2-4-20140723
					Sample Date	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014
					Depth	8 - 10 ft	0 - 2 ft	10 - 11.5 ft	11.5 - 12.5 ft	2 - 4 ft	4 - 6 ft	6 - 10 ft	0 - 2 ft	2 - 4 ft
					Sample Type	N	N	N	N	N	N	N	N	N
					Matrix	SE	SE	SE	SE	SE	SE	SE	SE	SE
					X	1211225	1211229	1211229	1211229	1211229	1211229	1211229	1211339	1211339
					Y	316226	316118	316118	316118	316118	316118	316118	316079	316079
	Site-Specific Criteria	DMMP SL	DMMP BT	DMMP ML										
Conventional Parameters (mg/kg)														
Ammonia as nitrogen	--	--	--	--	**2.34**	**14.4**	**1.71**	**0.91**	**17.4**	**15.6**	**6.06**	**19.6**	**17**
Sulfide	--	--	--	--	1.19 U	**960**	**10.1**	**103**	**176**	**93.4**	**135**	**834**	**519**
Conventional Parameters (pct)														
Ash content	--	--	--	--	**99.31**	**74.61**	**94.57**	**98.56**	**64.37**	**67.2**	**82.32**	**86**	**90.59**
Total organic carbon	--	--	--	--	**0.756**	**7.8**	**2.84**	**1.31**	**6.52**	**32.7**	**9.76**	**5.71**	**6.46**
Total solids	--	--	--	--	**88.68**	**44.27**	**62.59**	**84.23**	**26.75**	**21.07**	**36.42**	**38.69**	**42.56**
Total solids (preserved)	--	--	--	--	**83.84**	**43.92**	**69.83**	**75.09**	**31.48**	**23.09**	**36.98**	**40.41**	**39.69**
Total volatile solids/organic matter	15	--	--	--	**0.69**	**25.39**	**5.43**	**1.44**	**35.63**	**32.8**	**17.68**	**14**	**9.41**
Grain Size (pct)														
Gravel	--	--	--	--	**53.6**	**18.2**	**5.4**	**33.9**	**26.3**	**37.9**	**9.3**	**20**	**13.1**
Sand, very coarse	--	--	--	--	**7.4**	**5.5**	**4.4**	**5.9**	**17.1**	**27.6**	**9.3**	**6.3**	**8.7**
Sand, coarse	--	--	--	--	**4.1**	**6.3**	**6.1**	**8.7**	**13.3**	**13.6**	**8.3**	**6.1**	**7.7**
Sand, medium	--	--	--	--	**6.4**	**7.8**	**11.1**	**14**	**9.7**	**7**	**8.3**	**8**	**10.4**
Sand, fine	--	--	--	--	**16.5**	**11.7**	**42.3**	**18.4**	**9.3**	**4.5**	**21.3**	**12.1**	**15**
Sand, very fine	--	--	--	--	**8**	**14.6**	**18.6**	**8.1**	**7.6**	**3.3**	**16**	**12.9**	**12.1**
Silt, coarse	--	--	--	--	**0.2**	**13.6**	**4.1**	**1.2**	**1.6**	6.1 U	**11.8**	**5.7**	**8.3**
Silt, medium	--	--	--	--	**0.9**	**7.1**	**2.8**	**2.7**	**4.8**	6.1 U	**5.2**	**9.7**	**9.3**
Silt, fine	--	--	--	--	**0.6**	**3.7**	**1.7**	**2.4**	**2.6**	6.1 U	**2.9**	**5.7**	**4.5**
Silt, very fine	--	--	--	--	**0.4**	**2.7**	**0.7**	**1.7**	**1.4**	6.1 U	**1.5**	**3.6**	**2.8**
Clay, coarse	--	--	--	--	**0.5**	**2.1**	**0.5**	**1.2**	**1.1**	6.1 U	**0.9**	**2.4**	**1.8**
Clay, medium	--	--	--	--	**0.4**	**1.6**	**0.4**	**0.7**	**0.7**	6.1 U	**0.6**	**2**	**1.4**
Clay, fine	--	--	--	--	**1.1**	**5.1**	**2.1**	**1.1**	**4.5**	6.1 U	**4.7**	**5.5**	**5**
Total fines (Reported, not calculated)	--	--	--	--	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**
Polycyclic Aromatic Hydrocarbons (µg/kg)														
2-Methylnaphthalene	--	670	--	1900	4.8 U	**74**	**120**	**19 J**	**44 J**	50 U	**90**	**75**	**120**
Acenaphthene	--	500	--	2000	4.8 U	**75**	**110**	**28 J**	**55**	50 U	**82**	**99**	**88**
Acenaphthylene	--	560	--	1300	4.8 U	**59**	**290**	**51 J**	**39 J**	50 U	**170**	**110**	**230**
Anthracene	--	960	--	13000	4.8 UJ	**94 J**	**77 J**	**10 J**	**56 J**	**33 J**	**130 J**	**140 J**	**140 J**
Benzo(a)anthracene	--	1300	--	5100	4.8 UJ	**110 J**	49 UJ	70 UJ	**80 J**	**32 J**	**84 J**	**120 J**	**66 J**
Benzo(a)pyrene	--	1600	--	3600	4.8 U	**79**	49 U	**3.1 J**	**69**	**29 J**	**88**	**110**	**89**
Benzo(b,j,k)fluoranthenes	--	--	--	--	4.8 U	**190**	49 U	70 U	**160**	**62**	**160**	**240**	**160**
Benzo(g,h,i)perylene	--	670	--	3200	4.8 U	**56**	**39 J**	**5.3 J**	**57**	50 U	**140**	**86**	**120**
Chrysene	--	1400	--	21000	4.8 U	**360**	49 U	70 U	**120**	**38 J**	**100**	**300**	**110**
Dibenzo(a,h)anthracene	--	230	--	1900	4.8 UJ	48 UJ	49 UJ	70 UJ	49 UJ	50 UJ	48 UJ	49 UJ	50 UJ
Fluoranthene	--	1700	4600	30000	4.8 U	**280**	**450**	**82 J**	**380**	**130**	**620**	**660**	**590**
Fluorene	--	540	--	3600	4.8 UJ	**68 J**	**73 J**	**13 J**	**57 J**	50 UJ	**100 J**	**100 J**	**100 J**
Indeno(1,2,3-c,d)pyrene	--	600	--	4400	4.8 U	**36 J**	49 U	70 U	**37 J**	50 U	**48 J**	**52**	**45 J**
Naphthalene	--	2100	--	2400	4.8 U	**500**	**4200**	**740**	**340**	**210**	**2200**	**980**	**2900**

Table A-3-5
DMMP SAP Subtidal Core Interval Analytical Results

				Location ID	PG-PDI-SC-11	PG-PDI-SC-12	PG-PDI-SC-12	PG-PDI-SC-12	PG-PDI-SC-12	PG-PDI-SC-12	PG-PDI-SC-12	PG-PDI-SC-13	PG-PDI-SC-13
				Sample ID	PG-PDI-SC-11-8-10-20140723	PG-PDI-SC-12-0-2-20140723	PG-PDI-SC-12-10-11.5-20140723	PG-PDI-SC-12-11.5-12-20140723	PG-PDI-SC-12-2-4-20140723	PG-PDI-SC-12-4-6-20140723	PG-PDI-SC-12-6-10-20140723	PG-PDI-SC-13-0-2-20140723	PG-PDI-SC-13-2-4-20140723
				Sample Date	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014
				Depth	8 - 10 ft	0 - 2 ft	10 - 11.5 ft	11.5 - 12.5 ft	2 - 4 ft	4 - 6 ft	6 - 10 ft	0 - 2 ft	2 - 4 ft
				Sample Type	N	N	N	N	N	N	N	N	N
				Matrix	SE	SE	SE	SE	SE	SE	SE	SE	SE
				X	1211225	1211229	1211229	1211229	1211229	1211229	1211229	1211339	1211339
				Y	316226	316118	316118	316118	316118	316118	316118	316079	316079
	Site-Specific Criteria	DMMP SL	DMMP BT	DMMP ML									
Phenanthrene	--	1500	--	21000	4.8 UJ	**250 J**	**630 J**	**100 J**	**280 J**	**90 J**	**740 J**	**540 J**	**800 J**
Pyrene	--	2600	11980	16000	4.8 UJ	**350 J**	**710 J**	**150 J**	**500 J**	**170 J**	**1100 J**	**890 J**	**1000 J**
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	16	--	--	--	4.8 UJ	**118.6 J**	49 UJ	**17.45 J**	**100.35 J**	**43.78 J**	**120.6 J**	**156.65 J**	**119.7 J**
Dioxin Furans (ng/kg)													
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--	0.0596 U	**1 J**	**2.47**	**0.705 J**	**1.37**	**0.757 J**	**4.87**	**2.37**	**3.93 J**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--	0.0517 U	**3.49**	**5.97**	**1.28**	**5.05**	**2.34**	**15**	**10.5**	**8.78 J**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	0.0656 U	**2.13**	**3.75**	**0.663 J**	**2.84**	**1.65**	**9.57**	**3.86**	**4.45 J**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	0.0676 U	**12.8**	**6.42**	**1.27**	**15.6**	**5.97**	**26**	**33.7**	**12.5 J**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	0.0676 U	**4.83**	**5.43**	**1.04**	**6.27**	**3.27**	**20**	**13.1**	**8.25 J**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--	0.247 U	**149**	**24.1**	**5.33**	**173**	**67.7**	**96.7**	**262**	**129 J**
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	--	--	--	2.33 U	**1150**	**20.9**	5.46 U	**1140**	**443**	**157**	**1840**	**725 J**
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--	**0.201 J**	**132 J**	**1730 J**	**160 J**	**157**	**87.6 J**	**1720**	**264 J**	**656 J**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--	0.0517 U	**99.4 J**	**640**	**98.3 J**	**124**	**61 J**	**1420**	**175 J**	**427 J**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	**0.189 J**	**175**	**314 J**	**55.5 J**	**192**	**84.3 J**	**985**	**351 J**	**320 J**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--	**0.887 J**	**759 J**	**45.6**	**9.53 J**	**714**	**242 J**	**192 J**	**1130**	**314 J**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	--	--	--	0.0537 U	**5.2**	**16.5**	**3.5**	**5.97**	**3.36**	**29.3**	**10.1 J**	**21.6 J**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--	**0.0835 J**	**2.34**	**6.15**	**1.29**	**2.87**	**1.71 J**	**11.2**	**4.6**	**8.6 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--	0.0656 U	**2.41**	**4.56**	**0.938 J**	**2.98**	**1.49**	**9.08**	**4.63**	**6.96**
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0.0398 U	**2.31 J**	**1.46 J**	**0.32 J**	**2.5 J**	**1.48 J**	**3.67 J**	**3.81 J**	**4.44 J**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	**0.0338 J**	**1.59**	**1.56**	**0.38 J**	**1.92**	**1.06 J**	**3.92**	**3.28**	**3.32 J**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0.0497 U	**0.456 J**	**0.406 J**	**0.107 J**	**0.609 J**	**0.238 J**	**0.938 J**	**1.09 J**	**1.37 J**
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0.0417 U	**2.3 J**	**1.26 J**	**0.26 J**	**2.81 J**	**1.29 J**	**2.92 J**	**4.65 J**	**3.38 J**
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	--	--	--	**0.0537 J**	**21.5**	**2.08**	**0.568 J**	**38.2**	**11.8**	**9.1**	**56.5**	**26.2 J**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	--	--	--	0.0497 U	**0.956 J**	**0.229 J**	**0.0516 J**	**1.21**	**0.488 J**	**0.749 J**	**1.96**	**1.72 J**
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	--	--	--	0.145 U	**32.4**	**1.48 J**	**0.318 J**	**48.3**	**16**	**14.6**	**59.6**	**35.9 J**
Total Tetrachlorodibenzofuran (TCDF)	--	--	--	--	**0.587 J**	**86.6 J**	**298 J**	**60.6 J**	**103 J**	**67.4 J**	**628 J**	**169 J**	**414 J**
Total Pentachlorodibenzofuran (PeCDF)	--	--	--	--	**0.254 J**	**55.3 J**	**79 J**	**16 J**	**64.5 J**	**30.7 J**	**158 J**	**102 J**	**123 J**
Total Hexachlorodibenzofuran (HxCDF)	--	--	--	--	**0.173 J**	**47.8 J**	**15.5 J**	**3.04 J**	**67.6 J**	**24.2 J**	**37.5 J**	**110 J**	**56.7 J**
Total Heptachlorodibenzofuran (HpCDF)	--	--	--	--	**0.0535 J**	**57.6 J**	**3.99 J**	**0.954 J**	**96.6 J**	**27.8 J**	**22.4 J**	**139**	**69 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	5	10	--	--	**0.09305175 J**	**10.51408 J**	**13.941904 J**	**3.1195104 J**	**13.73259 J**	**6.36468 J**	**33.67877 J**	**25.53048 J**	**22.78447 J**

Table A-3-5
DMMP SAP Subtidal Core Interval Analytical Results

					Location ID	PG-PDI-SC-13	PG-PDI-SC-13	PG-PDI-SC-13	PG-PDI-SC-13	PG-PDI-SC-14	PG-PDI-SC-14	PG-PDI-SC-14	PG-PDI-SC-14	PG-PDI-SC-14
					Sample ID	PG-PDI-SC-13-4-6-20140723	PG-PDI-SC-13-6-8-20140723	PG-PDI-SC-13-8-10-20140723	PG-PDI-SC-63-6-8-20140723	PG-PDI-SC-14-0-2-20140723	PG-PDI-SC-14-2-4-20140723	PG-PDI-SC-14-4-6-20140723	PG-PDI-SC-14-6-8-20140723	PG-PDI-SC-14-8-10-20140723
					Sample Date	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014
					Depth	4 - 6 ft	6 - 8 ft	8 - 10 ft	6 - 8 ft	0 - 2 ft	2 - 4 ft	4 - 6 ft	6 - 8 ft	8 - 10 ft
					Sample Type	N	N	N	FD	N	N	N	N	N
					Matrix	SE	SE	SE	SE	SE	SE	SE	SE	SE
					X	1211339	1211339	1211339	1211339	1211356	1211356	1211356	1211356	1211356
					Y	316079	316079	316079	316079	315945	315945	315945	315945	315945
	Site-Specific Criteria	DMMP SL	DMMP BT	DMMP ML										
Conventional Parameters (mg/kg)														
Ammonia as nitrogen	--	--	--	--	**17.6**	**19.4**	**7.21**	**20.3**	**20.8**	**32.5**	**9.37**	**3.82**	**2.18**
Sulfide	--	--	--	--	**210**	**15.9**	**2.04**	**25.9**	**1210**	**628**	**139**	**6.24**	1.16 U
Conventional Parameters (pct)														
Ash content	--	--	--	--	**90.96**	**97.93**	**99.49**	**96.81**	**87.82**	**83.26**	**95.41**	**98.99**	**99.03**
Total organic carbon	--	--	--	--	**2.72**	**0.703**	**0.166**	**1.95 J**	**4.17 J**	**11.8 J**	**2.01 J**	**3.34 J**	**0.145 J**
Total solids	--	--	--	--	**53.38**	**74.65**	**85.5**	**74.31**	**46.34**	**40.7**	**67.79**	**81.96**	**86.34**
Total solids (preserved)	--	--	--	--	**56.87**	**77.58**	**82.75**	**74.29**	**44.45**	**45.69**	**62.52**	**78.43**	**86.22**
Total volatile solids/organic matter	15	--	--	--	**9.04**	**2.07**	**0.51**	**3.19**	**12.18**	**16.74**	**4.59**	**1.01**	**0.97**
Grain Size (pct)														
Gravel	--	--	--	--	**9.8**	**15.2**	**42**	**6.4**	**11.1**	**11.7**	**1**	**13.3**	**40.2**
Sand, very coarse	--	--	--	--	**6.1**	**4.1**	**5.2**	**4.6**	**4.8**	**4.5**	**1.6**	**4.6**	**5.4**
Sand, coarse	--	--	--	--	**6.9**	**7.5**	**4.7**	**8.8**	**5.3**	**6.6**	**5.1**	**7.5**	**4**
Sand, medium	--	--	--	--	**14.1**	**18.6**	**10.9**	**20**	**8.1**	**11.2**	**18.3**	**16.2**	**8.9**
Sand, fine	--	--	--	--	**27.8**	**36.1**	**24.2**	**40**	**12.9**	**19.7**	**44.2**	**45.7**	**25.7**
Sand, very fine	--	--	--	--	**11.3**	**8.5**	**8.2**	**9.3**	**14.6**	**12.8**	**12.2**	**6.7**	**10.3**
Silt, coarse	--	--	--	--	**7.2**	**2.2**	**0.8**	**2.3**	**9.3**	**9.3**	**6.1**	**2.2**	**2**
Silt, medium	--	--	--	--	**5.5**	**2.2**	**1**	**2.2**	**8.7**	**6.8**	**3.4**	**0.7**	**0.7**
Silt, fine	--	--	--	--	**3.6**	**1.5**	**0.6**	**1.6**	**6**	**4.2**	**2.3**	**0.7**	**0.7**
Silt, very fine	--	--	--	--	**2.3**	**1.1**	**0.7**	**1.4**	**5.2**	**3.4**	**1.8**	**0.6**	**0.6**
Clay, coarse	--	--	--	--	**1.3**	**1**	**0.4**	**1.1**	**4**	**2.7**	**1.1**	**0.5**	**0.4**
Clay, medium	--	--	--	--	**1.2**	**0.8**	**0.5**	**0.9**	**3.1**	**2.2**	**1**	**0.4**	**0.4**
Clay, fine	--	--	--	--	**3.1**	**1.3**	**0.8**	**1.5**	**6.9**	**5**	**2**	**1**	**0.8**
Total fines (Reported, not calculated)	--	--	--	--	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**	**--**
Polycyclic Aromatic Hydrocarbons (µg/kg)														
2-Methylnaphthalene	--	670	--	1900	**140**	48 U	15 U	46 U	**180**	**530**	**78**	14 U	4.9 U
Acenaphthene	--	500	--	2000	**100**	48 U	15 U	46 U	**270**	**240**	**68**	14 U	4.9 U
Acenaphthylene	--	560	--	1300	**330**	48 U	15 U	46 U	**250**	**1400**	**130**	14 U	4.9 U
Anthracene	--	960	--	13000	**170 J**	**25 J**	15 UJ	**26 J**	**280 J**	**600 J**	**100 J**	14 UJ	4.9 UJ
Benzo(a)anthracene	--	1300	--	5100	**69 J**	**24 J**	15 UJ	**24 J**	**150 J**	**180 J**	**46 J**	14 UJ	4.9 UJ
Benzo(a)pyrene	--	1600	--	3600	**72**	**26 J**	15 U	**24 J**	**130**	**220**	**60**	14 U	4.9 U
Benzo(b,j,k)fluoranthenes	--	--	--	--	**150**	**48**	15 U	**50**	**280**	**410**	**120**	14 U	4.9 U
Benzo(g,h,i)perylene	--	670	--	3200	**86**	48 U	15 U	**31 J**	**140**	**340**	**65**	14 U	4.9 U
Chrysene	--	1400	--	21000	**90**	**28 J**	15 U	**28 J**	**230**	**220**	**55**	14 U	4.9 U
Dibenzo(a,h)anthracene	--	230	--	1900	49 UJ	48 UJ	15 UJ	46 UJ	48 UJ	140 UJ	48 UJ	14 UJ	4.9 UJ
Fluoranthene	--	1700	4600	30000	**540**	**79**	15 U	**83**	**1100**	**2300**	**360**	**18**	4.9 U
Fluorene	--	540	--	3600	**130 J**	48 UJ	15 UJ	46 UJ	**160 J**	**390 J**	**98 J**	14 UJ	4.9 UJ
Indeno(1,2,3-c,d)pyrene	--	600	--	4400	**37 J**	48 U	15 U	46 U	**85**	**110 J**	48 U	14 U	4.9 U
Naphthalene	--	2100	--	2400	**3400**	**120**	15 U	**110**	**2900**	**13000**	**830**	**26**	4.9 UJ

Table A-3-5
DMMP SAP Subtidal Core Interval Analytical Results

					Location ID	PG-PDI-SC-13	PG-PDI-SC-13	PG-PDI-SC-13	PG-PDI-SC-13	PG-PDI-SC-14	PG-PDI-SC-14	PG-PDI-SC-14	PG-PDI-SC-14	PG-PDI-SC-14
					Sample ID	PG-PDI-SC-13-4-6-20140723	PG-PDI-SC-13-6-8-20140723	PG-PDI-SC-13-8-10-20140723	PG-PDI-SC-63-6-8-20140723	PG-PDI-SC-14-0-2-20140723	PG-PDI-SC-14-2-4-20140723	PG-PDI-SC-14-4-6-20140723	PG-PDI-SC-14-6-8-20140723	PG-PDI-SC-14-8-10-20140723
					Sample Date	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014	07/23/2014
					Depth	4 - 6 ft	6 - 8 ft	8 - 10 ft	6 - 8 ft	0 - 2 ft	2 - 4 ft	4 - 6 ft	6 - 8 ft	8 - 10 ft
					Sample Type	N	N	N	FD	N	N	N	N	N
					Matrix	SE	SE	SE	SE	SE	SE	SE	SE	SE
					X	1211339	1211339	1211339	1211339	1211356	1211356	1211356	1211356	1211356
					Y	316079	316079	316079	316079	315945	315945	315945	315945	315945
	Site-Specific Criteria	DMMP SL	DMMP BT	DMMP ML										
Phenanthrene	--	1500	--	21000		**820 J**	**93 J**	15 UJ	**80 J**	**960 J**	**3500 J**	**440 J**	**12 J**	4.9 UJ
Pyrene	--	2600	11980	16000		**860 J**	**98 J**	15 UJ	**90 J**	**1700 J**	**3800 J**	**510 J**	**18 J**	4.9 UJ
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	16	--	--	--		**100.95 J**	**38.28 J**	15 UJ	**36.28 J**	**186.2 J**	**299.2 J**	**81.95 J**	14 UJ	4.9 UJ
Dioxin Furans (ng/kg)														
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--		**4.16**	**0.246 J**	0.0495 U	**0.256 J**	**2.12**	**1.81**	**0.35 J**	0.0454 U	**0.161 J**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--		**10.3**	**0.228 J**	0.0495 U	**0.346 J**	**6.23**	**3.66**	**0.729 J**	0.0671 U	0.0447 U
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--		**6.62**	**0.108 J**	0.0594 U	0.147 U	**4.58**	**1.92**	**0.621 J**	0.0869 U	0.0816 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--		**16**	**0.181 J**	0.0614 U	**0.219 J**	**17.2**	**3.87**	**0.963 J**	0.0869 U	0.0816 U
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--		**10.6**	**0.201 J**	0.0634 U	0.26 U	**8.75**	**3.07**	**0.859 J**	0.0888 U	0.0855 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--		**195**	0.966 U	0.525 U	1.75 U	**282**	**27.2**	7.37 U	1.14 U	0.587 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	--	--	--		**1180**	3.67 U	3.3 U	6.56 U	**2460**	**110**	13.2 U	6.38 U	5.29 U
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--		**828 J**	**7.31 J**	**1.18 J**	**6.67 J**	**306 J**	**196**	**100 J**	**0.451 J**	**0.242 J**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--		**551**	**4.44 J**	**0.697 J**	**5.12 J**	**219 J**	**128**	**47.9 J**	**0.272 J**	0.0447 U
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--		**471**	**3.53 J**	**0.753 J**	**4.65 J**	**312**	**109 J**	**43**	**1.1 J**	**0.349 J**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--		**467**	**2.05 J**	**1.31 J**	**4.77 J**	**1420**	**64.2**	**14.7 J**	**3.61 J**	**1.93 J**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	--	--	--		**24.2**	**0.69 J**	0.0416 U	**0.624 J**	**10**	**11.5**	**1.64**	0.0454 U	0.0214 U
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--		**9.34**	**0.517 J**	**0.0772 J**	**0.376 J**	**4.43**	**4.92**	**0.674 J**	0.0553 U	**0.0389 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--		**8.38**	**0.262 J**	0.0554 U	**0.249 J**	**4.41**	**4.13**	**0.55 J**	0.0671 U	0.0447 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--		**4.62 J**	**0.338 J**	**0.0614 J**	**0.354 J**	**3.32 J**	**2.58 J**	**0.548 J**	0.0533 U	0.035 U
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--		**3.99**	**0.234 J**	**0.0832 J**	**0.165 J**	**2.58**	**1.85**	**0.314 J**	0.0513 U	0.0311 U
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	--	--	--		**1.04 J**	0.0551 U	0.0495 U	0.0437 U	**0.783 J**	**0.543 J**	**0.053 J**	0.079 U	0.0525 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--		**3.79 J**	**0.149 J**	0.0396 U	**0.151 J**	**3.4 J**	**1.74 J**	**0.261 J**	0.0573 U	0.0389 U
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	--	--	--		**32**	**0.584 J**	**0.135 J**	**0.726 J**	**41.2**	**7.28**	**1.15**	**0.0869 J**	**0.033 J**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	--	--	--		**1.38**	0.0393 U	0.0634 U	0.0736 U	**1.85**	**0.507 J**	0.0688 U	0.105 U	0.0816 U
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	--	--	--		**39.1**	**0.264 J**	0.117 U	**0.153 J**	**79.8**	**7.03**	**0.733 J**	0.296 U	0.214 U
Total Tetrachlorodibenzofuran (TCDF)	--	--	--	--		**447 J**	**12 J**	**0.982 J**	**9.96 J**	**176 J**	**226 J**	**29 J**	**0.425 J**	**0.21 J**
Total Pentachlorodibenzofuran (PeCDF)	--	--	--	--		**135 J**	**3.69 J**	**0.309 J**	**3.56 J**	**78.2 J**	**69.9 J**	**8.16 J**	**0.133 J**	**0.0733 J**
Total Hexachlorodibenzofuran (HxCDF)	--	--	--	--		**70.3 J**	**1.62 J**	**0.431 J**	**1.4 J**	**71.9 J**	**22.7 J**	**2.61 J**	**0.0657 J**	**0.0443 J**
Total Heptachlorodibenzofuran (HpCDF)	--	--	--	--		**83.1**	**0.654 J**	**0.276 J**	**0.788 J**	**121 J**	**14.4 J**	**1.34 J**	**0.0875**	**0.0323 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	5	10	--	--		**26.98973 J**	**0.7724612 J**	**0.09513555 J**	**0.8792229 J**	**18.87964 J**	**9.948879 J**	**1.8410139 J**	**0.1026849 J**	**0.2171006 J**

Table A-3-5
DMMP SAP Subtidal Core Interval Analytical Results

				Location ID	PG-PDI-SC-14	PG-PDI-SC-15	PG-PDI-SC-15	PG-PDI-SC-15	PG-PDI-SC-15	PG-PDI-SC-15
				Sample ID	PG-PDI-SC-64-4-6-20140723	PG-PDI-SC-15-0-2-20140724	PG-PDI-SC-15-2-4-20140724	PG-PDI-SC-15-4-6-20140724	PG-PDI-SC-15-6-8.4-20140724	PG-PDI-SC-65-6-8.4-20140724
				Sample Date	07/23/2014	07/24/2014	07/24/2014	07/24/2014	07/24/2014	07/24/2014
				Depth	4 - 6 ft	0 - 2 ft	2 - 4 ft	4 - 6 ft	6 - 8.4 ft	6 - 8.4 ft
				Sample Type	FD	N	N	N	N	N
				Matrix	SE	SE	SE	SE	SE	SE
				X	1211356	1211250	1211250	1211250	1211250	1211250
				Y	315945	315967	315967	315967	315967	315967
	Site-Specific Criteria	DMMP SL	DMMP BT	DMMP ML						
Conventional Parameters (mg/kg)										
Ammonia as nitrogen	--	--	--	--	**11.8**	**22.9**	**61.6**	**58.1**	**14.5**	**15.4**
Sulfide	--	--	--	--	**146**	**412**	**103**	**34.7**	1.17 U	**4.4**
Conventional Parameters (pct)										
Ash content	--	--	--	--	**96.71**	**87.21**	**88.47**	**92.79**	**99.48**	**99.25**
Total organic carbon	--	--	--	--	**3.17 J**	**6.56 J**	**4.48 J**	**6.18 J**	**0.284 J**	**1.59 J**
Total solids	--	--	--	--	**63.97**	**53.75**	**53.95**	**58.74**	**86.77**	**86.95**
Total solids (preserved)	--	--	--	--	**62.46**	**57.01**	**55.32**	**64.93**	**85.43**	**85.48**
Total volatile solids/organic matter	15	--	--	--	**3.29**	**12.79**	**11.53**	**7.21**	**0.52**	**0.75**
Grain Size (pct)										
Gravel	--	--	--	--	**1**	**24.2**	**6.9**	**3.3**	**29.3**	**22.9**
Sand, very coarse	--	--	--	--	**1.7**	**2.7**	**2.6**	**2.1**	**6.4**	**6.1**
Sand, coarse	--	--	--	--	**5.2**	**4.4**	**3.2**	**3**	**6.5**	**7.4**
Sand, medium	--	--	--	--	**18.6**	**9.3**	**8.4**	**6.8**	**12.2**	**13.8**
Sand, fine	--	--	--	--	**44.2**	**18.7**	**18.2**	**27.6**	**20.4**	**22.5**
Sand, very fine	--	--	--	--	**11.9**	**18.5**	**19.8**	**19.9**	**10**	**10.8**
Silt, coarse	--	--	--	--	**5.4**	**5.9**	**16.2**	**13.9**	**4.9**	**5.2**
Silt, medium	--	--	--	--	**3.3**	**5.1**	**7.5**	**6.7**	**3.1**	**3.2**
Silt, fine	--	--	--	--	**2.2**	**2.7**	**4**	**4.4**	**2.1**	**2.5**
Silt, very fine	--	--	--	--	**1.8**	**2.2**	**3.4**	**3.4**	**1.8**	**2**
Clay, coarse	--	--	--	--	**1.3**	**1.6**	**2.8**	**2.7**	**1.3**	**1.4**
Clay, medium	--	--	--	--	**1.3**	**1.3**	**2.3**	**2.3**	**0.8**	**0.9**
Clay, fine	--	--	--	--	**2.2**	**3.6**	**4.7**	**4**	**1.2**	**1.3**
Total fines (Reported, not calculated)	--	--	--	--	**--**	**--**	**--**	**--**	**--**	**--**
Polycyclic Aromatic Hydrocarbons (µg/kg)										
2-Methylnaphthalene	--	670	--	1900	**49**	**180**	**170**	**200**	48 U	**9.7 J**
Acenaphthene	--	500	--	2000	**59**	**94**	**150**	**150**	48 U	14 U
Acenaphthylene	--	560	--	1300	**92**	**110**	**180**	**350**	48 U	**17**
Anthracene	--	960	--	13000	**91 J**	**170 J**	**200 J**	**230 J**	48 UJ	**12 J**
Benzo(a)anthracene	--	1300	--	5100	**52 J**	**230 J**	**100 J**	**83 J**	48 UJ	14 UJ
Benzo(a)pyrene	--	1600	--	3600	**56**	**160**	**68**	**78**	48 U	**8.6 J**
Benzo(b,j,k)fluoranthenes	--	--	--	--	**99**	**360**	**160**	**150**	48 U	**15**
Benzo(g,h,i)perylene	--	670	--	3200	**57**	**110**	**83**	**110**	48 U	**9.4 J**
Chrysene	--	1400	--	21000	**71**	**540**	**170**	**120**	48 U	**7.8 J**
Dibenzo(a,h)anthracene	--	230	--	1900	15 UJ	**25 J**	47 UJ	49 UJ	48 UJ	14 UJ
Fluoranthene	--	1700	4600	30000	**310**	**630**	**740**	**830**	**70**	**52**
Fluorene	--	540	--	3600	**79 J**	**110 J**	**150 J**	**200 J**	48 UJ	**9.2 J**
Indeno(1,2,3-c,d)pyrene	--	600	--	4400	**28**	**72**	**46 J**	**46 J**	48 U	14 U
Naphthalene	--	2100	--	2400	**690**	**860**	**1800**	**3300**	**210**	**220**

Table A-3-5
DMMP SAP Subtidal Core Interval Analytical Results

				Location ID	PG-PDI-SC-14	PG-PDI-SC-15	PG-PDI-SC-15	PG-PDI-SC-15	PG-PDI-SC-15	PG-PDI-SC-15
				Sample ID	PG-PDI-SC-64-4-6-20140723	PG-PDI-SC-15-0-2-20140724	PG-PDI-SC-15-2-4-20140724	PG-PDI-SC-15-4-6-20140724	PG-PDI-SC-15-6-8.4-20140724	PG-PDI-SC-65-6-8.4-20140724
				Sample Date	07/23/2014	07/24/2014	07/24/2014	07/24/2014	07/24/2014	07/24/2014
				Depth	4 - 6 ft	0 - 2 ft	2 - 4 ft	4 - 6 ft	6 - 8.4 ft	6 - 8.4 ft
				Sample Type	FD	N	N	N	N	N
				Matrix	SE	SE	SE	SE	SE	SE
				X	1211356	1211250	1211250	1211250	1211250	1211250
				Y	315945	315967	315967	315967	315967	315967
	Site-Specific Criteria	DMMP SL	DMMP BT	DMMP ML						
Phenanthrene	--	1500	--	21000	**330 J**	**570 J**	**710 J**	**1200 J**	**72 J**	**66 J**
Pyrene	--	2600	11980	16000	**540 J**	**1200 J**	**1000 J**	**1400 J**	**90 J**	**75 J**
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	16	--	--	--	**75.36 J**	**234.1 J**	**102.65 J**	**109.55 J**	48 UJ	**12.278 J**
Dioxin Furans (ng/kg)										
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--	**0.375 J**	**1 J**	**3.24**	**1.42**	**0.16 J**	0.0518 U
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--	**0.571 J**	**3.42**	**11.2**	**4.01**	**0.197 J**	**0.179 J**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	**0.304 J**	**2.1**	**5.86**	**2.59**	**0.086 J**	0.0896 U
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	**0.398 J**	**14.6**	**32.8**	**4.93**	**0.16 J**	**0.169 J**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	**0.44 J**	**4.93**	**12.3**	**3.96**	**0.18 J**	**0.239 J**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--	2.91 U	**128**	**202**	**56.2**	1.49 U	2.26 U
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	--	--	--	--	9.94 U	**888**	**1090**	**223**	8.18 U	10.7 U
Total Tetrachlorodibenzo-p-dioxin (TCDD)	--	--	--	--	**18 J**	**128 J**	**535**	**245 J**	**7.69 J**	**6.37 J**
Total Pentachlorodibenzo-p-dioxin (PeCDD)	--	--	--	--	**13 J**	**100**	**320**	**178 J**	**5.45 J**	**4.07 J**
Total Hexachlorodibenzo-p-dioxin (HxCDD)	--	--	--	--	**13.6 J**	**178**	**325**	**104**	**5.74 J**	**4.15 J**
Total Heptachlorodibenzo-p-dioxin (HpCDD)	--	--	--	--	**7.67 J**	**525**	**578**	**116 J**	**4.82 J**	**6.46 J**
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	--	--	--	--	**1.4**	**4.4**	**13**	**7.15**	**0.403 J**	**0.301 J**
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--	**0.636 J**	**1.94**	**6.2**	**3.14 J**	**0.17 J**	**0.149 J**
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	--	--	--	--	**0.565 J**	**2.08**	**6.8**	**3**	0.0626 U	0.0876 U
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	**0.442 J**	**2 J**	**5.11 J**	**2.03 J**	**0.0743 J**	**0.106 J**
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	**0.247 J**	**1.51 J**	**4.25**	**1.6 J**	**0.102 J**	**0.0737 J**
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	0.0432 U	**0.461 J**	**1.2 J**	**0.522 J**	0.0528 U	0.0876 U
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	--	--	--	--	**0.29 J**	**2.05 J**	**5.43 J**	**1.64 J**	0.043 U	0.0677 U
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	--	--	--	--	**0.944 J**	**20.8**	**46**	**10**	**0.235 J**	**0.303 J**
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	--	--	--	--	0.0981 U	**0.987 J**	**2.02**	**0.611 J**	0.0899 U	0.135 U
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	--	--	--	--	**0.449 J**	**25.5**	**48.2**	**13.4**	0.215 U	0.319 U
Total Tetrachlorodibenzofuran (TCDF)	--	--	--	--	**27.9 J**	**61.3 J**	**199 J**	**149 J**	**8.25 J**	**6.74 J**
Total Pentachlorodibenzofuran (PeCDF)	--	--	--	--	**7.5 J**	**50.2 J**	**128 J**	**53.4 J**	**1.16 J**	**1.04 J**
Total Hexachlorodibenzofuran (HxCDF)	--	--	--	--	**2.32 J**	**48.5 J**	**108 J**	**23.9 J**	**0.657 J**	**0.578 J**
Total Heptachlorodibenzofuran (HpCDF)	--	--	--	--	**1.12 J**	**52.4 J**	**114**	**23.3**	**0.446 J**	**0.519 J**
Total Dioxin/Furan TEQ 2005 (Mammal) (U = 1/2)	5	10	--	--	**1.5149462 J**	**10.07922 J**	**27.50266 J**	**9.60543 J**	**0.48831875 J**	**0.34028285 J**

Table A-3-5
DMMP SAP Subtidal Core Interval Analytical Results

Notes:
Detected concentration is greater than Site-Specific Criteria
Detected concentration is greater than DMMP Screening Level (SL)
Detected concentration is greater than DMMP Bioaccumulation Trigger (BT)
Detected concentration is greater than DMMP Maximum Level Marine Guideline (ML)
Non-detected concentration is above one or more identified screening levels
Bold = Detected result
-- = results not reported or not applicable
cPAH = carcinogenic polycyclic aromatic hydrocarbon
FD = field duplicate
J = Estimated value
DMMP = Dredge Material Management Program
mg/kg = milligrams per kilogram
BT = bioaccumulation Trigger
ML = maximum level
SL = screening level
N = normal field sample
ng/kg = nanograms per kilogram
pct = percent
PAH = polycyclic aromatic hydrocarbons
TEQ = toxic equivalency
SMA = Sediment Management Area
µg/kg = micrograms per kilogram
U = Compound analyzed, but not detected above detection limit
UJ = Compound analyzed, but not detected above estimated detection limit
Totals are calculated as the sum of all detected results and half of the reporting limit of undetected results (U=1/2). If all results are not detected, the highest reporting limit value is reported as the sum.
Total cPAH TEQ (7 minimum CAEPA 2005) calculation includes benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene and indeno(1,2,3-c,d)pyrene.
Per MTCA cleanup Regulation, Table 708-2 "Toxicity Equivalency Factors for Minimum Required Carcinogenic Polyaromatic Hydrocarbons (cPAHs) under WAC 173-340-708(e).
Dioxin TEQ values were calculated with 2005 World Health Organization (WHO) TEF values for mammals.
USEPA Stage 2B and/or Stage 4 data validation was completed by Laboratory Data Consultants (LDC).

Table A-3-6

Subtidal Core Intervals Converted to Mean Lower Low Water Elevations with Total Volatile Solids Results

SMA	Core ID	Sample ID	Interval Start Depth (ft)	Interval End Depth (ft)	Mudline from Core Log (MLLW)	Start Depth (MLLW)	End Depth (MLLW)	TVS (% dry wt)
SMA-1	PG-PDI-SC01	PG-PDI-SC-01-0-2-20140721	0	2	-18	-18	-20	16.4%
		PG-PDI-SC-01-2-4-20140721	2	4		-20	-22	0.8%
		PG-PDI-SC-01-4-6-20140721	4	6		-22	-24	1.6%
		PG-PDI-SC-01-6-8-20140721	6	8		-24	-26	1.9%
		PG-PDI-SC-01-8-9.2-20140721	8	9.2		-26	-27.2	2.5%
		PG-PDI-SC-01-9.2-9.9-20140721	9.2	9.9		-27.2	-27.9	1.4%
	PG-PDI-SC02	PG-PDI-SC-02-0-2-20140721	0	2	-9	-9	-11	55.6%
		PG-PDI-SC-02-2-4-20140721	2	4		-11	-13	48.0%
		PG-PDI-SC-02-4-6-20140721	4	6		-13	-15	38.9%
		PG-PDI-SC-02-6-8-20140721	6	8		-15	-17	34.8%
		PG-PDI-SC-02-8-10.3-20140721	8	10.3		-17	-19.3	46.4%
		PG-PDI-SC-02-10.3-12-20140721	10.3	12		-19.3	-21	0.4%
	PG-PDI-SC03	PG-PDI-SC-03-0-4-20140721	0	4	-7.4	-7.4	-11.4	10.4%
		PG-PDI-SC-03-4-7-20140721	4	7		-11.4	-14.4	23.0%
		PG-PDI-SC-03-7-9-20140721	7	9		-14.4	-16.4	7.0%
		PG-PDI-SC-03-9-11-20140721	9	11		-16.4	-18.4	0.5%
		PG-PDI-SC-03-11-13-20140721	11	13		-18.4	-20.4	0.4%
	PG-PDI-SC04	PG-PDI-SC-04-0-2-20140721	0	2	-17.1	-17.1	-19.1	8.4%
		PG-PDI-SC-04-2-4-20140721	2	4		-19.1	-21.1	1.1%
		PG-PDI-SC-04-4-6-20140721	4	6		-21.1	-23.1	0.6%
	PG-PDI-SC20	PG-PDI-SC-20-0-2-20140724	0	2	-14.6	-14.6	-16.6	32.2%
		PG-PDI-SC-20-2-4-20140724	2	4		-16.6	-18.6	6.9%
		PG-PDI-SC-20-4-6-20140724	4	6		-18.6	-20.6	0.5%

Table A-3-6

Subtidal Core Intervals Converted to Mean Lower Low Water Elevations with Total Volatile Solids Results

SMA	Core ID	Sample ID	Interval Start Depth (ft)	Interval End Depth (ft)	Mudline from Core Log (MLLW)	Start Depth (MLLW)	End Depth (MLLW)	TVS (% dry wt)
SMA-2	PG-PDI-SC18	PG-PDI-SC-18-0-4-COMP-140724	0	4	-19.6	-19.6	-23.6	35.2%
		PG-PDI-SC-18-4-8-COMP-140724	4	8		-23.6	-27.6	27.5%
		PG-PDI-SC-18-8-12-COMP-140724	8	12		-27.6	-31.6	8.2%
		PG-PDI-SC-18-12-13-COMP-140724	12	13		-31.6	-32.6	6.0%
	PG-PDI-SC05	PG-PDI-SC-05-0-2-20140722	0	2	-22.6	-22.6	-24.6	17.3%
		PG-PDI-SC-05-2-4-20140722	2	4		-24.6	-26.6	26.1%
		PG-PDI-SC-05-4-6-20140722	4	6		-26.6	-28.6	20.7%
		PG-PDI-SC-05-6-8-20140722	6	8		-28.6	-30.6	18.2%
		PG-PDI-SC-05-8-10-20140722	8	10		-30.6	-32.6	21.3%
		PG-PDI-SC-05-10-12-20140722	10	12		-32.6	-34.6	27.9%
		PG-PDI-SC-05-12-14-20140722	12	14		-34.6	-36.6	25.1%
		PG-PDI-SC-05-14-16-20140722	14	16		-36.6	-38.6	7.8%
		PG-PDI-SC-05-16-18.5-20140722	16	18.5		-38.6	-41.1	9.5%
		PG-PDI-SC-05-18.5-20-20140722	18.5	20		-41.1	-42.6	0.8%
	PG-PDI-SC21	PG-PDI-SC-21-0-2-20140725	0	2	-17.2	-17.2	-19.2	16.7%
		PG-PDI-SC-21-2-4-20140725	2	4		-19.2	-21.2	18.3%
		PG-PDI-SC-21-4-6-20140725	4	6		-21.2	-23.2	40.4%
		PG-PDI-SC-21-6-8-20140725	6	8		-23.2	-25.2	53.1%
		PG-PDI-SC-21-8-10-20140725	8	10		-25.2	-27.2	55.2%
		PG-PDI-SC-21-10-12-20140725	10	12		-27.2	-29.2	55.9%
		PG-PDI-SC-21-12-14-20140725	12	14		-29.2	-31.2	55.2%
		PG-PDI-SC-21-14-16-20140725	14	16		-31.2	-33.2	63.8%
		PG-PDI-SC-21-16-18-20140725	16	18		-33.2	-35.2	56.6%
		PG-PDI-SC-21-18-20-20140725	18	20		-35.2	-37.2	1.2%
		PG-PDI-SC-21-20-22-20140725	20	22		-37.2	-39.2	1.0%

Table A-3-6

Subtidal Core Intervals Converted to Mean Lower Low Water Elevations with Total Volatile Solids Results

SMA	Core ID	Sample ID	Interval Start Depth (ft)	Interval End Depth (ft)	Mudline from Core Log (MLLW)	Start Depth (MLLW)	End Depth (MLLW)	TVS (% dry wt)
SMA-2	PG-PDI-SC06	PG-PDI-SC-06-0-4-20140722	0	4	-13.4	-13.4	-17.4	53.5%
		PG-PDI-SC-06-4-6-20140722	4	6		-17.4	-19.4	63.5%
		PG-PDI-SC-06-6-8-20140722	6	8		-19.4	-21.4	72.7%
		PG-PDI-SC-06-8-10-20140722	8	10		-21.4	-23.4	54.2%
		PG-PDI-SC-06-10-14-20140722	10	14		-23.4	-27.4	67.4%
		PG-PDI-SC-06-14-18-20140722	14	18		-27.4	-31.4	14.0%
		PG-PDI-SC-06-18-20-20140722	18	20		-31.4	-33.4	0.9%
	PG-PDI-SC07	PG-PDI-SC-07-0-2-20140724	0	2	-11.2	-11.2	-13.2	31.4%
		PG-PDI-SC-07-2-4-20140724	2	4		-13.2	-15.2	42.8%
		PG-PDI-SC-07-4-6-20140724	4	6		-15.2	-17.2	48.8%
		PG-PDI-SC-07-6-8-20140724	6	8		-17.2	-19.2	37.7%
		PG-PDI-SC-07-8-10-20140724	8	10		-19.2	-21.2	25.7%
		PG-PDI-SC-07-10-12-20140724	10	12		-21.2	-23.2	1.19%
		PG-PDI-SC-07-12-14-20140724	12	14		-23.2	-25.2	0.67%
	PG-PDI-SC08	PG-PDI-SC-08-0-2-20140722	0	2	-17.9	-17.9	-19.9	55.5%
		PG-PDI-SC-08-2-4-20140722	2	4		-19.9	-21.9	49.0%
		PG-PDI-SC-08-4-7-20140722	4	7		-21.9	-24.9	15.7%
		PG-PDI-SC-08-7-9-20140722	7	9		-24.9	-26.9	0.8%
		PG-PDI-SC-08-9-11-20140722	9	11		-26.9	-28.9	0.8%
		PG-PDI-SC-08-11-13-20140722	11	13		-28.9	-30.9	archive
	PG-PDI-SC09	PG-PDI-SC-09-0-2-20140722	0	2	-13.1	-13.1	-15.1	14.98%
		PG-PDI-SC-09-2-4-20140722	2	4		-15.1	-17.1	11.1%
		PG-PDI-SC-09-4-6-20140722	4	6		-17.1	-19.1	2.0%
		PG-PDI-SC-09-6-8-20140722	6	8		-19.1	-21.1	0.7%

Table A-3-6

Subtidal Core Intervals Converted to Mean Lower Low Water Elevations with Total Volatile Solids Results

SMA	Core ID	Sample ID	Interval Start Depth (ft)	Interval End Depth (ft)	Mudline from Core Log (MLLW)	Start Depth (MLLW)	End Depth (MLLW)	TVS (% dry wt)
SMA-2	PG-PDI-SC10	PG-PDI-SC-10-0-4-20140723	0	4	-8.6	-8.6	-12.6	12.62%
		PG-PDI-SC-10-4-6-20140723	4	6		-12.6	-14.6	0.62%
		PG-PDI-SC-10-6-8-20140723	6	8		-14.6	-16.6	0.64%
		PG-PDI-SC-10-8-10-20140723	8	10		-16.6	-18.6	0.68%
	PG-PDI-SC11	PG-PDI-SC-11-0-2-20140723	0	2	-8.3	-8.3	-10.3	19.97%
		PG-PDI-SC-11-2-4-20140723	2	4		-10.3	-12.3	6.96%
		PG-PDI-SC-11-4-6-20140723	4	6		-12.3	-14.3	0.65%
		PG-PDI-SC-11-6-8-20140723	6	8		-14.3	-16.3	0.44%
		PG-PDI-SC-11-8-10-20140723	8	10		-16.3	-18.3	0.69%
	PG-PDI-SC12	PG-PDI-SC-12-0-2-20140723	0	2	-9.9	-9.9	-11.9	25.4%
		PG-PDI-SC-12-2-4-20140723	2	4		-11.9	-13.9	35.6%
		PG-PDI-SC-12-4-6-20140723	4	6		-13.9	-15.9	32.8%
		PG-PDI-SC-12-6-10-20140723	6	10		-15.9	-19.9	17.7%
		PG-PDI-SC-12-10-11.5-20140723	10	11.5		-19.9	-21.4	5.43%
		PG-PDI-SC-12-11.5-12-20140723	11.5	12		-21.4	-21.9	1.44%
	PG-PDI-SC13	PG-PDI-SC-13-0-2-20140723	0	2	-14.7	-14.7	-16.7	14.00%
		PG-PDI-SC-13-2-4-20140723	2	4		-16.7	-18.7	9.41%
		PG-PDI-SC-13-4-6-20140723	4	6		-18.7	-20.7	9.04%
		PG-PDI-SC-13-6-8-20140723	6	8		-20.7	-22.7	2.07%
		PG-PDI-SC-13-8-10-20140723	8	10		-22.7	-24.7	0.51%
	PG-PDI-SC14	PG-PDI-SC-14-0-2-20140723	0	2	-17.4	-17.4	-19.4	13.8%
		PG-PDI-SC-14-2-4-20140723	2	4		-19.4	-21.4	16.7%
		PG-PDI-SC-14-4-6-20140723	4	6		-21.4	-23.4	4.6%
		PG-PDI-SC-14-6-8-20140723	6	8		-23.4	-25.4	1.0%
		PG-PDI-SC-14-8-10-20140723	8	10		-25.4	-27.4	1.0%

Table A-3-6

Subtidal Core Intervals Converted to Mean Lower Low Water Elevations with Total Volatile Solids Results

SMA	Core ID	Sample ID	Interval Start Depth (ft)	Interval End Depth (ft)	Mudline from Core Log (MLLW)	Start Depth (MLLW)	End Depth (MLLW)	TVS (% dry wt)
SMA-2	PG-PDI-SC15	PG-PDI-SC-15-0-2-20140724	0	2	-14.9	-14.9	-16.9	13%
		PG-PDI-SC-15-2-4-20140724	2	4		-16.9	-18.9	12%
		PG-PDI-SC-15-4-6-20140724	4	6		-18.9	-20.9	7%
		PG-PDI-SC-15-6-8.4-20140724	6	8.4		-20.9	-23.3	0.75%

Notes:

ft = feet

MLLW = mean lower low water

% = percent

SMA = Sediment Management Areas

Table A-3-7
Prospective SMA-1 DMMU Results

				Location ID	PG-PDI-SMA-1	PG-PDI-SMA-1	PG-PDI-SMA-1
				Sample ID	SMA-INW	SMA-ISE	SMA-SUBSURFACE B
				Sample Date	09/08/2014	09/08/2014	09/08/2014
				Sample Type	N	N	N
				Matrix	SE	SE	SE
				X	1211575.875	1211575.875	1211575.875
				Y	317437.0112	317437.0112	317437.0112
	Site-specific Criteria	DMMP SL	DMMP BT	DMMP ML			
Metals (mg/kg)							
Antimony	--	150	--	200	8 UJ	7 UJ	6 UJ
Arsenic	--	57	507.1	700	8 U	**1.25 J**	**4.61 J**
Cadmium	3	5.1	11.3	14	**0.5**	**0.5**	**0.2**
Chromium	--	260	260	--	**30.7**	**24.5**	**21.6**
Copper	--	390	1027	1300	**22.9**	**18**	**10.8**
Lead	--	450	975	1200	**4**	**5**	**2.23 J**
Mercury	--	0.41	1.5	2.3	**0.0291 J**	**0.03 J**	**0.03 J**
Nickel	--	--	--	--	**28**	**26**	**24**
Selenium	--	--	3	--	**0.493 J**	**0.337 J**	**0.251 J**
Silver	--	6.1	6.1	8.4	0.5 U	0.4 U	0.4 U
Zinc	--	410	2783	3800	**45**	**40**	**31**
Semivolatile Organics (µg/kg)							
1,2,4-Trichlorobenzene	--	31	--	64	19 UJ	19 UJ	19 UJ
1,2-Dichlorobenzene	--	35	--	110	19 UJ	19 UJ	19 UJ
1,3-Dichlorobenzene	--	--	--	--	19 UJ	19 UJ	19 UJ
1,4-Dichlorobenzene	--	110	--	120	19 UJ	19 UJ	19 UJ
2,4-Dimethylphenol	--	29	--	210	24 UJ	24 UJ	24 UJ
2-Methylphenol (o-Cresol)	--	63	--	77	19 UJ	19 UJ	19 UJ
4-Methylphenol (p-Cresol)	--	670	--	3600	**83 J**	**97 J**	**23 J**
Benzoic acid	--	650	--	760	**140 J**	**71 J**	190 UJ
Benzyl alcohol	--	57	--	870	19 UJ	19 UJ	19 UJ
bis(2-Ethylhexyl)phthalate	--	1300	--	8300	48 UJ	48 UJ	48 UJ
Butylbenzyl phthalate	--	63	--	970	19 UJ	19 UJ	19 UJ
Dibenzofuran	--	540	--	1700	**120 J**	**52 J**	**120 J**
Diethyl phthalate	--	200	--	1200	**22 J**	19 UJ	19 UJ
Dimethyl phthalate	--	71	--	1400	19 UJ	19 UJ	19 UJ
Di-n-butyl phthalate	--	1400	--	5100	19 UJ	19 UJ	19 UJ
Di-n-octyl phthalate	--	6200	--	6200	19 UJ	19 UJ	19 UJ
Hexachloroethane	--	--	--	--	19 UJ	19 UJ	19 UJ
n-Nitrosodiphenylamine	--	28	--	130	19 UJ	19 UJ	19 UJ
Pentachlorophenol	--	400	504	690	96 UJ	97 UJ	97 UJ
Phenol	--	420	--	1200	**48 J**	**23 J**	**9.7 J**

Table A-3-7
Prospective SMA-1 DMMU Results

				Location ID	PG-PDI-SMA-1	PG-PDI-SMA-1	PG-PDI-SMA-1
				Sample ID	SMA-INW	SMA-ISE	SMA-SUBSURFACE B
				Sample Date	09/08/2014	09/08/2014	09/08/2014
				Sample Type	N	N	N
				Matrix	SE	SE	SE
				X	1211575.875	1211575.875	1211575.875
				Y	317437.0112	317437.0112	317437.0112
	Site-specific Criteria	DMMP SL	DMMP BT	DMMP ML			
Polycyclic Aromatic Hydrocarbons (µg/kg)							
2-Methylnaphthalene	--	670	--	1900	**65 J**	**30 J**	**48 J**
Acenaphthene	--	500	--	2000	**130 J**	**53 J**	**150 J**
Acenaphthylene	--	560	--	1300	**51 J**	**53 J**	**19 J**
Anthracene	--	960	--	13000	**160 J**	**83 J**	**150 J**
Benzo(a)anthracene	--	1300	--	5100	**190 J**	**180 J**	**270 J**
Benzo(a)pyrene	--	1600	--	3600	**180 J**	**120 J**	**110 J**
Benzo(b,j,k)fluoranthenes	--	--	--	--	**390 J**	**530 J**	**330 J**
Benzo(g,h,i)perylene	--	670	--	3200	**110 J**	**65 J**	**45 J**
Chrysene	--	1400	--	21000	**310 J**	**460 J**	**460 J**
Dibenzo(a,h)anthracene	--	230	--	1900	**36 J**	**22 J**	**22 J**
Fluoranthene	--	1700	4600	30000	**740 J**	**1300 J**	**500 J**
Fluorene	--	540	--	3600	**150 J**	**67 J**	**150 J**
Indeno(1,2,3-c,d)pyrene	--	600	--	4400	**110 J**	**64 J**	**40 J**
Naphthalene	--	2100	--	2400	**550 J**	**240 J**	**270 J**
Phenanthrene	--	1500	--	21000	**540 J**	**320 J**	**310 J**
Pyrene	--	2600	11980	16000	**700 J**	**980 J**	**350 J**
Total cPAH TEQ (7 minimum CAEPA 2005) (U = 1/2)	16	--	--	--	**255.7 J**	**204.2 J**	**180.8 J**
Pesticides (µg/kg)							
4,4'-DDD (p,p'-DDD)	--	16	--	--	2 UJ	0.96 UJ	0.99 UJ
4,4'-DDE (p,p'-DDE)	--	9	--	--	2 UJ	0.96 UJ	0.99 UJ
4,4'-DDT (p,p'-DDT)	--	12	--	--	2 UJ	0.96 UJ	0.99 UJ
Aldrin	--	9.5	--	--	0.98 UJ	0.48 UJ	0.49 UJ
Chlordane, alpha- (Chlordane, cis-)	--	--	--	--	0.98 UJ	0.48 UJ	0.49 UJ
Chlordane, beta- (Chlordane, trans-)	--	--	--	--	0.98 UJ	0.48 UJ	0.49 UJ
Dieldrin	--	1.9	--	1700	2 UJ	0.96 UJ	0.99 UJ
Heptachlor	--	1.5	--	270	0.98 UJ	0.48 UJ	0.49 UJ
Hexachlorobenzene	--	22	168	230	2 UJ	0.96 UJ	0.99 UJ
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	--	11	--	270	3 UJ	0.96 UJ	0.99 UJ
Hexachlorocyclohexane (BHC), gamma- (Lindane)	--	--	--	--	0.98 UJ	0.48 UJ	0.49 UJ
Nonachlor, cis-	--	--	--	--	2 UJ	0.96 UJ	0.99 UJ
Nonachlor, trans-	--	--	--	--	33 UJ	3.2 UJ	0.99 UJ
Oxychlordane	--	--	--	--	2 UJ	0.96 UJ	0.99 UJ

Table A-3-7
Prospective SMA-1 DMMU Results

				Location ID	PG-PDI-SMA-1	PG-PDI-SMA-1	PG-PDI-SMA-1
				Sample ID	SMA-INW	SMA-ISE	SMA-SUBSURFACE B
				Sample Date	09/08/2014	09/08/2014	09/08/2014
				Sample Type	N	N	N
				Matrix	SE	SE	SE
				X	1211575.875	1211575.875	1211575.875
				Y	317437.0112	317437.0112	317437.0112
	Site-specific Criteria	DMMP SL	DMMP BT	DMMP ML			
PCB Aroclors (µg/kg)							
Aroclor 1016	--	--	--	--	9.1 UJ	9.1 UJ	9 UJ
Aroclor 1221	--	--	--	--	9.1 UJ	9.1 UJ	9 UJ
Aroclor 1232	--	--	--	--	91 UJ	23 UJ	9 UJ
Aroclor 1242	--	--	--	--	9.1 UJ	9.1 UJ	9 UJ
Aroclor 1248	--	--	--	--	9.1 UJ	9.1 UJ	9 UJ
Aroclor 1254	--	--	--	--	9.1 UJ	9.1 UJ	9 UJ
Aroclor 1260	--	--	--	--	9.1 UJ	9.1 UJ	9 UJ

Notes:
Detected concentration is greater than Site-Specific Criteria
Detected concentration is greater than DMMP Screening Level (SL)
Detected concentration is greater than DMMP Bioaccumulation Trigger (BT)
Detected concentration is greater than DMMP Maximum Level Marine Guideline (ML)
Non-detected concentration is above one or more identified screening levels
Bold = Detected result
-- = results not reported or not applicable
BT = bioaccumulation trigger
ML = maximum level
SL = screening level
cPAH = carcinogenic polycyclic aromatic hydrocarbon
FD = field duplicate
J = estimated value
mg/kg = milligrams per kilogram
N = normal field sample
ng/kg = nanograms per kilogram
pct = percent
PAH = polycyclic aromatic hydrocarbons
SE = sediment matrix
TEQ = toxic equivalency
µg/kg = micrograms per kilogram
U = Compound analyzed, but not detected above detection limit
UJ = Compound analyzed, but not detected above estimated detection limit
Totals are calculated as the sum of all detected results and half of the reporting limit of undetected results (U=1/2). If all results are not detected, the highest reporting limit value is reported as the sum.
Total cPAH TEQ (7 minimum CAEPA 2005) calculation includes benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene and indeno(1,2,3-c,d)pyrene.
Per MTCA cleanup Regulation, Table 708-2 "Toxicity Equivalency Factors for Minimum Required Carcinogenic Polyaromatic Hydrocarbons (cPAHs) under WAC 173-340-708(e).
Dioxin TEQ values were calculated with 2005 World Health Organization (WHO) TEF values for mammals.
USEPA Stage 2B data validation was completed by Laboratory Data Consultants (LDC).

Table A-3-8
Dispersive DMMP Bioassay Testing Results

Composite Sample ID	2-Hit			1-Hit			Overall Determination
	Amphipod	Polychaete	Larval	Amphipod	Polychaete	Larval	
SMA-1SE	Pass	Pass	Pass	Pass	Pass	Pass	Pass
SMA-1NW	Pass	Pass	**Fail**	Pass	Pass	Pass	Pass
SMA-1SB	Pass	Pass	**Fail**	Pass	Pass	**Fail**	**Fail**

Table A-3-9
Non-dispersive DMMP Bioassay Testing Results

Composite Sample ID	2-Hit			1-Hit			Overall Determination
	Amphipod	Polychaete	Larval	Amphipod	Polychaete	Larval	
SMA-1SE	Pass	Pass	Pass	Pass	Pass	Pass	Pass
SMA-1NW	Pass	Pass	**Fail**	Pass	Pass	Pass	Pass
SMA-1SB	Pass	Pass	**Fail**	Pass	Pass	Pass	Pass

Table A-3-10
CAP Confirmation Core Results

	Task	2014_Subtidal	2014_Subtidal	2014_Subtidal	2014_Subtidal	2014_Subtidal	2014_Subtidal	2014_Subtidal	2014_Subtidal
	Location ID	PG-PDI-SC-16	PG-PDI-SC-17	PG-PDI-SC-18	PG-PDI-SC-18	PG-PDI-SC-18	PG-PDI-SC-18	PG-PDI-SC-19	PG-PDI-SC-19
	Sample ID	PG-PDI-SC-16-0-4-COMP-140724	PG-PDI-SC-17-0-4-COMP-140724	PG-PDI-SC-18-0-4-COMP-140724	PG-PDI-SC-18-4-8-COMP-140724	PG-PDI-SC-18-8-12-COMP-140724	PG-PDI-SC-18-12-13-COMP-140724	PG-PDI-SC-19-0-4-COMP-140724	PG-PDI-SC-19-4-8-COMP-140724
	Sample Date	07/24/2014	07/24/2014	07/24/2014	07/24/2014	07/24/2014	07/24/2014	07/25/2014	07/25/2014
	Depth	0 - 4 ft	0 - 4 ft	0 - 4 ft	4 - 8 ft	8 - 12 ft	12 - 13 ft	0 - 4 ft	4 - 8 ft
	Sample Type	N	N	N	N	N	N	N	N
	Matrix	SE	SE	SE	SE	SE	SE	SE	SE
	X	1211491	1211738	1211640	1211640	1211640	1211640	1211247	1211247
	Y	317508	317569	316606	316606	316606	316606	315803	315803
	Site-Specific Criteria								
Conventional Parameters (pct)									
Total volatile solids/organic matter	15	**3.79**	**6.09**	**35.2**	**27.5**	**8.16**	**5.96**	**8.25**	**6.78**

Notes:
Detected concentration is greater than Site-Specific Criteria
Bold = Detected result
CAP = Cleanup Action Plan
N = normal field sample
pct = percent

Table A-3-11
Subtidal Sediment DRET Results

	2014_Subtidal	2014_Subtidal	2014_Subtidal	2014_Subtidal
Location ID	**PG-PDI-SMA-1**	**PG-PDI-SMA-1**	**PG-PDI-SMA-2**	**PG-PDI-SMA-2**
Sample ID	**PG-PDI-DRET-SMA-1-201407-DISS**	**PG-PDI-DRET-SMA-1-201407-TOTAL**	**PG-PDI-DRET-SMA-2-20141021-D**	**PG-PDI-DRET-SMA-2-20141021-T**
Sample Date	**07/28/2014**	**07/28/2014**	**10/27/2014**	**10/27/2014**
Depth				
Sample Type	**N**	**N**	**N**	**N**
Matrix	**WEL**	**WEL**	**WEL**	**WEL**
X	**1211575.875**	**1211575.875**	**1211227.759**	**1211227.759**
Y	**317437.0112**	**317437.0112**	**316281.9227**	**316281.9227**
Conventional Parameters, Total				
Ammonia as nitrogen	--	**0.096**	--	**0.126**
Nitrate + nitrite as nitrogen	--	**0.252**	--	**0.23**
Nitrate as nitrogen	--	**0.237**	--	**0.219**
Nitrite as nitrogen	--	**0.015**	--	**0.011**
Nitrogen (Kjeldahl)	--	1 U	--	1 U
Conventional Parameters, Dissolved (mg/L)				
Ammonia as nitrogen	**0.122**	--	**0.172**	--
Nitrate + nitrite as nitrogen	**0.263**	--	**0.229**	--
Nitrate as nitrogen	**0.25**	--	**0.217**	--
Nitrite as nitrogen	**0.013**	--	**0.012**	--
Nitrogen (Kjeldahl)	1 U	--	1 U	--

Notes:

Bold = Detected result

-- = results not reported or not applicable

mg/L = milligrams per liter

N = normal field sample

U = Compound analyzed, but not detected above detection limit

WEL = elutriate matrix

DRET = Drege Elutriate Testing

Table A-3-12
Bioassay Recovery Bioassay Testing Results

Station ID	Mean Number Normal Larvae	Statistically Less Than Reference?	Mean Normal Survivorship[1,2] vs. Reference (%)	Fails SQS?[3]	Fails CSL?[4]
Control	367	--	--	--	--
Carr Inlet Reference	302	--	--	--	--
CR-11 Reference	299	--	--	--	--
BW-11	238	Yes	78.8	Yes	No
BW-12	257	Yes	85	No	No
BW-15	219	Yes	72.5	Yes	No
BW-16	231	Yes	76.3	Yes	No
BW-18	257	Yes	85.1	No	No
BW-19	264	Yes	87.4	No	No
PGSS-29	306	No	102.5	No	No

Notes:

-- = not applicable

1 = Control normality normalized to stocking density (366)

2 = Reference and treatment normal survivorship are normalized to the mean number of normal larvae in the Control

3 = SQS: statistically different than reference and < 85% of reference

4 = CSL: statistically different than reference and < 70% of reference

Sample results were compared to one reference location based on comparable grain size. All samples were compared to the Carr Inlet reference except PGSS-29, which was compared to CR-11 reference.

FIGURES

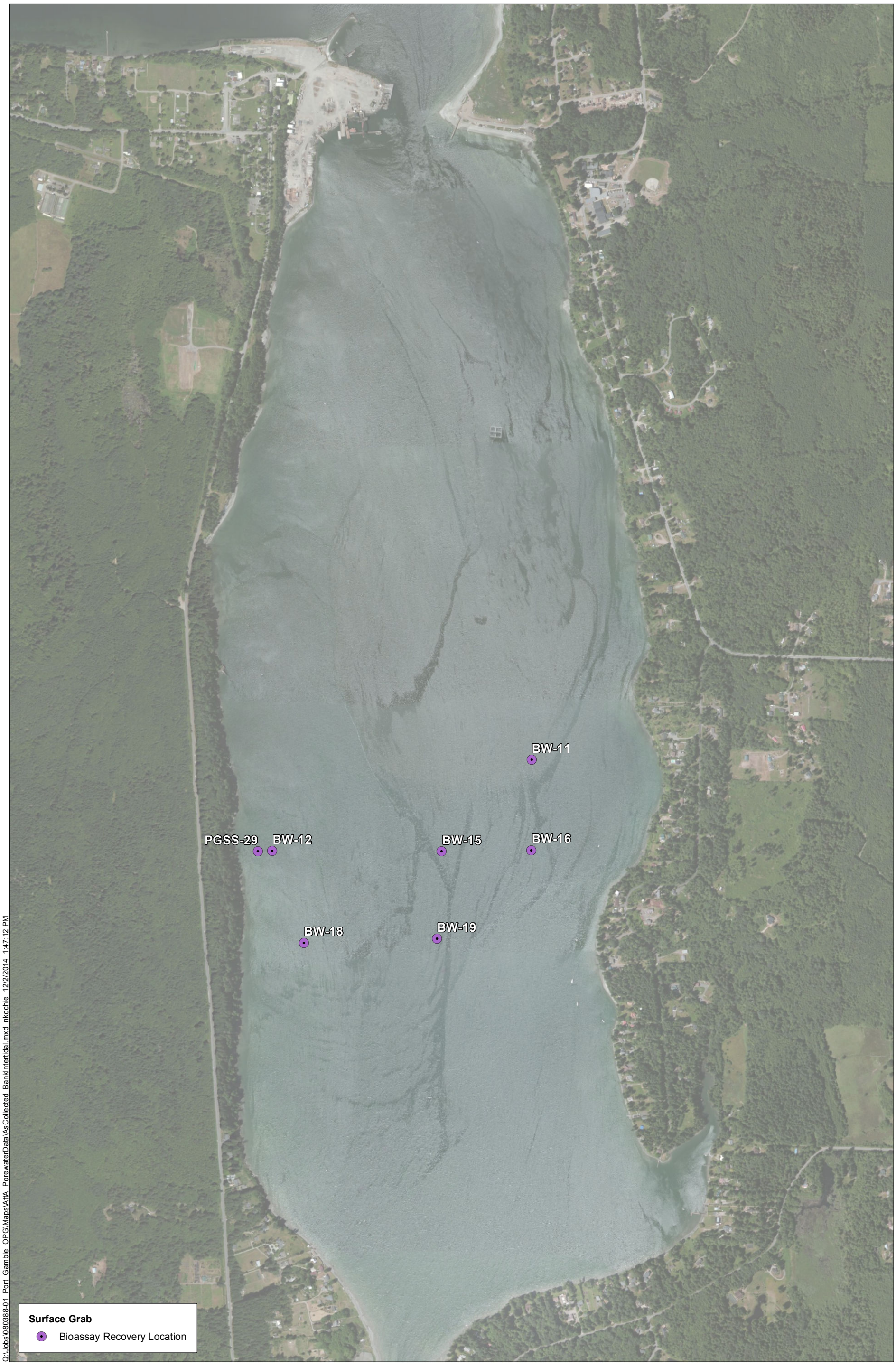
Q:\Jobs\080388-01_Port_Gamble_OPG\Maps\AttA_PorewaterData\Bank_Intertidal_DF_TEQ.mxd nkochie 12/2/2014 1:44:37 PM

ANCHOR QEA

Feet
0 125 250

Figure A-3-1
As-collected Bank and Intertidal Locations
Attachment A-3: Soil and Sediment Data Report
Port Gamble Bay Cleanup Site

Figure A-3-2
As-collected Sediment Core Locations
Attachment A-3: Soil and Sediment Data Report
Port Gamble Bay Cleanup Site



ANCHOR QEA

Feet
0 500 1,000 1,500 2,000

Figure A-3-3
As-collected Bioassay Recovery Locations
Attachment A-3: Soil and Sediment Data Report
Port Gamble Bay Cleanup Site

ATTACHMENT A-3-1
DIRECT PUSH LOGS

Geoprobe Soil Boring Log

SMU1-B1

Sheet 1 of 1

Project: Port Gamble	Location: Port Gamble, WA	Method: Geoprobe
Project #: 130388-01.02	Northing: 317323.6388 Easting: 1211219.498	Total Depth (ft): 10
Client: Pope Resources LP and OPG Properties LLC	Horizontal Datum: NAD83 WA State Plane North Zone	Logged By: Delaney Peterson
Collection Date: 7/9/2014		
Contractor: Cascade Drilling		

Recovered Depth (ft)	Sample Recovery	Soil Description	Graphic Log	Recovered Depth (ft)
0		Samples and descriptions are in recovered depths. Classification scheme based on USCS		0
1		Dry, loose, brown, sandy bark, layer of dead grass on top		1
2		Dry, loose, gray, gravelly SAND		2
3		Dry, loose, light brown, sandy and gravelly SILT		3
4				4
5				5
6				6
7		Dry, loose, gray, slightly gravelly vf-c SAND		7
8		@1.2': Grades to brown		8
9		@1.6': Grades to damp		9
10		@3.6': Grades to dry		10
11				11
12		Dry, loose, brown, slightly gravelly vf-c SAND		12
13				13
14		@5.6': Grades to light brown, slightly gravelly, silty vf-c SAND		14
15		@6.1': Grades to dark brown		15
16				16
17		@6.8': Grades to damp, medium-dense, gray to dark gray, slightly gravelly, vf-c SAND		17
18				18
19		@7.1': Grades to damp, medium-stiff, gray SAND		19
20				20
21		@8-8.5': Shell debrid interbeds		21
22				22
23		@8.5': Grades to moist, dark gray, very woody, vf-f SAND		23
24				24
25		@9.5': Grades to moise, medium-dense, dark gray, slightly shelly f-SAND		25
26				26
27				27
28				28
29				29
30				30
31				31
32				32
33				33
34				34
35				35
36				36
37				37
38				38
39				39
40				40

ANCHOR QEA
720 Olive Way, Suite 1900
Seattle, WA 98101
206-287-9130

Geoprobe Soil Boring Log

SMU1-B2

Sheet 1 of 1

Project: Port Gamble	Location: Port Gamble, WA	Method: Geoprobe
Project #: 130388-01.02	Northing: 317271.0998 Easting: 1211292.66	Total Depth (ft): 10
Client: Pope Resources LP and OPG Properties LLC	Horizontal Datum: NAD83 WA State Plane North Zone	Logged By: Delaney Peterson
Collection Date: 7/9/201		
Contractor: Cascade Drilling		

Recovered Depth (ft)	Sample Recovery	Soil Description	Graphic Log	Recovered Depth (ft)
0		Samples and descriptions are in recovered depths. Classification scheme based on USCS		0
1		Dry, soft, brown, gravelly SILT		1
2		Damp, loose, light brown, f-SAND		2
3		Damp, medium-dense, black, f-c SAND, slight creosote-like odor		3
4		Damp, gray to black, loose f-c SAND		4
5		Dry, light brown, f-c sandy SILT		5
6		Damp, loose, dark gray, f-m SAND		6
7		@6.5': Grades to m-c SAND		7
8		@7.1': Grades to c-SAND		8
9		Moist, medium-dense, slightly sandy rounded GRAVEL		9
10		@7.9': Layer of decomposing wood		10
11		Moist, dense, gray, subangular GRAVEL, trace silt and clay		11
12				12
13				13
14				14
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Geoprobe Soil Boring Log

SMU1-I1

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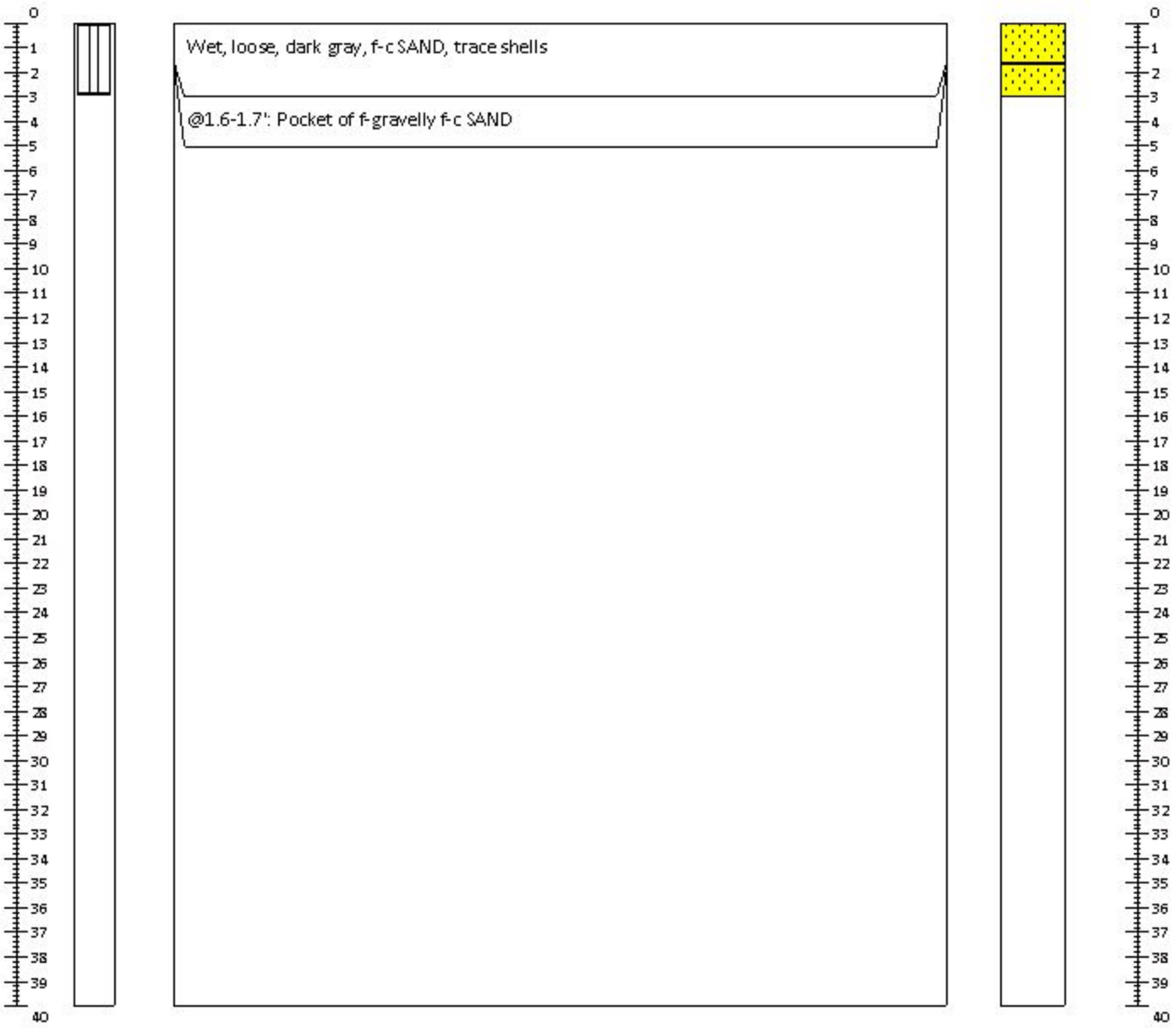
Project: Port Gamble	Location: Port Gamble, WA	Method: Geoprobe
Project #: 130388-01.02	Northing: 317610.2812 Easting: 1211465.813	Total Depth (ft): 4
Client: Pope Resources LP and OPG Properties LLC	Horizontal Datum: NAD83 WA State Plane North Zone	Logged By: Delaney Peterson
Collection Date: 7/11/2014		
Contractor: Cascade Drilling		

Recovered Depth (ft)	Sample Recovery	Soil Description	Graphic Log	Recovered Depth (ft)
		Samples and descriptions are in recovered depths. Classification scheme based on USCS		



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Geoprobe Soil Boring Log

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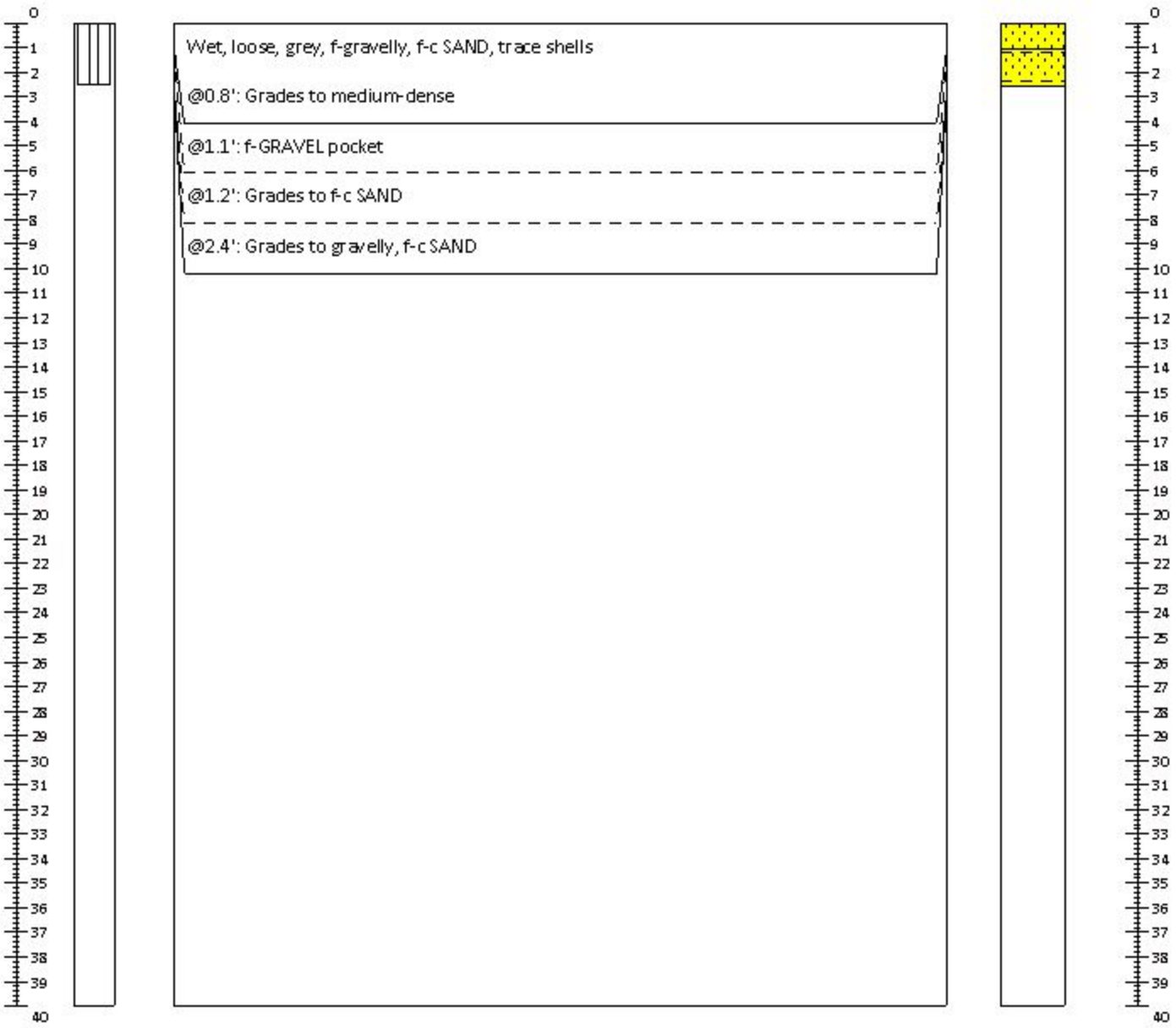
SMU1-I2

Project: Port Gamble	Location: Port Gamble, WA	Method: Geoprobe
Project #: 130388-01.02	Northing: 317494.8973 Easting: 1211338.806	Total Depth (ft): 4
Client: Pope Resources LP and OPG Properties LLC	Horizontal Datum: NAD83 WA State Plane North Zone	Logged By: Delaney Peterson
Collection Date: 7/11/2014		
Contractor: Cascade Drilling		

Recovered Depth (ft)	Sample Recovery	Soil Description	Graphic Log	Recovered Depth (ft)
		Samples and descriptions are in recovered depths. Classification scheme based on USCS		



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SMU1-I3

Project: Port Gamble	Location: Port Gamble, WA	Method: Geoprobe
Project #: 130388-01.02	Northing: 317407.5474 Easting: 1211331.803	Total Depth (ft): 4
Client: Pope Resources LP and OPG Properties LLC	Horizontal Datum: NAD83 WA State Plane North Zone	Logged By: Delaney Peterson
Collection Date: 7/11/201		
Contractor: Cascade Drilling		

Recovered Depth (ft)	Sample Recovery	Soil Description	Graphic Log	Recovered Depth (ft)
		Samples and descriptions are in recovered depths. Classification scheme based on USCS		

@0.8': Grades to wet, loose, gray, well sorted f-SAND

@1.5': Grades to occasional shell and gravelly f-c SAND

@1.8': Grades to trace shells

@2.5': Pocket of occasional shells

@2.9': Pocket of decomposing wood

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Geoprobe Soil Boring Log

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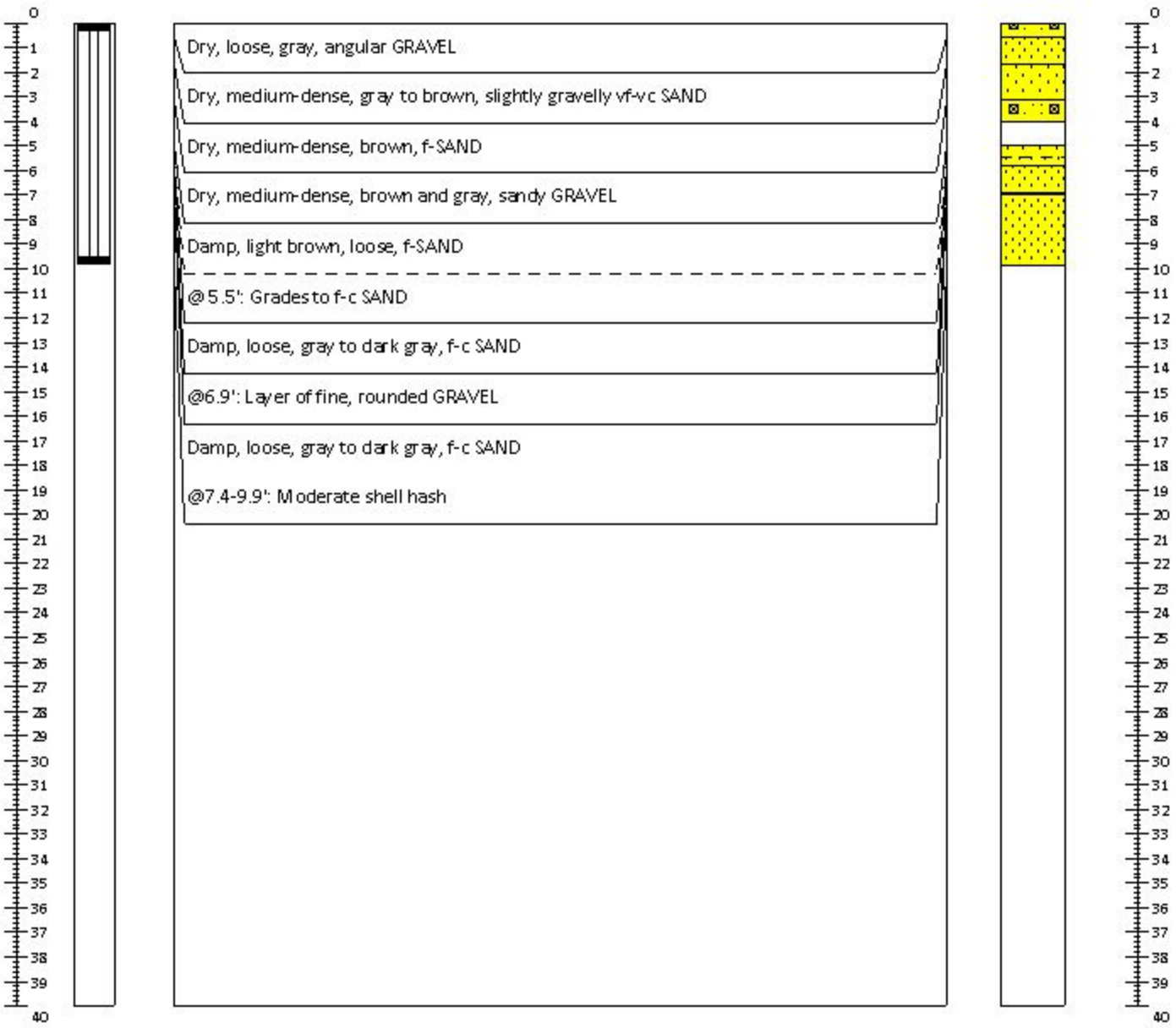
SMU2-B1

Project: Port Gamble	Location: Port Gamble, WA	Method: Geoprobe
Project #: 130388-01.02	Northing: 317177.1148 Easting: 1211497.184	Total Depth (ft): 10
Client: Pope Resources LP and OPG Properties LLC	Horizontal Datum: NAD83 WA State Plane North Zone	Logged By: Delaney Peterson
Collection Date: 7/9/2014		
Contractor: Cascade Drilling		

Recovered Depth (ft)	Sample Recovery	Soil Description	Graphic Log	Recovered Depth (ft)
		Samples and descriptions are in recovered depths. Classification scheme based on USCS		



Dry, loose, gray, angular GRAVEL

Dry, medium-dense, gray to brown, slightly gravelly vf-vc SAND

Dry, medium-dense, brown, f-SAND

Dry, medium-dense, brown and gray, sandy GRAVEL

Damp, light brown, loose, f-SAND

@5.5': Grades to f-c SAND

Damp, loose, gray to dark gray, f-c SAND

@6.9': Layer of fine, rounded GRAVEL

Damp, loose, gray to dark gray, f-c SAND

@7.4-9.9': Moderate shell hash

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SMU2-B2

Project: Port Gamble	Location: Port Gamble, WA	Method: Geoprobe
Project #: 130388-01.02	Northing: 317057.6012 Easting: 1211785.097	Total Depth (ft): 10
Client: Pope Resources LP and OPG Properties LLC	Horizontal Datum: NAD83 WA State Plane North Zone	Logged By: Delaney Peterson
Collection Date: 7/9/2014		
Contractor: Cascade Drilling		

Recovered Depth (ft)	Sample Recovery	Soil Description	Graphic Log	Recovered Depth (ft)
0		Samples and descriptions are in recovered depths. Classification scheme based on USCS		0
1		Dry, loose, gray, angular GRAVEL		1
2		Grades to dry, loose, gray, gravelly f-c SAND		2
3		Dry, loose, light gray, slightly gravelly f-c SAND		3
4		Damp, loose to medium-dense, light brown f-SAND		4
5		Damp, loose to medium-dense, light brown f-SAND		5
6		Layer of gravelly f-c SAND		6
7		Damp, loose to medium-dense, light brown f-SAND		7
8		@6.8': Piece of orange aggregate (1" diameter)		8
9		Damp, loose, gray, f-c SAND with interbedded layers of shell hash		9
10		Layer of vf-SAND		10
11		@9.1': Moderate shells		11
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Geoprobe Soil Boring Log

SMU3-B1

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Project: Port Gamble	Location: Port Gamble, WA	Method: Geoprobe
Project #: 130388-01.02	Northing: 316770.0533 Easting: 1211708.156	Total Depth (ft): 10
Client: Pope Resources LP and OPG Properties LLC	Horizontal Datum: NAD83 WA State Plane North Zone	Logged By: Delaney Peterson
Collection Date: 7/9/2014		
Contractor: Cascade Drilling		

Recovered Depth (ft)	Sample Recovery	Soil Description	Graphic Log	Recovered Depth (ft)
0				0
1		Dry, loose, gray, angular GRAVEL		1
2		Grades to dry, loose, gray, gravelly f-c SAND		2
3		Dry, dense, dark to light gray, gravelly, silty f-c SAND		3
4		@1.3': Grades to light brown		4
5				5
6				6
7				7
8		Slightly damp, loose to medium-dense, brown f-SAND		8
9				9
10		Slightly damp, loose to medium-dense, brown f-SAND		10
11				11
12		Dry, loose, gray and brown, f-c SAND, trace gravel		12
13				13
14		@6.4': Layer of angular GRAVEL		14
15				15
16		Damp, medium-dense, brown, slightly clayey, c-sandy GRAVEL		16
17				17
18		@7': Layer of angular GRAVEL		18
19				19
20		Damp, medium-dense, brown, slightly clayey, c-sandy GRAVEL @7.8 Grades to moist and brown		20
21				21
22				22
23				23
24				24
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SMU3-B2

Project: Port Gamble	Location: Port Gamble, WA	Method: Geoprobe
Project #: 130388-01.02	Northing: 316707.6275 Easting: 1211534.537	Total Depth (ft): 10
Client: Pope Resources LP and OPG Properties LLC	Horizontal Datum: NAD83 WA State Plane North Zone	Logged By: Delaney Peterson
Collection Date: 7/9/2014		
Contractor: Cascade Drilling		

Recovered Depth (ft)	Sample Recovery	Soil Description	Graphic Log	Recovered Depth (ft)
0		Samples and descriptions are in recovered depths. Classification scheme based on USCS		0
1		Dry, loose, gray GRAVEL		1
2		Dry, loose, gray and brown, slightly gravelly, sandy SILT		2
3				3
4				4
5		Grades to gravelly, silty, SAND		5
6				6
7		Slightly damp, medium-dense, brown, f-SAND		7
8				8
9		Slightly damp, medium-dense, brown and gray, slightly gravelly, f-c SAND		9
10				10
11		Dry, soft, light brown, f-sandy SILT		11
12				12
13		@5.9': 1" layer of reddish-brown ad black wood		13
14				14
15		Damp, loose, brown, gravelly, f-SAND		15
16		@6.5: Damp, dark to light brown wood		16
17				17
18		Damp, gray, f-SAND		18
19		@7.4': Layer of reddish-brown wood		19
20		@8.1': Layer of damp, light brown wood		20
21				21
22				22
23				23
24				24
25				25
26				26
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Geoprobe Soil Boring Log

SMU3-B3

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Project: Port Gamble	Location: Port Gamble, WA	Method: Geoprobe
Project #: 130388-01.02	Northing: 316627.5493 Easting: 1211394.793	Total Depth (ft): 10
Client: Pope Resources LP and OPG Properties LLC	Horizontal Datum: NAD83 WA State Plane North Zone	Logged By: Delaney Peterson
Collection Date: 7/9/2014		
Contractor: Cascade Drilling		

Recovered Depth (ft)	Sample Recovery	Soil Description	Graphic Log	Recovered Depth (ft)
0–40		Samples and descriptions are in recovered depths. Classification scheme based on USCS		0–40
		Dry, loose, light brown, gravelly f-SAND		
		@0.9': Grades to medium-dense @1.2': Grades to gray		
		Dry, dense, gray, slightly f-sandy angular GRAVEL		
		Damp, loose, brown, f-SAND		
		Dry, gray, loose, gravelly f-c SAND		
		Dry, loose, light brown, f-SAND, trace gravel		
		@7.2': Grades to damp and medium-dense		
		@8.5': Grades to gravelly f-c SAND		
		Damp, loose, grayish-brown, f-SAND		

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SMU3-B4

Project: Port Gamble	Location: Port Gamble, WA	Method: Geoprobe
Project #: 130388-01.02	Northing: 316522.4317 Easting: 1211238.714	Total Depth (ft): 10
Client: Pope Resources LP and OPG Properties LLC	Horizontal Datum: NAD83 WA State Plane North Zone	Logged By: Delaney Peterson
Collection Date: 7/9/2014		
Contractor: Cascade Drilling		

Recovered Depth (ft)	Sample Recovery	Soil Description	Graphic Log	Recovered Depth (ft)
0		Samples and descriptions are in recovered depths. Classification scheme based on USCS		0
1		Dry, loose, light brown, gravelly silty SAND		1
2		Dry, medium-dense, light gray, silty, sandy GRAVEL (concrete slab)		2
3		Dry, loose, light brown, gravelly f-c SAND		3
4		Degraded		4
5		Damp, loose, gray, f-SAND		5
6		@3.1': Grades to slightly shelly		6
7		Dry, medium-dense, brown and gray, f-c sandy GRAVEL		7
8		Damp, medium-dense, brownish-gray, f-SAND @6.2': Thick piece of shell @7.1': Grades to gray @8.2': Grades to wet @8.4': Small bit of porcelain with markings ("Dublin")		8
9				9
10				10
11				11
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SMU3-B5

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Project: Port Gamble	Location: Port Gamble, WA	Method: Geoprobe
Project #: 130388-01.02	Northing: 316348.7979 Easting: 1211126.695	Total Depth (ft): 10
Client: Pope Resources LP and OPG Properties LLC	Horizontal Datum: NAD83 WA State Plane North Zone	Logged By: Delaney Peterson
Collection Date: 7/9/2014		
Contractor: Cascade Drilling		

Recovered Depth (ft)	Sample Recovery	Soil Description	Graphic Log	Recovered Depth (ft)
0		Samples and descriptions are in recovered depths. Classification scheme based on USCS		0
1		Dry, loose, brown twigs and organic debris		1
2		Dry, loose, gray to brown, silty angular GRAVEL		2
3		@1': Grades to gravelly, silty SAND		3
4		Dry, medium-dense, light gray, sandy angular GRAVEL (concrete)		4
5		Layer of damp, loose, brown and gray f-SAND		5
6		Dry, medium-dense, light gray, sandy angular GRAVEL (concrete)		6
7		@ 2.6': Pocket of brown, silty, clayey f-SAND		7
8		Damp, gray and black, f-c SAND, trace shell fragments		8
9		Dry, soft, brown, gravelly SILT, slight wood debris		9
10		Dry, loose, gray, gravelly, silty f-SAND		10
11		@5.6': Grades to gray, silty SAND		11
12		Damp, loose, grayish brown, f-c SAND		12
13		@5.9': Pocket of dark gray CLAY		13
14		Damp, medium-dense, gray, gravelly m-c SAND		14
15		Dry, loose, light gray, gravelly f-c SAND		15
16		Light brown and red-brown wood		16
17				17
18				18
19				19
20				20
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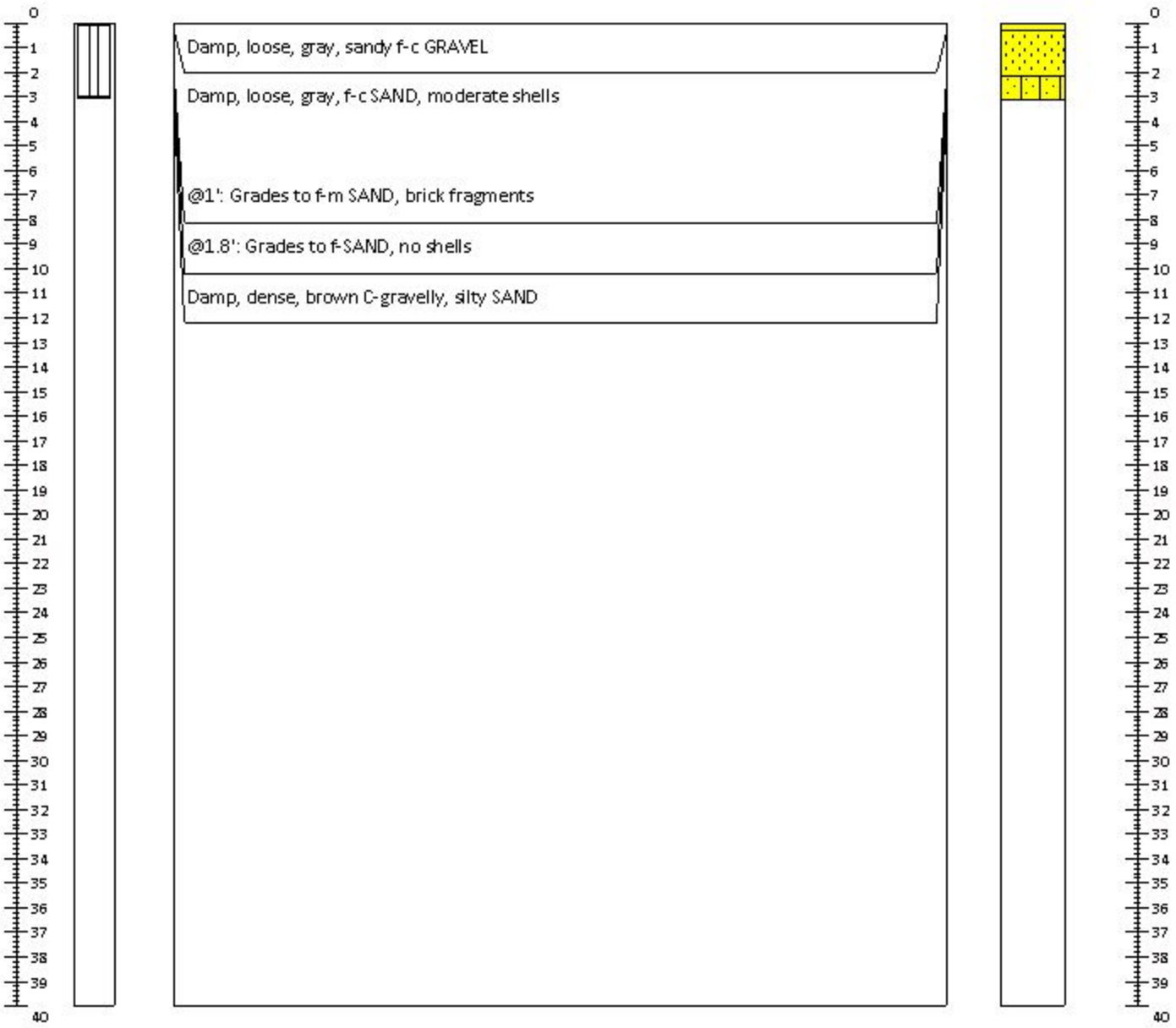
SMU3-I1

Project: Port Gamble	Location: Port Gamble, WA	Method: Geoprobe
Project #: 130388-01.02	Northing: 317610.2812 Easting: 1211465.813	Total Depth (ft): 4
Client: Pope Resources LP and OPG Properties LLC	Horizontal Datum: NAD83 WA State Plane North Zone	Logged By: Delaney Peterson
Collection Date: 7/11/2014		
Contractor: Cascade Drilling		

Recovered Depth (ft)	Sample Recovery	Soil Description	Graphic Log	Recovered Depth (ft)
		Samples and descriptions are in recovered depths. Classification scheme based on USCS		



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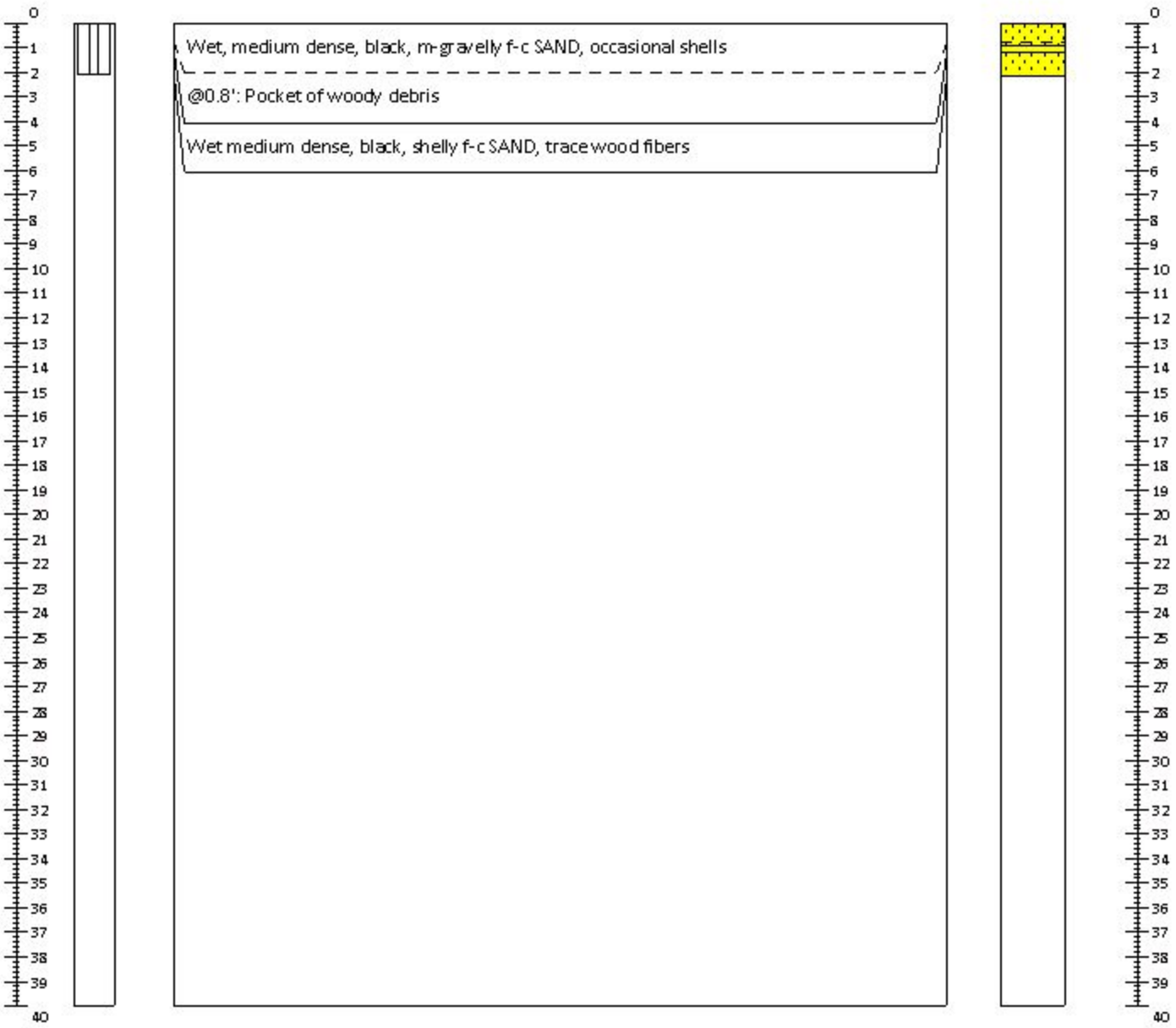
SMU3-I2

Project: Port Gamble	Location: Port Gamble, WA	Method: Geoprobe
Project #: 130388-01.02	Northing: 316639.5089 Easting: 1211575.054	Total Depth (ft): 4
Client: Pope Resources LP and OPG Properties LLC	Horizontal Datum: NAD83 WA State Plane North Zone	Logged By: Delaney Peterson
Collection Date: 7/11/2014		
Contractor: Cascade Drilling		

Recovered Depth (ft)	Sample Recovery	Soil Description	Graphic Log	Recovered Depth (ft)
		Samples and descriptions are in recovered depths. Classification scheme based on USCS		



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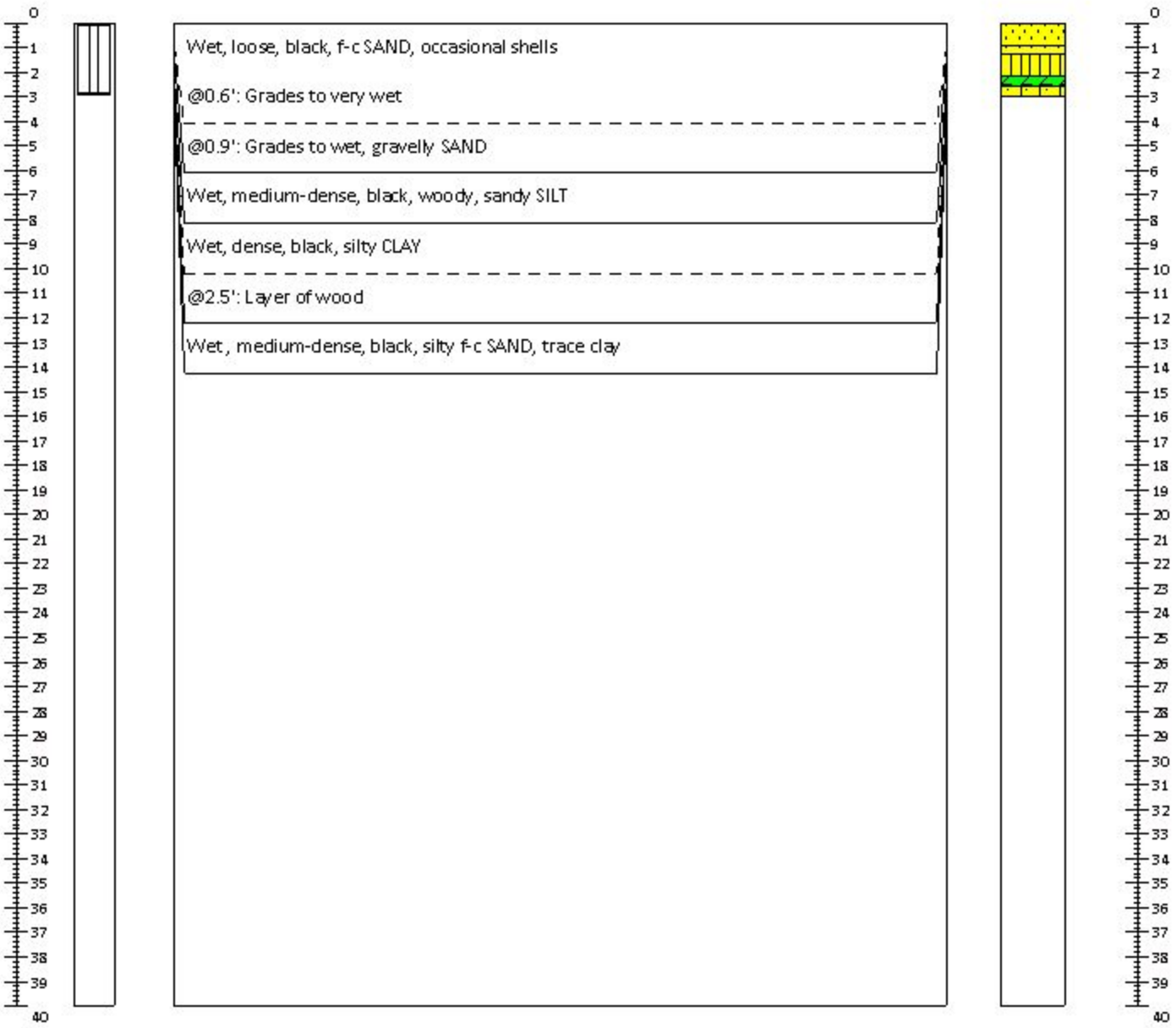
SMU3-I3

Project: Port Gamble	Location: Port Gamble, WA	Method: Geoprobe
Project #: 130388-01.02	Northing: 316574.2846 Easting: 1211445.395	Total Depth (ft): 4
Client: Pope Resources LP and OPG Properties LLC	Horizontal Datum: NAD83 WA State Plane North Zone	Logged By: Delaney Peterson
Collection Date: 7/11/2014		
Contractor: Cascade Drilling		

Recovered Depth (ft)	Sample Recovery	Soil Description	Graphic Log	Recovered Depth (ft)
		Samples and descriptions are in recovered depths. Classification scheme based on USCS		



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Geoprobe Soil Boring Log

SMU3-I4

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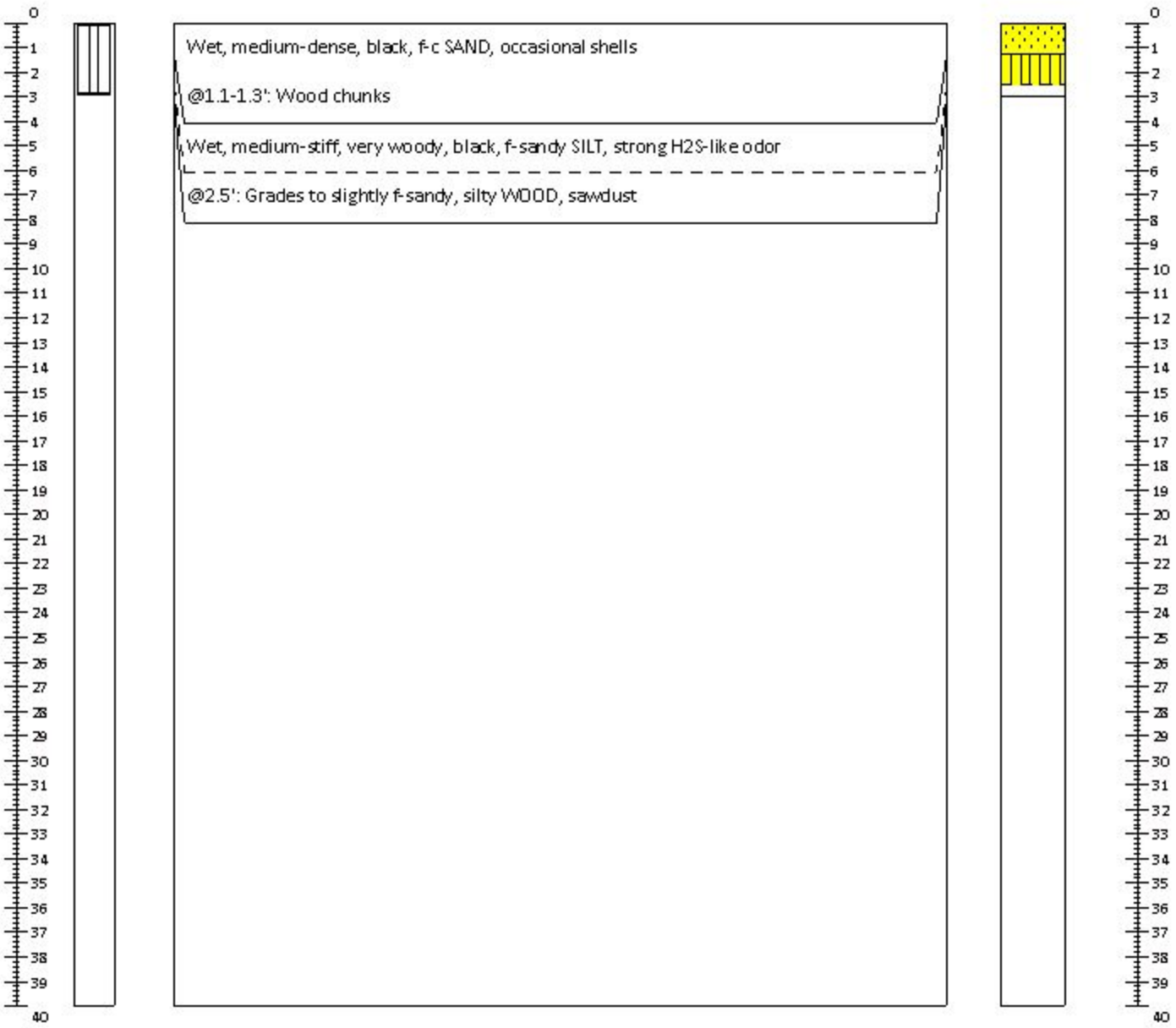
Project: Port Gamble	Location: Port Gamble, WA	Method: Geoprobe
Project #: 130388-01.02	Northing: 316465.8682 Easting: 1211284.844	Total Depth (ft): 4
Client: Pope Resources LP and OPG Properties LLC	Horizontal Datum: NAD83 WA State Plane North Zone	Logged By: Delaney Peterson
Collection Date: 7/11/2014		
Contractor: Cascade Drilling		

Recovered Depth (ft)	Sample Recovery	Soil Description	Graphic Log	Recovered Depth (ft)
		Samples and descriptions are in recovered depths. Classification scheme based on USCS		



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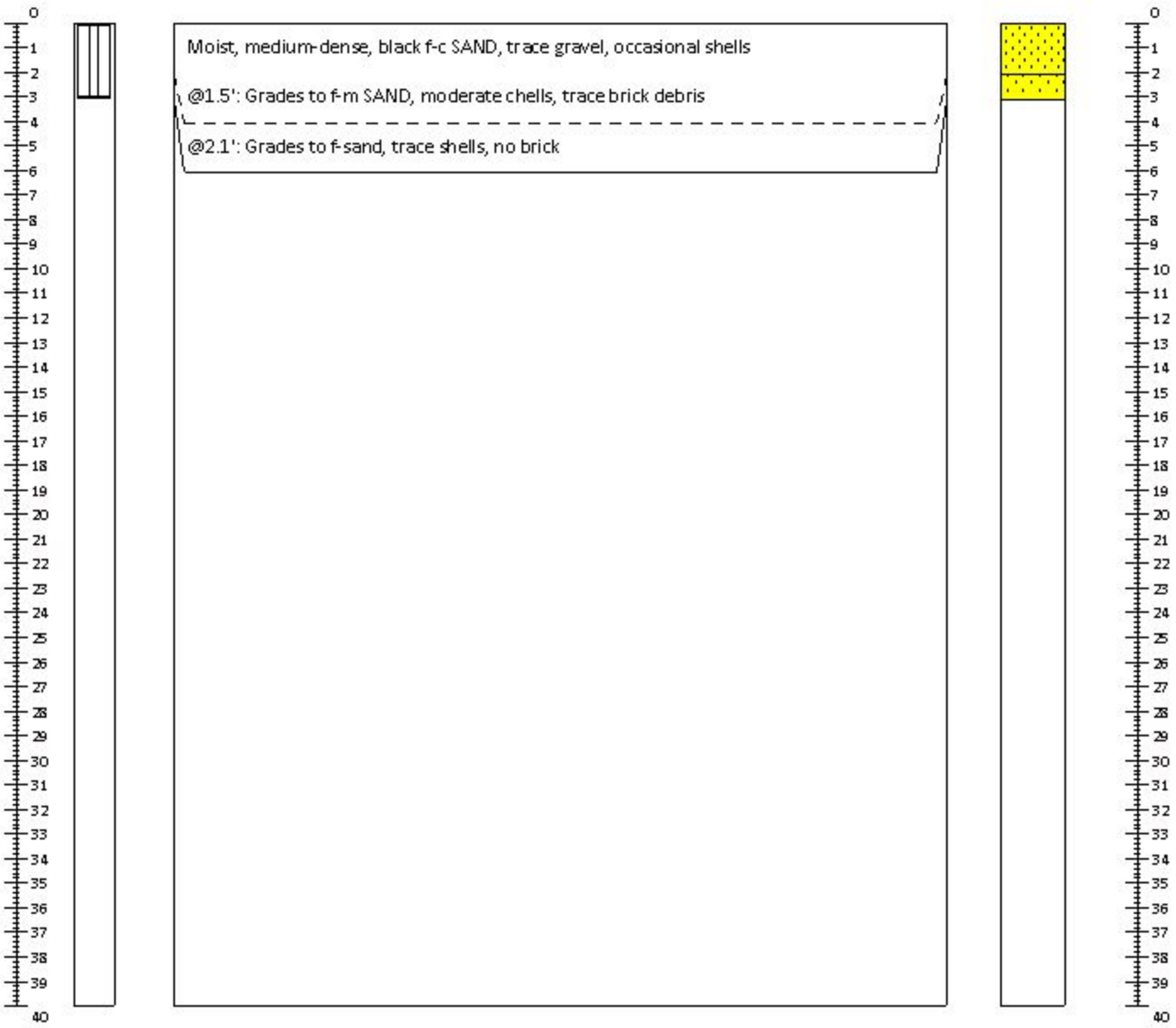
SMU3-I5

Project: Port Gamble	Location: Port Gamble, WA	Method: Geoprobe
Project #: 130388-01.02	Northing: 316354.1243 Easting: 1211181.735	Total Depth (ft): 4
Client: Pope Resources LP and OPG Properties LLC	Horizontal Datum: NAD83 WA State Plane North Zone	Logged By: Delaney Peterson
Collection Date: 7/11/2014		
Contractor: Cascade Drilling		

Recovered Depth (ft)	Sample Recovery	Soil Description	Graphic Log	Recovered Depth (ft)
		Samples and descriptions are in recovered depths. Classification scheme based on USCS		



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SMU4-B1

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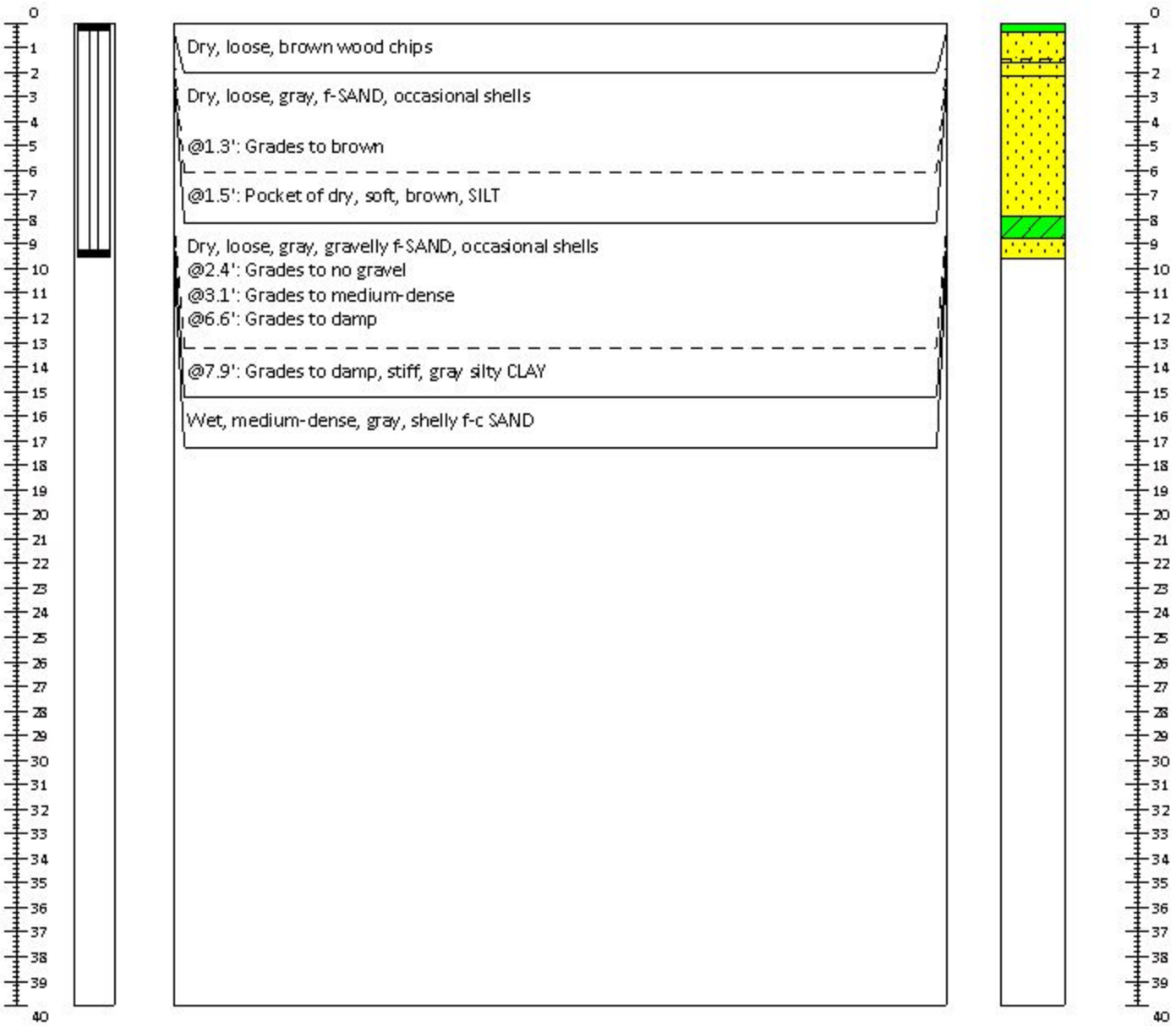
Project: Port Gamble	Location: Port Gamble, WA	Method: Geoprobe
Project #: 130388-01.02	Northing: 316202.0295 Easting: 1211086.77	Total Depth (ft): 10
Client: Pope Resources LP and OPG Properties LLC	Horizontal Datum: NAD83 WA State Plane North Zone	Logged By: Delaney Peterson
Collection Date: 7/10/2014		
Contractor: Cascade Drilling		

Recovered Depth (ft)	Sample Recovery	Soil Description	Graphic Log	Recovered Depth (ft)
		Samples and descriptions are in recovered depths. Classification scheme based on USCS		



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SMU4-B2

Project: Port Gamble	Location: Port Gamble, WA	Method: Geoprobe
Project #: 130388-01.02	Northing: 315859.77 Easting: 1211036.837	Total Depth (ft): 10
Client: Pope Resources LP and OPG Properties LLC	Horizontal Datum: NAD83 WA State Plane North Zone	Logged By: Delaney Peterson
Collection Date: 7/10/2014		
Contractor: Cascade Drilling		

Recovered Depth (ft)	Sample Recovery	Soil Description	Graphic Log	Recovered Depth (ft)
0		Samples and descriptions are in recovered depths. Classification scheme based on USCS		0
1		Dry, loose, brown, woody debris		1
2		Dry, loose, gray f-SAND, occasional shells		2
3				3
4				4
5		@1.5': Grades to shelly sand		5
6				6
7		Damp, loose, gray f-SAND		7
8				8
9		Dry, dense, light gray, gravelly f-c SAND (concrete)		9
10				10
11		Damp, medium-dense, dark gray, f-SAND		11
12		@3.8': Grades to dry, loose, light gray		12
13		@5-5.7': Slight woody debris		13
14		@5.8': Occasional shells		14
15				15
16		Dry, medium-dense, light gray, gravelly f-SAND		16
17				17
18		Damp, loose, gray, f-SAND		18
19				19
20		Interbedded layers of damp, medium-stiff, dark gray, silty CLAY		20
21				21
22				22
23				23
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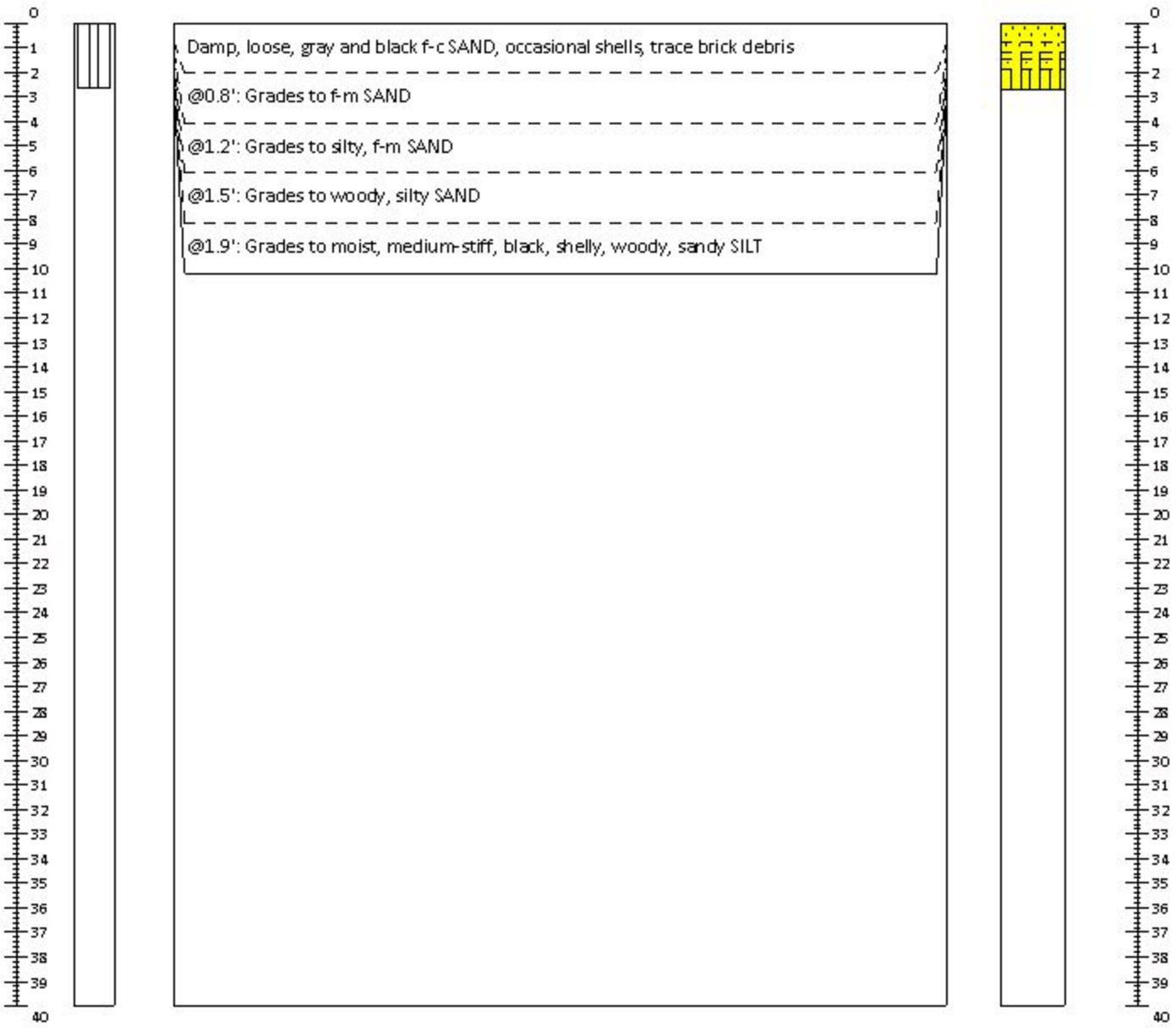
SMU4-I1

Project: Port Gamble	Location: Port Gamble, WA	Method: Geoprobe
Project #: 130388-01.02	Northing: 316200.1243 Easting: 1211172.862	Total Depth (ft): 4
Client: Pope Resources LP and OPG Properties LLC	Horizontal Datum: NAD83 WA State Plane North Zone	Logged By: Delaney Peterson
Collection Date: 7/10/2014		
Contractor: Cascade Drilling		

Recovered Depth (ft)	Sample Recovery	Soil Description	Graphic Log	Recovered Depth (ft)
		Samples and descriptions are in recovered depths. Classification scheme based on USCS		



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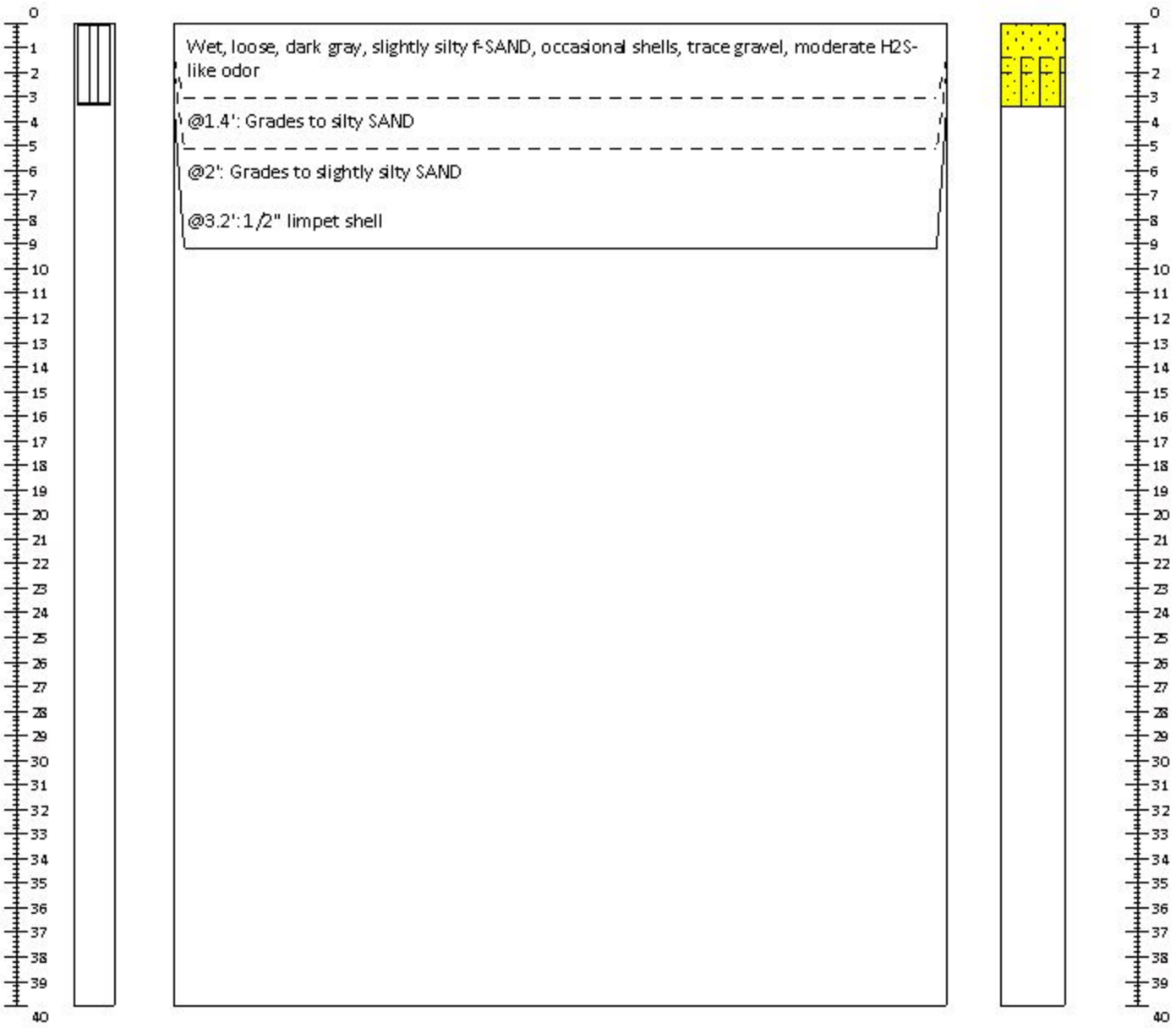
Geoprobe Soil Boring Log

SMU4-I2

Sheet 1 of 1

Project: Port Gamble	Location: Port Gamble, WA	Method: Geoprobe
Project #: 130388-01.02	Northing: 315853.353 Easting: 1211200.179	Total Depth (ft): 4
Client: Pope Resources LP and OPG Properties LLC	Horizontal Datum: NAD83 WA State Plane North Zone	Logged By: Delaney Peterson
Collection Date: 7/10/2014		
Contractor: Cascade Drilling		

Recovered Depth (ft)	Sample Recovery	Soil Description	Graphic Log	Recovered Depth (ft)
		Samples and descriptions are in recovered depths. Classification scheme based on USCS		



Wet, loose, dark gray, slightly silty f-SAND, occasional shells, trace gravel, moderate H2S-like odor

@1.4': Grades to silty SAND

@2': Grades to slightly silty SAND

@3.2': 1/2" limpet shell

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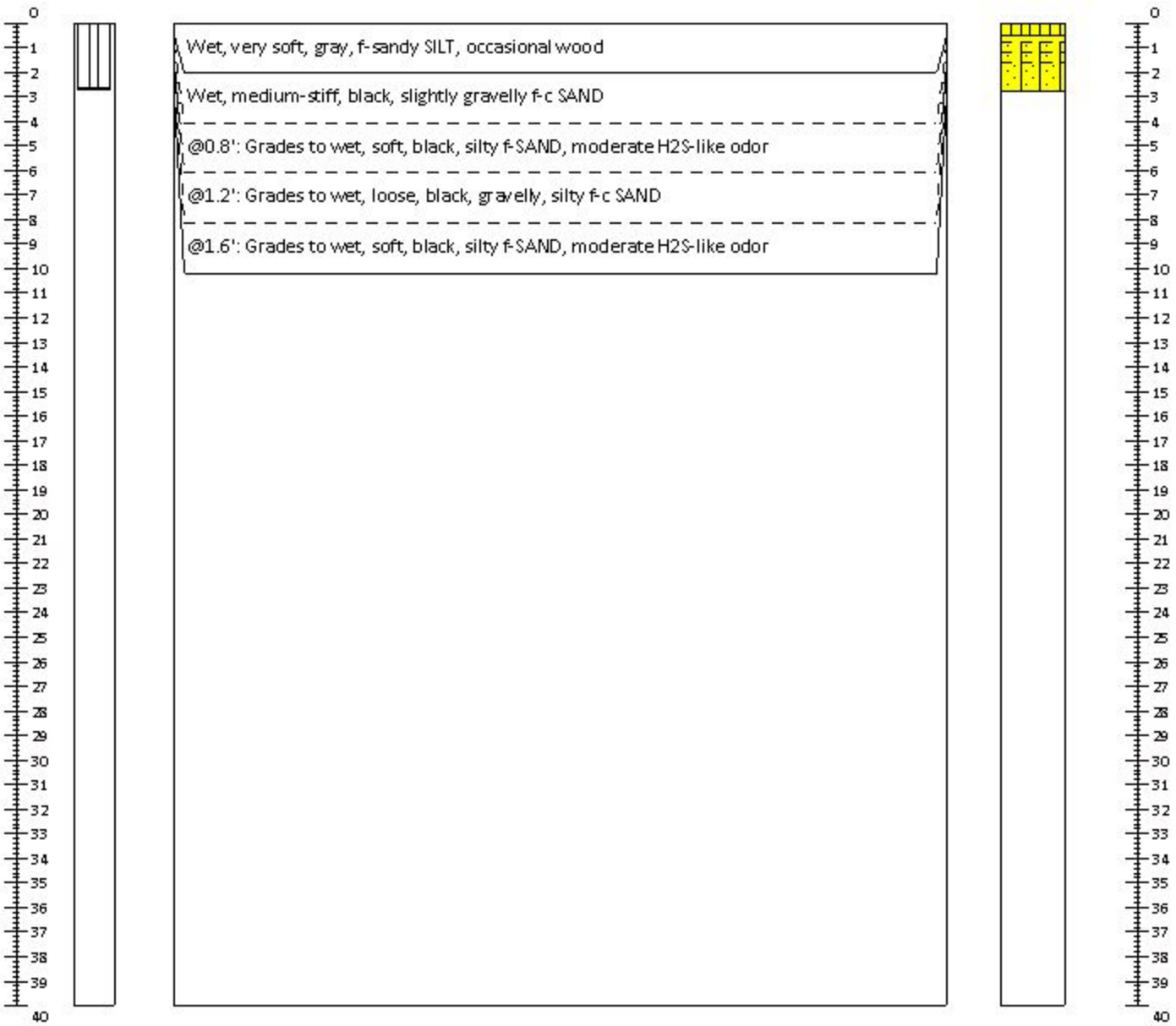
Geoprobe Soil Boring Log

SMU4-I3

Sheet 1 of 1

Project: Port Gamble	Location: Port Gamble, WA	Method: Geoprobe
Project #: 130388-01.02	Northing: 316013.4239 Easting: 1211169.443	Total Depth (ft): 4
Client: Pope Resources LP and OPG Properties LLC	Horizontal Datum: NAD83 WA State Plane North Zone	Logged By: Delaney Peterson
Collection Date: 7/10/2014		
Contractor: Cascade Drilling		

Recovered Depth (ft)	Sample Recovery	Soil Description	Graphic Log	Recovered Depth (ft)
		Samples and descriptions are in recovered depths. Classification scheme based on USCS		



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Geoprobe Soil Boring Log

Sheet 1 of 1

SMU5-B1

Project: Port Gamble	Location: Port Gamble, WA	Method: Geoprobe
Project #: 130388-01.02	Northing: 315694.2555 Easting: 1211000.761	Total Depth (ft): 10
Client: Pope Resources LP and OPG Properties LLC	Horizontal Datum: NAD83 WA State Plane North Zone	Logged By: Delaney Peterson
Collection Date: 7/10/2014		
Contractor: Cascade Drilling		

Recovered Depth (ft)	Sample Recovery	Soil Description	Graphic Log	Recovered Depth (ft)
0		Samples and descriptions are in recovered depths. Classification scheme based on USCS		0
1		Dry, loose, gray, subangular and rounded GRAVEL		1
2		@0,4': Grades to damp, medium-dense, gray, slightly gravelly f-c SAND		2
3		Damp, gray, sandy GRAVEL		3
4		@1.1': Pocket of damp, stiff, dark gray, CLAY		4
5		Damp, gray, sandy GRAVEL		5
6		Damp, stiff, gray, gravelly, sandy CLAY		6
7		Damp, gray, sandy GRAVEL		7
8		@ 2.3': Grades to dry, loose, black, slightly clayey, gravelly f-c SAND		8
9		@2.7-3.3': Trace wood debris		9
10		Damp, loose, gray, f-SAND, trace shells		10
11		Damp, loose, gray, gravelly f-SAND, small pockets of dark gray CLAY		11
12		Damp, medium-dense, black and gray, gravelly f-c SAND		12
13		Moist, medium-dense, gray, shelly f-SAND		13
14		Moist, dark gray, f-c SAND, trace shells		14
15		@7': Grades to black, silty f-c SAND		15
16		@7.7-7.8': Layer of moist, soft, black, slightly f-sandy SILT		16
17		Moist, loose, dark gray, f-SAND		17
18		@8.6-8.7': Layer of moist, stiff, brown, woody SILT		18
19		Moist, loose, dark gray, f-SAND, with interbedded pockets of black SILT and fibrous woody debris		19
20				20
21				21
22				22
23				23
24				24
25				25
26				26
27				27
28				28
29				29
30				30
31				31
32				32
33				33
34				34
35				35
36				36
37				37
38				38
39				39
40				40

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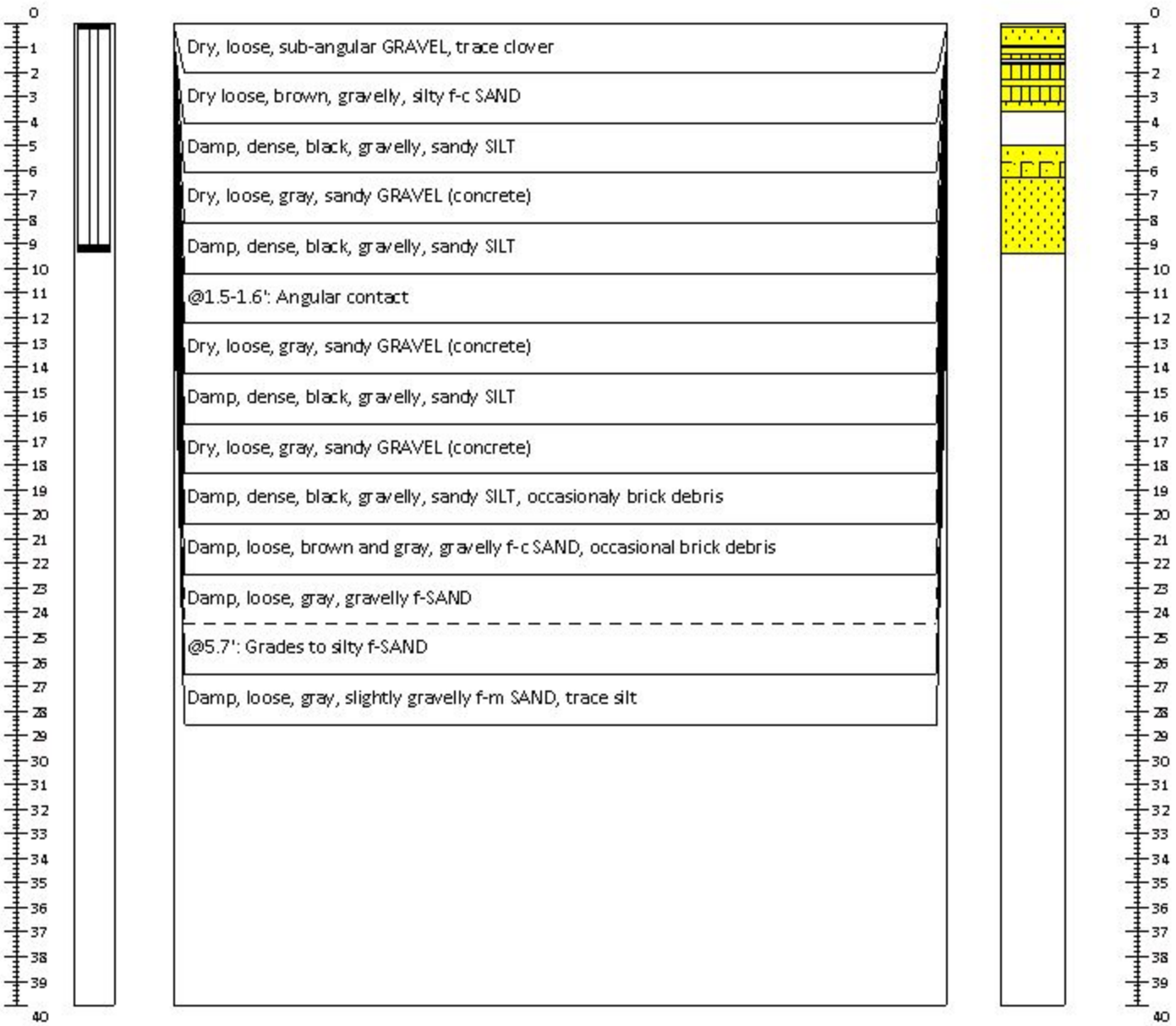
Geoprobe Soil Boring Log

Sheet 1 of 1

SMU5-B2

Project: Port Gamble	Location: Port Gamble, WA	Method: Geoprobe
Project #: 130388-01.02	Northing: 315599.1521 Easting: 1210885.292	Total Depth (ft): 10
Client: Pope Resources LP and OPG Properties LLC	Horizontal Datum: NAD83 WA State Plane North Zone	Logged By: Delaney Peterson
Collection Date: 7/10/2015		
Contractor: Cascade Drilling		

Recovered Depth (ft)	Sample Recovery	Soil Description	Graphic Log	Recovered Depth (ft)
		Samples and descriptions are in recovered depths. Classification scheme based on USCS		



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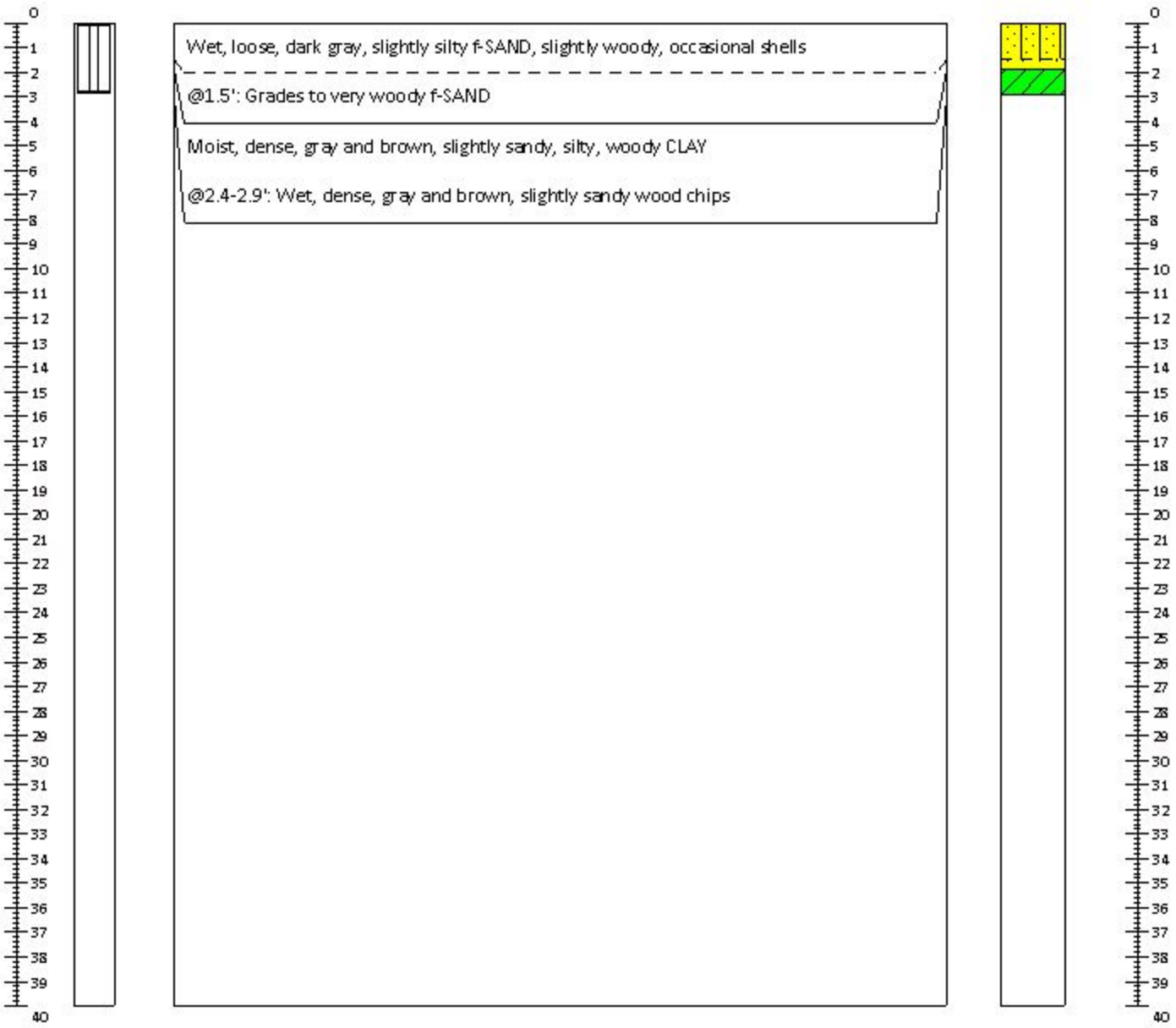
Geoprobe Soil Boring Log

Sheet 1 of 1

SMU5-I1

Project: Port Gamble	Location: Port Gamble, WA	Method: Geoprobe
Project #: 130388-01.02	Northing: 315651.544 Easting: 1211174.09	Total Depth (ft): 4
Client: Pope Resources LP and OPG Properties LLC	Horizontal Datum: NAD83 WA State Plane North Zone	Logged By: Delaney Peterson
Collection Date: 7/10/2014		
Contractor: Cascade Drilling		

Recovered Depth (ft)	Sample Recovery	Soil Description	Graphic Log	Recovered Depth (ft)
		Samples and descriptions are in recovered depths. Classification scheme based on USCS		



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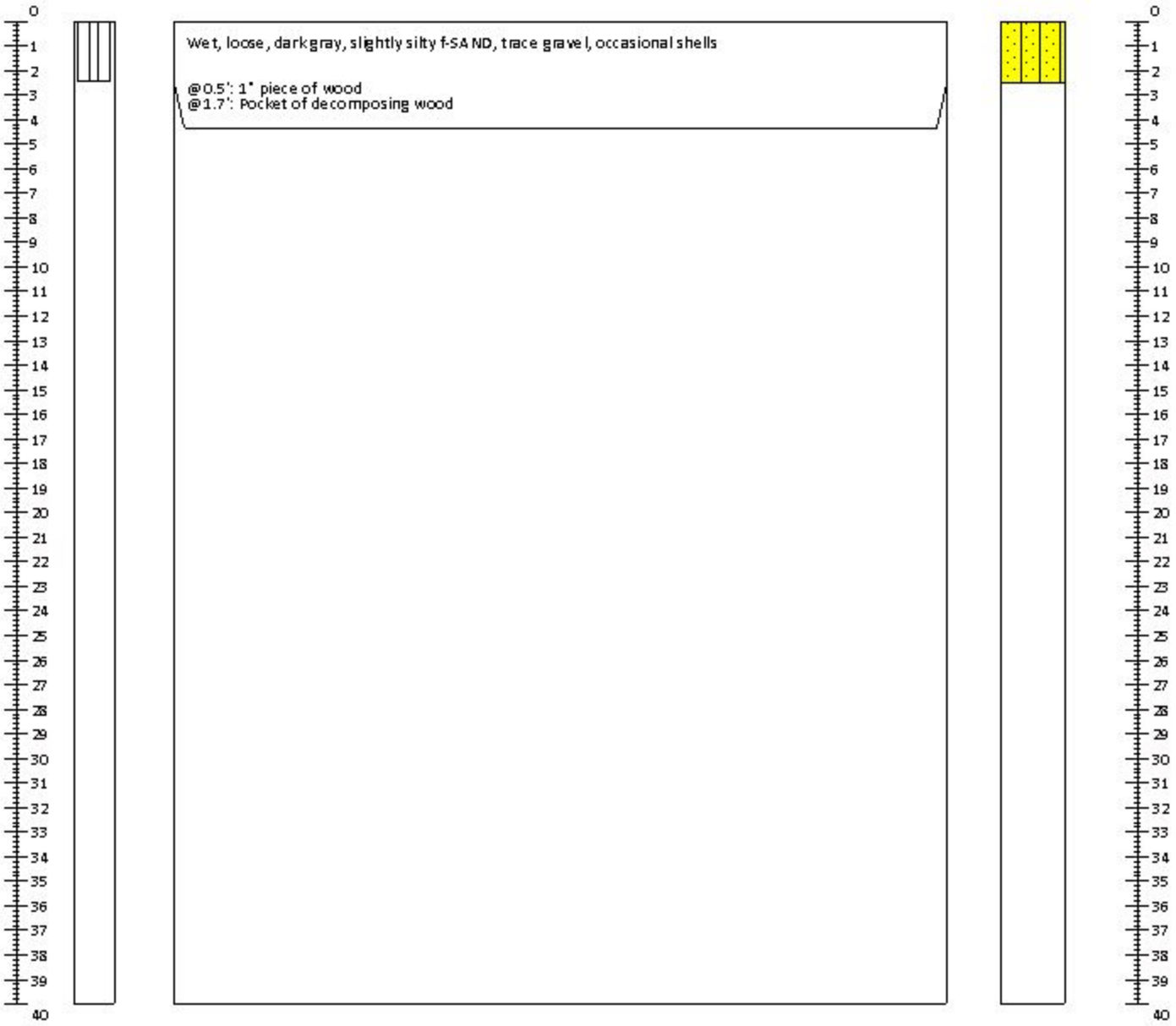
Geoprobe Soil Boring Log

Sheet 1 of 1

SMU5-I2

Project: Port Gamble	Location: Port Gamble, WA	Method: Geoprobe
Project #: 130388-01.02	Northing: 315504.1837 Easting: 1211114.479	Total Depth (ft): 4
Client: Pope Resources LP and OPG Properties LLC	Horizontal Datum: NAD83 WA State Plane North Zone	Logged By: Delaney Peterson
Collection Date: 7/10/2014		
Contractor: Cascade Drilling		

Recovered Depth (ft)	Sample Recovery	Soil Description	Graphic Log	Recovered Depth (ft)
		Samples and descriptions are in recovered depths. Classification scheme based on USCS		



Wet, loose, dark gray, slightly silty f-SAND, trace gravel, occasional shells

@0.5': 1" piece of wood
@1.7': Pocket of decomposing wood

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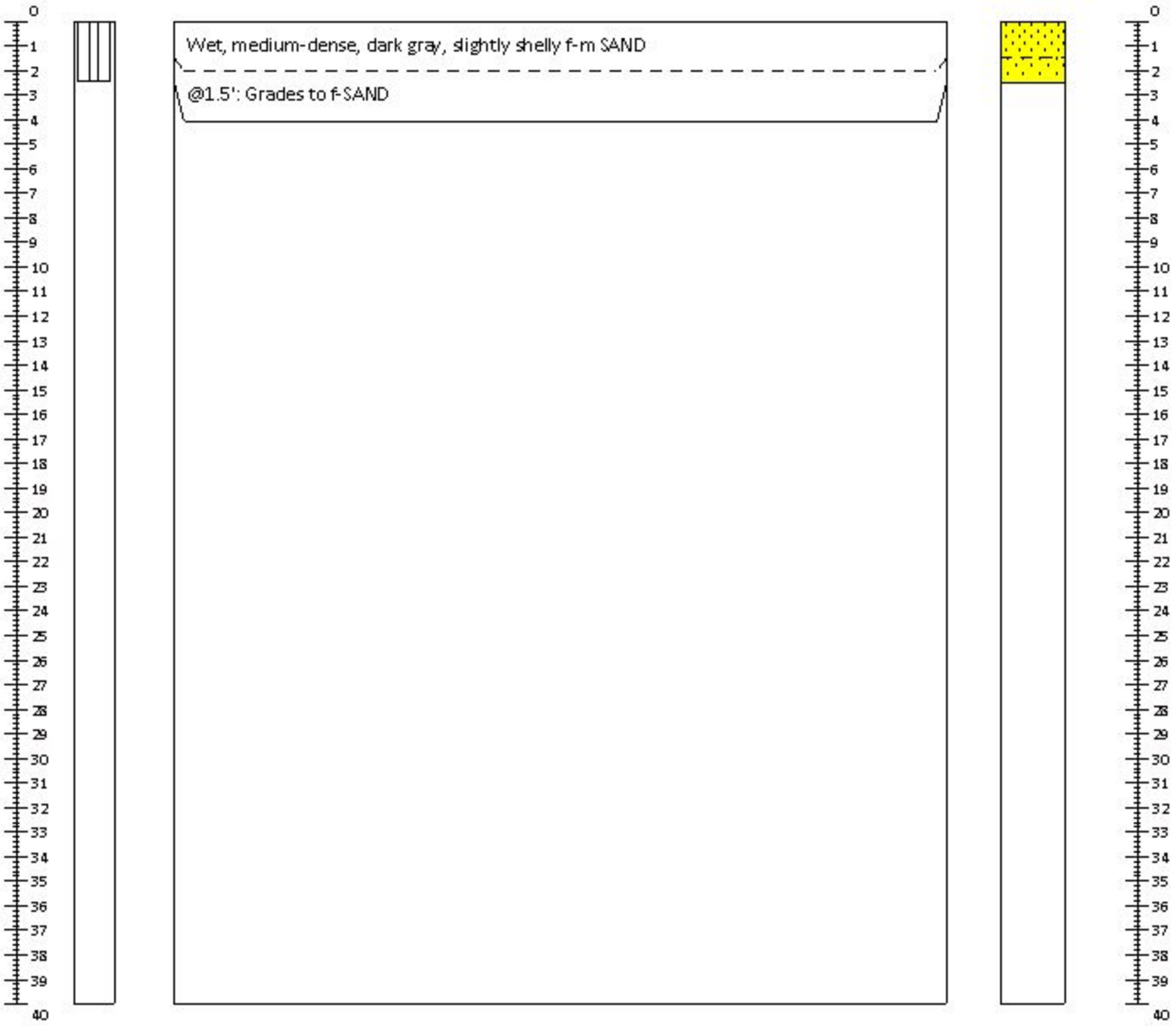
Geoprobe Soil Boring Log

SMU5-I3

Sheet 1 of 1

Project: Port Gamble	Location: Port Gamble, WA	Method: Geoprobe
Project #: 130388-01.02	Northing: 315545.7007 Easting: 1211014.286	Total Depth (ft): 4
Client: Pope Resources LP and OPG Properties LLC	Horizontal Datum: NAD83 WA State Plane North Zone	Logged By: Delaney Peterson
Collection Date: 7/10/2014		
Contractor: Cascade Drilling		

Recovered Depth (ft)	Sample Recovery	Soil Description	Graphic Log	Recovered Depth (ft)
		Samples and descriptions are in recovered depths. Classification scheme based on USCS		



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ATTACHMENT A-3-2
MUDMOLE CORE LOGS

Mudmole™ Core Summary Log

Project: Port Gamble Sediment Coring

Station: **PG-PDI-SC-01**

Maximum depth of retained sediment: 9.8 ft

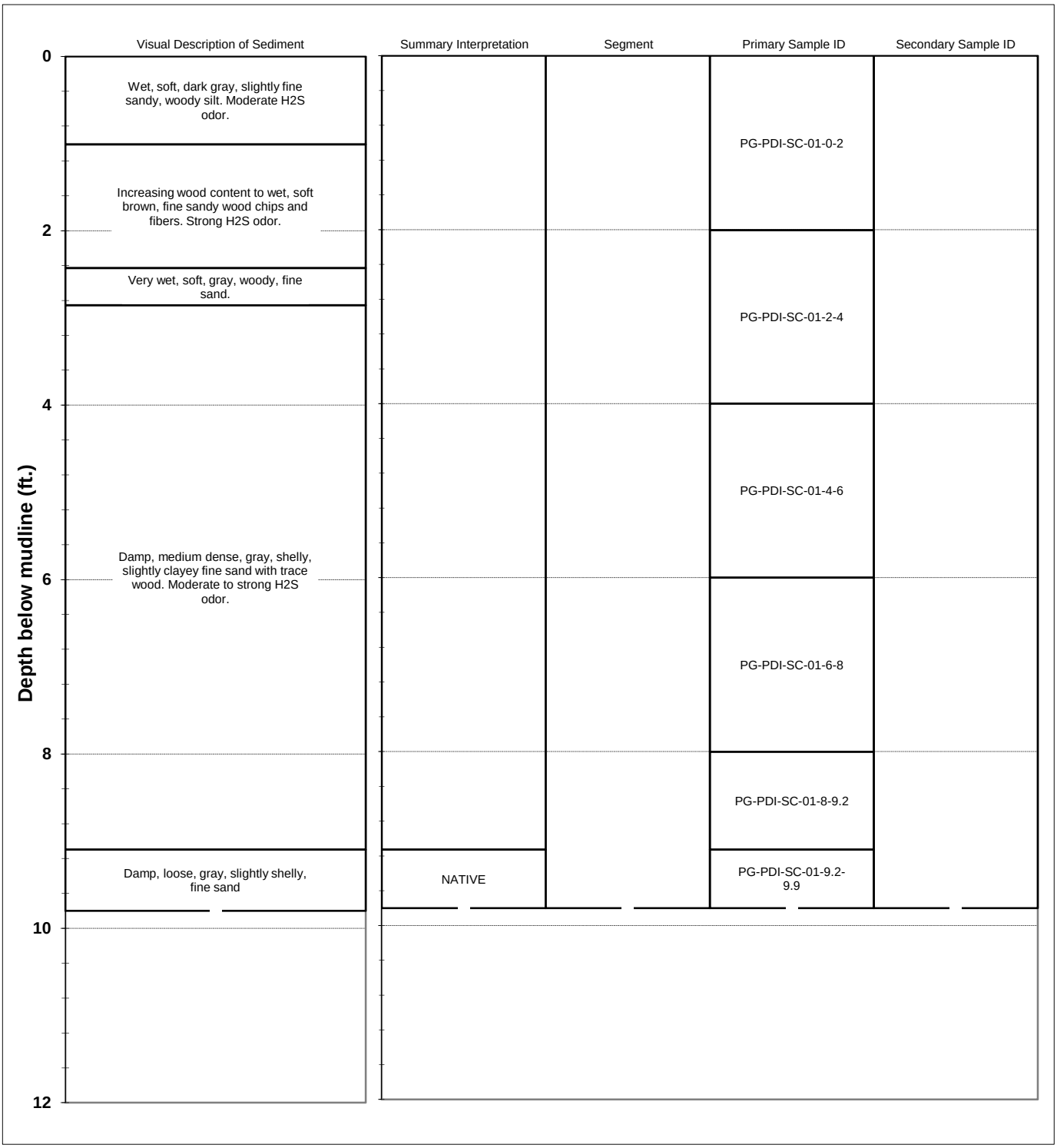
Mudline elevation: -18.0 **ft MLLW**

Percent recovery (on-deck): 71%

	Core collection	Laboratory processing
Date:	7/21/2014	7/21/2014
Time:	9:37	0:00

Field Log: DP

Summary Log: NB



File name: PG-PDI-SC-01_dp_nws
Summary Core Log

Mudmole™ Core Summary Log

Project: Port Gamble Sediment Coring

Station: **PG-PDI-SC-02R2**

Maximum depth of retained sediment: 13.1 ft

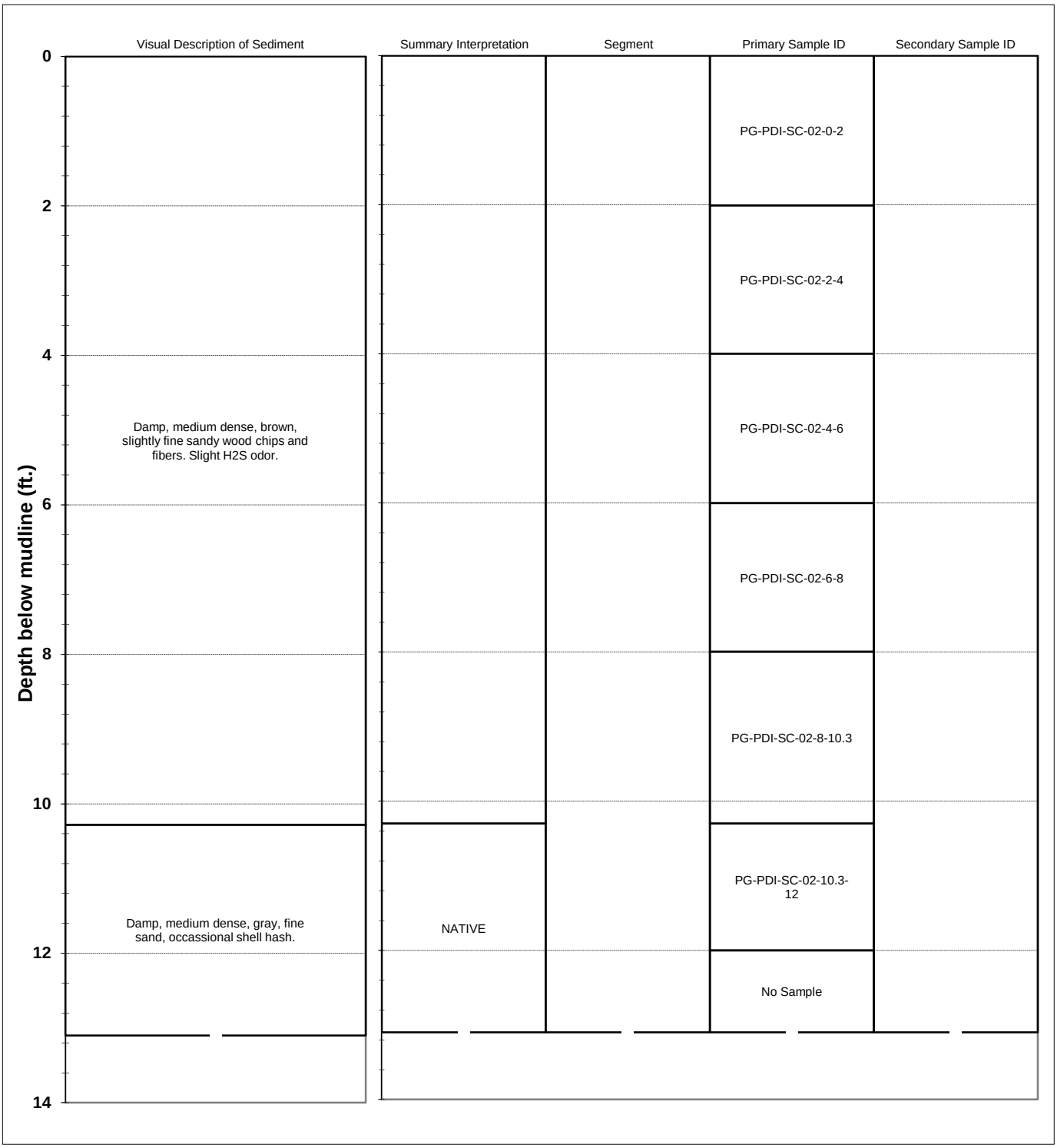
Mudline elevation: -9.0 **ft MLLW**

Percent recovery (on-deck): 70%

	Core collection	Laboratory processing
Date:	7/21/2014	7/21/2014
Time:	15:37	0:00

Field Log: DP

Summary Log: NB



File name: PG-PDI-SC-02R2_dp.xls
Summary Core Log

Mudmole™ Core Summary Log

Project: Port Gamble Sediment Coring

Station: **PG-PDI-SC-03**

Maximum depth of retained sediment: 13.3 ft

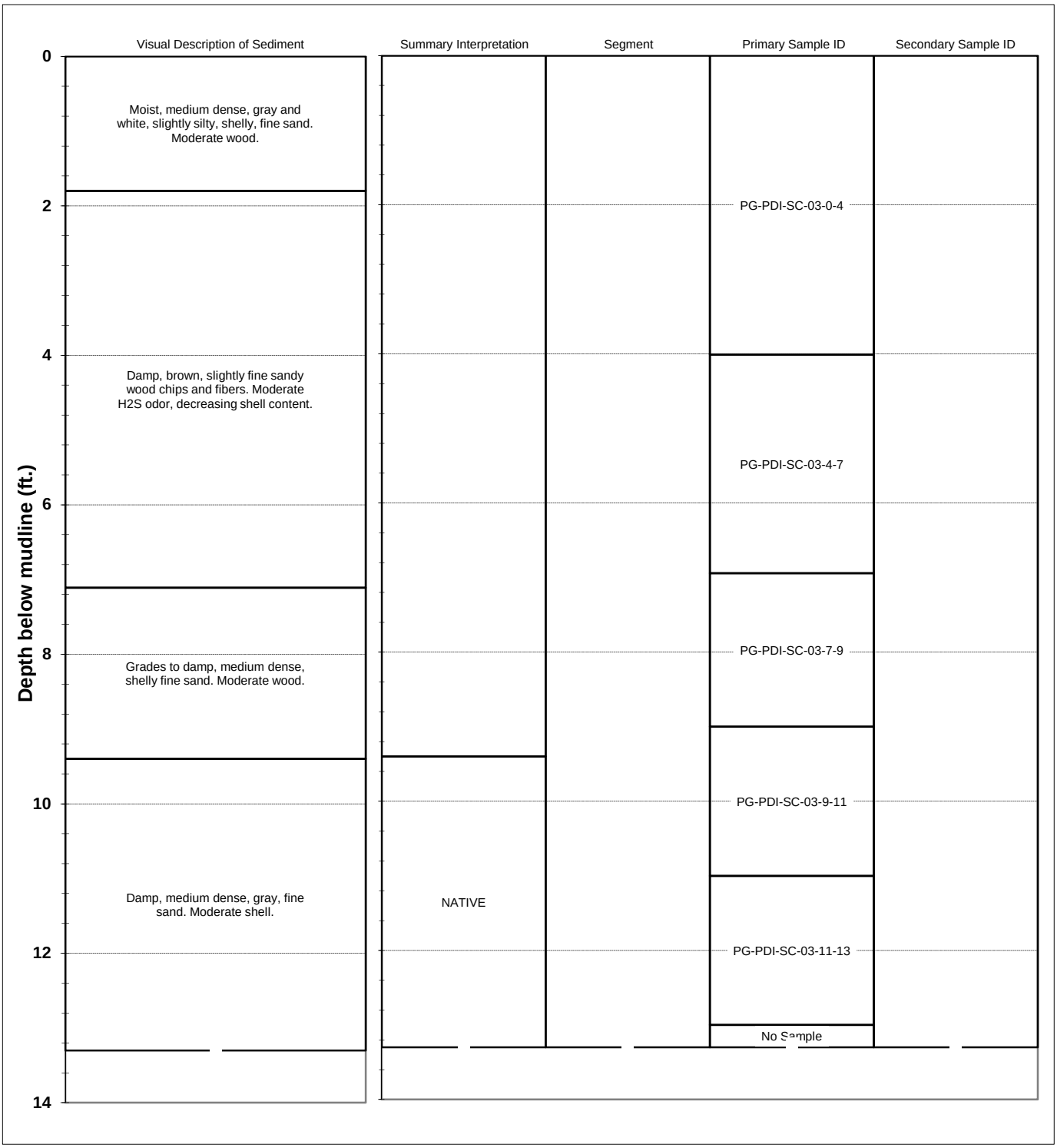
Mudline elevation: -7.4 **ft MLLW**

Percent recovery (on-deck): 50%

	Core collection	Laboratory processing
Date:	7/21/2014	7/21/2014
Time:	13:25	0:00

Field Log: DP

Summary Log: NB



File name: PG-PDI-SC-03_dp.xls
Summary Core Log

Mudmole™ Core Summary Log

Project: Port Gamble Sediment Coring

Station: **PG-PDI-SC-04**

Maximum depth of retained sediment: 8.9 ft

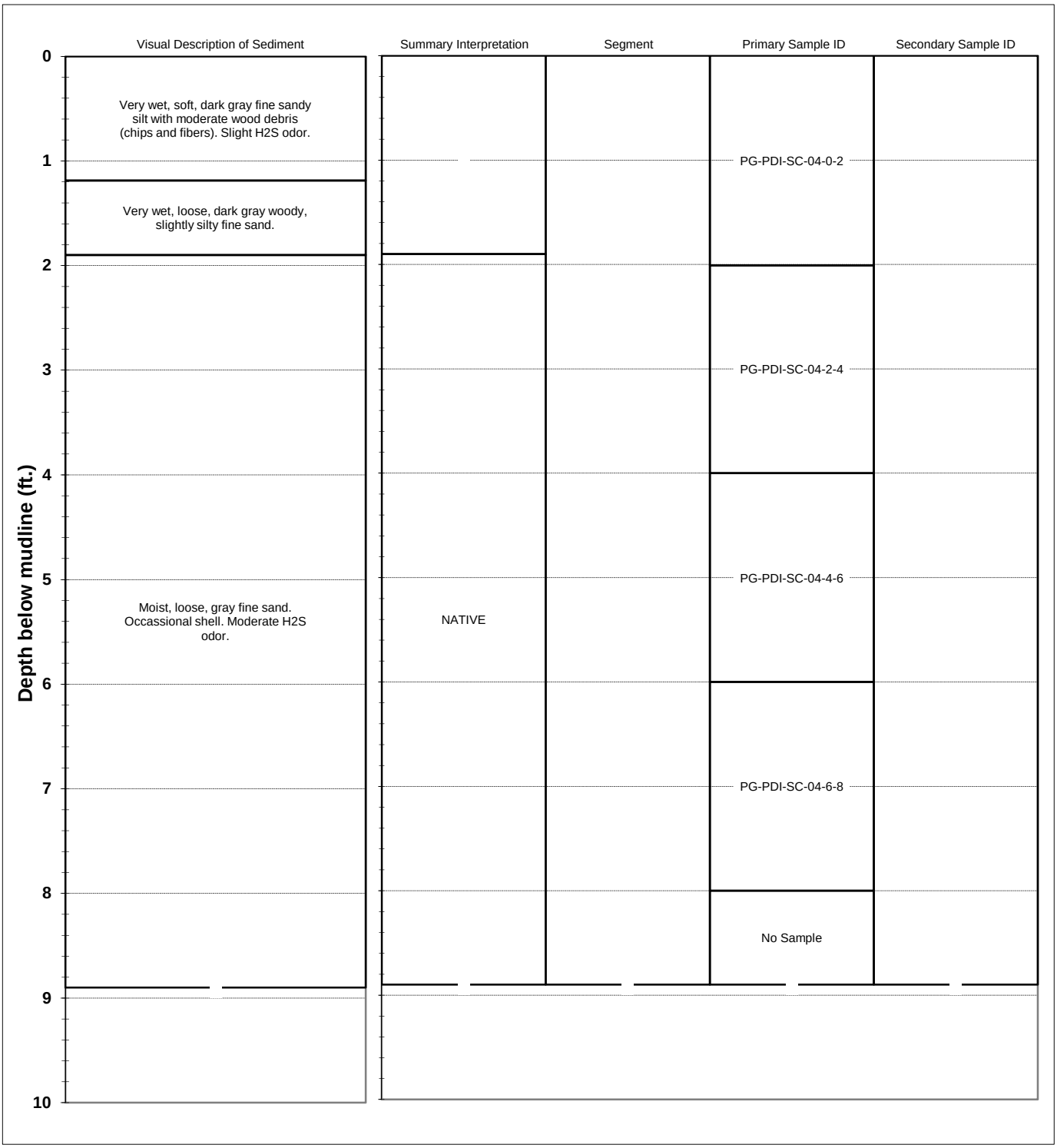
Mudline elevation: -17.1 **ft MLLW**

Percent recovery (on-deck): 85%

	Core collection	Laboratory processing
Date:	7/21/2014	7/21/2014
Time:	14:15	0:00

Field Log: DP

Summary Log: NB



File name: PG-PDI-SC-04_dp.xls
Summary Core Log

Mudmole™ Core Summary Log

Project: Port Gamble Sediment Coring

Station: **PG-PDI-SC-05r2**

Maximum depth of retained sediment: 20.0 ft

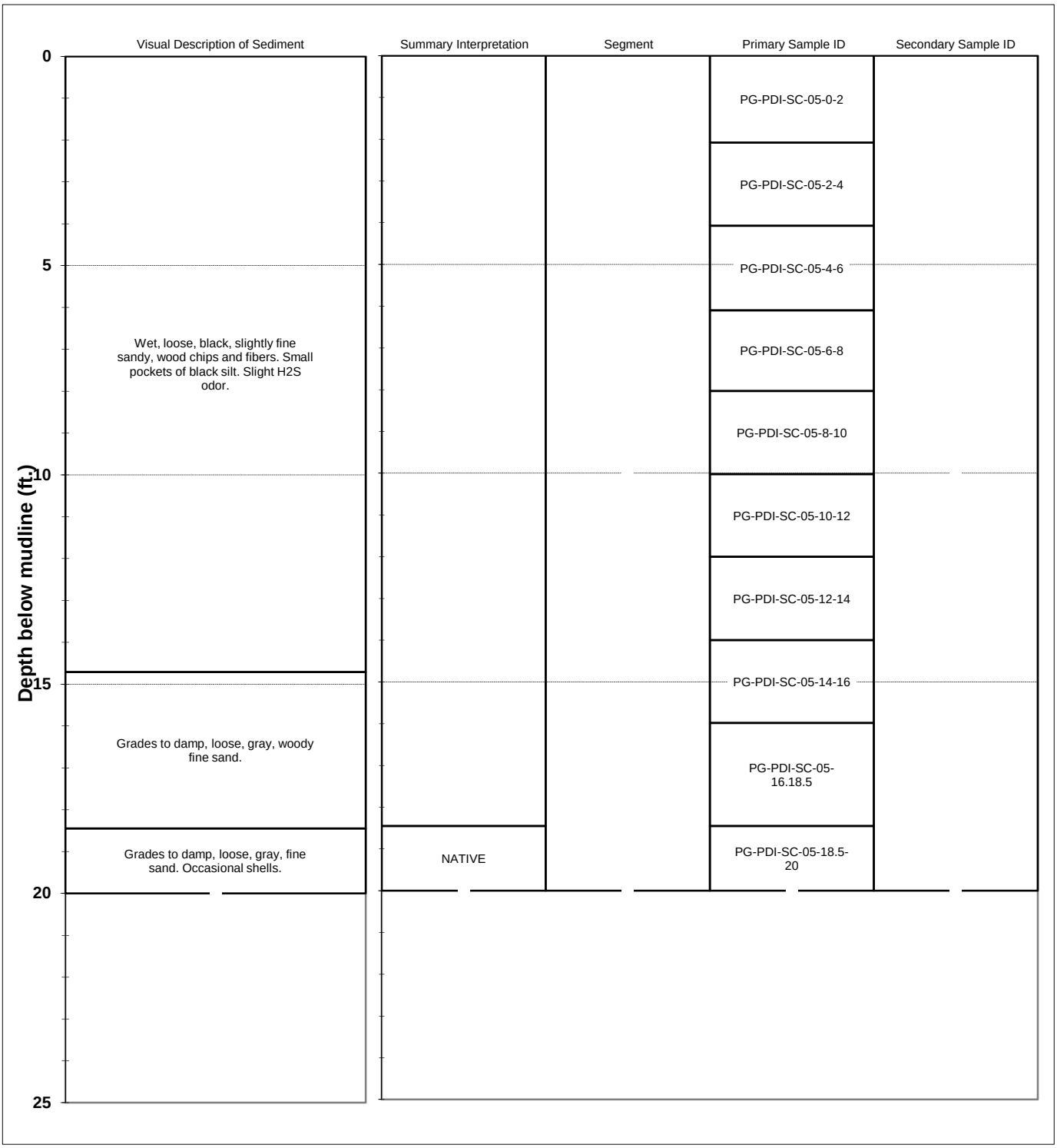
Mudline elevation: -22.6 **ft MLLW**

Percent recovery (on-deck): 64%

	Core collection	Laboratory processing
Date:	7/22/2014	7/22/2014
Time:	15:01	0:00

Field Log: DP

Summary Log: NB



File name: PG-PDI-SC-05r2_dp.xls

Summary Core Log

Mudmole™ Core Summary Log

Project: Port Gamble Sediment Coring

Station: **PG-PDI-SC-06**

Maximum depth of retained sediment: 20.2 ft

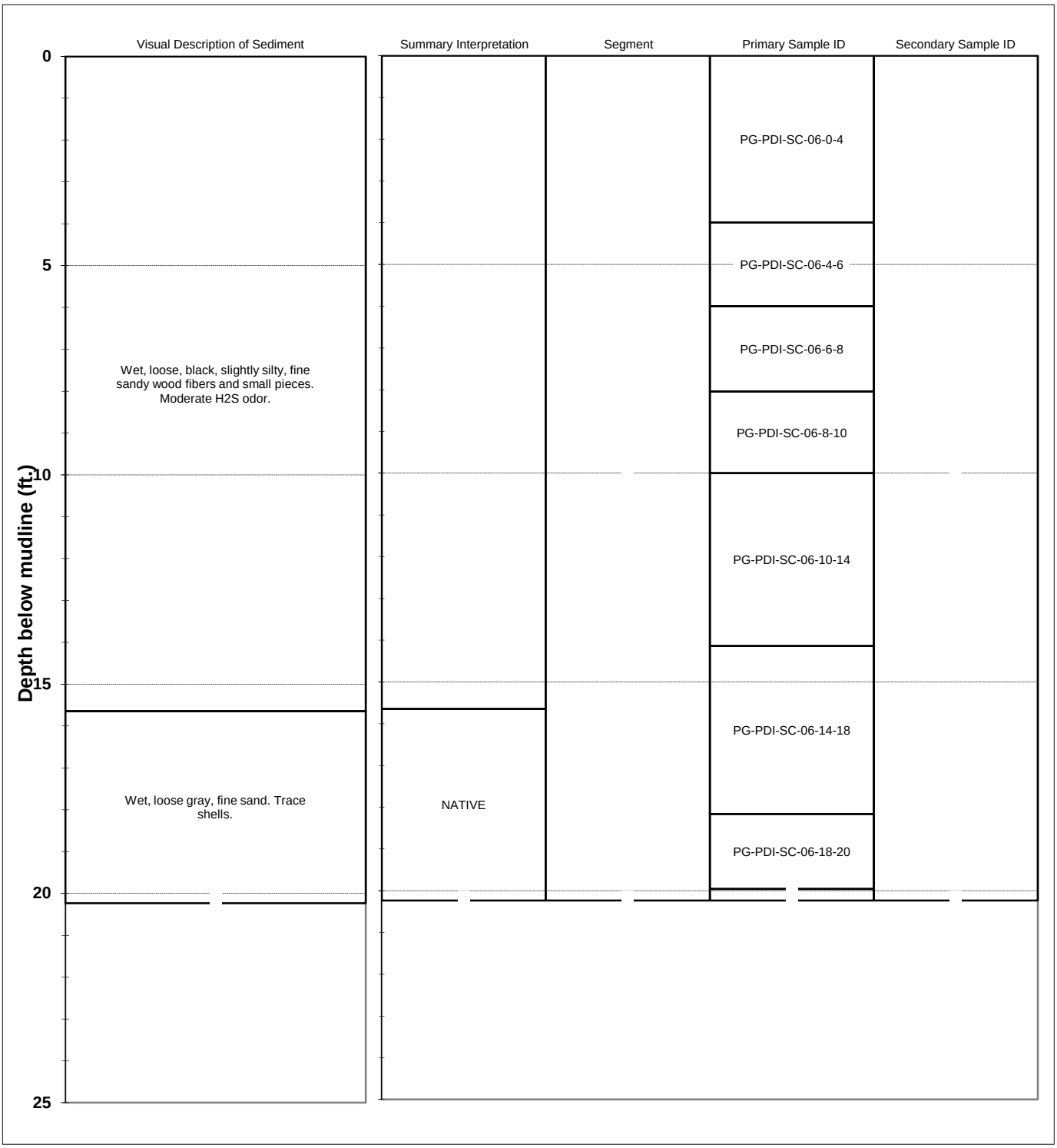
Mudline elevation: -13.4 **ft MLLW**

Percent recovery (on-deck): 48%

	Core collection	Laboratory processing
Date:	7/22/2014	7/22/2014
Time:	9:30	0:00

Field Log: DP

Summary Log: NB



Mudmole™ Core Summary Log

Project: Port Gamble Sediment Coring

Station: **PG-PDI-SC-07R2**

Maximum depth of retained sediment: 14.3 ft

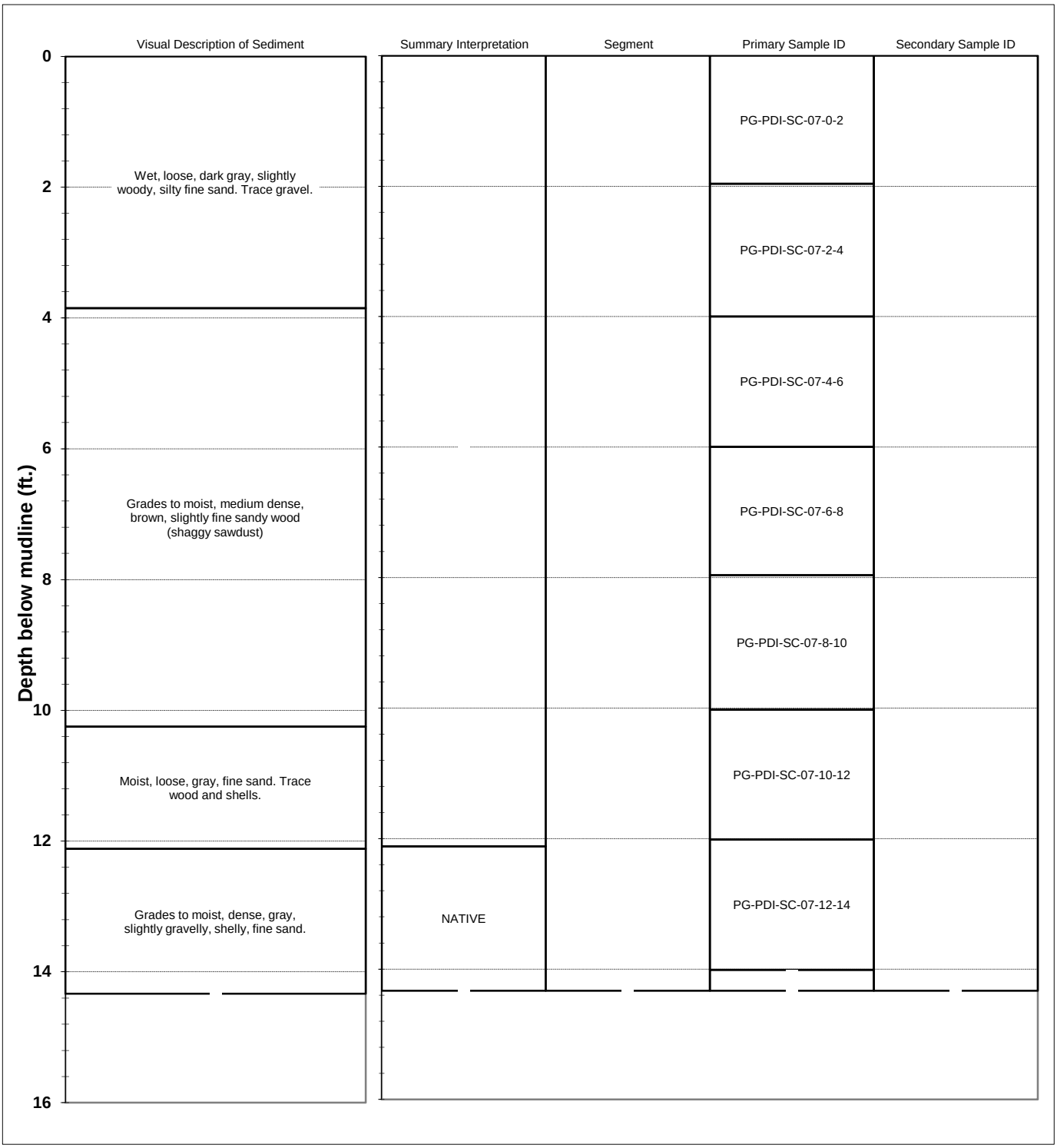
Mudline elevation: -11.2 **ft MLLW**

Percent recovery (on-deck): 55%

	Core collection	Laboratory processing
Date:	7/24/2014	7/24/2014
Time:	13:48	0:00

Field Log: DP

Summary Log: NB



File name: PG-PDI-SC-07R2_dp.xls
Summary Core Log

Mudmole™ Core Summary Log

Project: Port Gamble Sediment Coring

Station: **PG-PDI-SC-08**

Maximum depth of retained sediment: 13.5 ft

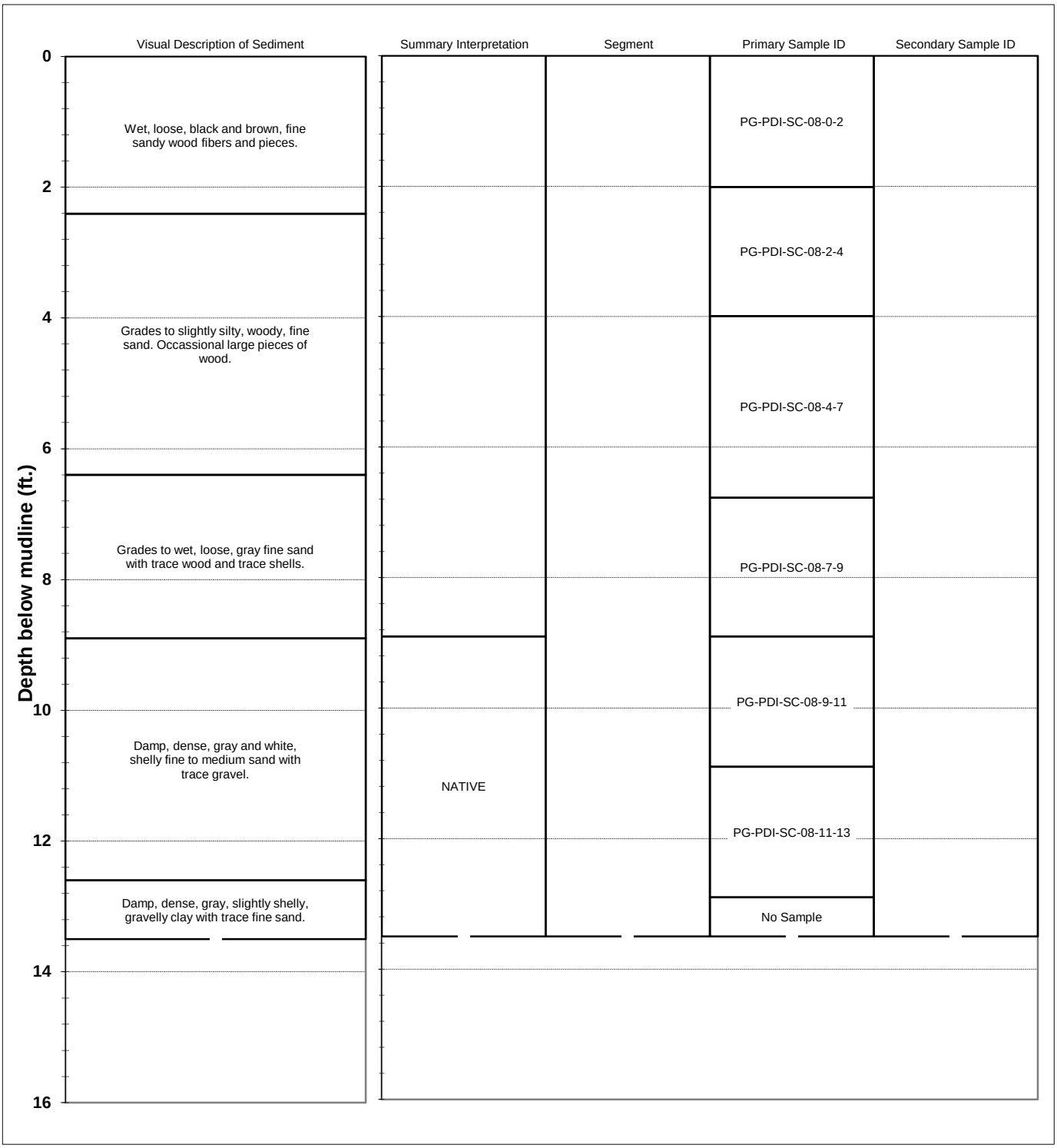
Mudline elevation: -17.9 **ft MLLW**

Percent recovery (on-deck): 68%

	Core collection	Laboratory processing
Date:	7/22/2014	7/22/2014
Time:	11:48	0:00

Field Log: DP

Summary Log: NB



File name: PG-PDI-SC-08_dp.xls
Summary Core Log

Mudmole™ Core Summary Log

Project: Port Gamble Sediment Coring

Station: **PG-PDI-SC-09**

Maximum depth of retained sediment: 9.7 ft

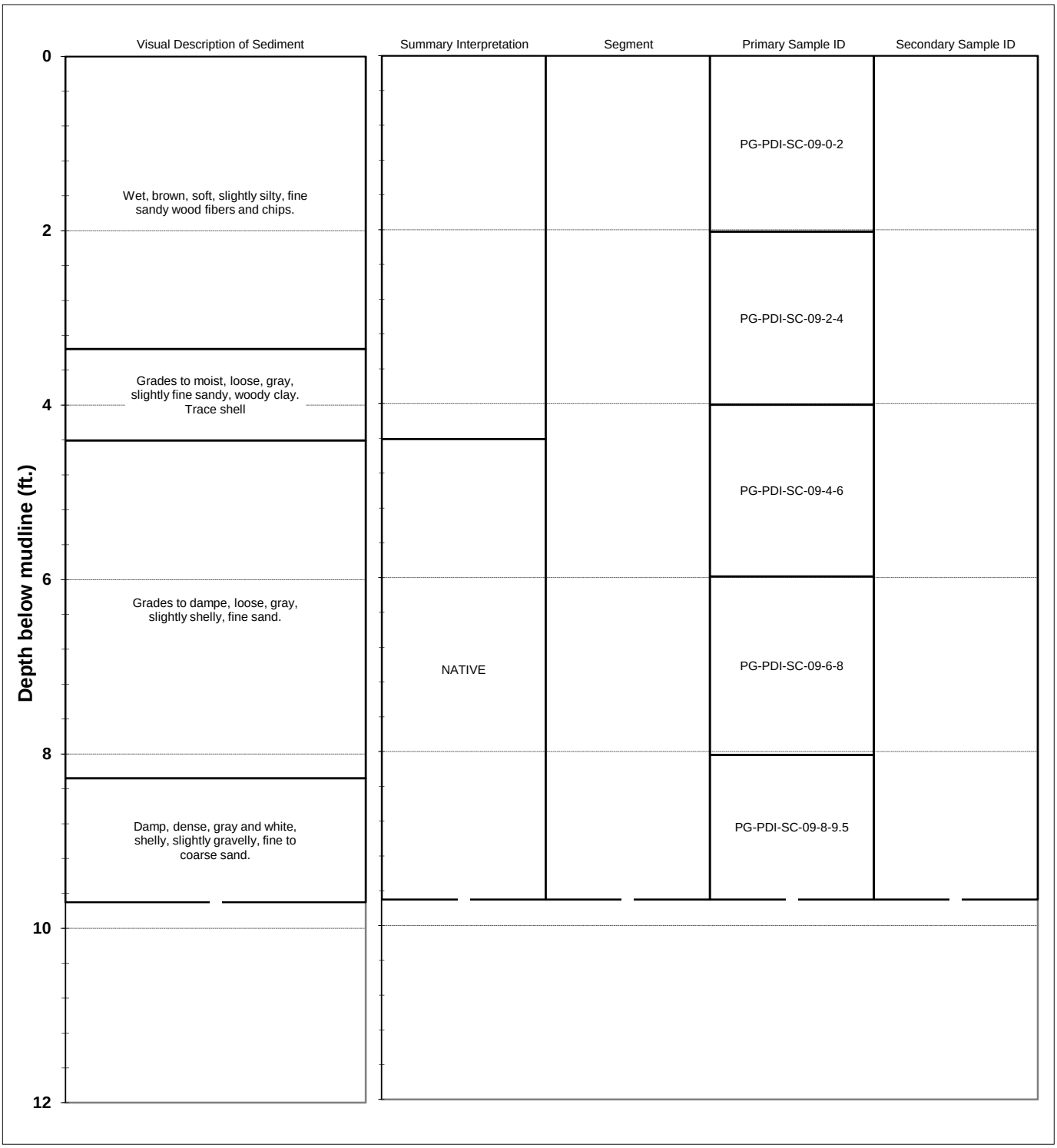
Mudline elevation: -13.1 **ft MLLW**

Percent recovery (on-deck): 71%

	Core collection	Laboratory processing
Date:	7/22/2014	7/22/2014
Time:	14:16	0:00

Field Log: DP

Summary Log: NB



File name: PG-PDI-SC-09_dp.xls
Summary Core Log

Mudmole™ Core Summary Log

Project: Port Gamble Sediment Coring

Station: **PG-PDI-SC-10**

Maximum depth of retained sediment: 10.8 ft

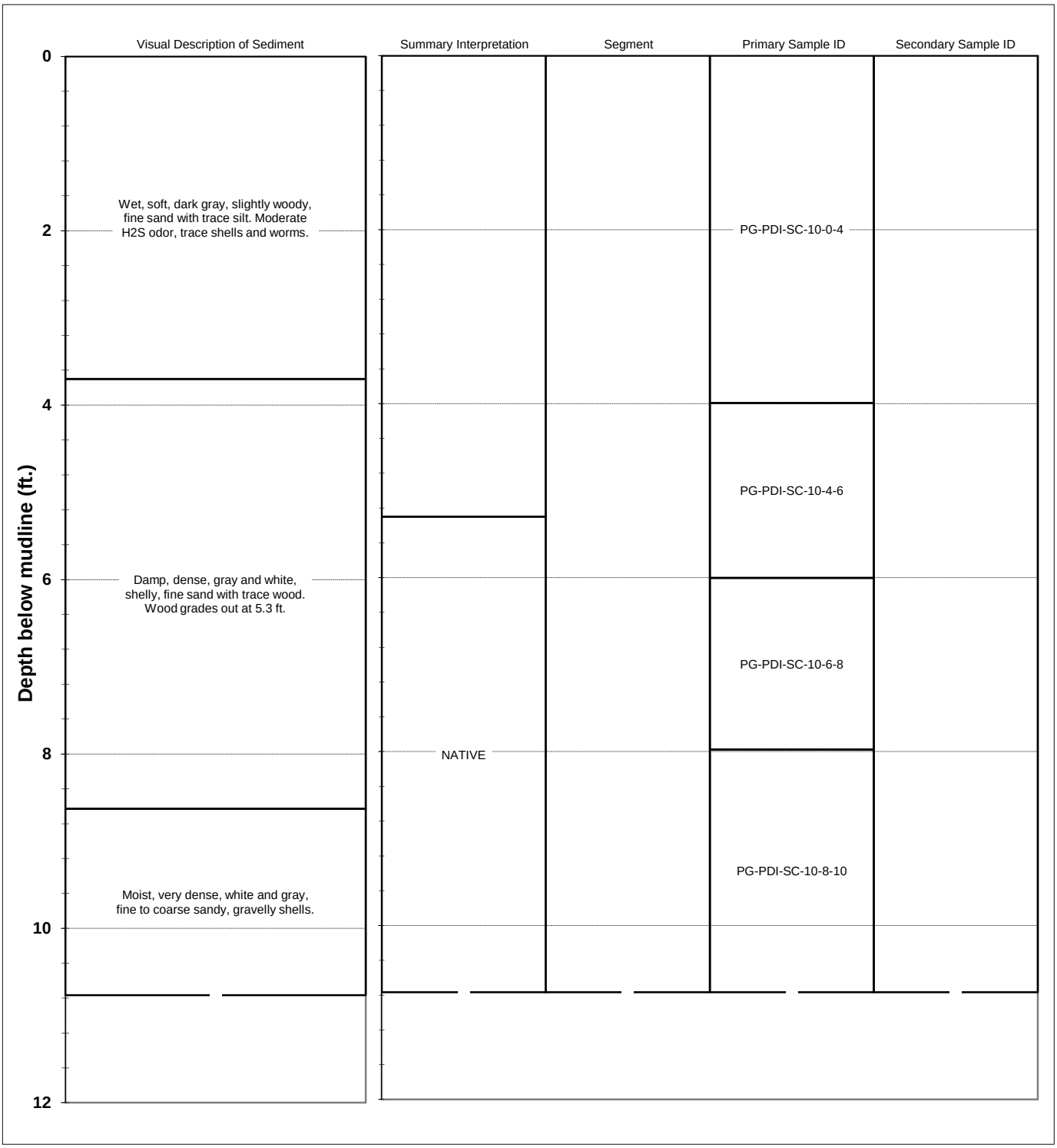
Mudline elevation: -8.6 **ft MLLW**

Percent recovery (on-deck): 64%

	Core collection	Laboratory processing
Date:	7/23/2014	7/23/2014
Time:	8:22	0:00

Field Log: DP

Summary Log: NB



File name: PG-PDI-SC-10.xls
Summary Core Log

Mudmole™ Core Summary Log

Project: Port Gamble Sediment Coring

Station: **PG-PDI-SC-11**

Maximum depth of retained sediment: 11.2 ft

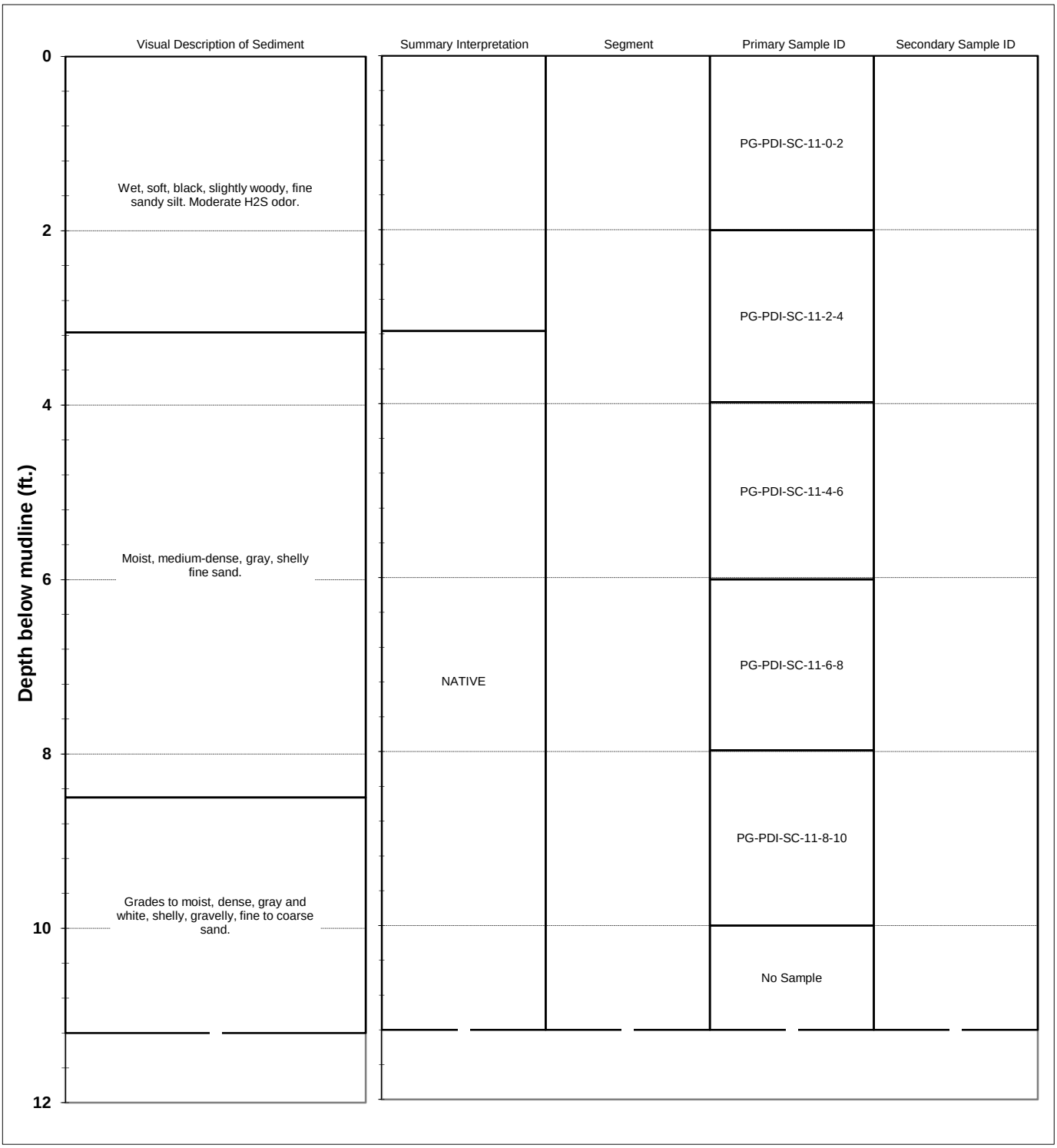
Mudline elevation: -8.3 **ft MLLW**

Percent recovery (on-deck): 73%

	Core collection	Laboratory processing
Date:	7/23/2014	7/23/2014
Time:	9:47	0:00

Field Log: DP

Summary Log: NB



File name: PG-PDI-SC-11_dp.xls
Summary Core Log

Mudmole™ Core Summary Log

Project: Port Gamble Sediment Coring

Station: **PG-PDI-SC-12**

Maximum depth of retained sediment: 12.0 ft

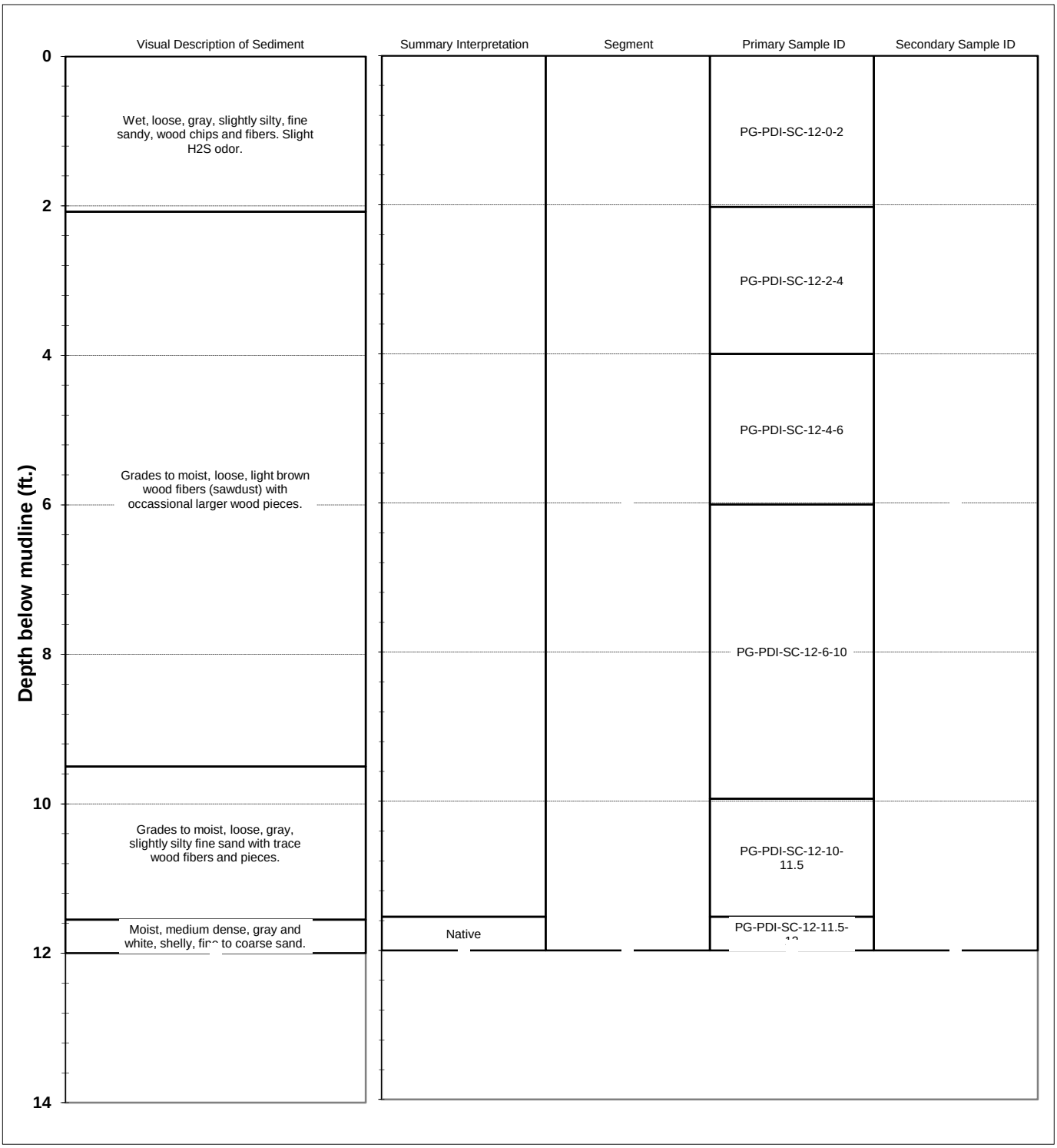
Mudline elevation: -9.9 **ft MLLW**

Percent recovery (on-deck): 38%

	Core collection	Laboratory processing
Date:	7/23/2014	7/23/2014
Time:	11:09	0:00

Field Log: DP

Summary Log: NB



File name: PG-PDI-SC-12_dp.xls
Summary Core Log

Mudmole™ Core Summary Log

Project: Port Gamble Sediment Coring

Station: **PG-PDI-SC-13**

Maximum depth of retained sediment: 11.2 ft

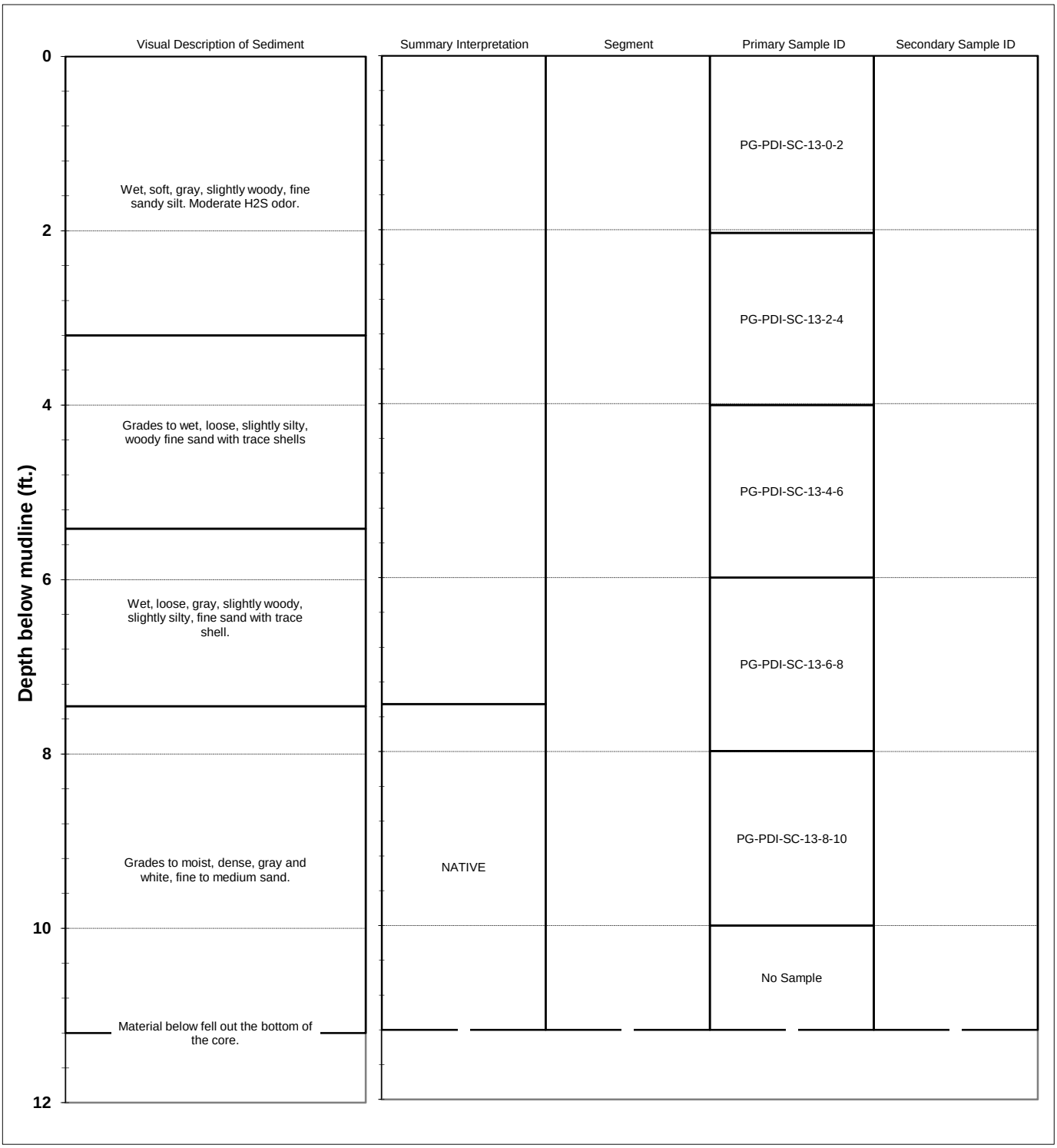
Mudline elevation: -14.7 **ft MLLW**

Percent recovery (on-deck): 81%

	Core collection	Laboratory processing
Date:	7/23/2014	7/23/2014
Time:	14:28	0:00

Field Log: DP

Summary Log: NB



File name: PG-PDI-SC-13_dp.xls
Summary Core Log

Mudmole™ Core Summary Log

Project: Port Gamble Sediment Coring

Station: **PG-PDI-SC-14**

Maximum depth of retained sediment: 10.7 ft

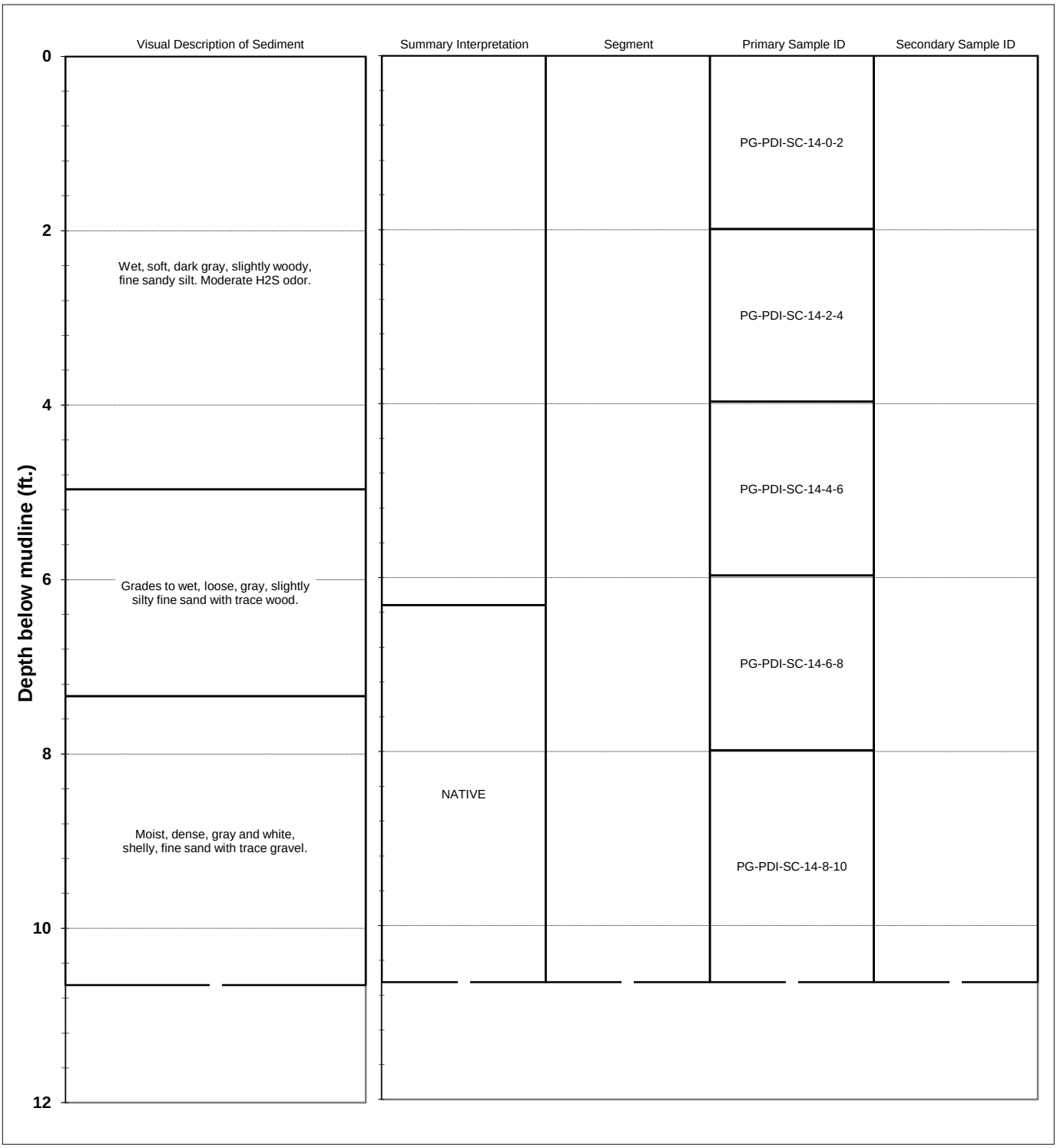
Mudline elevation: -17.4 **ft MLLW**

Percent recovery (on-deck): 81%

	Core collection	Laboratory processing
Date:	7/23/2014	7/23/2014
Time:	15:13	0:00

Field Log: DP

Summary Log: NB



File name: PG-PDI-SC-14_dp.xls
Summary Core Log

Mudmole™ Core Summary Log

Project: Port Gamble Sediment Coring

Station: **PG-PDI-SC-15**

Maximum depth of retained sediment: 8.4 ft

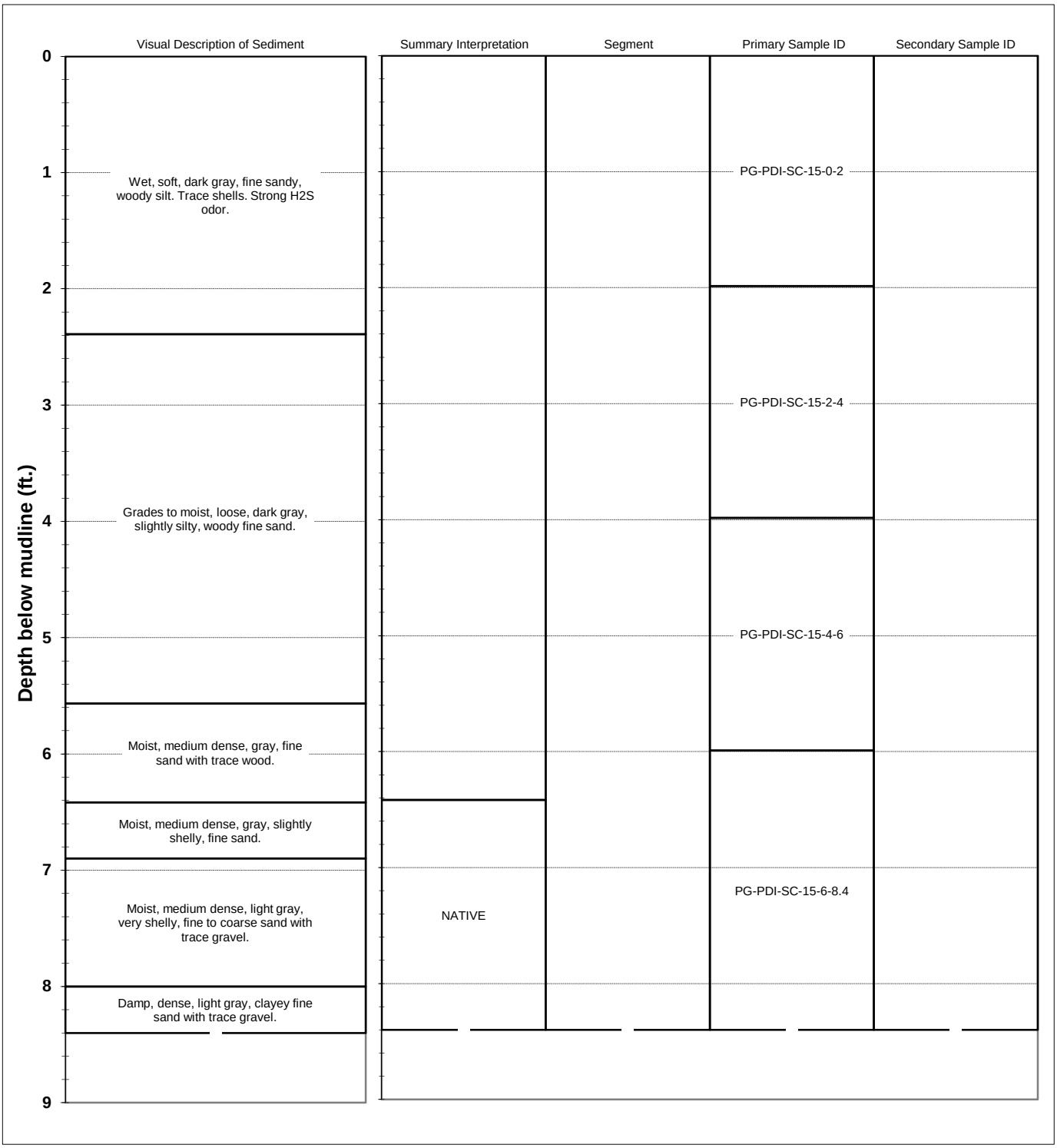
Mudline elevation: -14.9 **ft MLLW**

Percent recovery (on-deck): 74%

	Core collection	Laboratory processing
Date:	7/24/2014	7/24/2014
Time:	8:20	0:00

Field Log: DP

Summary Log: NB



File name: PG-PDI-SC-15_dp.xls
Summary Core Log

Mudmole™ Core Summary Log

Project: Port Gamble Sediment Coring

Station: **PG-PDI-SC-16**

Maximum depth of retained sediment: 7.2 ft

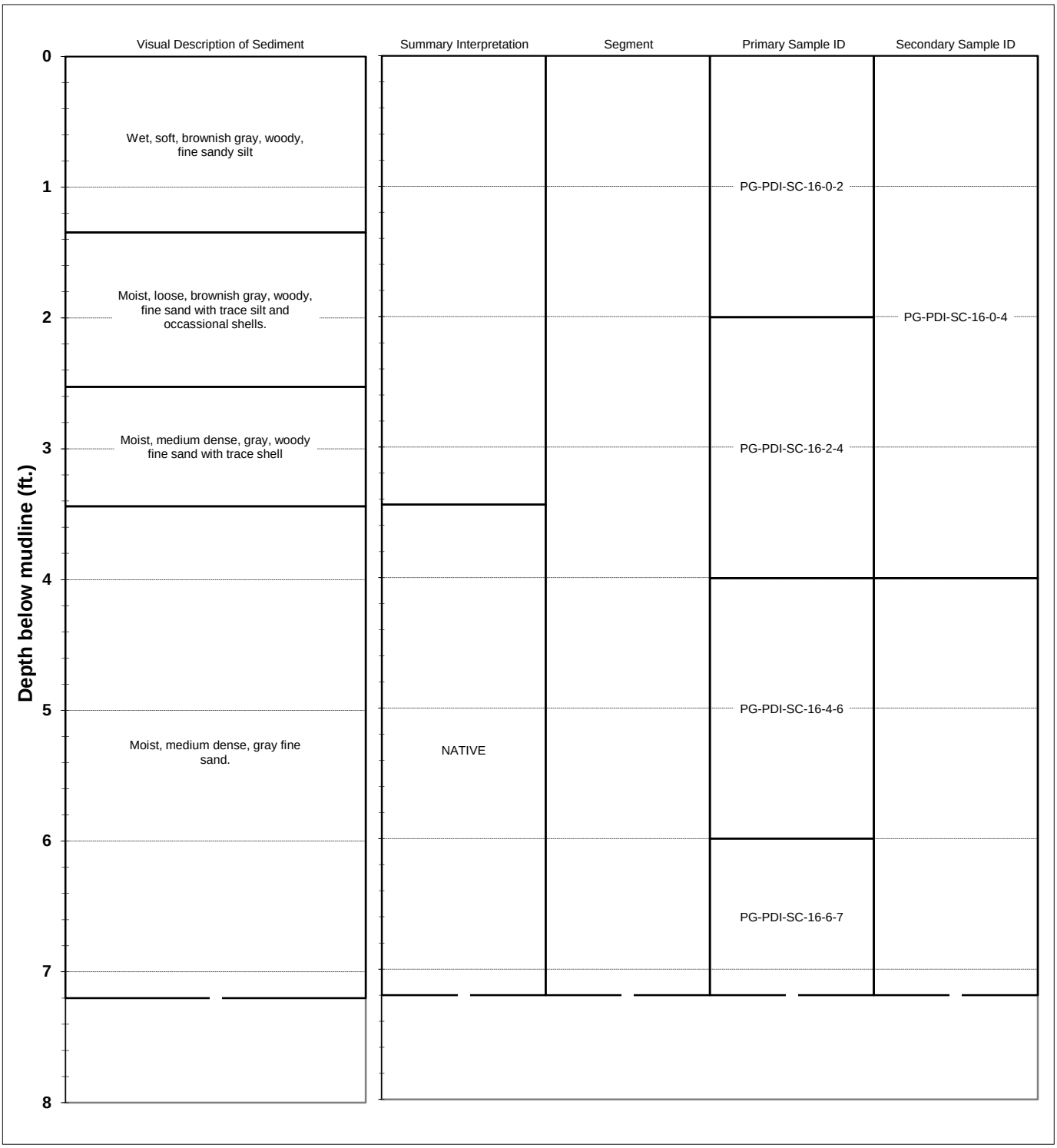
Mudline elevation: -13.9 **ft MLLW**

Percent recovery (on-deck): 76%

	Core collection	Laboratory processing
Date:	7/24/2014	7/24/2014
Time:	9:27	0:00

Field Log: DP

Summary Log: NB



File name: PG-PDI-SC-16_dp.xls
Summary Core Log

Mudmole™ Core Summary Log

Project: Port Gamble Sediment Coring

Station: **PG-PDI-SC-17**

Maximum depth of retained sediment: 7.6 ft

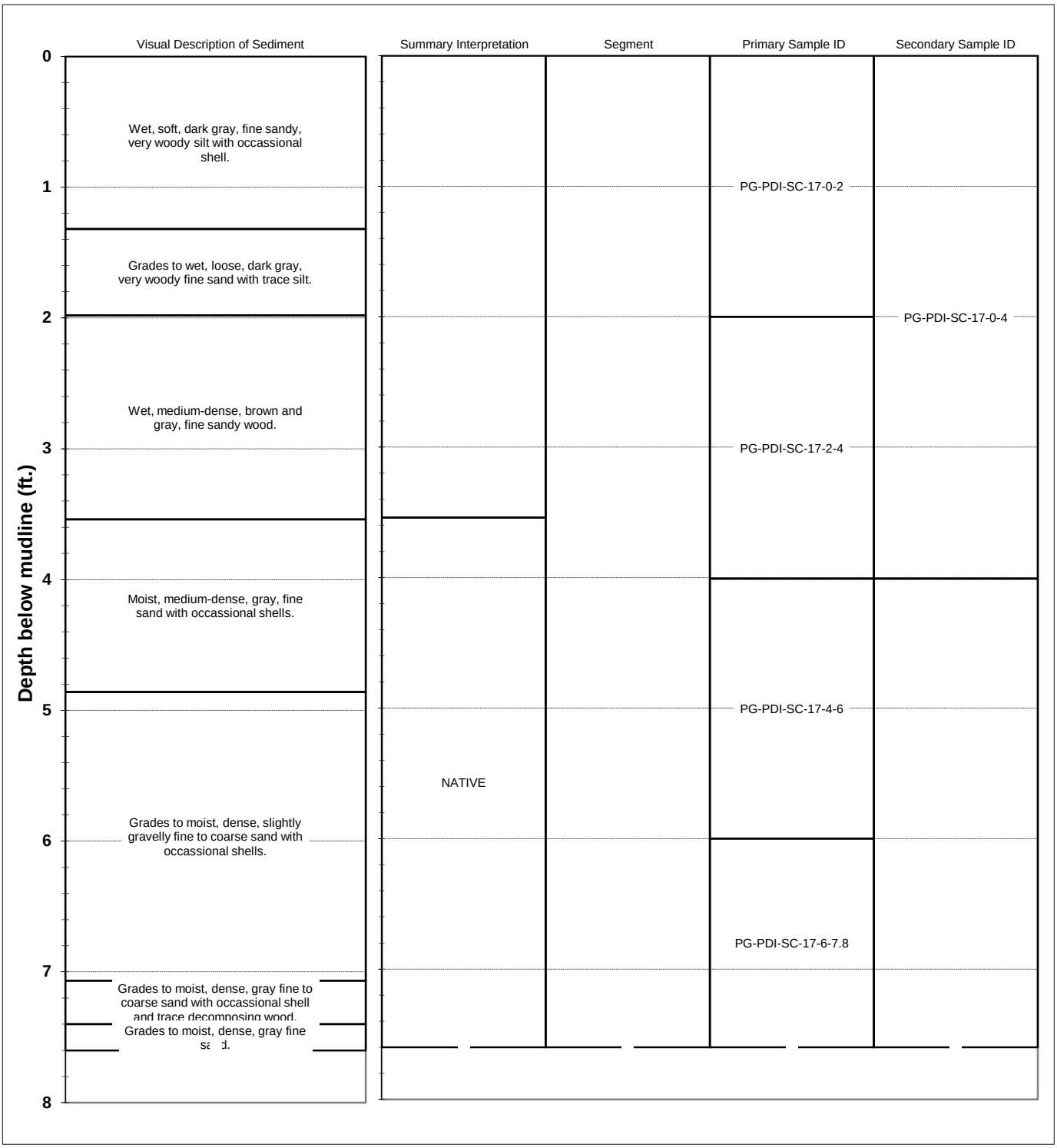
Mudline elevation: -18.6 **ft MLLW**

Percent recovery (on-deck): 62%

	Core collection	Laboratory processing
Date:	7/24/2014	7/24/2014
Time:	10:26	0:00

Field Log: DP

Summary Log: NB



File name: PG-PDI-SC-17_dp.xls
Summary Core Log

Mudmole™ Core Summary Log

Project: Port Gamble Sediment Coring

Station: **PG-PDI-SC-18**

Maximum depth of retained sediment: 14.2 ft

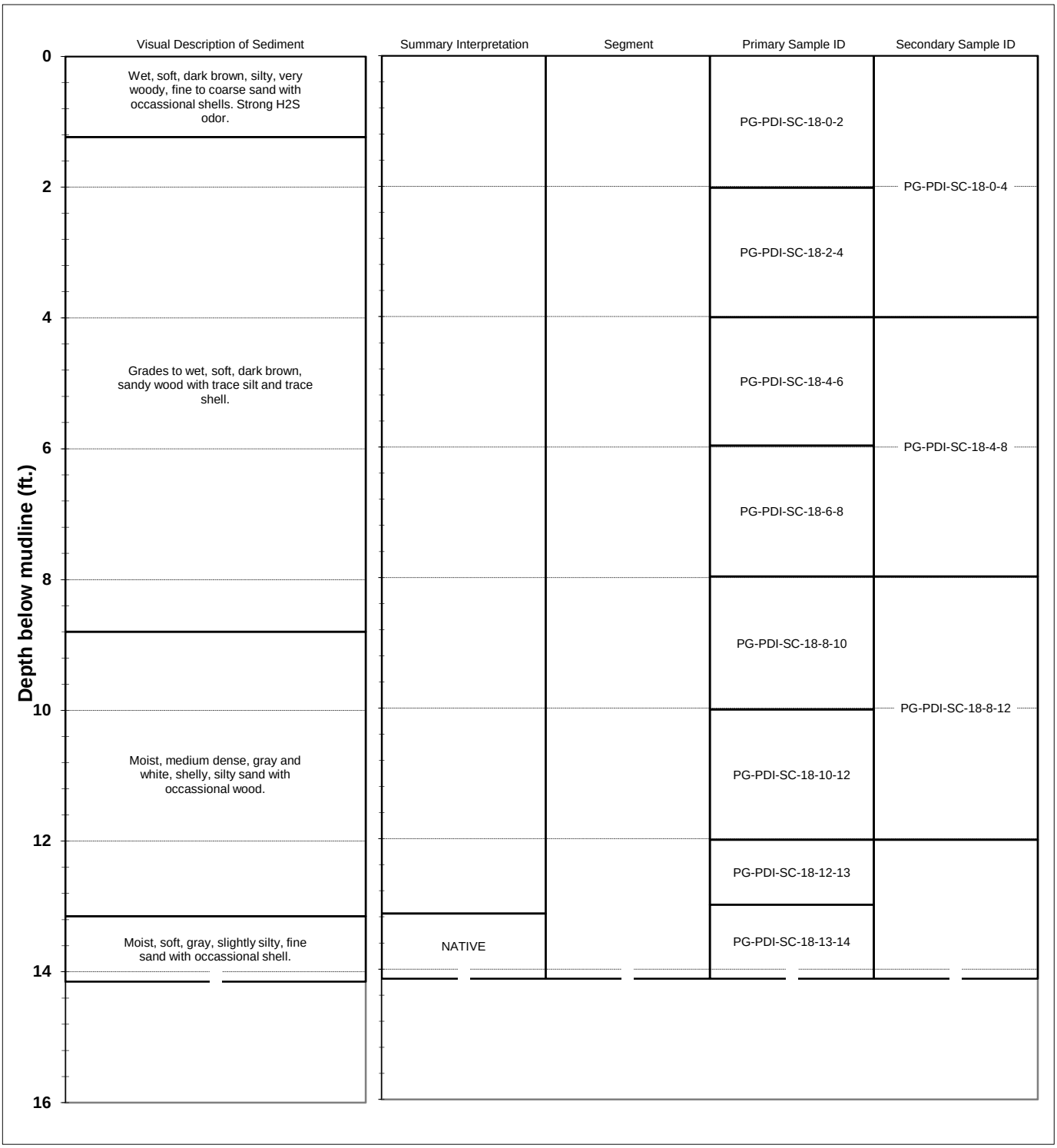
Mudline elevation: -19.6 **ft MLLW**

Percent recovery (on-deck): 44%

	Core collection	Laboratory processing
Date:	7/24/2014	7/24/2014
Time:	11:35	0:00

Field Log: DP

Summary Log: NB



File name: PG-PDI-SC-18_dp.xls
Summary Core Log

Mudmole™ Core Summary Log

Project: Port Gamble Sediment Coring

Station: **PG-PDI-SC-19**

Maximum depth of retained sediment: 11.8 ft

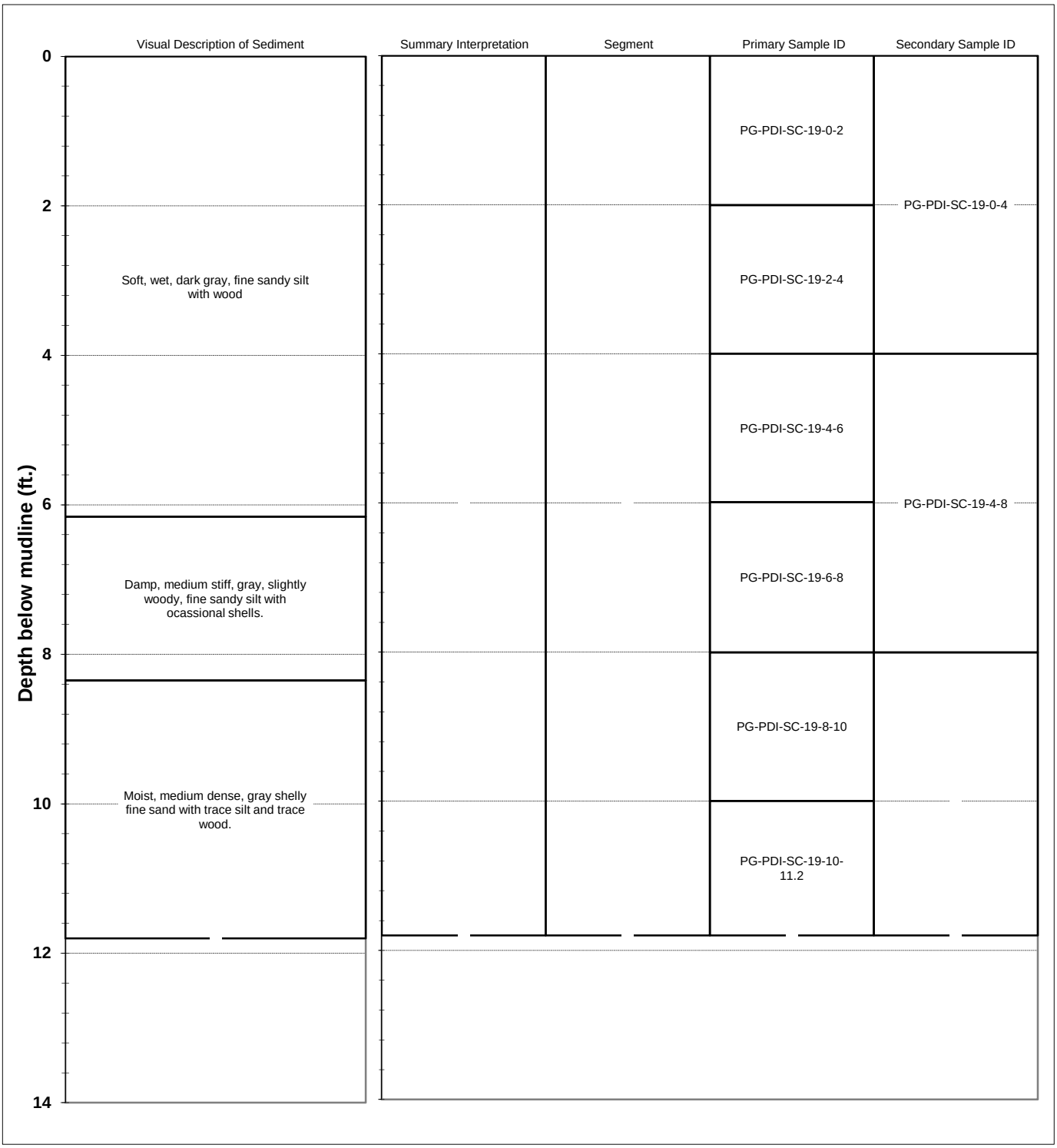
Mudline elevation: -10.3 **ft MLLW**

Percent recovery (on-deck): 58%

	Core collection	Laboratory processing
Date:	7/24/2014	7/24/2014
Time:	12:48	0:00

Field Log: DP

Summary Log: NB



File name: PG-PDI-SC-19_dp.xls
Summary Core Log

Mudmole™ Core Summary Log

Project: Port Gamble Sediment Coring

Station: **PG-PDI-SC-20**

Maximum depth of retained sediment: 6.1 ft

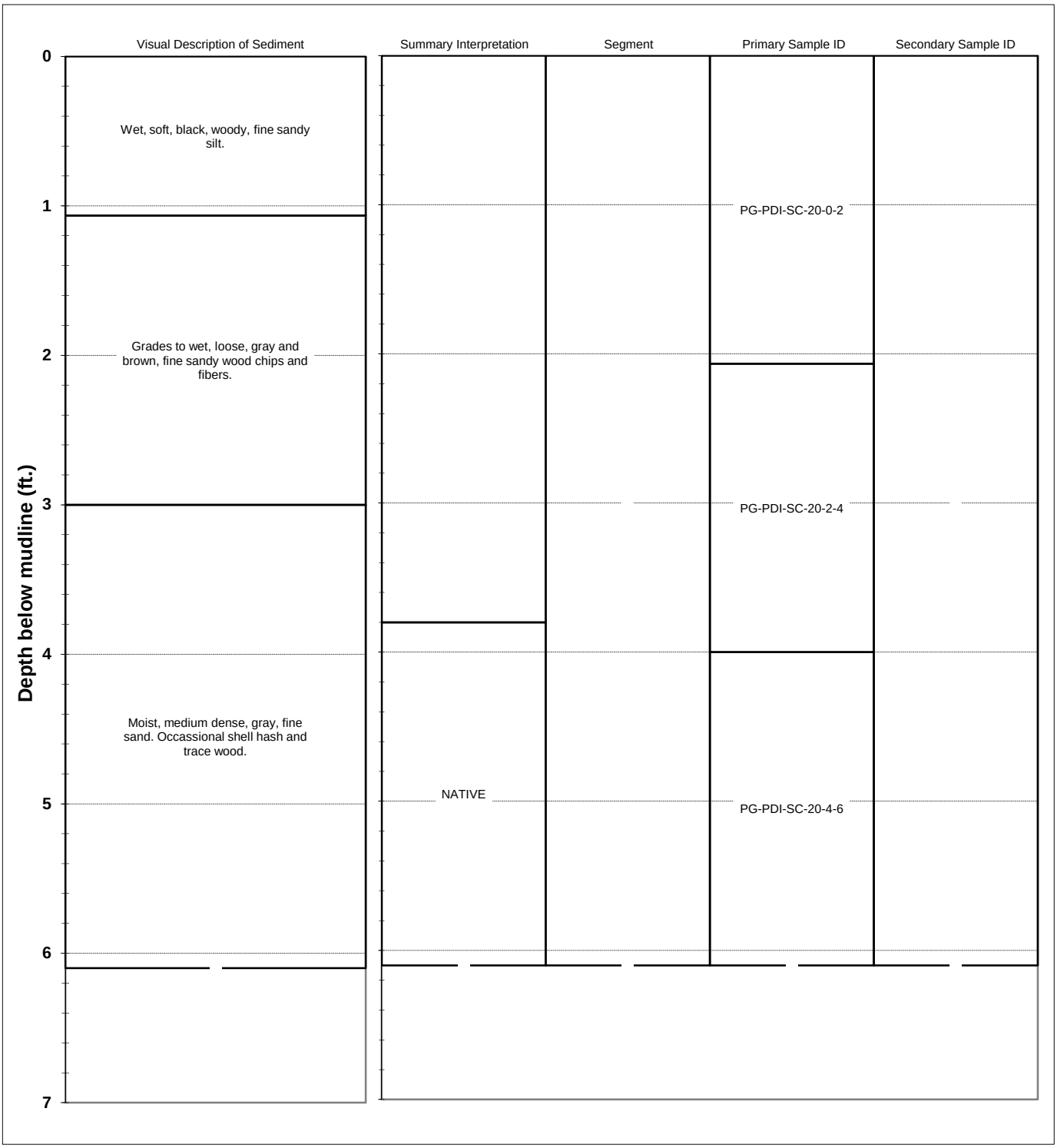
Mudline elevation: -14.6 **ft MLLW**

Percent recovery (on-deck): 77%

	Core collection	Laboratory processing
Date:	7/24/2014	7/24/2015
Time:	14:57	0:00

Field Log: DP

Summary Log: NB



AMEC E&I
3500 188th Street SW, Suite 601
Lynnwood, WA 98037
(425) 921-4000
fax (425) 921-4040

File name: PG-PDI-SC-20.xls
Summary Core Log

Mudmole™ Core Summary Log

Project: Port Gamble Sediment Coring

Station: **PG-PDI-SC-21**

Maximum depth of retained sediment: 20.3 ft

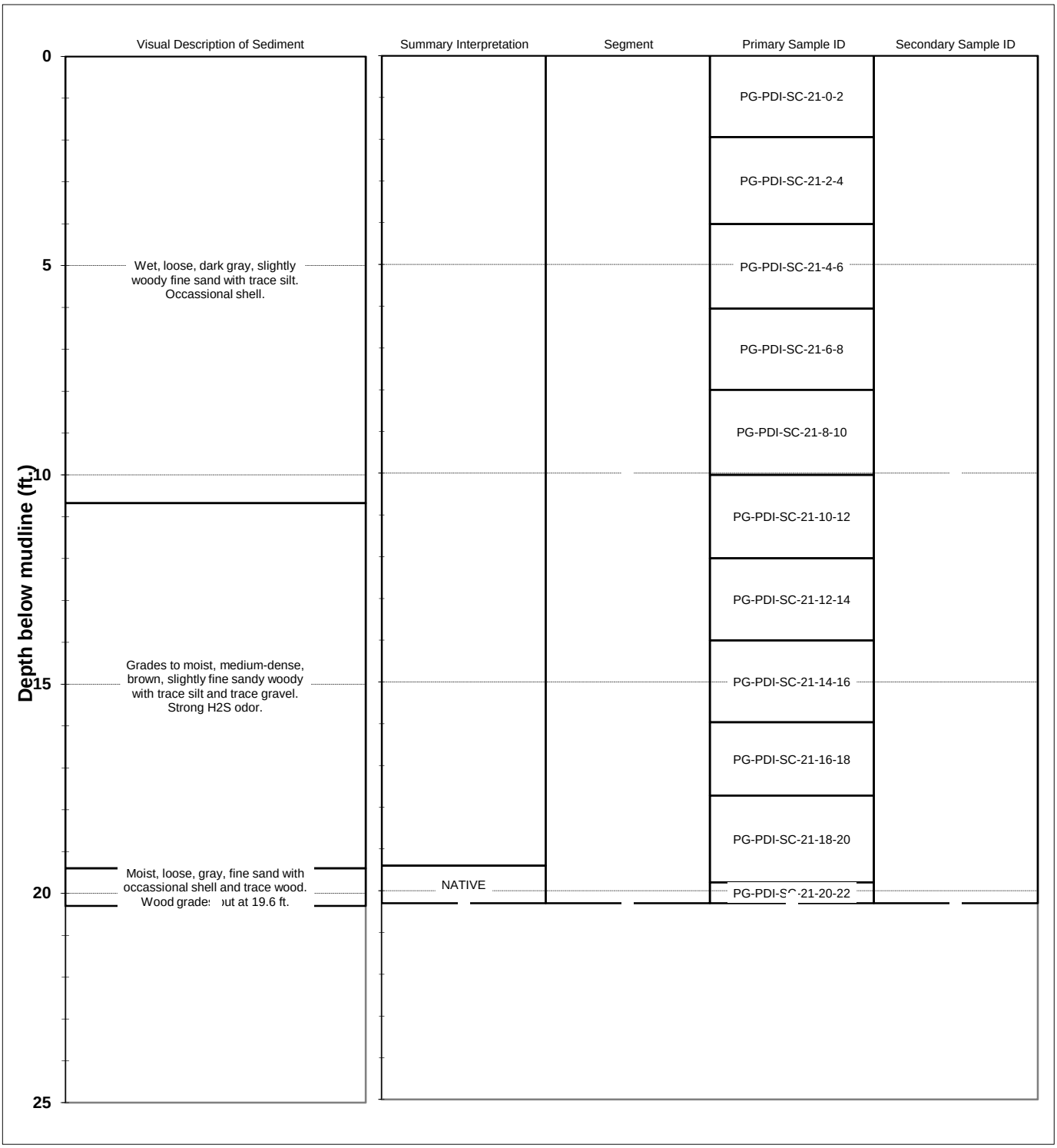
Mudline elevation: -17.2 **ft MLLW**

Percent recovery (on-deck): 53%

	Core collection	Laboratory processing
Date:	7/25/2014	7/25/2014
Time:	8:13	0:00

Field Log: DP

Summary Log: NB



File name: PG-PDI-SC-21.xls
Summary Core Log

ATTACHMENT A-3-3
SURFACE GRAB COLLECTION LOGS

ANCHOR QEA

Surface Sediment Field Log

Job: 130388-01.01 Port Gamble Station: BW-01
Job No: " Date: 8/11/14
Field Staff: EM, KH Sample Method: Power Grab
Contractor: RSS Proposed Coordinates: Lat. 312627.743
Horizontal Datum: NAD 83 Wash. SP South Zone Long. 1211481.743

Water Height
DTM Depth Sounder: 42.5
DTM Lead Line:

Tide Measurements
Time: 1336
Height: 0.3

Sample Acceptability Criteria:
1) Overlying water is present
2) Water has low turbidity
3) Sampler is not overfilled
4) Surface is flat
5) Desired penetration depth

Notes: Mudline Elevation calculated after sampling

Grab #	Time	Confirmed Coordinates (datum)		Sample Accept (Y/N)	Recovery Depth (in) cm	Comments: jaws close, good seal, winnowing, overlying water, surface intact, etc
		Longitude/Easting	Latitude/Northing			
1	1330			Y	26	overlying water jaws closed
			EM			

Sample Description: surface cover, density, moisture, color, minor modifier, MAJOR modifier, other constituents, odor, sheen, layering, anoxic layer, debris, plant matter, shells, biota

0-2: SILTY SAND (SM) loose, wet, brownish gray, 20% fines, 80% f-sand, trace biota (worms, ~~snail~~ one large marine invertebrate - orange), trace seaweed at surface

2-26: POORLY GRADED SAND w/ SILT (SP-SM), moist, loose, brownish gray, 15% fines, 85% f-sand

Sample Containers:
3x 4oz, 8oz Amber, 8oz clear, 16oz HDPE, 16oz glass

Analyses: Cd, TS/TOC, D/F, PAH, Grain Size

ANCHOR QEA

Surface Sediment Field Log

Job: 130344-01.01 | Station: BW-11
Job No: Post Gamble | Date: 8/11/14
Field Staff: EM / KH | Sample Method: Power Grab
Contractor: RSS | Proposed Coordinates: Lat. 309621.3569
Horizontal Datum: NAD 83 Wash. SP South Zone | Long. 1213493.509

Water Height
DTM Depth Sounder:
DTM Lead Line: 37.7'

Tide Measurements
Time: 1515
Height: +5.3

Sample Acceptability Criteria:
1) Overlying water is present
2) Water has low turbidity
3) Sampler is not overfilled
4) Surface is flat
5) Desired penetration depth

Notes: Mudline Elevation calculated after sampling

Grab #	Time	Confirmed Coordinates (datum) Longitude/Easting	Confirmed Coordinates (datum) Latitude/Northing	Sample Accept (Y/N)	Recovery Depth (in) cm	Comments: jaws close, good seal, winnowing, overlying water, surface intact, etc
1	1515			Y	28	jaws close overlying water

EM

Sample Description: surface cover, density, moisture, color, minor modifier, MAJOR modifier, other constituents, odor, sheen, layering, anoxic layer, debris, plant matter, shells, biota

0-10: SILT (mL), wet, very soft, brownish gray, 10% f-sand,
10-28: 90% fines, trace biota (clam shells), trace organic material (branch/sticks at surface), moderate H_2S-like odor
10-28: same as above except moist, soft

Sample Containers: 1x 2 gallon bag

Analyses: bioassay

ANCHOR QEA

Surface Sediment Field Log

Job:	EM 8/12/14 Port Gamble	Station:	BW-12
Job No:	130388 (130388.01-01	Date:	8/11/14
Field Staff:	EM KH	Sample Method:	Power grab
Contractor:	RSS	Proposed Coordinates: Lat.	308622.7658
Horizontal Datum:	NAD 83 Wash. SP South Zone	Long.	1210651.753

Water Height
DTM Depth Sounder:
DTM Lead Line: 31.10

Tide Measurements
Time: 0830
Height: 4.5

Sample Acceptability Criteria:
1) Overlying water is present
2) Water has low turbidity
3) Sampler is not overfilled
4) Surface is flat
5) Desired penetration depth

Notes: Mudline Elevation calculated after sampling

Grab #	Time	Confirmed Coordinates (datum) Longitude/Easting	Latitude/Northing	Sample Accept (Y/N)	Recovery Depth ~~(in)~~ cm	Comments: jaws close, good seal, winnowing, overlying water, surface intact, etc
1	0830			Y	22	Overlying water, wood fragments in jaw. Wood fragments caused surface to be uneven when core retrieved
			EM			

Sample Description: surface cover, density, moisture, color, minor modifier, MAJOR modifier, other constituents, odor, sheen, layering, anoxic layer, debris, plant matter, shells, biota

0-22: wet, very soft, brownish gray, 30% f-sand, 70% fines Sandy SILT (ML), trace H_2S like odor from 10-22 cm, substantial woody debris (up to 6 inches), bark-like, at surface occasional biota (2 ~~ghost~~ shrimp)

Sample Containers: 1 - 2 gallon bag

Analyses: Biosassay / Grain size

ANCHOR QEA

Surface Sediment Field Log

Job:	Port Gamble	Station:	BW-15
Job No:	130388-01-01	Date:	8/11/14
Field Staff:	BM KH	Sample Method:	Power Grab
Contractor:	ESS	Proposed Coordinates: Lat.	308619.5089
Horizontal Datum:	NAD 83 Wash. SP South Zone	Long.	1212 510.216

Water Height
DTM Depth Sounder:
DTM Lead Line: #1 29.7'
#2 31.2'

Tide Measurements
Time: 1150
Height: -1.8'

Sample Acceptability Criteria:
1) Overlying water is present
2) Water has low turbidity
3) Sampler is not overfilled
4) Surface is flat
5) Desired penetration depth

Notes: Mudline Elevation calculated after sampling

Grab #	Time	Confirmed Coordinates (datum) Longitude/Easting	Confirmed Coordinates (datum) Latitude/Northing	Sample Accept (Y/N)	Recovery Depth (in)	Comments: jaws close, good seal, winnowing, overlying water, surface intact, etc
~~1150~~ EM 8/11/14 1	1150			Y	29	overlying water jaws close
2	1215			Y	30	overlying water jaws close
			EM			

Sample Description: surface cover, density, moisture, color, minor modifier, MAJOR modifier, other constituents, odor, sheen, layering, anoxic layer, debris, plant matter, shells, biota

0-10: SILT (ML), wet, very soft, brownish gray, 5% f-sand, ~~10~~ 95% fines, moderate H_2S-like odor,
10-29: same as above except moist, soft.
Trace biota (clam) in lower depths of grab

Grab 2 same as 1 but to 30cm.

Sample Containers: 2 x (4 oz, 2 x 8 oz, 2 x 16 oz)
1 x 2 gallon bag

Analyses: bioassay, Cd, TS/TOC, PAH, D/F, Grain size

ANCHOR QEA

Surface Sediment Field Log

Job:	Port Gamble	Station:	BW-16
Job No:	130388-01.01	Date:	8/11/14
Field Staff:	EM, KH	Sample Method:	Power Grab
Contractor:	RSS	Proposed Coordinates: Lat.	308628.8983
Horizontal Datum:	NAD 83 Wash. SP South Zone	Long.	1213493.128

Water Height
DTM Depth Sounder:
DTM Lead Line: 37.0

Tide Measurements
Time: 1545
Height: +6.7

Sample Acceptability Criteria:
1) Overlying water is present
2) Water has low turbidity
3) Sampler is not overfilled
4) Surface is flat
5) Desired penetration depth

Notes: Mudline Elevation calculated after sampling

Grab #	Time	Confirmed Coordinates (datum) Longitude/Easting	Confirmed Coordinates (datum) Latitude/Northing	Sample Accept (Y/N)	Recovery Depth ~~(in)~~ cm	Comments: jaws close, good seal, winnowing, overlying water, surface intact, etc
1	1545			Y	28	jaws close overlying wtr

Sample Description: surface cover, density, moisture, color, minor modifier, MAJOR modifier, other constituents, odor, sheen, layering, anoxic layer, debris, plant matter, shells, biota

0-2 cm: SILT(ML) wet, very soft, brownish gray, 5% f-sand, 95% fines.
2-28cm: Same as before but Moist, Soft.
Trace biota @ bottom of grab (clam, shells)
Moderate H_2S-like odor throughout.

Sample Containers: 1 - 2 gallon bag

Analyses: Bioassay.

ANCHOR QEA

Surface Sediment Field Log

Job: Port Gamble
Station: BW-18
Job No: 130358-01.01
Date: 8/11/14
Field Staff: EM, ICH
Sample Method: Power Grab
Contractor: RSS
Proposed Coordinates: Lat. 307609.7488
Horizontal Datum: NAD 83 Wash. SP South Zone
Long. 1210995.61

Water Height
DTM Depth Sounder:
DTM Lead Line: 32.7'

Tide Measurements
Time: 1015
Height: -0.1

Sample Acceptability Criteria:
1) Overlying water is present
2) Water has low turbidity
3) Sampler is not overfilled
4) Surface is flat
5) Desired penetration depth

Notes: Mudline Elevation calculated after sampling

Grab #	Time	Confirmed Coordinates (datum)		Sample Accept (Y/N)	Recovery Depth (in)	Comments: jaws close, good seal, winnowing, overlying water, surface intact, etc
		Longitude/Easting	Latitude/Northing			
1	1015				30	Jaws are closed, winnowing at surface, overlying water present
				EM		

Sample Description: surface cover, density, moisture, color, minor modifier, MAJOR modifier, other constituents, odor, sheen, layering, anoxic layer, debris, plant matter, shells, biota

0-10: SILT (mL), wet, very soft, brownish gray, 10% f-sand, 90% fines, trace biota (shell fragments),
10-30: same as above except moist and soft

Sample Containers: 1x 2gallon bag

Analyses: bioassay, grainsize

ANCHOR QEA

Surface Sediment Field Log

Job: 130388-01.01 Port Gamble
Station: BW-19
Job No: 1
Date: 8/11/14
Field Staff: EM KH
Sample Method: Power Grab
Contractor: RSS
Proposed Coordinates: Lat. 307657.5518
Horizontal Datum: NAD 83 Wash. SP South Zone
Long. 1212453.628

Water Height
DTM Depth Sounder:
DTM Lead Line: 29.3

Tide Measurements
Time: 1125
Height: -1.8

Sample Acceptability Criteria:
1) Overlying water is present
2) Water has low turbidity
3) Sampler is not overfilled
4) Surface is flat
5) Desired penetration depth

Notes: Mudline Elevation calculated after sampling

Grab #	Time	Confirmed Coordinates (datum)		Sample Accept (Y/N)	Recovery Depth (in)	Comments: jaws close, good seal, winnowing, overlying water, surface intact, etc
		Longitude/Easting	Latitude/Northing			
1	1125			Y	27	overlying water
			EM			

Sample Description: surface cover, density, moisture, color, minor modifier, MAJOR modifier, other constituents, odor, sheen, layering, anoxic layer, debris, plant matter, shells, biota

0-10: SILT (ML), wet, very soft, brownish gray, 5% f-sand, 95% fines, moderate H_2S-like odor, trace biota (shell fragments)
10-27: Same as above except moist and soft
16-27: Same as above except medium stiff

→ clam siphon caught in jaw

Sample Containers: 1 x 2 gallon bag

Analyses: bioassay

ANCHOR QEA

Surface Sediment Field Log

Job: Port Gamble
Station: BW-21
Job No: 130388-01.01
Date: 8/11/14
Field Staff: EM KDI
Sample Method: Power Grab
Contractor: RSS
Proposed Coordinates: Lat. 305743.2597
Horizontal Datum: NAD 83 Wash. SP South Zone
Long: EM ~~1.21251~~ 1212479.485

Water Height
DTM Depth Sounder:
DTM Lead Line: 28.0

Tide Measurements
Time: 1055
Height: -1.4

Sample Acceptability Criteria:
1) Overlying water is present
2) Water has low turbidity
3) Sampler is not overfilled
4) Surface is flat
5) Desired penetration depth

Notes: Mudline Elevation calculated after sampling

Grab #	Time	Confirmed Coordinates (datum)		Sample Accept (Y/N)	Recovery Depth (in)	Comments: jaws close, good seal, winnowing, overlying water, surface intact, etc
		Longitude/Easting	Latitude/Northing			
1	1055			Y	29	Jaws closed, surface intact, water at surface

Sample Description: surface cover, density, moisture, color, minor modifier, MAJOR modifier, other constituents, odor, sheen, layering, anoxic layer, debris, plant matter, shells, biota

0-10: SILT (ML), wet, very soft, brownish gray, 5% fine sand, 95% fines, moderate H_2S like odor
10-30: same as above except moist and soft.

Sample Containers: 2x (4 oz, 2x 8oz, 2x 16 oz)

Analyses: ~~2x (4 oz, 2x 8oz 2x 16 oz)~~
Cd, TS/TOC, PAH, D/F, Grain Size

ANCHOR QEA

Surface Sediment Field Log

Job: Port Gamble | Station: PGSS-29

Job No: 130388-01-01 | Date: 8/4/14

Field Staff: EM, KH | Sample Method: Power Grab

Contractor: RSS | Proposed Coordinates: Lat. 30886.16

Horizontal Datum: NAD 83 Wash. SP South Zone | Long. 1210495.6

Water Height

DTM Depth Sounder:

DTM Lead Line: #1 17.1' @ 0915

#2 15.6' @ 0940

Tide Measurements

Time: 0915

Height: 2.4'

Sample Acceptability Criteria:

1) Overlying water is present
2) Water has low turbidity
3) Sampler is not overfilled
4) Surface is flat
5) Desired penetration depth

Notes: Mudline Elevation calculated after sampling

Grab #	Time	Confirmed Coordinates (datum)		Sample Accept (Y/N)	Recovery Depth ~~(in)~~ cm	Comments: jaws close, good seal, winnowing, overlying water, surface intact, etc
		Longitude/Easting	Latitude/Northing			
1	0915			Y	27	wood fragments in jaw overlying water sediment surface bowed
2	0940			Y	28	overlying water organic debris in jaw

Sample Description: surface cover, density, moisture, color, minor modifier, MAJOR modifier, other constituents, odor, sheen, layering, anoxic layer, debris, plant matter, shells, biota

0-10: SILTY SAND (sm), moist, soft, gray, 40% fines, 60% f-sand, trace biota (shells), seaweed at surface

10-~~22~~ 10-27: Same as above except 25% fines, 75% f-sand, moderate – trace H_2S-like odor,

Grab 1 used for bioassay, Grab 2 used for Chemistry

Grab 2 same lithology as 1 but biota containing worm & worm tubes, fish, snail.

Sample Containers: 2x (4oz, 2x 8oz, 2x 16oz)

1x 2 gallon bag

Analyses: cd, TS/TOC, PAH, D/F, Grain Size, Bioassay

ANCHOR QEA

Surface Sediment Field Log

Job:	Port Gamble	Station:	PGST-1
Job No:	130388-01.01	Date:	8/11/14
Field Staff:	EM / KH	Sample Method:	Power grab
Contractor:	RSS	Proposed Coordinates: Lat.	311079.801
Horizontal Datum:	NAD 83 Wash. SP South Zone	Long.	1211634.94

Water Height
DTM Depth Sounder: 65.4'
DTM Lead Line: too deep, lead line off target

Tide Measurements
Time: 1400
Height: + 1.6'

Sample Acceptability Criteria:
1) Overlying water is present
2) Water has low turbidity
3) Sampler is not overfilled
4) Surface is flat
5) Desired penetration depth

Notes: Mudline Elevation calculated after sampling

Grab #	Time	Confirmed Coordinates (datum)		Sample Accept (Y/N)	Recovery Depth (in)	Comments: jaws close, good seal, winnowing, overlying water, surface intact, etc
		Longitude/Easting	Latitude/Northing			
1	1400			Y	28	Jaws closed, overlying water, some ~~seaweed~~, seaweed in jaw

Sample Description: surface cover, density, moisture, color, minor modifier, MAJOR modifier, other constituents, odor, sheen, layering, anoxic layer, debris, plant matter, shells, biota

0-20 SILT (ML), wet, very soft, brownish gray, 5% f-sand, 95% fines,
20-28 Same as before but moist, soft.

Sample Containers: 2x (4oz, 2x8oz, 2x16oz)

Analyses: Cd, TS/TOC, D/F, PAH, Grain size

ANCHOR QEA — Surface Sediment Field Log

Job: Port Gamble
Station: PG-ST-5
Job No: 130388-01.01
Date: 8/4/14
Field Staff: EM KH
Sample Method: Power grab
Contractor: RSS
Proposed Coordinates: Lat. 309873.587
Horizontal Datum: NAD 83 Wash. SP South Zone
Long. 1212132.54
Water Height
DTM Depth Sounder:
DTM Lead Line: 41.0'
Tide Measurements
Time: 1435
Height: 3.2

Sample Acceptability Criteria:
1) Overlying water is present
2) Water has low turbidity
3) Sampler is not overfilled
4) Surface is flat
5) Desired penetration depth

Notes: Mudline Elevation calculated after sampling

Grab #	Time	Confirmed Coordinates (datum) Longitude/Easting	Confirmed Coordinates (datum) Latitude/Northing	Sample Accept (Y/N)	Recovery Depth (in)	Comments: jaws close, good seal, winnowing, overlying water, surface intact, etc
EM 8/4/14 KH 1	1435			Y	27	Jaws closed, overlying water, surface intact

EM

Sample Description: surface cover, density, moisture, color, minor modifier, MAJOR modifier, other constituents, odor, sheen, layering, anoxic layer, debris, plant matter, shells, biota

0-10: SILT (ML), wet, very soft, brownish gray, 10% f-sand, 90% ~~8~~ KH fines, trace H_2S-like odor

10-27: same as above, except moist, soft

Sample Containers: 2x (4oz, 2x8oz, 2x16oz) = ~~7~~ KH 10 Total

Analyses: Cd, TS/TOC, D/F, PAH, Grain Size

ATTACHMENT A-3-4
DMMP BIOASSAY REPORT

BIOLOGICAL TESTING OF SEDIMENT FOR

PORT GAMBLE BAY

PORT GAMBLE, WASHINGTON

OCTOBER 17, 2014

PREPARED FOR:
ANCHOR QEA
720 OLIVE WAY, SUITE 1900
SEATTLE, WA 98101

PREPARED BY:
ENVIRON
PO BOX 216
4770 NE VIEW DRIVE
PORT GAMBLE, WA 98364

Contents

List of Tables

1.0 INTRODUCTION

ENVIRON conducted biological toxicity testing with sediment samples collected by Anchor QEA as part of a sediment investigation at Port Gamble Bay, Port Gamble, Washington. Sediments were evaluated for biological effects following guidance provided by the USACE Dredge Material Evaluation and Disposal Procedures, Dredge Material Management Program (DMMP, 2013). This report presents the results of the toxicity testing portion of the sediment investigation.

2.0 METHODS

This section summarizes the test methods followed for this biological characterization. Test methods followed guidance provided by the Puget Sound Estuary Program (PSEP 1995), the USACE Region 10 DMMP User Manual (USACE 2013), and the various updates presented during the Annual Sediment Management Review meetings (SMARM). Sediment toxicity was evaluated using three standard PSEP bioassays; the 10-day amphipod test, the juvenile polychaete survival and growth test, and the benthic larval development test.

2.1 SAMPLE AND ANIMAL RECEIPT

One hundred and four test Individual sediment core samples were collected between July 21 and July 25, 2014, and were received at ENVIRON between July 22 and July 25, 2014. Anchor QEA identified a subset of individual sediments to be composited by ENVIRON and used for biological testing. Reference sediments from two stations within Carr Inlet were collected by ENVIRON personnel on August 17, 2014 and received the same day. Sediment samples were stored in a walk-in cold room at 4 ± 2ºC in the dark. The test sediment was not sieved prior to testing. All tests were conducted within the eight-week holding time.

Amphipods (*Eohaustorius estuarius*) were supplied by Northwestern Aquatic Sciences in Newport, Oregon. Animals were held in native sediment at 15°C prior to test initiation. Juvenile polychaete worms (*Neanthes arenaceodentata*) were obtained from Aquatic Toxicology Support in Bremerton, Washington. Juvenile polychaetes were held in seawater at 20°C (*Neanthes* were cultured in water-only and were not held in sediment prior to testing). *Crassostrea gigas* (oyster) broodstock were collected by ENVIRON personnel. Broodstock were held in unfiltered seawater at 20°C prior to spawning.

Native *Eohaustorius* sediment from Yaquina Bay, Oregon was also provided by Northwest Aquatic Sciences for use as control sediment treatments for the amphipod and juvenile polychaete tests.

2.2 SAMPLE GRAIN SIZE AND REFERENCE COMPARISON

Sediment grain size is one of the characteristics used in selecting the appropriate reference sediment(s) to compare the chemical and biological responses of project sediments. The percent fines value is defined as the amount of sediment that passes through a 62.5-µm sieve, expressed as a percentage of the total sample analyzed. This is also the sum of the silt and clay fraction of sediment. Wet-sieve grain size results for the project sediments were conducted in the ENVIRON laboratory upon sample composition. Reference sediment wet-sieve grain size results were conducted in the field (at the time of collection) by ENVIRON personnel. The percent-fines determination of the project sediments are summarized in Table 2-1.

Table 2-1. Sample and Reference Grain Size Comparison.

Treatment	Percent Fines	Treatment Compared To:
CR-11	5.0	
SMA-1SE	0.0	CR-11
SMA-1NW	0.0	CR-11
SMA-1SB	6.0	CR-11

In the amphipod, polychaete and larval bioassays, samples SMA-1SE, SMA-1NW and SMA-1SB were compared to the CR-11 reference for the purposes of evaluating the sediment under the DMMP.

Prior to testing, bulk sediment porewater ammonia and sulfide concentrations and salinity was measured to determine whether any methods modifications or supplemental testing would be required. Bulk sediments are homogenized test composites that have not been further processed for bioassay testing. The results of the bulk sediment analyses are summarized in Table 2-2.

Table 2-2. Bulk Sediment Porewater Measurements.

Sample ID	Ammonia and Sulfide (mg/L)					
	Total Ammonia	Unionized Ammonia	Total Sulfide	Hydrogen Sulfide	Salinity (ppt)	pH
SMA-1SE	0.333	0.003	0.260	0.006	29	7.4
SMA-1NW	0.999	0.010	0.163	0.051	31	7.2
SMA-1SB	1.55	0.013	0.112	0.025	29	7.4

Ammonia concentrations for the sediment composites ranged from 0.333 to 1.55 mg/L total ammonia. Sulfide concentrations for the sediment composites ranged from 0.112 to 0.260 mg/L total sulfide. Sample SMA-1SE had the highest porewater total sulfide concentration of 0.260 mg/L.

Threshold overlying unionized ammonia and hydrogen sulfide values for potential compound related effects for use as trigger values for ammonia/sulfide reduction methods the benthic tests are summarized in Table 2-3; these values were based on the USACE draft values (Inouye et al. 2013). These values are no-effects concentrations based on a review of available data on ammonia and sulfides. However, for this project, the threshold values were applied to the interstitial water rather than the overlying water as that represented the most significant exposure media for non-tube dwelling species. The measured sulfide concentrations for some samples were near or above threshold values (Table 2-3) and were predicted to have sulfide related effects for the amphipod test. Based upon these observations and subsequent discussions with Anchor QEA, reduction procedures following the USEPA/USACE (2008) guidance were implemented for all samples for the amphipod benthic tests.

Porewater salinity for all samples ranged from 29 to 31 ppt. Based on this salinity range, the test sediments appeared to be well acclimated to marine conditions and unlikely to pose any concerns for the suite of test species.

Table 2-3. Threshold Unionized Ammonia and Hydrogen Sulfide Concentrations Purging Triggers for Benthic Test Organisms.

Parameter	*Neanthes arenaceodentata*	*Eohaustorius estuarius*
Unionized Ammonia (Inouye et al. 2013)	0.46 mg/L	0.80 mg/L
Hydrogen Sulfide (Inouye et al. 2013)	3.4 mg/L	0.12 mg/L

2.3 10-DAY AMPHIPOD BIOASSAY

The 10-day acute toxicity test with *E. estuarius* was initiated on September 15, 2014. To prepare the test exposures, approximately 175 mL of sediment was placed in clean, acid and solvent-rinsed 1-L glass jars, which were then filled with 775 mL of 0.45-µm filtered seawater at 28 ppt. The control and reference sediments were tested concurrently with the test treatments. Seven replicate chambers were prepared for each test treatment. Five replicates were used to evaluate sediment toxicity while the remaining two replicates were designated as sacrificial surrogate chambers. One surrogate chamber was sacrificed at test initiation to measure porewater and overlying ammonia and sulfides. The remaining surrogate chamber was used for measuring daily water quality throughout the test, as well as porewater and overlying ammonia and sulfides at test termination. Total ammonia as nitrogen was monitored using an Orion meter fitted with an ammonia ion-specific probe. Total sulfides as S^{2-} were monitored using a HACH DR/2800 Spectrophotometer.

Test chambers were placed in randomly assigned positions in a 15°C water bath and allowed to equilibrate overnight. Trickle-flow aeration was provided to prevent dissolved oxygen concentrations from dropping below acceptable levels.

For the amphipod test, ammonia and sulfide concentrations were reduced in samples control, CR-11, SMA-1SE, SMA-1NW and SMA-1SB following the procedures in Appendix E of the ITM (USACE/USEPA 1998). As indicated in the guidance, overlying water in the test chambers was renewed twice daily during the reduction process. To perform renewals, overlying water was siphoned from each of the test chambers, ensuring that surficial sediments were not disturbed. Laboratory seawater was then placed into each test chamber using a diffuser to prevent disturbance of test sediments. Porewater ammonia and sulfide concentrations were monitored in sacrificial surrogate containers. To collect porewater samples, overlying water was removed and sediment was placed into a centrifuge tube. Sediment samples were centrifuged for 20 minutes, after which the supernatant was collected for analysis. Ammonia and sulfide was measured in the extracted porewater using ion-specific probes. Once the porewater ammonia and sulfide concentrations were below the values in Table 2-3, the benthic test was initiated.

Immediately prior to test initiation, water quality parameters were measured in the surrogate chamber for each treatment. Dissolved oxygen (DO), temperature, pH, and salinity were then monitored in the surrogate chambers daily until test termination. Target test parameters were:

Dissolved Oxygen:	≥ 4.6 mg/L
pH:	7 - 9 units
Temperature:	15 ± 1°C
Salinity:	28 ± 1ppt

The tests were initiated by randomly allocating 20 *E. estuarius* into each test chamber, ensuring that each of the amphipods successfully buried into the sediment. Amphipods that did not bury within approximately one hour were replaced. The 10-day amphipod bioassay was conducted as a static test with no feeding during the exposure period. At test termination, sediment from each test chamber was sieved through a 0.5-mm screen and all recovered amphipods transferred into a Petri dish. The number of surviving and dead amphipods was then determined under a dissecting microscope.

A water-only, 4-day reference-toxicant test was conducted concurrently with the sediment tests using ammonium chloride. The ammonium chloride reference-toxicant test was used to ensure animals used in the test were healthy and of similar sensitivity to prior tests. This test also provided information on the sensitivity to any ammonia concentrations that might be present in the sediments.

2.4 20-DAY JUVENILE POLYCHAETE BIOASSAY

The 20-day chronic toxicity test with *N. arenaceodentata* was initiated on September 9, 2014. Test exposures were prepared with approximately 175 mL of sediment placed in clean, acid and solvent-rinsed 1-L glass jars, which were then filled with 775 mL of 0.45-µm filtered seawater at 28 ppt. The control and reference sediments were tested concurrently with the test treatments. Seven replicate chambers were prepared for each test treatment. Five replicates were used to evaluate sediment toxicity while the remaining two replicates were designated as sacrificial surrogate chambers. One surrogate chamber was sacrificed at test initiation to measure overlying and interstitial ammonia and sulfides. The remaining surrogate chamber was used for measuring daily water quality throughout the test, as well as overlying and interstitial ammonia and sulfides at test termination. Total ammonia as nitrogen was monitored using an Orion meter fitted with an ammonia ion-specific probe. Total sulfides as S^{2-} were monitored using a HACH DR/2800 Spectrophotometer.

Test chambers were placed in randomly assigned positions in a water bath at 20°C and allowed to equilibrate overnight. Trickle-flow aeration was provided to prevent dissolved oxygen concentrations from dropping below acceptable levels.

Immediately prior to test initiation, water quality parameters were measured. Dissolved oxygen, temperature, pH, and salinity were then monitored in the surrogates daily until test termination. Target test parameters were:

Dissolved Oxygen:	≥ 4.6 mg/L
pH:	7 - 9 units
Temperature:	20 ± 1°C
Salinity:	28 ± 2 ppt

The juvenile polychaete test was initiated by randomly allocating five *N. arenaceodentata* into each test chamber, and observing whether each of the worms successfully buried into the sediment. Worms that did not bury within approximately one hour were replaced with healthy worms. The 20-day test was conducted as a static-renewal test, with exchanges of 300 mL of water occurring every third day. *N. arenaceodentata* were fed every other day with 40 mg of TetraMarin® (approximately 8 mg dry weight per worm). At test termination, sediment from each test chamber was sieved through a 0.5-mm screen and all recovered worms transferred into a Petri dish. The number of surviving and dead worms was determined. All surviving worms were then transferred to pre-weighed, aluminum foil weigh-boats, and dried in a drying oven at 110°C for a minimum of 6 hours. Each weigh-boat was removed, cooled in a dessicator, and then weighed on a microbalance to 0.01 mg. Each of the weigh boats was then heated to 550°C for 2

hours in order to determine the ashed weight. Ash-free dry weights (AFDW) were calculated to correct for the influence of sediment grain size differences between treatments. The ashed boats were weighed to 0.01 mg and the ashed weight was subtracted from the dry weight to calculate the AFDW. Both dry weight and AFDW were used to determine individual worm weight and growth rates.

A water-only, 4-day reference-toxicant test was conducted concurrently with the sediment tests using ammonium chloride. The ammonium chloride reference-toxicant test was used to ensure animals used in the test were healthy and of similar sensitivity to prior tests. This test also provided information on the sensitivity to any ammonia concentrations that might be present in the sediments.

2.5 LARVAL DEVELOPMENTAL BIOASSAY

Test sediments were evaluated using the larval benthic toxicity test with the oyster, *C. gigas*. The oyster larval test was initiated on September 12, 2014. The control and reference sediments were tested with the test treatments. To prepare the test exposures, 18 g (±1 g) of test sediment was placed in clean, acid and solvent-rinsed 1-L glass jars, which were then filled to 900 mL with 0.45-µm filtered seawater. Six replicate chambers were prepared for the test treatments, reference sediments, and the native sediment control treatment. Five of the replicates were used to evaluate the test; the sixth replicate was used as a water quality surrogate. Each chamber was shaken for 10 seconds and then placed in predetermined randomly-assigned positions in a water bath at 20°C.

To collect gametes for each test, oysters were placed in clean seawater and acclimated at 20°C for approximately 20 minutes. The water bath temperature was then increased over a period of 15 minutes to 25°C. Oysters were held at 25°C and monitored for spawning individuals. Spawning females and males were removed from the water bath and placed in individual containers with seawater. These individuals were allowed to spawn until sufficient gametes were available to initiate the test. After the spawning period, eggs are transferred to fresh seawater and filtered through a 0.5 mm Nitex® mesh screen to remove large debris, feces, and excess gonadal matter. A composite was made of the sperm and diluted with fresh seawater. The fertilization process was initiated by adding sperm to the isolated egg containers. Egg-sperm solutions were periodically homogenized with a perforated plunger during the fertilization process and sub-samples observed under the microscope for egg and sperm viability. Approximately one to one and a half hours after fertilization, embryo solutions were checked for fertilization rate. Only those embryo stocks with >90% fertilization were used to initiate the tests. Embryo solutions were rinsed free of excess sperm and then combined to create one embryo stock solution. Density of the embryo stock solution was determined by counting the number of embryos in a subsample of homogenized stock solution. This was used to determine the volume of embryo stock solution to deliver approximately 27,000 embryos to each test chamber.

Dissolved oxygen, temperature, pH, and salinity were monitored in water quality surrogates to prevent loss or transfer of larvae by adhesion to water-quality probes. Ammonia and sulfides in the overlying water were measured on Day 0 and Day 2. Total ammonia as nitrogen was monitored using an Orion meter fitted with an ammonia ion-specific probe. Total sulfides as S^{2-} were monitored using a HACH DR/2800V Spectrophotometer. Target test parameters were as follows:

Dissolved Oxygen:	≥ 4.6 mg/L
pH:	7 - 9 units
Temperature:	20 ± 1°C
Salinity:	28 ± 2ppt

The development test was conducted as a static test with aeration. The protocol calls for test termination when 95% of the embryos in the control have reached the prodissoconch I stage (approximately 48-60 hours). At termination, the overlying seawater was decanted into a clean 1-L jar and mixed with a perforated plunger. From this container, a 10 mL subsample was transferred to a scintillation vial and preserved in 5% buffered formalin. Larvae were subsequently stained with a dilute solution of Rose Bengal in 70% alcohol to help visualization of larvae. The number of normal and abnormal larvae was enumerated on an inverted microscope. Normal larvae included all D-shaped prodissoconch I stage larvae. Abnormal larvae included abnormally shaped prodissoconch I larvae and all early stage larvae.

A water-only reference-toxicant test was conducted concurrently with the sediment tests using ammonium chloride. The ammonium chloride reference-toxicant test was used to ensure animals used in the test were healthy and of similar sensitivity to prior tests. This test also provided information on the sensitivity to ammonia concentrations that would possibly be present in the sediments.

2.6 DATA ANALYSIS AND QA/QC

All water quality and endpoint data were entered into Excel spreadsheets. Water quality parameters were summarized by calculating the mean, minimum, and maximum values for each test treatment. Endpoint data were calculated for each replicate and the mean values and standard deviations were determined for each test treatment.

All hand-entered data was reviewed for data entry errors, which were corrected prior to summary calculations. A minimum of 10% of all calculations and data sorting were reviewed for errors. Review counts were conducted on any apparent outliers.

For the larval test, the normalized combined mortality and abnormality endpoint was used to evaluate the test sediment. This was based on the number of normal larvae in each treatment and reference sample divided by the mean number of normal larvae in the control replicates, as defined in USACE Region 10 User Manual (2013).

For DMMP suitability determinations, comparisons were made according to the SAPA and Fox et al. (1998). Data reported as percent mortality or survival were transformed using an arcsine square root transformation prior to statistical analysis. All data were tested for normality using the Wilk-Shapiro test and equality of variance using Levene's test. Determinations of statistical significance were based on one-tailed Student's t-tests with an alpha of 0.05. A comparison of the larval endpoint relative to the reference was made using an alpha level of 0.10. For samples failing to meet assumptions of normality, a Mann-Whitney test was conducted to determine significance. For those samples failing to meet the assumptions of normality and equality of variance, a t-test on rankits was used.

3.0 RESULTS

The results of the sediment testing, including a summary of test results and water quality observations are presented in this section. Data for each of the replicates, as well as laboratory bench sheets are provided Appendix A and statistical analyses are provided in Appendix B.

3.1 10-DAY AMPHIPOD BIOASSAY

The bioassay test with *E. estuarius* was validated with 2% mortality in the native sediment control, which met the DMMP performance criteria of ≤10% mortality. This result indicates that the test conditions were suitable for adequate amphipod survival. Mean mortality in the reference treatment was 2%, which met the DMMP performance criteria (<20% mortality) and indicated that the reference sediments were acceptable for suitability determination. Mean mortality in the project sediments ranged from 3 to 7%. All endpoint results are summarized in Table 3-1.

Summaries of water quality measurements, ammonia and sulfide concentrations, and test conditions are presented in Table 3-2, Table 3-3, and Table 3-4.

All water quality parameters were within the acceptable limits throughout the duration of the test.

A reference-toxicant test (positive control) was performed on the batch of test organisms utilized for this study. The LC_{50} value was well within control chart limits (±2 standard deviations from the laboratory historical mean). This result indicates that the test organisms used in this study were of similar sensitivity to those previously tested at ENVIRON.

Ammonia concentrations observed in the *E. estuarius* test were well below the No Observed Effect Concentration (NOEC) value derived from the concurrent ammonia reference-toxicant test (Table 3-3; compare to NOEC of 50.5 mg/L). Values were also below the published threshold concentration of 15 mg/L total ammonia (Barton 2002). Ammonia concentrations within the sediment samples should not have been a contributor to any adverse biological effects observed in the test treatment.

Table 3-1. Test Results for *Eohaustorius estuarius*.

Treatment	Rep	Number Surviving	Percentage Survival	Mean Percentage		SD
				Survival	Mortality	
Control	1	20	0	98	2	2.7
	2	20	0			
	3	20	0			
	4	19	1			
	5	19	1			
CR-11	1	20	0	98	2	2.7
	2	19	1			
	3	19	1			
	4	20	0			
	5	20	0			
SMA-1SE	1	16	4	93	7	9.7
	2	17	3			
	3	20	0			
	4	20	0			
	5	20	0			
SMA-1NW	1	19	1	93	7	2.7
	2	18	2			
	3	19	1			
	4	19	1			
	5	18	2			
SMA-1SB	1	19	1	97	3	2.7
	2	19	1			
	3	19	1			
	4	20	0			
	5	20	0			

Table 3-2. Water Quality Summary for *Eohaustorius estuarius*.

Treatment	Dissolved Oxygen (mg/L)			Temperature (°C)			Salinity (ppt)			pH (units)		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Control	8.3	8.0	8.4	15.8	15.6	15.9	28	27	28	8.0	7.8	8.0
CR-11	8.2	7.7	8.4	15.8	15.7	15.9	28	28	29	8.1	7.9	8.3
SMA-1SE	8.2	7.8	8.4	15.9	15.7	16.0	27	27	28	7.9	7.8	8.0
SMA-1NW	8.3	8.1	8.5	15.8	15.6	16.0	28	27	28	8.0	7.9	8.1
SMA-1SB	8.3	8.0	8.4	15.8	15.6	16.0	27	27	28	7.9	7.8	8.0

Table 3-3. Ammonia and Sulfide Summary for *Eohaustorius estuarius*.

Treatment	Overlying Ammonia (mg/L Total)		Interstitial Ammonia (mg/L Total)		Overlying Sulfides (mg/L Total)		Interstitial Sulfides (mg/L Total)	
	Day 0	Day 10	Day 0	Day 10	Day 0	Day 10	Day 0	Day 10
Control	0.066	0.00	0.210	0.00	0.006	0.003	0.000	0.023
CR-11	0.183	0.00	1.63	0.00	0.017	0.001	0.020	0.046
SMA-1SE	0.058	0.00	0.239	0.00	0.010	0.000	0.290	0.062
SMA-1NW	0.092	0.00	0.406	0.00	0.006	0.000	0.120	0.079
SMA-1SB	0.064	0.00	0.210	0.00	0.017	0.000	0.740	0.081

NOEC (concurrent reference-toxicant test derived) = 50.5 mg/L

Table 3-4 Test Condition Summary for *Eohaustorius estuarius*.

Test Conditions: PSEP *E. estuarius*		
Sample Identification	Control, CR-11, SMA-1SE, SMA-1NW, and SMA-1SB	
Date sampled	July 21 - 25, 2014 (Test Sediments) August 17, 2014 (Reference Sediment)	
Date received	July 22 - 25, 2014 (Test Sediments) August 17, 2014 (Reference Sediment)	
Test dates	September 15 – 25, 2014	
Sample storage conditions	4°C, dark	
Days of holding Recommended: ≤8 weeks (56 days)	56 Days (Test Sediments) 29 Days (Reference Sediments)	
Source of control sediment	Yaquina Bay, OR	
Test Species	***E. estuarius***	
Supplier	Northwestern Aquatic Sciences, Newport, OR	
Date acquired	September 11, 2014	
Age class	Subadult, 3-5 mm	
Test Procedures	PSEP 1995 with SMARM revisions	
Test location	ENVIRON Port Gamble Laboratory	
Test type/duration	10-Day static	
Control water	North Hood Canal seawater, 0.45µm filtered	
Test dissolved oxygen	Recommended: ≥ 4.6 mg/L	Achieved: 7.6 – 8.5 mg/L
Test temperature	Recommended: 15 ± 1 °C	Achieved: 15.6 – 16.0 °C
Test Salinity	Recommended: 28 ± 1 ppt	Achieved: 27 - 29 ppt
Test pH	Recommended: 7 – 9	Achieved: 7.8 – 8.6
DMMP Control Performance Standard	Recommended: Control ≤ 10% mortality	Achieved: 2%; Pass
DMMP Reference Performance Standard	Recommended: Reference mortality ≤ Control + 20%	Achieved: CR-11: 0%, Pass
Reference Toxicant LC_{50} (total ammonia)	LC_{50} = 106.3 mg/L total ammonia	
Mean; Acceptable Range (total ammonia)	143.3; 30.2 – 256.3 mg/L total ammonia	
NOEC (total ammonia)	50.5 mg/L total ammonia	
NOEC (unionized ammonia)	0.497 mg /L UIA	
Test Lighting	Continuous	
Test chamber	1-Liter Glass Chamber	
Replicates/treatment	5 + 2 surrogates (one used for WQ measurements throughout the test)	
Organisms/replicate	20	
Exposure volume	175 mL sediment/ 775 mL water	
Feeding	None	
Water renewal	None	
Deviations from Test Protocol	None	

3.2 20-DAY JUVENILE POLYCHAETE BIOASSAY

No mortality was observed in the *N. arenaceodentata* control sediment and mean individual growth (MIG) in the control sediment was 0.710 mg/ind/day (dry weight) and 0.366 mg/ind/day (AFDW). These values fall within the DMMP test acceptability criteria of ≤10% mean mortality and ≥0.38 mg/ind/day (dry weight) mean individual growth (Kendall 1996), indicating that the test conditions were suitable for adequate polychaete survival and growth. A summary of the test results for all samples is shown in Table 3-5. Summaries of water quality measurements, ammonia and sulfide concentrations, and test conditions are presented in Table 3-6, Table 3-7, and Table 3-8.

No mortality was observed in the reference treatment (CR-11), meeting the DMMP reference performance standard of ≥80% the control survival (USACE 2013). Mean individual growth rate was 0.641 mg/ind/day (dry weight) and 0.375 mg/ind/day (AFDW).

Mean individual growth (dry weight and AFDW) for the reference treatment compared to the control was greater than 80% of the control response and mortality was less than 20% in the reference treatment. These results indicate that the reference sediment was acceptable for suitability determination.

A reference-toxicant test (positive control) was performed on the batch of test organisms utilized for this study. The LC_{50} value was well within control chart limits (±2 standard deviations from the laboratory historical mean). This result indicates that the test organisms used in this study were of similar sensitivity to those previously tested at ENVIRON.

All water quality parameters were within the acceptable limits throughout the duration of the test. Ammonia concentrations observed in the *N. arenaceodentata* test were below the NOEC value derived from the concurrent ammonia reference-toxicant test (Table 3-7; compare to NOEC of 58.3 mg/L). This indicates that ammonia concentrations within the sediment samples should not have been a contributor to any adverse biological effects observed in the test treatments. Sulfide concentrations in interstitial water were below the NOEC (3.47 mg/L; Kendall and Barton 2004) for all samples with the exception of CR-11 on Day 0. The reference treatment had an initial interstitial sulfide measurement of >7.0 mg/L; however, the high level of survival and growth observed in this treatment suggest that sulfides did not have a detrimental effect on the test organisms.

Table 3-5. Test Results for *Neanthes arenaceodentata*.

Treatment	Rep	Survivors	Mean Mortality (%)	Individual Growth (mg/ind/day)					
				Dry Weight	Mean	SD	AFDW	Mean	SD
Control	1	5	0	0.455	0.710	0.183	0.268	0.366	0.081
	2	5		0.906			0.477		
	3	5		0.745			0.387		
	4	5		0.602			0.311		
	5	5		0.842			0.387		
CR-11	1	5	0	0.606	0.641	0.064	0.375	0.375	0.036
	2	5		0.615			0.360		
	3	5		0.571			0.326		
	4	5		0.682			0.388		
	5	5		0.731			0.424		
SMA-1SE	1	5	0	0.600	0.657	0.095	0.431	0.417	0.022
	2	5		0.609			0.419		
	3	5		0.817			0.442		
	4	5		0.591			0.385		
	5	5		0.667			0.406		
SMA-1NW	1	5	8	0.868	0.708	0.125	0.504	0.445	0.063
	2	5		0.671			0.426		
	3	4		0.732			0.470		
	4	4		0.743			0.479		
	5	5		0.525			0.344		
SMA-1SB	1	5	0	0.528	0.678	0.089	0.377	0.418	0.029
	2	5		0.676			0.414		
	3	5		0.696			0.436		
	4	5		0.746			0.411		
	5	5		0.743			0.454		

Table 3-6. Water Quality Summary for *Neanthes arenaceodentata*.

Treatment	Dissolved Oxygen (mg/L)			Temperature (°C)			Salinity (ppt)			pH (units)		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Control	7.5	7.3	7.9	20.6	19.7	21.0	28	28	29	8.0	7.7	8.1
CR-11	7.5	7.2	7.9	20.5	19.7	21.0	28	28	29	8.2	7.8	8.4
SMA-1SE	7.5	7.2	7.8	20.5	19.7	21.1	28	28	29	7.9	7.7	8.1
SMA-1NW	7.2	6.6	7.8	20.6	19.6	21.1	28	28	29	7.8	7.5	8.0
SMA-1SB	7.5	7.3	7.9	20.6	19.7	21.1	28	28	29	7.9	7.7	8.1

Table 3-7. Ammonia and Sulfide Summary for *Neanthes arenaceodentata*.

Treatment	Overlying Ammonia (mg/L Total)		Interstitial Ammonia (mg/L Total)		Overlying Sulfides (mg/L Total)		Interstitial Sulfides (mg/L Total)	
	Day 0	Day 20	Day 0	Day 20	Day 0	Day 20	Day 0	Day 20
Control	0.130	0.00	0.106	0.00	0.022	0.013	ND	0.050
CR-11	1.03	0.00	6.17	0.00	0.022	0.000	>7.0	0.024
SMA-1SE	0.158	0.00	0.772	ND	0.057	0.003	0.438	0.000
SMA-1NW	0.741	0.00	1.02	0.00	0.075	0.009	0.304	0.000
SMA-1SB	0.329	0.00	0.984	0.00	0.072	0.032	0.320	0.217

ND = no data; insufficient volume for analysis.
NOEC (concurrent reference-toxicant test derived) = 58.3 mg/L

Table 3-8. Test Condition Summary for *Neanthes arenaceodentata*.

Test Conditions: PSEP *N. arenaceodentata*		
Sample Identification	Control, CR-11, SMA-1SE, SMA-1NW, and SMA-1SB	
Date sampled	July 21 - 25, 2014 (Test Sediments) August 17, 2014 (Reference Sediment)	
Date received	July 22 - 25, 2014 (Test Sediments) August 17, 2014 (Reference Sediment)	
Test dates	September 9 – 29, 2014	
Sample storage conditions	4°C, dark	
Days of holding Recommended: ≤8 weeks (56 days)	50 Days (Test Sediments) 23 Days (Reference Sediments)	
Source of control sediment	Yaquina Bay, OR	
Test Species	***N. arenaceodentata***	
Supplier	Aquatic Toxicology Support	
Date acquired	September 9, 2014	
Age class	Juvenile; 16 Days post emergence	
Test Procedures	PSEP 1995 with SMARM revisions	
Test location	ENVIRON Port Gamble Laboratory	
Test type/duration	20-Day static renewal	
Control water	North Hood Canal sea water, 0.45µm filtered	
Test dissolved oxygen	Recommended: ≥ 4.6 mg/L	Achieved: 6.6 – 7.9 mg/L
Test temperature	Recommended: 20 ± 1 °C	Achieved: 19.6 – 21.1 °C
Test Salinity	Recommended: 28 ± 2 ppt	Achieved: 28 - 29 ppt
Test pH	Recommended: 7 – 9	Achieved: 7.5 – 8.4
Initial biomass	Recommended: 0.5 – 1.0 mg Minimum: 0.25 mg	0.977 mg; Acceptable
DMMP Control Performance Standard	Recommended: Control ≤ 10% mortality	Achieved: 0% Pass
	Recommended: Minimum: > 0.38 mg/ind/day	Achieved: 0.710 mg/ind/day; Pass
DMMP Reference Performance Standard	Recommended: Mortality ≤20% and $MIG_{Reference}/MIG_{Control}$ ≥ 80%	Mortality: CR-11, 0% (Pass) MIG Achieved; CR-11: 90% (Pass)
Reference Toxicant LC_{50} (total ammonia)	LC_{50} = 97.9 mg/L total ammonia	
Mean; Acceptable Range (total ammonia)	146.3; 50.9 – 241.7 mg/L total ammonia	
NOEC (total ammonia)	58.3 mg/L total ammonia	
NOEC (unionized ammonia)	0.599 mg/L UIA	
Test Lighting	Continuous	
Test chamber	1-Liter Glass Chamber	
Replicates/treatment	5 + 2 surrogates (one used for WQ measurements throughout the test)	
Organisms/replicate	5	
Exposure volume	175 mL sediment/ 775 mL water	
Feeding	40 mg/jar every other day (8mg/ind every other day)	
Water renewal	Water renewed every third day (1/3 volume of exposure chamber)	
Deviations from Test Protocol	None	

3.3 LARVAL DEVELOPMENT BIOASSAY

The larval development test with *C. gigas* was validated by 71.4% normalized combined normal survivorship, defined as the mean number of normal larvae within the control divided by the stocking density. This value was within the DMMP acceptability criteria of ≥70%. A summary of the test results for all samples is shown in Table 3-9. Summaries of water quality measurements, ammonia and sulfide concentrations, and test conditions are presented in Table 3-10, Table 3-11, and Table 3-12.

Mean control-normalized normal survival was 83.6% in the CR-11 reference sediment and ranged from 60.7 to 80.8% in the project samples. The test mean chamber stocking density (measured at test initiation) was 25.8 embryos/mL.

A reference-toxicant test (positive control) was performed on the batch of test organisms utilized for this study. The LC_{50} value was well within control chart limits (±2 standard deviations from the laboratory historical mean). This result indicates that the test organisms used in this study were of similar sensitivity to those previously tested at ENVIRON.

All water quality parameters were within the acceptable limits throughout the duration of the test.

Ammonia concentrations observed in the *C. gigas* test were below the NOEC value derived from the concurrent ammonia reference-toxicant test (Table 3-11; compare to NOEC of 2.4 mg/L). This indicates that ammonia concentrations within the sediment samples should not have been a contributor to any adverse biological effects observed in the test treatments.

Table 3-9. Test Results for *Crassostrea gigas*.

Treatment	Rep	Number Normal	Number Abnormal	Mean # Normal	Normalized Combined Normal Survivorship (%)[1, 2]	Mean Combined Normal Survivorship (%)	SD
Control	1	168	4	184.2	65.1	71.4	17.1
	2	136	1		52.7		
	3	159	4		61.6		
	4	245	6		95.0		
	5	213	6		82.6		
CR-11	1	146	3	154.0	79.3	83.6	8.1
	2	177	12		96.1		
	3	144	6		78.2		
	4	142	4		77.1		
	5	161	4		87.4		
SMA-1SE	1	144	3	148.8	78.2	80.8	9.7
	2	126	5		68.4		
	3	171	6		92.8		
	4	162	3		87.9		
	5	141	4		76.5		
SMA-1NW	1	157	9	140.8	85.2	76.4	6.3
	2	144	9		78.2		
	3	137	2		74.4		
	4	141	4		76.5		
	5	125	2		67.9		
SMA-1SB	1	135	6	111.8	73.3	60.7	18.5
	2	102	4		55.4		
	3	56	2		30.4		
	4	131	3		71.1		
	5	135	6		73.3		

[1] Control normality normalized to stocking density (258).
[2] Reference and treatment normal survivorship are normalized to the mean control normality (184.2).

Table 3-10. Water Quality Summary for *Crassostrea gigas*.

Treatment	Dissolved Oxygen (mg/L)			Temperature (°C)			Salinity (ppt)			pH (units)		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Control	7.4	7.2	7.7	20.6	20.0	20.9	29	28	29	7.9	7.7	8.1
CR-11	7.4	7.4	7.4	20.6	19.9	21.0	29	28	29	7.9	7.7	8.0
SMA-1SE	7.5	7.3	7.6	20.5	19.9	20.9	29	28	29	7.9	7.8	8.0
SMA-1NW	7.3	7.0	7.5	20.5	19.9	20.9	29	28	29	7.9	7.7	8.0
SMA-1SB	7.3	7.0	7.6	20.6	20.1	21.0	29	29	29	7.9	7.7	8.0

Table 3-11. Ammonia and Sulfide Summary for *Crassostrea gigas*.

Treatment	Overlying Ammonia (mg/L Total)		Overlying Sulfides (mg/L Total)	
	Day 0	Day 2	Day 0	Day 2
Control	0.062	0.056	0.004	0.019
CR-11	0.092	0.038	0.003	0.017
SMA-1SE	0.00	0.004	0.022	0.085
SMA-1NW	0.054	0.011	0.044	0.045
SMA-1SB	0.025	0.013	0.006	0.023

NOEC (concurrent reference-toxicant test derived) = 2.43 mg/L

Table 3-12. Test Condition Summary for *Crassostrea gigas*.

Test Conditions: PSEP *C. gigas*		
Sample Identification	Control, CR-11, SMA-1SE, SMA-1NW, and SMA-1SB	
Date sampled	July 21 - 25, 2014 (Test Sediments) August 17, 2014 (Reference Sediment)	
Date received	July 22 - 25, 2014 (Test Sediments) August 17, 2014 (Reference Sediment)	
Test dates	September 12 - 14, 2014	
Sample storage conditions	4°C, dark	
Holding time Recommended: < 8 weeks (56 days)	53 Days (Test Sediments) 26 Days (Reference Sediments)	
Test Species	***C. gigas***	
Supplier	ENVIRON, Port Gamble, WA	
Date acquired	September 11, 2014	
Age class	<2-h old embryos	
Test Procedures	PSEP 1995 with SMARM revisions	
Test location	ENVIRON Port Gamble Laboratory	
Test type/duration	48-60 Hour static test (Actual: 52 hours)	
Control water	North Hood Canal sea water, 0.45µm filtered	
Test dissolved oxygen	Recommended: > 5.0 mg/L	Achieved: 7.0 – 7.7 mg/L
Test temperature	Recommended: 20 ± 1 °C	Achieved: 19.9 – 21.0 °C
Test Salinity	Recommended: 28 ± 1 ppt	Achieved: 28 – 29 ppt
Test pH	Recommended: 7 - 9	Achieved: 7.7 – 8.1
Stocking Density	Recommended: 20 – 40 embryos/mL	Achieved: 25.8 embryos/mL
DMMP Control performance standard	Recommended: Control normal survival ≥ 70%	Achieved: 71.4%, Pass
DMMP Reference Performance Standard	Recommended: Reference normal survival / Control normal survival ≥ 65%	Achieved: CR-11: 83.6%; Pass
Reference Toxicant LC_{50} (total ammonia)	LC_{50} = 3.3 mg/L total ammonia	
Mean; Acceptable Range (total ammonia)	5.4; 1.1 – 9.8 mg/L total ammonia	
NOEC (total ammonia)	2.43 mg/L total ammonia	
NOEC (unionized ammonia)	0.038 mg /L UIA	
Test Lighting	14hr Light / 10hr Dark	
Test chamber	1-Liter Glass Chamber	
Replicates/treatment	5 + 1 surrogate (used for WQ measurements throughout the test)	
Exposure volume	18 g sediment/ 900 mL water	
Feeding	None	
Water renewal	None	
Deviations from Test Protocol	None	

4.0 DISCUSSION

Sediments were evaluated based on Dredged Material Management Plan (DMMP) criteria. The biological criteria are based on both statistical significance (a statistical comparison) and the degree of biological response (a numerical comparison). The DMMP criteria are taken from the Dredged Material Evaluation and Disposal Procedures for dispersive and nondispersive disposal sites (USACE 2013). Suitability was determined using a combination of test results, with 2-hit failures requiring a sample to fail 2-hit criteria in more than one bioassay. If a sample fails the 1-hit criteria for any bioassay, it is not considered suitable for disposal at a proposed disposal site.

4.1 AMPHIPOD TEST SUITABILITY DETERMINATION

Under the DMMP program, a test treatment will fail the Dispersive and Nondispersive 2-Hit criteria if mean mortality in the test treatment is >20% relative to the control sediment and the difference is statistically significant. Treatments will fail the 1-Hit criteria when the 2-Hit conditions are met and if the mean mortality in the test treatment is >10% (Dispersive) or >30% (Nondispersive) than the mean mortality in the appropriate reference sediment.

Samples SMA-1SE, SMA-1NW and SMA-1SB passed the 1-Hit and 2-Hit criteria for *E. estuarius* (Table 4-1).

Table 4-1. DMMP Comparison for *Eohaustorius estuarius*.

Treatment	Mean Mortality (%)	Statistically More than Reference?	Mortality Comparison to Control M_T-M_C (%)	Mortality Comparison to Reference M_T-M_R (%)	Fails 2-Hit Rule?[1]	Fails 1-Hit Rule?[2,3]	
						Dispersive	Non-Dispersive
Control	2						
CR-11	2						
SMA-1SE	7	No	5	5	No	No	No
SMA-1NW	7	Yes	5	5	No	No	No
SMA-1SB	3	No	1	1	No	No	No

[1]2-Hit Criteria: M_T-M_C >20% and Statistical Significance (Dispersive and Nondispersive)
[2]1-Hit Criteria: M_T-M_C >20% and Statistical Significance (M_T vs M_R) and M_T-M_R >10% (Dispersive)
[3]1-Hit Criteria: M_T-M_C >20% and Statistical Significance (M_T vs M_R) and M_T-M_R >30% (Nondispersive)
M_T = Treatment Mortality
M_C = Control Mortality
M_R = Reference Mortality

4.2 JUVENILE POLYCHAETE TEST SUITABILITY DETERMINATION

Suitability determinations for the juvenile polychaete test were based on mean individual growth (MIG). Juvenile polychaete test treatments fail to meet the Dispersive 2-Hit criteria when the mean individual growth rate (MIG) in the test sediment is less than 80% of the MIG in the control and the comparison to reference sediment is statistically significant. The test treatments fail to meet the Nondispersive 2-Hit criteria when the mean individual growth rate (MIG) in the test sediment is less than 80% of the MIG in the control, the comparison to reference sediment is statistically significant, and is less than 70% of the MIG in the reference sediment. Test treatments fail to meet 1-Hit criteria when the mean individual growth rate (MIG) in the test sediment is less than 80% of MIG in the control, the comparison to reference sediment is

statistically significant ($p \leq 0.05$), and is less than 70% of the MIG in the reference sediment (Dispersive) or less than 50% of the MIG in the reference sediment (Nondispersive).

Samples SMA-1SE, SMA-1NW and SMA-1SB passed the 1-Hit and 2-Hit criteria when compared to the reference and control sediments in ash-free dry weight comparisons (Table 4-2).

Table 4-2. DMMP Comparison for *Neanthes arenaceodentata*.

Treatment	MIG (mg/ind/day)	Statistically Less than Reference?	MIG Relative to Control MIG_T/MIG_C (%)	MIG Relative to Reference MIG_T/MIG_R (%)	Fails 2-Hit Rule?[1]	Fails 2-Hit Rule?[2]	Fails 1-Hit Rule?[3,4]	
							Dispersive	Non-dispersive
Control	0.366							
CR-11	0.375							
SMA-1SE	0.417	No	113.8	111.2	No	No	No	No
SMA-1NW	0.445	No	121.6	118.8	No	No	No	No
SMA-1SB	0.418	No	114.4	111.7	No	No	No	No

[1]2-Hit Criteria: MIG_T/MIG_C <80% and Statistical Significance (MIG_T vs MIG_R) (Dispersive)
[2]2-Hit Criteria: MIG_T/MIG_C <80% and Statistical Significance (MIG_T vs MIG_R) and MIG_T/MIG_R <70% (Nondispersive)
[3]1-Hit Criteria: MIG_T/MIG_C <80% and Statistical Significance (MIG_T vs MIG_R) and MIG_T/MIG_R <70% (Dispersive)
[4]1-Hit Criteria: MIG_T/MIG_C <80% and Statistical Significance (MIG_T vs MIG_R) and MIG_T/MIG_R <50% (Nondispersive)
MIG_T = Treatment Mean Individual Growth
MIG_R = Reference Mean Individual Growth
MIG_C = Control Mean Individual Growth

4.3 Larval Test Suitability Determination

Larval test treatments fail the DMMP 2-Hit criteria if the percentage of normal larvae (normalized to control) in the test treatment is less than 80% and is significantly lower ($p \leq 0.1$) than that of the reference. Treatments fail the DMMP 1-Hit criteria when the 2-Hit criteria are met and the normalized larval development in the test treatment is less than 85% of the normalized development in the reference (Dispersive) or less than 70% of the normalized development in the reference (Nondispersive).

Mean normal survival in treatment SMA-1SE was 80.8% relative to the control and 96.6%, relative to the reference, meeting both the 2-Hit and 1-Hit criteria for both dispersive and nondispersive disposal sites (Table 4-3).

Mean normal survivorship in project sample SMA-1NW was 76.4% relative to the control and 91.4% relative to the reference, failing the 2-Hit criterion but passing the 1-Hit criterion for both dispersive and nondispersive disposal sites (Table 4-3).

In sample SMA-1SB, mean normal survivorship was 60.7% relative to the control and 72.6% relative to the reference and was significantly different from that of the control and the reference. Based on the results of the larval test, this sample failed the 2-Hit criterion, but passed the 1-Hit criterion for nondispersive disposal sites; sample SMA-1SB failed the 1-Hit criterion for dispersive disposal sites (Table 4-3).

Table 4-3. DMMP Comparison for *Crassostrea gigas*.

Treatment	Mean Normal Survival (%)	<80%?	Statistically Less than Reference?	Normal Survival Comparison to Reference (N_T/N_R)	Fails 2-Hit Rule?[1]	Fails 1-Hit Rule?[2,3]	
						Dispersive	Non-Dispersive
Control	71.4						
CR-11	83.6						
SMA-1SE	80.8	No	No	96.6	No	No	No
SMA-1NW	76.4	Yes	Yes	91.4	Yes	No	No
SMA-1SB	60.7	Yes	Yes	72.6	Yes	Yes	No

[1]2-Hit Criteria: N_T<80% and Statistical Significance (N_T vs N_R) (Dispersive and Nondispersive)
[2]1-Hit Criteria: N_T<80% and Statistical Significance (N_T vs N_R) and N_T/N_R <85% (Dispersive)
[3]1-Hit Criteria: N_T<80% and Statistical Significance (N_T vs N_R) and N_T/N_R <70% (Nondispersive)
N_T =Treatment Normal Survivorship (Control Normalized)
N_R =Reference Normal Survivorship (Control Normalized)

5.0 SUMMARY

Samples SMA-1SE, and SMA-1NW passed the Dredge Material Management Program (DMMP) criteria for dispersive disposal; sample SMA-1SB failed the DMMP criteria for dispersive disposal based on the larval 1-Hit failure.

Samples SMA-1NW, SMA-1SB, and SMA-1SB passed the DMMP criteria for nondispersive disposal.

Table 5-1. Summary of Port Gamble Bay DMMP Evaluation (Dispersive).

Treatment	Dispersive						Overall Determination
	2-Hit			1-Hit			
	Amphipod	Polychaete	Larval	Amphipod	Polychaete	Larval	
SMA-1SE	Pass	Pass	Pass	Pass	Pass	Pass	Pass
SMA-1NW	Pass	Pass	**Fail**	Pass	Pass	Pass	Pass
SMA-1SB	Pass	Pass	**Fail**	Pass	Pass	**Fail**	**Fail**

Table 5-2. Summary of Port Gamble Bay DMMP Evaluation (Nondispersive)

Treatment	Nondispersive						Overall Determination
	2-Hit			1-Hit			
	Amphipod	Polychaete	Larval	Amphipod	Polychaete	Larval	
SMA-1SE	Pass	Pass	Pass	Pass	Pass	Pass	Pass
SMA-1NW	Pass	Pass	**Fail**	Pass	Pass	Pass	Pass
SMA-1SB	Pass	Pass	**Fail**	Pass	Pass	Pass	Pass

6.0 REFERENCES

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APPENDICES

A. LABORATORY DOCUMENTS

B. STATISTICAL COMPARISONS

C. CHAIN-OF-CUSTODY FORMS

APPENDIX A

LABORATORY DOCUMENTS

APPENDIX A.1.1

Eohaustorius estuarius

Amphipod Bioassay

Laboratory Data Sheets

ENVIRON

10 DAY SOLID PHASE BIOASSAY
WATER QUALITY DATA SHEET

CLIENT	PROJECT
Anchor	Port Gamble
JOB NUMBER	PROJECT MANAGER
0	Bill Gardiner

SPECIES		LABORATORY	PROTOCOL
Eohaustorius estuarius		Port Gamble	PSEP 1995
TEST START DATE	TIME	TEST END DATE	TIME
12-Sep-14		22-Sep-14	

Test Conditions				WATER QUALITY DATA									
				DO (mg/L) >4.6 mg/L		Temperature (°C) 15±1		Salinity (ppt) 28±1		pH 7 - 9		Tech	Date
Client ID	Day	Rep	Jar#	meter	mg/L	meter	deg C	meter	ppt	meter	unit		
SMA-1SE	0	WQ	7	8	8.2	8	~~16.0~~ 16.0 (1)	8	28	8	7.8	MK	9/15/14
CR-11	0	WQ	9		8.2		15.9		28		7.9		
SMA-1SB	0	WQ	17		8.3		15.8		28		7.9		
Control	0	WQ	23		8.3		15.8		28		7.9		
SMA-1NW	0	WQ	30		8.3		16.0		28		7.9		
CR-23W	0	WQ			8.3		15.9		27		7.9		
SMA-1SE	1	WQ	7	8	8.0	8	15.9	8	27	8	7.9	MK	9/16
CR-11	1	WQ	9		7.7		15.8		28		(2) ~~7.7~~ 8.0		
SMA-1SB	1	WQ	17		8.0		15.7		28		7.9		
Control	1	WQ	23		8.0		15.6		28		8.0		
SMA-1NW	1	WQ	30		8.1		15.6		28		7.9		
CR-23W	1	WQ			(2) ~~7.7~~ 8.0		15.7		27		7.8		
SMA-1SE	2	WQ	7	8	7.8	8	16.0	8	28	8	7.9	MK	9/17
CR-11	2	WQ	9		8.3		15.7		28		8.0		
SMA-1SB	2	WQ	17		8.4		15.7		28		8.0		
Control	2	WQ	23		8.4		15.8		28		8.0		
SMA-1NW	2	WQ	30		8.3		15.9		27		(4) ~~8~~ 8.0		
CR-23W	2	WQ			8.2		15.6		27		8.1		

(1) Illegible MK 9/15 (2) values high recal; new value 8.0 MK 9/16 (3) WC MK 9/16
(4) WC. MK 9/17.

ENVIRON

10 DAY SOLID PHASE BIOASSAY
WATER QUALITY DATA SHEET

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Eohaustorius estuarius		Port Gamble	PSEP 1995
TEST START DATE	TIME	TEST END DATE	TIME
12-Sep-14		22-Sep-14	

Test Conditions				WATER QUALITY DATA									
				DO (mg/L) >4.6 mg/L		Temperature (°C) 15±1		Salinity (ppt) 28±1		pH 7 - 9		Tech	Date
Client ID	Day	Rep	Jar#	meter	mg/L	meter	deg C	meter	ppt	meter	unit		
SMA-1SE	3	WQ	7	8	① ~~7.6~~ 8.1	8	16.0	8	27	8	⑤ ~~8~~ 7.9	~~KMB~~	9/18
CR-11	3	WQ	9	↓	8.2	↓	15.7	↓	28	↓	8.1	↓	↓
SMA-1SB	3	WQ	17	↓	8.2	↓	15.8	↓	27	↓	8.0	↓	↓
Control	3	WQ	23	↓	8.2	↓	15.9	↓	28	↓	8.0	↓	↓
SMA-1NW	3	WQ	30	↓	8.3	↓	15.8	↓	27	↓	8.0	↓	↓
CR-23W	3	WQ		↓	7.6	↓	16.0	↓	27	↓	8.2	↓	↓
SMA-1SE	4	WQ	7	8	8.0	8	16.0	8	27	8	7.~~8~~.~~0~~⑤	KMB	9/19/14
CR-11	4	WQ	9	↓	8.3	↓	15.9	↓	28	↓	8.0	↓	↓
SMA-1SB	4	WQ	17	↓	8.4	↓	15.9	↓	27	↓	7.9	↓	↓
Control	4	WQ	23	↓	8.3	↓	15.9	↓	28	↓	7.9	↓	↓
SMA-1NW	4	WQ	30	↓	8.3	↓	16.0	↓	27	↓	8.0	↓	↓
CR-23W	4	WQ		↓	8.1	↓	16.0	↓	27	↓	~~8.5~~ 8.5⑤	↓	↓
SMA-1SE	5	WQ	7	8	8.3	8	15.7	8	28	8	8.0	JL	9/20/14
CR-11	5	WQ	9	↓	8.3	↓	15.7	↓	28	↓	8.3	↓	↓
SMA-1SB	5	WQ	17	↓	8.3	↓	15.7	↓	27	↓	8.0	↓	↓
Control	5	WQ	23	↓	8.3	↓	15.9	↓	28	↓	8.0	↓	↓
SMA-1NW	5	WQ	30	↓	8.3	↓	15.9	↓	28	↓	8.1	↓	↓
CR-23W	5	WQ		↓	8.2	↓	15.7	↓	27	↓	8.6	↓	↓

① WC ~~KMB~~ 9/18

⑤ WC. KMB 09/19/14

⑤ Illegible. KB. 9/19/14

ENVIRON

10 DAY SOLID PHASE BIOASSAY
WATER QUALITY DATA SHEET

CLIENT	PROJECT
Anchor	Port Gamble
JOB NUMBER	PROJECT MANAGER
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SPECIES		LABORATORY	PROTOCOL
Eohaustorius estuarius		Port Gamble	PSEP 1995
TEST START DATE	TIME	TEST END DATE	TIME
12-Sep-14		22-Sep-14	

Test Conditions				WATER QUALITY DATA									
				DO (mg/L) >4.6 mg/L		Temperature (°C) 15±1		Salinity (ppt) 28±1		pH 7 - 9		Tech	Date
Client ID	Day	Rep	Jar#	meter	mg/L	meter	deg C	meter	ppt	meter	unit		
SMA-1SE	6	WQ	7	8	8.4	8	15.7	8	28	8	7.8	JL	9/21/14
CR-11	6	WQ	9		8.4		15.7		28		8.1		
SMA-1SB	6	WQ	17		8.3		15.7		27		7.8		
Control	6	WQ	23		8.3		15.7		28		7.8		
SMA-1NW	6	WQ	30		8.3		15.7		28		7.9		
CR-23W	6	WQ			8.3		15.7		27		8.3		
SMA-1SE	7	WQ	7	8	8.3	8	16.0	8	27	8	7.9	~~HK~~	9/22 HK
CR-11	7	WQ	9		8.4		15.7		28		8.3		
SMA-1SB	7	WQ	17		8.4		16.0		27		8.0		
Control	7	WQ	23		8.4		15.9		28		8.0		
SMA-1NW	7	WQ	30		8.3		15.8		① ~~27~~ 28		8.0		
CR-23W	7	WQ			8.3		15.7		27		8.3		
SMA-1SE	8	WQ	7	8	8.4	8	15.8	8	28	8	8.0	~~HK~~	9/23
CR-11	8	WQ	9		8.3		15.7		29		8.3		
SMA-1SB	8	WQ	17		8.4		15.6		27		8.0		
Control	8	WQ	23		8.4		15.7		28		8.0		
SMA-1NW	8	WQ	30		8.4		15.7		28		8.1		
CR-23W	8	WQ			8.3		15.8		27		8.4		

① MR HK 9/22

ENVIRON

10 DAY SOLID PHASE BIOASSAY
WATER QUALITY DATA SHEET

CLIENT	PROJECT
Anchor	Port Gamble
JOB NUMBER	PROJECT MANAGER
0	Bill Gardiner

SPECIES		LABORATORY	PROTOCOL
Eohaustorius estuarius		Port Gamble	PSEP 1995
TEST START DATE	TIME	TEST END DATE	TIME
12-Sep-14		22-Sep-14	

Test Conditions				WATER QUALITY DATA									
				DO (mg/L) >4.6 mg/L		Temperature (°C) 15±1		Salinity (ppt) 28±1		pH 7 - 9		Tech	Date
Client ID	Day	Rep	Jar#	meter	mg/L	meter	deg C	meter	ppt	meter	unit		
SMA-1SE	9	WQ	7	8	7.9	8	16.0	8	27	8	~~7.9~~ 7.9	HH	9/24
CR-11	9	WQ	9	↓	8.2	↓	15.8	↓	29	↓	8.3	↓	↓
SMA-1SB	9	WQ	17	↓	8.2	↓	15.7	↓	28	↓	8.0	↓	↓
Control	9	WQ	23	↓	8.3	↓	15.6	↓	27	↓	8.0	↓	↓
SMA-1NW	9	WQ	30	↓	8.3	↓	15.6	↓	28	↓	8.1	↓	↓
CR-23W	9	WQ		↓	8.0	↓	16.0	↓	27	↓	8.3	↓	↓
SMA-1SE	10	WQ	7	8	8.3	8	15.8	8	27	8	7.9	HH	9/25
CR-11	10	WQ	9	↓	8.3	↓	15.9	↓	29	↓	8.3	↓	↓
SMA-1SB	10	WQ	17	↓	8.4	↓	15.8	↓	27	↓	7.9	↓	↓
Control	10	WQ	23	↓	8.4	↓	15.6	↓	28	↓	7.9	↓	↓
SMA-1NW	10	WQ	30	↓	8.5	↓	15.7	↓	28	↓	8.0	↓	↓
CR-23W	10	WQ		↓	8.2	↓	16.0	↓	27	↓	8.2	↓	↓

(1) Illegible HH 9/24

ENVIRON

10-DAY SOLID PHASE TEST OBSERVATION DATA

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Anchor	Port Gamble	*Eohaustorius estuarius*	Port Gamble	PSEP 1995
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE**	**TEST END DATE**	
0	Bill Gardiner	12-Sep-14	22-Sep-14	

N = Normal
#E = Emergence
#M = Mortality or Molts
G = Growth
(fungal, bacterial, or algal)
D = No Air Flow (DO?)
F = Floating on Surface
TC = Too Cloudy

Client ID	Rep	Jar #	Initial # of Organisms	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Number Alive	Number Dead Recovered (if any) / Comments
				ENDPOINT DATA AND OBSERVATIONS											
				Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10		
			20	Date 9/16	Date 9/17	Date 9/18	Date 9/19	Date 9/20	Date 9/21	Date 9/22	Date 9/23	Date 9/24	Date 9/25		
				Tech. MK	Tech. MK	Tech. JL	Tech. KMB	Tech. JL	Tech. JL	Tech. MK	Tech. [illegible]	Tech. [illegible]	Tech. [illegible]		
Control	1			N	N	N	N	N	N	N	N	N	N	20	
	2			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	20	
	3			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	20	
	4			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	19	
	5			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	19	
CR-11	1			N	N	↓	N	↓	G	G	G	G	G	20	
	2			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	19	
	3			3F	↓	↓	G	↓	↓	↓	↓	↓	↓	19	
	4			N	↓	↓	N	↓	↓	↓	↓	↓	↓	20	
	5			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	20	
SMA-1SE	1			↓	↓	↓	N	↓	N	N	N	N	N	16	1M
	2			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	17	1M
	3			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	20	
	4			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	20	
	5			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	20	
SMA-1NW	1			N	1F	↓	N	↓	↓	↓	↓	↓	↓	19	
	2			↓	N	↓	↓	↓	↓	↓	↓	↓	↓	①~~20~~ 18	1M
	3			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	19	
	4			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	19	
	5			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	18	

① WC [illegible] 9/25

ENVIRON

10-DAY SOLID PHASE TEST OBSERVATION DATA

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Anchor	Port Gamble	*Eohaustorius estuarius*	Port Gamble	PSEP 1995
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE**	**TEST END DATE**	
0	Bill Gardiner	12-Sep-14	22-Sep-14	

N = Normal
#E = Emergence
#M = Mortality or Molts
G = Growth
(fungal, bacterial, or algal)
D = No Air Flow (DO?)
F = Floating on Surface
TC = Too Cloudy

Client ID	Rep	Jar #	Initial # of Organisms	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Number Alive	Number Dead Recovered (if any) / Comments
				ENDPOINT DATA AND OBSERVATIONS											
				Date	Date	Date	Date	Date	Date	Date	Date	Date	Date		
			20	9/16	9/17	9/18	9/19	9/20	9/21	9/22	9/23	9/24	9/25		
				Tech.	Tech.	Tech.	Tech.	Tech.	Tech.	Tech.	Tech.	Tech.	Tech.		
SMA-1SB	1			MK	MK	JL	KMB	JL	JL	MK	MK	MK	MK		
	1			N	N	N	N	N	N	N	N	N	N	19	
	2			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	19	
	3			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	19	
	4			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	20	
	5			↓	↓	↓	↓	↓	↓	↓	↓	(1) ↓	↓	20	
CR-23W	1						N					N	N	20	
	2						↓					↓	↓	19	
	3						↓					↓	↓	20	
	4						↓					↓	↓	20	
	5			↓	↓	↓	↓	↓	↓	↓	↓	G	G	20	

(1) aeration interrupted. ~~reint~~ restarted

ENVIRON

PURGING AND ACCLIMATION LOG

PROJECT: Port Gamble (Anchor)
LOCATION: Bath 7

Protocol: PSEP	Date ~~Initiated~~ layered: 9/8/14
Sample IDs: Control, CR-11, SMA-1NW, SMA-1SE, SMA-Subsurface B, (CR-23W Layered 9/12/14)	

Date	Day (0,1,2...)	Method of Renewal (F/T, S/R)*	Water Renewal AM/PM		Initials AM/PM		Ammonia/Sulfide Analysis Performed (OV/PW)**	Initials	Comments
9/11/14	3	S/R	X		JL		OV/PW	CR	
9/12/14	4	S/R	X		CR		OV/PW	JL	
9/13/14	5	S/R		X		JL			
9/14/14	6	S/R		X		JL			

* F/T – Flow through, S/R – Static renewal
** For water quality and specific information refer to ammonia/sulfide analysis datasheet

ENVIRON

Ammonia Reduction Record

Client/Project: Anchor Port Gamble | **Sample ID:** Control | **Organism:** Eoh

Type: OV

Date	Day	Calibration Temp (°C)	Ammonia Value (mg/L)	Sample Temp (°C)	Sample WQ			Sulfide Value (mg/L)	Initials
					DO* (mg/L)	Sal (ppt)	pH (units)		
9/11/14	3	20.6	0.00	19.9	NA	28	7.9	0.015	CR
9/12/14	4	21.4	0.00	21.1	NA	29	8.0	0.015	[illegible]

Type: PW

Date	Day	Calibration Temp (°C)	Ammonia Value (mg/L)	Sample Temp (°C)	Sample WQ			Sulfide Value (mg/L)	Initials
					DO* (mg/L)	Sal (ppt)	pH (units)		
9/11/14	3	20.6	0.160	20.3	NA	~~4~~ 28	7.6	0.036	CR
9/12/14	4	21.4	0.205	21.0	NA	28	7.4	0.040	[illegible]

* Dissolved Oxygen is only to be taken on overlying water

ENVIRON

Ammonia Reduction Record

Client/Project: Anchor Port Gamble | **Sample ID:** Reference | **Organism:** Eoh

Type: OV

Date	Day	Calibration Temp (°C)	Ammonia Value (mg/L)	Sample Temp (°C)	Sample WQ			Sulfide Value (mg/L)	Initials
					DO* (mg/L)	Sal (ppt)	pH (units)		
9/11/14	3	~~19.9~~ 20.6	0.830	19.9	NA	28	8.0	0.014	CR
9/12/14	4	21.4	0.249	21.2	NA	29	8.0	0.023	CR

Type: PW

Date	Day	Calibration Temp (°C)	Ammonia Value (mg/L)	Sample Temp (°C)	Sample WQ			Sulfide Value (mg/L)	Initials
					DO* (mg/L)	Sal (ppt)	pH (units)		
9/11/14	3	20.6	6.51	20.3	NA	28	7.9	①	CR
9/12/14	4	21.4	1.69	21.0	NA	28	7.5	19.11	CR

* Dissolved Oxygen is only to be taken on overlying water

① Diluted by 50%, still greater than measuring capability of spectrophotometer, not enough sample to rerun

ENVIRON

Ammonia Reduction Record

Client/Project:	Sample ID:	Organism:
Anchor Port Gamble	SMA - 158	Eoh

Type: OV

Date	Day	Calibration Temp (°C)	Ammonia Value (mg/L)	Sample Temp (°C)	Sample WQ			Sulfide Value (mg/L)	Initials
					DO* (mg/L)	Sal (ppt)	pH (units)		
9/11/14	3	20.6	0.00	19.9	NA	28	7.9	0.019	CR
9/12/14	4	21.4	0.084	21.2	NA	29	7.9	0.011	KMB

Type: PW

Date	Day	Calibration Temp (°C)	Ammonia Value (mg/L)	Sample Temp (°C)	Sample WQ			Sulfide Value (mg/L)	Initials
					DO* (mg/L)	Sal (ppt)	pH (units)		
9/11/14	3	20.6	0.485	20.3	NA	29	7.4	0.500	CR
9/12/14	4	21.4	0.293	21.0	NA	28	7.5	0.292	KMB

* Dissolved Oxygen is only to be taken on overlying water

ENVIRON

Ammonia Reduction Record

Client/Project:	Sample ID:	Organism:
Anchor Port Gamble	~~Eoh~~ SMA-INW	Eoh

Type: OV

Date	Day	Calibration Temp (°C)	Ammonia Value (mg/L)	Sample Temp (°C)	Sample WQ			Sulfide Value (mg/L)	Initials
					DO* (mg/L)	Sal (ppt)	pH (units)		
9/11/14	3	20.6	0.160	19.9	NA	28	7.9	0.010	CR
9/12/14	4	21.4	0.338	21.6	NA	29	7.9	0.018	KMB

Type: PW

Date	Day	Calibration Temp (°C)	Ammonia Value (mg/L)	Sample Temp (°C)	Sample WQ			Sulfide Value (mg/L)	Initials
					DO* (mg/L)	Sal (ppt)	pH (units)		
9/11/14	3	20.6	0.826	20.3	NA	29	7.5	0.260	CR
9/12/14	4	21.4	0.535	21.0	NA	28	7.5	0.640	KMB

* Dissolved Oxygen is only to be taken on overlying water

ENVIRON

Ammonia Reduction Record

Client/Project:	Sample ID:	Organism:
Anchor Port Gamble	SMA - Subsurface B	Eoh

Type: OV

Date	Day	Calibration Temp (°C)	Ammonia Value (mg/L)	Sample Temp (°C)	Sample WQ			Sulfide Value (mg/L)	Initials
					DO* (mg/L)	Sal (ppt)	pH (units)		
9/11/14	3	20.6	0.134	19.9	NA	28	7.9	0.026	CR
9/12/14	4	21.4	0.146	21.8	NA	29	7.9	0.017	EMB

Type: PW

Date	Day	Calibration Temp (°C)	Ammonia Value (mg/L)	Sample Temp (°C)	Sample WQ			Sulfide Value (mg/L)	Initials
					DO* (mg/L)	Sal (ppt)	pH (units)		
9/11/014	3	20.6	0.767	20.3	NA	29	7.6	0.604	CR
9/12/14	4	21.4	0.200	21.0	NA	28	7.5	0.252	[illegible]

* Dissolved Oxygen is only to be taken on overlying water

ENVIRON

Ammonia and Sulfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
Anchor / Port Gamble	Eoh	10

PRETEST / INITIAL / FINAL / OTHER (circle one)

OVERLYING (OV) / POREWATER (PW) (circle one) / Comments: _____

DAY of TEST: 0

Calibration Standards Temperature		
Date:	Temperature:	Sample temperature should be within ±1°C of standards temperature at time and date of analysis.
9/15/14	20.0°C	

Sample ID or Description	Conc. or Rep	Date of Sampling and Initials	Ammonia Value (mg/L)	Temp °C	Date of Reading and Initials	Sample Preserved (Y/N)	pH	Sal (ppt)	Sample Volume (mL)	Measured Sulf. (mg/L)	Multi-plier	Calc-ulated Sulf. (mg/L)
Control		09/15/14 MK	0.0655	20.6	09/15/14 KMB + MK	N			10	0.006		
Ref CR-11			0.183	20.2						0.017		
SMA-SSB			0.0639	20.0						0.017		
SMA-1NW			0.0918	20.6						0.006		
SMA-1SE			0.0584	20.5						0.010		
CR-23W			0.655	20.2						0.019		

ENVIRON

Ammonia and Sulfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
Anchor / Port Gamble	Eoh	10

PRETEST / (INITIAL) / FINAL / OTHER (circle one)

OVERLYING (OV) / (POREWATER (PW)) (circle one) / Comments: _____

DAY of TEST: 0

Calibration Standards Temperature		
Date:	Temperature:	Sample temperature should be within ±1°C of standards temperature at time and date of analysis.
9/15/14	20.0°C	

Sample ID or Description	Conc. or Rep	Date of Sampling and Initials	Ammonia Value (mg/L)	Temp °C	Date of Reading and Initials	Sample Preserved (Y/N)	pH	Sal (ppt)	Sample Volume (mL)	Measured Sulf. (mg/L)	Multi-plier	Calc-ulated Sulf. (mg/L)
Control		9/15/14 MK	0.210	21.0	9/15/14 KB + MK	N	7.7	27	1mL	0.00 ~~0.022~~ ①	10	0.00
Ref CR-11			1.63	21.0			7.6	28		0.002		0.02
SMA-SSB			0.210	21.0			7.8	28		0.074		0.74
SMA-1NW			0.406	21.0			7.5	28		0.012		0.12
SMA-1SE			0.239	21.0			7.7	28		0.029		0.29
CR-23W			2.83	21.0			7.9	30		0.00		0.00

① Remeasured control. True value = 0.00 MK 9/15.

ENVIRON

Ammonia and Sulfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
Anchor / Port Gamble	Eohs	10

PRETEST / INITIAL / FINAL / OTHER (circle one)

OVERLYING (OV) / POREWATER (PW) (circle one) / Comments: _____

DAY of TEST: 10

Calibration Standards Temperature		
Date: 9/24/14	Temperature: 21.1 °C	Sample temperature should be within ±1°C of standards temperature at time and date of analysis.

Sample ID or Description	Conc. or Rep	Date of Sampling and Initials	Ammonia Value (mg/L)	Temp °C	Date of Reading and Initials	Sample Preserved (Y/N)	pH	Sal (ppt)	Sample Volume (mL)	Measured Sulf. (mg/L)	Multi-plier	Calc-ulated Sulf. (mg/L)
OV. Ø	Surr.	9/24/14 MK	0.00	21.7	9/24/14 JL	N			10	0.003	NA	NA
CR-11	↓	↓	0.00	↓	↓	↓			↓	0.001	↓	↓
CR-23W			0.00							0.000		
SMA-1SE			0.00							0.000		
SMA-1NW			0.00							0.000		
↓ SMA-1SB			0.00							0.000		
				207								
PW Ø	Surr.	9/24/14 HE	0.00	① ~~7.6~~ ~~21.6~~	9/24/14 HE/MK	N	7.6	29	10	0.023	NA	NA
CR-11	↓	↓	0.00		↓	↓	7.7	30	↓	0.046	↓	↓
CR-23W			0.00				7.1	28		0.069		
SMA-1SE			0.00				7.6	28	1	0.062	10	0.620
SMA-1NW			0.00				7.5	28	1	0.079	10	0.790
↓ SMA-1SB			0.00				7.5	28	1	0.081	10	0.810

① WC. MK. 9/25.

ENVIRON

ORGANISM RECEIPT LOG

Date: 9/11/14	Time: 1230	Batch No. NAS ~~6158~~ 8600 ①
Organism / Project: Eohs / Port Gamble	Source: Northwestern Aquatic Sciences	
Address: Newport, OR		Invoice Attached (Yes) No
Phone: On File	Contact: On File	
No. Ordered: 1200	No. Received: 1200 + 10x	Source Batch: Field collected 9/09/14
Condition of Organisms: Good	Approximate Size or Age: 3-5 mm	
Shipper: Fed Ex	B of L (Tracking No.) 0215 8043 2993 8600	
Condition of Container: Good	Received By: JL	

Container	D.O. (mg/L)	Temp. (°C)	Conductivity or Salinity (Include Units)	pH (Units)	Technician (Initials)
1	8.0	6.0	28 ppt	8.0	JL

Notes: ① E. JL ~~9/10~~ 9/11/14.

Northwestern Aquatic Sciences
3814 Yaquina Bay Rd., P.O. Box 1437, Newport, OR 97365
Tel: 541-265-7225, Fax: 541-265-2799, www.nwaquatic.com

SUBJECT: Animal Collection Data Sheet (shipping)

SOLD TO: Environ
4729 NE View Dr.
P.O. Box 216
Port Gamble WA 98364

FedEx# 5507-1540-6

Brian Hester/Collin Ray
360.297.6044
Mary Bacon
360.297.6058

DATE OF SHIPMENT: 9-10-14

ANIMAL HISTORY

Species	Age/Size	Number Shipped
Eohaustorius estuarius	3-5mm	1200 + 10%

WATER QUALITY AT TIME OF SHIPMENT

Temperature (°C): 15.0	pH: 8.0	Salinity (ppt): 28.0	D.O. (mg/L): 8.0
Other:			

PACKAGED BY: Lauren Brady **DATE:** 9-10-14

FIELD COLLECTION/CULTURE NOTES

Collected 9-9-14 from Yaquina Bay, OR.
Interstitial WQ: Temp: 9.0°C, Salinity 33.0 ppt.; salinity adjusted down ~5ppt.
Held at 15°C in aerated water.

ADDITIONAL COMMENTS

2-liters of 0.5 mm sieved home sediment included.

PLEASE RETURN ALL SHIPPING MATERIALS

If you have any questions, Please call Gary Buhler or Gerald Irissarri at (541) 265-7225. Thank You.

APPENDIX A.1.2

Eohaustorius estuarius

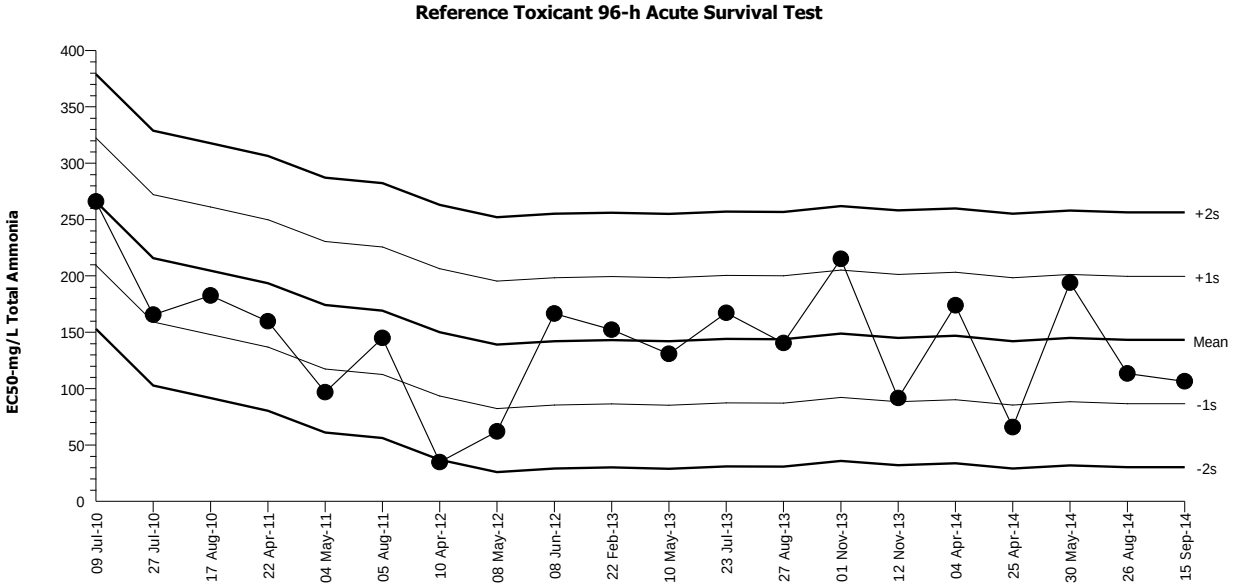
Amphipod Bioassay

Reference Toxicant Test

CETIS QC Plot

Reference Toxicant 96-h Acute Survival Test — **All Matching Labs**

Test Type:	Survival	**Organism:**	Eohaustorius estuarius (Amphipod)	**Material:**	Total Ammonia
Protocol:	EPA/600/R-94/025 (1994)	**Endpoint:**	Proportion Survived	**Source:**	Reference Toxicant-REF



Mean:	143.3	**Count:**	19	**-1s Warning Limit:**	86.76	**-2s Action Limit:**	30.24
Sigma:	56.52	**CV:**	39.40%	**+1s Warning Limit:**	199.8	**+2s Action Limit:**	256.3

Quality Control Data

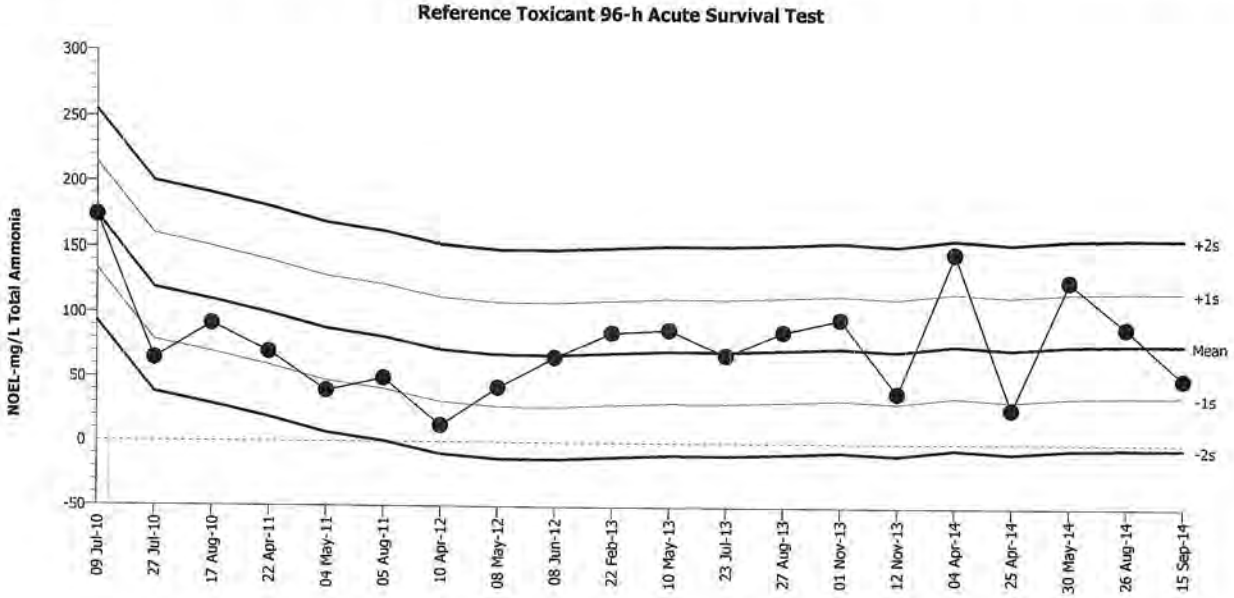
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2010	Jul	9	15:20	265.9	122.6	2.17	(+)	(+)	02-9263-1875	13-7083-7088	NewFields
2			27	14:50	165.5	22.22	0.3931			16-3262-6250	12-1070-3879	NewFields
3		Aug	17	16:00	182.5	39.24	0.6943			00-5947-2918	13-7468-5586	NewFields
4	2011	Apr	22	16:45	159.7	16.36	0.2895			12-3251-7366	15-6923-8618	NewFields
5		May	4	14:20	96.78	-46.52	-0.823			15-9053-5291	03-3498-4458	NewFields
6		Aug	5	14:35	144.9	1.559	0.02758			05-3970-3796	17-5474-7748	NewFields
7	2012	Apr	10	15:10	34.72	-108.6	-1.921	(-)		02-5902-8958	20-3951-0452	NewFields
8		May	8	14:30	61.87	-81.43	-1.441	(-)		20-1853-8108	14-9890-9529	NewFields
9		Jun	8	15:30	166.5	23.19	0.4102			03-4756-9479	07-8270-3224	NewFields
10	2013	Feb	22	11:40	152.2	8.919	0.1578			09-9358-3146	14-0757-4516	NewFields
11		May	10	14:20	130.8	-12.54	-0.2219			01-9831-6628	02-4493-3987	NewFields
12		Jul	23	15:10	167.1	23.84	0.4218			15-9850-7427	05-2897-2730	NewFields
13		Aug	27	12:10	140.4	-2.907	-0.05143			20-8540-9997	05-1258-2331	NewFields
14		Nov	1	13:30	215	71.71	1.269	(+)		15-9765-5224	08-6656-9431	NewFields
15			12	13:45	91.52	-51.78	-0.9162			12-4327-2465	06-0504-8497	NewFields
16	2014	Apr	4	19:15	173.9	30.55	0.5405			13-5617-0473	14-6315-5154	NewFields
17			25	13:00	65.78	-77.52	-1.372	(-)		11-2394-9115	16-6351-0798	NewFields
18		May	30	15:30	193.9	50.62	0.8956			11-1744-7543	02-6036-0984	ENVIRON
19		Aug	26	15:45	113.3	-29.98	-0.5304			15-5557-5937	00-0529-4993	ENVIRON
20		Sep	15	15:10	106.3	-36.96	-0.6538			07-1282-2061	01-5984-9612	ENVIRON

CETIS QC Plot

Report Date: 26 Sep-14 14:49 (1 of 1)

Reference Toxicant 96-h Acute Survival Test — **All Matching Labs**

Test Type:	Survival	**Organism:**	Eohaustorius estuarius (Amphipod)	**Material:**	Total Ammonia
Protocol:	EPA/600/R-94/025 (1994)	**Endpoint:**	Proportion Survived	**Source:**	Reference Toxicant-REF



Mean:	77.14	**Count:**	19	**-1s Warning Limit:**	36.67	**-2s Action Limit:**	-3.803
Sigma:	40.47	**CV:**	52.50%	**+1s Warning Limit:**	117.6	**+2s Action Limit:**	158.1

Quality Control Data

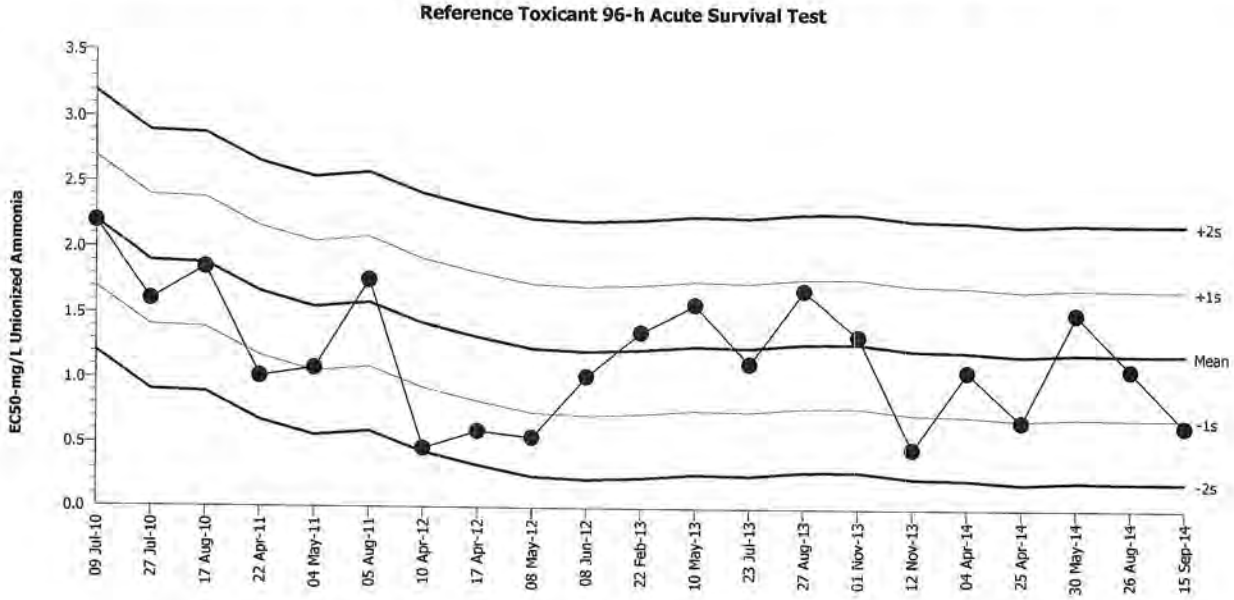
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2010	Jul	9	15:20	174	96.86	2.393	(+)	(+)	02-9263-1875	21-0926-0699	NewFields
2			27	14:50	64.7	-12.44	-0.3074			16-3262-6250	07-8105-4494	NewFields
3		Aug	17	16:00	91.6	14.46	0.3573			00-5947-2918	19-8213-9681	NewFields
4	2011	Apr	22	16:45	69.8	-7.34	-0.1814			12-3251-7366	16-4565-4919	NewFields
5		May	4	14:20	39.8	-37.34	-0.9227			15-9053-5291	14-1177-0441	NewFields
6		Aug	5	14:35	49.6	-27.54	-0.6805			05-3970-3796	20-5970-4725	NewFields
7	2012	Apr	10	15:10	13	-64.14	-1.585	(-)		02-5902-8958	03-7154-8292	NewFields
8		May	8	14:30	42.6	-34.54	-0.8535			20-1853-8108	20-5519-2940	NewFields
9		Jun	8	15:30	66.4	-10.74	-0.2654			03-4756-9479	03-6674-9041	NewFields
10	2013	Feb	22	11:40	85.6	8.46	0.209			09-9358-3146	06-2817-6220	NewFields
11		May	10	14:20	88	10.86	0.2683			01-9831-6628	03-9560-5903	NewFields
12		Jul	23	15:10	68.3	-8.84	-0.2184			15-9850-7427	18-8212-0119	NewFields
13		Aug	27	12:10	86.4	9.26	0.2288			20-8540-9997	03-1133-2124	NewFields
14		Nov	1	13:30	96.4	19.26	0.4759			15-9765-5224	03-3609-7670	NewFields
15			12	13:45	39.3	-37.84	-0.935			12-4327-2465	09-6874-0351	NewFields
16	2014	Apr	4	19:15	147	69.86	1.726	(+)		13-5617-0473	16-0396-5073	NewFields
17			25	13:00	27	-50.14	-1.239	(-)		11-2394-9115	19-2434-9439	NewFields
18		May	30	15:30	126	48.86	1.207	(+)		11-1744-7543	06-3985-7474	ENVIRON
19		Aug	26	15:45	90.1	12.96	0.3202			15-5557-5937	08-3094-4388	ENVIRON
20		Sep	15	15:10	50.5	-26.64	-0.6583			07-1282-2061	16-3885-0935	ENVIRON

CETIS QC Plot

Report Date: 26 Sep-14 14:45 (1 of 1)

Reference Toxicant 96-h Acute Survival Test — **All Matching Labs**

Test Type:	Survival	**Organism:**	Eohaustorius estuarius (Amphipod)	**Material:**	Unionized Ammonia
Protocol:	EPA/600/R-94/025 (1994)	**Endpoint:**	Proportion Survived	**Source:**	Reference Toxicant-REF



Mean:	1.204	**Count:**	20	**-1s Warning Limit:**	0.7088	**-2s Action Limit:**	0.2133
Sigma:	0.4955	**CV:**	41.20%	**+1s Warning Limit:**	1.7	**+2s Action Limit:**	2.195

Quality Control Data

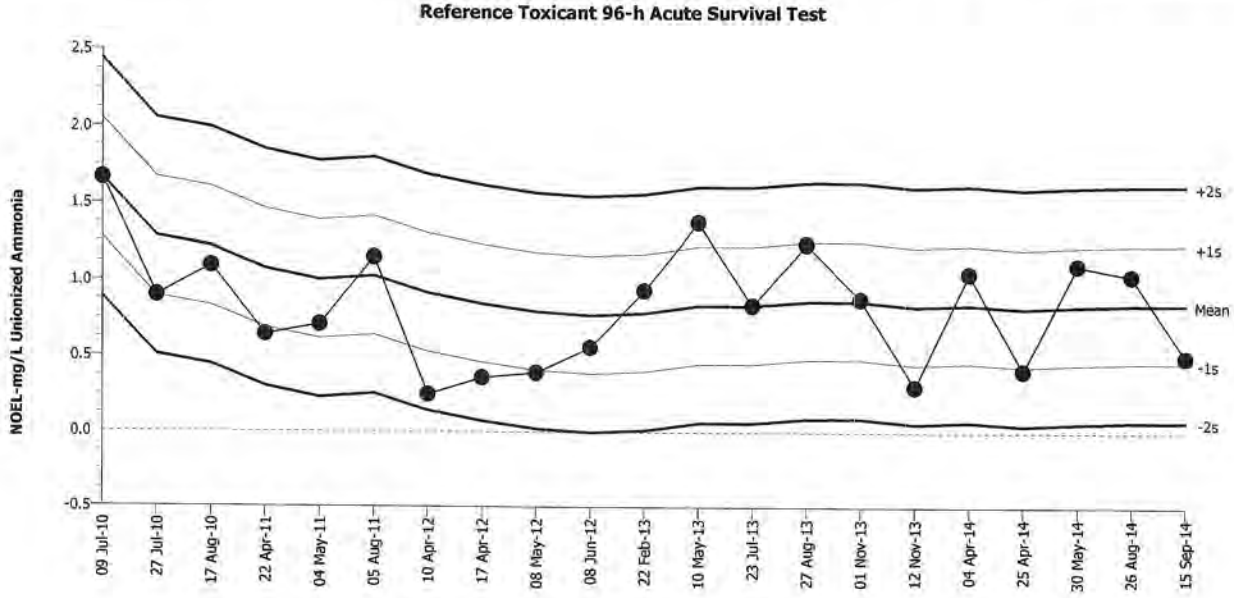
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2010	Jul	9	15:20	2.198	0.9935	2.005	(+)	(+)	01-7209-8485	05-8082-3474	NewFields
2			27	14:50	1.608	0.4044	0.8161			00-7007-0295	03-9110-2709	NewFields
3		Aug	17	16:00	1.854	0.6503	1.312	(+)		04-9660-1658	10-4250-3896	NewFields
4	2011	Apr	22	16:45	1.017	-0.1866	-0.3766			03-6965-3395	14-3447-2473	NewFields
5		May	4	14:20	1.081	-0.1228	-0.2478			18-8723-9922	17-9305-2155	NewFields
6		Aug	5	14:35	1.76	0.5562	1.122	(+)		17-9542-0646	06-2792-7024	NewFields
7	2012	Apr	10	15:10	0.4636	-0.7404	-1.494	(-)		18-7283-5013	07-7471-6807	NewFields
8			17	15:45	0.5982	-0.6058	-1.223	(-)		18-5229-3668	10-4921-5938	NewFields
9		May	8	14:30	0.5509	-0.6531	-1.318	(-)		15-4565-2403	06-1396-7211	NewFields
10		Jun	8	15:30	1.024	-0.1797	-0.3627			03-7901-3036	07-6844-7156	NewFields
11	2013	Feb	22	11:40	1.364	0.1602	0.3232			10-3861-9695	21-2507-0831	NewFields
12		May	10	14:20	1.578	0.3738	0.7544			05-8857-3753	18-2954-4563	NewFields
13		Jul	23	15:10	1.126	-0.07811	-0.1576			08-8059-3744	12-6137-6954	NewFields
14		Aug	27	12:10	1.689	0.4853	0.9794			18-3860-3992	18-0374-3993	NewFields
15		Nov	1	13:30	1.339	0.1346	0.2715			01-7225-6737	09-1642-9045	NewFields
16			12	13:45	0.4715	-0.7325	-1.478	(-)		15-7445-3893	06-3812-4989	NewFields
17	2014	Apr	4	19:15	1.072	-0.1324	-0.2671			02-4910-1045	07-9486-3041	NewFields
18			25	13:00	0.6871	-0.5169	-1.043	(-)		05-3931-3196	11-2528-6540	NewFields
19		May	30	15:30	1.517	0.3126	0.6308			03-2348-8477	19-6287-3473	ENVIRON
20		Aug	26	15:45	1.087	-0.117	-0.236			16-9917-4183	13-7453-5343	ENVIRON
21		Sep	15	15:10	0.6543	-0.5497	-1.109	(-)		04-2286-3837	03-1229-8693	ENVIRON

CETIS QC Plot

Report Date: 26 Sep-14 14:45 (1 of 1)

Reference Toxicant 96-h Acute Survival Test — **All Matching Labs**

Test Type:	Survival	**Organism:**	Eohaustorius estuarius (Amphipod)	**Material:**	Unionized Ammonia
Protocol:	EPA/600/R-94/025 (1994)	**Endpoint:**	Proportion Survived	**Source:**	Reference Toxicant-REF



Mean:	0.8455	**Count:**	20	**-1s Warning Limit:**	0.4581	**-2s Action Limit:**	0.0707
Sigma:	0.3874	**CV:**	45.80%	**+1s Warning Limit:**	1.233	**+2s Action Limit:**	1.62

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2010	Jul	9	15:20	1.665	0.8195	2.115	(+)	(+)	01-7209-8485	15-5728-8112	NewFields
2			27	14:50	0.9	0.0545	0.1407			00-7007-0295	13-8034-1240	NewFields
3		Aug	17	16:00	1.096	0.2505	0.6466			04-9660-1658	04-8886-1755	NewFields
4	2011	Apr	22	16:45	0.644	-0.2015	-0.5201			03-6965-3395	08-9559-0930	NewFields
5		May	4	14:20	0.71	-0.1355	-0.3498			18-8723-9922	06-9505-1415	NewFields
6		Aug	5	14:35	1.152	0.3065	0.7912			17-9542-0646	01-3764-6854	NewFields
7	2012	Apr	10	15:10	0.249	-0.5965	-1.54	(-)		18-7283-5013	17-8032-8770	NewFields
8			17	15:45	0.36	-0.4855	-1.253	(-)		18-5229-3668	21-3980-0168	NewFields
9		May	8	14:30	0.393	-0.4525	-1.168	(-)		15-4565-2403	07-1675-0393	NewFields
10		Jun	8	15:30	0.56	-0.2855	-0.737			03-7901-3036	09-3097-7160	NewFields
11	2013	Feb	22	11:40	0.935	0.0895	0.231			10-3861-9695	14-6175-2687	NewFields
12		May	10	14:20	1.38	0.5345	1.38	(+)		05-8857-3753	12-0577-0060	NewFields
13		Jul	23	15:10	0.839	-0.0065	-0.01678			08-8059-3744	14-8468-9199	NewFields
14		Aug	27	12:10	1.242	0.3965	1.023	(+)		18-3860-3992	13-4279-2307	NewFields
15		Nov	1	13:30	0.882	0.0365	0.09422			01-7225-6737	17-4499-2761	NewFields
16			12	13:45	0.302	-0.5435	-1.403	(-)		15-7445-3893	14-8429-9092	NewFields
17	2014	Apr	4	19:15	1.05	0.2045	0.5279			02-4910-1045	18-6624-7464	NewFields
18			25	13:00	0.409	-0.4365	-1.127	(-)		05-3931-3196	00-2785-8568	NewFields
19		May	30	15:30	1.105	0.2595	0.6699			03-2348-8477	17-7984-3461	ENVIRON
20		Aug	26	15:45	1.037	0.1915	0.4943			16-9917-4183	01-4278-7622	ENVIRON
21		Sep	15	15:10	0.497	-0.3485	-0.8996			04-2286-3837	01-4675-9354	ENVIRON

CETIS Summary Report

Reference Toxicant 96-h Acute Survival Test **ENVIRON**

Batch ID:	06-4160-8016	**Test Type:**	Survival	**Analyst:**	
Start Date:	15 Sep-14 15:10	**Protocol:**	EPA/600/R-94/025 (1994)	**Diluent:**	Laboratory Seawater
Ending Date:	19 Sep-14 14:10	**Species:**	Eohaustorius estuarius	**Brine:**	Not Applicable
Duration:	95h	**Source:**	Northwestern Aquatic Science, OR	**Age:**	
Sample ID:	09-0219-2184	**Code:**	35C65C38	**Client:**	Internal Lab
Sample Date:	05 May-14	**Material:**	Total Ammonia	**Project:**	Reference Toxicant
Receive Date:	05 May-14	**Source:**	Reference Toxicant		
Sample Age:	133d 15h	**Station:**	P140505.36		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
16-3885-0935	Proportion Survived	50.5	110	74.53	NA		Fisher Exact/Bonferroni Adj Test

Point Estimate Summary

Analysis ID	Endpoint	Level	mg/L	95% LCL	95% UCL	TU	Method
01-5984-9612	Proportion Survived	EC50	106.3	93.71	120.7		Spearman-Kärber

Proportion Survived Summary

C-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	3	0.9333	0.7899	1	0.9	1	0.03333	0.05774	6.19%	0.0%
11.2		3	1	1	1	1	1	0	0	0.0%	-7.14%
22.3		3	0.9667	0.8232	1	0.9	1	0.03333	0.05774	5.97%	-3.57%
50.5		3	1	1	1	1	1	0	0	0.0%	-7.14%
110		3	0.5	0	1	0.1	0.8	0.2082	0.3606	72.11%	46.43%
202		3	0	0	0	0	0	0	0		100.0%

Proportion Survived Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	0.9	0.9	1
11.2		1	1	1
22.3		1	0.9	1
50.5		1	1	1
110		0.1	0.6	0.8
202		0	0	0

Proportion Survived Binomials

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	9/10	9/10	10/10
11.2		10/10	10/10	10/10
22.3		10/10	9/10	10/10
50.5		10/10	10/10	10/10
110		1/10	6/10	8/10
202		0/10	0/10	0/10

CETIS Test Data Worksheet

Reference Toxicant 96-h Acute Survival Test **ENVIRON**

Start Date:	15 Sep-14 15:10	**Species:**	Eohaustorius estuarius
End Date:	19 Sep-14 14:10	**Protocol:**	EPA/600/R-94/025 (1994)
Sample Date:	05 May-14	**Material:**	Total Ammonia
Sample Code:	35C65C38		
Sample Source:	Reference Toxicant		
Sample Station:	P140505.36		

C-mg/L	Code	Rep	Pos	# Exposed	# Survived	Notes
0	D	1	16	10	9	
0	D	2	15	10	9	
0	D	3	13	10	10	
11.2		1	18	10	10	
11.2		2	14	10	10	
11.2		3	9	10	10	
22.3		1	1	10	10	
22.3		2	6	10	9	
22.3		3	2	10	10	
50.5		1	10	10	10	
50.5		2	4	10	10	
50.5		3	11	10	10	
110		1	12	10	1	
110		2	8	10	6	
110		3	7	10	8	
202		1	3	10	0	
202		2	5	10	0	
202		3	17	10	0	

ENVIRON

Ammonia Reference Toxicant Test Water Quality Data Sheet

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Anchor	Port Gamble	*Eohaustorius estuarius*	Port Gamble	PSEP 1995
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE** / **TIME**	**TEST END DATE**	**TIME**
NA	Bill Gardiner	15Sep14 / 1510	25Sep14	1410
TEST ID	**LOT #:**			
P140505.36	3244C535			

WATER QUALITY DATA

DILTIN.WAT.BATCH	TEMP REC#	REFERENCE TOX. MATERIAL	REFERENCE TOXICANT
0		ammonia - TAN	ammonium chloride

TEST CONDITIONS					DO (mg/L) > 4.6		TEMP(C) 15 ± 1		SAL (ppt) 28 ± 1		pH 7.8 ± 0.5		TECHNICIAN		AMMONIA		
CLIENT ID	CONCENTRATION value	CONCENTRATION units	DAY	REP	D.O. meter	D.O. mg/L	TEMP. meter	TEMP. °C	SALINITY meter	SALINITY ppt	pH meter	pH unit	WQ TECH		AMMONIA METER	AMMONIA mg/L	Tech
Ref.Tox.-	0	mg/L	0	Stock	8	7.6	8	16.0	8	27	8	7.8	9115	TN	3	0.0305	KB
			4	1	8	7.1	8	16.0	8	27	8	7.7	9/19	KB			
			6	2	8	6.7	8	15.4	8	27	8	7.5	9/21	JL			
			8	3	8	5.6	8	16.0	8	27	8	7.4	9123	HL			
			10	1	8	6.8	8	16.0	8	26	8	7.6	9125	HL			
Ref.Tox.-	15	mg/L	0	Stock	8	7.8	8	16.0	8	27	8	7.7	9115	TN	3	11.2	KB
			4	1	8	7.6	8	16.0	8	27	8	7.9	9/19	KB			
			6	2	8	6.6	8	15.3	8	27	8	7.5	9/21	JL			
			8	3	8	6.5	8	16.0	8	27	8	7.6	9123	TN			
			10	1	8	7.8	8	16.0	8	27	8	7.7	9125	TN			
Ref.Tox.-	30	mg/L	0	Stock	8	7.9	8	15.8	8	~~27~~ 29	8	7.7	9115	TN	3	22.3	KB
			4	1	8	7.3	8	16.0	8	27	8	7.8	9/19	KB			
			6	2	8	6.6	8	15.2	8	27	8	7.6	9/21	JL			
			8	3	8	6.0	8	15.8	8	27	8	7.6	9123	HL			
			10	1	8	7.2	8	15.8	8	27	8	7.7	9125	TN			

ST = 9115 27

ENVIRON

Ammonia Reference Toxicant Test Water Quality Data Sheet

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Anchor	Port Gamble	*Eohaustorius estuarius*	Port Gamble	PSEP 1995

JOB NUMBER	PROJECT MANAGER	TEST START DATE	TIME	TEST END DATE	TIME
NA	Bill Gardiner	15Sep14	1510	25Sep14	1410

TEST ID	LOT #:
P140505.36	3244C535

WATER QUALITY DATA

DILTIN.WAT.BATCH	TEMP REC#	REFERENCE TOX. MATERIAL	REFERENCE TOXICANT	
0		ammonia - TAN	ammonium chloride	

TEST CONDITIONS					DO (mg/L)		TEMP(C)		SAL (ppt)		pH		TECHNICIAN		AMMONIA		
					> 4.6		15 ± 1		28 ± 1		7.8 ± 0.5						
CLIENT ID	CONCENTRATION value	CONCENTRATION units	DAY	REP	D.O. meter	D.O. mg/L	TEMP. meter	TEMP. °C	SALINITY meter	SALINITY ppt	pH meter	pH unit	WQ TECH		AMMONIA METER	AMMONIA mg/L	Tech
Ref.Tox.-	60	mg/L	0	Stock	8	7.8	8	16.0	8	27	8	7.6	9115	KB	3	50.5	KB
			4	1	8	7.7	8	16.0	8	27	8	7.8	9/19	KB			
			6	2	8	6.4	8	15.3	8	27	8	7.6	9/21	JL			
			8	3	8	6.3	8	15.6	8	27	8	7.6	9/23	KB			
			10	1	8	7.8	8	15.9	8	27	8	7.7	9/25	KB			
Ref.Tox.-	120	mg/L	0	Stock	8	8.0	8	15.9	8	27	8	7.4	9115	KB	3	110	KB
			4	1	8	7.2	8	16.0	8	27	8	7.7	9/19	KB			
			6	2	8	6.3	8	15.3	8	28	8	7.5	9/21	JL			
			8														
			10														
Ref.Tox.-	240	mg/L	0	Stock	8	7.8	8	15.9	8	28	8	7.2	9115	KB	3	202	KB
			4	1①	8①		8①		8①		8①	7①	9/19①	KB①			
			6														
			8														
			10														

① All organisms dead in all reps of 240 mg/L concentrat 9/19/14 KMB.

ENVIRON

Ammonia Reference Toxicant Test Survival Data Sheet

CLIENT	PROJECT	JOB NO.	SPECIES		
Anchor	Port Gamble	NA	*Eohaustorius estuarius*		
			PROJECT MANAGER: Bill Gardiner	LABORATORY: Port Gamble	PROTOCOL: PSEP 1995

SURVIVAL & BEHAVIOR DATA

N = Normal
Q = Quiescent
F = Floating on Surface
D = Discolored

INITIAL # OF ORGANISMS:

CLIENT ID	CONC. value	units	REP	INITIAL NUMBER	9/16 #ALIVE	#DEAD	OBS	9/17 #ALIVE	#DEAD	OBS	9/18 #ALIVE	#DEAD	OBS	9/19 #ALIVE	#DEAD	OBS	9/20 #ALIVE	#DEAD	OBS
TECHNICIAN					MK			MK			JL			MK			JL		
Ref.Tox.- ammonia - TAN	0	mg/L	1		10	Ø	2F	10	Ø	1F	10	Ø	N	9	1	1F	9	Ø	1F
			2		10	Ø	3F	10	Ø	2F	10	Ø	3F	9	1	N	9	Ø	N
			3		10	Ø	2F	10	Ø	1F	10	Ø	1F	10	Ø	2F	10	Ø	2F
Ref.Tox.- ammonia - TAN	15	mg/L	1		10	Ø	N	10	Ø	1F	10	Ø	1F	10	Ø	1F	10	Ø	N
			2		10	Ø	1F	10	Ø	N	10	Ø	N	10	Ø	N	10	Ø	↓
			3		10	Ø	N	10	Ø	2F	10	Ø	3F	10	Ø	↓	10	Ø	1F
Ref.Tox.- ammonia - TAN	30	mg/L	1		10	Ø	1F	10	Ø	1F	10	Ø	1F	10	Ø	N	10	Ø	N
			2		10	Ø	1F	10	Ø	3F	9	1	2F	9	Ø	1F	9	Ø	↓
			3		10	Ø	1F	10	Ø	2F	10	Ø	1F	10	Ø	N	10	Ø	↓
Ref.Tox.- ammonia - TAN	60	mg/L	1		10	Ø	6F	10	Ø	N	10	Ø	N	10	Ø	N	10	Ø	Q
			2		10	Ø	N	10	Ø	2F	10	Ø	↓	10	Ø	↓	10	Ø	↓
			3		10	Ø	2F	10	Ø	1F	10	Ø	↓	10	Ø	↓	10	Ø	↓
Ref.Tox.- ammonia - TAN	120	mg/L	1		10	Ø	2F ①	9	1	Q	5	4	Q	1	4	Q	Ø	1	NA
			2		10	Ø	3F ↓	9	1	↓	9	Ø	↓	6	3	↓	3	3	Q
			3		10	Ø	↓	10	Ø	↓	8	2	↓	8	Ø	↓	4	4	↓
Ref.Tox.- ammonia - TAN	240	mg/L	1		7	3	Q	Ø	7	\									
			2		6	4	↓	Ø	6	\									
			3		7	3	↓	Ø	7	\									

CLIENT ID	CONC. value	units	REP	9/21 #ALIVE	#DEAD	OBS	9/22 #ALIVE	#DEAD	OBS	9/23 #ALIVE	#DEAD	OBS	9/24 #ALIVE	#DEAD	OBS	9/25 #ALIVE	#DEAD	OBS
TECHNICIAN				JL			MK			[illegible]			MK			MK		
Ref.Tox.- ammonia - TAN	0	mg/L	1	9	Ø	N	9	Ø	N	9	0	N	9	Ø	N	9	Ø	N
			2	9	Ø	↓	9	Ø	↓	9	0	↓	9	Ø	↓	7	2	↓
			3	10	Ø	3F	10	Ø	N	10	0	↓	9	1	↓	9	Ø	
Ref.Tox.- ammonia - TAN	15	mg/L	1	9	1	2F	9	Ø	↓	8	1	N	8	Ø	N	8	Ø	N
			2	10	Ø	N	10	Ø	N	10	0	N	① ~~9~~ 10	① ~~1~~ Ø	↓	9	1	↓
			3	10	Ø	2F	10	Ø	2F	10	0	1F	9	1	↓	9	Ø	↓
Ref.Tox.- ammonia - TAN	30	mg/L	1	10	Ø	N	10	Ø	N	10	0	N	10	Ø	N	9	1	N
			2	9	Ø	1F	8	1	N	8	0	↓	8	Ø	↓	8	Ø	↓
			3	10	Ø	1F	10	Ø	↓	10	0	↓	10	Ø	↓	10	Ø	↓
Ref.Tox.- ammonia - TAN	60	mg/L	1	10	Ø	Q	8	2	Q	8	0	Q	7	1	Q	6	1	Q
			2	10	Ø	↓	10	Ø	↓	7	3	↓	6	1	↓	3	3	↓
			3	10	Ø	↓	9	1	↓	9	0	↓	7	2	↓	5	2	↓
Ref.Tox.- ammonia - TAN	120	mg/L	1	—	—	—	—	—	—									
			2	Ø	3	—	—	—	—									
			3	1	3	Q	Ø	1	\									
Ref.Tox.- ammonia - TAN	240	mg/L	1															
			2															
			3															

① WC. MK 9/24.

9/20, Day 5 ← feed JL

ENVIRON **Ammonia Reference Toxicant Spiking Worksheet**

Amp/Eoh NH_3 RT

Assumptions in Model
Stock ammonia concentration is 10,000 mg/L = 10 mg/mL

Actual Reading
6770

Test Solutions			Volume of stock to reach desired concentration	
Measured Concentration	**Desired Concentration**	**Volume**		
mg/L	mg/L	mL	mL stock to increase	
			[redacted]	SALT WATER
202	**240**	750		**39.882**
110	**120**	750		**19.941**
50.5	**60**	750		**9.970**
22.3	**30**	750		**4.985**
11.2	**15**	750		**2.493**
0.0305	**0**	750		**0.000**
				0.000
				0.000

APPENDIX A.2.1

Neanthes arenaceodentata

Juvenile Polychaete Bioassay

Laboratory Data Sheets

ENVIRON

20 DAY SOLID PHASE BIOASSAY
WATER QUALITY DATASHEET

CLIENT	PROJECT	START TIME/ END TIME	DILUTION WATER BATCH	PROTOCOL	TEST START DATE
Anchor	Port Gamble	/	FSW090814.01	PSEP 1995	9-Sep-2014
JOB NUMBER	**PROJECT MANAGER**	**ENVIRON LABORATORY**	**TEMP. RECDR./HOBO#**	**TEST SPECIES**	**TEST END DATE**
-	B. Gardiner			*Neanthes arenaceodentata*	29-Sep-2014

WATER QUALITY DATA

TEST CONDITIONS				DO (mg/L) > 4.6		TEMP (C) 20 ± 1		SALINITY (ppt) 28 ± 2		pH 8.0±1.0				
CLIENT/ENVIRON ID	DAY	REP	JAR	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	SALINITY meter	SALINITY ppt	pH meter	pH unit	WATER RENEWAL	Feeding	TECH/DATE
Control /	0	Surr	18	8	7.9	8	19.7	8	28	8	8.0		MK	9/9
Control /	1	Surr	18	8	7.6	8	19.8	8	28	8	7.9			9/10
Control /	2	Surr	18	8	7.5	8	20.8	8	29	8	7.8			9/11
Control /	3	Surr	18	8	7.4	8	20.7	8	29	8	7.7	JL		MK 9/12
Control /	4	Surr	18	8	7.4	8	20.9	8	29	8	8.1		JL	JL 9/13
Control /	5	Surr	18	8	7.4	8	21.0	8	29	8	8.0			JL 9/14
Control /	6	Surr	18	8	7.5	8	20.4	8	28	8	8.0			9/15
Control /	7	Surr	18	8	7.3	8	20.5	8	28	8	8.0			9/16
Control /	8	Surr	18	8	7.5	8	20.5	8	28	8	7.9			MK 9/17
Control /	9	Surr	18	8	7.4	8	20.6	8	28	8	8.0	JL		9/18
Control /	10	Surr	18	8	7.5	8	20.6	8	28	8	8.0			KB 9/19
Control /	11	Surr	18	8	7.5	8	20.6	8	28	8	8.1			JL 9/20
Control /	12	Surr	18	8	7.5	8	20.7	8	28	8	7.9	JL	JL	JL 9/21
Control /	13	Surr	18	8	7.5	8	20.6	8	28	8	7.9			9/22
Control /	14	Surr	18	8	7.5	8	20.6	8	28	8	8.0			9/23
Control /	15	Surr	18	8	7.3	8	20.7	8	28	8	7.9	MK		9/24
Control /	16	Surr	18	8	② ~~7.5~~ 7.6	8	20.6	8	28	8	② ~~7.9~~ 8.0			9/25
Control /	17	Surr	18	8	7.7	8	20.6	8	28	8	7.9			9/26
Control /	18	Surr	18	8	7.6	8	20.6	8	28	8	7.9	JL	JL	JL 9/27
Control /	19	Surr	18	8	7.5	8	20.6	8	28	8	8.0			JL 9/28
Control /	20	Surr	18	8	③ ~~7.5~~ 7.5	8	20.4	8	28	8	7.9			9/29

① IG 9/9

② u'P 9/25

③ Illegible 9/29

ENVIRON

20 DAY SOLID PHASE BIOASSAY
WATER QUALITY DATASHEET

CLIENT	PROJECT	START TIME/ END TIME	DILUTION WATER BATCH	PROTOCOL	TEST START DATE
Anchor	Port Gamble	/	FSW090814.01	PSEP 1995	9-Sep-2014
JOB NUMBER	**PROJECT MANAGER**	**ENVIRON LABORATORY**	**TEMP. RECDR./HOBO#**	**TEST SPECIES**	**TEST END DATE**
.	B. Gardiner			*Neanthes arenaceodentata*	29-Sep-2014

WATER QUALITY DATA

TEST CONDITIONS				DO (mg/L) > 4.6		TEMP (C) 20 ± 1		SALINITY (ppt) 28 ± 2		pH 8.0±1.0				
CLIENT/ENVIRON ID	DAY	REP	JAR	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	SALINITY meter	SALINITY ppt	pH meter	pH unit	WATER RENEWAL	Feeding	TECH/DATE
CR-11 /	0	Surr	17 5	8	7.9	8	19.7	8	28	8	8.1		MK	9/9/14
CR-11 /	1	Surr	5	8	7.6	8	19.8	8	28	8	8.0			9/10
CR-11 /	2	Surr	5	8	7.5	8	20.8	8	29	8	7.8			9/11
CR-11 /	3	Surr	5	8	7.3	8	20.7	8	29	8	7.9			MK 9/12
CR-11 /	4	Surr	5	8	7.4	8	20.9	8	29	8	8.1		JL	JL 9/13
CR-11 /	5	Surr	5	8	7.3	8	21.0	8	29	8	8.1			JL 9/14
CR-11 /	6	Surr	5	8	7.5	8	20.3	8	29	8	8.1			9/15
CR-11 /	7	Surr	5	8	7.2	8	20.4	8	28	8	8.1			9/16
CR-11 /	8	Surr	5	8	7.5	8	20.6	8	28	8	8.3			MK 9/17
CR-11 /	9	Surr	5	8	7.4	8	20.6	8	28	8	8.3			9/18
CR-11 /	10	Surr	5	8	7.6	8	20.6	8	28	8	8.3		KB	KB 9/19
CR-11 /	11	Surr	5	8	7.5	8	20.6	8	28	8	8.4			JL 9/20
CR-11 /	12	Surr	5	8	7.5	8	20.7	8	28	8	8.3		JL	JL 9/21
CR-11 /	13	Surr	5	8	7.4	8	20.7	8	28	8	8.1			9/22
CR-11 /	14	Surr	5	8	7.5	8	20.5	8	28	8	8.4			9/23
CR-11 /	15	Surr	5	8	7.4	8	20.7	8	28	8	8.3			9/24
CR-11 /	16	Surr	5	8	7.6	8	20.5	8	28	8	8.2			9/25
CR-11 /	17	Surr	5	8	7.7	8	20.5	8	28	8	8.2			9/26
CR-11 /	18	Surr	5	8	7.6	8	20.6	8	28	8	8.3		JL	JL 9/27
CR-11 /	19	Surr	5	8	7.5	8	20.6	8	28	8	8.3			JL 9/28
CR-11 /	20	Surr	5	8	7.5	8	20.4	8	28	8	8.2			9/29

ENVIRON

20 DAY SOLID PHASE BIOASSAY
WATER QUALITY DATASHEET

CLIENT	PROJECT	START TIME/ END TIME	DILUTION WATER BATCH	PROTOCOL	TEST START DATE
Anchor	Port Gamble	1350 /	FSW090814.01	PSEP 1995	9-Sep-2014
JOB NUMBER	**PROJECT MANAGER**	**ENVIRON LABORATORY**	**TEMP. RECDR./HOBO#**	**TEST SPECIES**	**TEST END DATE**
.	B. Gardiner			*Neanthes arenaceodentata*	29-Sep-2014

WATER QUALITY DATA

TEST CONDITIONS				DO (mg/L) > 4.6		TEMP (C) 20 ± 1		SALINITY (ppt) 28 ± 2		pH 8.0±1.0				
CLIENT/ENVIRON ID	DAY	REP	JAR	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	SALINITY meter	SALINITY ppt	pH meter	pH unit	WATER RENEWAL	Feeding	TECH/DATE
SMA-1SE /	0	Surr	5→7	8	7.8	8	19.7	8	28	8	8.0		MK	~~HE~~ 9/9
SMA-1SE /	1	Surr	7	8	7.6	8	19.8	8	28	8	7.9			~~HE~~ 9/10
SMA-1SE /	2	Surr	7	8	7.5	8	20.7	8	29	8	7.7		JL	JL 9/11
SMA-1SE /	3	Surr	7	8	7.4	8	20.5	8	29	8	7.9	JL		MK 9/12
SMA-1SE /	4	Surr	7	8	7.4	8	20.9	8	29	8	8.1		JL	JL 9/13
SMA-1SE /	5	Surr	7	8	7.3	8	21.1 ①	8	29	8	8.0			JL 9/14
SMA-1SE /	6	Surr	7	8	7.5	8	20.3	8	28	8	8.0	~~HE~~	~~HE~~	~~HE~~ 9/15
SMA-1SE /	7	Surr	7	8	7.2	8	20.4	8	28	8	8.0			~~HE~~ 9/16
SMA-1SE /	8	Surr	7	8	7.5	8	20.5	8	28	8	8.0		~~HE~~	MK 9/17
SMA-1SE /	9	Surr	7	8	7.3	8	20.6	8	28	8	8.0	JL		~~HE~~ 9/18
SMA-1SE /	10	Surr	7	8	7.5	8	20.8	8	28	8	8.0		KB	KB 9/19
SMA-1SE /	11	Surr	7	8	7.5	8	20.3	8	28	8	8.1			JL 9/20
SMA-1SE /	12	Surr	7	8	7.5	8	20.7	8	28	8	7.9	JL	JL	JL 9/21
SMA-1SE /	13	Surr	7	8	7.4	8	20.8	8	28	8	7.9			~~HE~~ 9/22
SMA-1SE /	14	Surr	7	8	7.4	8	20.6	8	28	8	8.0		~~HE~~	~~HE~~ 9/23
SMA-1SE /	15	Surr	7	8	7.3	8	20.8	8	28	8	7.9	MK		~~HE~~ 9/24
SMA-1SE /	16	Surr	7	8	7.5	8	20.4	8	28	8	7.9		~~HE~~	~~HE~~ 9/25
SMA-1SE /	17	Surr	7	8	7.7	8	20.4	8	28	8	7.8			~~HE~~ 9/26
SMA-1SE /	18	Surr	7	8	7.5	8	20.6	8	28	8	7.9	JL	JL	JL 9/27
SMA-1SE /	19	Surr	7	8	7.5	8	20.7	8	28	8	7.9			JL 9/28
SMA-1SE /	20	Surr	7	8	7.4	8	20.3	8	28	8	7.8			~~HE~~ 9/29

① Decreased bath temp. by 0.5 °C. JL 9/14/14.

⑥ ~~HE~~ ~~HE~~ 9/15

ENVIRON

20 DAY SOLID PHASE BIOASSAY
WATER QUALITY DATASHEET

CLIENT	PROJECT	START TIME/ END TIME	DILUTION WATER BATCH	PROTOCOL	TEST START DATE
Anchor	Port Gamble	/	FSW090814.01	PSEP 1995	9-Sep-2014
JOB NUMBER	**PROJECT MANAGER**	**ENVIRON LABORATORY**	**TEMP. RECDR./HOBO#**	**TEST SPECIES**	**TEST END DATE**
.	B. Gardiner			*Neanthes arenaceodentata*	29-Sep-2014

WATER QUALITY DATA

TEST CONDITIONS				DO (mg/L) > 4.6		TEMP (C) 20 ± 1		SALINITY (ppt) 28 ± 2		pH 8.0±1.0				
CLIENT/ENVIRON ID	DAY	REP	JAR	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	SALINITY meter	SALINITY ppt	pH meter	pH unit	WATER RENEWAL	Feeding	TECH/DATE
SMA-1NW /	0	Surr	21	8	7.8	8	19.6	8	28	8	7.9		MK	7H 9/9/14
SMA-1NW /	1	Surr		8	7.2	8	19.9	8	28	8	7.7			HE 9/10
SMA-1NW /	2	Surr		8	7.3	8	20.8	8	29	8	7.6		JL	JL 9/11
SMA-1NW /	3	Surr		8	6.8	8	20.7	8	29	8	7.5	JL		MK 9/12
SMA-1NW /	4	Surr		8	7.2	8	21.0	8	29	8	7.9		JL	JL 9/13
SMA-1NW /	5	Surr		8	7.1	8	①21.1	8	29	8	7.9			JL 9/14
SMA-1NW /	6	Surr		8	7.1	8	20.3	8	28	8	7.9	HE	HE	HE 9/15
SMA-1NW /	7	Surr		8	6.7	8	20.5	8	28	8	7.8			HE 9/16
SMA-1NW /	8	Surr		8	7.1	8	20.6	8	28	8	7.9		HE	MK 9/17
SMA-1NW /	9	Surr		8	7.0	8	20.7	8	28	8	7.9	JL		HE 9/18
SMA-1NW /	10	Surr		8	7.4	8	20.7	8	28	8	8.0		KB	KB 9/19
SMA-1NW /	11	Surr		8	7.2	8	20.7	8	28	8	8.0			JL 9/20
SMA-1NW /	12	Surr		8	7.3	8	20.8	8	28	8	②7.9	JL	JL	JL 9/21
SMA-1NW /	13	Surr		8	6.6	8	20.7	8	28	8	7.6			HE 9/22
SMA-1NW /	14	Surr		8	7.2	8	20.7	8	28	8	8.0		HE	HE 9/23
SMA-1NW /	15	Surr		8	7.2	8	20.8	8	28	8	7.8	MK		HE 9/24
SMA-1NW /	16	Surr		8	7.4	8	20.6	8	28	8	7.9		HE	HE 9/25
SMA-1NW /	17	Surr		8	7.5	8	20.6	8	28	8	7.8			HE 9/26
SMA-1NW /	18	Surr		8	7.3	8	20.7	8	28	8	7.9	JL	JL	JL 9/27
SMA-1NW /	19	Surr		8	7.3	8	20.6	8	28	8	7.8			JL 9/28
SMA-1NW /	20	Surr		8	7.3	8	20.4	8	28	8	7.8			HE 9/29

①Decreased bath temp. by 0.5°C. JL 9/14/14. ②WC. JL 9/21/14.

ENVIRON

20 DAY SOLID PHASE BIOASSAY
WATER QUALITY DATASHEET

CLIENT	PROJECT	START TIME/ END TIME	DILUTION WATER BATCH	PROTOCOL	TEST START DATE
Anchor	Port Gamble	/	FSW090814.01	PSEP 1995	9-Sep-2014
JOB NUMBER	**PROJECT MANAGER**	**ENVIRON LABORATORY**	**TEMP. RECDR./HOBO#**	**TEST SPECIES**	**TEST END DATE**
.	B. Gardiner			*Neanthes arenaceodentata*	29-Sep-2014

WATER QUALITY DATA

TEST CONDITIONS				DO (mg/L) > 4.6		TEMP (C) 20 ± 1		SALINITY (ppt) 28 ± 2		pH 8.0±1.0				
CLIENT/ENVIRON ID	DAY	REP	JAR	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	SALINITY meter	SALINITY ppt	pH meter	pH unit	WATER RENEWAL	Feeding	TECH/DATE
SMA-1SB /	0	Surr	30	8	7.9	8	19.7	8	28	8	8.0		MK	~~MK~~ 9/9
SMA-1SB /	1	Surr		8	7.6	8	19.8	8	28	8	7.9			~~MK~~ 9/10
SMA-1SB /	2	Surr		8	7.5	8	20.8	8	29	8	7.8		JL	JL 9/11
SMA-1SB /	3	Surr		8	7.4	8	20.8	8	29	8	7.7	JL		MK 9/12
SMA-1SB /	4	Surr		8	7.4	8	21.0	8	29	8	8.1		JL	JL 9/13
SMA-1SB /	5	Surr		8	7.4	8	①21.1	8	29	8	8.1			JL 9/14
SMA-1SB /	6	Surr		8	7.5	8	20.5	8	28	8	8.0	~~MK~~	~~MK~~	~~MK~~ 9/15
SMA-1SB /	7	Surr		8	7.3	8	20.5	8	28	8	8.0			~~MK~~ 9/16
SMA-1SB /	8	Surr		8	7.5	8	20.6	8	28	8	7.9		~~MK~~	MK 9/17
SMA-1SB /	9	Surr		8	7.4	8	20.6	8	28	8	8.0	JL		~~MK~~ 9/18
SMA-1SB /	10	Surr		8	7.5	8	20.7	8	28	8	8.0		KB	KB 9/19
SMA-1SB /	11	Surr		8	7.5	8	20.7	8	28	8	8.1			JL 9/20
SMA-1SB /	12	Surr		8	7.5	8	20.7	8	28	8	7.9	JL	JL	JL 9/21
SMA-1SB /	13	Surr		8	7.5	8	20.6	8	28	8	7.8			~~MK~~ 9/22
SMA-1SB /	14	Surr		8	7.5	8	20.6	8	28	8	8.0		~~MK~~	~~MK~~ 9/23
SMA-1SB /	15	Surr		8	7.7	8	20.7	8	28	8	7.9	MK		~~MK~~ 9/24
SMA-1SB /	16	Surr		8	7.5	8	20.6	8	28	8	8.0		~~MK~~	~~MK~~ 9/25
SMA-1SB /	17	Surr		8	7.7	8	20.6	8	28	8	7.9			~~MK~~ 9/26
SMA-1SB /	18	Surr		8	7.6	8	20.6	8	28	8	7.9	JL	JL	JL 9/27
SMA-1SB /	19	Surr		8	7.5	8	20.6	8	28	8	7.9			JL 9/28
SMA-1SB /	20	Surr		8	7.5	8	20.5	8	28	8	7.9			~~MK~~ 9/29

① Decreased bath temp. by 0.5°C. JL 9/14/14

/

ENVIRON

20-DAY SOLID PHASE BIOASSAY
OBSERVATION DATASHEET

CLIENT	PROJECT	JOB NO.	PROJECT MANAGER	NEWFIELDS LABORATORY	PROTOCOL	SPECIES
Anchor	Port Gamble		B. Gardiner	Port Gamble	PSEP 1995	*Neanthes arenaceodentata*

ENDPOINT DATA & OBSERVATIONS

N = Normal
#E = Emergence
#M = Mortality
G = Growth (fungal, bacterial, or algal)
D = No Air Flow (DO?)
F = Floating on Surface
TC = Too Cloudy
U=Excess food

INITIAL # OF ORGANISMS: 5

CLIENT/NEWFIELDS ID	REP	JAR	INITIAL # (if differs)	Date and Initials	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	NUMBER REMAINING	TARE WEIGHT (mg)	TOTAL WEIGHT (mg)	ASHED WEIGHT (mg)
				9/10/14 MK	9/11/14	9/12/14 JL	9/13 JL	9/14 JL	9/15	9/16 KMB	9/17 MK	9/18 JL	9/19 KMB	9/20 JL	9/21 JL	9/22 MK	9/23	9/24	9/25	9/26	9/27 JL	9/28 JL	9/29					
Control /	1		5	N	N	U	N	U (2)	N	N	N	N	N	N	N	IE	N	N	N	N	N	N	N	5	1 188.63	238.97	208.97
	2		5	IE	↓											2E	IE	IE		IE				4	5	2 383.60	479.07	428.12
	3		5	N	U											N	N	N		N				N	5	3 188.20	267.56	225.60
	4		5	↓	N											IE	↓								5	4 180.64	245.72	211.39 211.37 (8)
	5		5		↓											N	IE	↓		↓					5	5 207.14	296.26	254.30
Ref. CR-11 /	1		5	G	G	G (4)	↓	↓	G	G	G		G	G	G	G	G	G	G	G	G	G	G	G	5	6 190.43	255.96	215.22
	2		5	G	G	U	G	G (4)	G	G			↓	↓	↓	↓		↓	↓	↓	↓	↓	↓	↓	5	7 194.96	261.36	222.10
	3		5	N	N	U	N	U	G	G															5	8 187.07	249.06	213.18
	4		5	↓	G	G (4)	G	G (4)	G	G															5	9 193.11	266.19	224.18
	5		5		N	G (4)	N	U	G	G	↓		↓	↓	↓	↓	IE	↓	↓	↓	↓	↓	↓	↓	5	10 180.33	258.30	212.70
SMA-1SE /	1		5	N	↓	U	↓	↓	U	U	N		N	N	N	N	N	N	IE	N	N	N	N	N	5	11 178.76	243.64	197.32
	2		5						N	N	↓		↓	↓	↓	IE (3)	IE	N		↓	↓	↓	↓	5	12 159.29	225.03	179.85
	3		5						U	↓						N	N	↓						5	13 183.26	269.88	222.46 (2) 222.
	4		5						N							IE	IE							5 (5)	14 187.67	251.65	209.95
	5		5		↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	N	↓	↓	↓	↓	↓	↓	↓	↓	5	15 165.23	236.77	192.88

Initial Biomass	Rep	Number	Tare Weight (mg)	Dry Weight (mg) (2)	Ashed Weight (mg)
	1	5	(1) 357.87	369.23 (2)	361.61
	2	5	268.31	275.88 (2)	272.57
	3	5	270.10	282.19 (2)	275.81

Comments:
(3) WC · MK 9/22.
(4) In oven 9/29 1120 into dessicator 91300820 oven temp: 108°C MK
(8) In furnace @ 0930 10/02/14, Moved into dessicator @ 1245 10/02/14 JL
Ashed wts @ 0830 10/03/14 KMB

(1) IE. JL 9/14/14.
(2) Actual dry weights (Re-weighed): Rep 1 = 364.20 mg, Rep 2 = 275.78 mg, Rep 3 = 279.74 mg. 9/19. MK
(4) Re-weighed after ash weights (boats scraped clean) to get initial tare weights due to scale measurement error. Actual tare weights: Rep 1 = 360.99 mg, Rep 2 = 270.68 mg, Rep 3 = 273.40 mg. 9/23 MK.
(5) IE. Body found. JL 9/29.
(8) Illegible - KB 10/03/14

ENVIRON

20-DAY SOLID PHASE BIOASSAY
OBSERVATION DATASHEET

CLIENT	PROJECT	JOB N0.	PROJECT MANAGER	NEWFIELDS LABORATORY	PROTOCOL	SPECIES
Anchor	Port Gamble		B. Gardiner	Port Gamble	PSEP 1995	*Nearthes arenaceodentata*

ENDPOINT DATA & OBSERVATIONS

N = Normal
#E = Emergence
#M = Mortality
G = Growth (fungal, bacterial, or algal)
D = No Air Flow (DO?)
F = Floating on Surface
TC = Too Cloudy
U=Excess food

INITIAL # OF ORGANISMS: 5

CLIENT / NEWFIELDS ID	REP	JAR	INITIAL # (if differs)	Date and initials	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	NUMBER REMAINING	TARE WEIGHT (mg)	TOTAL WEIGHT (mg)	ASHED WEIGHT (mg)
SMA-1NW /	1			9/10/14 MK	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	5	16 187.70	279.35	225.69
	2			9/11/14 JL										N			N								5	17 181.63	(2) ~~253.59~~	207.78
	3			9/12/14 JL										IE			IE								4	18 197.56	260.02	219.81
	4			9/13 JL										N			N								4	19 198.89	262.24	221.29
	5			9/14 JL										N											5	20 197.35	254.71	217.02
SMA-1SB /	1			9/15 ~~JL~~	N	N				U	U	N		N			N	IE							5	21 205.26	262.90	221.92
	2			9/16 KMB						N	N							N							5	22 206.56	279.07	234.38
	3			9/17 MK																					5	23 200.25	274.69	227.84
	4			9/18 JL									G	G											5	24 212.87	292.31	247.98
	5			9/19 KMB									N	N			IE								5	25 202.09	281.26	232.65

DIE 9/15 ~~JL~~ JK

(2) MR: 9/30/14 ~~252~~ 253.63 mg

26 211.43
27 208.54
28 128.64

ENVIRON

Ammonia and Sulfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
Anchor QEA	Neanthes	20 Day

PRETEST / **INITIAL** (circled) / FINAL / OTHER (circle one) DAY OF TEST: Ø

OVERLYING (OV) (circled) / **POREWATER (PW)** (circled) (circle one)

Comments: ______

Calibration Standards Temperature		Sample temperature should be within ±1°C of standards temperature at time and date of analysis.
Date:	Temperature:	
09/09/14	20.0°C	

Sample ID or Description	Conc. or Rep	Date of Sampling and Initials	Ammonia Value (mg/L)	Temp °C	Date of Reading and Initials	Sample Preserved (Y/N)	pH	Sal (ppt)	Sulf. mg/L
Ø	OV	09/09/14 KMB	0.130	20.6	09/09/14 KMB	N			0.022
REF	↓	↓	1.03	20.6	↓	↓			0.022
SMA-INW	↓	↓	0.741	20.5	↓	↓			0.075
SMA-SSB	↓	↓	0.329	20.5	↓	↓			0.072
SMA-ISE	↓	↓	0.158	20.6	↓	↓			0.057
Ø	PW	09/09/14 KB	0.106	20.6	09/09/14 KB	N	—	—	(4)
REF	↓	↓	6.17	20.6	↓	↓	7.6	28	(1) >7.0
SMA-INW	↓	↓	1.02	20.6	↓	↓	7.6	28	~~0.152~~ 0.309 ~~0.160~~ (2)
~~SMA-SSB~~	↓	↓	0.984	20.6	↓	↓	7.6	28	0.320 ~~0.160~~ (3)
SMA-ISE	↓	↓	0.772	20.6	↓	↓	7.3	28	0.438

(1) Sulfide measurements are 50% sample 50% dI 9/9/14 recorded values are 2x meter reading
(2) we 9/9/14
(3) IE 9/9/14
(4) Not enough for analysis 9/9/14

ENVIRON

Ammonia and Sulfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
Anchor / Port Gamble DMMP	Neanthes arenaceodentata	20

PRETEST / INITIAL / FINAL / OTHER (circle one) DAY of TEST: 20

OVERLYING (OV) / ~~POREWATER (PW)~~ (circle one)

Comments: _____

Calibration Standards Temperature		Sample temperature should be within ±1°C of standards temperature at time and date of analysis.
Date: 9/29/14	Temperature: 19.9°C	

Sample ID or Description	Conc. or Rep	Date of Sampling and Initials	Ammonia Value (mg/L)	Temp °C	Date of Reading and Initials	Sample Preserved (Y/N)	pH	Sal (ppt)	Sulf. mg/L
OV. Ø	Surr.	9/29/14 JC	0.00	20.9	9/29/14 JC	N			0.013
CR-11			0.00						0.000
SMA-1SE			0.00						0.003
SMA-1NW			0.00						0.009
SMA-1SB			0.00						0.032
PW. Ø		9/29/14 HE	0.00	20.1	HE/JC 9/29/14	N	7.4	28	0.050
CR-11			0.00				7.3	29	0.024
SMA-1SE			(1)				7.5	29	0.000
SMA-1NW			0.00				7.5	29	0.000
SMA-1SB			0.00				7.5	28	0.217

(1) Insufficient PW HE 9/29

ENVIRON

ORGANISM RECEIPT LOG

Date:	Time:	Batch No.
9/9/14	0900	ATS 090914

Organism / Project:	Source:
Neanthes	Aquatic toxicology support

Address:	Invoice Attached
on file	Yes (No)

Phone:	Contact:
on file	on file

No. Ordered:	No. Received:	Source Batch:
350	350+	Emergent 8/22/14

Condition of Organisms:	Approximate Size or Age:
Good	

Shipper:	B of L (Tracking No.)
Courier	NA

Condition of Container:	Received By:
Good	KW

Container	D.O. (mg/L)	Temp. (°C)	Conductivity or Salinity (Include Units)	pH (Units)	Technician (Initials)
1	19.2	19.4	31 ppt	6.8	KW
2	10.5	18.9	31 ppt	6.9	
3	20.6	19.0	31 ppt	6.8	
4	15.2	18.4	30 ppt	6.8	

Notes:

Aquatic Toxicology Support
1849 Charleston Beach Road West
Bremerton, Washington 98312
(360) 813-1202

Order Summary

Species: *Neanthes arenaceodentata**	Emerge Date: 22 Aug '14
Number Ordered: 350	Number Shipped: 350+10%
Date Shipped: 9 Sept. '14	Salinity (ppt): 30

*Smith 1964. CSU Long Beach strain. Feed upon arrival.

APPENDIX A.2.2

Neanthes arenaceodentata

Juvenile Polychaete Bioassay

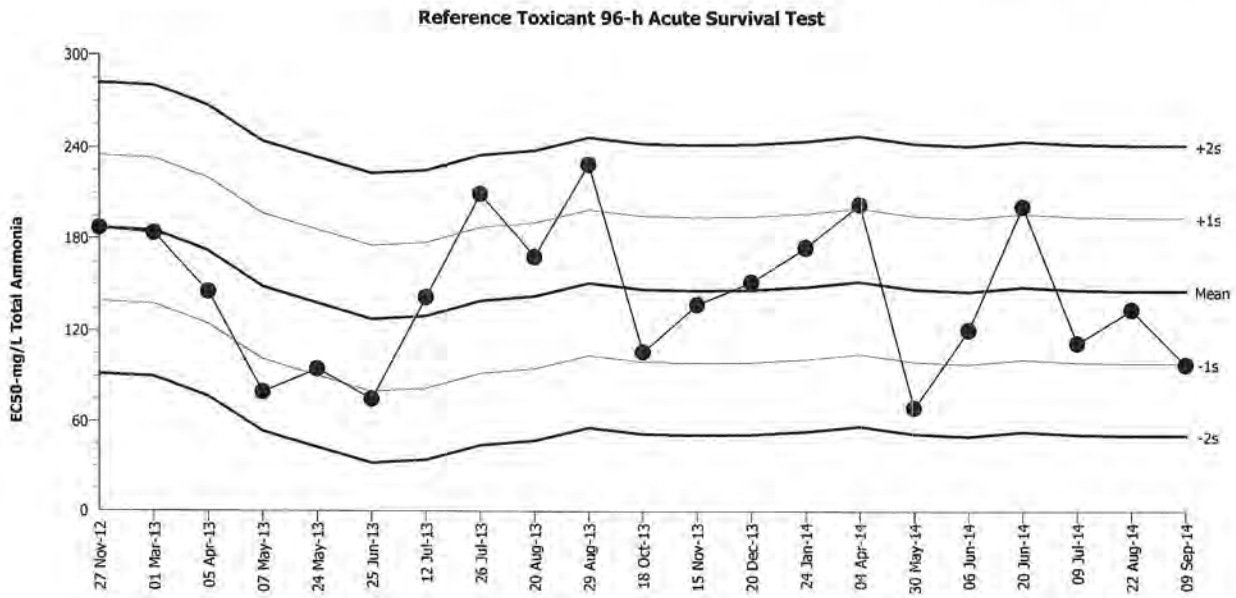
Reference Toxicant Test

CETIS QC Plot

Report Date: 14 Sep-14 19:43 (1 of 1)

Reference Toxicant 96-h Acute Survival Test — **All Matching Labs**

Test Type:	Survival	**Organism:**	Neanthes arenaceodentata (Polycha	**Material:**	Total Ammonia
Protocol:	PSEP (1995)	**Endpoint:**	Proportion Survived	**Source:**	Reference Toxicant-REF



Mean:	146.3	**Count:**	20	**-1s Warning Limit:**	98.6	**-2s Action Limit:**	50.89
Sigma:	47.71	**CV:**	32.60%	**+1s Warning Limit:**	194	**+2s Action Limit:**	241.7

Quality Control Data

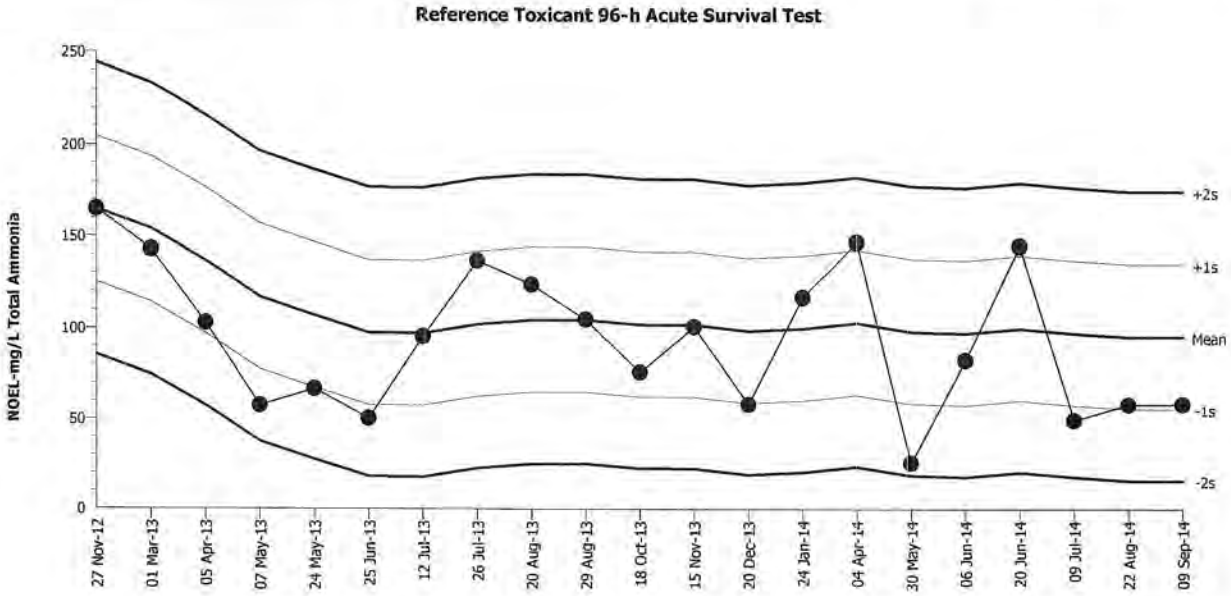
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2012	Nov	27	16:05	187.1	40.8	0.8551			11-0295-5053	21-1714-9848	NewFields
2	2013	Mar	1	14:40	183.7	37.41	0.784			16-0938-7761	05-5518-0938	NewFields
3		Apr	5	10:40	145.7	-0.636	-0.01333			12-4084-6308	11-0088-3368	NewFields
4		May	7	13:00	79.7	-66.6	-1.396	(-)		03-6682-4675	04-2369-0564	NewFields
5			24	11:30	94.89	-51.41	-1.078	(-)		19-1651-0673	18-8601-2491	NewFields
6		Jun	25	14:13	75.13	-71.17	-1.492	(-)		08-9049-5052	01-8172-0753	NewFields
7		Jul	12	13:20	141.9	-4.367	-0.09153			14-1288-0905	06-4191-8012	NewFields
8			26	12:00	209.7	63.41	1.329	(+)		21-1882-7830	07-5315-7472	NewFields
9		Aug	20	15:45	168.6	22.35	0.4684			00-0072-4465	03-0193-2385	NewFields
10			29	13:40	229.1	82.83	1.736	(+)		00-4506-4349	11-1553-1817	NewFields
11		Oct	18	15:35	106.3	-39.99	-0.8383			21-0368-6339	03-0733-6178	NewFields
12		Nov	15	15:30	137.4	-8.87	-0.1859			16-5727-5696	09-2903-6118	NewFields
13		Dec	20	14:00	152.2	5.871	0.1231			08-9922-1254	05-5343-6267	NewFields
14	2014	Jan	24	13:20	174.5	28.22	0.5916			20-9603-7883	05-6245-5381	NewFields
15		Apr	4	15:40	202.9	56.58	1.186	(+)		09-1443-8374	04-8864-2138	ENVIRON
16		May	30	16:25	69.43	-76.87	-1.611	(-)		18-4751-2702	06-4812-5268	ENVIRON
17		Jun	6	14:00	120.6	-25.73	-0.5393			02-4901-6395	02-6665-3375	ENVIRON
18			20	13:20	201.3	55.05	1.154	(+)		04-8899-1061	18-6388-8462	ENVIRON
19		Jul	9	15:30	112	-34.28	-0.7184			00-3047-6484	19-8550-4064	ENVIRON
20		Aug	22	12:30	133.9	-12.43	-0.2606			19-3698-7324	19-8424-2994	ENVIRON
21		Sep	9	15:00	97.87	-48.43	-1.015	(-)		04-0379-7898	08-6657-8417	ENVIRON

CETIS QC Plot

Report Date: 14 Sep-14 19:44 (1 of 1)

Reference Toxicant 96-h Acute Survival Test — **All Matching Labs**

Test Type:	Survival	**Organism:**	Neanthes arenaceodentata (Polycha	**Material:**	Total Ammonia
Protocol:	PSEP (1995)	**Endpoint:**	Proportion Survived	**Source:**	Reference Toxicant-REF



Mean:	95.37	**Count:**	20	**-1s Warning Limit:**	55.65	**-2s Action Limit:**	15.93
Sigma:	39.72	**CV:**	41.60%	**+1s Warning Limit:**	135.1	**+2s Action Limit:**	174.8

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2012	Nov	27	16:05	165	69.63	1.753	(+)		11-0295-5053	20-4892-3773	NewFields
2	2013	Mar	1	14:40	143	47.63	1.199	(+)		16-0938-7761	07-7870-4978	NewFields
3		Apr	5	10:40	103	7.63	0.1921			12-4084-6308	12-0348-0416	NewFields
4		May	7	13:00	57.6	-37.77	-0.9509			03-6682-4675	13-3264-9963	NewFields
5			24	11:30	66.7	-28.67	-0.7218			19-1651-0673	19-7443-7088	NewFields
6		Jun	25	14:13	50.4	-44.97	-1.132	(-)		08-9049-5052	06-0503-5931	NewFields
7		Jul	12	13:20	95.6	0.23	0.005791			14-1288-0905	07-0996-7321	NewFields
8			26	12:00	137	41.63	1.048	(+)		21-1882-7830	14-5107-6466	NewFields
9		Aug	20	15:45	124	28.63	0.7208			00-0072-4465	04-2226-9652	NewFields
10			29	13:40	105	9.63	0.2424			00-4506-4349	03-1605-8937	NewFields
11		Oct	18	15:35	76	-19.37	-0.4877			21-0368-6339	09-9293-9888	NewFields
12		Nov	15	15:30	101	5.63	0.1417			16-5727-5696	19-4124-7251	NewFields
13		Dec	20	14:00	58.3	-37.07	-0.9333			08-9922-1254	11-2068-6689	NewFields
14	2014	Jan	24	13:20	117	21.63	0.5446			20-9603-7883	15-6685-9407	NewFields
15		Apr	4	15:40	147	51.63	1.3	(+)		09-1443-8374	10-8829-6450	ENVIRON
16		May	30	16:25	25.7	-69.67	-1.754	(-)		18-4751-2702	12-3702-5556	ENVIRON
17		Jun	6	14:00	82.6	-12.77	-0.3215			02-4901-6395	20-5404-5146	ENVIRON
18			20	13:20	145	49.63	1.249	(+)		04-8899-1061	10-6019-5810	ENVIRON
19		Jul	9	15:30	49.5	-45.87	-1.155	(-)		00-3047-6484	08-3152-1432	ENVIRON
20		Aug	22	12:30	58.1	-37.27	-0.9383			19-3698-7324	16-9806-3196	ENVIRON
21		Sep	9	15:00	58.3	-37.07	-0.9333			04-0379-7898	19-3535-3112	ENVIRON

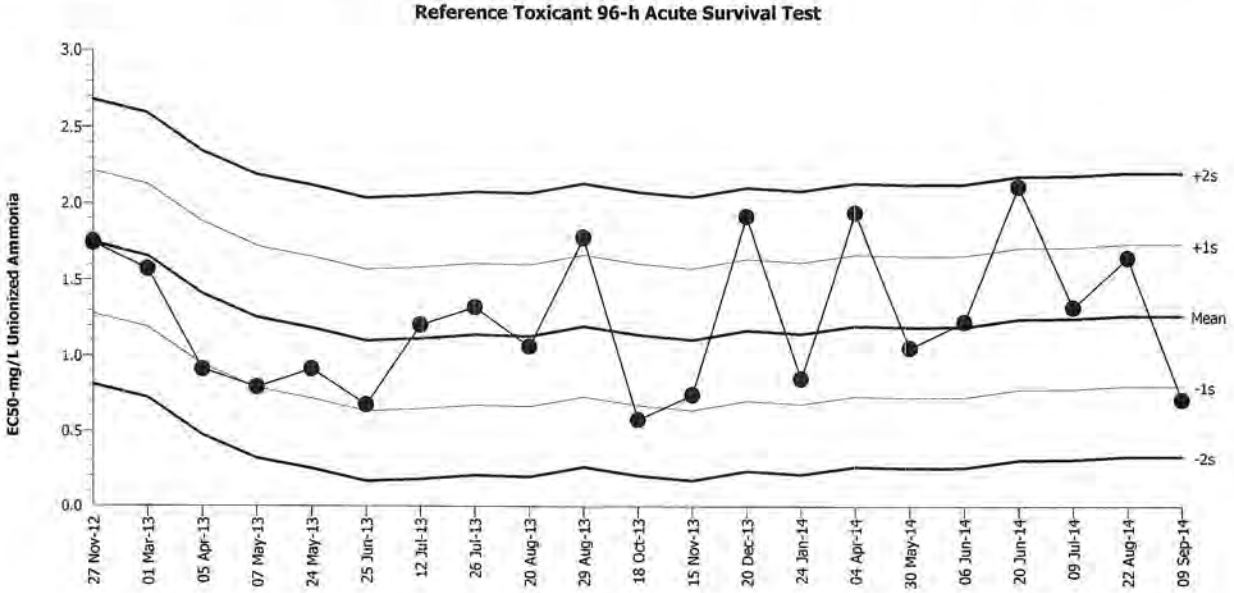
Analyst: JL QA: CR

CETIS QC Plot

Report Date: 14 Sep-14 19:48 (1 of 1)

Reference Toxicant 96-h Acute Survival Test — **All Matching Labs**

Test Type:	Survival	**Organism:**	Neanthes arenaceodentata (Polycha	**Material:**	Unionized Ammonia
Protocol:	PSEP (1995)	**Endpoint:**	Proportion Survived	**Source:**	Reference Toxicant-REF



Mean:	1.27	**Count:**	20	**-1s Warning Limit:**	0.8023	**-2s Action Limit:**	0.3348
Sigma:	0.4675	**CV:**	36.80%	**+1s Warning Limit:**	1.737	**+2s Action Limit:**	2.205

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2012	Nov	27	16:05	1.746	0.4756	1.017	(+)		08-6061-4466	00-3182-3735	NewFields
2	2013	Mar	1	14:40	1.573	0.3034	0.6489			18-8051-2966	06-9085-4102	NewFields
3		Apr	5	10:40	0.9122	-0.3578	-0.7654			03-5469-7681	20-0412-7755	NewFields
4		May	7	13:00	0.794	-0.476	-1.018	(-)		11-4883-5754	10-2519-8358	NewFields
5			24	11:30	0.9143	-0.3557	-0.7609			03-1268-0321	17-3627-5339	NewFields
6		Jun	25	14:30	0.6782	-0.5918	-1.266	(-)		07-6412-1006	01-8270-7142	NewFields
7		Jul	12	13:20	1.207	-0.06281	-0.1344			06-2793-5359	03-5477-0692	NewFields
8			26	12:00	1.324	0.05372	0.1149			08-3568-6719	13-1071-7473	NewFields
9		Aug	20	15:45	1.065	-0.2046	-0.4376			11-8125-8700	06-3963-9074	NewFields
10			29	13:40	1.779	0.5089	1.089	(+)		06-4372-6299	20-5863-7836	NewFields
11		Oct	18	15:35	0.5812	-0.6888	-1.473	(-)		21-1191-9888	03-5569-7261	NewFields
12		Nov	15	15:30	0.746	-0.524	-1.121	(-)		09-2209-5330	09-1007-2814	NewFields
13		Dec	20	14:00	1.916	0.6456	1.381	(+)		01-5055-0133	16-3961-8899	NewFields
14	2014	Jan	24	13:20	0.8517	-0.4183	-0.8947			09-1104-1497	12-8333-6553	NewFields
15		Apr	4	15:40	1.94	0.6697	1.433	(+)		00-6512-2526	06-9520-2408	NewFields
16		May	30	16:25	1.055	-0.2152	-0.4603			04-6747-6619	11-2879-2220	ENVIRON
17		Jun	6	14:00	1.228	-0.04244	-0.09077			19-7971-8908	15-6482-0033	ENVIRON
18			20	13:20	2.113	0.8435	1.804	(+)		01-9511-3585	14-0146-3778	ENVIRON
19		Jul	9	15:30	1.322	0.05228	0.1118			09-1500-8488	10-4546-7656	ENVIRON
20		Aug	22	12:30	1.65	0.3798	0.8124			18-5611-8800	16-9514-3424	ENVIRON
21		Sep	9	15:00	0.7125	-0.5575	-1.193	(-)		18-5349-8839	17-4717-4294	ENVIRON

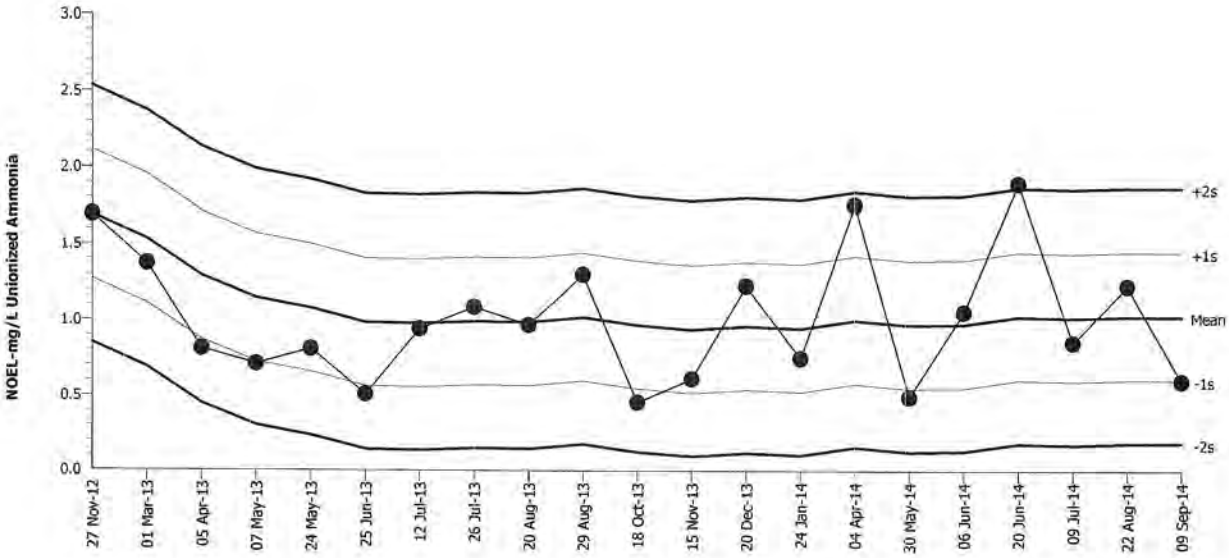
CETIS QC Plot

Report Date: 14 Sep-14 19:48 (1 of 1)

Reference Toxicant 96-h Acute Survival Test — **All Matching Labs**

Test Type:	Survival	**Organism:**	Neanthes arenaceodentata (Polycha	**Material:**	Unionized Ammonia
Protocol:	PSEP (1995)	**Endpoint:**	Proportion Survived	**Source:**	Reference Toxicant-REF

Reference Toxicant 96-h Acute Survival Test



Mean:	1.027	**Count:**	20	**-1s Warning Limit:**	0.6061	**-2s Action Limit:**	0.1847
Sigma:	0.4213	**CV:**	41.00%	**+1s Warning Limit:**	1.449	**+2s Action Limit:**	1.87

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2012	Nov	27	16:05	1.693	0.666	1.581	(+)		08-6061-4466	05-8355-5463	NewFields
2	2013	Mar	1	14:40	1.373	0.346	0.8213			18-8051-2966	09-6023-4535	NewFields
3		Apr	5	10:40	0.811	-0.216	-0.5127			03-5469-7681	20-7653-9268	NewFields
4		May	7	13:00	0.71	-0.317	-0.7524			11-4883-5754	20-7240-7121	NewFields
5			24	11:30	0.81	-0.217	-0.5151			03-1268-0321	20-4684-2719	NewFields
6		Jun	25	14:30	0.51	-0.517	-1.227	(-)		07-6412-1006	18-2969-6397	NewFields
7		Jul	12	13:20	0.943	-0.084	-0.1994			06-2793-5359	18-9450-4090	NewFields
8			26	12:00	1.087	0.06	0.1424			08-3568-6719	20-5296-6252	NewFields
9		Aug	20	15:45	0.97	-0.057	-0.1353			11-8125-8700	00-8450-2616	NewFields
10			29	13:40	1.301	0.274	0.6504			06-4372-6299	17-0691-0612	NewFields
11		Oct	18	15:35	0.459	-0.568	-1.348	(-)		21-1191-9888	08-6606-1702	NewFields
12		Nov	15	15:30	0.615	-0.412	-0.9779			09-2209-5330	09-5248-1072	NewFields
13		Dec	20	14:00	1.228	0.201	0.4771			01-5055-0133	05-3710-3857	NewFields
14	2014	Jan	24	13:20	0.75	-0.277	-0.6575			09-1104-1497	11-9980-1624	NewFields
15		Apr	4	15:40	1.759	0.732	1.737	(+)		00-6512-2526	16-4646-7758	NewFields
16		May	30	16:25	0.494	-0.533	-1.265	(-)		04-6747-6619	20-5692-2184	ENVIRON
17		Jun	6	14:00	1.056	0.029	0.06883			19-7971-8908	15-9945-9119	ENVIRON
18			20	13:20	1.898	0.871	2.067	(+)	(+)	01-9511-3585	21-4292-7262	ENVIRON
19		Jul	9	15:30	0.853	-0.174	-0.413			09-1500-8488	15-2291-7760	ENVIRON
20		Aug	22	12:30	1.227	0.2	0.4747			18-5611-8800	02-5634-5468	ENVIRON
21		Sep	9	15:00	0.599	-0.428	-1.016	(-)		18-5349-8839	09-1071-5088	ENVIRON

CETIS Summary Report

Reference Toxicant 96-h Acute Survival Test **ENVIRON**

Batch ID:	03-4545-8228	**Test Type:**	Survival	**Analyst:**	
Start Date:	09 Sep-14 15:00	**Protocol:**	PSEP (1995)	**Diluent:**	Laboratory Seawater
Ending Date:	13 Sep-14 15:35	**Species:**	Neanthes arenaceodentata	**Brine:**	Not Applicable
Duration:	4d 1h	**Source:**	Aquatic Toxicology Support	**Age:**	
Sample ID:	05-2504-3734	**Code:**	1F4B8816	**Client:**	Internal Lab
Sample Date:	05 May-14	**Material:**	Total Ammonia	**Project:**	Reference Toxicant
Receive Date:	05 May-14	**Source:**	Reference Toxicant		
Sample Age:	127d 15h	**Station:**	P140505.33		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
19-3535-3112	Proportion Survived	58.3	108	79.35	NA		Fisher Exact/Bonferroni Adj Test

Point Estimate Summary

Analysis ID	Endpoint	Level	mg/L	95% LCL	95% UCL	TU	Method
08-6657-8417	Proportion Survived	EC50	97.87	87.06	110		Spearman-Kärber

Proportion Survived Summary

C-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	3	1	1	1	1	1	0	0	0.0%	0.0%
18.2		3	1	1	1	1	1	0	0	0.0%	0.0%
31.4		3	1	1	1	1	1	0	0	0.0%	0.0%
58.3		3	1	1	1	1	1	0	0	0.0%	0.0%
108		3	0.3	0.05159	0.5484	0.2	0.4	0.05774	0.1	33.33%	70.0%
236		3	0	0	0	0	0	0	0		100.0%

Proportion Survived Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	1	1	1
18.2		1	1	1
31.4		1	1	1
58.3		1	1	1
108		0.3	0.4	0.2
236		0	0	0

Proportion Survived Binomials

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	10/10	10/10	10/10
18.2		10/10	10/10	10/10
31.4		10/10	10/10	10/10
58.3		10/10	10/10	10/10
108		3/10	4/10	2/10
236		0/10	0/10	0/10

CETIS Test Data Worksheet

Reference Toxicant 96-h Acute Survival Test — **ENVIRON**

Start Date:	09 Sep-14 15:00	**Species:**	Neanthes arenaceodentata
End Date:	13 Sep-14 15:35	**Protocol:**	PSEP (1995)
Sample Date:	05 May-14	**Material:**	Total Ammonia
Sample Code:	1F4B8816		
Sample Source:	Reference Toxicant		
Sample Station:	P140505.33		

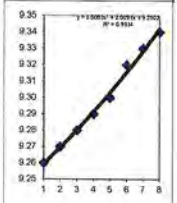
C-mg/L	Code	Rep	Pos	# Exposed	# Survived	Notes
0	D	1	8	10	10	
0	D	2	18	10	10	
0	D	3	11	10	10	
18.2		1	16	10	10	
18.2		2	17	10	10	
18.2		3	3	10	10	
31.4		1	5	10	10	
31.4		2	4	10	10	
31.4		3	10	10	10	
58.3		1	15	10	10	
58.3		2	14	10	10	
58.3		3	13	10	10	
108		1	2	10	3	
108		2	6	10	4	
108		3	7	10	2	
236		1	1	10	0	
236		2	12	10	0	
236		3	9	10	0	

Analyst: JL QA: CR

CLIENT:	Anchor	Date of Test:	09-Sep-14
PROJECT:	Port Gamble	Test Type:	Neanthes ammonia RT
COMMENTS:			

To convert Total Ammonia (mg/L) to Free (un-ionized) Ammonia (mg/L) enter the corresponding total ammonia, salinity, temperature, and pH.

Integer:	I-factor
1	9.26
2	9.27
3	9.28
4	9.29
5	9.30
6	9.32
7	9.33
8	9.34



	Sample	Mod	NH3T (mg/L)	salinity (ppt)	pH	temp (C)	temp (K)	i-factor	Mod	NH3U (mg/L)
	Target / Sample Name		Actual	22.9	8.0	24.1	297.26	9.3053		#VALUE!
	Example 3.5		2.000	10.0	7.5	5.0	278.16	9.2750		0.008
1										
2										
3	15		18.2	31	7.6	19.8	292.96	9.3270		0.231
4	30		31.4	31	7.5	20.0	293.16	9.3270		0.323
5	60		58.3	31	7.5	20.0	293.16	9.3270		0.599
6	120		108	31	7.3	19.8	292.96	9.3270		0.692
7	240		236	31	7.2	19.5	292.66	9.3270		1.177
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
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44										
45										
46										

ENVIRON

96-HOUR REFERENCE TOXICANT TEST WATER QUALITY DATASHEET

CLIENT	PROJECT	SPECIES	ENVIRON LABORATORY		PROTOCOL
Anchor	Port Gamble	*Neanthes arenaceodentata*	Port Gamble		PSEP 1995
ENVIRON JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE:**	**TIME**	**TEST END DATE**	**TIME**
.	B. Gardiner	09Sep14	1500	13Sep14	1535
Test ID	**LOT #:**				
P14 0505.33	3244C535				

WATER QUALITY DATA

DILTIN.WAT.BATCH	TEMP REC#	REFERENCE TOX. MATERIAL	REFERENCE TOXICANT
.		ammonium chloride	ammonia - TAN

TEST CONDITIONS	DO (mg/L)	TEMP(C)	SAL (ppt)	pH	TECHNICIAN
	> 4.6	20 ± 1	30~~28~~ ± 2	7 - 9	

CLIENT/ ENVIRON ID		CONCENTRATION value	CONCENTRATION units	DAY	REP	D.O. meter	D.O. mg/L	TEMP. meter	TEMP. °C	SALINITY meter	SALINITY ppt	pH meter	pH unit	WQ TECH	
Ref.Tox.-ammonia - TAN	Target:	0	mg/L	0	Stock	8	7.1	8	19.4	8	31	8	7.7	HK	9/9/14
	Actual:			4	Rep	8	7.1	8	20.8	8	32	8	8.1	JL	9/13
Ref.Tox.-ammonia - TAN	Target:	15	mg/L	0	Stock	8	7.3	8	19.8	8	31	8	7.6	HK	9/9/14
	Actual:			4	Rep	8	7.1	8	20.8	8	32	8	8.0	JL	9/13
Ref.Tox.-ammonia - TAN	Target:	30	mg/L	0	Stock	8	7.1	8	20.0	8	31	8	7.5	HK	9/9/14
	Actual:			4	Rep	8	7.1	8	20.9	8	33	8	7.9	JL	9/13
Ref.Tox.-ammonia - TAN	Target:	60	mg/L	0	Stock	8	7.1	8	20.0	8	31	8	7.5	HK	9/9/14
	Actual:			4	Rep	8	7.1	8	20.7	8	34	8	7.7	JL	9/13
Ref.Tox.-ammonia - TAN	Target:	120	mg/L	0	Stock	8	7.1	8	19.8	8	31	8	7.3	HK	9/9/14
	Actual:			4	Rep	8	6.8	8	20.8	8	32 ~~33 35~~ ①	8	7.7	JL	9/13
Ref.Tox.-ammonia - TAN	Target:	240	mg/L	0	Stock	8	7.1	8	19.5	8	31	8	7.2	HK	9/9/14
	Actual:			4	Rep										

① DIE JL 9/13/14. 32 ppt

ENVIRON

96-HOUR REFERENCE TOXICANT TEST
OBSERVATION DATASHEET

SPECIES					
Neanthes arenaceodentata					
CLIENT	**PROJECT**	**ENVIRON JOB #**	**PROJECT MANAGER**	**ENVIRON LAB**	**PROTOCOL**
Anchor	Port Gamble	.	B. Gardiner	Port Gamble	PSEP 1995

SURVIVAL & BEHAVIOR DATA

OBSERVATIONS KEY
N = normal
Q = quiescent
D = Discolored
F = Floating on surface

INITIAL # OF ORGANISMS: 10

CLIENT/ ENVIRON ID	CONC. value	CONC. units	REP	INITIAL # if differs	DAY 1 DATE 9/10/14 TECHNICIAN MK #ALIVE	DAY 1 #DEAD	DAY 1 OBS	DAY 2 DATE 9/11/14 TECHNICIAN MK #ALIVE	DAY 2 #DEAD	DAY 2 OBS	DAY 3 DATE 9/12 TECHNICIAN JL #ALIVE	DAY 3 #DEAD	DAY 3 OBS	DAY 4 DATE 9/13 TECHNICIAN JL #ALIVE	DAY 4 #DEAD	DAY 4 OBS
Ref.Tox.- ammonia - TAN	0	mg/L	1		10	Ø	N	10	Ø	N	10	Ø	N	10	Ø	N
			2		10	Ø		10	Ø		10	Ø		10	Ø	
			3		10	Ø		10	Ø		10	Ø		10	Ø	
Ref.Tox.- ammonia - TAN	15	mg/L	1		10	Ø	N	10	Ø	N	10	Ø	N	10	Ø	N
			2		10	Ø		10	Ø		10	Ø		10	Ø	
			3		10	Ø		10	Ø		10	Ø		10	Ø	
Ref.Tox.- ammonia - TAN	30	mg/L	1		10	Ø	N	10	Ø	Q	10	Ø	Q	10	Ø	Q
			2		10	Ø		10	Ø		10	Ø		10	Ø	
			3		10	Ø		10	Ø		10	Ø		10	Ø	
Ref.Tox.- ammonia - TAN	60	mg/L	1		10	Ø	Q	10	Ø	Q	10	Ø	Q	10	Ø	Q
			2		10	Ø		10	Ø		10	Ø		10	Ø	
			3		10	Ø		10	Ø		10	Ø		10	Ø	
Ref.Tox.- ammonia - TAN	120	mg/L	1		10	Ø	Q	10	Ø	Q	10	Ø	Q	3	7	Q
			2		10	Ø		10	Ø		10	Ø		4	6	
			3		10	Ø		10	Ø		10	Ø		2	8	
Ref.Tox.- ammonia - TAN	240	mg/L	1		10	Ø	Q	Ø	10	—						
			2		10	Ø		Ø	10	—						
			3		10	Ø		Ø	10	—						

ENVIRON **Ammonia Reference Toxicant Spiking Worksheet**

Neanthes NH_3 RT

Assumptions in Model
Stock ammonia concentration is 10,000 mg/L = 10 mg/mL

Actual Reading reading from 12300

Test Solutions			Volume of stock to reach desired concentration
Measured Concentration	**Desired Concentration**	**Volume**	
mg/L	mg/L	mL	mL stock to increase
			SALT WATER (mL)
236	**240**	750	**21.951**
108	**120**	750	**10.976**
50.3	**60**	750	**5.488**
31.4	**30**	750	**2.744**
18.2	**15**	750	**1.372**
0.0008	0	750	

APPENDIX A.3.1

Crassostrea gigas

Benthic Larval Bioassay

Laboratory Data Sheets

ENVIRON

LARVAL DEVELOPMENT TEST
WATER QUALITY DATA

CLIENT	PROJECT	SPECIES		ENVIRON LAB / LOCATION	PROTOCOL
Anchor	Port Gamble	*Crassostrea gigas (oyster)*		Port Gamble / Incubator	PSEP (1995)
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE**	**TIME**	**TEST END DATE**	**TIME**
	B. Hester	12Sep14	1605	9.14.14	2015

* Day 3&4 observations needed only if development endpoint not met by day 2

WATER QUALITY DATA

TEST CONDITIONS				DO (mg/L) >5.0		Temp (°C) 20 ± 1		Sal (ppt) 28 ± 1		pH 7.8 ± 0.5		Ammonia NA		Sulfide NA		TECH	DATE
				D.O.		TEMP.		SALINITY		pH		AMMONIA		SULFIDE			
CLIENT/ ENVIRON ID	DAY	Random #	REP	meter	mg/L	meter	°C	meter	ppt	meter	unit	Techn.	mg/L (total)	Techn.	mg/L (Total)		
Control /	0	25	WQ Surr	8	7.7	8	20.0	8	28	8	7.7	MMB	0.062	KB+ MK	0.004	MMB	9/12
Control /	1	↓	WQ Surr	8	7.2	8	20.8	8	29	8	8.1					JL	9/13
Control /	2		WQ Surr	8	7.4	8	20.9	8	29	8	8.0	JL	0.056	JL	0.019	JL	9/14
Control /	3		WQ Surr														
Control /	4	↓	WQ Surr														
CR-11 /	0	8	WQ Surr	8	7.4	8	19.9	8	28	8	7.7	MMB	0.091	KB+ MK	0.003	MMB	9/12
CR-11 /	1	↓	WQ Surr	8	7.4	8	20.9	8	29	8	8.0					JL	9/13
CR-11 /	2		WQ Surr	8	7.3	8	21.0	8	29	8	7.9	JL	0.037	JL	0.017	JL	9/14
CR-11 /	3		WQ Surr														
CR-11 /	4	↓	WQ Surr														

ENVIRON

LARVAL DEVELOPMENT TEST
WATER QUALITY DATA

CLIENT	PROJECT	SPECIES		ENVIRON LAB / LOCATION	PROTOCOL
Anchor	Port Gamble	*Crassostrea gigas (oyster)*		Port Gamble / Incubator	PSEP (1995)
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE**	**TIME**	**TEST END DATE**	**TIME**
	B. Hester	12Sep14			

* Day 3&4 observations needed only if development endpoint not met by day 2

WATER QUALITY DATA

TEST CONDITIONS				DO (mg/L) >5.0		Temp (°C) 20 ± 1		Sal (ppt) 28 ± 1		pH 7.8 ± 0.5		Ammonia NA		Sulfide NA		TECH	DATE
CLIENT/ ENVIRON ID	DAY	Random #	REP	D.O.		TEMP.		SALINITY		pH		AMMONIA		SULFIDE			
				meter	mg/L	meter	°C	meter	ppt	meter	unit	Techn.	mg/L (total)	Techn.	mg/L (Total)		
SMA-1SE /	0	14	WQ Surr	8	7.6	8	19.9	8	28	8	7.8	MMB	0.00	KBR MK	0.044① 0.022	MMB	9/12
SMA-1SE /	1	↓	WQ Surr	8	7.5	8	20.8	8	29	8	8.6					JL	9/13
SMA-1SE /	2	↓	WQ Surr	8	7.3	8	20.9	8	29	8	7.9	JL	0.0036	JL	0.085	JL	9/14
SMA-1SE /	3	↓	WQ Surr														
SMA-1SE /	4	↓	WQ Surr														
SMA-1NW /	0	20	WQ Surr	8	7.5	8	19.9	8	28	8	7.7	MMB	0.0544	KBR MK	0.044	MMB	9/12
SMA-1NW /	1	↓	WQ Surr	8	7.0	8	20.7	8	29	8	8.0					JL	9/13
SMA-1NW /	2	↓	WQ Surr	8	7.3	8	20.9	8	29	8	7.9	JL	0.0109	JL	0.045	JL	9/14
SMA-1NW /	3	↓	WQ Surr														
SMA-1NW /	4	↓	WQ Surr														
SMA-1SB /	0	15	WQ Surr	8	7.6	8	20.1	8	29	8	7.7	MMB	0.0248	KBR MK	0.006	MMB	9/12
SMA-1SB /	1	↓	WQ Surr	8	7.0	8	20.8	8	29	8	8.0					JL	9/13
SMA-1SB /	2	↓	WQ Surr	8	7.3	8	21.0	8	29	8	7.9	JL	0.0129	JL	0.023	JL	9/14
SMA-1SB /	3	↓	WQ Surr														
SMA-1SB /	4	↓	WQ Surr														

① WC. MK. 9/12

ENVIRON

LARVAL DEVELOPMENT TEST
ENDPOINT DATA

CLIENT	PROJECT	JOB NUMBER	SPECIES		
Anchor	Port Gamble		*Crassostrea gigas (oyster)*		
			PROJECT MANAGER: B. Hester	ENVIRON LAB / LOCATION: Port Gamble / Incubator	PROTOCOL: PSEP (1995)

ORGANISM BATCH	TEST START DATE:	TIME	TEST END DATE:	TIME

LARVAL OBSERVATION DATA

CLIENT/ ENVIRON ID	REP	NUMBER NORMAL	NUMBER ABNORMAL	DATE	TECHNICIAN	COMMENTS
STOCKING DENSITY	1	264	38	10/8	BG	
	2	246	36	↓	↓	
	3	277	38			
	4	242	33			
	5	261	44			
Control /	1	168	4			
	2	136	1			
	3	159	4			
	4	245	6			
	5	213	6			
CR-11 /	1	146	3			
	2	177	12			
	3	144	6			
	4	142	4			
	5	161	4			
SMA-1SE /	1	144	3			
	2	126	5			
	3	171	6			
	4	162	3			
	5	141	4			
SMA-1NW	1	157	9			
	2	144	9			
	3	137	2			
	4	141	4			
	5	125	2	↓	↓	

ENVIRON

LARVAL DEVELOPMENT TEST
ENDPOINT DATA

CLIENT	PROJECT	JOB NUMBER	SPECIES		
			Crassostrea gigas (oyster)		
Anchor	Port Gamble		PROJECT MANAGER: B. Hester	ENVIRON LAB / LOCATION: Port Gamble / Incubator	PROTOCOL: PSEP (1995)

ORGANISM BATCH	TEST START DATE:	TIME	TEST END DATE:	TIME

LARVAL OBSERVATION DATA

CLIENT/ ENVIRON ID	REP	NUMBER NORMAL	NUMBER ABNORMAL	DATE	TECHNICIAN	COMMENTS
SMA-SSB	1	135	6	10/8	BG	
	2	102	4	↓	↓	
	3	56	2			
	4	131	3			
	5	135	6	↓	↓	

ENVIRON

LARVAL DEVELOPMENT TEST INITIATION DATA SHEET

CLIENT	PROJECT	JOB NUMBER	PROJECT MANAGER	LABORATORY	PROTOCOL
Anchor	Port Gamble		B. Hester	Port Gamble Incubator	PSEP (1995)

TEST ORGANISM SPAWNING DATA

SPECIES			
Crassostrea gigas (oyster)			
SUPPLIER: ATS			ORGANISM BATCH: ATS 081114
DATE RECEIVED: 8.11.14	TIME RECEIVED: 1400		DATE USED: 8.12.14
SPAWNING METHOD: dess/ feed/ heat shock	INITIAL SPAWNING TIME: 1217		FINAL SPAWNING TIME: 1325
MALES: 3 / FEMALES: 2	SPERM VIABILITY: ✓		EGG CONDITION: fair
BEGIN FERTILIZATION: 1325	END FERTILIZATION: 1600		CONDITION OF EMBRYOS: >90 d.v

SAMPLE STORAGE	4 Degrees Celsius - dark
SEDIMENT TREATMENT	none
TEST CHAMBERS	1 L Mason Jars
EXPOSURE VOLUME	900mL seawater / 18g Sediment
TIME OF SHAKE	1230
TIME OF INITIATION	1605

SPECIAL CONDITIONS

UV LIGHT EXPOSURE (YES/NO)	AERATION FROM TEST INITIATION (YES/NO)
SCREEN TUBE TEST (YES/NO)	**OTHER (EXPLAIN)**
	Resus 9.19.14 1040

EMBRYO DENSITY CALCULATIONS

89 x 100 = 8900 ess/mL

28,000 target / 8900 = 3.1 mL

2800 / 8900 = 0.31 · 40

12 ml ess stock / 28 mL c-H$_2$O

Deliver 0.100 mL

ENVIRON

ORGANISM RECEIPT LOG

Date:	Time:	Batch No.
9/11/14	1300	ENV091114

Organism / Project:	Source:
Oysters/Port Gamble	Field. collected

Address:	Invoice Attached
NA	Yes (No)

Phone:	Contact:
NA	ENVIRON

No. Ordered:	No. Received:	Source Batch:
15	15	Field

Condition of Organisms:	Approximate Size or Age:
Good	Adult
Shipper: ENVIRON courier	**B of L (Tracking No.)** NA
Condition of Container: Good	**Received By:** BH

Container	D.O. (mg/L)	Temp. (°C)	Conductivity or Salinity (Include Units)	pH (Units)	Technician (Initials)
*	—		—	7	BH

Notes: * : received dry

APPENDIX A.3.2

Crassostrea gigas

Benthic Larval Bioassay

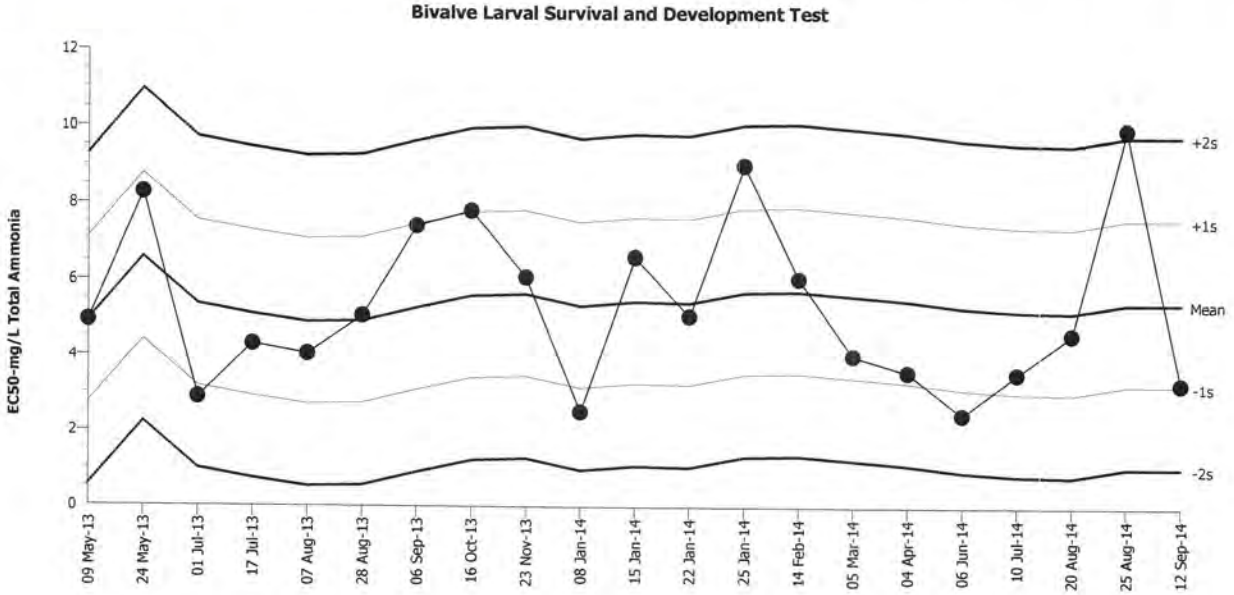
Reference Toxicant Test

CETIS QC Plot

Report Date: 17 Oct-14 14:20 (1 of 1)

Bivalve Larval Survival and Development Test — **All Matching Labs**

Test Type:	Development-Survival	**Organism:**	All Organisms	**Material:**	Total Ammonia
Protocol:	EPA/600/R-95/136 (1995)	**Endpoint:**	Combined Proportion Normal	**Source:**	Reference Toxicant-REF



Mean:	5.417	**Count:**	20	**-1s Warning Limit:**	3.238	**-2s Action Limit:**	1.059
Sigma:	2.179	**CV:**	40.20%	**+1s Warning Limit:**	7.596	**+2s Action Limit:**	9.775

Quality Control Data

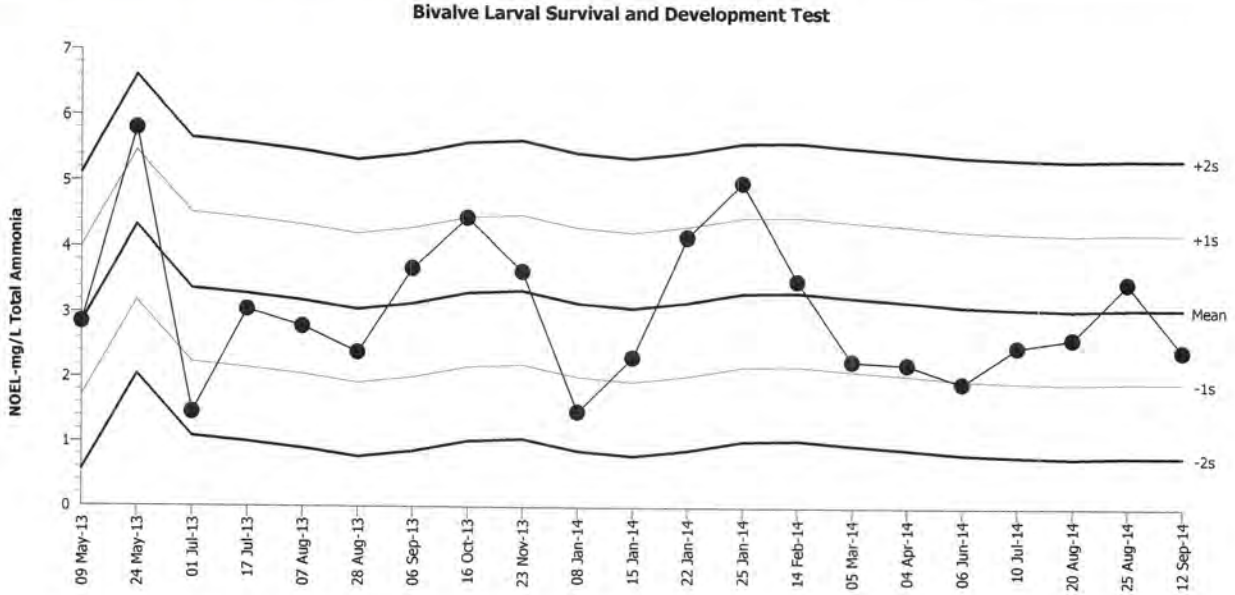
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2013	May	9	17:15	4.927	-0.4903	-0.225			00-6360-9095	16-4147-0802	NewFields
2			24	16:45	8.28	2.863	1.314	(+)		09-2967-0128	19-0159-4289	NewFields
3		Jul	1	19:00	2.895	-2.522	-1.157	(-)		19-5961-2730	13-0986-6895	NewFields
4			17	17:55	4.313	-1.104	-0.5065			18-2536-1347	00-8750-2223	NewFields
5		Aug	7	19:00	4.051	-1.366	-0.627			04-7788-4843	09-8595-7999	NewFields
6			28	16:55	5.063	-0.3543	-0.1626			19-6611-9162	04-7207-2891	NewFields
7		Sep	6	18:55	7.413	1.996	0.916			15-9826-4846	08-5407-1877	NewFields
8		Oct	16	20:15	7.813	2.396	1.099	(+)		06-1596-0976	02-5933-8680	NewFields
9		Nov	23	17:25	6.092	0.6745	0.3095			16-7309-8662	15-4529-5520	NewFields
10	2014	Jan	8	18:22	2.527	-2.89	-1.326	(-)		17-8058-8048	06-8566-9958	NewFields
11			15	18:45	6.625	1.208	0.5542			13-6807-1804	14-8094-6245	NewFields
12			22	18:47	5.072	-0.3449	-0.1583			13-2808-9359	13-2338-2483	NewFields
13			25	20:20	9.018	3.601	1.653	(+)		14-2680-8854	01-2301-1257	NewFields
14		Feb	14	15:45	6.063	0.646	0.2965			00-9581-0604	10-3047-2486	NewFields
15		Mar	5	19:35	4.03	-1.387	-0.6365			00-1473-4954	06-0848-4308	NewFields
16		Apr	4	19:30	3.594	-1.823	-0.8365			00-0374-9463	01-3815-4471	NewFields
17		Jun	6	18:15	2.465	-2.952	-1.355	(-)		06-9491-1560	12-3152-8677	ENVIRON
18		Jul	10	12:12	3.548	-1.869	-0.8575			12-3335-0599	17-2619-8277	ENVIRON
19		Aug	20	18:55	4.595	-0.8217	-0.3771			03-3666-4351	12-9663-9075	ENVIRON
20			25	19:45	9.954	4.537	2.082	(+)	(+)	18-5120-4553	05-8275-9550	ENVIRON
21		Sep	12	16:10	3.285	-2.132	-0.9786			19-9962-6115	06-6660-8764	ENVIRON

CETIS QC Plot

Report Date: 17 Oct-14 14:21 (1 of 1)

Bivalve Larval Survival and Development Test — **All Matching Labs**

Test Type:	Development-Survival	**Organism:**	All Organisms	**Material:**	Total Ammonia
Protocol:	EPA/600/R-95/136 (1995)	**Endpoint:**	Combined Proportion Normal	**Source:**	Reference Toxicant-REF



Mean:	3.078	**Count:**	20	**-1s Warning Limit:**	1.937	**-2s Action Limit:**	0.7962
Sigma:	1.141	**CV:**	37.10%	**+1s Warning Limit:**	4.219	**+2s Action Limit:**	5.36

Quality Control Data

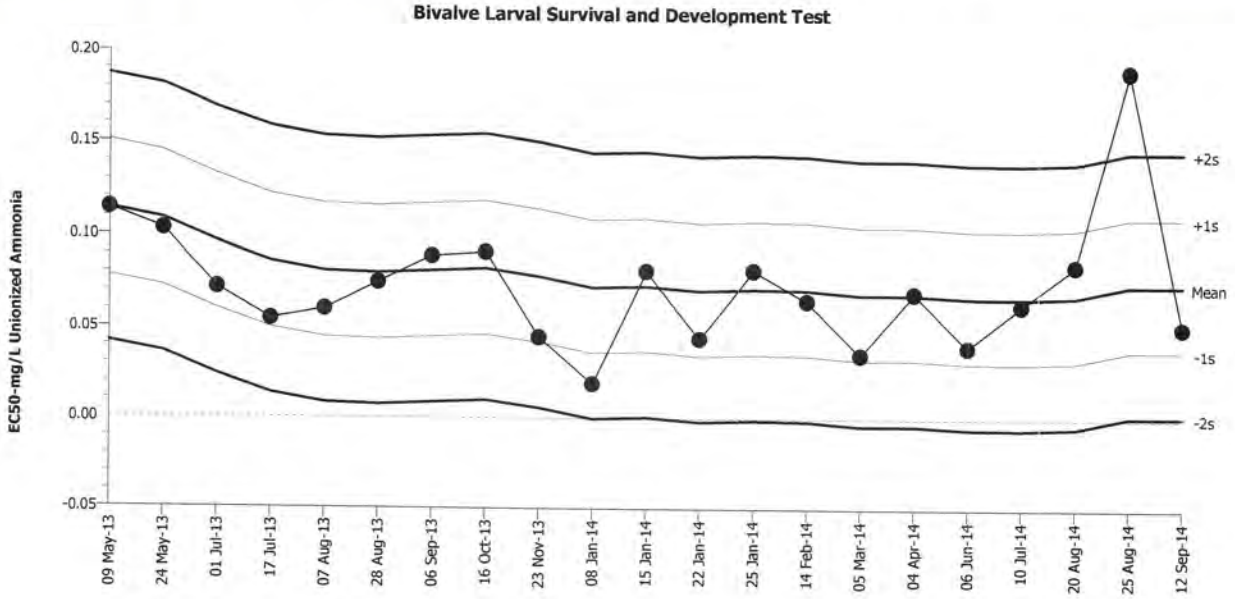
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2013	May	9	17:15	2.85	-0.228	-0.1998			00-6360-9095	00-7540-8630	NewFields
2			24	16:45	5.8	2.722	2.386	(+)	(+)	09-2967-0128	21-4315-6699	NewFields
3		Jul	1	19:00	1.46	-1.618	-1.418	(-)		19-5961-2730	20-9160-8614	NewFields
4			17	17:55	3.05	-0.028	-0.02454			18-2536-1347	04-3468-0815	NewFields
5		Aug	7	19:00	2.79	-0.288	-0.2524			04-7788-4843	18-8631-2521	NewFields
6			28	16:55	2.39	-0.688	-0.603			19-6611-9162	06-3129-4473	NewFields
7		Sep	6	18:55	3.68	0.602	0.5276			15-9826-4846	11-1511-0674	NewFields
8		Oct	16	20:15	4.445	1.367	1.198	(+)		06-1596-0976	11-9282-8356	NewFields
9		Nov	23	17:25	3.64	0.562	0.4926			16-7309-8662	17-7125-0481	NewFields
10	2014	Jan	8	18:22	1.48	-1.598	-1.401	(-)		17-8058-8048	14-0659-1138	NewFields
11			15	18:45	2.32	-0.758	-0.6643			13-6807-1804	20-8888-7287	NewFields
12			22	18:47	4.16	1.082	0.9483			13-2808-9359	09-9457-8825	NewFields
13			25	20:20	4.99	1.912	1.676	(+)		14-2680-8854	19-4144-0794	NewFields
14		Feb	14	15:45	3.5	0.422	0.3699			00-9581-0604	14-2175-7836	NewFields
15		Mar	5	19:35	2.27	-0.808	-0.7082			00-1473-4954	06-9188-5839	NewFields
16		Apr	4	19:30	2.22	-0.858	-0.752			00-0374-9463	13-5593-8276	NewFields
17		Jun	6	18:15	1.93	-1.148	-1.006	(-)		06-9491-1560	15-1591-7876	ENVIRON
18		Jul	10	12:12	2.49	-0.588	-0.5153			12-3335-0599	09-8186-3962	ENVIRON
19		Aug	20	18:55	2.62	-0.458	-0.4014			03-3666-4351	02-5771-3266	ENVIRON
20			25	19:45	3.48	0.402	0.3523			18-5120-4553	02-0328-1110	ENVIRON
21		Sep	12	16:10	2.43	-0.648	-0.5679			19-9962-6115	21-1414-4251	ENVIRON

CETIS QC Plot

Report Date: 17 Oct-14 14:21 (1 of 1)

Bivalve Larval Survival and Development Test — **All Matching Labs**

Test Type:	Development-Survival	**Organism:**	All Organisms	**Material:**	Unionized Ammonia
Protocol:	EPA/600/R-95/136 (1995)	**Endpoint:**	Combined Proportion Normal	**Source:**	Reference Toxicant-REF



Mean:	0.07402	**Count:**	20	**-1s Warning Limit:**	0.03776	**-2s Action Limit:**	0.0015
Sigma:	0.03626	**CV:**	49.00%	**+1s Warning Limit:**	0.1103	**+2s Action Limit:**	0.1465

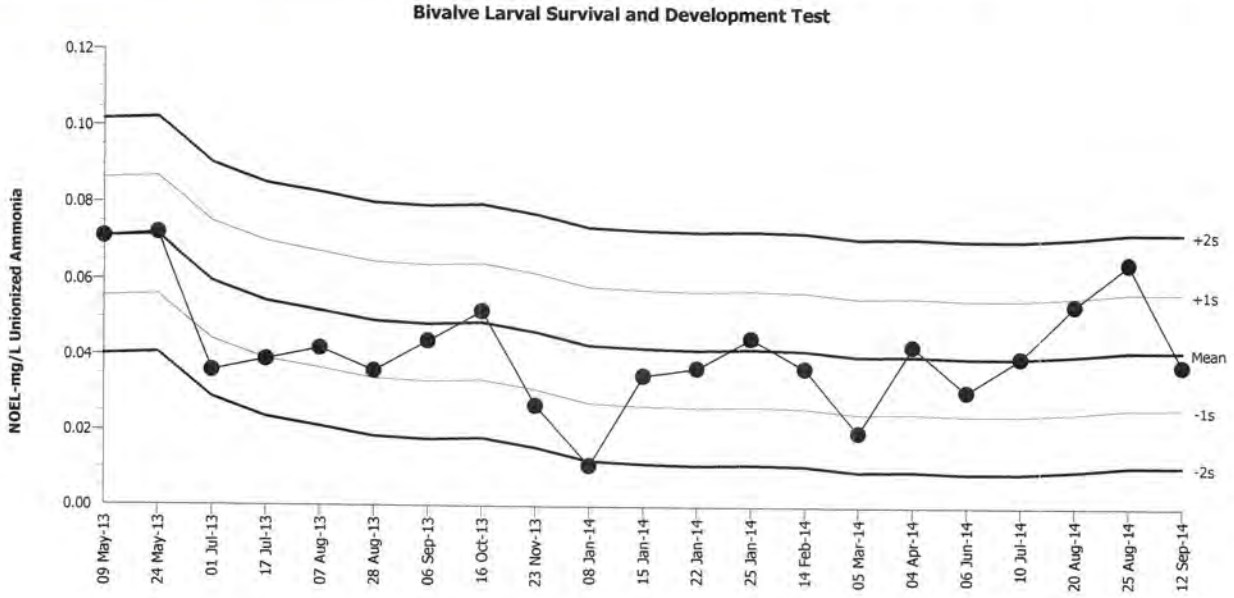
Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2013	May	9	17:15	0.1144	0.04038	1.114	(+)		14-3450-0734	06-3515-6667	NewFields
2			24	16:45	0.1032	0.02923	0.806			12-0363-4074	14-7147-2595	NewFields
3		Jul	1	19:00	0.07187	-0.00215	-0.05925			10-8846-7294	05-7595-2849	NewFields
4			17	17:55	0.0548	-0.01922	-0.5301			10-3414-5102	08-1738-2772	NewFields
5		Aug	7	19:00	0.06027	-0.01375	-0.3792			10-7217-0339	06-7338-0554	NewFields
6			28	16:55	0.07491	0.000885	0.02441			19-6745-0030	16-9398-7287	NewFields
7		Sep	6	18:55	0.08923	0.01521	0.4195			20-4996-9287	13-4360-8251	NewFields
8		Oct	16	20:15	0.0914	0.01738	0.4792			08-6327-9927	19-9515-4386	NewFields
9		Nov	23	17:25	0.04496	-0.02906	-0.8014			13-8738-6674	02-5355-5019	NewFields
10	2014	Jan	8	18:22	0.01919	-0.05483	-1.512	(-)		02-3576-5336	17-1917-6754	NewFields
11			15	18:45	0.0814	0.007378	0.2035			06-9099-5939	00-9901-2590	NewFields
12			22	18:47	0.04434	-0.02968	-0.8186			15-7285-0453	02-5494-3481	NewFields
13			25	20:20	0.08179	0.007765	0.2142			04-0859-3739	09-7301-2928	NewFields
14		Feb	14	15:45	0.0653	-0.00872	-0.2404			15-0233-5150	16-5673-1462	NewFields
15		Mar	5	19:35	0.03552	-0.0385	-1.062	(-)		02-2074-6026	13-5083-6151	NewFields
16		Apr	4	19:30	0.06967	-0.00435	-0.1199			08-9987-7352	06-2075-5011	NewFields
17		Jun	6	18:15	0.03982	-0.0342	-0.9431			20-1079-3686	12-0135-9289	ENVIRON
18		Jul	10	12:12	0.06305	-0.01097	-0.3024			19-8476-3131	14-6960-0330	ENVIRON
19		Aug	20	18:55	0.08475	0.01073	0.2958			14-9751-1227	04-1532-7472	ENVIRON
20			25	19:45	0.1905	0.1165	3.212	(+)	(+)	00-8792-7550	08-9753-5531	ENVIRON
21		Sep	12	16:10	0.05098	-0.02304	-0.6354			16-3861-3900	00-5681-5567	ENVIRON

CETIS QC Plot

Bivalve Larval Survival and Development Test — **All Matching Labs**

Test Type:	Development-Survival	**Organism:**	All Organisms	**Material:**	Unionized Ammonia
Protocol:	EPA/600/R-95/136 (1995)	**Endpoint:**	Combined Proportion Normal	**Source:**	Reference Toxicant-REF



Mean:	0.04185	**Count:**	20	**-1s Warning Limit:**	0.02646	**-2s Action Limit:**	0.01107
Sigma:	0.01539	**CV:**	36.80%	**+1s Warning Limit:**	0.05724	**+2s Action Limit:**	0.07263

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2013	May	9	17:15	0.071	0.02915	1.894	(+)		14-3450-0734	19-5425-3899	NewFields
2			24	16:45	0.072	0.03015	1.959	(+)		12-0363-4074	02-1616-6384	NewFields
3		Jul	1	19:00	0.036	-0.00585	-0.3801			10-8846-7294	11-2659-9719	NewFields
4			17	17:55	0.039	-0.00285	-0.1852			10-3414-5102	05-6701-2859	NewFields
5		Aug	7	19:00	0.042	0.00015	0.009747			10-7217-0339	15-9321-6181	NewFields
6			28	16:55	0.036	-0.00585	-0.3801			19-6745-0030	11-4907-1298	NewFields
7		Sep	6	18:55	0.044	0.00215	0.1397			20-4996-9287	08-7464-1360	NewFields
8		Oct	16	20:15	0.052	0.01015	0.6595			08-6327-9927	20-4743-8794	NewFields
9		Nov	23	17:25	0.027	-0.01485	-0.9649			13-8738-6674	05-6624-9800	NewFields
10	2014	Jan	8	18:22	0.011	-0.03085	-2.005	(-)	(-)	02-3576-5336	15-3876-8049	NewFields
11			15	18:45	0.035	-0.00685	-0.4451			06-9099-5939	01-3042-8920	NewFields
12			22	18:47	0.037	-0.00485	-0.3151			15-7285-0453	12-0010-0113	NewFields
13			25	20:20	0.045	0.00315	0.2047			04-0859-3739	20-3446-9116	NewFields
14		Feb	14	15:45	0.037	-0.00485	-0.3151			15-0233-5150	19-2470-0896	NewFields
15		Mar	5	19:35	0.02	-0.02185	-1.42	(-)		02-2074-6026	10-8335-1484	NewFields
16		Apr	4	19:30	0.043	0.00115	0.07472			08-9987-7352	01-2582-7818	NewFields
17		Jun	6	18:15	0.031	-0.01085	-0.705			20-1079-3686	02-2339-8824	ENVIRON
18		Jul	10	12:12	0.04	-0.00185	-0.1202			19-8476-3131	17-3224-7922	ENVIRON
19		Aug	20	18:55	0.054	0.01215	0.7895			14-9751-1227	13-4768-2245	ENVIRON
20			25	19:45	0.065	0.02315	1.504	(+)		00-8792-7550	14-4895-9621	ENVIRON
21		Sep	12	16:10	0.038	-0.00385	-0.2502			16-3861-3900	01-0658-7152	ENVIRON

Bivalve Larval Survival and Development Test **ENVIRON**

Batch ID:	05-6193-4593	**Test Type:**	Development-Survival	**Analyst:**	
Start Date:	12 Sep-14 16:10	**Protocol:**	EPA/600/R-95/136 (1995)	**Diluent:**	Laboratory Seawater
Ending Date:	14 Sep-14 20:15	**Species:**	Crassostrea gigas	**Brine:**	Not Applicable
Duration:	52h	**Source:**	Taylor Shellfish	**Age:**	
Sample ID:	11-7819-2742	**Code:**	4639CB66	**Client:**	Internal Lab
Sample Date:	05 May-14	**Material:**	Total Ammonia	**Project:**	Reference Toxicant
Receive Date:	05 May-14	**Source:**	Reference Toxicant		
Sample Age:	130d 16h	**Station:**	P140505.34		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
21-1414-4251	Combined Proportion Norm	2.43	4.68	3.372	25.4%		Dunnett Multiple Comparison Test

Point Estimate Summary

Analysis ID	Endpoint	Level	mg/L	95% LCL	95% UCL	TU	Method
06-6660-8764	Combined Proportion Norm	EC50	3.285	3.255	3.315		Trimmed Spearman-Kärber

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
21-1414-4251	Combined Proportion Norm	PMSD	0.2541	NL - 0.25	No	Above Acceptability Criteria

Combined Proportion Normal Summary

C-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	3	0.4208	0.3036	0.5379	0.373	0.4672	0.02722	0.04715	11.2%	0.0%
0.502		3	0.3798	0.1881	0.5714	0.291	0.4303	0.04454	0.07715	20.31%	9.74%
1.07		3	0.3798	0.3047	0.4548	0.3566	0.4139	0.01744	0.03021	7.95%	9.74%
2.43		3	0.388	0.2338	0.5422	0.3443	0.459	0.03583	0.06206	16.0%	7.79%
4.68		3	0.008197	0	0.02583	0.004098	0.01639	0.004098	0.007099	86.6%	98.05%
12.8		3	0	0	0	0	0	0	0		100.0%

Combined Proportion Normal Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	0.373	0.4672	0.4221
0.502		0.291	0.4303	0.418
1.07		0.3566	0.3689	0.4139
2.43		0.459	0.3607	0.3443
4.68		0.01639	0.004098	0.004098
12.8		0	0	0

Combined Proportion Normal Binomials

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	91/244	114/244	103/244
0.502		71/244	105/244	102/244
1.07		87/244	90/244	101/244
2.43		112/244	88/244	84/244
4.68		4/244	1/244	1/244
12.8		0/244	0/244	0/244

ENVIRON

LARVAL DEVELOPMENT TEST
AMMONIA REF TOX WQ

CLIENT	PROJECT	SPECIES	ENVIRON LAB / LOCATION		PROTOCOL
Anchor	Port Gamble	*Crassostrea gigas (oyster)*	Port Gamble / Incubator		PSEP (1995)
JOB NUMBER	PROJECT MANAGER	QUANTITY OF TOXICANT:	QUANTITY OF DILUENT:		INIT
	B. Hester	ACTUAL:	ACTUAL:		
TEST ID	LOT #:	TEST START DATE:	TIME	TEST END DATE	TIME
P140505.34	3244C535	12Sep14	1610	9/14/14	2015

WATER QUALITY DATA

DILTIN.WAT.BATCH	ORGANISM BATCH	REFERENCE TOX. MATERIAL	REFERENCE TOXXICANT
FSW091214.01		Ammonium chloride	Ammonia

TEST CONDITIONS					DO (mg/L)		TEMP(C)		SAL (ppt)		pH		TECH.	DATE
					>5.0		~~20~~ ~~18~~ ± 1		28 ± 1		7.8 ± 0.5			
CLIENT/ ENVIRON ID	CONCENTRATION value	CONCENTRATION units	DAY	REP	D.O. meter	D.O. mg/L	TEMP. meter	TEMP. °C	SALINITY meter	SALINITY ppt	pH meter	pH unit		
Ref.Tox.-Ammonia	Target: 0	mg/L	0	Stock	8	7.4	8	19.3	8	28	8	7.7	MMB	9/12
			1	Stock	8	7.5	8	19.9	8	28	8	7.9	JL	9/13
	Actual: WC, MMB ~~0.502~~ 0.00		2	Stock	8	7.5	8	20.0	8	28	8	7.9	JL	9/14
			3	Stock										
			4	Stock										
Ref.Tox.-Ammonia	Target: 0.75	mg/L	0	Stock	8	7.5	8	19.1	8	28	8	7.7	MMB	9/12
			1	Stock	8	7.5	8	19.9	8	28	8	7.9	JL	9/13
	Actual: 0.502		2	Stock	8	7.6	8	19.9	8	28	8	7.9	JL	9/14
			3	Stock										
			4	Stock										
Ref.Tox.-Ammonia	Target: 1.5	mg/L	0	Stock	8	7.5	8	19.1	8	28	8	7.7	MMB	9/12
			1	Stock	8	7.6	8	19.7	8	28	8	7.9	JL	9/13
	Actual: 1.07		2	Stock	8	7.7	8	19.7	8	28	8	8.0	JL	9/14
			3	Stock										
			4	Stock										
Ref.Tox.-Ammonia	Target: 3	mg/L	0	Stock	8	7.5	8	19.1	8	28	8	7.7	MMB	9/12
			1	Stock	8	7.6	8	19.9	8	28	8	7.9	JL	9/13
	Actual: 2.43		2	Stock	8	7.7	8	19.9	8	28	8	8.0	JL	9/14
			3	Stock										
			4	Stock										
Ref.Tox.-Ammonia	Target: 6	mg/L	0	Stock	8	7.5	8	19.0	8	28	8	7.7	MMB	9/12
			1	Stock	8	7.5	8	19.9	8	28	8	7.9	JL	9/13
	Actual: 4.68		2	Stock	8	7.6	8	20.0	8	28	8	7.9	JL	9/14
			3	Stock										
			4	Stock										
Ref.Tox.-Ammonia	Target: 12	mg/L	0	Stock	8	7.5	8	19.1	8	28	8	7.7	MMB	9/12
			1	Stock	8	7.5	8	20.0	8	28	8	7.9	JL	9/13
	Actual: 12.8		2	Stock	8	7.6	8	20.0	8	28	8	7.9	JL	9/14
			3	Stock										
			4	Stock										
Ref.Tox.-Ammonia	Target: 18	mg/L	0	Stock	8	7.5	8	19.0	8	28	8	7.6	MMB	9/12
			1	Stock	8	7.5	8	20.0	8	28	8	7.9	JL	9/13
	Actual: 16.8		2	Stock	8	7.7	8	20.0	8	28	8	7.9	JL	9/14
			3	Stock										
			4	Stock										

ENVIRON

LARVAL DEVELOPMENT TEST
AMMONIA REF TOX OBSERVATION SHEET

SPECIES					
Crassostrea gigas (oyster)					
CLIENT	**PROJECT**	**JOB NUMBER**	**PROJECT MANAGER**	**ENVIRON LAB / LOCATION**	**PROTOCOL**
Anchor	Port Gamble	.	B. Hester	Port Gamble / Incubator	PSEP (1995)

TEST ID	ORGANISM BATCH	TEST START DATE:	TIME	TEST END DATE:	TIME
P140505.34	ENV091114	9/12/14	1610	9/14/14	2015

LARVAL OBSERVATION DATA

CLIENT/ ENVIRON ID	CONC. value	CONC. units	VIAL NUMBER	REP	NUMBER NORMAL	NUMBER ABNORMAL	DATE	TECHNICIAN	COMMENTS
Ref.Tox. - Ammonia	0	mg/L		1	91	13	10/15	CR	
				2	114	23	↓	↓	
				3	103	12			
Ref.Tox. - Ammonia	0.75	mg/L		1	71	7			
				2	105	12			
				3	102	4			
Ref.Tox. - Ammonia	1.5	mg/L		1	87	10			
				2	90	6			
				3	101	17			
Ref.Tox. - Ammonia	3	mg/L		1	112	26			
				2	88	20			
				3	84	14			
Ref.Tox. - Ammonia	6	mg/L		1	4	81			
				2	1	96			
				3	1	82			
Ref.Tox. - Ammonia	12	mg/L		1	0	16			
				2	0	20			
				3	0	4	↓	↓	
Ref.Tox. - Ammonia	18	mg/L		1					
				2					
				3					

STOCKING DENSITY		1		225	10/15	CR		$\bar{X}$ = 244
		2		280	↓	↓		
		3		228	↓	↓		

ENVIRON **Ammonia Reference Toxicant Spiking Worksheet**

Biv NH_3 RT

Assumptions in Model
Stock ammonia concentration is 9,000 mg/L = 9 mg/mL

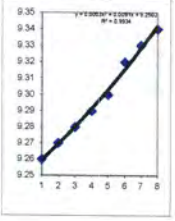
Actual Reading
6770

Test Solutions			Volume of stock to reach desired concentration	
Measured Concentration	**Desired Concentration**	**Volume**		
mg/L	mg/L	mL	mL stock to increase	
0.00	0.00	250	[redacted]	SALT WATER
0.502	**0.75**	250		**0.042**
1.07	**1.5**	250		**0.083**
2.43	**3**	250		**0.166**
4.68	**6**	250		**0.332**
~~9.31~~ 12.8	**12**	250		**0.665**
16.8	**18**	250		**0.997**

CLIENT:	Anchor	Date of Test:	15-Sep-14
PROJECT:	Port Gamble DMMP	Test Type:	Larval ammonia RT
COMMENTS:			

To convert Total Ammonia (mg/L) to Free (un-ionized) Ammonia (mg/L) enter the corresponding total ammonia, salinity, temperature, and pH.

Integer: I-factor	
1	9.26
2	9.27
3	9.28
4	9.29
5	9.30
6	9.32
7	9.33
8	9.34



	Sample	Mod	NH3T (mg/L)	salinity (ppt)	pH	temp (C)	temp (K)	i-factor	Mod	NH3U (mg/L)
	Target / Sample Name		Actual	22.9	8.0	24.1	297.26	9.3053		#VALUE!
	Example 3.5		2.000	10.0	7.5	5.0	278.16	9.2750		0.008
1										
2										
3	0.75		0.502	28	7.7	19.1	292.26	9.3187		0.008
4	1.5		1.07	28	7.7	19.1	292.26	9.3187		0.017
5	3		2.43	28	7.7	19.1	292.26	9.3187		0.038
6	6		4.68	28	7.7	19.0	292.16	9.3187		0.072
7	12		12.8	28	7.7	19.1	292.26	9.3187		0.198
8										
9										
10										
11										
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APPENDIX B

STATISTICAL COMPARISONS

Project Name:	Port Gamble DMMP Eohs			
Sample:	x1		Ref Samp:	x2
Samp ID:	SMA-1NW		Ref ID:	CR-11
Alias:			Alias:	
Replicates:	5		Replicates:	5
Mean:	93		Mean:	98
SD:	2.739		SD:	2.739
Tr Mean:	74.873		Tr Mean:	99.587
Trans SD:	3.02		Trans SD:	20.546

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	9.529
SS:	1725.112
K:	5
b:	38.47
Alpha Level:	0.05
Calculated Value:	0.8579
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	2.647
Test Residual SD:	0.604
Ref. Residual Mean:	18.006
Ref. Residual SD:	4.109
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	8.2689
Critical Value:	>= 1.860
Variances Homogeneous:	No

Test Results:

Statistic:	Approximate t
Balanced Design:	Yes
Transformation:	ArcSin
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	4
Experimental Alpha Level:	0.05
Calculated Value:	2.6609
Critical Value:	>= 2.132
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	95	77.079	100	114.592	2.206	15.005			-22.508
2	90	71.565	95	77.079	3.308	22.508			-22.508
3	95	77.079	95	77.079	2.206	22.508			-3.308
4	95	77.079	100	114.592	2.206	15.005			-3.308
5	90	71.565	100	114.592	3.308	15.005			2.206
6									2.206
7									2.206
8									15.005
9									15.005
10									15.005

Project Name:	Port Gamble DMMP Eohs				
Sample:	x1		Ref Samp:	x2	
Samp ID:	SMA-1SB		Ref ID:	CR-11	
Alias:			Alias:		
Replicates:		5	Replicates:		5
Mean:		97	Mean:		98
SD:		2.739	SD:		2.739
Tr Mean:	N/A		Tr Mean:	N/A	
Trans SD:	N/A		Trans SD:	N/A	

Shapiro-Wilk Results:

Residual Mean:		0	
Residual SD:		13.332	
SS:		3377.255	
K:		5	
b:		51.944	
Alpha Level:		0.05	
Calculated Value:		0.7989	
Critical Value:	<= 0.842		
Normally Distributed:	No		
Override Option:	Not Invoked		

Levene's Results:

Test Residual Mean:		18.006	
Test Residual SD:		4.109	
Ref. Residual Mean:		18.006	
Ref. Residual SD:		4.109	
Deg. of Freedom:		8	
Alpha Level:		0.1	
Calculated Value:		0	
Critical Value:	>= 1.860		
Variances Homogeneous:	Yes		

Test Results:

Statistic:	Mann-Whitney
Balanced Design:	Yes
Transformation:	rank-order
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1:	5
Mann-Whitney N2:	5
Degrees of Freedom:	
Experimental Alpha Level:	0.05
Calculated Value:	15
Critical Value:	>= 21.000
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	95	3	100	8	15.005	15.005	3		-22.508
2	95	3	95	3	15.005	22.508	3		-22.508
3	95	3	95	3	15.005	22.508	3		-15.005
4	100	8	100	8	22.508	15.005	3		-15.005
5	100	8	100	8	22.508	15.005	3		-15.005
6							8		15.005
7							8		15.005
8							8		15.005
9							8		22.508
10							8		22.508

Project Name:	Port Gamble DMMP Eohs			
Sample:	x1		Ref Samp:	x2
Samp ID:	SMA-1SE		Ref ID:	CR-11
Alias:			Alias:	
Replicates:	5		Replicates:	5
Mean:	93		Mean:	98
SD:	9.747		SD:	2.739
Tr Mean:	N/A		Tr Mean:	N/A
Trans SD:	N/A		Trans SD:	N/A

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	15.574
SS:	4608.49
K:	5
b:	58.581
Alpha Level:	0.05
Calculated Value:	0.7446
Critical Value:	<= 0.842
Normally Distributed:	No
Override Option:	Not Invoked

Levene's Results:

Test Residual Mean:	23.648
Test Residual SD:	5.56
Ref. Residual Mean:	18.006
Ref. Residual SD:	4.109
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.8249
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Mann-Whitney
Balanced Design:	Yes
Transformation:	rank-order
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1:	5
Mann-Whitney N2:	5
Degrees of Freedom:	
Experimental Alpha Level:	0.05
Calculated Value:	14.5
Critical Value:	>= 21.000
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	80	1	100	7.5	-31.45	15.005	1		-31.45
2	85	2	95	3.5	27.671	22.508	2		-27.671
3	100	7.5	95	3.5	19.707	22.508	3.5		-22.508
4	100	7.5	100	7.5	19.707	15.005	3.5		-22.508
5	100	7.5	100	7.5	19.707	15.005	7.5		15.005
6							7.5		15.005
7							7.5		15.005
8							7.5		19.707
9							7.5		19.707
10							7.5		19.707

Project Name: Port Gamble DMMP Neanthes Dry Wt.

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-1NW	Ref ID:	CR-11
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	0.708	Mean:	0.641
SD:	0.125	SD:	0.064
Tr Mean:	0.708	Tr Mean:	0.641
Trans SD:	0.125	Trans SD:	0.064

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.064
SS:	0.079
K:	5
b:	0.277
Alpha Level:	0.05
Calculated Value:	0.9715
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.088
Test Residual SD:	0.077
Ref. Residual Mean:	0.052
Ref. Residual SD:	0.027
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.973
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-1.0639
Critical Value:	>= 1.860
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.868	0.868	0.606	0.606	0.16	0.035			-0.183
2	0.671	0.671	0.615	0.615	0.037	0.026			-0.07
3	0.732	0.732	0.571	0.571	0.024	0.07			-0.037
4	0.743	0.743	0.682	0.682	0.035	0.041			-0.035
5	0.525	0.525	0.731	0.731	0.183	0.09			-0.026
6									0.024
7									0.035
8									0.041
9									0.09
10									0.16

Project Name: Port Gamble DMMP Neanthes Dry Wt.

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-1SB	Ref ID:	CR-11
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	0.678	Mean:	0.641
SD:	0.089	SD:	0.064
Tr Mean:	0.678	Tr Mean:	0.641
Trans SD:	0.089	Trans SD:	0.064

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.05
SS:	0.048
K:	5
b:	0.214
Alpha Level:	0.05
Calculated Value:	0.945
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.061
Test Residual SD:	0.058
Ref. Residual Mean:	0.052
Ref. Residual SD:	0.027
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.29
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-0.7492
Critical Value:	>= 1.860
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.528	0.528	0.606	0.606	0.15	0.035			-0.15
2	0.676	0.676	0.615	0.615	0.002	0.026			-0.07
3	0.696	0.696	0.571	0.571	0.018	0.07			-0.035
4	0.746	0.746	0.682	0.682	0.068	0.041			-0.026
5	0.743	0.743	0.731	0.731	0.065	0.09			-0.002
6									0.018
7									0.041
8									0.065
9									0.068
10									0.09

Project Name: Port Gamble DMMP Neanthes Dry Wt.

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-1SE	Ref ID:	CR-11
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	0.657	Mean:	0.641
SD:	0.094	SD:	0.064
Tr Mean:	0.657	Tr Mean:	0.641
Trans SD:	0.094	Trans SD:	0.064

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.052
SS:	0.052
K:	5
b:	0.212
Alpha Level:	0.05
Calculated Value:	0.8594
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.068
Test Residual SD:	0.056
Ref. Residual Mean:	0.052
Ref. Residual SD:	0.027
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.5711
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-0.3093
Critical Value:	>= 1.860
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.6	0.6	0.606	0.606	0.057	0.035			-0.07
2	0.609	0.609	0.615	0.615	0.048	0.026			-0.066
3	0.817	0.817	0.571	0.571	0.16	0.07			-0.057
4	0.591	0.591	0.682	0.682	0.066	0.041			-0.048
5	0.667	0.667	0.731	0.731	0.01	0.09			-0.035
6									-0.026
7									0.01
8									0.041
9									0.09
10									0.16

Project Name: Port Gamble DMMP Neanthes AFDW

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-1NW	Ref ID:	CR-11
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	0.445	Mean:	0.375
SD:	0.063	SD:	0.036
Tr Mean:	0.445	Tr Mean:	0.375
Trans SD:	0.063	Trans SD:	0.036

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.033
SS:	0.021
K:	5
b:	0.141
Alpha Level:	0.05
Calculated Value:	0.9437
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.048
Test Residual SD:	0.033
Ref. Residual Mean:	0.025
Ref. Residual SD:	0.022
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.2467
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-2.1593
Critical Value:	>= 1.860
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.504	0.504	0.375	0.375	0.059	0			-0.101
2	0.426	0.426	0.36	0.36	0.019	0.015			-0.049
3	0.47	0.47	0.326	0.326	0.025	0.049			-0.019
4	0.479	0.479	0.388	0.388	0.034	0.013			-0.015
5	0.344	0.344	0.424	0.424	0.101	0.049			0
6									0.013
7									0.025
8									0.034
9									0.049
10									0.059

Project Name: Port Gamble DMMP Neanthes AFDW

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-1SB	Ref ID:	CR-11
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	0.418	Mean:	0.375
SD:	0.029	SD:	0.036
Tr Mean:	0.418	Tr Mean:	0.375
Trans SD:	0.029	Trans SD:	0.036

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.021
SS:	0.009
K:	5
b:	0.091
Alpha Level:	0.05
Calculated Value:	0.9719
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.021
Test Residual SD:	0.017
Ref. Residual Mean:	0.025
Ref. Residual SD:	0.022
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.3212
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-2.1171
Critical Value:	>= 1.860
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.377	0.377	0.375	0.375	0.041	0			-0.049
2	0.414	0.414	0.36	0.36	0.004	0.015			-0.041
3	0.436	0.436	0.326	0.326	0.018	0.049			-0.015
4	0.411	0.411	0.388	0.388	0.007	0.013			-0.007
5	0.454	0.454	0.424	0.424	0.036	0.049			-0.004
6									0
7									0.013
8									0.018
9									0.036
10									0.049

Project Name: Port Gamble DMMP Neanthes AFDW

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-1SE	Ref ID:	CR-11
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	0.417	Mean:	0.375
SD:	0.022	SD:	0.036
Tr Mean:	0.417	Tr Mean:	0.375
Trans SD:	0.022	Trans SD:	0.036

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.019
SS:	0.007
K:	5
b:	0.084
Alpha Level:	0.05
Calculated Value:	0.9902
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.017
Test Residual SD:	0.012
Ref. Residual Mean:	0.025
Ref. Residual SD:	0.022
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.7447
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	No Transformation
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-2.2191
Critical Value:	>= 1.860
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.431	0.431	0.375	0.375	0.014	0			-0.049
2	0.419	0.419	0.36	0.36	0.002	0.015			-0.032
3	0.442	0.442	0.326	0.326	0.025	0.049			-0.015
4	0.385	0.385	0.388	0.388	0.032	0.013			-0.011
5	0.406	0.406	0.424	0.424	0.011	0.049			0
6									0.002
7									0.013
8									0.014
9									0.025
10									0.049

Project Name: Port Gamble DMMP Larval

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-1NW	Ref ID:	CR-11
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	76.44	Mean:	83.62
SD:	6.264	SD:	8.071
Tr Mean:	61.127	Tr Mean:	66.866
Trans SD:	4.308	Trans SD:	7.258

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	3.873
SS:	284.939
K:	5
b:	15.999
Alpha Level:	0.05
Calculated Value:	0.8983
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	2.914
Test Residual SD:	2.818
Ref. Residual Mean:	5.634
Ref. Residual SD:	3.605
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.3293
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	ArcSin
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	1.5205
Critical Value:	>= 1.397
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	85.2	67.374	79.3	62.937	6.247	3.93			-5.639
2	78.2	62.166	96.1	78.61	1.039	11.744			-5.456
3	74.4	59.605	78.2	62.166	1.523	4.7			-4.7
4	76.5	61.003	77.1	61.41	0.125	5.456			-3.93
5	67.9	55.489	87.4	69.209	5.639	2.342			-1.523
6									-0.125
7									1.039
8									2.342
9									6.247
10									11.744

Project Name:	Port Gamble DMMP Larval			
Sample:	x1		Ref Samp:	x2
Samp ID:	SMA-1SB		Ref ID:	CR-11
Alias:			Alias:	
Replicates:	5		Replicates:	5
Mean:	60.7		Mean:	83.62
SD:	18.519		SD:	8.071
Tr Mean:	51.363		Tr Mean:	66.866
Trans SD:	10.975		Trans SD:	7.258

Shapiro-Wilk Results:

Residual Mean:	0	Alpha Level:	0.05
Residual SD:	6.037	Calculated Value:	0.9284
SS:	692.511	Critical Value:	<= 0.842
K:	5		
b:	25.357		
Normally Distributed:	Yes		
Override Option:	N/A		

Levene's Results:

Test Residual Mean:	8.466	Alpha Level:	0.1
Test Residual SD:	5.555	Calculated Value:	0.9563
Ref. Residual Mean:	5.634	Critical Value:	>= 1.860
Ref. Residual SD:	3.605		
Deg. of Freedom:	8		
Variances Homogeneous:	Yes		

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	ArcSin
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	2.6347
Critical Value:	>= 1.397
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	73.3	58.887	79.3	62.937	7.524	3.93			-17.903
2	55.4	48.1	96.1	78.61	3.263	11.744			-5.456
3	30.4	33.46	78.2	62.166	17.903	4.7			-4.7
4	71.1	57.48	77.1	61.41	6.117	5.456			-3.93
5	73.3	58.887	87.4	69.209	7.524	2.342			-3.263
6									2.342
7									6.117
8									7.524
9									7.524
10									11.744

Project Name: Port Gamble DMMP Larval

Sample:	x1	Ref Samp:	x2
Samp ID:	SMA-1SE	Ref ID:	CR-11
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	80.76	Mean:	83.62
SD:	9.662	SD:	8.071
Tr Mean:	64.609	Tr Mean:	66.866
Trans SD:	7.392	Trans SD:	7.258

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	4.753
SS:	429.249
K:	5
b:	19.725
Alpha Level:	0.05
Calculated Value:	0.9064
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	5.945
Test Residual SD:	3.235
Ref. Residual Mean:	5.634
Ref. Residual SD:	3.605
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.1432
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	ArcSin
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	0.4873
Critical Value:	>= 1.397
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	78.2	62.166	79.3	62.937	2.442	3.93			-8.813
2	68.4	55.796	96.1	78.61	8.813	11.744			-5.456
3	92.8	74.435	78.2	62.166	9.826	4.7			-4.7
4	87.9	69.644	77.1	61.41	5.035	5.456			-3.93
5	76.5	61.003	87.4	69.209	3.606	2.342			-3.606
6									-2.442
7									2.342
8									5.035
9									9.826
10									11.744

APPENDIX C

CHAIN-OF-CUSTODY FORMS

CHAIN OF CUSTODY

ENVIRON

Shipping: 4770 NE View Dr. Mailing: P.O. Box 2
Port Gamble, WA. 983
Tel: (360) 297-6(Fax: (360)297-69

Destination Lab:	Sample Originator (Organization): Anchor QEA	Report Results To:	Phone:
Destination Contact:	Person who collected Sample: Delany Peterson	Contact Name:	Fax:
Date: 7/25/2014	Address:	Address:	Email:
Turn-Around-Time:			
Project Name: Port Gamble	Phone:	Analyses:	Invoicing To:
Contract/PO:	Fax:		Comments or Special Instructions:
	E-mail		

No.	Sample ID	Matrix	Volume & Type of Container	Date & Time	Hold	Preservation	Sample Temp Upon Receipt	LAB ID
1	PG-PDI-SC-21-12-14-20140725	SED		7/25/2014, 1030				
2	-14-16			1035				
3	-16-18			1040				
4	-18-20			1045				
5	-20-22			1050				
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

7/25/14 DP

Relinquished by:	Recieved by:	Relinquished by:	Recieved by:	Matrix Codes
Print Name: D Peterson	Print Name: Brian Hester	Print Name:	Print Name:	FW = Fresh Water
Signature:	Signature:	Signature:	Signature:	WW = Waste Water
Affiliation: AQ	Affiliation: ENVIRON	Affiliation:	Affiliation:	SB = Salt & Brackish Water
Date/Time: 7/25/14 1248	Date/Time: 7.25.14 1248	Date/Time:	Date/Time:	SS = Soil & Sediment

CHAIN OF CUSTODY

ENVIRON

Shipping: 4770 NE View Dr. Mailing: P.O. Box 21
Port Gamble, WA. 9836
Tel: (360) 297-60[illegible] Fax: (360)297-690

Destination Lab:	Sample Originator (Organization): Anchor QEA	Report Results To:	Phone:
Destination Contact:	Person who collected Sample: Delaney Peterson	Contact Name:	Fax:
Date: 7/25/2014	Address:	Address:	Email:
Turn-Around-Time:			
Project Name: Port Gamble	Phone:	Analyses:	Invoicing To:
	Fax:		Comments or Special Instructions:
Contract/PO:	E-mail		

No.	Sample ID	Matrix	Volume & Type of Container	Date & Time	Hold	Preservation	Sample Temp Upon Receipt	LAB ID
1	PG-PDI-SC-15-0-2-20140724	SED		7/24/2014 1000	X			
2	2-4			1005				
3	4-6			1010				
4	6-8.4			1015				
5	PG-PDI-SC-07-0-2-20140724			1515				
6	2-4			1520				
7	4-6			1525				
8	6-8			1530				
9	8-10			1535				
10	10-12			1540				
11	12-14			1545				
12	PG-PDI-SC-20-02-20140724			1640				
13	2-4			1645				
14	4-6			1650				
15	PG-PDI-SC-21-0-2-20140725			7/25/2014 1000				
16	-2-4-20140725			1005				
17	-4-6			1010				
18	-6-8			1015				
19	-8-10			1020				
20	-10-12			1025				

Relinquished by:	Recieved by:	Relinquished by:	Recieved by:
Print Name: D. Peterson	Print Name: Brian Heste	Print Name:	Print Name:
Signature:	Signature:	Signature:	Signature:
Affiliation: Anchor QEA	Affiliation: ENVIRON	Affiliation:	Affiliation:
Date/Time: 7/25/14 1248	Date/Time: 7.25.14 1249	Date/Time:	Date/Time:

Matrix Codes

FW = Fresh Water
WW = Waste Water
SB = Salt & Brackish Water
SS = Soil & Sediment

CHAIN OF CUSTODY

ENVIRON

Shipping: 4770 NE View Dr. Mailing: P.O. Box 21
Port mble, WA. 9836
Tel: (360) 297-604 ax: (360)297-690

Destination Lab:	Sample Originator (Organization): Anchor QEA	Report Results To: Anchor QEA	Phone: (206) 287-9130
Destination Contact:	Person who collected Sample: Delaney Peterson	Contact Name: Cindy Fields	Fax:
Date:	Address:	Address:	Email: cfields@anchorqea.com
Turn-Around-Time:			
Project Name: Port Gamble	Phone:	Analyses:	Invoicing To:
Contract/PO:	Fax:		Comments or Special Instructions:
	E-mail		

No.	Sample ID	Matrix	Volume & Type of Container	Date & Time	Hold	Preservation	Sample Temp Upon Receipt	LAB ID
1	PG-PDI-SC-10-0-4-20140723	SED		7/23/2014 10:30	X			
2	4-6-20140723			10:35				
3	6-8-20140723			10:40				
4	8-10-20140723			10:45				
5	PG-PDI-SC-11-0-2-20140723			11:40				
6	2-4-20140723			11:45				
7	4-6-20140723			11:50				
8	6-8-20140723			11:55				
9	8-10-20140723			12:00				
10	PG-PDI-SC-12-0-2-20140723			13:30				
11	2-4			13:35				
12	4-6			13:40				
13	6-10*			13:45				
14	0-11.5			13:50				
15	PG-PDI-SC-13-0-2-20140723			15:00				
16	2-4			15:05				
17	4-6			15:10				
18	6-8			15:15				
19	8-10			15:20				
20	PG-PDI-SC-13-8-10-20140723			15:25				

Relinquished by:	Recieved by:	Relinquished by:	Recieved by:	Matrix Codes
Print Name: Amy Thatcher	Print Name: Jay Ward	Print Name:	Print Name:	
Signature: Amy Thatcher	Signature: Jay Ward	Signature:	Signature:	FW = Fresh Water
Affiliation: Anchor QEA	Affiliation: ENVIRON	Affiliation:	Affiliation:	WW = Waste Water
Date/Time: 7/24/2014 09:45	Date/Time: 7/24/14 0945	Date/Time:	Date/Time:	SB = Salt & Brackish Water
				SS = Soil & Sediment

CHAIN OF CUSTODY

ENVIRON

Shipping: 4770 NE View Dr. Mailing: P.O. Box 2
Port Gamble, WA. 983
Tel: (360) 297-6(Fax: (360)297-69

Destination Lab:	Sample Originator (Organization): Anchor QEA	Report Results To: Anchor QEA	Phone: (206)287-1130
Destination Contact:	Person who collected Sample: Delaney Peterson	Contact Name: Cindy Fields	Fax:
Date:	Address:	Address:	Email: cfields@anchorqea.com
Turn-Around-Time:			
Project Name: Port Gamble	Phone:		
Contract/PO:	Fax:		
	E-mail		

No.	Sample ID	Matrix	Volume & Type of Container	Date & Time	Analyses: Hold	Preservation	Sample Temp Upon Receipt	LAB ID
1	PG-PDI-SC-12-11.5-12-20140723	SED		7/23/2014 13:55	X			
2	PG-PDI-SC-14-0-2-20140723			16:00				
3	2-4			16:05				
4	4-6			16:10				
5	6-8			16:15				
6	8-10			16:20				
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Invoicing To:

Comments or Special Instructions:

Relinquished by:	Recieved by:	Relinquished by:	Recieved by:
Print Name: Amy Thatcher	Print Name: Jay Ward	Print Name:	Print Name:
Signature: Amy Thatcher	Signature: Jay Ward	Signature:	Signature:
Affiliation: Anchor QEA	Affiliation: ENVIRON	Affiliation:	Affiliation:
Date/Time: 7/24/2014 09:45	Date/Time: 7/24/14 0945	Date/Time:	Date/Time:

Matrix Codes

FW = Fresh Water
WW = Waste Water
SB = Salt & Brackish Water
SS = Soil & Sediment

CHAIN OF CUSTODY

ENVIRON

Shipping: 4770 NE View Dr. Mailing: P.O. Box 21
Port ıble, WA. 9836
Tel: (360) 297-6045, ax: (360)297-690

Destination Lab:	Sample Originator (Organization):	Report Results To: Anchor QEA	Phone: ~~(360)~~ (206) 903-3385
Destination Contact:	Person who collected Sample: DP/AT/VA	Contact Name: Nathan Soccorsy	Fax:
Date:	Address:	Address:	Email: nsoccorsy@anchorqea.com
Turn-Around-Time:			
Project Name:	Phone:		
	Fax:		
Contract/PO:	E-mail		

Analyses: ~~Biodiesel~~ Hold

Invoicing To:

Comments or Special Instructions:

No.	Sample ID	Matrix	Volume & Type of Container	Date & Time	Hold	Preservation	Sample Temp Upon Receipt	LAB ID
1	PG-PDI-SC-06-0-4-20140722	SED	1 Ziploc bag; 1	7/22/2014; 1200	X	Cool		
2	-4-6-20140722			; 1210	X			
3	-6-8-20140722			; 1215	X			
4	-8-10-20140722			; 1220	X			
5	-10-14-20140722			; 1225	X			
6	-14-18-20140722			; 1230	X			
7	-18-20-20140722			; 1205	X			
8	PG-PDI-SC-08-0-2-20140722			; 14:00	X			
9	2-4-20140722			; 14:05	X			
10	4-7-20140722			; 14:10	X			
11	7-9-20140722			; 14:15	X			
12	9-11-20140722			; 1420	X			
13	11-13-20140722			; 1425	X			
14	PG-PDI-SC-09-0-2-20140722			; 1645	X			
15	2-4-20140722			; 1650	X			
16	4-6-20140722			; 1655	X			
17	6-8-20140722			; 1700	X			
18	8-9.5-20140722			; 1705	X			
19	PG-PDI-SC-05-0.2-20140722			; 1800	X			
20	2-4			; 1805	X			

Relinquished by:	Recieved by:	Relinquished by:	Recieved by:	Matrix Codes
Print Name: Delaney Peterson	Print Name: Hillary Eichler	Print Name:	Print Name:	
Signature:	Signature:	Signature:	Signature:	FW = Fresh Water
Affiliation: Anchor QEA	Affiliation: Environ	Affiliation:	Affiliation:	WW = Waste Water
Date/Time: 7/23/14 1068	Date/Time: 7/23/14 1008	Date/Time:	Date/Time:	SB = Salt & Brackish Water
				SS = Soil & Sediment

CHAIN OF CUSTODY

ENVIRON

Shipping: 4770 NE View Dr. Mailing: P.O. Box 21
Port Townsend, WA. 9836
Tel: (360) 297-6040 Fax: (360)297-6909

Destination Lab:	Sample Originator (Organization):	Report Results To: Anchor QEA	Phone: 206.903.3385
Destination Contact:	Person who collected Sample: DP/AT/JA	Contact Name: Nathan Soccorsy	Fax:
Date:	Address:	Address:	Email: nSoccorsy@anchorqea.com
Turn-Around-Time:			
Project Name:	Phone:		
	Fax:		
Contract/PO:	E-mail		

No.	Sample ID	Matrix	Volume & Type of Container	Date & Time	Analyses: Hold	Preservation	Sample Temp Upon Receipt	LAB ID
1	PE-PDI-SC-05-4-6-20140722	SED	Ziploc	7/22/14 1810	X			
2	-6-8			1815	X			
3	-8-10			1820	X			
4	-10-12			1825	X			
5	-12-14			1830	X			
6	-14-16			1835	X			
7	-16-18.5			1840	X			
8	-18.5-20			1845	X			
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

7/23/14 DP

Invoicing To:

Comments or Special Instructions:

Relinquished by:	Recieved by:	Relinquished by:	Recieved by:
Print Name: Delaney Peterson	Print Name: Hillary Eichler	Print Name:	Print Name:
Signature:	Signature:	Signature:	Signature:
Affiliation: Anchor QEA	Affiliation: ENVIRON	Affiliation:	Affiliation:
Date/Time: 7/23/14 1008	Date/Time: 7/23/14 1008	Date/Time:	Date/Time:

Matrix Codes

FW = Fresh Water
WW = Waste Water
SB = Salt & Brackish Water
SS = Soil & Sediment

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number:	Turn-around Requested:
ARI Client Company: Anchor QEA	Phone: 206.287.9130
Client Contact: Nathan Soccorsy	
Client Project Name: Port Gamble	
Client Project #: 130388-01.01	Samplers: JA, AT, DP

Page: 1 of 3
Date: 7/22/14 Ice Present? Y
No. of Coolers: 2 Cooler Temps: 3.6, 3.7

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)
www.arilabs.com

Sample ID	~~Date~~	Date / Time	Matrix	No. Containers	Analysis Requested: PAH	Notes/Comments
PG-PDI-SC-01-0-2-2014	0721	7/21/14 1245	SED	1	X	
-2-4		7/21/14 1248			X	
-4-6		7/21/14 1250			X	
-6-8		7/21/14 1253			X	
-8-9		7/21/14 1255			X	
PG-PDI-SC-02-0-2-2014	0721R	7/21/14 1430			X	
-2-4		7/21/14 1432			X	
-4-6		7/21/14 1435			X	
-6-8		7/21/14 1438			X	
-8-10		7/21/14 1450			X	

Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: D Peterson	Printed Name: H. Eichler	Printed Name:	Printed Name:
	Company: AQ	Company: Environ	Company:	Company:
	Date & Time: 7/22/14 1015	Date & Time: 7/22/14 1015	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number:	Turn-around Requested:
ARI Client Company: Anchor QEA	Phone:
Client Contact:	
Client Project Name: Port Gamble	
Client Project #:	Samplers:

Page: 2 of 3	
Date:	Ice Present?
No. of Coolers:	Cooler Temps:

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)
www.arilabs.com

Sample ID	~~Date~~ Date	Time	Matrix	No. Containers	Analysis Requested: Hold	Notes/Comments
PG-PDI-SC-02-10-11-14	0721R	7/24/14 1452	SED	1	X	
PG-PDI-SC-03-0-4-20	140721	1455			X	
-4-7		1458			X	
-7-9		1522			X	
-9-11		1500			X	
-11-13		1505			X	
PG-PDI-SC-04-0-2-20140	721	1715			X	
-2-4		1718			X	
-4-6		1725			X	
-6-8		1730			X	

Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: D. Peterson	Printed Name: H. Eichler	Printed Name:	Printed Name:
	Company: AQ	Company: Environ	Company:	Company:
	Date & Time: 7/22/14 1015	Date & Time: 7/22/14 1015	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number:	Turn-around Requested:	Page: 3 of 3	
ARI Client Company: Anchor QEA	Phone:	Date:	Ice Present?
Client Contact:		No. of Coolers:	Cooler Temps:
Client Project Name: Port Gamble			
Client Project #:	Samplers:		

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)
www.arilabs.com

Sample ID	~~Date~~	Date/Time	Matrix	No. Containers	Analysis Requested: Hg	Notes/Comments
PG-PDI-SC-02-2-4-2014	0721	7/21/14 1605	SED	1	X	
-0-2		1800			X	
-4-6		1610			X	
-6-8		1615			X	
-8-10.3		1620			X	
-10.3-12		1625			X	
					7/22/14 DP	

Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: D. Peterson	Printed Name: H. Eichler	Printed Name:	Printed Name:
	Company: AQ	Company: Environ	Company:	Company:
	Date & Time: 7/22/14 1015	Date & Time: 7/22/14 1015	Date & Time:	Date & Time:

CHAIN OF CUSTODY

ENVIRON

1027

Shipping: 4770 NE View Dr. Mailing: P.O. Box 216
Port Gamble, WA. 98364
Tel: (360) 297-6045, Fax: (360)297-6901

Destination: ENVIRON	Sample Originator (Organization): ENVIRON	Report Results To: Anchor QEA	Phone:
Destination Contact: B. Gardiner	PERSON WHO COLLECTED SAMPLE: C. Ray	Contact Name:	Fax:
Date: 8/17/14	Address:	Address:	Email:
Turn-Around-Time: NA	Phone:		
Project Name: Port Gamble DMMP	Fax:		
Contract/PO:	E-mail		

No.	Sample ID	Matrix	Volume & Type of Container	Date & Time	Analyses: Reference Sediment	Preservation	Sample Temp Upon Receipt	LAB ID
1	CR 23W	SS	5 gallon bag	8/17/14, 1110	X	4·C		
2	CR·11	↓	↓	↓ 1149	X	4·C		
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Invoicing To:

Comments or Special Instructions:

Relinquished by:	Recieved by:	Relinquished by:	Recieved by:
Print Name: Collin Ray	Print Name: Mary Bacon	Print Name:	Print Name:
Signature:	Signature: MBacon	Signature:	Signature:
Affiliation: ENVIRON	Affiliation: ENVIRON	Affiliation:	Affiliation:
Date/Time: 8/17/14 1330	Date/Time: 8/17/14 1330	Date/Time:	Date/Time:

Matrix Codes

FW = Fresh Water

SB = Salt & Brackish Water

SS = Soil & Sediment

Version 1.0, Effective 7/1/14

PAGE ___ of ___

ENVIRON

Field Cruise Log

Project / Program: Carr Inlet Reference **Survey Number:** NA

Vessel: _____ **Sampling Type:** Ponar

Date: 8/17/14 **Start Time:** 0800 **End Time:** 1230

Cruise Director: Collin Ray **Boat Captain:** Michael Blanton

Crew: _____

Weather:

Time:	Wind:	Sky:	Sea State:
0830	Calm	Clear	<1 ft.

Problems: CARR02 was reported to be 3.4% fines but when collected was much different.

Comments / Other Observations: CARR02 should be removed from our list of sites to collect material or flagged to warn of incorrect % fines measurements

ENVIRON

STATION COORDINATE LOG

Project: CARR INLET Recorder: Collin Ray

DATE	TIME	STATION	DROP NO.	LATITUDE	LONGITUDE	DEPTH ~~(m)~~ ft	RECOVERY DEPTH (cm)	COMMENTS
8/17	0845	CARR02	1	47.33329	122.68340	98	10	incorrect grain size
	0913	CARR	1	47.33303	122.67604	52	10	52% fines
	0926	↓	2	↓	↓	↓	↓	
	0929		3					
	0934		4					
	0938		5					
	0952	CR23W	1	47.33321	122.67502	53	10	54% fines - too fine - moved best shoreward
	1000		1	47.33308	122.67478	35	10	51% fines - moved shoreward
	1042		1	47.33288	122.67545	20	10	29% fines
	1057		2					
	1100		3					
	1105		4					
	1108		5					
	1110		6					
	1128	CR11	1	47.29193	122.68414	8	7	~5% fines
	1140		2				NA	washout - discarded material
	1141		3				7	
	1142		4				7	
	1144		5				7	
	1145		6				NA	washout - discarded material
	1147		7				7	
	1149	↓	8	↓	↓	↓	7	

Ammonia and Sulfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
ANCHOR / Port Gamble	NA, Bulk	NA

PRETEST / INITIAL / FINAL / OTHER (circle one) DAY of TEST: NA

OVERLYING (OV) / POREWATER (PW) (circle one)

Comments: Bulk

Calibration Standards Temperature		Sample temperature should be within ±1°C of standards temperature at time and date of analysis.
Date: 9/06/14	Temperature: 20.5°C	

Sample ID or Description	Conc. or Rep	Date of Sampling and Initials	Ammonia Value (mg/L)	Temp °C	Date of Reading and Initials	Sample Preserved (Y/N)	pH	Sal (ppt)	Sulf. mg/L
OV B	Surv.	9/06/14 HE	0.257	20.0	9/06/14 JC/HE	N	8.0	28	0.013
ISE			0.00				8.0	28	0.023
INW			0.154				8.0	28	0.081
PW B			1.55	21.3			7.4	29	0.112
ISE			0.333				7.4	29	0.260
INW			0.999				7.2	31	0.163

Wet-Sieve Procedure for Determining Percent Fines (<63 µm) of Sediment

DATE: 9/5/11	CLIENT: Anchor	PROJECT: Port Gamble

Procedure:

1. Collect 50 mL of sediment to be analyzed
2. Transfer sediment to a #230 (63 µm) testing sieve
3. Rinse sieve thoroughly with a stream of water until water flowing through the sieve is clear
4. Transfer all retained material to a 100mL graduated cylinder using a small funnel and DI squirt bottle
5. Allow sediment to settle. Record the volume of sediment retained below.

SAMPLE ID:	INITIAL VOLUME OF SEDIMENT (mL)	VOLUME OF SEDIMENT RETAINED (mL)	(INIT VOL - VOL RETAINED) * 2	Estimated Percent Fines	
SMA-1SE	50 mL	50	(50 - 50)*2 =	0%	DK
SMA-1NE	50mL	50	(50 - 50)*2 =	0%	DK
SMA-1 surf.B	50mL	47	(50-47) *2 =	6%	
			=		
			=		
			=		
			=		
			=		
			=		
			=		
			=		
			=		
			=		
			=		
			=		
			=		
			=		
			=		
			=		
			=		
			=		
			=		
			=		
			=		
			=		
			=		

① A good portion of the sample is woody debris 9/5/14 DK

ATTACHMENT A-3-5
BIOASSAY RECOVERY REPORT

SEDIMENT TESTING FOR PORT GAMBLE BAY MONITORING

OCTOBER 1, 2014

PREPARED FOR:

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PREPARED BY:

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Introduction

ENVIRON conducted biological toxicity tests with sediment samples collected from Port Gamble Bay in support an ongoing sediment monitoring program. Reference sediment samples were tested concurrent to the test sediments and were collected in Carr Inlet by ENVIRON. Biological testing was conducted on selected stations using the 48-h benthic larval test with the bivalve *Mytilus galloprovincialis* following the resuspension protocol. This report presents the results of the toxicity testing conducted on test and reference sediments.

Methods

Methods for sediment collection, storage and handling, and toxicity testing followed those outlined in the "*Sampling and Analysis Plan Port Gamble Data Gaps Investigation*" (Anchor 2014). Biological test methods followed guidance provided by the Puget Sound Estuary Program (PSEP 1995) with appropriate modifications as developed in support of the Sediment Management Standards Program (SMS), the WDOE Sediment Sampling and Analysis Plan Appendix (SSAPA; Ecology 2008), and the various updates presented during the Annual Sediment Management Review meetings (SMARM). The SMS Program is administered by the Department of Ecology, providing sediment management standards for marine and estuarine environments in the state of Washington with the goal of reducing or eliminating adverse effects on biological resources.

Sample and Animal Receipt

Seven test sediments were collected on August 11, 2014; samples were delivered by courier to ENVIRON. Two reference sediment samples were collected from Carr Inlet by ENVIRON personnel on August 17, 2014. Sediment samples were stored in the dark with zero headspace in a walk-in cold room at 4 ± 2°C. All of the test sediments were tested using the PSEP benthic larval tests. The test sediment was not sieved prior to testing and all tests were conducted within the eight week holding time.

Mytilus galloprovincialis (mussel) broodstock were received from Taylor Shellfish of Shelton, Washington. Broodstock were held in unfiltered seawater at 16°C prior to spawning.

Sample Grain Size and Reference Comparison

Sediment grain size is one of the characteristics used in selecting the appropriate reference sediment(s) to compare with the biological results of the test treatments. The percent fines value is defined as the mass of sediment that passes through a 62.5-µm sieve, expressed as a percentage of the mass of the total sample analyzed. Percent fines for each of the test treatments and the reference treatments are presented in Table 1.

Table 1. Sample and Reference Grain Size Comparison

Treatment	Grain Size[1]	Reference Comparison
CARR	52.0	
CR-11	3.0	
BW-11	65.5	CARR
BW-12	43.5	CARR
BW-15	61.0	CARR
BW-16	55.5	CARR
BW-18	58.0	CARR
BW-19	56.0	CARR
PGSS-29	7.5	CR-11

[1] Percent fines (∑ silt and clay)

Larval Developmental Bioassay

Test sediment was evaluated using the larval benthic toxicity test with the mussel, *M. galloprovincialis*. The mussel larval test was initiated on August 20, 2014. The seawater control and each of the reference sediments were tested concurrently with the test treatments. To prepare the test exposures, 18 g (±0.5 g) of test sediment was placed in clean, acid and solvent-rinsed 1-L glass jars, which were then filled with 900 mL with 0.45-µm filtered seawater. Six replicate chambers were prepared for each test treatment, reference sediment, and control treatment. Five of the replicates were used to evaluate the test; the sixth replicate was used as a water quality surrogate. Each chamber was shaken for 10 seconds and then placed in predetermined randomly-assigned positions in a water bath at 20°C.

To collect gametes for each test, mussels were placed in clean seawater and acclimated at 15°C for approximately 20 minutes. The water bath temperature was then increased over a period of 15 minutes to 20°C. Spawning females and males were removed from the water bath and placed in individual containers with seawater. These individuals were allowed to spawn until sufficient gametes were available to initiate the test. After the spawning period, eggs were transferred to fresh seawater and filtered through a 0.5 mm Nitex® mesh screen to remove large debris, feces, and excess gonadal matter. A composite was made of the sperm and diluted with fresh seawater. The fertilization process was initiated by adding sperm to the isolated egg containers. Egg-sperm solutions were periodically homogenized with a perforated plunger during the fertilization process and sub-samples observed under the microscope for egg and sperm viability. Approximately one to one and a half hours after fertilization, embryo solutions were checked for fertilization rate. Only those embryo stocks with >90% fertilization were used to initiate the tests. Embryo solutions were rinsed free of excess sperm and then combined to create one embryo stock solution. Density of the embryo stock solution was determined by counting the number of embryos in a subsample of homogenized stock solution. This was used to determine the volume of embryo stock solution to deliver approximately 27,000 embryos to each test chamber.

Dissolved oxygen, temperature, pH, and salinity were monitored in water quality surrogate chambers to prevent loss or transfer of larvae by adhesion to water-quality probes. Ammonia and sulfides in the overlying water were measured at initiation and termination. Total ammonia as nitrogen was monitored using an Orion meter fitted with an ammonia ion-specific probe. Total sulfides as S^{-2} were monitored using a HACH DR/2800V Spectrophotometer.

Target test parameters were as follows:

Dissolved Oxygen:	≥5.0 mg/L
pH:	7 - 9 units
Temperature:	16 ± 1°C
Salinity:	28 ± 1‰

The development test was conducted as a static test. No aeration was provided during the larval test.

The larval test was conducted following the resuspension technique developed by USACE and Ecology to address the potential entrainment of larvae in very fine sediments or sediments with a high wood-debris component (Kendall et al. 2012). At approximately 40 hours, the controls were checked for development to verify that greater than 90% of the larvae present had developed into the normal D-cell stage. The test sediment was then resuspended in the test chamber by gentle mixing with a perforated plunger for approximately 10 seconds. The contents of the test jar were then allowed to settle. At 48 hours, the tests were terminated by decanting the overlying seawater into a clean 1-L jar. The supernatant was homogenized with a perforated plunger. From this container, a 10 mL subsample was transferred to a scintillation vial and preserved in 5% buffered formalin. Larvae were subsequently stained with a dilute solution of Rose Bengal in 70% alcohol to help visualization of larvae. The number of normal and abnormal larvae was enumerated on an inverted microscope. Normal larvae included all D-shaped prodissoconch I stage larvae. Abnormal larvae included abnormally shaped prodissoconch I larvae and all early stage larvae.

A water-only reference-toxicant test was conducted concurrently with the sediment tests using ammonium chloride. The ammonium chloride reference-toxicant test was used to ensure animals used in the test were healthy and of similar sensitivity to prior tests. This test also provided information on the sensitivity of the test population to ammonia concentrations in the test sediments.

Data Analysis and QA/QC

All water quality and endpoint data were entered into Excel spreadsheets. Water quality parameters were summarized by calculating the mean, minimum, and maximum values for each test treatment. Endpoint data were calculated for each replicate and the mean values and standard deviations were determined for each test treatment. All hand-entered data was reviewed for data entry errors, which were corrected prior to summary calculations. A minimum of 10% of all calculations and data sorting were reviewed for errors.

For the larval test, normal survivorship was used to evaluate the test sediments. Control performance was based on the number of normal larvae in the control divided by the stocking density, expressed as a percentage. Normal survivorship in the test and reference treatments was defined as the number of normal larvae in the test or reference divided by the number of normal larvae in the control, expressed as a percentage, as defined in Ecology (2005).

For SMS suitability determinations, comparisons were made according to SSAPA and Fox et al. (1998). Data reported as proportion normal survival was transformed using an arcsine square root transformation prior to statistical analysis. All data were tested for normality using the Wilk-Shapiro test and equality of variance using Levene's test. A comparison of the larval endpoint relative to the reference was made using an alpha level of 0.10. For samples failing to meet assumptions of normality, a Mann-Whitney test was conducted to determine significance. For those samples failing to meet the assumptions of normality and equality of variance, a t-test on rankits was used.

Results

The results of sediment testing, including a summary of test results and water quality observations are presented in this section. Laboratory bench sheets are provided in Appendix A, statistical analyses are provided in Appendix B, and chain of custody forms are in Appendix C.

Larval Development Bioassay

The larval development test with *M. galloprovincialis* was validated by 98.2% combined normal survivorship, defined as the mean number of normal larvae within the control divided by the stocking density. This value was within the SMS acceptability criteria of ≥70%. A summary of the test results for all samples is shown in Table 2. Summaries of water quality measurements, ammonia and sulfide concentrations, and test conditions are presented in Tables 3, 4, and 5.

Mean control-normalized normal survival in the reference treatments (CARR and CR-11) was 82.4% and 81.6% respectively; both met the reference performance standard of >65% mean control-normalized normal survival. Mean control-normalized survival in test treatments ranged from 59.8% to 83.6%. The test mean chamber stocking density (measured at test initiation) was 36.6 embryos/mL.

A reference-toxicant test (positive control) was performed on the batch of test organisms utilized for this study. The LC50 value (4.60 mg/L total ammonia) was within control chart limits (1.29 mg/L – 9.61 mg/L total ammonia). This indicates that the test organisms used in this study were of similar sensitivity to those previously tested at ENVIRON.

All water quality parameters were within the acceptable limits throughout the duration of the test. Total sulfide concentrations in the test and reference treatments ranged from 0.02 – 0.23 mg/L at test initiation and ranged from 0.02 – 0.07 mg/L at test termination (Table 5). Ammonia concentrations observed in the *M. galloprovincialis* test were below the NOEC value derived from the concurrent ammonia reference-toxicant test (compare to NOEC of 3.2 mg/L for mean observed at ENVIRON). This indicates that ammonia concentrations within the sediment samples were below effects levels and should not have been a contributor to adverse biological effects observed in the test treatments.

Table 2. Test Results for *Mytilus galloprovincialis* Test

Treatment	Replicate	Number Normal	Number Abnormal	Mean Number Normal	Normal Survivorship (%)[1, 2]	Mean Normal Survivorship (%)	SD
Control	1	376	6	366.6	100	98.2	2.7
	2	372	9		100		
	3	344	6		94		
	4	386	23		100		
	5	355	11		97		
CARR	1	312	5	302.2	85.1	82.4	4.3
	2	311	6		84.8		
	3	278	3		75.8		
	4	316	8		86.2		
	5	294	5		80.2		
CR-11	1	294	6	299.0	80.2	81.6	3.3
	2	304	3		82.9		
	3	316	5		86.2		
	4	284	2		77.5		
	5	297	4		81.0		
BW-11	1	292	8	238.0	79.7	64.9	10.9
	2	195	5		53.2		
	3	217	13		59.2		
	4	219	5		59.7		
	5	267	7		72.8		
BW-12	1	242	2	256.8	66.0	70.0	8.3
	2	225	5		61.4		
	3	268	9		73.1		
	4	292	7		79.7		
	5	237	13		64.6		
BW-15	1	215	5	219.2	58.6	59.8	5.4
	2	200	2		54.6		
	3	235	8		64.1		
	4	226	6		61.6		
	5	220	6		60.0		
BW-16	1	230	3	230.6	62.7	62.9	0.2
	2	230	3		62.7		
	3	230	8		62.7		
	4	231	6		63.0		
	5	232	1		63.3		
BW-18	1	250	16	257.2	68.2	70.2	6.1
	2	267	7		72.8		
	3	264	14		72.0		
	4	223	11		60.8		
	5	282	7		76.9		

[1] Control normality normalized to stocking density (366).
[2] Reference and treatment normal survivorship are normalized to the mean number of normal larvae in the Control (366.6).

Table 2. Continued.

Treatment	Replicate	Number Normal	Number Abnormal	Mean Number Normal	Normal Survivorship (%)[1, 2]	Mean Normal Survivorship (%)	SD
BW-19	1	278	4	264.2	75.8	72.1	3.8
	2	261	18		71.2		
	3	244	24		66.6		
	4	261	15		71.2		
	5	277	4		75.6		
PGSS-29	1	300	15	306.4	81.8	83.6	2.0
	2	307	8		83.7		
	3	318	19		86.7		
	4	306	13		83.5		
	5	301	9		82.1		

Table 3. Water Quality Summary for *Mytilus galloprovincialis* Test

Treatment	Dissolved Oxygen (mg/L)			Temperature (°C)			Salinity (ppt)			pH (units)		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Control	7.7	7.6	7.8	16.6	16.3	17.2	28	28	28	7.8	7.7	7.9
CARR20	7.2	6.8	7.7	16.8	16.5	17.0	28	28	28	7.8	7.6	7.9
CR-02	6.9	5.8	7.8	16.9	16.6	17.2	28	28	28	7.8	7.6	7.9
BW-11	7.0	6.3	7.5	16.3	16.2	16.5	28	28	28	7.7	7.4	7.8
BW-12	7.1	6.6	7.8	16.6	16.4	17.0	28	28	28	7.7	7.5	7.9
BW-15	7.2	6.9	7.7	16.7	16.5	16.9	28	28	28	7.7	7.5	7.9
BW-16	7.2	7.0	7.5	16.6	16.4	16.7	28	28	28	7.7	7.5	7.9
BW-18	7.2	7.0	7.5	16.5	16.4	16.6	28	28	28	7.7	7.5	7.8
BW-19	6.9	5.8	7.6	16.4	16.2	16.6	28	28	28	7.7	7.5	7.8
PGSS-29	7.2	6.9	7.7	16.5	16.3	16.8	28	28	28	7.7	7.5	7.9

Table 4. Ammonia and Sulfide Summary for *Mytilus galloprovincialis* Test

Treatment	Overlying Ammonia (mg/L Total)		Overlying Sulfides (mg/L)	
	Initial	Final	Initial	Final
Control	0.000	0.060	0.000	0.019
CARR	0.000	0.051	0.087	0.041
CR-11	0.000	0.043	0.018	0.023
BW-11	0.000	0.039	0.191	0.071
BW-12	0.000	0.041	0.131	0.054
BW-15	0.000	0.071	0.200	0.070
BW-16	0.000	0.067	0.229	0.066
BW-18	0.000	0.060	0.193	0.062
BW-19	0.000	0.058	0.232	0.062
PGSS-29	0.000	0.061	0.128	0.025

NOEC for ammonia = 3.2 mg/L total ammonia, laboratory mean

Table 5. Test Condition Summary for *Mytilus galloprovincialis* Test

Test Conditions: PSEP *M. galloprovincialis* (SMS)		
Sample Identification	Control; References CARR, CR-11; BW-11, 12, 15, 16, 18, 19, and PGSS-29	
Date sampled	Reference Sediment: August 17, 2014 Test Sediment: August 11, 2014	
Date received at ENVIRON	August 11, 2014	
Test dates	August 20-22, 2014	
Sample storage conditions	4°C, dark	
Holding time Recommended: < 8 weeks (56 days)	9 days	
Test Species	***M. galloprovincialis***	
Supplier	Taylor Shellfish, Shelton, WA	
Date acquired	August 20, 2014	
Acclimation/holding time (broodstock)	1 day	
Age class	<2-h old embryos	
Test Procedures	PSEP 1995 with SMARM revisions	
Regulatory Program	SMS	
Test location	ENVIRON Port Gamble Laboratory	
Test type/duration	48-60 Hour static test	
Control water	North Hood Canal sea water, 0.45µm filtered	
Test dissolved oxygen	Recommended: >5.0 mg/L	Achieved: 5.8 -7.8 mg/L
Test temperature	Recommended: 16 ± 1 °C	Achieved: 16.2 – 17.2 °C
Test Salinity	Recommended: 28 ± 1 ppt	Achieved: 28 ppt
Test pH	Recommended: 7 - 9	Achieved: 7.4 – 7.9
Stocking Density	Recommended: 20 – 40 embryos/mL	Achieved: 36.6 embryos/mL
Control performance standard	Recommended: Control normal survival ≥70%	Achieved: 98.2%; Pass
Reference performance standard	Recommended: Reference normal survival ≥65%	Achieved: CARR: 84.1%; Pass CR-11: 81.6% Pass
Reference Toxicant LC_{50} (total ammonia)	LC_{50} = 4.60 mg $NH_3 + NH_4^+$/L	
Mean; Acceptable Range (total ammonia)	5.45; 1.29 – 9.61 mg $NH_3 + NH_4^+$/L	
NOEC (total ammonia)	3.2 mg $NH_3 + NH_4^+$/L	
NOEC (unionized ammonia)	0.043 mg NH_3/L	
Test Lighting	14hr Light / 10hr Dark	
Test chamber	1-Liter Glass Chamber	
Replicates/treatment	5 + 1 surrogate (used for WQ measurements)	
Exposure volume	18 g sediment/ 900 mL water	
Feeding	None	
Water renewal	None	
Deviations from Test Protocol	None	

Discussion

Sediments were evaluated based on criteria specified in the Sediment Management Standards (SMS). The biological criteria are based on both statistical significance (a statistical comparison) and the degree of biological response (a numerical comparison). The SMS criteria are derived from the Washington Department of Ecology Sediment Sampling and Analysis Plan Appendix (WDOE 2008). The criteria include a lower and a higher threshold, sediment quality standards (SQS) and Cleanup Standards Limit (CSL).

Endpoint comparisons were made for each treatment against the appropriate reference sample. Reference selection was based on a comparison of the percentage of fines for the test treatment and the each of the references. That reference with the most similar percentage of fines was selected for SMS endpoint evaluation. If the difference for two references were similar, the finer grained size reference was selected. The percentage of fines for all selected references were within the SMS recommended range of ≤25% (Fox 1997), relative to the test treatments.

Larval Bivalve Test

Larval test treatments fail SQS criteria if the percentage of normal larvae in the test treatment is significantly lower than that of the reference and if normal survivorship in the test treatment is less than 85%, relative to normal survivorship in the reference (on a relative basis). Test treatments fail CSL criteria if normal survivorship in the test treatment is significantly lower than that of the reference and if the normal survivorship in the test treatment is less than 70%, relative to the reference.

A summary of the SMS comparisons for the benthic larval test is presented in Table 6. Both references had acceptable normal survivorship, within 65% of the control. With the exception of PGSS-29, all treatments were compared to the CARR reference treatment. Sample PGSS-29 was compared to reference CR-11.

Mean normal survivorship in all test samples met the CSL criteria, with ≥70% normal survivorship, relative to their respective reference sample. Test samples BW-12, BW-18, BW-19, and PGSS-29 were ≥85%, meeting the SQS criteria. Mean normal survivorship in treatments BW-11, BW-15, and BW-16 was 72% – 79%, relative to the CARR reference, failing the SQS criteria.

Table 6. SMS Comparison for the Benthic Larval Test with *Mytilus galloprovincialis* Test

Treatment	Percent Fines	Mean Number Normal	Reference	Statistically Less than Reference?	Normal Survival Comparison to Reference $(N_T/N_C)/(N_R/N_C)$	Fails SQS?[1] < 85% and significant	Fails CSL?[2] < 70% and significant
Control		**367**					
CARR	52	**302**					
CR-11	3	**299**					
BW-11	66	**238**	CARR	Yes	78.8	Yes	No
BW-12	44	**257**	CARR	Yes	85.0	No	No
BW-15	61	**219**	CARR	Yes	72.5	Yes	No
BW-16	56	**231**	CARR	Yes	76.3	Yes	No
BW-18	58	**257**	CARR	Yes	85.1	No	No
BW-19	56	**264**	CARR	Yes	87.4	No	No
PGSS-29	8	**306**	CR-11	No	102.5	No	No

[1]SQS: Statistical Significance and $N_{CT}<0.85*N_{CR}$
[2]CSL: Statistical Significance and $N_{CT}<0.70*N_{CR}$
No = Meets criteria; Yes = Does not meet criteria

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APPENDICES

A. LABORATORY DOCUMENTS

B. STATISTICAL COMPARISONS

C. CHAIN-OF-CUSTODY FORMS

APPENDIX A

Laboratory Benchsheets

ENVIRON

LABORATORY REPORT TRACKING LOG

CLIENT: ANCHOR	PROJECT NUMBER: NA
PROJECT: B. Gardiner	
PM: ↓ Port Gamble	
TESTING COMPONENTS: Mytilus	

TEST: Larval PSEP	INITIALS AND DATE OF COMPLETION OF TASK				
	COMPLETE	1ST QA	REVISIONS COMPLETE	2ND QA	REVISIONS COMPLETE
REVIEW OF BENCH SHEETS	CR 9/19				
ENDPOINT DATA ENTRY AND SUMMARY TABLES	JL 9/18/14	JL 9/18/14	NA		
WQ DATA ENTRY AND SUMMARY TABLES	↓	JL 9/18/14	NA		
REFERENCE TOXICIANT PACKETS	9/18 JL	CR 9/19	NA		
STATISTICAL ANALYSES	9/18 JL	CR 9/19	NA		
REPORT					

ENVIRON

LARVAL DEVELOPMENT TEST
ENDPOINT DATA

SPECIES					
Mytilus galloprovincialis					
CLIENT	**PROJECT**	**JOB NUMBER**	**PROJECT MANAGER**	**LAB / LOCATION**	**PROTOCOL**
Anchor	Port Gamble		B. Hester	Port Gamble / Bath 2	PSEP (1995)

ORGANISM BATCH	TEST START DATE:	TIME	TEST END DATE:	TIME
TS3591	8/20/14	1900	8/22/14	1915

LARVAL OBSERVATION DATA

CLIENT/ ID	REP	NUMBER NORMAL	NUMBER	DATE	TECHNICIAN	COMMENTS
STOCKING DENSITY	1	400		9/4/NCR		
	2	363				
	3	355				
	4	350				
	5	361				
Control /	1	376	6			
	2	372	9			
	3	344	6			
	4	386	23			
	5	355	11			
CARR /	1	312	5			
	2	311	6			
	3	278	5			
	4	316	8			
	5	294	3			
CR-11 /	1	294	6			
	2	304	3			
	3	316	5			
	4	284	2			
	5	297	4			
BW-11 /	1	292	8			
	2	195	5			
	3	217	13			
	4	219	5			
	5	267	7			

ENVIRON

LARVAL DEVELOPMENT TEST
ENDPOINT DATA

SPECIES					
			Mytilus galloprovincialis		
CLIENT	PROJECT	JOB NUMBER	PROJECT MANAGER	LAB / LOCATION	PROTOCOL
Anchor	Port Gamble		B. Hester	Port Gamble / Bath 2	PSEP (1995)
ORGANISM BATCH		TEST START DATE:	TIME	TEST END DATE:	TIME

LARVAL OBSERVATION DATA

CLIENT/ ID	REP	NUMBER NORMAL	NUMBER	DATE	TECHNICIAN	COMMENTS
BW-12 /	1	268	2	9/4/14	CR	
	2	232	5	↓	↓	
	3	242	9			
	4	305	7			
	5	237	13			
BW-15 /	1	215	5			
	2	200	2			
	3	235	8			
	4	226	6			
	5	220	6	↓	↓	
BW-16 /	1	230	3	9/5/14	CR	
	2	230	3	↓	↓	
	3	230	8			
	4	231	6			
	5	232	1			
BW-18 /	1	250	16			
	2	267	7			
	3	264	14			
	4	223	11			
	5	282	7			
BW-19 /	1	278	4			
	2	261	18			
	3	244	24			
	4	261	15			
	5	277	4	↓	↓	

ENVIRON

LARVAL DEVELOPMENT TEST
ENDPOINT DATA

SPECIES					
Mytilus galloprovincialis					
CLIENT	PROJECT	JOB NUMBER	PROJECT MANAGER	LAB / LOCATION	PROTOCOL
Anchor	Port Gamble		B. Hester	Port Gamble / Bath 2	PSEP (1995)
ORGANISM BATCH	TEST START DATE:	TIME	TEST END DATE:	TIME	
TS3591	8/20/14	1900	8/22/14	1915	

LARVAL OBSERVATION DATA

CLIENT/ ID	REP	NUMBER NORMAL	NUMBER	DATE	TECHNICIAN	COMMENTS
PGSS-29 /	1	300	15	9/15/14	CR	
	2	307	8	↓	↓	
	3	318	19	↓	↓	
	4	306	13	↓	↓	
	5	301	9	↓	↓	

	1	8	
	2	9	
	3	57	
	4	28	
	5	49	ANCHOR
surr	6	6	PG-AUGUST
	7	35	
	8	27	
CARR	9	33	
	10	41	
	11	53	
surr	12	40	
	13	10	
	14	51	
	15	16	
CR-11	16	2	
	17	39	
surr	18	17	
	19	5	
	20	56	
BW-11	21	50	
	22	32	
	23	1	
surr	24	7	
	25	34	
	26	44	
BW-12	27	30	
	28	18	
	29	37	
surr	30	36	
	31	38	
	32	60	
BW-15	33	19	
	34	15	
	35	31	
surr	36	29	
	37	54	
	38	59	
BW-16	39	24	
	40	47	
	41	58	
surr	42	55	
	43	20	
	44	42	
BW-18	45	3	
	46	22	
	47	48	
surr	48	45	
	49	23	
	50	4	
BW-19	51	26	
	52	14	
	53	46	
surr	54	12	
	55	13	
	56	11	
PGSS-29	57	25	
	58	52	
	59	21	
surr	60	43	

Ø	1	7
	2	43
	3	36
	4	10
	5	3
surr	6	18
	7	11
	8	28
CARR	9	29
	10	17
	11	33
surr	12	15
	13	4
	14	42
CR-23W	15	22
	16	9
	17	32
surr	18	6
	19	34
	20	8
CR-11	21	47
	22	44
	23	21
surr	24	24
	25	1
	26	39
SS-103	27	31
	28	16
	29	5
surr	30	30
	31	25
	32	48
SS-106	33	41
	34	45
	35	13
surr	36	38
	37	35
	38	40
SS-111	39	23
	40	46
	41	19
surr	42	26
	43	2
	44	20
SS-112	45	27
	46	12
	47	37
surr	48	14

ANCHOR
ALEXANDER AVENUE

ENVIRON

LARVAL DEVELOPMENT TEST INITIATION DATA SHEET

CLIENT	PROJECT	JOB NUMBER	PROJECT MANAGER	LABORATORY	PROTOCOL
Anchor	Alexander Avenue		B. Gardiner	Port Gamble Bath 2	PSEP (1995)

TEST ORGANISM SPAWNING DATA

SPECIES		
Mytilus galloprovincialis		
SUPPLIER: Taylor Shellfish		ORGANISM BATCH: TS3591
DATE RECEIVED: 8.20.14	TIME RECEIVED: 1115	DATE USED: 8.20.14
SPAWNING METHOD: feed / heat shock	INITIAL SPAWNING TIME: 1520	FINAL SPAWNING TIME: 1630
MALES: 9 / FEMALES: 8	SPERM VIABILITY: ✓	EGG CONDITION: Good
BEGIN FERTILIZATION: 1630	END FERTILIZATION: 1900	CONDITION OF EMBRYOS: >90% div

SAMPLE STORAGE	4 Degrees Celsius - dark
SEDIMENT TREATMENT	none
TEST CHAMBERS	1 L Mason Jars
EXPOSURE VOLUME	900mL seawater / 18g Sediment
TIME OF SHAKE	0835 / 0845
TIME OF INITIATION	Port Gamble / Alex Ave 1900

SPECIAL CONDITIONS

UV LIGHT EXPOSURE (YES/NO)	AERATION FROM TEST INITIATION (YES/NO)
NO	NO
SCREEN TUBE TEST (YES/NO)	**OTHER (EXPLAIN)**
NO	Resus.

EMBRYO DENSITY CALCULATIONS

83 × 100 = 8300 ess/mL

$\frac{28{,}000}{8300} = 3.37\text{mL}$

deliver 3.4mL

KT

$\frac{2800}{8300} = 0.337 \cdot 40\text{mL}$

13mL ess stock / 27mL seawater

Deliver 0.100mL

ENVIRON

LARVAL DEVELOPMENT TEST
WATER QUALITY DATA

CLIENT	PROJECT	SPECIES		LAB / LOCATION	PROTOCOL
Anchor	Port Gamble	*Mytilus galloprovincialis*		Port Gamble / Bath 2	PSEP (1995)
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE**	**TIME**	**TEST END DATE**	**TIME**
	B. Hester	20Aug14	1900	8/22/14	1915

* Day 3&4 observations needed only if development endpoint not met by day 2

WATER QUALITY DATA

TEST CONDITIONS				DO (mg/L) >5.0		Temp (°C) 16 ± 1		Sal (ppt) 28 ± 1		pH 7 - 9		Ammonia NA		Sulfide NA		TECH	DATE
CLIENT/ ID	DAY	Random #	REP	D.O.		TEMP.		SALINITY		pH		AMMONIA		SULFIDE			
				meter	mg/L	meter	°C	meter	ppt	meter	unit	Techn.	mg/L (total)	Techn.	mg/L (Total)		
Control /	0	6	WQ Surr	8	7.6	8	17.2	8	28	8	7.9	CR	0.00	MK	0.00	CR	8/20
Control /	1	6	WQ Surr	9	7.8	9	16.3	9	28	9	7.9	JL				JL	8/21
Control /	2	6	WQ Surr	8	7.7	8	16.4	8	28	8	7.7	JL	0.0603	JL	0.019 ~~0.0603~~	JL	8/22
Control /	3	6	WQ Surr														
Control /	4	6	WQ Surr														
CARR /	0	40	WQ Surr	8	7.7	8	16.5	8	28	8	7.9	CR	0.00	MK	0.087	CR	8/20
CARR /	1	40	WQ Surr	9	7.1	9	17.0	9	28	9	7.9					JL	8/21
CARR /	2	40	WQ Surr	8	6.8	8	16.8	8	28	8	7.6	JL	0.0511	JL	0.041	JL	8/22
CARR /	3	40	WQ Surr														
CARR /	4	40	WQ Surr														
CR-11 /	0	17	WQ Surr	8	7.8	8	17.2	8	28	8	7.8	CR	0.00	MK	0.018	CR	8/20
CR-11 /	1	17	WQ Surr	~~8~~ 9 8.2	7.0	~~8~~ 9	16.6	~~9~~ 8	28	9	7.9					JL	8/21
CR-11 /	2	17	WQ Surr	8	5.8	8	16.8	8	28	8	7.6	JL	0.0429	JL	0.023	JL	8/22
CR-11 /	3	17	WQ Surr														
CR-11 /	4	17	WQ Surr														

© IE 8/21/14 JL

ENVIRON

LARVAL DEVELOPMENT TEST
WATER QUALITY DATA

CLIENT	PROJECT	SPECIES		LAB / LOCATION	PROTOCOL
Anchor	Port Gamble	*Mytilus galloprovincialis*		Port Gamble / Bath 2	PSEP (1995)
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE**	**TIME**	**TEST END DATE**	**TIME**
	B. Hester	20Aug14	1900	8/22/14	1915

* Day 3&4 observations needed only if development endpoint not met by day 2

WATER QUALITY DATA

TEST CONDITIONS				DO (mg/L) >5.0		Temp (°C) 16 ± 1		Sal (ppt) 28 ± 1		pH 7 - 9		Ammonia NA		Sulfide NA		TECH	DATE
CLIENT/ ID	DAY	Random #	REP	D.O.		TEMP.		SALINITY		pH		AMMONIA		SULFIDE			
				meter	mg/L	meter	°C	meter	ppt	meter	unit	Techn.	mg/L (total)	Techn.	mg/L (Total)		
BW-11 /	0	7	WQ Surr	8	7.5	8	16.5	8	28	8	7.8	CR	0.00	MK	0.191	CR	8/20
BW-11 /	1	7	WQ Surr	9	7.2	9	16.2	9	28	9	7.8					JL	8/21
BW-11 /	2	7	WQ Surr	8	6.3	8	16.3	8	28	8	7.4	JL	0.0393	JL	0.071	JL	8/22
BW-11 /	3	7	WQ Surr														
BW-11 /	4	7	WQ Surr														
BW-12 /	0	36	WQ Surr	8	7.8	8	16.4	8	28	8	7.8	CR	0.00	MK	0.131	CR	8/20
BW-12 /	1	36	WQ Surr	9	6.9	9	17.0	9	28	9	7.9					JL	8/21
BW-12 /	2	36	WQ Surr	8	6.6	8	16.5	8	28	8	7.5	JL	0.0909	JL	0.054	JL	8/22
BW-12 /	3	36	WQ Surr														
BW-12 /	4	36	WQ Surr														
BW-15 /	0	29	WQ Surr	8	7.7	8	16.5	8	28	8	7.8	CR	0.00	MK	0.200	CR	8/20
BW-15 /	1	29	WQ Surr	9	7.0	9	16.9	9	28	9	7.9					JL	8/21
BW-15 /	2	29	WQ Surr	8	6.9	8	16.6	8	28	8	7.5	JL	0.0714	JL	0.070	JL	8/22
BW-15 /	3	29	WQ Surr														
BW-15 /	4	29	WQ Surr														

ENVIRON

LARVAL DEVELOPMENT TEST
WATER QUALITY DATA

CLIENT	PROJECT	SPECIES		LAB / LOCATION	PROTOCOL
Anchor	Port Gamble	*Mytilus galloprovincialis*		Port Gamble / Bath 2	PSEP (1995)
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE**	**TIME**	**TEST END DATE**	**TIME**
	B. Hester	20Aug14	1900	8/22/14	1915

* Day 3&4 observations needed only if development endpoint not met by day 2

WATER QUALITY DATA

TEST CONDITIONS				DO (mg/L) >5.0		Temp (°C) 16 ± 1		Sal (ppt) 28 ± 1		pH 7 - 9		Ammonia NA		Sulfide NA		TECH	DATE
CLIENT/ ID	DAY	Random #	REP	D.O.		TEMP.		SALINITY		pH		AMMONIA		SULFIDE			
				meter	mg/L	meter	°C	meter	ppt	meter	unit	Techn.	mg/L (total)	Techn.	mg/L (Total)		
BW-16 /	0	55	WQ Surr	8	7.5	8	16.4	8	28	8	7.8	CR	0.00	MK	0.229	CR	8/20
BW-16 /	1	55	WQ Surr	9	7.1	9	16.7	9	28	9	7.9					JL	8/21
BW-16 /	2	55	WQ Surr	8	7.0	8	16.6	8	28	8	7.5	JL	0.0670	JL	0.066	JL	8/22
BW-16 /	3	55	WQ Surr														
BW-16 /	4	55	WQ Surr														
BW-18 /	0	45	WQ Surr	8	7.5	8	16.4	8	28	8	7.8	CR	0.00	MK	0.193	CR	8/20
BW-18 /	1	45	WQ Surr	9	7.2	9	16.6	9	28	9	7.8					JL	8/21
BW-18 /	2	45	WQ Surr	8	7.0	8	16.6	8	28	8	7.5	JL	0.0596	JL	0.062	JL	8/22
BW-18 /	3	45	WQ Surr														
BW-18 /	4	45	WQ Surr														
BW-19 /	0	12	WQ Surr	8	7.6	8	16.4	8	28	8	7.8	CR	0.00	MK	0.232	CR	8/20
BW-19 /	1	12	WQ Surr	9	7.4	9	16.2	9	28	9	7.8					JL	8/21
BW-19 /	2	12	WQ Surr	8	5.8	8	16.6	8	28	8	7.5	JL	0.0584	JL	0.062	JL	8/22
BW-19 /	3	12	WQ Surr														
BW-19 /	4	12	WQ Surr														

ENVIRON

LARVAL DEVELOPMENT TEST
WATER QUALITY DATA

CLIENT	PROJECT	SPECIES		LAB / LOCATION	PROTOCOL
Anchor	Port Gamble	*Mytilus galloprovincialis*		Port Gamble / Bath 2	PSEP (1995)
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE**	**TIME**	**TEST END DATE**	**TIME**
	B. Hester	20Aug14	1900	8/22/14	1915

* Day 3&4 observations needed only if development endpoint not met by day 2

WATER QUALITY DATA

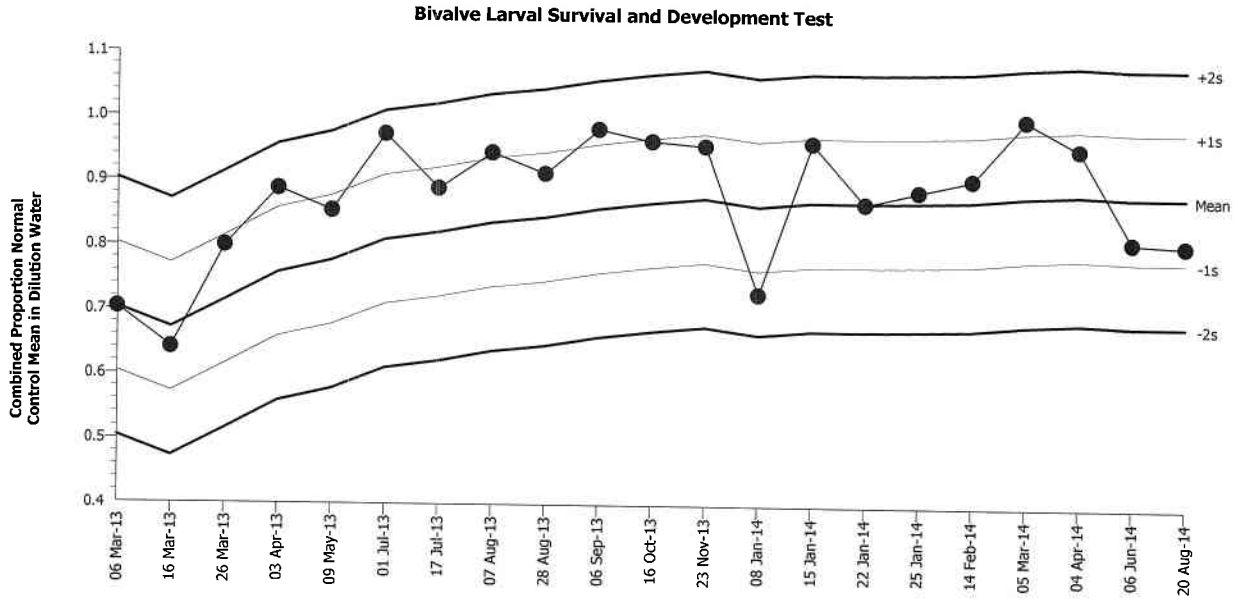
TEST CONDITIONS				DO (mg/L) >5.0		Temp (°C) 16 ± 1		Sal (ppt) 28 ± 1		pH 7 - 9		Ammonia NA		Sulfide NA		TECH	DATE
CLIENT/ ID	DAY	Random #	REP	D.O.		TEMP.		SALINITY		pH		AMMONIA		SULFIDE			
				meter	mg/L	meter	°C	meter	ppt	meter	unit	Techn.	mg/L (total)	Techn.	mg/L (Total)		
PGSS-29 /	0	43	WQ Surr	8	7.7	8	16.3	8	28	8	7.8	CR	0.00	MK	0.128	CR	8/20
PGSS-29 /	1	43	WQ Surr	9	7.0	9	16.8	9	28	9	7.9					JL	8/21
PGSS-29 /	2	43	WQ Surr	8	6.9	8	16.5	8	28	8	7.5	JL	0.0608	JL	0.025	JL	8/22
PGSS-29 /	3	43	WQ Surr														
PGSS-29 /	4	43	WQ Surr														

CETIS QC Plot

Report Date: 08 Sep-14 12:40 (1 of 1)

Bivalve Larval Survival and Development Test — **All Matching Labs**

Test Type:	Development-Survival	**Organism:**	Mytilus galloprovincialis (Bay Mussel	**Material:**	Total Ammonia
Protocol:	EPA/600/R-95/136 (1995)	**Endpoint:**	Combined Proportion Normal	**Source:**	Reference Toxicant-REF



Mean:	0.8814	**Count:**	20	**-1s Warning Limit:**	0.7819	**-2s Action Limit:**	0.6824
Sigma:	0.09948	**CV:**	11.30%	**+1s Warning Limit:**	0.9808	**+2s Action Limit:**	1.08

Quality Control Data

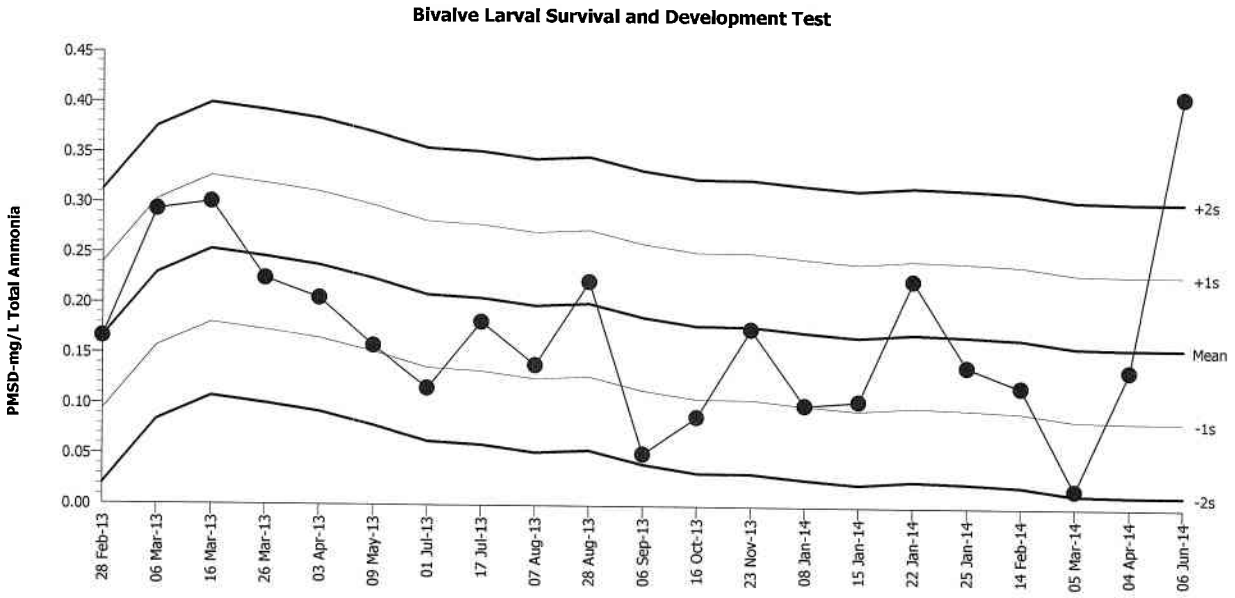
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2013	Mar	6	16:45	0.7031	-0.1783	-1.792	(-)		20-1267-3706		NewFields
2			16	17:45	0.6408	-0.2406	-2.419	(-)	(-)	14-2253-0526		NewFields
3			26	18:15	0.7995	-0.0819	-0.8233			03-8532-3895		NewFields
4		Apr	3	0:00	0.8876	0.0062	0.06232			10-3604-5723		NewFields
5		May	9	17:15	0.8538	-0.0276	-0.2774			00-6360-9095		NewFields
6		Jul	1	19:00	0.9725	0.0911	0.9158			19-5961-2730		NewFields
7			17	17:55	0.8889	0.0075	0.07539			18-2536-1347		NewFields
8		Aug	7	19:00	0.9444	0.063	0.6333			04-7788-4843		NewFields
9			28	16:55	0.9121	0.0307	0.3086			19-6611-9162		NewFields
10		Sep	6	18:55	0.9816	0.1002	1.007	(+)		15-9826-4846		NewFields
11		Oct	16	20:15	0.9634	0.082	0.8243			06-1596-0976		NewFields
12		Nov	23	17:25	0.9565	0.0751	0.7549			16-7309-8662		NewFields
13	2014	Jan	8	18:22	0.7281	-0.1533	-1.541	(-)		17-8058-8048		NewFields
14			15	18:45	0.9622	0.0808	0.8122			13-6807-1804		NewFields
15			22	18:47	0.8693	-0.0121	-0.1216			13-2808-9359		NewFields
16			25	20:20	0.8885	0.0071	0.07137			14-2680-8854		NewFields
17		Feb	14	15:45	0.907	0.0256	0.2573			00-9581-0604		NewFields
18		Mar	5	19:35	1	0.1186	1.192	(+)		00-1473-4954		NewFields
19		Apr	4	19:30	0.9553	0.0739	0.7429			00-0374-9463		NewFields
20		Jun	6	18:15	0.8125	-0.0689	-0.6926			06-9491-1560		ENVIRON
21		Aug	20	18:55	0.8079	-0.0735	-0.7388			03-3666-4351		ENVIRON

CETIS QC Plot

Report Date: 08 Sep-14 12:41 (1 of 1)

Bivalve Larval Survival and Development Test — **All Matching Labs**

Test Type:	Development-Survival	**Organism:**	Mytilus galloprovincialis (Bay Mussel	**Material:**	Total Ammonia
Protocol:	EPA/600/R-95/136 (1995)	**Endpoint:**	Combined Proportion Normal	**Source:**	Reference Toxicant-REF



Mean:	0.1586	**Count:**	20	**-1s Warning Limit:**	0.0856	**-2s Action Limit:**	0.01262
Sigma:	0.07298	**CV:**	46.00%	**+1s Warning Limit:**	0.2316	**+2s Action Limit:**	0.3045

Quality Control Data

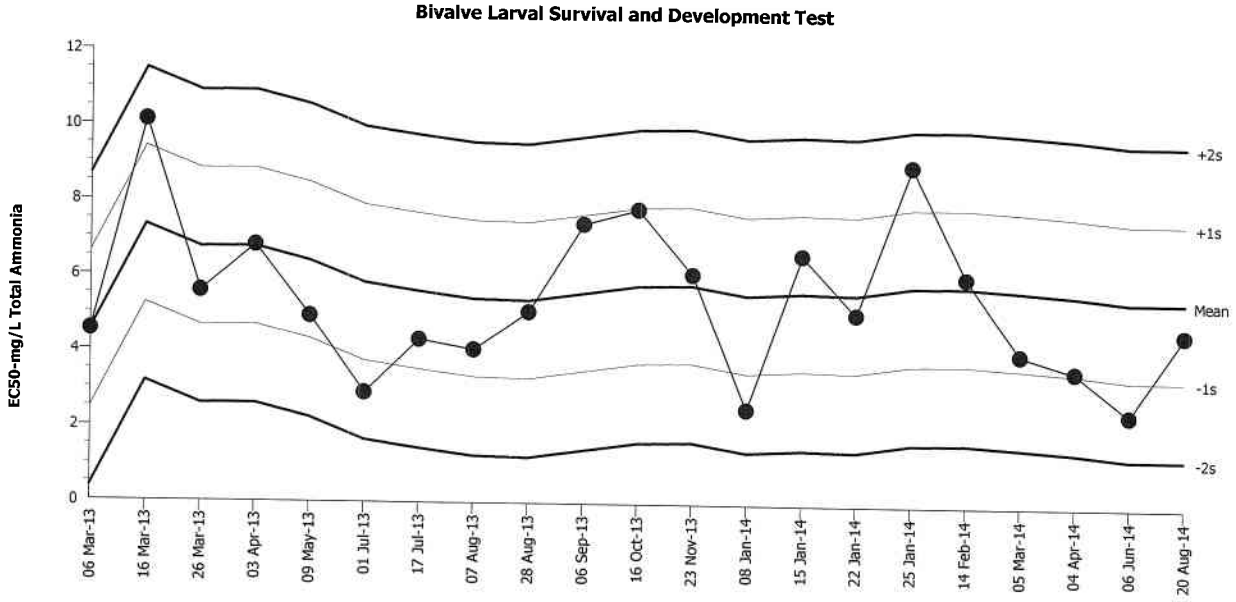
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2013	Feb	28	21:20	0.1666	0.008048	0.1103			06-9403-7957	16-1498-7518	NewFields
2		Mar	6	16:45	0.2933	0.1347	1.846	(+)		20-1267-3706	13-0769-0097	NewFields
3			16	17:45	0.3008	0.1422	1.949	(+)		14-2253-0526	09-1011-9616	NewFields
4			26	18:15	0.2249	0.06628	0.9082			03-8532-3895	01-1639-1779	NewFields
5		Apr	3	0:00	0.2054	0.04682	0.6415			10-3604-5723	13-5448-8759	NewFields
6		May	9	17:15	0.1581	-0.00049	-0.00676			00-6360-9095	00-7540-8630	NewFields
7		Jul	1	19:00	0.1161	-0.04255	-0.583			19-5961-2730	20-9160-8614	NewFields
8			17	17:55	0.1822	0.02357	0.3229			18-2536-1347	04-3468-0815	NewFields
9		Aug	7	19:00	0.1392	-0.0194	-0.2658			04-7788-4843	18-8631-2521	NewFields
10			28	16:55	0.2226	0.06404	0.8775			19-6611-9162	06-3129-4473	NewFields
11		Sep	6	18:55	0.05165	-0.107	-1.466	(-)		15-9826-4846	11-1511-0674	NewFields
12		Oct	16	20:15	0.08855	-0.07005	-0.9599			06-1596-0976	11-9282-8356	NewFields
13		Nov	23	17:25	0.1762	0.01759	0.241			16-7309-8662	17-7125-0481	NewFields
14	2014	Jan	8	18:22	0.1009	-0.05771	-0.7908			17-8058-8048	14-0659-1138	NewFields
15			15	18:45	0.1052	-0.05343	-0.7321			13-6807-1804	20-8888-7287	NewFields
16			22	18:47	0.2254	0.0668	0.9154			13-2808-9359	09-9457-8825	NewFields
17			25	20:20	0.1398	-0.01877	-0.2572			14-2680-8854	19-4144-0794	NewFields
18		Feb	14	15:45	0.1199	-0.03871	-0.5305			00-9581-0604	14-2175-7836	NewFields
19		Mar	5	19:35	0.0183	-0.1403	-1.922	(-)		00-1473-4954	06-9188-5839	NewFields
20		Apr	4	19:30	0.1364	-0.02216	-0.3037			00-0374-9463	13-5593-8276	NewFields
21		Jun	6	18:15	0.4096	0.251	3.44	(+)	(+)	06-9491-1560	15-1591-7876	ENVIRON

CETIS QC Plot

Report Date: 08 Sep-14 12:40 (1 of 1)

Bivalve Larval Survival and Development Test — **All Matching Labs**

Test Type:	Development-Survival	**Organism:**	Mytilus galloprovincialis (Bay Mussel	**Material:**	Total Ammonia
Protocol:	EPA/600/R-95/136 (1995)	**Endpoint:**	Combined Proportion Normal	**Source:**	Reference Toxicant-REF



Mean:	5.45	**Count:**	20	**-1s Warning Limit:**	3.371	**-2s Action Limit:**	1.292
Sigma:	2.079	**CV:**	38.10%	**+1s Warning Limit:**	7.529	**+2s Action Limit:**	9.608

Quality Control Data

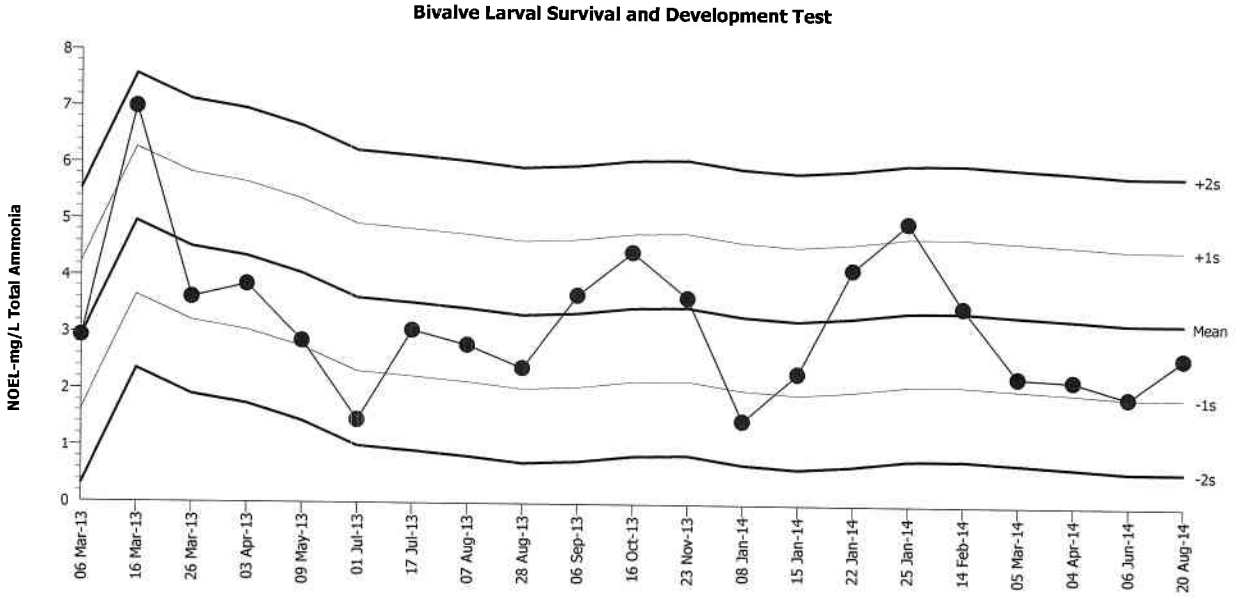
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2013	Mar	6	16:45	4.538	-0.9123	-0.4388			20-1267-3706	09-5346-5604	NewFields
2			16	17:45	10.13	4.677	2.25	(+)	(+)	14-2253-0526	18-0087-0374	NewFields
3			26	18:15	5.579	0.1291	0.06212			03-8532-3895	00-6308-0782	NewFields
4		Apr	3	0:00	6.805	1.355	0.6519			10-3604-5723	04-8356-0800	NewFields
5		May	9	17:15	4.927	-0.5233	-0.2517			00-6360-9095	16-4147-0802	NewFields
6		Jul	1	19:00	2.895	-2.555	-1.229	(-)		19-5961-2730	13-0986-6895	NewFields
7			17	17:55	4.313	-1.137	-0.5467			18-2536-1347	00-8750-2223	NewFields
8		Aug	7	19:00	4.051	-1.399	-0.673			04-7788-4843	09-8595-7999	NewFields
9			28	16:55	5.063	-0.3873	-0.1863			19-6611-9162	04-7207-2891	NewFields
10		Sep	6	18:55	7.413	1.963	0.9442			15-9826-4846	08-5407-1877	NewFields
11		Oct	16	20:15	7.813	2.363	1.136	(+)		06-1596-0976	02-5933-8680	NewFields
12		Nov	23	17:25	6.092	0.6415	0.3086			16-7309-8662	15-4529-5520	NewFields
13	2014	Jan	8	18:22	2.527	-2.923	-1.406	(-)		17-8058-8048	06-8566-9958	NewFields
14			15	18:45	6.625	1.175	0.565			13-6807-1804	14-8094-6245	NewFields
15			22	18:47	5.072	-0.3779	-0.1818			13-2808-9359	13-2338-2483	NewFields
16			25	20:20	9.018	3.568	1.716	(+)		14-2680-8854	01-2301-1257	NewFields
17		Feb	14	15:45	6.063	0.613	0.2949			00-9581-0604	10-3047-2486	NewFields
18		Mar	5	19:35	4.03	-1.42	-0.683			00-1473-4954	06-0848-4308	NewFields
19		Apr	4	19:30	3.594	-1.856	-0.8927			00-0374-9463	01-3815-4471	NewFields
20		Jun	6	18:15	2.465	-2.985	-1.436	(-)		06-9491-1560	12-3152-8677	ENVIRON
21		Aug	20	18:55	4.595	-0.8547	-0.4111			03-3666-4351	12-9663-9075	ENVIRON

CETIS QC Plot

Report Date: 08 Sep-14 12:40 (1 of 1)

Bivalve Larval Survival and Development Test — **All Matching Labs**

Test Type:	Development-Survival	**Organism:**	Mytilus galloprovincialis (Bay Mussel	**Material:**	Total Ammonia
Protocol:	EPA/600/R-95/136 (1995)	**Endpoint:**	Combined Proportion Normal	**Source:**	Reference Toxicant-REF



Mean:	3.228	**Count:**	20	**-1s Warning Limit:**	1.923	**-2s Action Limit:**	0.6182
Sigma:	1.305	**CV:**	40.40%	**+1s Warning Limit:**	4.533	**+2s Action Limit:**	5.838

Quality Control Data

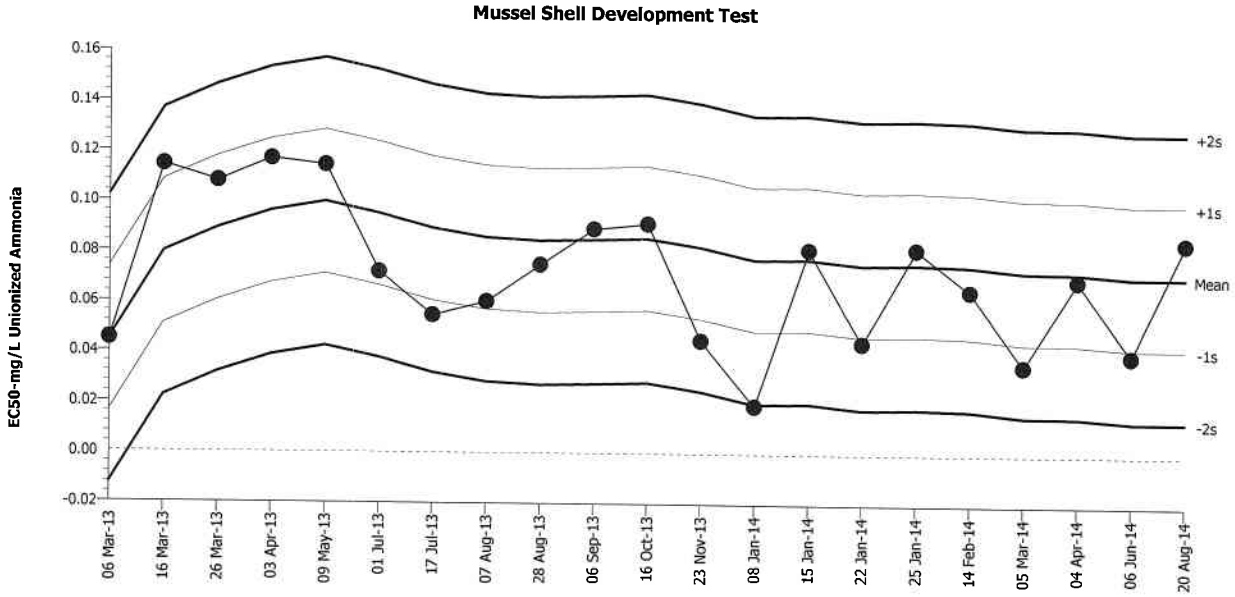
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2013	Mar	6	16:45	2.93	-0.298	-0.2284			20-1267-3706	13-0769-0097	NewFields
2			16	17:45	6.99	3.762	2.883	(+)	(+)	14-2253-0526	09-1011-9616	NewFields
3			26	18:15	3.62	0.392	0.3004			03-8532-3895	01-1639-1779	NewFields
4		Apr	3	0:00	3.85	0.622	0.4766			10-3604-5723	13-5448-8759	NewFields
5		May	9	17:15	2.85	-0.378	-0.2897			00-6360-9095	00-7540-8630	NewFields
6		Jul	1	19:00	1.46	-1.768	-1.355	(-)		19-5961-2730	20-9160-8614	NewFields
7			17	17:55	3.05	-0.178	-0.1364			18-2536-1347	04-3468-0815	NewFields
8		Aug	7	19:00	2.79	-0.438	-0.3356			04-7788-4843	18-8631-2521	NewFields
9			28	16:55	2.39	-0.838	-0.6421			19-6611-9162	06-3129-4473	NewFields
10		Sep	6	18:55	3.68	0.452	0.3464			15-9826-4846	11-1511-0674	NewFields
11		Oct	16	20:15	4.445	1.217	0.9326			06-1596-0976	11-9282-8356	NewFields
12		Nov	23	17:25	3.64	0.412	0.3157			16-7309-8662	17-7125-0481	NewFields
13	2014	Jan	8	18:22	1.48	-1.748	-1.339	(-)		17-8058-8048	14-0659-1138	NewFields
14			15	18:45	2.32	-0.908	-0.6958			13-6807-1804	20-8888-7287	NewFields
15			22	18:47	4.16	0.932	0.7142			13-2808-9359	09-9457-8825	NewFields
16			25	20:20	4.99	1.762	1.35	(+)		14-2680-8854	19-4144-0794	NewFields
17		Feb	14	15:45	3.5	0.272	0.2084			00-9581-0604	14-2175-7836	NewFields
18		Mar	5	19:35	2.27	-0.958	-0.7341			00-1473-4954	06-9188-5839	NewFields
19		Apr	4	19:30	2.22	-1.008	-0.7724			00-0374-9463	13-5593-8276	NewFields
20		Jun	6	18:15	1.93	-1.298	-0.9946			06-9491-1560	15-1591-7876	ENVIRON
21		Aug	20	18:55	2.62	-0.608	-0.4659			03-3666-4351	02-5771-3266	ENVIRON

CETIS QC Plot

Report Date: 08 Sep-14 12:50 (1 of 1)

Mussel Shell Development Test — **All Matching Labs**

Test Type:	Development-Survival	**Organism:**	Mytilus galloprovincialis (Bay Mussel	**Material:**	Unionized Ammonia
Protocol:	EPA/600/R-95/136 (1995)	**Endpoint:**	Combined Proportion Normal	**Source:**	Reference Toxicant-REF



Mean:	0.07115	**Count:**	20	**-1s Warning Limit:**	0.04248	**-2s Action Limit:**	0.01381
Sigma:	0.02867	**CV:**	40.30%	**+1s Warning Limit:**	0.09982	**+2s Action Limit:**	0.1285

Quality Control Data

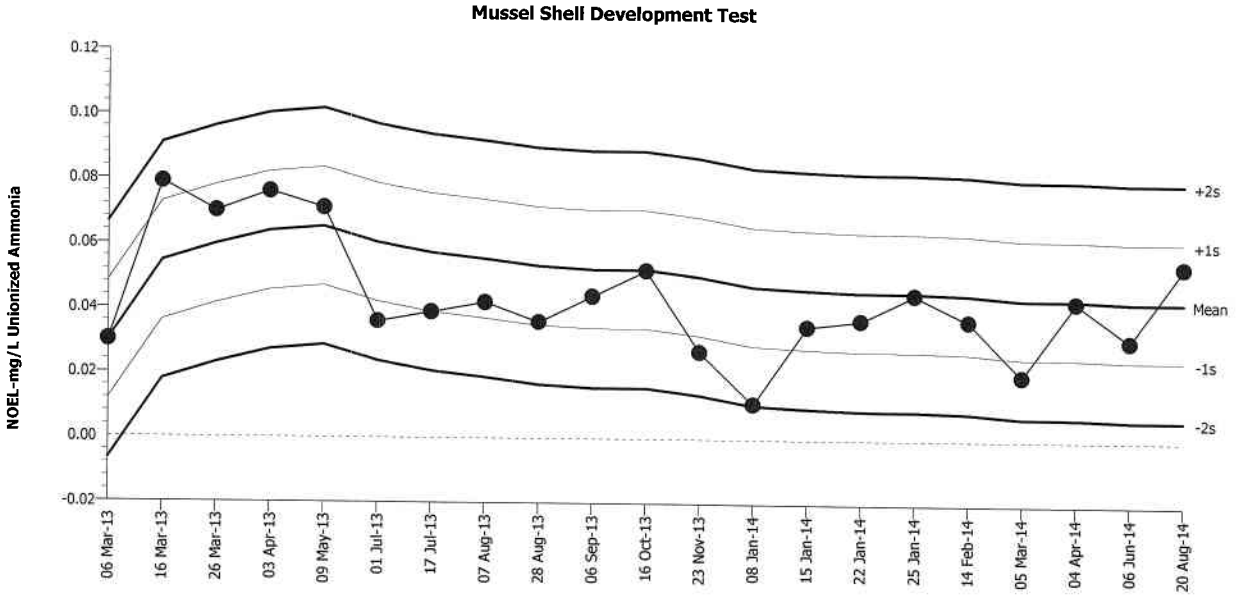
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2013	Mar	6	16:45	0.04499	-0.02616	-0.9125			18-3418-4255	07-5324-7355	NewFields
2			16	16:10	0.1144	0.0433	1.51	(+)		11-4894-2693	12-9463-9515	NewFields
3			26	18:15	0.1079	0.03673	1.281	(+)		10-2444-9875	09-9596-0674	NewFields
4		Apr	3	0:00	0.1168	0.0457	1.594	(+)		20-6076-9735	05-3848-1619	NewFields
5		May	9	17:15	0.1144	0.04325	1.508	(+)		14-3450-0734	06-3515-6667	NewFields
6		Jul	1	19:00	0.07187	0.000722	0.02516			10-8846-7294	05-7595-2849	NewFields
7			17	17:55	0.0548	-0.01635	-0.5703			10-3414-5102	08-1738-2772	NewFields
8		Aug	7	19:00	0.06027	-0.01088	-0.3795			10-7217-0339	06-7338-0554	NewFields
9			28	16:55	0.07491	0.003755	0.131			19-6745-0030	16-9398-7287	NewFields
10		Sep	6	18:55	0.08923	0.01808	0.6306			20-4996-9287	13-4360-8251	NewFields
11		Oct	16	20:15	0.0914	0.02025	0.7062			08-6327-9927	19-9515-4386	NewFields
12		Nov	23	17:25	0.04496	-0.02619	-0.9135			13-8738-6674	02-5355-5019	NewFields
13	2014	Jan	8	18:22	0.01919	-0.05196	-1.812	(-)		02-3576-5336	17-1917-6754	NewFields
14			15	18:45	0.0814	0.01025	0.3574			06-9099-5939	00-9901-2590	NewFields
15			22	18:47	0.04434	-0.02681	-0.9352			15-7285-0453	02-5494-3481	NewFields
16			25	20:20	0.08179	0.01064	0.371			04-0859-3739	09-7301-2928	NewFields
17		Feb	14	15:45	0.0653	-0.00585	-0.204			15-0233-5150	16-5673-1462	NewFields
18		Mar	5	19:35	0.03552	-0.03563	-1.243	(-)		02-2074-6026	13-5083-6151	NewFields
19		Apr	4	19:30	0.06967	-0.00148	-0.05152			08-9987-7352	06-2075-5011	NewFields
20		Jun	6	18:15	0.03982	-0.03133	-1.093	(-)		20-1079-3686	12-0135-9289	ENVIRON
21		Aug	20	18:55	0.08475	0.0136	0.4742			14-9751-1227	04-1532-7472	ENVIRON

CETIS QC Plot

Report Date: 08 Sep-14 12:50 (1 of 1)

Mussel Shell Development Test — **All Matching Labs**

Test Type:	Development-Survival	**Organism:**	Mytilus galloprovincialis (Bay Mussel	**Material:**	Unionized Ammonia
Protocol:	EPA/600/R-95/136 (1995)	**Endpoint:**	Combined Proportion Normal	**Source:**	Reference Toxicant-REF



Mean:	0.04305	**Count:**	20	**-1s Warning Limit:**	0.02476	**-2s Action Limit:**	0.00647
Sigma:	0.01829	**CV:**	42.50%	**+1s Warning Limit:**	0.06134	**+2s Action Limit:**	0.07963

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2013	Mar	6	16:45	0.03	-0.01305	-0.7135			18-3418-4255	11-0229-7491	NewFields
2			16	16:10	0.079	0.03595	1.966	(+)		11-4894-2693	17-8368-9370	NewFields
3			26	18:15	0.07	0.02695	1.473	(+)		10-2444-9875	00-8976-6127	NewFields
4		Apr	3	0:00	0.076	0.03295	1.802	(+)		20-6076-9735	14-2423-4592	NewFields
5		May	9	17:15	0.071	0.02795	1.528	(+)		14-3450-0734	19-5425-3899	NewFields
6		Jul	1	19:00	0.036	-0.00705	-0.3855			10-8846-7294	11-2659-9719	NewFields
7			17	17:55	0.039	-0.00405	-0.2214			10-3414-5102	05-6701-2859	NewFields
8		Aug	7	19:00	0.042	-0.00105	-0.05741			10-7217-0339	15-9321-6181	NewFields
9			28	16:55	0.036	-0.00705	-0.3855			19-6745-0030	11-4907-1298	NewFields
10		Sep	6	18:55	0.044	0.00095	0.05194			20-4996-9287	08-7464-1360	NewFields
11		Oct	16	20:15	0.052	0.00895	0.4893			08-6327-9927	20-4743-8794	NewFields
12		Nov	23	17:25	0.027	-0.01605	-0.8775			13-8738-6674	05-6624-9800	NewFields
13	2014	Jan	8	18:22	0.011	-0.03205	-1.752	(-)		02-3576-5336	15-3876-8049	NewFields
14			15	18:45	0.035	-0.00805	-0.4401			06-9099-5939	01-3042-8920	NewFields
15			22	18:47	0.037	-0.00605	-0.3308			15-7285-0453	12-0010-0113	NewFields
16			25	20:20	0.045	0.00195	0.1066			04-0859-3739	20-3446-9116	NewFields
17		Feb	14	15:45	0.037	-0.00605	-0.3308			15-0233-5150	19-2470-0896	NewFields
18		Mar	5	19:35	0.02	-0.02305	-1.26	(-)		02-2074-6026	10-8335-1484	NewFields
19		Apr	4	19:30	0.043	-0.00005	-0.00273			08-9987-7352	01-2582-7818	NewFields
20		Jun	6	18:15	0.031	-0.01205	-0.6588			20-1079-3686	02-2339-8824	ENVIRON
21		Aug	20	18:55	0.054	0.01095	0.5987			14-9751-1227	13-4768-2245	ENVIRON

CETIS Summary Report

Bivalve Larval Survival and Development Test ENVIRON

Batch ID:	14-9035-6364	**Test Type:**	Development-Survival	**Analyst:**	
Start Date:	20 Aug-14 18:55	**Protocol:**	EPA/600/R-95/136 (1995)	**Diluent:**	Natural Seawater
Ending Date:	22 Aug-14 16:55	**Species:**	Mytilus galloprovincialis	**Brine:**	Not Applicable
Duration:	46h	**Source:**	Aquatic Research Organisms, NH	**Age:**	
Sample ID:	13-5513-3902	**Code:**	50C5B3CE	**Client:**	Internal Lab
Sample Date:	05 May-14	**Material:**	Total Ammonia	**Project:**	Reference Toxicant
Receive Date:	05 May-14	**Source:**	Reference Toxicant		
Sample Age:	107d 19h	**Station:**	P140505.28		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
02-5771-3266	Combined Proportion Norm	2.62	8.06	4.595	NA		Fisher Exact/Bonferroni Adj Test
08-1769-3580	Proportion Normal	2.62	8.06	4.595	NA		Fisher Exact/Bonferroni Adj Test

Point Estimate Summary

Analysis ID	Endpoint	Level	mg/L	95% LCL	95% UCL	TU	Method
12-9663-9075	Combined Proportion Norm	EC50	4.595	2.62	8.06		Binomial/Graphical
04-0140-6234	Proportion Normal	EC50	4.595	2.62	8.06		Binomial/Graphical

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
04-0140-6234	Proportion Normal	Control Resp	0.9538	0.9 - NL	Yes	Passes Acceptability Criteria
08-1769-3580	Proportion Normal	Control Resp	0.9538	0.9 - NL	Yes	Passes Acceptability Criteria

Combined Proportion Normal Summary

C-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	3	0.8079	0.2164	1	0.5339	0.9647	0.1375	0.2381	29.47%	0.0%
0.734		3	0.9459	0.8142	1	0.8941	1	0.0306	0.05301	5.6%	-17.07%
1.35		3	0.9802	0.8951	1	0.9407	1	0.01977	0.03425	3.49%	-21.33%
2.62		3	0.9426	0.8185	1	0.9096	1	0.02882	0.04992	5.3%	-16.67%
8.06		3	0	0	0	0	0	0	0		100.0%
12.9		3	0	0	0	0	0	0	0		100.0%
17.7		3	0	0	0	0	0	0	0		100.0%

Proportion Normal Summary

C-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	3	0.9538	0.8514	1	0.9065	0.982	0.02381	0.04124	4.32%	0.0%
0.734		3	0.9721	0.9604	0.9838	0.9681	0.9773	0.002723	0.004716	0.49%	-1.92%
1.35		3	0.9734	0.9446	1	0.96	0.9807	0.006694	0.01159	1.19%	-2.05%
2.62		3	0.9726	0.9435	1	0.9601	0.9834	0.006762	0.01171	1.2%	-1.97%
8.06		3	0	0	0	0	0	0	0		100.0%
12.9		3	0	0	0	0	0	0	0		100.0%
17.7		3	0	0	0	0	0	0	0		100.0%

CETIS Test Data Worksheet

Bivalve Larval Survival and Development Test — ENVIRON

Start Date:	20 Aug-14 18:55	**Species:**	Mytilus galloprovincialis	**Sample Code:**	50C5B3CE
End Date:	22 Aug-14 16:55	**Protocol:**	EPA/600/R-95/136 (1995)	**Sample Source:**	Reference Toxicant
Sample Date:	05 May-14	**Material:**	Total Ammonia	**Sample Station:**	P140505.28

C-mg/L	Code	Rep	Pos	Initial Density	Final Density	# Counted	# Normal	Notes
0	D	1	8	708	667	667	655	
0	D	2	10	708	702	702	683	
0	D	3	6	708	417	417	378	
0.734		1	12	708	749	749	732	
0.734		2	13	708	690	690	668	
0.734		3	2	708	652	652	633	
1.35		1	3	708	775	775	744	
1.35		2	7	708	725	725	711	
1.35		3	18	708	680	680	666	
2.62		1	4	708	721	721	709	
2.62		2	17	708	661	661	644	
2.62		3	11	708	677	677	650	
8.06		1	20	708	714	714	0	
8.06		2	16	708	702	702	0	
8.06		3	1	708	674	674	0	
12.9		1	14	708	682	682	0	
12.9		2	9	708	738	738	0	
12.9		3	21	708	698	698	0	
17.7		1	19	708	636	636	0	
17.7		2	5	708	806	806	0	
17.7		3	15	708	678	678	0	

CETIS Summary Report

Mussel Shell Development Test — **ENVIRON**

Batch ID:	19-7887-6566	**Test Type:**	Development-Survival	**Analyst:**	
Start Date:	20 Aug-14 18:55	**Protocol:**	EPA/600/R-95/136 (1995)	**Diluent:**	Laboratory Seawater
Ending Date:	22 Aug-14 16:55	**Species:**	Mytilus galloprovincialis	**Brine:**	Not Applicable
Duration:	46h	**Source:**	Taylor Shellfish	**Age:**	
Sample ID:	01-1244-9290	**Code:**	6B3D70A	**Client:**	Internal Lab
Sample Date:	05 May-14	**Material:**	Unionized Ammonia	**Project:**	Reference Toxicant
Receive Date:	05 May-14	**Source:**	Reference Toxicant		
Sample Age:	107d 19h	**Station:**	P140505.28		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
13-4768-2245	Combined Proportion Norm	0.054	0.133	0.08475	NA		Fisher Exact/Bonferroni Adj Test
17-8076-6667	Proportion Normal	0.054	0.133	0.08475	NA		Fisher Exact/Bonferroni Adj Test

Point Estimate Summary

Analysis ID	Endpoint	Level	mg/L	95% LCL	95% UCL	TU	Method
04-1532-7472	Combined Proportion Norm	EC50	0.08475	0.054	0.133		Binomial/Graphical
17-8396-8103	Proportion Normal	EC50	0.08475	0.054	0.133		Binomial/Graphical

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
17-8076-6667	Proportion Normal	Control Resp	0.9538	0.9 - NL	Yes	Passes Acceptability Criteria
17-8396-8103	Proportion Normal	Control Resp	0.9538	0.9 - NL	Yes	Passes Acceptability Criteria

Combined Proportion Normal Summary

C-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	3	0.8079	0.2164	1	0.5339	0.9647	0.1375	0.2381	29.47%	0.0%
0.015		3	0.9459	0.8142	1	0.8941	1	0.0306	0.05301	5.6%	-17.07%
0.028		3	0.9802	0.8951	1	0.9407	1	0.01977	0.03425	3.49%	-21.33%
0.054		3	0.9426	0.8185	1	0.9096	1	0.02882	0.04992	5.3%	-16.67%
0.133		3	0	0	0	0	0	0	0		100.0%
0.214		3	0	0	0	0	0	0	0		100.0%
0.294		3	0	0	0	0	0	0	0		100.0%

Proportion Normal Summary

C-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	3	0.9538	0.8514	1	0.9065	0.982	0.02381	0.04124	4.32%	0.0%
0.015		3	0.9721	0.9604	0.9838	0.9681	0.9773	0.002723	0.004716	0.49%	-1.92%
0.028		3	0.9734	0.9446	1	0.96	0.9807	0.006694	0.01159	1.19%	-2.05%
0.054		3	0.9726	0.9435	1	0.9601	0.9834	0.006762	0.01171	1.2%	-1.97%
0.133		3	0	0	0	0	0	0	0		100.0%
0.214		3	0	0	0	0	0	0	0		100.0%
0.294		3	0	0	0	0	0	0	0		100.0%

CETIS Test Data Worksheet

Mussel Shell Development Test — **ENVIRON**

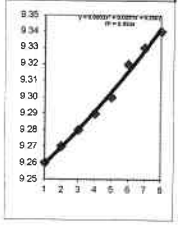
Start Date:	20 Aug-14 18:55	**Species:**	Mytilus galloprovincialis	**Sample Code:**	6B3D70A
End Date:	22 Aug-14 16:55	**Protocol:**	EPA/600/R-95/136 (1995)	**Sample Source:**	Reference Toxicant
Sample Date:	05 May-14	**Material:**	Unionized Ammonia	**Sample Station:**	P140505.28

C-mg/L	Code	Rep	Pos	Initial Density	Final Density	# Counted	# Normal	Notes
0	D	1	18	708	667	667	655	
0	D	2	10	708	702	702	683	
0	D	3	9	708	417	417	378	
0.015		1	15	708	749	749	732	
0.015		2	7	708	690	690	668	
0.015		3	14	708	652	652	633	
0.028		1	21	708	775	775	744	
0.028		2	11	708	725	725	711	
0.028		3	5	708	680	680	666	
0.054		1	3	708	721	721	709	
0.054		2	4	708	661	661	644	
0.054		3	6	708	677	677	650	
0.133		1	17	708	714	714	0	
0.133		2	2	708	702	702	0	
0.133		3	20	708	674	674	0	
0.214		1	13	708	682	682	0	
0.214		2	16	708	738	738	0	
0.214		3	12	708	698	698	0	
0.294		1	1	708	636	636	0	
0.294		2	8	708	806	806	0	
0.294		3	19	708	678	678	0	

CLIENT:	Anchor	Date of Test:	20-Aug-14
PROJECT:	Alexander Ave.	Test Type:	Mytilus ammonia RT
COMMENTS:			

To convert Total Ammonia (mg/L) to Free (un-ionized) Ammonia (mg/L) enter the corresponding total ammonia, salinity, temperature, and pH.

Integer: I-factor	
1	9.26
2	9.27
3	9.28
4	9.29
5	9.30
6	9.32
7	9.33
8	9.34



	Sample	Mod	NH3T (mg/L)	salinity (ppt)	pH	temp (C)	temp (K)	i-factor	Mod	NH3U (mg/L)
	Target / Sample Name		Actual	22.9	8.0	24.1	297.26	9.3053		#VALUE!
	Example 3.5		2.000	10.0	7.5	5.0	278.16	9.2750		0.008
1										
2										
3	0.75		0.734	27	7.9	16.8	289.96	9.3160		0.015
4	1.5		1.35	27	7.9	16.8	289.96	9.3160		0.028
5	3		2.62	28	7.9	16.8	289.96	9.3187		0.054
6	6		8.06	28	7.8	16.9	290.06	9.3187		0.133
7	12		12.9	27	7.8	16.9	290.06	9.3160		0.214
8	18		17.700	28	7.8	17.0	290.16	9.3187		0.294
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
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46										

ENVIRON

LARVAL DEVELOPMENT TEST
AMMONIA REF TOX WQ

CLIENT	PROJECT	SPECIES	NEWFIELDS LAB / LOCATION		PROTOCOL
Anchor	Alexander Avenue	*Mytilus galloprovincialis*	Port Gamble / Incubator		PSEP (1995)
JOB NUMBER	PROJECT MANAGER	TEST START DATE:	TIME	TEST END DATE	TIME
	B. Gardiner	20Aug14	1855	22Aug14	1655
TEST ID	LOT #:				
P140505.28	3244C535				

WATER QUALITY DATA

DILTIN.WAT.BATCH	ORGANISM BATCH	REFERENCE TOX. MATERIAL	REFERENCE TOXICANT
FSW082014.01		Ammonium chloride	Ammonia - TAN

					DO (mg/L)		TEMP(C)		SAL (ppt)		pH			
					>5.0		16 ± 1		28 ± 1		7 - 9			
CLIENT/ NEWFIELDS ID	CONCENTRATION value	CONCENTRATION units	DAY	REP	D.O. meter	D.O. mg/L	TEMP. meter	TEMP. °C	SALINITY meter	SALINITY ppt	pH meter	pH unit	TECH.	DATE
Ref.Tox.-Ammonia - TAN	Target: 0	mg/L	0	Stock	8	7.7	8	16.8	8	28	8	7.8	CR	8/20
	Actual: 0.0332		1	Stock			9	15.1					JL	8/21
			2	Stock	8	7.6	8	15.1	8	31	8	7.7	JL	8/22
			3	Stock										
			4	Stock										
Ref.Tox.-Ammonia - TAN	Target: 0.75	mg/L	0	Stock	8	7.5	8	16.8	8	27	8	7.9	CR	8/20
	Actual: 0.734		1	Stock			9	15.1					JL	8/21
			2	Stock	8	8.0	8	15.0	8	30	8	7.8	JL	8/22
			3	Stock										
			4	Stock										
Ref.Tox.-Ammonia - TAN	Target: 1.5	mg/L	0	Stock	8	7.3	8	16.8	8	27	8	7.9	CR	8/20
	Actual: 1.35		1	Stock			9	15.1					JL	8/21
			2	Stock	8	8.3	8	15.2	8	30	8	7.8	JL	8/22
			3	Stock										
			4	Stock										
Ref.Tox.-Ammonia - TAN	Target: 3	mg/L	0	Stock	8	7.5	8	16.8	8	28	8	7.9	CR	8/20
	Actual: 2.62		1	Stock			9	15.1					JL	8/21
			2	Stock	8	8.4	8	15.0	8	30	8	7.8	JL	8/22
			3	Stock										
			4	Stock										
Ref.Tox.-Ammonia - TAN	Target: 6	mg/L	0	Stock	8	7.3	8	16.9	8	28	8	7.8	CR	8/20
	Actual: 8.06		1	Stock			9	15.1					JL	8/21
			2	Stock	8	8.5	8	15.0	8	30	8	7.8	JL	8/22
			3	Stock										
			4	Stock										
Ref.Tox.-Ammonia - TAN	Target: 12	mg/L	0	Stock	8	7.3	8	16.9	8	27	8	7.8	CR	8/20
	Actual: 12.9		1	Stock			9	15.1					JL	8/21
			2	Stock	8	8.6	8	15.1	8	30	8	7.8	JL	8/22
			3	Stock										
			4	Stock										
Ref.Tox.-Ammonia - TAN	Target: 18	mg/L	0	Stock	8	7.3	8	17.0	8	28	8	7.8	CR	8/20
	Actual: 17.7		1	Stock			9	15.1					JL	8/21
			2	Stock	8	8.6	8	15.2	8	30	8	7.7	JL	8/22
			3	Stock										
			4	Stock										

ENVIRON

LARVAL DEVELOPMENT TEST
AMMONIA REF TOX OBSERVATION SHEET

CLIENT	PROJECT	JOB NUMBER	SPECIES		
Anchor	Alexander Avenue		*Mytilus galloprovincialis*		
PROJECT MANAGER	**NEWFIELDS LAB / LOCATION**	**PROTOCOL**			
B. Gardiner	Port Gamble / Incubator	PSEP (1995)			
TEST ID	**ORGANISM BATCH**	**TEST START DATE:**	**TIME**	**TEST END DATE:**	**TIME**
P140505.28	3244C535	20 Aug 14	1855	22 Aug 14	1655

LARVAL OBSERVATION DATA

CLIENT/ NEWFIELDS ID	CONC. value	CONC. units	VIAL NUMBER	REP	NUMBER NORMAL	NUMBER ABNORMAL	DATE	TECHNICIAN	COMMENTS
Ref.Tox. - Ammonia - TAN	0	mg/L		1	655	12	9/4/14	lw	
				2	683	19			
				3	378	39			
Ref.Tox. - Ammonia - TAN	0.75	mg/L		1	732	17			
				2	668	22			
				3	633	19			
Ref.Tox. - Ammonia - TAN	1.5	mg/L		1	744	31			
				2	711	14			
				3	666	14			
Ref.Tox. - Ammonia - TAN	3	mg/L		1	709	12			
				2	644	17			
				3	650	27			
Ref.Tox. - Ammonia - TAN	6	mg/L		1	0	714			
				2	0	702			
				3	0	674			
Ref.Tox. - Ammonia - TAN	12	mg/L		1	0	682			
				2	0	738			
				3	0	698			
Ref.Tox. - Ammonia - TAN	18	mg/L		1	0	636			
				2	0	806			
				3	0	678			
STOCKING DENSITY				1		730			
				2		694			
				3		699			

APPENDIX B

Statistical Comparisons

Project Name: Port Gamble SMS

Sample:	x1
Samp ID:	BW11
Alias:	
Replicates:	5
Mean:	35.08
SD:	10.93
Tr Mean:	36.097
Trans SD:	6.753

Ref Samp:	x2
Ref ID:	CARR
Alias:	
Replicates:	5
Mean:	17.58
SD:	4.356
Tr Mean:	24.67
Trans SD:	3.206

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	3.43
SS:	223.548
K:	5
b:	14.685
Alpha Level:	0.05
Calculated Value:	0.9647
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	5.592
Test Residual SD:	2.554
Ref. Residual Mean:	2.62
Ref. Residual SD:	1.303
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	2.3176
Critical Value:	>= 1.860
Variances Homogeneous:	No

Test Results:

Statistic:	Approximate t
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Degrees of Freedom:	6
Experimental Alpha Level:	0.1
Calculated Value:	3.418
Critical Value:	>= 1.440
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	20.3	26.779	14.9	22.706	9.318	1.964			-9.318
2	46.8	43.165	15.2	22.947	7.068	1.723			-4.662
3	40.8	39.699	24.2	29.468	3.602	4.798			-2.863
4	40.3	39.407	13.8	21.807	3.31	2.863			-1.964
5	27.2	31.435	19.8	26.422	4.662	1.752			-1.723

Project Name: Port Gamble SMS

Sample:	x1
Samp ID:	BW12
Alias:	
Replicates:	5
Mean:	29.96
SD:	8.275
Tr Mean:	32.981
Trans SD:	5.441

Ref Samp:	x2
Ref ID:	CARR
Alias:	
Replicates:	5
Mean:	17.58
SD:	4.356
Tr Mean:	24.67
Trans SD:	3.206

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	2.898
SS:	159.515
K:	5
b:	12.01
Alpha Level:	0.05
Calculated Value:	0.9043
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	4.209
Test Residual SD:	2.73
Ref. Residual Mean:	2.62
Ref. Residual SD:	1.303
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.1748
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	2.9429
Critical Value:	>= 1.397
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	26.9	31.242	14.9	22.706	1.739	1.964			-8.784
2	36.7	37.287	15.2	22.947	4.306	1.723			-2.863
3	34	35.669	24.2	29.468	2.687	4.798			-1.964
4	16.8	24.197	13.8	21.807	8.784	2.863			-1.739
5	35.4	36.511	19.8	26.422	3.53	1.752			-1.723
6									1.752
7									2.687
8									3.53
9									4.306
10									4.798

Project Name: Port Gamble SMS

Sample:	x1
Samp ID:	BW15
Alias:	
Replicates:	5
Mean:	40.22
SD:	3.544
Tr Mean:	39.349
Trans SD:	2.07

Ref Samp:	x2
Ref ID:	CARR
Alias:	
Replicates:	5
Mean:	17.58
SD:	4.356
Tr Mean:	24.67
Trans SD:	3.206

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	1.751
SS:	58.244
K:	5
b:	7.353
Alpha Level:	0.05
Calculated Value:	0.9282
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	1.485
Test Residual SD:	1.236
Ref. Residual Mean:	2.62
Ref. Residual SD:	1.303
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.4133
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	8.6016
Critical Value:	>= 1.397
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	41.4	40.048	14.9	22.706	0.699	1.964			-2.863
2	45.4	42.361	15.2	22.947	3.012	1.723			-2.538
3	35.9	36.81	24.2	29.468	2.538	4.798			-1.964
4	38.4	38.293	13.8	21.807	1.056	2.863			-1.723
5	40	39.232	19.8	26.422	0.117	1.752			-1.056
6									-0.117
7									0.699
8									1.752
9									3.012
10									4.798

Project Name: Port Gamble SMS

Sample:	x1
Samp ID:	BW16
Alias:	
Replicates:	5
Mean:	37.12
SD:	0.268
Tr Mean:	37.536
Trans SD:	0.159

Ref Samp:	x2
Ref ID:	CARR
Alias:	
Replicates:	5
Mean:	17.58
SD:	4.356
Tr Mean:	24.67
Trans SD:	3.206

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	1.473
SS:	41.212
K:	5
b:	6.062
Alpha Level:	0.05
Calculated Value:	0.8916
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.128
Test Residual SD:	0.069
Ref. Residual Mean:	2.62
Ref. Residual SD:	1.303
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	4.27
Critical Value:	>= 1.860
Variances Homogeneous:	No

Test Results:

Statistic:	Approximate t
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Degrees of Freedom:	4
Experimental Alpha Level:	0.1
Calculated Value:	8.9631
Critical Value:	>= 1.533
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	37.3	37.643	14.9	22.706	0.107	1.964			-2.863
2	37.3	37.643	15.2	22.947	0.107	1.723			-1.964
3	37.3	37.643	24.2	29.468	0.107	4.798			-1.723
4	37	37.465	13.8	21.807	0.071	2.863			-0.249
5	36.7	37.287	19.8	26.422	0.249	1.752			-0.071
6									0.107
7									0.107
8									0.107
9									1.752
10									4.798

Project Name: Port Gamble SMS

Sample:	x1
Samp ID:	BW18
Alias:	
Replicates:	5
Mean:	29.86
SD:	6.067
Tr Mean:	33.04
Trans SD:	3.768

Ref Samp:	x2
Ref ID:	CARR
Alias:	
Replicates:	5
Mean:	17.58
SD:	4.356
Tr Mean:	24.67
Trans SD:	3.206

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	2.27
SS:	97.894
K:	5
b:	9.466
Alpha Level:	0.05
Calculated Value:	0.9152
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	2.804
Test Residual SD:	2.09
Ref. Residual Mean:	2.62
Ref. Residual SD:	1.303
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.1672
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	3.7833
Critical Value:	>= 1.397
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	31.8	34.327	14.9	22.706	1.287	1.964			-4.314
2	27.2	31.435	15.2	22.947	1.605	1.723			-2.863
3	28	31.948	24.2	29.468	1.092	4.798			-1.964
4	39.2	38.763	13.8	21.807	5.723	2.863			-1.723
5	23.1	28.726	19.8	26.422	4.314	1.752			-1.605
6									-1.092
7									1.287
8									1.752
9									4.798
10									5.723

Project Name: Port Gamble SMS

Sample:	x1
Samp ID:	BW19
Alias:	
Replicates:	5
Mean:	27.92
SD:	3.802
Tr Mean:	31.857
Trans SD:	2.419

Ref Samp:	x2
Ref ID:	CARR
Alias:	
Replicates:	5
Mean:	17.58
SD:	4.356
Tr Mean:	24.67
Trans SD:	3.206

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	1.843
SS:	64.512
K:	5
b:	7.582
Alpha Level:	0.05
Calculated Value:	0.8911
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	1.858
Test Residual SD:	1.239
Ref. Residual Mean:	2.62
Ref. Residual SD:	1.303
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.9474
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.1
Calculated Value:	4.002
Critical Value:	>= 1.397
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	24.2	29.468	14.9	22.706	2.39	1.964			-2.863
2	28.8	32.456	15.2	22.947	0.599	1.723			-2.39
3	33.4	35.305	24.2	29.468	3.448	4.798			-2.256
4	28.8	32.456	13.8	21.807	0.599	2.863			-1.964
5	24.4	29.601	19.8	26.422	2.256	1.752			-1.723
6									0.599
7									0.599
8									1.752
9									3.448
10									4.798

Project Name: Port Gamble SMS

Sample:	x1
Samp ID:	PGSS29
Alias:	
Replicates:	5
Mean:	16.44
SD:	1.944
Tr Mean:	23.89
Trans SD:	1.535

Ref Samp:	x2
Ref ID:	CR-11
Alias:	
Replicates:	5
Mean:	17.58
SD:	4.356
Tr Mean:	24.67
Trans SD:	3.206

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	1.631
SS:	50.535
K:	5
b:	6.865
Alpha Level:	0.05
Calculated Value:	0.9326
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	1.032
Test Residual SD:	1.013
Ref. Residual Mean:	2.62
Ref. Residual SD:	1.303
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	2.1519
Critical Value:	>= 1.860
Variances Homogeneous:	No

Test Results:

Statistic:	Approximate t
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Degrees of Freedom:	6
Experimental Alpha Level:	0.1
Calculated Value:	-0.4907
Critical Value:	>= 1.440
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	18.2	25.253	14.9	22.706	1.363	1.964			-2.863
2	16.3	23.812	15.2	22.947	0.078	1.723			-2.501
3	13.3	21.389	24.2	29.468	2.501	4.798			-1.964
4	16.5	23.966	13.8	21.807	0.077	2.863			-1.723
5	17.9	25.029	19.8	26.422	1.14	1.752			-0.078
6									0.077
7									1.14
8									1.363
9									1.752
10									4.798

APPENDIX C

CHAIN-OF-CUSTODY FORMS

Chain of Cust **Record & Laboratory Analysis Request**

Laboratory Number: Environ

Date: 8/11/14
Project Name: Port Gamble
Project Number: 130388-01.01
Project Manager: Nathan Soccorsy
Phone Number: (206) 287-9130
Shipment Method: Drop off @ Lab

ANCHOR QEA

Anchor QEA
Suite 1900
720 Olive Way
Seattle WA 98101

Line	Field Sample ID	Collection Date/Time	Matrix	No. of Containers	Test Parameters: Larval Bioassay	Test Parameters: Grain Size	Comments/Preservation
1	BW-11-140811	8/11/14 1515	SE	1	X	X	5.6
2	BW-12-140811	0830		1	X	X	5.6
3	BW-15-140811	1150		1	X	X	5.6
4	BW-16-140811	1545		1	X	X	5.6
5	BW-18-140811	1015		1	X	X	4.6
6	BW-19-140811	1125		1	X	X	05.6 4.6
7	PGSS-29-140811	0915		1	X	X	4.6
8							
9							
10							
11							
12							
13							
14							
15							

Notes:

Relinquished By:	Company:	Received By:	Company:
Even Malczyk	Anchor QEA	Brian Heste	ENVIRON
8/11/14 1640		8/11/14 1640	
Signature/Printed Name Date/Time		Signature/Printed Name Date/Time	
Relinquished By:	Company:	Received By:	Company:
Signature/Printed Name Date/Time		Signature/Printed Name Date/Time	

(1) WC 8.11.14 BH

Distribution: A copy will be made for the laboratory and client. The Project file will retain the original.

ATTACHMENT A-3-6
DATA VALIDATION REPORTS (ON CD)

ATTACHMENT A-3-7
LABORATORY REPORTS (ON CD)

ATTACHMENT A-4
EELGRASS AND HABITAT SURVEY REPORT

EELGRASS AND HABITAT SURVEYS IN PORT GAMBLE BAY, WASHINGTON

OCTOBER 24, 2014

PREPARED FOR:

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Introduction

As part of the Port Gamble Bay Cleanup Project, ENVIRON conducted eelgrass and habitat surveys in northwestern Port Gamble Bay, Washington (Figure 1). Areas that are being considered for either piling and structure removal, dredging, capping, or enhanced monitored natural recovery (EMNR) were evaluated for their potential effects on eelgrass beds (*Zostera marina*). While *Zostera japonica* is present in intertidal substrates of Port Gamble Bay, it is not common in the two sediment management areas (SMAs) proposed for sediment cleanup actions and was not included in these surveys. Additionally, the presence of macroalgae as well as observations of any vertebrates/invertebrates and substrate type were recorded at each station.

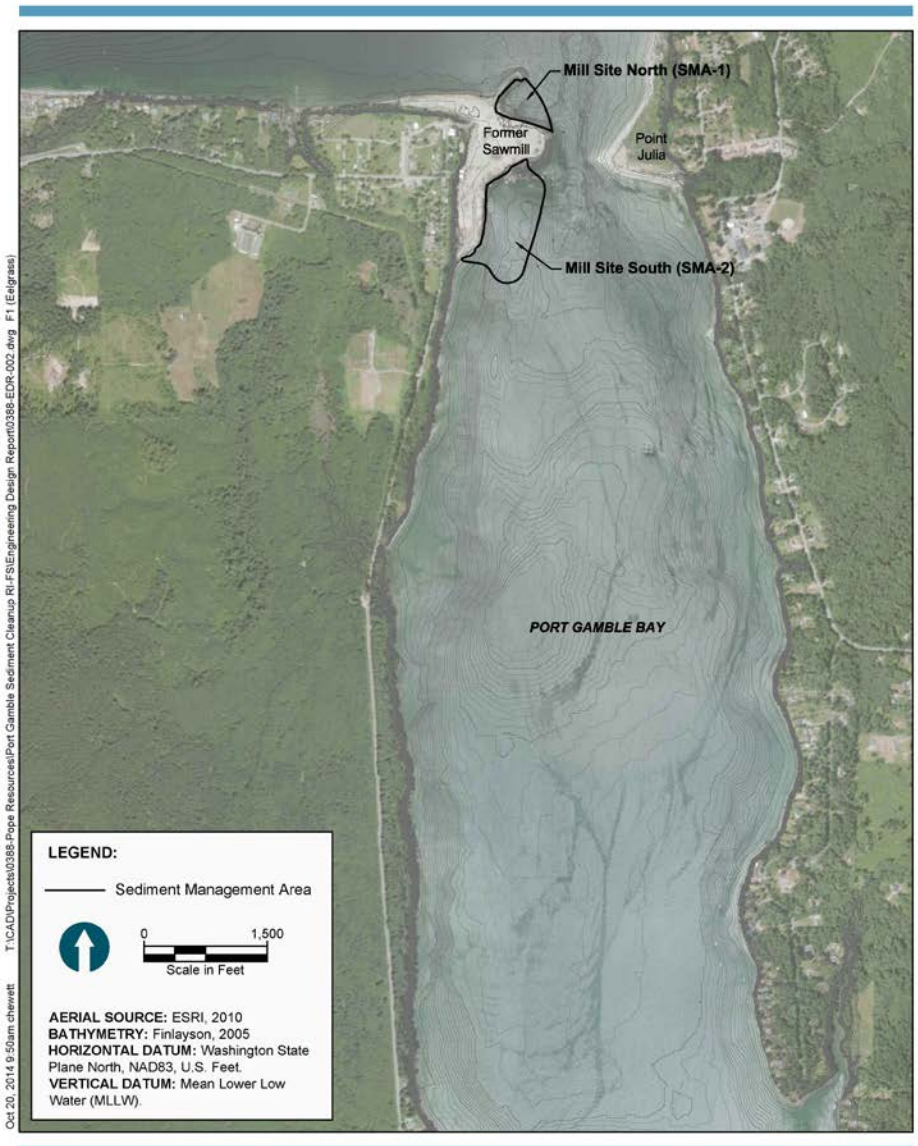

Figure 1
Sediment Management Areas
Port Gamble Eelgrass Report
Port Gamble Bay and Mill Site

ANCHOR QEA

The areas surveyed include the Mill Site North (SMA-1) and Mill Site South (SMA-2). SMA-1 is an approximately six acre embayment that includes those intertidal and subtidal lands bounded by the rock jetty northwest of the Port Gamble Bay entrance and the northwestern shore of the Bay entrance (Figure 1). SMA-2 is an approximately 20 acre area that includes those intertidal and subtidal lands immediately east and south of the former sawmill.

Methods

Underwater surveys were conducted in SMA-1 and SMA-2 between September 16 and 30, 2014. The eelgrass and habitat surveys were conducted in accordance with the Washington Department of Fish and Wildlife (WDFW) guidelines as described in their publication "*Eelgrass/Macroalgae Habitat Surveys*" with some modification to allow for characterization of the large SMAs. Surveys included both shore-perpendicular and shore-parallel transects, as well as "perimeter" surveys to assist in understanding the extent of certain eelgrass beds. All surveys were conducted by ENVIRON staff using standard SCUBA equipment.

The WDFW guidelines are generally applied to proposed docks or other well defined shoreline structures. For intensive surveys, WDFW recommends placing two transects on either side of the centerline of a project (e.g., a dock) and then additional transects at the outer boundary of the structure. For both SMA-1 and SMA-2, large areas are proposed for sediment cleanup actions, with over 3,000 feet of shoreline. Due to the large areas to be surveys, survey designs were modified used to better characterize eelgrass within each of the study areas.

For SMA-1, the transects were placed to characterize the area near the existing dock that is proposed for piling and structure removal and dredging, as well as transects to characterize the basins to the north and south of the existing dock that are proposed for capping. The dock was used as an approximate center line for the SMA; transects were placed parallel to this line (Figure 2). Three transect heads were established north of the center line at distances of 10, 60 and 185 feet from the center. Four transect heads were marked south of the center line at distances of 10, 60, 185 and 310 feet from the center. At the northernmost portion of the SMA, an additional shore-parallel transect was conducted along the -8 feet mean lower low water (ft. MLLW; SMA1-0), along the slope of the jetty. This allowed for a better characterization of the eelgrass beds that were found in this area. Additional stations were added to the north of transect SMA1-3 to better characterize the density of this eelgrass bed.

Transect heads in SMA-1 were located at the 0 ft. MLLW contour or at the outer boundary of existing structures that prevented surveys nearer to shore. Surveys were conducted on a compass heading that was either parallel to the existing dock structure in SMA-1 or were oriented perpendicular to the shoreline and extended 300 ft. In some cases, transects were less than 300 ft. based on the boundary of the SMA or if it was clear that the depth along the transect exceeded the depth range for eelgrass in Port Gamble Bay (generally greater than -14 feet MLLW).

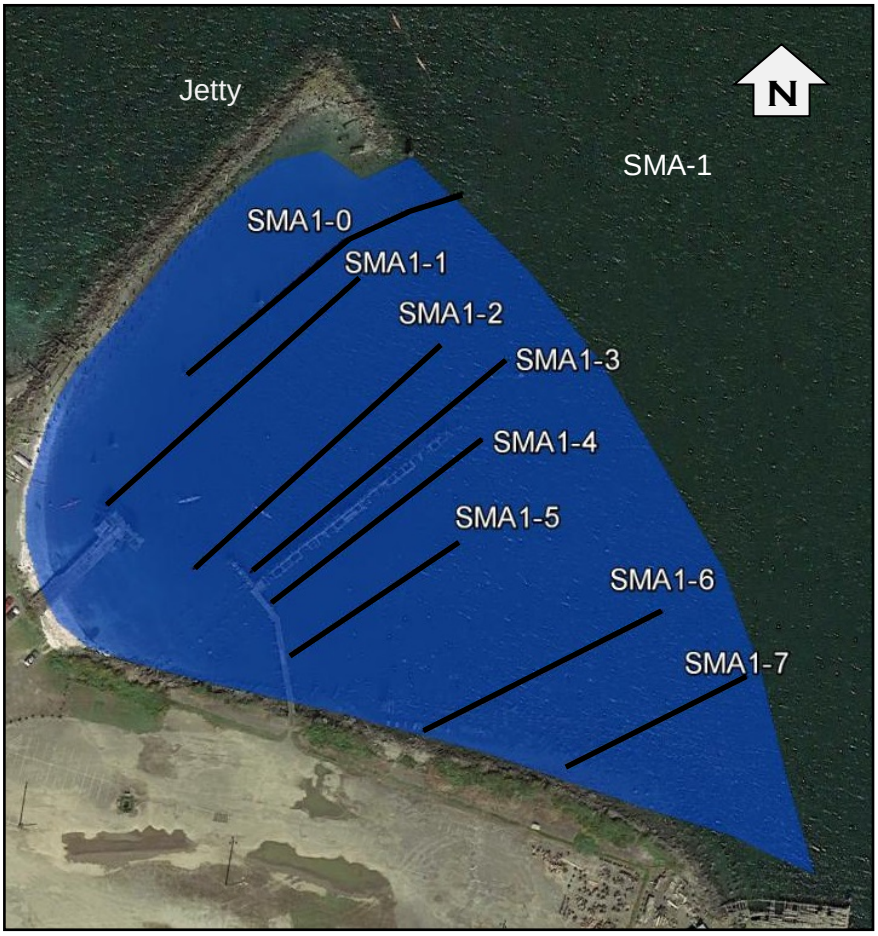

Figure 2. Location of transects in SMA-1

Shore-parallel transects were performed throughout SMA-2 in order to identify where more intensive shore-perpendicular transects were needed to delineate eelgrass beds. Shore-parallel transects were conducted along the 0 ft., -5 ft. and -10 ft. MLLW contours, at depths where eelgrass had been observed during previous surveys in Port Gamble Bay. Based on the findings of the shore-parallel survey, as well as observations made during previous surveys conducted in the study area, SMA-2 was divided into two sections on either side of Pier 5 in the northwest corner of the project area. Area SMA-2N included all transects north and east of Pier 5. Area SMA-2S included all transects south of Pier 5. Five transect heads were identified on the shoreline and spaced 125 feet apart in SMA-2N, with one additional transect added 50 feet east of the project area (Figure 3). More closely spaced surveys were performed in SMA-2S where large and dense eelgrass beds were observed during the shore-parallel survey. Starting at the northwest margin of the area and working southward, nine transects were marked 62.5 feet apart along the shoreline. Three more transects were performed at 125 foot intervals continuing south to the end of the project area.

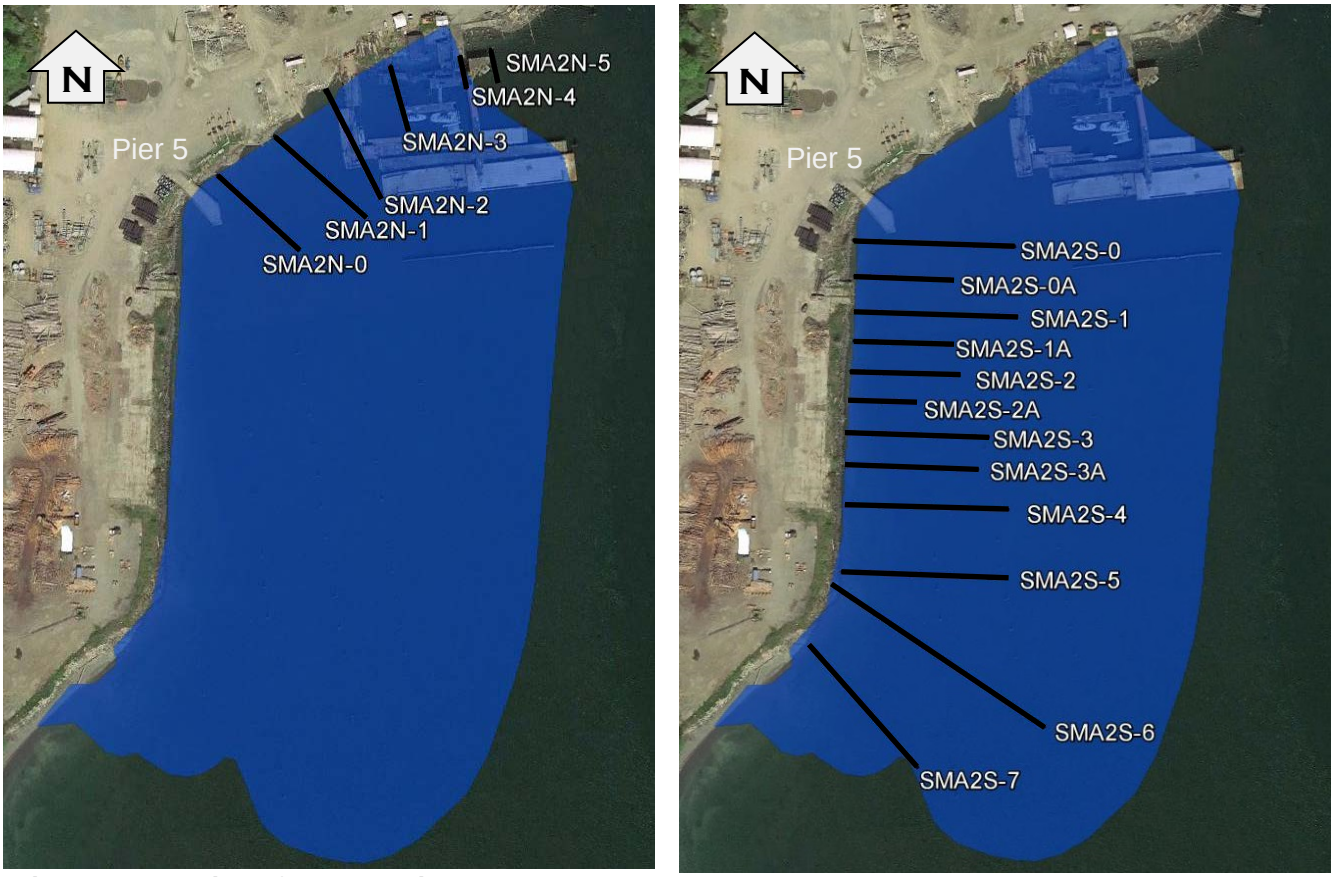

Figure 3. Location of transects in SMA-2

In SMA-2, transect heads were located at the base on the riprap. Four transects in SMA-2S were extended in order to characterize the habitat over the entire project area and to confirm the absence of eelgrass in the outer portions of the SMA. SMA2S-1, SMA2S-3, SMA2S-5, and SMA2S-6 were extended in order to evenly cover the project area (Figure 4).

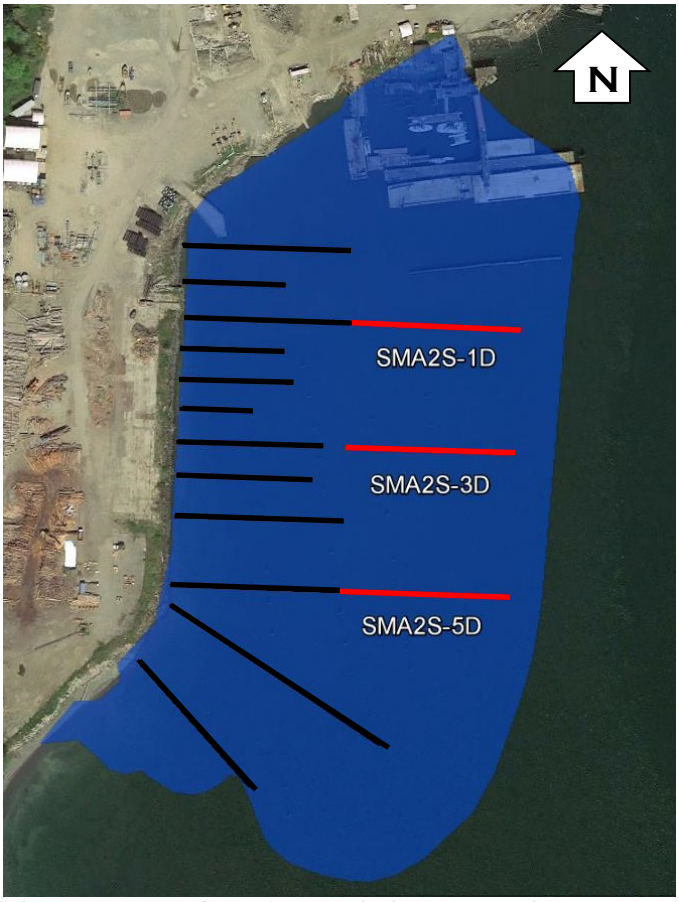

Figure 4. Location of extended transects in SMA-2

For all transects, stations were located at 20 foot intervals along each transect, as measured by a 300 foot tape. Depth, eelgrass density, presence of macroalgae, as well as observations of any vertebrates/invertebrates, and substrate type (including the presence of wood) were recorded at each station. Depth was measured by diver computers or depth gauges. When present on station, eelgrass was enumerated in three locations using a 0.25 square meter (m^2) quadrat. One corner of the quadrat was placed on the transect line at the established station and the opposite corner was rotated to two, six and ten o'clock for three replicate counts of eelgrass turion density. Observations beyond 300 ft. were performed in a similar manner to other transects, except that stations were located every 50 feet.

A final survey was performed in southern portion of SMA-2S to delineate the boundary of what was found to be the densest eelgrass. Divers swam the margin of the bed while their location was tracked on the surface. A handheld GPS unit was used to mark waypoints to indicate the boundary of the bed. Divers also relayed information on depth at waypoints to help synchronize coordinates on bathymetric charts.

Results

The results of the eelgrass and habitat surveys are summarized in this section. Data recorded for each station is presented in Appendix A.

Mill Site North – SMA-1

A total of eight transect surveys were conducted in SMA-1 (Table 1). The head of each transect was located at approximately 0 feet MLLW with a heading of approximately 40°NNE. The head of transects SMA1-0, 3, 4, and 5 were located in deeper waters either due to structures at shallower locations or based on previous observations that eelgrass was not present in the shallower areas. During previous surveys, the shallower portions of SMA1-3, 4, and 5 were observed to be dominated by cobble, sand, shell hash, with heavy debris; eelgrass was not observed in this area. The head of transect SMA1-0 was located approximately 140 feet beyond the head of SMA1-1 to allow for a better characterization of the eelgrass beds along the southern slope of the rock jetty.

Table 1. Location of Transects Conducted in SMA-1

Transect	Date	Time	Transect Head		Compass Heading	Distance (ft.)	Comments
			Latitude	Longitude			
SMA1-0	9/29/2014	1525	47° 51.428'	122° 34.865'	NA	300	-8 ft. depth contour
SMA1-1	9/29/2014	1410	47° 51.409	122° 34.883	40°	300	
SMA1-2	9/16/2014	1450	47° 51.398'	122° 34.865'	40°	300	
SMA1-3	9/16/2014	1525	47° 51.399'	122° 34.851'	40°	280	10' north of dock
SMA1-4	9/18/2014	945	47° 51.394'	122° 34.847'	40°	240	10' south of dock
SMA1-5	9/18/2014	1030	47° 51.386'	122° 34.843'	40°	180	
SMA1-6	9/30/2014	1020	47° 51.375	122° 34.813	50°	240	
SMA1-7	9/30/2014	1055	47° 51.370	122° 34.782	50°	180	

In general, the intertidal portion (less than -2 ft. MLLW) of SMA-1 was dominated by gravel, silt, sand, and shellhash. Along the southern portion of the embayment, the intertidal substrate was primarily riprap and cobble. Throughout the northern and central portion of the bay, the slope dramatically increased between approximately -8 to -10 ft. MLLW and -14 to -18 ft. MLLW and the substrate shifted from sand to fine silt and silt. Approximately 200 to 250 ft. from the transect head, the substrate shifted to silty sand to sand. Near the existing dock structure, depth decreased from -18 ft. to -12 ft. MLLW and the substrate shifted to sand with shell hash. Along the southern portion of SMA-1 represented by transects SMA1-6 and 7, the substrate was primarily silty sand and sand.

Low to moderate density eelgrass beds were observed in the northern embayment, either as isolated plants (Figure 6) or as patchy beds (Figure 7). Low to moderate eelgrass beds were observed along the southern slope of the rock jetty; moderate density eelgrass beds were observed along the northern edge of the existing dock structure. Eelgrass was observed in the shoals along the northern portion of the existing dock with density counts ranging from 4 to 20 turions per 0.25 m^2 and mean station densities of 1.3 to 11.7 turions per 0.25 m^2 (4 to 50 plants per m^2). The eelgrass in this area occurred as patches that can cover 40 to 50% of the substrate where documented.

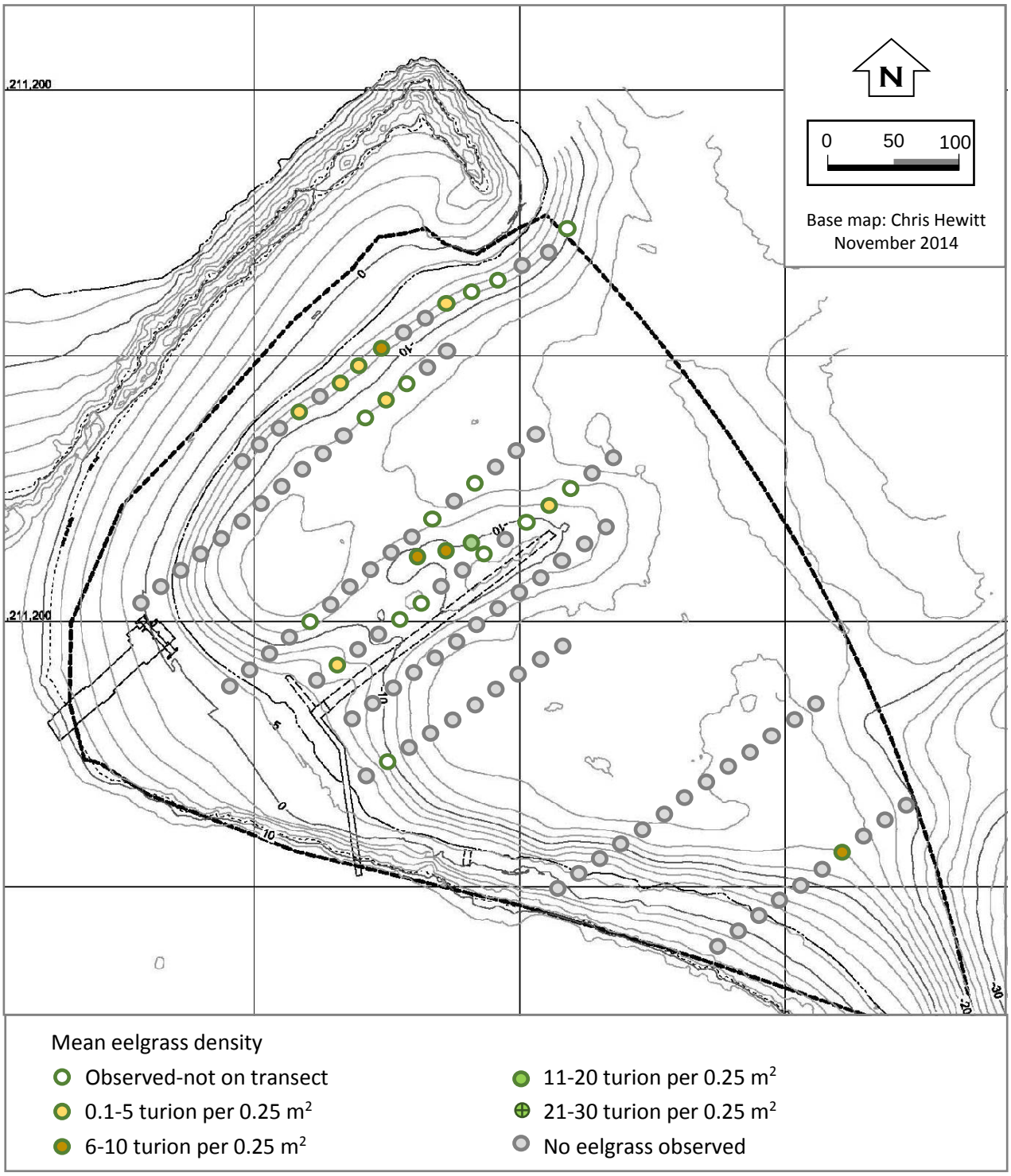

Figure 5. Mean eelgrass density observed at stations in SMA-1

Figure 6. Examples of individual eelgrass plants in SMA-1

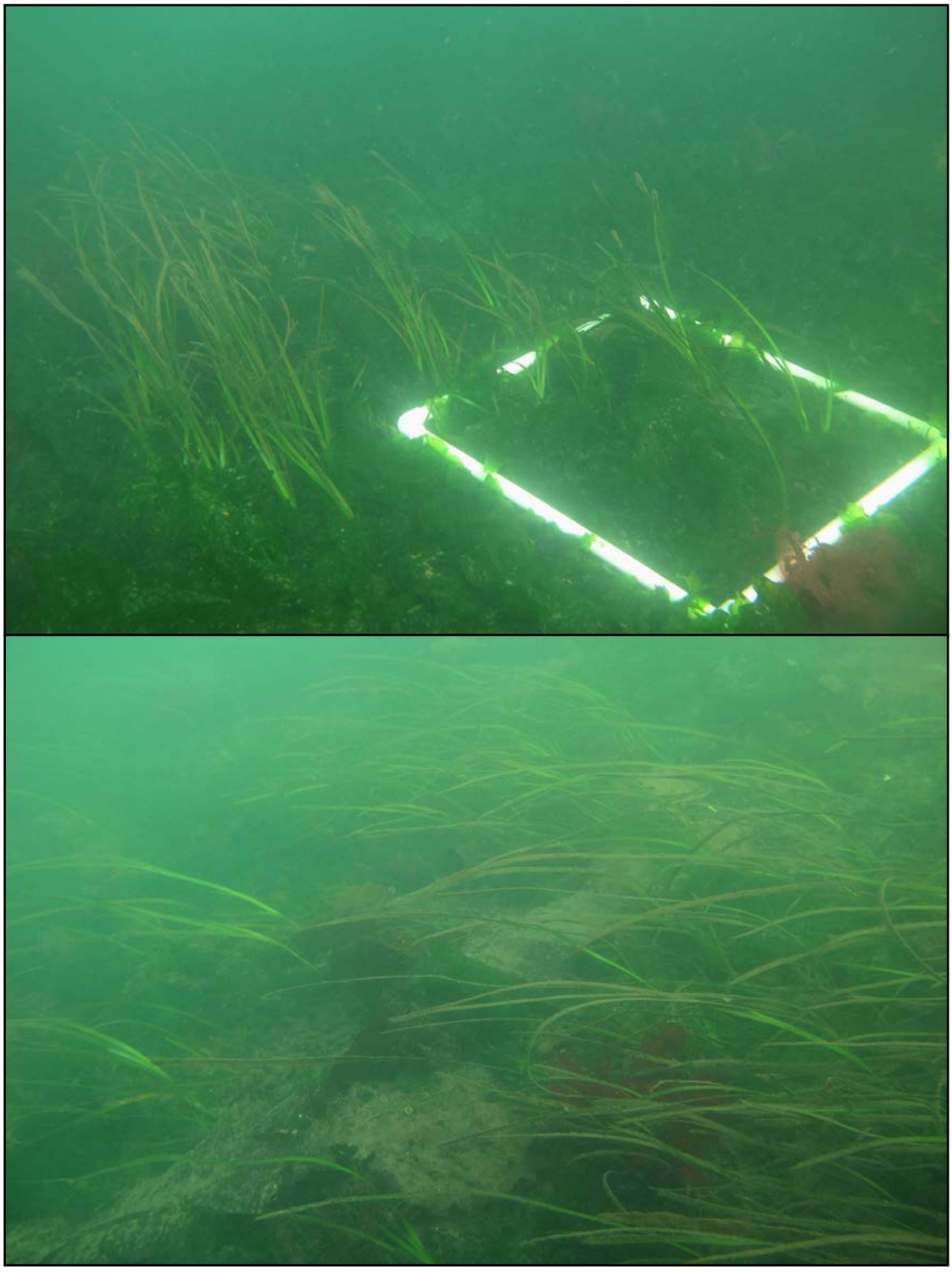

Figure 7. Examples of patchy eelgrass beds in SMA-1

Along the southern slope of the rock jetty, eelgrass was observed between depths of approximately -6 ft. and -10 ft. MLLW. Eelgrass density counts in this area ranged from 1 to 11 turions per 0.25 m^2, with mean turion density at each station of 0.3 to 7.0 turions per 0.25 m^2 or <4 to 28 turions per m^2. This bed appears as an elongated bed that covers 20% to 40% of the bottom where documented.

Macroalgae (*Ulva* and *Enteromorpha*) were common throughout the SMA-1 survey area and coverage was 80 to 100% in some areas, particularly in the intertidal area and along the slopes in the northern and central portion of SMA-1. Attached *Ulva* and drift *Ulva* spp. and *Laminaria* spp. dominated the base of the slope and can be found covering nearly 100% of the bottom substrate in portions of SMA-1. There was some *Gracilaria* present (up to 5-40% coverage), however, plants were generally small, partially buried in very fine silt and rotting drift kelp. Towards the end of the transects (260 to 300 feet), *Gracilaria* density increased to 10 to 30%, with a mix of small and larger plants.

Mill Site South – SMA-2

The northern portion of SMA-2 included those areas north of the breakwater and alder chip mill and have areas with existing overwater structures and docks. A total of six transects were conducted in the SMA-2N, with SMA2N-5 being just outside the footprint of the proposed sediment cleanup actions (Figure 3, Table 2). A small intertidal area immediately beyond the bulkhead in the eastern portion of SMA2N descended steeply to the channel depth of greater than -20 ft. MLLW. Sediment in this sloping area was a mixture of fine silt, sand, shell hash. The intertidal area was more gradual in the areas represented by transects SMA2N-0, 1, and 2. The substrate was comprised of sand with silt. No eelgrass was counted in the SMA-2N transects. One turion was noted near to transect SMA2N-3 at the 60-foot station, but no other eelgrass was observed. Macroalgae was less common than in SMA-1, with percent cover generally between 0 and 40%. *Ulva* spp. was the dominant microalgae species.

In the southern portion of SMA-2, three shore-parallel transects were conducted to determine the general distribution of eelgrass in this area. Shore parallel transects were conducted along bathymetric contours of 0 ft., -5 ft. and -10 ft. MLLW from the northwestern corner of SMA-2 to the southern portion of the area. Eelgrass was found throughout this portion of SMA-2. At the northernmost portion of the area, individual plants or small groups of 5 to 10 plants were observed (Figure 8a). Eelgrass density increased approximately 100 ft. south of Pier 5, with frequent interconnected patches of eelgrass that were moderately dense (5 to 45 plants per m^2; Figure 8b, c). Patches were common between depths of -2 ft. and -12 ft. MLLW. Approximately 500 ft. south of Pier 5, the eelgrass bed becomes dense (30 to >200 plants per m^2) and continuous and extends to the south of the site (Figure 9). Based on the shore-parallel transects, a total of 12 shore-perpendicular transects were conducted in SMA-2S (Table 2).

In general, the shallow intertidal portion (less than 0 ft. MLLW) of SMA-2S was dominated by gravel and sand. The slope from 0 ft. to approximately -14 ft. MLLW (the depth range for eelgrass) occurred over approximately 100 ft. on transects SMA2S-1 through 2a. This slope increased in the middle portion of the SMA, narrowing to a linear distance of 20 to 40 ft. on transects SMA2S-3 through 4. In the southern portion of the SMA, the slope decreased and the linear distance represented by the 0 ft. to -14 ft. MLLW increased to 100 to 200 ft.

Beyond the -14 ft. MLLW contour, depth increased gradually to -20 to -28 ft. MLLW and substrate shifted to fine and very fine silt. At the outer portion of the SMA (400 to 500 ft. from the transect head), depth decreased and the substrate shifted to sand. A boulder patch was observed at the outer portion of transects SMA2S-1 and 1a, where depth decreased to less than -10 ft. MLLW. The boulder patch formed a hard substrate community, with well-developed coralline algae, attached *Laminaria* spp., *Cucumaria* sp., shrimp, and a variety of rock-reef fish.

As indicated in the shore-parallel transects, eelgrass was found in SMA-2S between depths of approximately -2 ft. MLLW and -14 ft. MLLW. In the areas represented by transects SMA2S-1 through 3, the eelgrass bed was defined by interconnected patches of moderately dense eelgrass, with eelgrass density counts ranging from of 1 to 16 turions per 0.25 m^2 and mean densities of 0.3 to 11.3 turions per 0.25 m^2 (1.3 to 45 plants per m^2). In this portion of the SMA, eelgrass patches occupy 40 to 50% of the area.

Table 2. Location of Transects in SMA-2

Transect	Date	Time	Transect Head		Compass Heading	Distance (ft.)	Comments
			Latitude	Longitude			
Shore Parallel Transects							
SMA2-0'	9/22/2014	1030	NA	NA	NA	NA	0 ft. MLLW contour
SMA2-5'	9/23/2014	1130	NA	NA	NA	NA	-5 ft. MLLW contour
SMA2-10'	9/23/2014	1130	NA	NA	NA	NA	-10 ft. MLLW contour
Northern Portion of SMA-2							
SMA2N-0	9/24/2014	930	47 51.254	122 34.903	130	200	
SMA2N-1	9/24/2014	955	47 51.265	122 34.877	120	220	
SMA2N-2	9/24/2014	1025	47 51.279	122 34.855	150	220	
SMA2N-3	9/24/2014	1055	47 51.286	122 34.826	140	120	
SMA2N-4	9/30/2014	1640	47° 51.289	122° 34.795	150	60	NE corner of SMA2
SMA2N-5	9/30/2014	1640	47° 51.290	122° 34.781	150	60	~50' east of project area
Southern Portion of SMA-2							
SMA2S-0	9/30/2014	1330	47° 51.237'	122° 34.924'	75	300	
SMA2S-0A	9/29/2014	1150	47 51.226	122 34.920	60	180	Added to refine patches
SMA2S-1	9/26/2014	940	47° 51.212'	122° 34.924'	60	300	
SMA2S-1A	9/26/2014	1010	47 51.207	122 34.920	60	180	Added to refine patches
SMA2S-2	9/24/2014	1530	47 51.197	122 34.922	80	200	
SMA2S-2A	9/25/2014	1426	47 51.189	122 34.922	80	120	Added to refine patches
SMA2S-3	9/24/2014	1600	47 51.179	122 34.923	80	260	
SMA2S-3A	9/29/2014	1030	47 51.169	122 34.923	80	240	Added to refine patches
SMA2S-4	9/25/2014	1029	47° 51.157	122° 34.924	80	300	
SMA2S-5	9/25/2014	945	47° 51.137	122° 34.927	80	300	
SMA2S-6	9/25/2014	1330	47° 51.132	122° 34.927	130	450	
SMA2S-7	9/29/2014	1107	47 51.116	122 34.941	135	300	
SMA-2SP	10/03/14	1610	Eelgrass bed perimeter survey				Added to refine bed
SMA2S-1D	9/30/2014	1415	47.51.213	122.34.846	60	300	began 300' from SMA2S-1 transect head
SMA2S-3D	9/30/2014	1530	47 51.177	122 34.849	80	300	began 300' from SMA2S-3 transect head
SMA2S-5D	9/30/2014	1550	47 51.135	122 34.853	80	300	began 300' from SMA2S-5 transect head

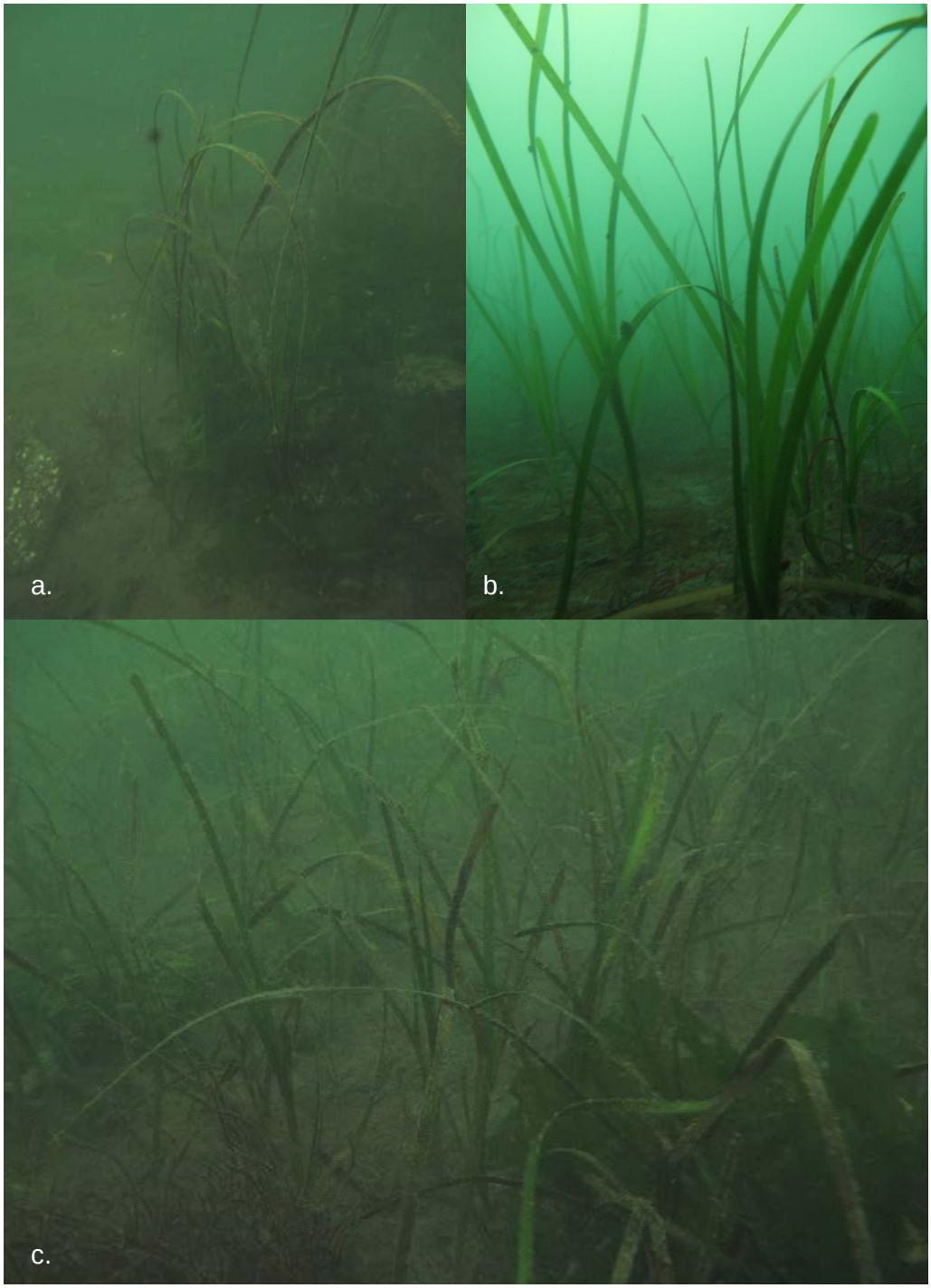

Figure 8. Examples of individual eelgrass plants (a) and eelgrass patches (b, c) in SMA-2

Figure 9. Dense beds of eelgrass in SMA-2

A dense eelgrass bed was observed in the southern portion of SMA-2S, extending from SMA-3a to the southern boundary of SMA-2. Eelgrass density counts were up to 67 turions per 0.25 m^2, and the mean turion density at stations in this area ranged from 7.3 to 52.3 turions per 0.25 m^2 or 29 to 209 eelgrass plants m^2. Due to a widening of the intertidal shelf in this portion of the site, the area of dense eelgrass (>100 turions per m^2) extended >100 linear feet along the SMA2S-6 and 7 transects. The eelgrass bed in southern SMA-2 covered approximately 80 to 100% of the substrate within the depth range of approximately -3 ft. to -10 ft. MLLW. At the edge of this depth range, eelgrass was less dense 30 to 100 turions per m^2.

At the outer portion of SMA-2, a shallow "bar" occurs, with depths decreasing to -10 to -20 ft. MLLW. This area was dominated by sand; no eelgrass was observed in this area.

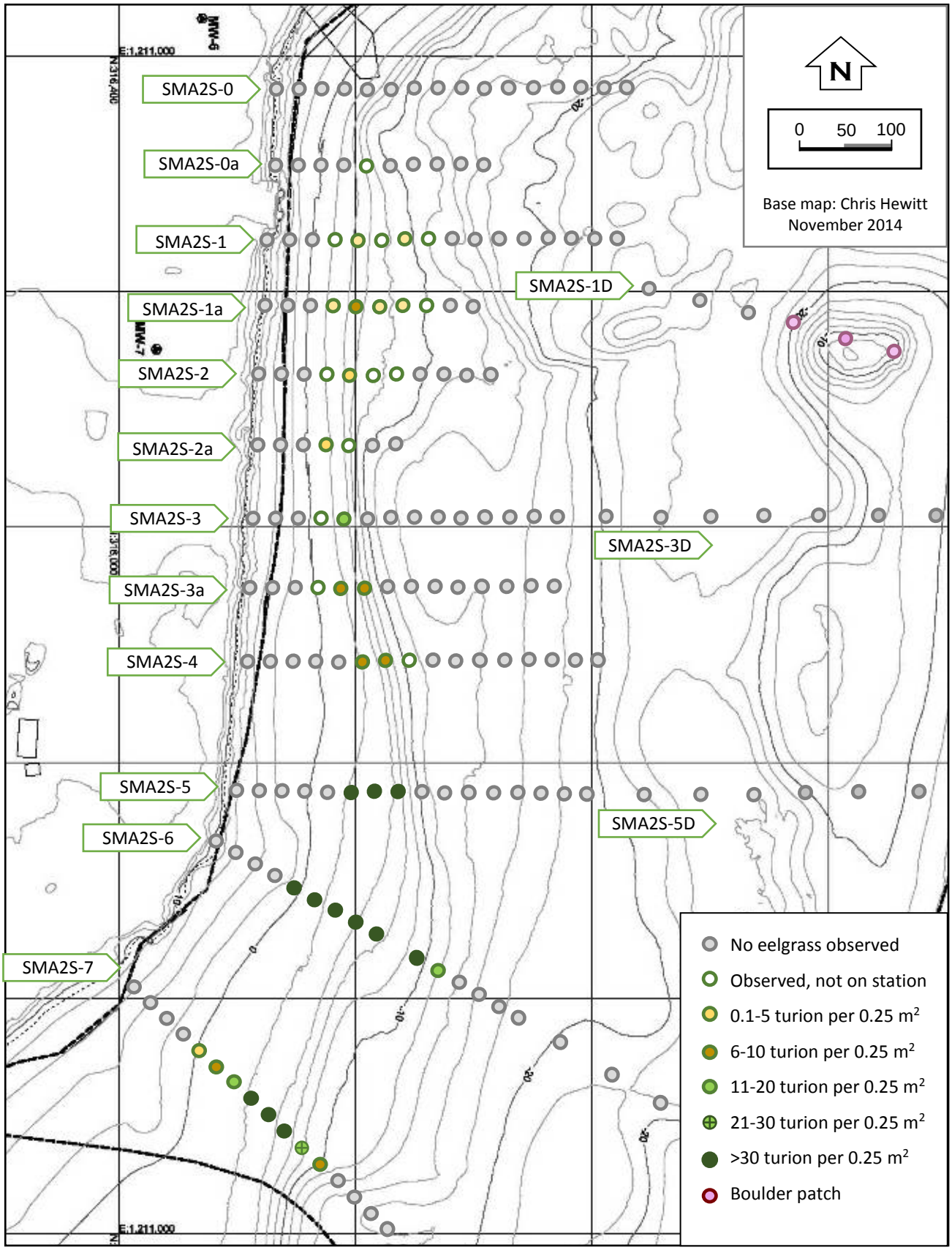

Figure 10. Mean eelgrass density observed at stations in SMA-2

Discussion

Based on the surveys conducted in SMA-1 and SMA-2, there were four areas of significant eelgrass distribution. In SMA-1, eelgrass beds were found north of the existing dock and south of the rock jetty (Figure 11). In both cases, eelgrass beds were comprised of low to moderately dense patches with 4 to 50 plants per m^2. Eelgrass beds occurred between depths of -6 ft. and -12 ft. MLLW.

Based on a compilation of shore-parallel and shore-perpendicular transects, as well as a perimeter survey, significant eelgrass beds were observed along the western portion of SMA-2 from approximately 65 feet south of Pier 5 to the southern boundary of the site (Figure 12). Interconnected patches of moderately dense eelgrass (5 to 45 plants per m^2) were observed in the areas to the north becoming a continuous bed of dense eelgrass (>100 plants per m^2) to the south.

A substantial boulder-patch rocky reef community was observed at the outer boundary of SMA-2, at depths of -8 ft. to -20 ft. MLLW. Coralline algae and other hard-substrate macro algae species were well developed and the reef provided habitat to a number of invertebrate and fish species.

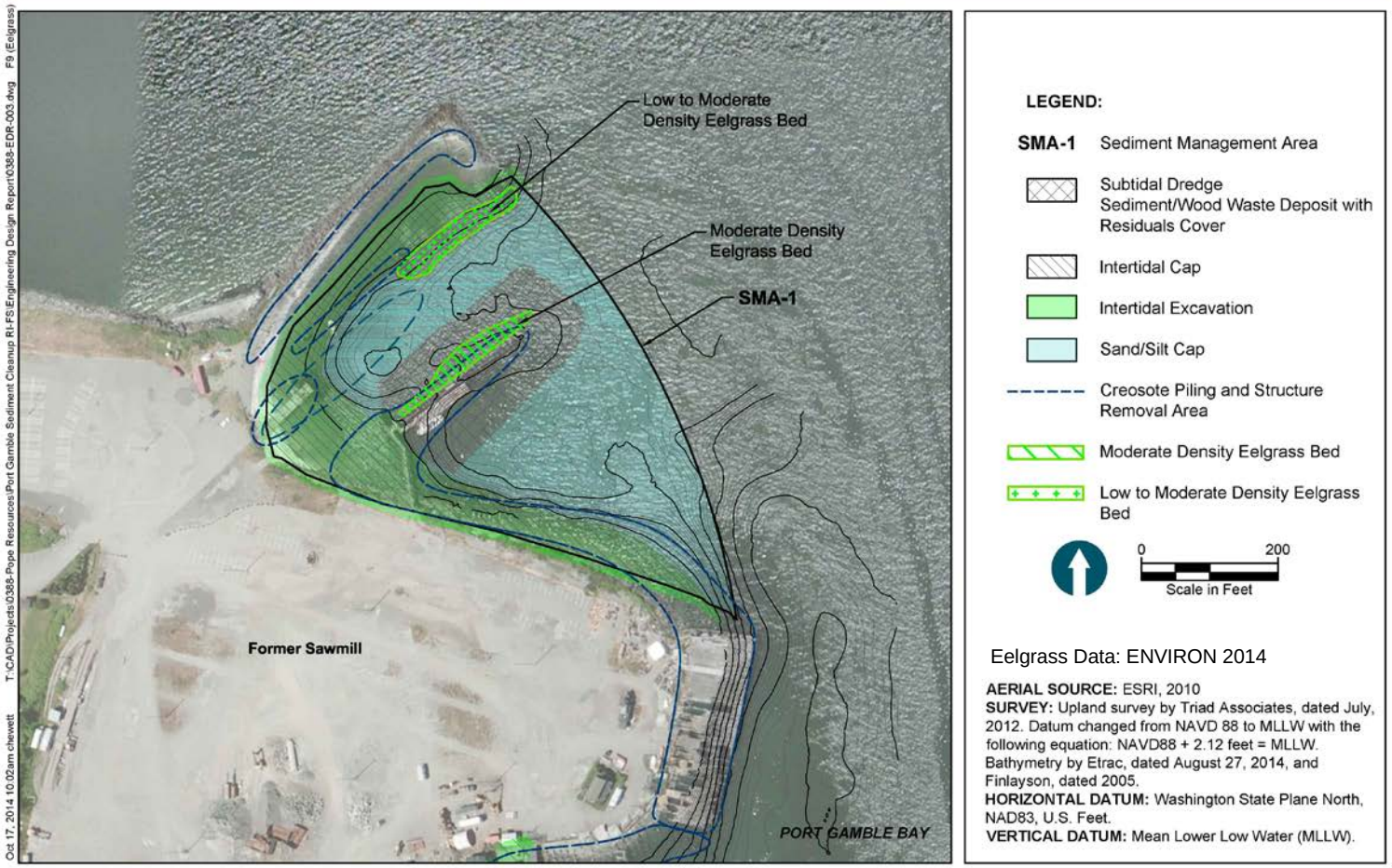

Figure 11

Eelgrass Beds Observed in SMA-1 with Engineering Design
Port Gamble Bay and Mill Site

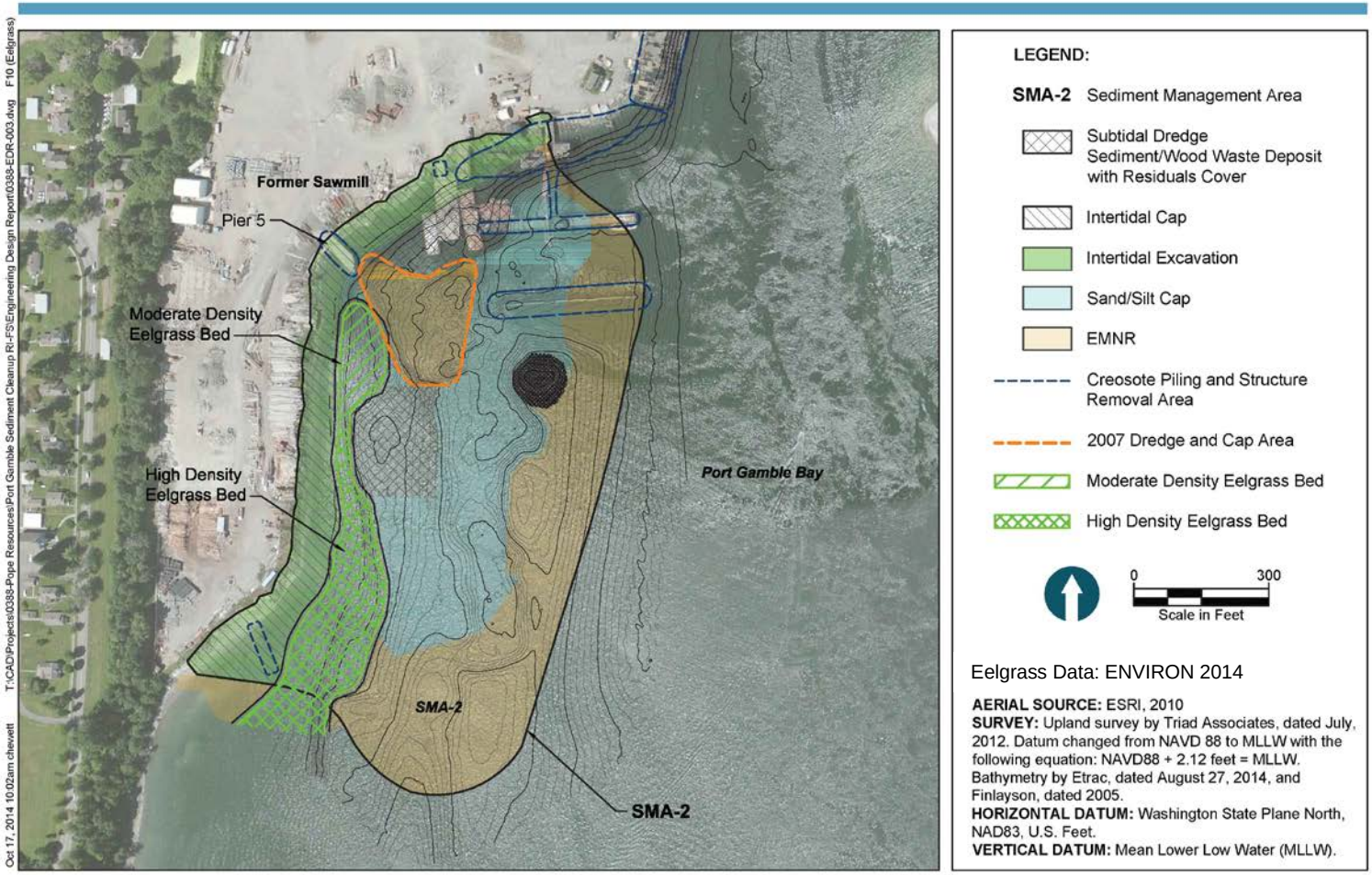

Figure 12

Eelgrass Beds Observed in SMA-2 with Engineering Design
Port Gamble Bay and Mill Site

Appendix A

Field Survey Data

List of abbreviations:

Algae Type
U- *Ulva sp.*
L- *Laminaria sp.*
G- *Gracilaria sp.*
F- *Fucus sp.*
C- *Chondracanthus sp.*

Substrate
S- Silt
Sa- Sand
Gr- Gravel
C- Cobble
Sh- Shells/Shell hash
Lww- Light wood waste
Mww- Medium wood waste
Hww- Heavy wood waste

Table A1. Observations from transects in SMA-1

Station	Corrected Depth (-ft. MLLW)	Eelgrass Turions (per 0.25 m^2)			Station Mean Turions		Eelgrass Near Station	Macro algae (% area)	Algae Type	Substrate
		1	2	3	per 0.25m^2	per m^2				
SMA1-0	Date: 9/29/14		Time: 1525			Starting location: Lat. 47° 51.428' Long. 122° 34.865'				
0	9	0	0	0	0.0	0.0		100	U, G, L	S, Sa
20	9	0	0	0	0.0	0.0		100	U, G, L	S, Sa
40	9	0	0	0	0.0	0.0		100	U, G, L	S, Sa
60	8	1	0	0	0.3	1.3		0		S, Sa
80	8	0	0	0	0.0	0.0		0		S, Sa
100	8	8	0	2	3.3	13.3		100	U, G	S
120	9	1	0	0	0.3	1.3		0		S, Sa
130	9	Start of Eelgrass bed								
140	9	8	11	2	7.0	28.0		100	U	S, Sa, Gr
158	8	End of Eelgrass bed								
160	8	0	0	0	0.0	0.0		100	U, G	S, Sa, Gr
180	8	0	0	0	0.0	0.0		100	U, G	S, Sa, Gr
200	8	0	6	2	2.7	10.7		0		S, Sa
220	8	0	0	0	0.0	0.0	●	50	U, G	Gr, Sa
240	8	0	0	0	0.0	0.0	●	0		S, Gr
260	8	0	0	0	0.0	0.0		50	U, G	Sa, Gr
280	10	0	0	0	0.0	0.0		0		Sa, Gr, Sh
300	10	0	0	0	0.0	0.0	●	20	U, L	Sh, Gr
SMA1-1	Date: 9/29/14		Time: 1410			Starting location: Lat. 47° 51.409' Long. 122° 34.883'				
0	0	0	0	0	0.0	0.0		20	U	S, Sa
20	0	0	0	0	0.0	0.0		20	U, G	S, Sa
40	2	0	0	0	0.0	0.0		40	U, G	S, Sa
60	6	0	0	0	0.0	0.0		60	U, G	S, Sa
80	10	0	0	0	0.0	0.0		100	U, G	S, Sa
100	14	0	0	0	0.0	0.0		100	U	S
120	14	0	0	0	0.0	0.0		100	U, L, G	Sa, S
140	14	0	0	0	0.0	0.0		100	U, L, G	Sa, Gr
160	14	0	0	0	0.0	0.0		100	U, L, G	Sa, Gr
180	14	0	0	0	0.0	0.0		100	U, L, G	Sa, Gr
200	14	0	0	0	0.0	0.0		100	U, L, G	Sa, S
220	14	0	0	0	0.0	0.0	●	100	U, L, G	Sa , Gr
240	14	8	3	0	3.7	14.7		100	U, L, G	Sa , Gr
260	14	0	0	0	0.0	0.0	●	100	U, L, G	Sa, Gr
280	14	0	0	0	0.0	0.0		100	U, L, G	Sa, Gr, Sh
300	14	0	0	0	0.0	0.0		100	U, L, G	Gr, Sh

Table A1. Observations from transects in SMA-1

Station	Corrected Depth (-ft. MLLW)	Eelgrass Turions (per 0.25 m^2)			Station Mean Turions		Eelgrass Near Station	Macro algae (% area)	Algae Type	Substrate
		1	2	3	per 0.25m^2	per m^2				
SMA1-2 Date: 9/16/14 Time: 1450 Starting location: Lat. 47° 51.398' Long. 122° 34.865'										
0	0	0	0	0	0.0	0.0		20	U	Sa
20	3	0	0	0	0.0	0.0		30	U	S, Sa
40	5	0	0	0	0.0	0.0		60	U	S, Sa
60	7	0	0	0	0.0	0.0		80	U	S, Sa
80	10	0	0	0	0.0	0.0	●	80	U	S, Sa
100	13	0	0	0	0.0	0.0		80	U	S
120	16	0	0	0	0.0	0.0		40	U, L	S, Sa
140	17	0	0	0	0.0	0.0		40	U, L, G	S, Sa, Gr
160	18	0	0	0	0.0	0.0		20	G, L	S, Sa, Gr
180	17	0	0	0	0.0	0.0		20	G, L	S, Sa, Gr
200	16	0	0	0	0.0	0.0	●	20	G, L	S, Sa
220	16	0	0	0	0.0	0.0		40	G, U	Gr, Sa
240	16	0	0	0	0.0	0.0	●	10	G	S, Gr
260	15	0	0	0	0.0	0.0		20	G	Sa, Gr
280	16	0	0	0	0.0	0.0		10	G	Sa, Gr, Sh
300	19	0	0	0	0.0	0.0		20	G, U	Sh, Gr
SMA1-3 Date: 9/16/14 Time: 1525 Starting location: Lat. 47° 51.399' Long. 122° 34.851'										
0	7.5	0	0	0	0.0	0.0		0		Sh, Sa, Lww
20	8.5	0	1	3	1.3	5.3		0		S, Sa
40	10.5	0	0	0	0.0	0.0		30	G	S, Sa
60	12.5	0	0	0	0.0	0.0		10	G	S, Sa
80	11.5	0	0	0	0.0	0.0	●	10	G	S, Sa
100	12.5	0	0	0	0.0	0.0	●	10	G	S, Sa, Lww
120	12.5	0	0	0	0.0	0.0		30	G	S, Sa, Lww
140	12.5	0	0	0	0.0	0.0		30	G	S, Sa, Lww
160	10.5	0	0	0	0.0	0.0	●	10	G	S, Sa, Lww
180	11.5	0	0	0	0.0	0.0		20	G	S, Sa, Lww
200	12.5	0	0	0	0.0	0.0	●	20	G	S, Sa, Lww
220	12.5	0	2	6	2.7	10.7		20	G	S, Sa, Lww
240	13.5	0	0	0	0.0	0.0	●	20	G	S, Sa, Lww
260	16.5	0	0	0	0.0	0.0		20	G	S, Sa
280	18.5	0	0	0	0.0	0.0		20	G	S, Sa
SMA1-3 Added stations										
200	12	8	0	5	4.3	17.3		0		S, Sa
220	12	15	4	0	6.3	25.3		10	G	S, Sa
240	12	15	20	0	11.7	46.7		0		S, Sa

Table A1. Observations from transects in SMA-1

Station	Corrected Depth (-ft. MLLW)	Eelgrass Turions (per 0.25 m^2)			Station Mean Turions		Eelgrass Near Station	Macro algae (% area)	Algae Type	Substrate
		1	2	3	per 0.25m^2	per m^2				
SMA1-4	Date: 9/18/14		Time: 0945			Starting location: Lat. 47° 51.394' Long. 122° 34.847'				
0	4	0	0	0	0.0	0.0		0		Sh, Sa, S
20	7	0	0	0	0.0	0.0		60	U, L	Sh, Sa, S
40	9	0	0	0	0.0	0.0		80	G, L, U	Sh, Sa, S, Lww
60	13	0	0	0	0.0	0.0		40	G	S, Lww
80	15	0	0	0	0.0	0.0		0		S, Lww, Sh
100	17	0	0	0	0.0	0.0		60	G, U	S, Lww
120	16	0	0	0	0.0	0.0		100	G, L, U	S, Lww
140	17	0	0	0	0.0	0.0		100	G, L, U	S
160	16	0	0	0	0.0	0.0		80	L, U	S, Lww
180	16	0	0	0	0.0	0.0		80	L, U	S, Lww
200	16	0	0	0	0.0	0.0		80	G, L, U	S, Lww
220	16	0	0	0	0.0	0.0		60	G, L, U	S
240	16	0	0	0	0.0	0.0		60	G, L, U	S
SMA1-5	Date: 9/18/14		Time: 1030			Starting location: Lat. 47° 51.386' Long. 122° 34.843'				
0	3.5	0	0	0	0.0	0.0		60	U, L	Sh, Sa, S
20	6.5	0	0	0	0.0	0.0	•	100	U	Sh, Sa, S
40	12.5	0	0	0	0.0	0.0		80	U, L	S, Lww, Sa
60	15.5	0	0	0	0.0	0.0		80	U, L	Sa
80	17.5	0	0	0	0.0	0.0		60	U, L, G	S, Lww, Sh
100	18.5	0	0	0	0.0	0.0		80	U, L	S, Lww, Sa
120	18.5	0	0	0	0.0	0.0		40	G, L	S, Sa
140	17.5	0	0	0	0.0	0.0		40	G, L	S, Sa
160	17.5	0	0	0	0.0	0.0		40	G, L	S, Sa
180	17.5	0	0	0	0.0	0.0		40	G, L	S, Sa
SMA1-6	Date: 9/30/14		Time: 1020			Starting location: Lat. 47° 51.375' Long. 122° 34.813'				
0		0	0	0	0.0	0.0		0		rip rap
20	0	0	0	0	0.0	0.0		90	U	rip rap
40	1	0	0	0	0.0	0.0		40	U, F	rocky
60	4	0	0	0	0.0	0.0		30	U, F, G	Sh, Sa
80	8	0	0	0	0.0	0.0		10	U, F, G, C	Sh, Sa
100	10	0	0	0	0.0	0.0		30	U	Sh, Sa
120	12	0	0	0	0.0	0.0		20	L	Sh, Sa
140	15	0	0	0	0.0	0.0		20	U, L, G, C	Sh, Sa, C, Lww
160	18	0	0	0	0.0	0.0		40	L, U, G	Sh, Sa, C, Lww
180	17	0	0	0	0.0	0.0		40	G, L	Sh, Sa, C, Lww
200	18	0	0	0	0.0	0.0		40	G, L	Sh, Sa, C, Lww
220	18	0	0	0	0.0	0.0		60	G, L	Sh, Sa, C, Lww
240	18	0	0	0	0.0	0.0		60	G, L	Sh, Sa, C, Lww

Table A1. Observations from transects in SMA-1

Station	Corrected Depth (-ft. MLLW)	Eelgrass Turions (per 0.25 m^2)			Station Mean Turions		Eelgrass Near Station	Macro algae (% area)	Algae Type	Substrate
		1	2	3	per 0.25m^2	per m^2				
SMA1-7	Date: 9/30/14		Time: 1055			Starting location: Lat. 47° 51.370' Long. 122° 34.782'				
0		0	0	0	0.0	0.0		0		rip rap, C
20	-3	0	0	0	0.0	0.0		0		rip rap, C
40	0	0	0	0	0.0	0.0		80	U, F	C
60	4	0	0	0	0.0	0.0		50	U, C, G	C
80	9	0	0	0	0.0	0.0		20	U, C, G	Sh, Sa
100	10	0	0	0	0.0	0.0		20	U, C, G	Sh, Sa
120	14	8	12	6	8.7	34.7		0		Sh, Sa, Gr, Lww
140	16	0	0	0	0.0	0.0		40	U, G	Sh, Sa, Gr, Lww
160	18	0	0	0	0.0	0.0		40	G, L	Sa, Gr
180	19	0	0	0	0.0	0.0		40	L	Sa, Gr

Table A2. Observations from transects in SMA-2N

Station	Corrected Depth (-ft. MLLW)	Eelgrass Turions (per 0.25 m^2)			Station Mean Turions		Eelgrass Near Station	Macro algae (% area)	Algae Type	Substrate
		1	2	3	per 0.25m^2	per m^2				
SMA2N-0	Date: 9/24/14		Time: 0930			Starting location: Lat. 47° 51.254' Long. 122° 34.903'				
0		0	0	0	0.0	0.0		0		Rip rap
20		0	0	0	0.0	0.0		0		C
40	-1	0	0	0	0.0	0.0		0		C
60	2	0	0	0	0.0	0.0		50	U	Sa, Gr, Sh
80	6	0	0	0	0.0	0.0		40	U	Sa, S, Sh, Lww
100	9	0	0	0	0.0	0.0		50	U	S, Sa, Lww
120	12	0	0	0	0.0	0.0		20	U	S, Sa, Lww
140	14	0	0	0	0.0	0.0		5	U	S, Sa, Lww
160	14	0	0	0	0.0	0.0		5	U	S, Sa, Lww
180	16	0	0	0	0.0	0.0		5	G	S, Sa, Gr, Lww
200	17	0	0	0	0.0	0.0		5	G	S, Sa, Gr, Lww
SMA2N-1	Date: 9/24/14		Time: 0955			Starting location: Lat. 47° 51.265' Long. 122° 34.877'				
0		0	0	0	0.0	0.0		0		Rip rap
20		0	0	0	0.0	0.0		0		C
40	-0.5	0	0	0	0.0	0.0		0		C
60	3.5	0	0	0	0.0	0.0		30	U	Sa, Gr, Sh
80	8.5	0	0	0	0.0	0.0		20	U	Sa, S, Sh, Lww
100	11.5	0	0	0	0.0	0.0		20	U	Sa, S, Sh, Lww
120	13.5	0	0	0	0.0	0.0		5	U	Sa, S, Sh, Lww
140	15.5	0	0	0	0.0	0.0		5	U	S, Sh, Lww
160	16.5	0	0	0	0.0	0.0		5	U	S, Sh, Lww
180	16.5	0	0	0	0.0	0.0		0		S, Sh, Lww
200	18.5	0	0	0	0.0	0.0		0		S, Sh, Lww
220	22.5	0	0	0	0.0	0.0		0		S, Sh, Lww
SMA2N-2	Date: 9/24/14		Time: 1025			Starting location: Lat. 47° 51.279' Long. 122° 34.855'				
0		0	0	0	0.0	0.0		0		Rip rap
20		0	0	0	0.0	0.0		0		Rocky
40	0	0	0	0	0.0	0.0		0		Gr, Sa
60	3	0	0	0	0.0	0.0		80	U	Sa, Gr, S
80	7	0	0	0	0.0	0.0		40	U	Sa, S, Sh, Lww
100	10	0	0	0	0.0	0.0		30	U	Sa, S, Sh, Lww
120	14	0	0	0	0.0	0.0		30	U	Sa, S, Sh, Lww
140	14	0	0	0	0.0	0.0		10	U, G, L	Sa, S, Sh, Lww
160	14	0	0	0	0.0	0.0		10	L	Sa, Sh, Boulders
180	15	0	0	0	0.0	0.0		5	G	Sa, Sh, Boulders
200	19	0	0	0	0.0	0.0		5	G	S, Sa, Mww
220	20	0	0	0	0.0	0.0		0		S, Sa, Mww

Table A2. Observations from transects in SMA-2N

Station	Corrected Depth (-ft. MLLW)	Eelgrass Turions (per 0.25 m^2)			Station Mean Turions		Eelgrass Near Station	Macro algae (% area)	Algae Type	Substrate
		1	2	3	per 0.25m^2	per m^2				
SMA2N-3	Date: 9/24/14		Time: 1055			Starting location: Lat. 47° 51.286' Long. 122° 34.826'				
0		0	0	0	0.0	0.0		0		Sa, Gr
20		0	0	0	0.0	0.0		0		Sa, Gr
40	-0.5	0	0	0	0.0	0.0		0		Sa, Gr, S
60	2.5	0	0	0	0.0	0.0	●	10	U	Sa, S, Sh, Lww
80	7.5	0	0	0	0.0	0.0		10	U	Sa, S, Sh, Lww
100	13.5	0	0	0	0.0	0.0		10	U	S, Sa, Lww
120	20.5	0	0	0	0.0	0.0		0		S, Sa, Lww
SMA2N-4	Date: 9/30/14		Time: 1645			Starting location: Lat. 47° 51.289' Long. 122° 34.795'				
0	0	0	0	0	0.0	0.0		0	0	Sh, S, Gr
20	3	0	0	0	0.0	0.0		3	0	Sh, S
40	13	0	0	0	0.0	0.0		13	0	Sh, S
60	20	0	0	0	0.0	0.0		20	0	Sh, S
SMA2N-5	Date: 9/30/14		Time: 1640			Starting location: Lat. 47° 51.290' Long. 122° 34.781'				
0	1	0	0	0	0.0	0.0		0		Sh, S, Gr
20	8	0	0	0	0.0	0.0		0		Sh, S, Gr
40	18	0	0	0	0.0	0.0		0		S, Sh
60	25	0	0	0	0.0	0.0		0		S, Sh

Table A3. Observations from transects in SMA-2S

Station	Corrected Depth (-ft. MLLW)	Eelgrass Turions (per 0.25 m^2)			Station Mean Turions		Eelgrass Near Station	Macro algae (% area)	Algae Type	Substrate
		1	2	3	per 0.25m^2	per m^2				
SMA2S-0 Date: 9/25/14 Time: 1330 Starting location: Lat. 47° 51.132' Long. 122° 34.927'										
0	0	0	0	0	0.0	0.0		0		Sa, Gr
20	-1	0	0	0	0.0	0.0		10	U	S, Gr
40	3	0	0	0	0.0	0.0		100	U	S, Lww
60	8	0	0	0	0.0	0.0		100	U	S, Lww
80	10	0	0	0	0.0	0.0		100	U	S, Sa
100	12	0	0	0	0.0	0.0		0		S, Sa
120	14	0	0	0	0.0	0.0		0		S, Sa
140	15	0	0	0	0.0	0.0		20	U	S, Sa
160	17	0	0	0	0.0	0.0		0		S, Sa
180	17	0	0	0	0.0	0.0		0		S, Sa
200	20	0	0	0	0.0	0.0		0		Sa, Gr
220	21	0	0	0	0.0	0.0		0		Sa
240	23	0	0	0	0.0	0.0		0		Sa
260	23	0	0	0	0.0	0.0		0		Sa
280	23	0	0	0	0.0	0.0		0		Sa, Hww
300	24	0	0	0	0.0	0.0		0		Sa, Hww
SMA2S-0A Date: 9/29/14 Time: 1150 Starting location: Lat. 47° 51.226' Long. 122° 34.920'										
0		0	0	0	0.0	0.0		0		C
20	0	0	0	0	0.0	0.0		100	U	Sa, Gr, Sh
40	3	0	0	0	0.0	0.0		100	U	Sa, Gr
60	6	0	0	0	0.0	0.0		100	U	Sa, Gr
80	9	0	0	0	0.0	0.0	•	100	U	Sa, S
100	11	0	0	0	0.0	0.0		100	U	Sa, S
120	12	0	0	0	0.0	0.0		80	U, G	Sa, S
140	15	0	0	0	0.0	0.0		10	L	Sa, Gr, S
160	18	0	0	0	0.0	0.0		10	L, U	Sa, Gr, S
180	19	0	0	0	0.0	0.0		10	L, U, G	Sa, Gr, S

Table A3. Observations from transects in SMA-2S

Station	Corrected Depth (-ft. MLLW)	Eelgrass Turions (per 0.25 m^2)			Station Mean Turions		Eelgrass Near Station	Macro algae (% area)	Algae Type	Substrate
		1	2	3	per 0.25m^2	per m^2				
SMA2S-1 Date: 9/26/14 Time: 0940 Starting location: Lat. 47° 51.212' Long. 122° 34.924'										
0	-6.5	0	0	0	0.0	0.0		0		Rocky
20	-1.5	0	0	0	0.0	0.0		0		Gr
40	2.5	0	0	0	0.0	0.0		100	U	Sa, Gr
60	4.5	0	0	0	0.0	0.0	●	100	U	Sa, S
80	5.5	0	2	6	2.7	10.7		60	U	Sa, S
100	9.5	0	0	0	0.0	0.0	●	20	U, G	Sa, S
120	10.5	4	3	7	4.7	18.7		30	U, G	Sa, S
140	11.5	0	0	0	0.0	0.0	●	20	U, G	Sa, S
160	10.5	0	0	0	0.0	0.0		20	U, G, L	Sa, S, Lww
180	12.5	0	0	0	0.0	0.0		10	U, G, C	Sa, S, Mww
200	16.5	0	0	0	0.0	0.0		30	U, L	Sa, S, Mww
220	21.5	0	0	0	0.0	0.0		10	U, G	Sa, S, Mww, Gr
240	22.5	0	0	0	0.0	0.0		10	U	S, Gr, Mww
260	24.5	0	0	0	0.0	0.0		30	U, C	S, Gr, Mww
280	20.5	0	0	0	0.0	0.0		10	U, C	Sa, S, Gr, Lww
300	21.5	0	0	0	0.0	0.0		10	U, G, C	Sa, S, Gr, Mww
SMA2S-1D Date: 9/30/14 Time: 1415 Starting location: Lat. 47° 51.213' Long. 122° 34.846'										
0	16	0	0	0	0.0	0.0		10	U, G	S, Sa
50	21	0	0	0	0.0	0.0		10	L	S, Sa
100	23	0	0	0	0.0	0.0		0		S, Hww
150	24	0	0	0	0.0	0.0		100	L	S, Hww
200	20	0	0	0	0.0	0.0		0		Sa
250	9	0	0	0	0.0	0.0		0		Boulders
300	13	0	0	0	0.0	0.0		0		Boulders, Sa
SMA2S-1A Date: 9/26/14 Time: 1010 Starting location: Lat. 47° 51.207' Long. 122° 34.920'										
0	0	0	0	0	0.0	0.0				rocky
20	-2	0	0	0	0.0	0.0		60	U	Sa, Gr, S
40	2	0	0	0	0.0	0.0		100	U	Sa, S
60	4	3	1	0	1.3	5.3		100	U	Sa, S
71	5	Start of Eelgrass bed								
80	6	10	5	8	7.7	30.7		20	U	Sa, S
100	8	1	2	9	4.0	16.0		20	U	Sa, S
120	9	4	0	0	1.3	5.3		20	U	Sa, S
120	9	End of Eelgrass bed								
140	12	0	0	0	0.0	0.0	●	10	U, C, G	Sa, S, Lww
160	13	0	0	0	0.0	0.0		10	U	Sa, S, Lww
180	13	0	0	0	0.0	0.0		10	U, G	Sa, S, Lww

Table A3. Observations from transects in SMA-2S

Station	Corrected Depth (-ft. MLLW)	Eelgrass Turions (per 0.25 m^2)			Station Mean Turions		Eelgrass Near Station	Macro algae (% area)	Algae Type	Substrate
		1	2	3	per 0.25m^2	per m^2				
SMA2S-2	Date: 9/24/14	Time: 1530					Starting location: Lat. 47° 51.197' Long. 122° 34.922'			
0	0	0	0	0	0.0	0.0		0		Rocky
20	-1.5	0	0	0	0.0	0.0		0		Rocky
40	0.5	0	0	0	0.0	0.0		100	U	Sa
60	3.5	0	0	0	0.0	0.0	●	100	U	Sa
80	7.5	1	0	0	0.3	1.3		0		Sa
100	12.5	0	0	0	0.0	0.0	●	0		Sa, S
125	12.5	0	0	0	0.0	0.0	●	10	U, L	Sa, S, Lww
150	12.5	0	0	0	0.0	0.0		10	U, G	Sa, S
175	12.5	0	0	0	0.0	0.0		0		Sa, S
200	12.5	0	0	0	0.0	0.0		0		Sa, S
SMA2S-2A	Date: 9/25/14	Time: 1426					Starting location: Lat. 47° 51.399' Long. 122° 34.851'			
0	0	0	0	0	0.0	0.0		0		C
20	-1.5	0	0	0	0.0	0.0		0		C
40	0.5	0	0	0	0.0	0.0		100	U	Gr
60	2.5	1	0	0	0.3	1.3		100	U	S, Sa
66	4.5	Start of Eelgrass bed								
76	9.5	End of Eelgrass bed								
80	12.5	0	0	0	0.0	0.0	●	0		S
100	12.5	0	0	0	0.0	0.0		10	U	S
120	12.5	0	0	0	0.0	0.0		10	G	S

Table A3. Observations from transects in SMA-2S

Station	Corrected Depth (-ft. MLLW)	Eelgrass Turions (per 0.25 m^2)			Station Mean Turions		Eelgrass Near Station	Macro algae (% area)	Algae Type	Substrate, Comments
		1	2	3	per 0.25m^2	per m^2				
SMA2S-3 Date: 9/24/14 Time: 1600 Starting location: Lat. 47° 51.179' Long. 122° 34.923'										
0	0	0	0	0	0.0	0.0		0		Sa, C
20	-2	0	0	0	0.0	0.0		0		Sa, S, Sh
40	0	0	0	0	0.0	0.0		0		Sa, S, Sh
60	1	0	0	0	0.0	0.0	●	100	U	Sa, S
70	3	Start of Eelgrass bed								
80	5	8	10	16	11.3	45.3		100	U	Sa, S
88	8	End of Eelgrass bed								
100	12	0	0	0	0.0	0.0		0		S
120	15	0	0	0	0.0	0.0		0		S, Sa
140	16	0	0	0	0.0	0.0		0		S
160	17	0	0	0	0.0	0.0		0		S, Hww
180	16	0	0	0	0.0	0.0		0		S, Sa
200	15	0	0	0	0.0	0.0		0		S, Sa
220	16	0	0	0	0.0	0.0		5	G	S, Sa
240	18	0	0	0	0.0	0.0		10	G	S, Hww
260	18	0	0	0	0.0	0.0		0		S, Sa, Hww
SMA2S-3D Date: 9/30/14 Time: 1530 Starting location: Lat. 47° 51.177' Long. 122° 34.849'										
0	18	0	0	0	0.0	0.0		5	G	S, Hww
50	21	0	0	0	0.0	0.0		0		S, Hww
100	24	0	0	0	0.0	0.0		0		S, Hww,
150	25	0	0	0	0.0	0.0		0		S, Hww
200	20	0	0	0	0.0	0.0		0		Sa, Geoduck
250	17	0	0	0	0.0	0.0		0		Sa, Geoduck
300	17	0	0	0	0.0	0.0		0		Sa, Geoduck
SMA2S-3A Date: 9/29/14 Time: 1030 Starting location: Lat. 47° 51.169' Long. 122° 34.923'										
0	0	0	0	0	0.0	0.0		0		Sa, C
20	-1	0	0	0	0.0	0.0		100	U	Sa, Gr
40	0	0	0	0	0.0	0.0		100	U	Sa, Gr
60	2	0	0	0	0.0	0.0	●	100	U	Sa, Gr
76	3	Start of Eelgrass bed								
80	3	9	4	6	6.3	25.3		100	U	Sa, S
100	5	10	14	0	8.0	32.0		10	U	S
100	5	End of Eelgrass bed								
120	10	0	0	0	0.0	0.0		10	U	S
140	14	0	0	0	0.0	0.0		10	U	S
160	16	0	0	0	0.0	0.0		40	U	S, Mww
180	14	0	0	0	0.0	0.0		10	U, C	S, Lww
200	15	0	0	0	0.0	0.0		50	U, C, G	S
220	16	0	0	0	0.0	0.0		10	U, C	S, Mww
260	18	0	0	0	0.0	0.0		10	U, C, L	S, Hww

Table A3. Observations from transects in SMA-2S

Station	Corrected Depth (-ft. MLLW)	Eelgrass Turions (per 0.25 m^2)			Station Mean Turions		Eelgrass Near Station	Macro algae (% area)	Algae Type	Substrate
		1	2	3	per 0.25m^2	per m^2				
SMA2S-4	Date: 9/25/14	Time: 1029			Starting location: Lat. 47° 51.157' Long. 122° 34.924'					
0		0	0	0	0.0	0.0		0		Sa, C
20	-3	0	0	0	0.0	0.0		0		Sa, Gr
40	-1	0	0	0	0.0	0.0		100	U	Sa, S, Sh
60	0	0	0	0	0.0	0.0		100	U	Sa, S, Sh
80	1	0	0	0	0.0	0.0		100	U	Sa, S, Sh
93	2	Start of Eelgrass bed								
100	2	6	13	9	9.3	37.3		40	U	S, Sa
120	6	4	11	8	7.7	30.7		40	U	S, Sa
136	10	End of Eelgrass bed								
140	11	0	0	0	0.0	0.0		10	U	Sa, S, Sh
160	13	0	0	0	0.0	0.0		10	U, G	Sa, S, Sh, Lww
180	13	0	0	0	0.0	0.0		10	U, G	Sa, S, Sh, Mww
200	14	0	0	0	0.0	0.0		10	U, G, C, L	Sa, S, Sh, Mww
220	15	0	0	0	0.0	0.0		10	U, C	Sa, S, Sh, Mww
240	16	0	0	0	0.0	0.0		10	C	Sa, S, Sh, Hww
260	17	0	0	0	0.0	0.0		10	U, C	Sa, S, Sh, Hww
280	18	0	0	0	0.0	0.0		10	C	Sa, S, Sh, Hww
300	22	0	0	0	0.0	0.0		10	C, L	Sa, S, Sh, Mww

Table A3. Observations from transects in SMA-2S

Station	Corrected Depth (-ft. MLLW)	Eelgrass Turions (per 0.25 m^2)			Station Mean Turions		Eelgrass Near Station	Macro algae (% area)	Algae Type	Substrate
		1	2	3	per 0.25m^2	per m^2				
SMA2S-5	Date: 9/25/14		Time: 0945			Starting location: Lat. 47° 51.137' Long. 122° 34.927'				
0		0	0	0	0.0	0.0		0		Sa, C
20	-5	0	0	0	0.0	0.0		0		Gr
40	-3	0	0	0	0.0	0.0		20	U	Gr
60	-2	0	0	0	0.0	0.0		20	U	Gr
80	0	0	0	0	0.0	0.0		100	U	Sa, Gr
84	0	Start of Eelgrass bed								
100	1	23	46	31	33.3	133.3		20	U	Sa, S, Sh
120	3	32	67	44	47.7	190.7		10	U	Sa, S, Sh
140	5	63	48	46	52.3	209.3		10	U	Sa, S, Sh
156	9	End of Eelgrass bed								
160	9	0	0	0	0.0	0.0		50	U, G	S, Sa
180	11	0	0	0	0.0	0.0		10	U, G	S, Sa, Mww
200	12	0	0	0	0.0	0.0		10	U, G, C	S, Sa, Hww
220	13	0	0	0	0.0	0.0		10	U, G, C	S, Sa, Hww
240	14	0	0	0	0.0	0.0		10	U, G, L	S, Sa, Hww
260	17	0	0	0	0.0	0.0		10	U, G, L	S, Sa, Hww
280	15	0	0	0	0.0	0.0		10	U, G, L	S, Sa, Hww
300	15	0	0	0	0.0	0.0		10	U, G, L	S, Sa, Hww
SMA2S-5D	Date: 9/24/14		Time: 1600			Starting location: Lat. 47° 51.179' Long. 122° 34.923'				
0	19	0	0	0	0.0	0.0		10	L	S, Mww
50	22	0	0	0	0.0	0.0		0		Sa, Mww
100	25	0	0	0	0.0	0.0		10	G	S, Hww
150	21	0	0	0	0.0	0.0		0		Sa, Geoduck
200	17	0	0	0	0.0	0.0		0		Sa, Geoduck
250	19	0	0	0	0.0	0.0		0		Sa, Geoduck
300	23	0	0	0	0.0	0.0		0		Sa, Geoduck

Table A3. Observations from transects in SMA-2S

Station	Corrected Depth (-ft. MLLW)	Eelgrass Turions (per 0.25 m^2)			Station Mean Turions		Eelgrass Near Station	Macro algae (% area)	Algae Type	Substrate
		1	2	3	per 0.25m^2	per m^2				
SMA2S-6	Date: 9/25/14	Time: 1330			Starting location: Lat. 47° 51.132' Long. 122° 34.927'					
0	0	0	0	0	0.0	0.0		0		Sa, C
20	0	0	0	0	0.0	0.0		0		Sa, Sh
40	0	0	0	0	0.0	0.0		0		Sa, Sh
60	-0.5	0	0	0	0.0	0.0		100	U	Sa, Sh
75	2	Start of Eelgrass bed								
80	2.5	52	43	55	50.0	200.0		40	U	S, Sa
100	2.5	42	38	56	45.3	181.3		10	U	S, Sa
120	3.5	39	46	42	42.3	169.3		5	U	Sa
140	5.5	28	45	32	35.0	140.0		0		Sa
160	7.5	38	36	43	39.0	156.0		0		S, Sa
180	No data									
200	10.5	46	35	25	35.3	141.3		0		S, Sa
215	11	End of continuous Eelgrass bed								
220	11.5	21	0	11	10.7	42.7		5	G	S, Sa
240	14.5	0	0	0	0.0	0.0		10	G	Sa, Mww
260	15.5	0	0	0	0.0	0.0		0		Sa, Mww
280	16.5	0	0	0	0.0	0.0		5	L	Sa, Mww
300	18.5	0	0	0	0.0	0.0		5	G	Sa
350	20.5	0	0	0	0.0	0.0		5	G	Sa
400	22.5	0	0	0	0.0	0.0		0		Sa, Mww
450	22.5	0	0	0	0.0	0.0		0		Sa, Mww
SMA2S-7	Date: 9/29/14	Time: 1107			Starting location: Lat. 47° 51.116' Long. 122° 34.941'					
0		0	0	0	0.0	0.0		0		Sa, C
20	-2	0	0	0	0.0	0.0		0	U	Sa, Gr
40	1	0	0	0	0.0	0.0		0	U	Sa, Gr
60	2	0	0	0	0.0	0.0		100	U	Sa, Gr
80	2	0	0	1	0.3	1.3		100	U	S, Sa
86	2	Start of continuous Eelgrass bed								
100	3	5	4	14	7.7	30.7		80	U	S, Sa
120	3	37	47	56	46.7	186.7		40	U	S, Sa
140	4	39	51	47	45.7	182.7		20	U	S, Sa
160	6	45	49	38	44.0	176.0		0		S, Sa
180	8	42	37	48	42.3	169.3		20	U, G	S, Sa
200	10	41	17	24	27.3	109.3		10	U, G	S, Sa
220	11	9	5	8	7.3	29.3		30	G	S, Sa
220	11	End of Eelgrass bed								
240	16	0	0	0	0.0	0.0		10	G, C	S, Lww
260	18	0	0	0	0.0	0.0		10	G, C, L	S, Lww
280	18	0	0	0	0.0	0.0		10	U, G, C	S
300	20	0	0	0	0.0	0.0		10	C	S

Table A4. Boundary of dense Eelgrass bed in SMA-2S

Inner boundary of southern eelgrass bed	
Latitude (N)	Longitude (W)
47° 51.091’	122° 34.933’
47° 51.099’	122° 34.932’
47° 51.104’	122° 34.931’
47° 51.108’	122° 34.923’
47° 51.115’	122° 34.921’
47° 51.120’	122° 34.914’
47° 51.130’	122° 34.908’
47° 51.138’	122° 34.908’
47° 51.146’	122° 34.901’
47° 51.150’	122° 34.903’
47° 51.159’	122° 34.904’
47° 51.161’	122° 34.906’
47° 51.170’	122° 34.910’
47° 51.177’	122° 34.906’
Outer margin of southern eelgrass bed	
Latitude (N)	Longitude (W)
47° 51.161’	122° 34.897’
47° 51.155’	122° 34.890’
47° 51.146’	122° 34.890’
47° 51.143’	122° 34.887’
47° 51.135’	122° 34.884’
47° 51.128’	122° 34.882’
47° 51.125’	122° 34.883’
47° 51.119’	122° 34.883’
47° 51.112’	122° 34.884’
47° 51.106’	122° 34.888’
47° 51.103’	122° 34.890’
47° 51.096’	122° 34.891’
47° 51.090’	122° 34.890’