Memo

PIONEER TECHNOLOGIES CORPORATION
5205 Corporate Ctr. Ct. SE, Ste. A
Olympia, WA 98503-5901
Phone: 360.570.1700
Fax: 360.570.1777
www.uspioneer.com

To: Steve Teel, LHG (Department of Ecology)

From: Shella Swain & Chris Waldron

Cc: Kip Summers, P.E. (City of Olympia)

Date: February 2, 2015

Subject: November 2014 Supplemental Sediment Sampling Results for the Solid Wood Incorporated Site

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This technical memorandum presents the results of additional supplemental sediment sampling that was performed in November 2014 at the Solid Wood Incorporated Site (Site) located in Olympia, Washington (Figure 1). This sampling event was conducted on behalf of the City of Olympia (City) under the Site's existing Agreed Order (No. DE-08-TCPSR-5415), in accordance with *Addendum No.9 to the Work Plan for the RI/FS and IA for the Solid Wood Incorporated Site* (PIONEER Technologies Corporation [PIONEER] 2014a). The purpose of this sampling event was to finalize the delineation of the Site Focus Area[1] by evaluating bioassay results using Sediment Management Standards (SMS) criteria and comparing surficial sediment concentrations to the Ecology-derived total petroleum hydrocarbons (TPH) screening level of 100 milligrams per kilogram (mg/kg).

Background

Previous sediment investigations were conducted as part of the Remedial Investigation/Feasibility Study (RI/FS) and Interim Actions (IAs) to characterize concentrations of: (1) SMS constituents,[2] and (2) TPH in the diesel range (TPH-D)/heavy oil range (TPH-HO) in beach sediment adjacent to the upland area of the Site (Parametrix 2010, 2011a, 2011b).

Additionally, the following three SMS bioassay tests were performed during previous Site sediment investigations:

1. 10-Day amphipod solid phase survival test using *Eohaustorius estuarius*,
2. Sediment larval test using *Mytilus galloprovincialis*, and
3. 20-Day polychaete solid phase survival and growth test using *Neanthes arenaceodentata*.

Results of previous investigations indicated that constituent concentrations were below applicable SMS chemical criteria (i.e., WAC 173-204-320 or WAC 173-204-520); however, concentrations TPH-D/TPH-HO exceeded the Ecology-derived Total TPH screening level. Additionally, one of the three bioassay tests failed at one sample location (SD-30/SD-33). Previous TPH and bioassay results are presented in Figure 2.

A supplemental sampling event was conducted at the Site in February 2014 to further characterize TPH concentrations in sediment. TPH-D was not detected in any supplemental sample and TPH-HO concentrations were primarily limited to the southern portion of the Focus Area (PIONEER 2014b). Based on the supplemental sampling results, a TPH-HO delineation boundary was identified and additional characterization (via sediment chemistry and bioassays) of the southern portion of the Focus Area was recommended (PIONEER 2014b).

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[1] All sample locations located outside of the Focus Area were appropriately characterized. No further characterization is required in these areas.

[2] Washington Administrative Code [WAC] 173-204-320 – Table 1

Supplemental Sediment Investigation

Sediment Collection

Four sediment and bioassay samples were collected and analyzed in accordance with the Addendum No.9 to the Work Plan for the RI/FS and IA for the Solid Wood Incorporated Site. The samples were collected from four locations within the TPH-HO delineation boundary (see Figure 3). Sampling was conducted during low tide on November 1, 2014, to ensure that the proposed sample locations were not under water. Prior to sampling, surficial gravel was removed from the sampling locations. Sediment samples were collected with a decontaminated shovel, to a depth of half a foot below ground surface (bgs), and homogenized in a sediment bag that was placed in a five-gallon bucket. Approximately two gallons of sediment were distributed between two sediment bags for bioassays and additional sediment was placed into sample jars for analytical chemistry analyses. After each sample was collected, the shovels were decontaminated (i.e., they were scrubbed with a brush and a phosphate-free detergent [Alconox], and then rinsed with deionized water). Field quality control guidelines were followed in accordance with *Addendum No.9 to the Work Plan for the RI/FS and IA for the Solid Wood Incorporated Site* (PIONEER 2014a). All samples were placed in a cooler and held at approximately four degrees Celsius until they were received by the project laboratories.

In addition to the Site sediment samples, two reference sediment samples were collected from reference sediment stations located in Carr Inlet. Carr Inlet is considered a suitable reference area in the Puget Sound under SMS and PSEP standards (PTI 1991). The samples were collected on November 11, 2014 by Environ Global.

Sediment sampling field notes are provided in Attachment 1 and sediment sampling photos are provided in Attachment 2.[3]

Sediment Sample Test Results

Chemical Testing

Sediment samples were shipped overnight to Amtest Laboratories in Kirkland, Washington for rush analysis of TPH-D and TPH-HO via NWTPH-HCID. No constituents were detected in the NWTPH-HCID analysis. Per Ecology's request and based on historical Site data, the samples were also analyzed via NWTPH-DX with a silica gel cleanup[4]. TPH-D and TPH-HO are presented as separate products based on laboratory chromatograms (Ecology 2004). TPH results are presented in Figure 3. TPH-D was only detected in one of the four samples (66 mg/kg at SD-59). All sample locations had TPH-HO concentrations that exceeded the Ecology-derived screening level (100 mg/kg) and their concentrations ranged from 110 to 210 mg/kg.

The samples were also analyzed for TPH-G, total organic carbon, total solids, total volatile solids, total sulfides, ammonia, and grain size. All supplemental sediment sampling results are presented in Table 1. The analytical laboratory reports are included in Attachment 3.

[3] The number of photos taken during the sampling event was limited by daylight hours and the incoming tide. No photos were taken while the samples at SD-59 and SD-57 were collected due to a lack of daylight.

[4] The project laboratory was not able to achieve the intended practical quantitation limit (PQL) of 50 mg/kg for TPH-HO due to a high amount of moisture in the sediment samples.

Biological Testing

Sediment samples were shipped overnight to Environ Global in Port Gamble, WA for bioassay testing. Biological tests consisted of a 10-day amphipod solid phase survival test using *Eohaustorius estuarius*, a 20-day polychaete solid phase survival and growth test using *Neanthes arenaceodentata*, and a sediment larval test using *Mytilus galloprovincialis* conducted according to Puget Sound Estuary Program Guidelines (PTI 1995).

The results of the biological testing are presented in the Environ Global report provided in Figure 4 and Attachment 4. Site sediment sampling results were compared to the reference sediment sampling results with similar percent fines content (see Environ Global report Table 2-1). The four Site sediment samples and two reference samples passed the sediment quality standards (SQS) and cleanup screening levels (CSL) performance criteria for the three bioassay tests (Figure 3).

Discussion and Conclusion

Although all of the sediment sample concentrations collected from the Focus Area exceeded the Ecology-derived Total TPH screening level of 100 mg/kg, all of the bioassay tests performed at the same sample locations passed SMS bioassay test criteria for SQS and CSL. Based on the bioassay results, sediment in the Focus Area is considered characterized and no further sediment characterization is recommended.

Note: This memo focused solely on the supplemental sampling collected per *Addendum No.9 to the Work Plan for the RI/FS and IA for the Solid Wood Incorporated Site* (PIONEER 2014a). An upcoming report will document the results of all sediment samples that have been collected at the Site.

References

Ecology 2004. Determining Compliance with Method A Cleanup Levels for Diesel and Heavy Oil, Implementation Memorandum #4, June 17.

Parametrix. 2010. Solid Wood Incorporated Site Interim Action Report. Olympia, Washington. September.

Parametrix. 2011a. Solid Wood Incorporated Site RI/FS and IA Work Plan Addendum No. 4 – Supplemental Post Piling Removal Sediment Sampling and Analysis Plan. Olympia, Washington. March.

Parametrix. 2011b. Results of Supplemental Post Piling Removal Sediment Sampling. Olympia, Washington. August.

PIONEER. 2014a. Addendum No. 9 to the Work Plan for the RI/FS and IA for the Solid Wood Incorporated Site. October.

PIONEER. 2014b. Supplemental Sediment Sampling Results for the Solid Wood Incorporated Site. August 21.

PTI. 1991. Reference Area Performance Standards for Puget Sound. Prepared for USEPA, Office of Coastal Waters, Seattle, WA.

PTI. 1995. Recommended Guidelines for Conducting Laboratory Bioassays on Puget Sound Sediments. Prepared for PSEP, United States Environmental Protection Agency, Office of Puget Sound, Seattle, WA.

Enclosures

Table 1	Supplemental Sediment Sampling Results
Figure 1	Site Location
Figure 2	Previous TPH and Bioassay Results
Figure 3	November 2014 TPH and Bioassay Sample Locations and Results
Figure 4	Bioassay and TPH Comparisons
Attachment 1	Sampling Field Notes
Attachment 2	Sampling Photo Log
Attachment 3	Chemical Testing Laboratory Reports
Attachment 4	Biological Testing Laboratory Reports

Tables

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Table 1: Supplemental Sediment Sampling Results

Sample	Depth (ft bgs)	Total Petroleum Hydrocarbons			Conventional Analyses			Nutrient Analyses			Grain Size (%)			
		TPH-D (mg/kg)	TPH-HO (mg/kg)	Total TPH (mg/kg)	Total Solids (%)	Percent Moisture	Total Volatile Solids (%)	Total Organic Carbon (%)	Ammonia (ug/g)	Sulfide (ug/g)	Gravel	Sand	Silt	Clay
SD-56	0 - 0.5	25 U	110	110	57	43	8.9	3.1	8.7 U	28	28	60	6.8	5.6
SD-57	0 - 0.5	25 U	110	110	67	33	6.6	2.8	7.5 U	43	21	56	16	6.7
SD-58	0 - 0.5	25 U	130	130	74	26	4.4	2.4	44	31	54	32	8.3	6.0
SD-59	0 - 0.5	66	210	276	45	55	16	3.8	148	67	11	51	26	12

Notes:

U: Non-detect

Shaded cells indicate that the concentration in the shallow sample (0-0.5 ft bgs) exceeded Ecology's Total TPH screening level of 100 mg/kg.

TPH-D and TPH-HO were analyzed using the NWTPH-Dx method preceded by a silica gel cleanup.

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Figures

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Legend

Agreed Order Boundary

Site

0 250 500 750 Feet

PIONEER TECHNOLOGIES CORPORATION

Site Location
November 2014 Supplemental Sediment Sampling Results for the
Solid Wood Incorporated Site
Olympia, Washington

Figure 1

Document Path: G:\Projects\City of Olympia\GIS\Maps\2014 November\Fig1_Site_Location.mxd; Author: GM; Date Saved: 1/9/2015

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Legend

1. TPH-HO Concentration[1]
2. TPH-D Concentration[1]
3. Bioassay Results[2]

Focus Area

TPH-HO Delineation Boundary

TPH Concentrations

- Non-Detect
- 0 - 100 mg/kg
- 101 - 400 mg/kg
- 401 - 700 mg/kg
- > 701 mg/kg

Bioassay Results

- Fail
- Pass

Notes:
[1] Only the maximum concentration at each sample location is displayed.
[2] If one of the three bioassay tests failed, the sample location was designated "fail."

0 50 100 150 Feet

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Previous TPH and Bioassay Results
November 2014 Supplemental Sediment Sampling Results for the
Solid Wood Incorporated Site
Olympia, Washington

Figure 2

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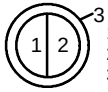

1. TPH-HO Concentration[1]
2. TPH-D Concentration[1]
3. Bioassay Results[2]

Legend

TPH-HO Delineation Boundary

Bioassay Results
- Pass
- Fail

TPH Concentrations
- Non-Detect
- 0 - 100 mg/kg
- 101 - 400 mg/kg
- 401 - 700 mg/kg
- > 701 mg/kg

Notes:
[1] Only the maximum concentration in surficial sediment (0-0.5 ft bgs) is displayed.
[2] If one of the three bioassay tests failed, the sample location was designated "fail."

0 15 30 Feet

PIONEER TECHNOLOGIES CORPORATION

November 2014 TPH and Bioassay Sample Location and Results
November 2014 Supplemental Sediment Sampling Results for the
Solid Wood Incorporated Site
Olympia, Washington

Figure 3

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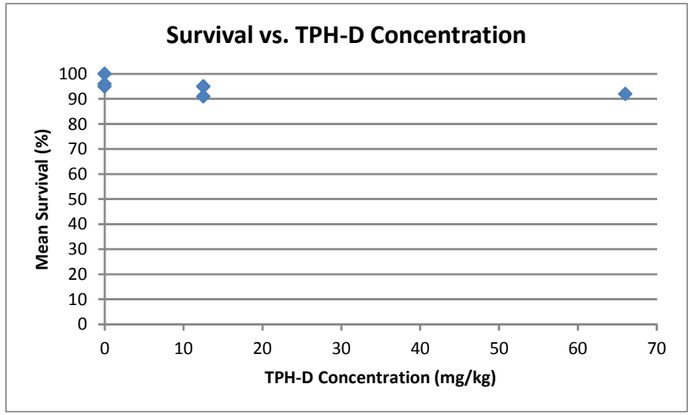
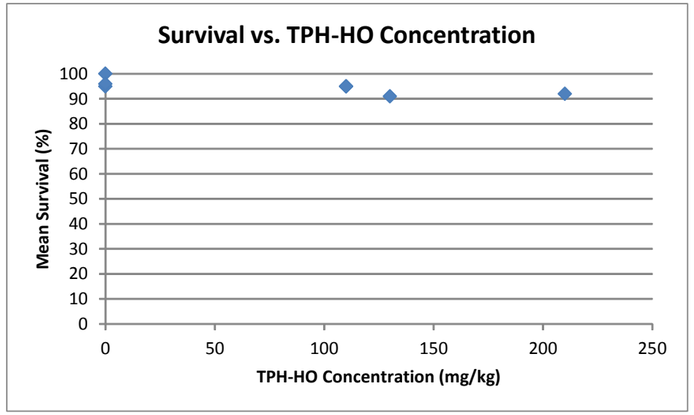
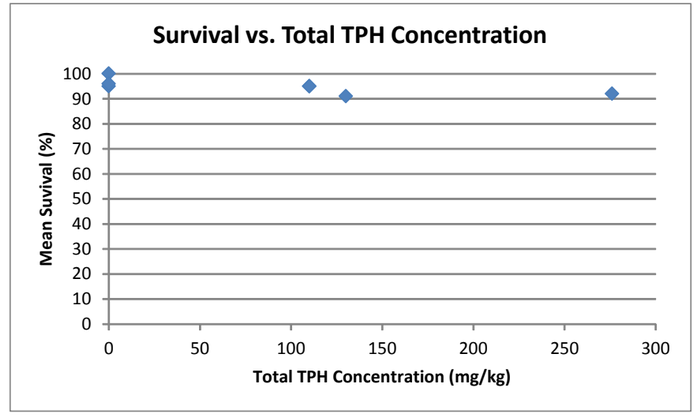
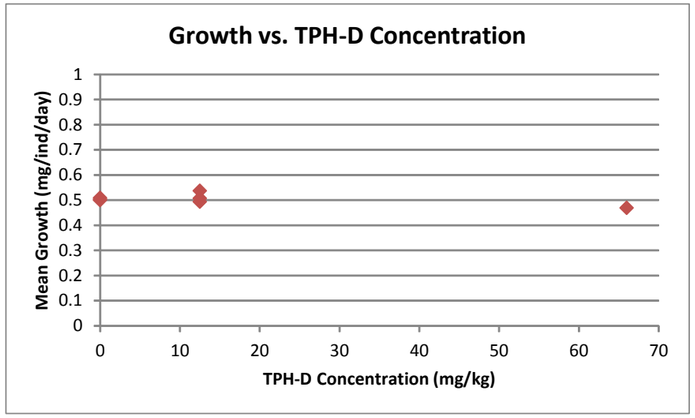
Results for 10-day *Eohaustorius estuarius* test:

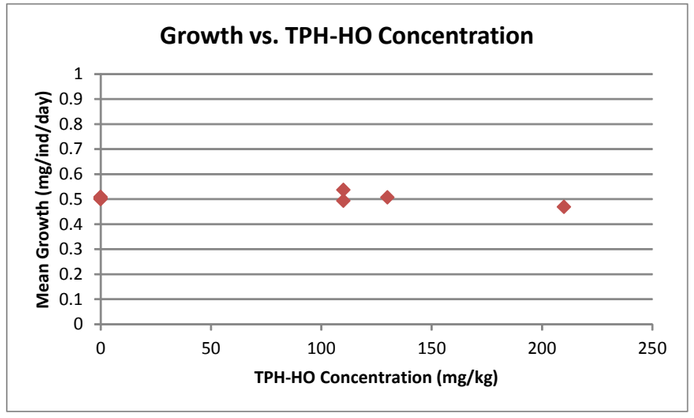


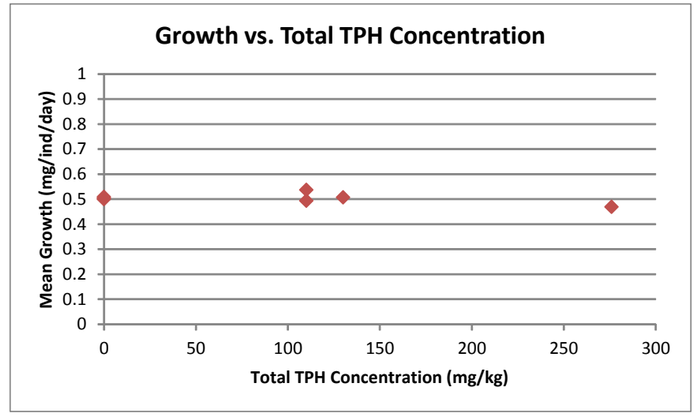




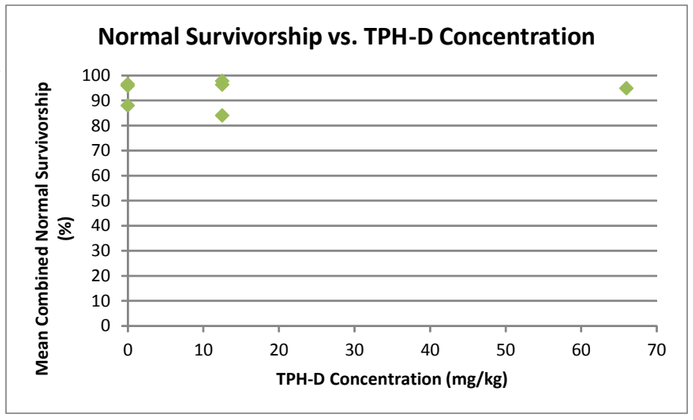
Results for 20-day *Neanthes arenaceodentata* test:

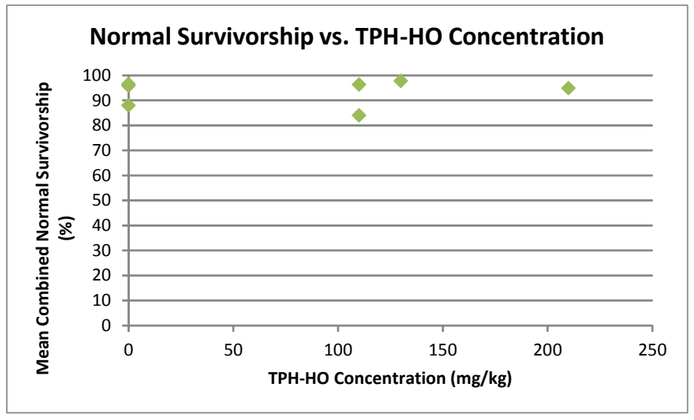


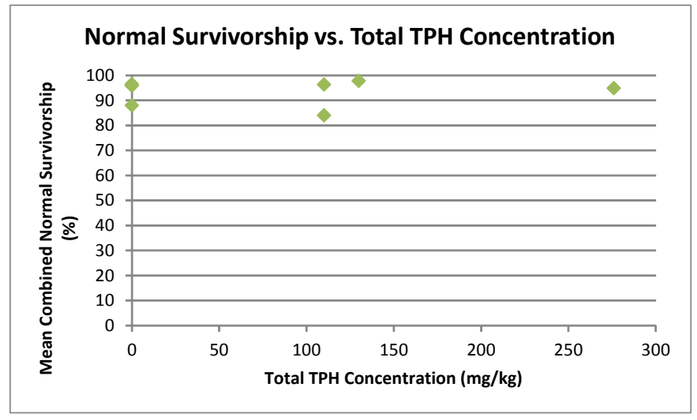




Results for *Mytilus galloprovincialis* larval development test:







PIONEER TECHNOLOGIES CORPORATION

Bioassay Tests and TPH Comparisons
November 2014 Supplemental Sediment Sampling Results
for the Solid Wood Incorporated Site
Olympia, Washington

Notes:
The two reference samples and the control sample for each test were assumed to have TPH-D, TPH-HO and Total TPH concentrations of 0 mg/kg.

Figure 4

Attachment 1

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PIONEER TECHNOLOGIES CORPORATION (PIONEER)
FIELD CHECKLIST

Project/Task Name: West Bay Sediment Sampling Site Location: West Bay, Olympia, WA

Requested By / Date: October 15-16, 2014 Work Deadline: _____

SERVICES REQUESTED — **COMPLETED**

1. Office/field prep tasks: (a) ensure all applicable pre-mob HASP forms are completed, (b) gather tide info, (c) conduct tailgate & document, (d) communicate decon & site control expectations, (e) load sample coordinates into GPS	☑ YES ☐ NO
2. Collect four sediment samples	☑ YES ☐ NO
3. Complete daily field notes, and note any deviations from Work Plan	☑ YES ☐ NO
4. Use PIONEER Sample ID nomenclature for all samples per Work Plan	☑ YES ☐ NO
5. Ship bioassay samples to Environ	☑ YES ☐ NO
6. Ship analytical samples to AmTest	☑ YES ☐ NO
	☐ YES ☐ NO
	☐ YES ☐ NO
	☐ YES ☐ NO
	☐ YES ☐ NO
	☐ YES ☐ NO
	☐ YES ☐ NO

ADDITIONAL STANDARD INSTRUCTIONS

	COMPLETED		COMPLETED
☒ Review Docs: FSAP, HASP	☐ YES ☐ NO	☒ Health & Safety Meeting	☒ YES ☐ NO
☐ Agency NOI / Utility Locate / Concrete Coring	☐ YES ☐ NO	☐ Call PM from Site	☐ YES ☐ NO
☑ Coordinate Access: City	☑ YES ☐ NO	☐ Draw Site Map _____	☐ YES ☐ NO
☐ Coordinate Sub / Equip: _____	☐ YES ☐ NO	☐ Cuttings / Purge Water Characterization & Disposal	
☒ Purchase / Rent Equip: U-Haul	☒ YES ☐ NO	☐ Potential HW _____	☐ YES ☐ NO
☐ Client/Agency Coordination: _____	☐ YES ☐ NO	☐ Non-Haz _____	☐ YES ☐ NO
☐ Calibrate Equipment: _____	☐ YES ☐ NO	☐ Background _____	☐ YES ☐ NO

SAMPLING REQUIREMENTS

☐ Field Testing: _____

☒ Lab Testing: Four 2-gallon sediment samples Laboratory: Environ

☒ Lab Testing: Four analytical sediment samples Laboratory: AmTest

☐ Lab Testing: _____ Laboratory: _____

FIELD SUPPLIES NEEDED

☒ Site Map ☒ Camera ☒ Survey Equip / GPS ☒ Vehicle

☒ Std Field Equip (keys, forms, SAP, HASP, PPE, decon, tools)

☐ Drilling Equip (PID, references, knife, baggies, tape)

☒ Soil Equip (SS bowls, spoon/shovel, hand auger, pick, sieves)

☐ GWM (pump, tubing, gen., compres., bailers, rope/string, PDB)

☐ Pump / Slug Test Equip (GWM Equip, slug, stopwatch)

☐ Water Level Indicator / Interface Probe

☐ Water Quality Meter _____ ☐ Field Test Kits _____

☒ Sample Kit / Cooler / COC / Ice _____

☐ IDW: ☐ Drums _____ ☒ 5-gal buckets _____

☐ Other: _____

☐ Other: _____

PIONEER
DAILY FIELD REPORT

Date: 11/1/2014 Site Location: West Bay Site Arrival Time: 6:45 Site Departure Time: 10:15

WEATHER
TEMPERATURE
WIND

Clear/Sun	Overcast	Drizzle	Rain	Snow
To 32	32-50	50-70	70-85	85 Up
Calm	Med.	Strong	Severe	

PEOPLE PRESENT ON-SITE

NAME	ASSOCIATION	TIME ON-SITE AND OFF-SITE
SHELLA SWAIN	PTZ	6:45-10:15
DANIEL BRITTAIN	PTZ	6:45-10:15

NOTES ON WORK COMPLETED

6:45 Arrive on site → safety tailgate (see form).

7:00 sun not risen, tide still above SD-59.

7:15 Enough light to sample. Mark locations.

7:20 Begin digging SD-59.
- Oil light sheen visible
- high amount of fines & moisture
- higher amount of sediment, not a high amount of shells, rocks, or biological matter

7:30 collect SD-WB-56-110114-0-0.5

7:30 Begin digging SD-57
- high amount of spongy sand, dark grey
- high amount of shells (large & intact), and 1-2 inch rock
- small chunks of dark, organic sediment.

8:00 collect SD-WB-57-110114-0-0.5

7:50 begin digging SD-58
- high amount of large (3-4 inch) rocks.
- light grey sand
- high amount of biological activity (earthworms)

8:30 collect SD-WB-58-110114-0-0.5

8:20 begin digging SD-56
- high amount of broken shell dispersed in large grey sand
- high amount of bio (earthworms, flatworms, clams) barnacles
- bricks present

SIGNATURE: [signature] DATE: 11/1/14

Attachment 2

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Photographic Log

Table of Contents

Photographic Log

Photo No. 1: SD-58 Sample Location	
Date: 11/1/2014	
Direction Photo Taken: NA	
Description: SD-58 had a high amount of rocks and coarse grey sand. High amounts of biological activity (earthworms) were noted.	

Photo No. 2: SD-56 Sample Location	
Date: 11/1/2014	
Direction Photo Taken: NA	
Description: SD-56 had large rocks and a high amount of shells. High amounts of biological activity (earthworms, flatworms, clams, and barnacles) were noted.	

Photographic Log

Photo No. 3: SD-56 Sample Location	
Date: 11/1/2014	
Direction Photo Taken: NA	
Description: SD-56 sample location prior to sample collection.	

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Attachment 3

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Am Test Inc.
13600 NE 126TH PL
Suite C
Kirkland, WA 98034
(425) 885-1664

Professional Analytical Services

Nov 5 2014
Pioneer Technologies Corp.
5205 Corporate Center Court SE
Suite A
Olympia, WA 98503
Attention: Sheila Swain

Dear Sheila Swain:

Enclosed please find the analytical data for your West Bay project.

The following is a cross correlation of client and laboratory identifications for your convenience.

CLIENT ID	MATRIX	AMTEST ID	TEST
SD-WB-56-110114-0-0.5	Soil	14-A017448	NWTPH-Dx, HCID, DEM, NUT, CONV, Moisture, TVS-s, H2S-S EPA, Grain Size
SD-WB-57-110114-0-0.5	Soil	14-A017449	NWTPH-Dx, HCID, DEM, NUT, CONV, Moisture, TVS-s, H2S-S EPA, Grain Size
SD-WB-58-110114-0-0.5	Soil	14-A017450	NWTPH-Dx, HCID, DEM, NUT, CONV, Moisture, TVS-s, H2S-S EPA, Grain Size
SD-WB-59-110114-0-0.5	Soil	14-A017451	NWTPH-Dx, HCID, DEM, NUT, CONV, Moisture, TVS-s, H2S-S EPA, Grain Size

Your samples were received on Tuesday, November 4, 2014. At the time of receipt, the samples were logged in and properly maintained prior to the subsequent analysis.

The analytical procedures used at AmTest are well documented and are typically derived from the protocols of the EPA, USDA, FDA or the Army Corps of Engineers.

Following the analytical data you will find the Quality Control (QC) results.

Please note that the detection limits that are listed in the body of the report refer to the Practical Quantitation Limits (PQL's), as opposed to the Method Detection Limits (MDL's).

If you should have any questions pertaining to the data package, please feel free to conact me.

Sincerely,

Aaron W. Young
Laboratory Manager

BACT = Bacteriological
CONV = Conventionals
MET = Metals
ORG = Organics
NUT=Nutrients
DEM=Demand
MIN=Minerals

Am Test Inc.
13600 NE 126TH PL
Suite C
Kirkland, WA 98034
(425) 885-1664
www.amtestlab.com

AMTEST LABORATORIES

Professional Analytical Services

ANALYSIS REPORT

Pioneer Technologies Corp.
5205 Corporate Center Court SE
Olympia, WA 98503
Attention: Sheila Swain
Project Name: West Bay
All results reported on a dry weight basis.

Date Received: 11/04/14
Date Reported: 11/ 5/14

AMTEST Identification Number **14-A017448**
Client Identification **SD-WB-56-110114-0-0.5**
Sampling Date **11/01/14, 08:50**

Conventionals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Total Solids	57.3	%		0.1	SM 2540G	BP	11/04/14
% Moisture	42.7	%		0.1	Std Mthds. 2540 G	BP	11/04/14
Total Volatile Solids	8.86	%		0.1	SM 2540-G	BP	11/04/14

Demand

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Total Organic Carbon	3.1	%		0.05	SW 846 9060	MR	11/05/14

Nutrients

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Ammonia	< 8.7	ug/g		8.7	SM 4500NH3B&E	BP	11/04/14

Grain Size Distribution

PHI	OPENING (mm)	% RETENTION	FRACTION	PERCENT	METHOD	ANALYST	DATE
-2.25	4.75	18.1 %	GRAVEL	28.1	ASTM D422	AY	11/04/14
- 2	4.00	1.70 %			ASTM D422	AY	11/04/14
-1	2.00	8.30 %			ASTM D422	AY	11/04/14
0	1.00	8.40 %	SAND	59.5	ASTM D422	AY	11/04/14
+1	0.50	11.6 %			ASTM D422	AY	11/04/14
+ 2	0.25	21.6 %			ASTM D422	AY	11/04/14
+ 3	0.125	12.3 %			ASTM D422	AY	11/04/14
+ 4	0.063	5.60 %			ASTM D422	AY	11/04/14
+ 5	0.032	< 0.1 %	SILT	6.80	ASTM D422	AY	11/04/14
+ 6	0.016	4.00 %			ASTM D422	AY	11/04/14
+ 7	0.008	1.40 %			ASTM D422	AY	11/04/14
+ 8	0.004	1.40 %			ASTM D422	AY	11/04/14
+ 9	0.002	0.30 %	CLAY	5.60	ASTM D422	AY	11/04/14
+ 10	0.001	< 0.1 %			ASTM D422	AY	11/04/14
> + 10	< 0.001	5.30 %			ASTM D422	AY	11/04/14

NWTPH-HCID (Soil)

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Fuel Type	None				NWTPH-Dx	ED	11/04/14
Gasoline	< 20	mg/Kg		20.	NWTPH-HCID	ED	11/04/14
Diesel	< 25	mg/Kg		25.	NWTPH-HCID	ED	11/04/14
Heavy Oil	< 50	mg/Kg		50.	NWTPH-HCID	ED	11/04/14

Surrogates

ANALYTE	% RECOVERY	LIMITS
Bromofluorobenzene	67.0 %	50.0 - 150.

NWTPH-Dx (Soil)

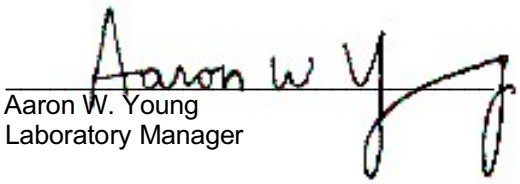
PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Diesel	< 25	mg/kg		25.	NWTPH-Dx	ED	11/04/14
Heavy Oil	110	mg/kg		50.	NWTPH-Dx	ED	11/04/14

Surrogates

ANALYTE	% RECOVERY	LIMITS
Bromofluorobenzene	125. %	50.0 - 150.

Miscellaneous

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANLST	DATE
Sulfide	27.9	ug/g		10	EPA 9030B	MR	11/05/14



Aaron W. Young
Laboratory Manager

Am Test Inc.
13600 NE 126TH PL
Suite C
Kirkland, WA 98034
(425) 885-1664
www.amtestlab.com

AMTEST LABORATORIES

Professional Analytical Services

ANALYSIS REPORT

Pioneer Technologies Corp.
5205 Corporate Center Court SE
Olympia, WA 98503
Attention: Sheila Swain
Project Name: West Bay
All results reported on a dry weight basis.

Date Received: 11/04/14
Date Reported: 11/ 5/14

AMTEST Identification Number **14-A017449**
Client Identification **SD-WB-57-110114-0-0.5**
Sampling Date **11/01/14, 08:00**

Conventionals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Total Solids	66.6	%		0.1	SM 2540G	BP	11/04/14
% Moisture	33.4	%		0.1	Std Mthds. 2540 G	BP	11/04/14
Total Volatile Solids	6.58	%		0.1	SM 2540-G	BP	11/04/14

Demand

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Total Organic Carbon	2.8	%		0.05	SW 846 9060	MR	11/05/14

Nutrients

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Ammonia	< 7.5	ug/g		7.5	SM 4500NH3B&E	BP	11/04/14

Grain Size Distribution

PHI	OPENING (mm)	% RETENTION	FRACTION	PERCENT	METHOD	ANALYST	DATE
-2.25	4.75	9.20 %	GRAVEL	20.8	ASTM D422	AY	11/04/14
- 2	4.00	2.20 %			ASTM D422	AY	11/04/14
-1	2.00	9.40 %			ASTM D422	AY	11/04/14
0	1.00	8.40 %	SAND	56.4	ASTM D422	AY	11/04/14
+1	0.50	12.0 %			ASTM D422	AY	11/04/14
+ 2	0.25	21.2 %			ASTM D422	AY	11/04/14
+ 3	0.125	10.8 %			ASTM D422	AY	11/04/14
+ 4	0.063	4.00 %			ASTM D422	AY	11/04/14
+ 5	0.032	11.5 %	SILT	16.2	ASTM D422	AY	11/04/14
+ 6	0.016	3.40 %			ASTM D422	AY	11/04/14
+ 7	0.008	1.30 %			ASTM D422	AY	11/04/14
+ 8	0.004	< 0.1 %			ASTM D422	AY	11/04/14
+ 9	0.002	0.90 %	CLAY	6.70	ASTM D422	AY	11/04/14
+ 10	0.001	0.70 %			ASTM D422	AY	11/04/14
> + 10	< 0.001	5.10 %			ASTM D422	AY	11/04/14

NWTPH-HCID (Soil)

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Fuel Type	None				NWTPH-Dx	ED	11/04/14
Gasoline	< 20	mg/Kg		20.	NWTPH-HCID	ED	11/04/14
Diesel	< 25	mg/Kg		25.	NWTPH-HCID	ED	11/04/14
Heavy Oil	< 50	mg/Kg		50.	NWTPH-HCID	ED	11/04/14

Surrogates

ANALYTE	% RECOVERY	LIMITS
Bromofluorobenzene	102. %	50.0 - 150.

NWTPH-Dx (Soil)

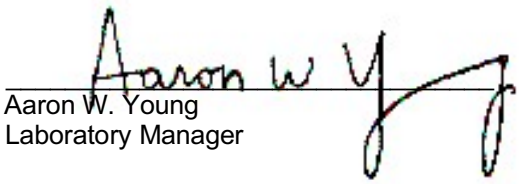
PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Diesel	< 25	mg/kg		25.	NWTPH-Dx	ED	11/04/14
Heavy Oil	110	mg/kg		50.	NWTPH-Dx	ED	11/04/14

Surrogates

ANALYTE	% RECOVERY	LIMITS
Bromofluorobenzene	128. %	50.0 - 150.

Miscellaneous

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANLST	DATE
Sulfide	43.0	ug/g		10	EPA 9030B	MR	11/05/14



Aaron W. Young
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Am Test Inc.
13600 NE 126TH PL
Suite C
Kirkland, WA 98034
(425) 885-1664
www.amtestlab.com

AMTEST LABORATORIES

Professional Analytical Services

ANALYSIS REPORT

Pioneer Technologies Corp.
5205 Corporate Center Court SE
Olympia, WA 98503
Attention: Sheila Swain
Project Name: West Bay
All results reported on a dry weight basis.

Date Received: 11/04/14
Date Reported: 11/ 5/14

AMTEST Identification Number **14-A017450**
Client Identification **SD-WB-58-110114-0-0.5**
Sampling Date **11/01/14, 08:30**

Conventionals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Total Solids	74.2	%		0.1	SM 2540G	BP	11/04/14
% Moisture	25.8	%		0.1	Std Mthds. 2540 G	BP	11/04/14
Total Volatile Solids	4.39	%		0.1	SM 2540-G	BP	11/04/14

Demand

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Total Organic Carbon	2.4	%		0.05	SW 846 9060	MR	11/05/14

Nutrients

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Ammonia	44.1	ug/g		6.7	SM 4500NH3B&E	BP	11/04/14

Grain Size Distribution

PHI	OPENING (mm)	% RETENTION	FRACTION	PERCENT	METHOD	ANALYST	DATE
-2.25	4.75	36.3 %	GRAVEL	53.7	ASTM D422	AY	11/04/14
- 2	4.00	4.60 %			ASTM D422	AY	11/04/14
-1	2.00	12.8 %			ASTM D422	AY	11/04/14
0	1.00	7.20 %	SAND	31.8	ASTM D422	AY	11/04/14
+1	0.50	6.40 %			ASTM D422	AY	11/04/14
+ 2	0.25	9.50 %			ASTM D422	AY	11/04/14
+ 3	0.125	6.00 %			ASTM D422	AY	11/04/14
+ 4	0.063	2.70 %			ASTM D422	AY	11/04/14
+ 5	0.032	4.60 %	SILT	8.30	ASTM D422	AY	11/04/14
+ 6	0.016	2.60 %			ASTM D422	AY	11/04/14
+ 7	0.008	0.80 %			ASTM D422	AY	11/04/14
+ 8	0.004	0.30 %			ASTM D422	AY	11/04/14
+ 9	0.002	0.80 %	CLAY	6.00	ASTM D422	AY	11/04/14
+ 10	0.001	0.60 %			ASTM D422	AY	11/04/14
> + 10	< 0.001	4.60 %			ASTM D422	AY	11/04/14

NWTPH-HCID (Soil)

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Fuel Type	None				NWTPH-Dx	ED	11/04/14
Gasoline	< 20	mg/Kg		20.	NWTPH-HCID	ED	11/04/14
Diesel	< 25	mg/Kg		25.	NWTPH-HCID	ED	11/04/14
Heavy Oil	< 50	mg/Kg		50.	NWTPH-HCID	ED	11/04/14

Surrogates

ANALYTE	% RECOVERY	LIMITS
Bromofluorobenzene	102. %	50.0 - 150.

NWTPH-Dx (Soil)

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Diesel	< 25	mg/kg		25.	NWTPH-Dx	ED	11/04/14
Heavy Oil	130	mg/kg		50.	NWTPH-Dx	ED	11/04/14

Surrogates

ANALYTE	% RECOVERY	LIMITS
Bromofluorobenzene	125. %	50.0 - 150.

Miscellaneous

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANLST	DATE
Sulfide	30.6	ug/g		10	EPA 9030B	MR	11/05/14

Aaron W. Young
Laboratory Manager

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Professional Analytical Services

ANALYSIS REPORT

Pioneer Technologies Corp.
5205 Corporate Center Court SE
Olympia, WA 98503
Attention: Sheila Swain
Project Name: West Bay
All results reported on a dry weight basis.

Date Received: 11/04/14
Date Reported: 11/ 5/14

AMTEST Identification Number **14-A017451**
Client Identification **SD-WB-59-110114-0-0.5**
Sampling Date **11/01/14, 07:30**

Conventionals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Total Solids	45.2	%		0.1	SM 2540G	BP	11/04/14
% Moisture	54.8	%		0.1	Std Mthds. 2540 G	BP	11/04/14
Total Volatile Solids	15.6	%		0.1	SM 2540-G	BP	11/04/14

Demand

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Total Organic Carbon	3.8	%		0.05	SW 846 9060	MR	11/05/14

Nutrients

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Ammonia	148.	ug/g		11.	SM 4500NH3B&E	BP	11/04/14

Grain Size Distribution

PHI	OPENING (mm)	% RETENTION	FRACTION	PERCENT	METHOD	ANALYST	DATE
-2.25	4.75	7.00 %	GRAVEL	11.2	ASTM D422	AY	11/04/14
- 2	4.00	0.80 %			ASTM D422	AY	11/04/14
-1	2.00	3.40 %			ASTM D422	AY	11/04/14
0	1.00	3.40 %	SAND	51.0	ASTM D422	AY	11/04/14
+1	0.50	4.20 %			ASTM D422	AY	11/04/14
+ 2	0.25	6.80 %			ASTM D422	AY	11/04/14
+ 3	0.125	16.7 %			ASTM D422	AY	11/04/14
+ 4	0.063	19.9 %			ASTM D422	AY	11/04/14
+ 5	0.032	3.30 %	SILT	25.6	ASTM D422	AY	11/04/14
+ 6	0.016	14.0 %			ASTM D422	AY	11/04/14
+ 7	0.008	6.20 %			ASTM D422	AY	11/04/14
+ 8	0.004	2.10 %			ASTM D422	AY	11/04/14
+ 9	0.002	1.80 %	CLAY	12.4	ASTM D422	AY	11/04/14
+ 10	0.001	1.00 %			ASTM D422	AY	11/04/14
> + 10	< 0.001	9.60 %			ASTM D422	AY	11/04/14

NWTPH-HCID (Soil)

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Fuel Type	None				NWTPH-Dx	ED	11/04/14
Gasoline	< 20	mg/Kg		20.	NWTPH-HCID	ED	11/04/14
Diesel	< 25	mg/Kg		25.	NWTPH-HCID	ED	11/04/14
Heavy Oil	< 50	mg/Kg		50.	NWTPH-HCID	ED	11/04/14

Surrogates

ANALYTE	% RECOVERY	LIMITS
Bromofluorobenzene	97.4 %	50.0 - 150.

NWTPH-Dx (Soil)

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Diesel	66.	mg/kg		25.	NWTPH-Dx	ED	11/04/14
Heavy Oil	210	mg/kg		50.	NWTPH-Dx	ED	11/04/14

Surrogates

ANALYTE	% RECOVERY	LIMITS
Bromofluorobenzene	127. %	50.0 - 150.

Miscellaneous

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANLST	DATE
Sulfide	67.2	ug/g		10	EPA 9030B	MR	11/05/14

Aaron W. Young
Laboratory Manager

Am Test Inc.
13600 NE 126th PL
Suite C
Kirkland, WA, 98034
(425) 885-1664
www.amtestlab.com

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Professional Analytical Services

QC Summary for sample numbers: 14-A017448 to 14-A017451

DUPLICATES

SAMPLE #	ANALYTE	UNITS	SAMPLE VALUE	DUP VALUE	RPD
14-A017448	Total Organic Carbon	%	3.1	3.6	15.
14-A016458	Ammonia	ug/g	1610	1630	1.2
14-A016875	Ammonia	ug/g	1580	1580	0.00
14-A017451	Total Solids	%	45.2	43.4	4.1
14-A017451	Total Volatile Solids	%	15.6	17.0	8.6
14-A017448	Sulfide	ug/g	27.9	35.6	24.
14-A017450	-2.25	%	36.3	31.2	15.
14-A017450	-2.25	%	36.3	33.8	7.1
14-A017450	- 2	%	4.60	4.50	2.2
14-A017450	- 2	%	4.60	3.90	16.
14-A017450	-1	%	12.8	13.2	3.1
14-A017450	-1	%	12.8	13.4	4.6
14-A017450	0	%	7.20	7.60	5.4
14-A017450	0	%	7.20	7.50	4.1
14-A017450	+1	%	6.40	6.90	7.5
14-A017450	+1	%	6.40	6.50	1.6
14-A017450	+ 2	%	9.50	10.4	9.0
14-A017450	+ 2	%	9.50	9.20	3.2
14-A017450	+ 3	%	6.00	7.60	24.
14-A017450	+ 3	%	6.00	7.50	22.
14-A017450	+ 4	%	2.70	2.30	16.
14-A017450	+ 4	%	2.70	3.40	23.
14-A017450	+ 5	%	4.60	6.60	36.
14-A017450	+ 5	%	4.60	5.20	12.
14-A017450	+ 6	%	2.60	2.20	17.
14-A017450	+ 6	%	2.60	2.20	17.
14-A017450	+ 7	%	0.80	0.70	13.
14-A017450	+ 7	%	0.80	0.70	13.
14-A017450	+ 8	%	0.30	0.80	91.
14-A017450	+ 8	%	0.30	0.80	91.
14-A017450	+ 9	%	0.80	0.90	12.
14-A017450	+ 9	%	0.80	0.90	12.
14-A017450	+ 10	%	0.60	0.60	0.00
14-A017450	+ 10	%	0.60	0.60	0.00
14-A017450	> + 10	%	4.60	4.60	0.00
14-A017450	> + 10	%	4.60	4.60	0.00

MATRIX SPIKES

SAMPLE #	ANALYTE	UNITS	SAMPLE VALUE	SMPL+ SPK	SPK AMT	RECOVERY
14-A017448	Sulfide	ug/g	27.9	95.4	61.1	110.48 %

STANDARD REFERENCE MATERIALS

ANALYTE	UNITS	TRUE VALUE	MEASURED VALUE	RECOVERY
Total Organic Carbon	%	0.80	0.83	104. %
Ammonia	ug/g	851.	859.	101. %
Sulfide	ug/g	50.0	45.0	90.0 %
Gasoline	mg/Kg	250	250	100. %
Diesel	mg/Kg	400	420	105. %
Heavy Oil	mg/Kg	400	430	108. %
Diesel	mg/kg	400	430	108. %
Diesel	mg/kg	400	420	105. %
Heavy Oil	mg/kg	400	460	115. %
Heavy Oil	mg/kg	400	430	108. %

BLANKS

ANALYTE	UNITS	RESULT
Total Organic Carbon	%	< 0.05
Ammonia	ug/g	< 5
Total Solids	%	< 0.1
Total Volatile Solids	%	< 0.1
Sulfide	ug/g	< 10
Gasoline	mg/Kg	< 20
Diesel	mg/Kg	< 25
Heavy Oil	mg/Kg	< 50
Diesel	mg/kg	< 25
Heavy Oil	mg/kg	< 50
Bromofluorobenzene	%	130.

AMTEST LABORATORIES

AmTest Chain of Custody Record

13600 NE 126th PL, Suite C, Kirkland, WA 98034
Ph (425) 885-1664 Fx (425) 820-0245
www.amtestlab.com

Chain of Custody No. 22879

Client Name & Address:	Invoice To:
PIONEER Technologies Corp. 5205 Corporate Center Court SE Suite A Olympia, WA 98503	← PIONEER
Contact Person: SHELLA SWAIN	Invoice Contact: SHELLA SWAIN
Phone No: 360-570-1700	PO Number:
Fax No: 360-570-1777	Invoice Ph/Fax:
E-mail: swains@ustpioneer.com	Invoice E-mail:
Report Delivery: (Choose all that apply) Mail / Fax / Email / Posted Online	Data posted to online account: YES / NO Web Login ID:

Special Instructions: one-day report, EDD can follow later

Requested TAT: **(Rush must be pre-approved by lab)** Standard RUSH (5 Day / 3 Day / 48 HR / ~~24 HR~~)

Temperature upon Receipt: 4.8°C

Project Name: West BAY

Project Number:

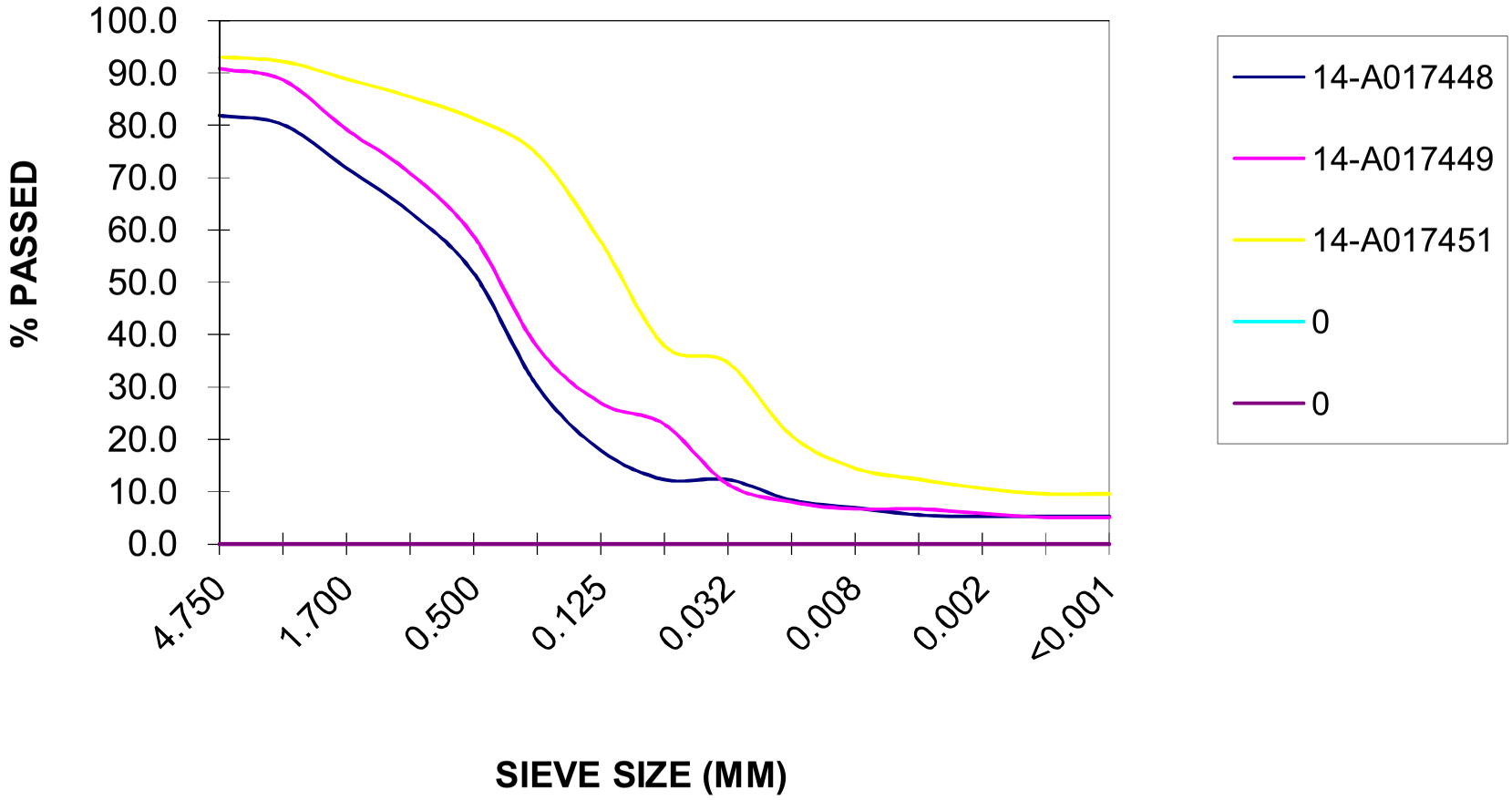
AmTest ID	Client ID (35 characters max)	Date Sampled	Time Sampled	Matrix	No. of containers	Analysis Requested: NWTPH-Dx	NWTPH-HCID	Total Vol Solids	Total Solids	Total Sulfides	Ammonia	Total Organic Carbon	Grain size w/ hydrometer (ASTM D422)	% Moisture	QA/QC
17448	SD-WB-56-110114-0-0.5	11/1/14	8:50	SD	2	X	X	X	X	X	X	X	X	X	
17449	SD-WB-57-110114-0-0.5	11/1/14	8:00	SD	2	X	X	X	X	X	X	X	X	X	
17450	SD-WB-58-110114-0-0.5	11/1/14	8:30	SD	2	X	X	X	X	X	X	X	X	X	
17451	SD-WB-59-110114-0-0.5	11/1/14	7:30	SD	2	X	X	X	X	X	X	X	X	X	

Collected/Relinquished By:	Date	Time	Received By:	Date	Time
Shella Swain	11/3/14	11:00	Andrea Betts	11/4/14	10:10
Relinquished By:	Date	Time	Received By:	Date	Time
Relinquished By:	Date	Time	Received By:	Date	Time

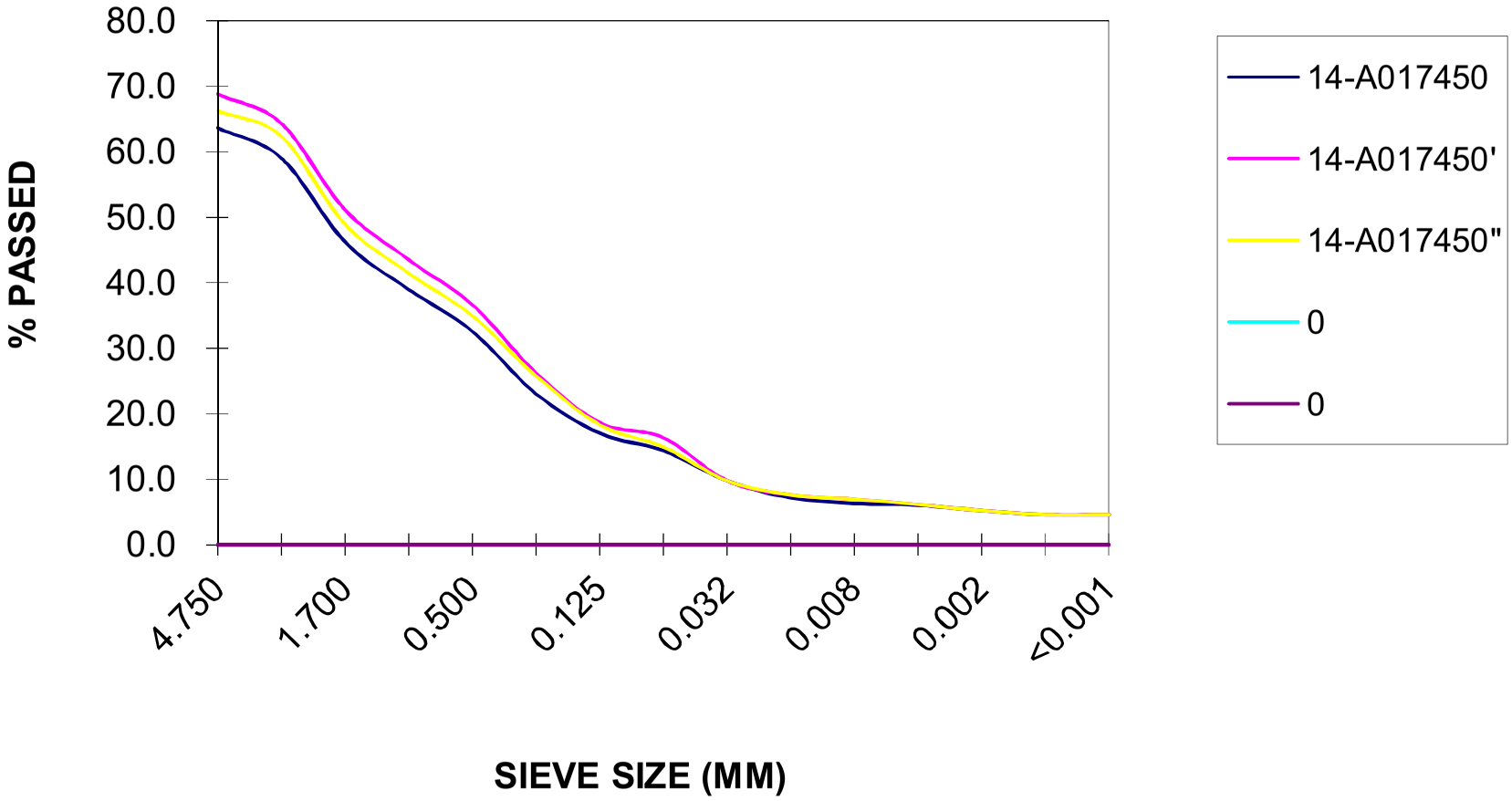
COMMENTS:

Fedex

GRAIN SIZE ANALYSIS



GRAIN SIZE ANALYSIS



Attachment 4

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BIOLOGICAL TESTING OF SEDIMENT FOR WEST BAY PARK

OLYMPIA, WASHINGTON

JANUARY 2, 2015

PREPARED FOR:
PIONEER TECHNOLOGIES
5205 CORPORATE CENTER CT. SE
OLYMPIA, WA 98503

PREPARED BY:
JULIA LEVENGOOD
BILL GARDINER

ENVIRON
PO BOX 216
4770 NE VIEW DRIVE
PORT GAMBLE, WA 98364
360-297-6040

ENVIRON

Contents

Tables

1.0 INTRODUCTION

ENVIRON conducted biological toxicity testing with sediment samples collected by Pioneer Technologies as part of a sediment investigation being performed at West Bay Park in Olympia, Washington. Sediments were evaluated for biological effects as indicated in the project specific work plan and following guidance provided by the Washington State Department of Ecology (WDOE) Sediment Management Standards (SMS) under the Washington Administrative Code (WAC) 173-204-315. This report presents the results of the toxicity testing portion of the West Bay Park site sediment investigation.

All testing was performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and ENVIRON is not responsible for use of less than the complete report. Results apply only to the samples tested.

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 WDOE Sediment Sampling and Analysis Plan Appendix (SSAPA; Ecology 2008), 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

Four test sediments were collected on November 1, 2014 and were received at ENVIRON on November 4, 2014. Reference sediments from two stations within Carr Inlet were collected by ENVIRON personnel on November 11, 2014 and received the same day. Sediment samples were stored in a walk-in cold room at 4 ± 2ºC in the dark. Test sediments were sieved through a 2 mm wire mesh sieve prior to testing in order to prevent potential spikes in ammonia that might be caused by the presence of tissues of organisms in the originally collected samples that perished during sediment holding. 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). *Mytilus galloprovincialis* (mussel) broodstock were provided by Taylor Shellfish in Shelton, Washington. Broodstock were held in unfiltered seawater at 16°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 receipt. Wet-sieve grain size results for the Carr Inlet reference sediments 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:
Ref_Carr Reference	2	
Carr 20 Reference	40	
SD-WB-56	0	Ref_Carr
SD-WB-57	0	Ref_Carr
SD-WB-58	0	Ref_Carr
SD-WB-59	30	Carr 20

Samples SD-WB-56, SD-WB-57, and SD-WB-58 were compared to the Ref_Carr reference and sample SD-WB-59 was compared to the Carr 20 reference for the purposes of evaluating the sediment under the sediment management standards.

2.3 10-DAY AMPHIPOD BIOASSAY

The 10-day acute toxicity test with *E. estuarius* was initiated on November 14, 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.

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 with healthy amphipods. 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 November 14, 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 TetraMin® (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 105°C for a minimum of 6 hours. Each weigh-boat was removed, cooled in a desiccator, 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 mussel, *M. galloprovincialis*. The mussel larval test was initiated on November 19, 2014. Control seawater was tested concurrent with each test batch. 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 16°C.

To collect gametes for each test, mussels were placed in clean seawater and acclimated at 16°C for approximately 20 minutes. The water bath temperature was then increased over a period of 15 minutes to 20°C. Mussels were held at 20°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:	≥5.0 mg/L
pH:	7 - 9 units
Temperature:	16 ± 1°C
Salinity:	28 ± 1ppt

The development test was conducted as a static test without 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 approximately 40 hours, the controls were checked for development indicating that greater than 90% of the larvae present had developed into the normal D-cell stage. At 48 hours from test initiation, the larval test was terminated following resuspension protocols recently 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). The test was terminated by resuspending the sediment and water in the test chamber at approximately 40 hours and allowing the contents to settle. To terminate the test, 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 Ecology (2005).

For SMS suitability determinations, comparisons were made according to 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 0% mortality in the native sediment control, which met the SMS performance criteria of ≤10% mortality. This result indicates that the test conditions were suitable for adequate amphipod survival. Mean mortality in the reference sediments were 5% in Ref_Carr and 4% in Carr 20, which met the SMS performance criteria (<25% mortality) and indicated that the reference sediments were acceptable for suitability determination. Mean mortality in the project sediments ranged from 5 - 9%. 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, with the exception of minor deviations in salinity. Although salinity was recorded at 26 ppt in the water quality surrogate for sample SD-WB-56 on day 10, this salinity is within the tolerance range for this estuarine species.

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 114 mg/L). Values were also below the published threshold concentration of 15 mg/L total ammonia (Barton 2002), with the exception of an initial interstitial ammonia value of 20.6 mg/L in reference sediment Ref_Carr. Initial sulfide concentrations in interstitial water were not expected to contribute to toxicity as adequate oxygen levels in overlying water were maintained throughout the duration of the test (USACE/USEPA 1998).

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

Treatment	Rep	Number Surviving	Percentage Survival	Mean Percentage		SD
				Survival	Mortality	
Control	1	20	100	100	0	0.0
	2	20	100			
	3	20	100			
	4	20	100			
	5	20	100			
Ref_Carr	1	16	80	95	5	8.7
	2	20	100			
	3	19	95			
	4	20	100			
	5	20	100			
Carr 20	1	19	95	96	4	4.2
	2	20	100			
	3	19	95			
	4	18	90			
	5	20	100			
SD-WB-56	1	18	90	95	5	3.5
	2	19	95			
	3	19	95			
	4	20	100			
	5	19	95			
SD-WB-57	1	18	90	95	5	3.5
	2	19	95			
	3	19	95			
	4	20	100			
	5	19	95			
SD-WB-58	1	16	80	91	9	7.4
	2	20	100			
	3	18	90			
	4	18	90			
	5	19	95			
SD-WB-59	1	19	95	92	8	6.7
	2	17	85			
	3	19	95			
	4	17	85			
	5	20	100			

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	8.1	8.6	15.7	15.4	16.0	28	28	28	8.0	7.8	8.1
Ref_Carr	8.4	8.2	8.6	15.7	15.3	16.0	29	28	29	8.0	7.9	8.1
Carr 20	8.3	8.1	8.6	15.8	15.6	16.0	28	27	29	8.0	7.8	8.2
SD-WB-56	8.2	8.0	8.5	15.8	15.6	16.0	27	26	28	8.0	7.9	8.1
SD-WB-57	7.9	7.4	8.2	15.9	15.6	16.0	28	27	28	8.0	7.8	8.1
SD-WB-58	8.2	7.9	8.5	15.7	15.3	16.0	28	27	28	8.0	7.7	8.2
SD-WB-59	8.2	8.1	8.5	15.7	15.4	16.0	28	27	28	8.0	7.8	8.2

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	<0.001	<0.001	<0.001	0.082	<0.001	<0.001	ND	0.100
Ref_Carr	<0.001	<0.001	20.6	<0.001	<0.001	0.001	0.090	0.338
Carr 20	<0.001	<0.001	1.54	0.374	<0.001	<0.001	0.497	0.402
SD-WB-56	<0.001	<0.001	5.28	2.86	0.001	0.006	0.015	1.05
SD-WB-57	2.47	0.781	2.01	2.31	0.001	0.003	0.128	0.255
SD-WB-58	0.126	<0.001	8.25	2.75	0.015	0.009	0.059	0.315
SD-WB-59	<0.001	<0.001	0.563	0.818	0.016	0.005	0.037	0.305

ND – no data; insufficient volume for analysis.
NOEC (concurrent reference-toxicant test derived) = 114 mg/L

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

Test Conditions: PSEP *E. estuarius*		
Sample Identification	Control, Ref_Carr, Carr 20, SD-WB-56, SD-WB-57, SD-WB-58, SD-WB-59	
Date sampled	November 1, 2014 (Test Sediments) November 11, 2014 (Reference Sediments)	
Date received	November 4, 2014 (Test Sediments) November 11, 2014 (Reference Sediments)	
Test dates	November 14 – 24, 2014	
Sample storage conditions	4°C, dark	
Days of holding Recommended: ≤8 weeks (56 days)	10 Days (Test Sediments) 3 Days (Reference Sediments)	
Source of control sediment	Yaquina Bay, OR	
Test Species	***E. estuarius***	
Supplier	Northwestern Aquatic Sciences, Newport, OR	
Date acquired	November 14, 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 sea water, 0.45µm filtered	
Test dissolved oxygen	Recommended: ≥ 4.6 mg/L	Achieved: 7.4 – 8.6 mg/L
Test temperature	Recommended: 15 ± 1 °C	Achieved: 15.3 – 16.0 °C
Test Salinity	Recommended: 28 ± 1 ppt	Achieved: 26 - 29 ppt
Test pH	Recommended: 7 - 9	Achieved: 7.7 – 8.2
SMS and DMMP Control Performance Standard	Recommended: Control ≤ 10% mortality	Achieved: 0%; Pass
SMS Reference Performance Standard	Recommended: Reference mortality < 25%	Achieved: Ref_Carr: 5%, Carr 20: 4%; Pass
Reference Toxicant LC_{50} (total ammonia)	LC_{50} = 168 mg/L total ammonia	
Mean; Acceptable Range (total ammonia)	141.4; 30.2 – 252.7 mg/L total ammonia	
NOEC (total ammonia)	114 mg/L total ammonia	
NOEC (unionized ammonia)	0.881 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	Minor deviations in salinity	

3.2 20-DAY JUVENILE POLYCHAETE BIOASSAY

No mortality was observed in the *N. arenaceodentata* control sediment and mean individual growth (MIG) was 0.984 mg/ind/day (dry weight) and 0.509 mg/ind/day (AFDW). These values fall within the test acceptability criteria of ≤10% mean mortality and ≥0.38 mg/ind/day 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.

Mortality observed in the reference treatments was 0% and 8% (Ref-Carr and Carr 20, respectively), meeting the reference performance standard of ≥80% the control survival (Ecology 2008). Mean individual growth rates were 0.975 and 0.857 mg/ind/day (dry weight) and 0.503 and 0.500 mg/ind/day (AFDW), respectively.

Mean individual growth (dry weight and AFDW) for the reference treatments compared to the control was greater than 80% of the control response and mortality was less than 20% in all reference treatments. These results indicate that the reference sediments were 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 142 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.

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	1.114	0.984	0.1	0.511	0.509	0.021
	2	5		0.975			0.505		
	3	5		0.951			0.498		
	4	5		0.861			0.487		
	5	5		1.017			0.543		
Ref_Carr	1	5	0	1.014	0.975	0.1	0.534	0.503	0.075
	2	5		1.032			0.500		
	3	5		0.882			0.454		
	4	5		0.797			0.416		
	5	5		1.148			0.611		
Carr 20	1	5	8	0.809	0.857	0.1	0.447	0.500	0.072
	2	5		0.828			0.529		
	3	5		0.739			0.424		
	4	5		0.918			0.494		
	5	3		0.989			0.606		
SD-WB-56	1	5	0	0.797	0.686	0.1	0.528	0.493	0.049
	2	5		0.559			0.427		
	3	5		0.666			0.479		
	4	5		0.775			0.552		
	5	5		0.634			0.479		
SD-WB-57	1	5	0	0.766	0.775	0.1	0.519	0.537	0.040
	2	5		0.670			0.490		
	3	5		0.759			0.541		
	4	5		0.888			0.598		
	5	5		0.794			0.538		
SD-WB-58	1	5	0	0.760	0.685	0.1	0.562	0.507	0.039
	2	5		0.682			0.499		
	3	5		0.687			0.517		
	4	5		0.575			0.454		
	5	5		0.723			0.502		
SD-WB-59	1	5	0	0.665	0.652	0.0	0.462	0.469	0.031
	2	5		0.628			0.463		
	3	5		0.634			0.488		
	4	5		0.617			0.426		
	5	5		0.717			0.509		

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	7.6	7.3	8.1	20.1	19.6	20.4	28	28	29	8.0	7.8	8.1
Ref_Carr	7.7	7.3	8.3	20.1	19.7	20.4	28	28	29	8.0	7.9	8.1
Carr 20	7.6	7.0	8.3	20.1	19.6	20.4	28	28	29	8.0	7.9	8.2
SD-WB-56	7.6	7.1	7.9	20.2	19.9	20.4	28	27	29	8.1	7.9	8.3
SD-WB-57	7.5	7.0	7.8	20.1	19.8	20.4	29	28	29	8.1	7.9	8.3
SD-WB-58	7.6	7.2	7.8	20.1	19.8	20.4	28	27	29	8.1	8.0	8.2
SD-WB-59	7.3	6.9	7.7	20.2	19.9	20.4	28	27	28	8.0	7.7	8.2

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	<0.001	<0.001	<0.001	0.411	<0.001	0.002	0.040	0.120
Ref_Carr	<0.001	<0.001	8.25	0.051	0.016	0.005	0.210	0.248
Carr 20	<0.001	<0.001	0.228	0.275	0.041	0.005	ND	0.340
SD-WB-56	<0.001	<0.001	8.02	<0.001	0.500	0.005	0.590	0.098
SD-WB-57	0.228	<0.001	7.23	<0.001	0.011	0.011	0.094	0.140
SD-WB-58	0.036	<0.001	14.6	<0.001	0.035	0.008	0.081	0.130
SD-WB-59	<0.001	<0.001	3.68	0.118	0.027	0.015	0.090	0.118

ND – no data; insufficient volume for analysis.
NOEC (concurrent reference-toxicant test derived) = 142 mg/L

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

Test Conditions: PSEP *N. arenaceodentata*		
Sample Identification	Control, Ref_Carr, Carr 20, SD-WB-56, SD-WB-57, SD-WB-58, SD-WB-59	
Date sampled	November 1, 2014 (Test Sediments) November 11, 2014 (Reference Sediments)	
Date received	November 4, 2014 (Test Sediments) November 11, 2014 (Reference Sediments)	
Test dates	November 14 – December 4, 2014	
Sample storage conditions	4°C, dark	
Days of holding Recommended: ≤8 weeks (56 days)	10 Days (Test Sediments) 3 Days (Reference Sediments)	
Source of control sediment	Yaquina Bay, OR	
Test Species	***N. arenaceodentata***	
Supplier	Aquatic Toxicology Support	
Date acquired	November 14, 2014	
Age class	Juvenile; 16-21 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: 6.9 – 8.3 mg/L
Test temperature	Recommended: 20 ± 1 °C	Achieved: 19.6 - 20.4 °C
Test Salinity	Recommended: 28 ± 2 ppt	Achieved: 27 - 29 ppt
Test pH	Recommended: 7 - 9	Achieved: 7.7 – 8.3
Initial biomass	Recommended: 0.5 - 1.0 mg Minimum: 0.25 mg	0.735 mg; Acceptable
SMS and DMMP Control Performance Standard	Recommended: Control ≤ 10% mortality	Achieved: 0% Pass
	Recommended: ≥ 0.72 mg/ind/d Minimum: ≥ 0.38 mg/ind/day dw	Achieved: 0.984 mg/ind/day; Pass
SMS Reference Performance Standard	Recommended: $MIG_{Reference}/MIG_{Control}$ ≥ 80%	MIG Achieved: Ref_Carr: 99% (Pass), Carr 20: 87% (Pass)
Reference Toxicant LC_{50} (total ammonia)	LC_{50} = 203.3 mg/L total ammonia	
Mean; Acceptable Range (total ammonia)	141.8; 46.1 – 237.6 mg/L total ammonia	
NOEC (total ammonia)	142 mg/L total ammonia	
NOEC (unionized ammonia)	1.39 mg /L UIA	
Test Lighting	Continuous	
Test chamber	1-Liter Glass Chamber	
Replicates/treatment	5 + 2 surrogates	
Organisms/replicate	5	
Exposure volume	175 mL sediment/ 775 mL water	
Feeding	40 mg/jar every other day (8 mg/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 *M. galloprovincialis* was validated by 88% 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 SMS 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 survivals were 95.9%, and 96.5% in the Ref_Carr and Carr 20 reference sediments, respectively, and ranged from 84.0 - 97.8% in the project samples. The test mean chamber stocking density (measured at test initiation) was 38.5 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). Therefore 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, with the exception of minor deviations in temperature. Although temperatures reach 17.2 °C in water quality surrogates on day 1, this minor deviation is not suspected of influencing test results.

Ammonia concentrations observed in the *M. galloprovincialis* test were below the NOEC value derived from the concurrent ammonia reference-toxicant test (Table 3-11; compare to NOEC of 1.3 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.

Table 3-9. Test Results for *Mytilus galloprovincialis*.

Treatment	Rep	Number Normal	Number Abnormal	Mean Number Normal	Normalized Combined Normal Survivorship (%)[1, 2]	Mean Combined Normal Survivorship (%)	SD
Control	1	303	8	339	79	88.0	7.1
	2	364	19		95		
	3	364	16		95		
	4	319	16		83		
	5	345	13		90		
Ref_Carr	1	348	12	334	100	95.9	6.7
	2	287	13		85		
	3	354	12		100		
	4	359	11		100		
	5	322	7		95		
Carr 20	1	324	14	334	96	96.5	3.5
	2	323	9		95		
	3	374	6		100		
	4	340	12		100		
	5	311	6		92		
SD-WB-56	1	320	8	285	94	84.0	8.1
	2	250	9		74		
	3	270	8		80		
	4	303	8		89		
	5	281	13		83		
SD-WB-57	1	347	7	332	100	96.3	5.3
	2	298	26		88		
	3	357	14		100		
	4	337	14		99		
	5	320	6		94		
SD-WB-58	1	325	6	333	96	97.8	1.8
	2	331	5		98		
	3	349	6		100		
	4	336	4		99		
	5	326	7		96		
SD-WB-59	1	343	4	322	100	94.9	4.6
	2	334	12		99		
	3	302	24		89		
	4	322	13		95		
	5	311	16		92		

[1] Control normality normalized to stocking density (385.2).
[2] Reference and treatment normal survivorship are normalized to the mean Control normality (339).

Table 3-10. Water Quality Summary for *Mytilus galloprovincialis*.

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	7.5	7.9	16.3	16.0	16.6	28	28	28	7.8	7.8	7.8
Ref_Carr	7.7	7.5	7.8	16.8	16.5	17.2	28	28	28	7.8	7.7	7.8
Carr 20	7.1	6.7	7.9	16.4	16.3	16.6	28	28	28	7.7	7.7	7.8
SD-WB-56	7.0	6.4	7.6	16.9	16.5	17.1	28	28	28	7.7	7.7	7.7
SD-WB-57	6.7	6.1	7.4	16.8	16.4	17.1	28	28	28	7.7	7.6	7.7
SD-WB-58	6.5	5.9	7.7	16.6	16.4	16.9	28	28	28	7.7	7.6	7.8
SD-WB-59	6.9	6.5	7.6	16.6	16.3	17.0	28	28	28	7.7	7.6	7.7

Table 3-11. Ammonia and Sulfide Summary for *Mytilus galloprovincialis*.

Treatment	Overlying Ammonia (mg/L Total)		Overlying Sulfides (mg/L Total)	
	Day 0	Day 2	Day 0	Day 2
Control	<0.001	<0.001	<0.001	0.005
Ref_Carr	<0.001	<0.001	0.019	0.001
Carr 20	<0.001	<0.001	0.055	0.012
SD-WB-56	<0.001	<0.001	0.114	0.016
SD-WB-57	<0.001	<0.001	0.082	0.010
SD-WB-58	<0.001	<0.001	0.111	0.008
SD-WB-59	<0.001	<0.001	0.098	0.008

NOEC (concurrent reference-toxicant test derived) = 1.3 mg/L

Table 3-12. Test Condition Summary for *Mytilus galloprovincialis*.

Test Conditions: PSEP *M. galloprovincialis*		
Sample Identification	Control, Ref_Carr, Carr 20, SD-WB-56, SD-WB-57, SD-WB-58, SD-WB-59	
Date sampled	November 1, 2014 (Test Sediments) November 11, 2014 (Reference Sediments)	
Date received	November 4, 2014 (Test Sediments) November 11, 2014 (Reference Sediments)	
Test dates	November 19 - 21, 2014	
Sample storage conditions	4°C, dark	
Holding time Recommended: < 8 weeks (56 days)	15 Days (Test Sediments) 8 Days (Reference Sediments)	
Test Species	***M. galloprovincialis***	
Supplier	Taylor Shellfish, Shelton, WA	
Date acquired	November 19, 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: 48 hours)	
Control water	North Hood Canal sea water, 0.45µm filtered	
Test dissolved oxygen	Recommended: > 5.0 mg/L	Achieved: 5.9 – 7.9 mg/L
Test temperature	Recommended: 16 ± 1 °C	Achieved: 16.0 – 17.2 °C
Test Salinity	Recommended: 28 ± 1 ppt	Achieved: 28 ppt
Test pH	Recommended: 7 - 9	Achieved: 7.6 – 7.8
Stocking Density	Recommended: 20 – 40 embryos/mL	Achieved: 38.5 embryos/mL
SMS and DMMP Control performance standard	Recommended: Control normal survival ≥ 70%	Achieved: 88%, Pass
SMS Reference Performance Standard	None	None
DMMP Reference Performance Standard	Recommended: Reference normal survival / Control normal survival ≥ 65%	Achieved: Ref_Carr: 95.9%, Carr 20: 96.5%; Pass
Reference Toxicant LC_{50} (total ammonia)	LC_{50} = 1.9 mg/L total ammonia	
Mean; Acceptable Range (total ammonia)	5.4; 1.3 – 9.6 mg/L total ammonia	
NOEC (total ammonia)	1.3 mg/L total ammonia	
NOEC (unionized ammonia)	0.014 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	Minor deviations in temperature	

4.0 DISCUSSION

Sediments were evaluated based on Sediment Management Standards (SMS) criteria. 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 Sampling and Analysis Plan Appendix (WDOE 2008). Comparisons were made for each treatment against the corresponding reference sample. Two numerical comparisons were made under SMS, the Sediment Quality Standards (SQS) and the Cleanup Standards Limit (CSL).

4.1 AMPHIPOD TEST SUITABILITY DETERMINATION

Under the SMS program, a treatment will fail SQS if mean mortality in the test sediment is >25% more than the mean mortality in the appropriate reference sediment and the difference is statistically significant ($p \leq 0.05$). Treatments fail the CSL if mean mortality in the test treatment >30% relative to the reference sediment and the difference is statistically significant.

Samples SD-WB-56, SD-WB-57, SD-WB-58, and SD-WB-59 do not fail the SQS and CSL criteria for the amphipod test as shown in Table 4-1.

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

Treatment	Mean Mortality (%)	Comparison To:	Statistically More than Reference?	Mortality Comparison to Reference MT-MR (%)	Fails SQS?[1] > 25 %	Fails CSL?[2] > 30 %
Control	0					
Ref_Carr	5					
Carr 20	4					
SD-WB-56	5	Ref_Carr	No	0	No	No
SD-WB-57	5	Ref_Carr	No	0	No	No
SD-WB-58	9	Ref_Carr	No	4	No	No
SD-WB-59	8	Carr 20	No	4	No	No

[1]SQS: Statistical Significance and MT-MR >25%
[2] CSL: Statistical Significance and MT-MR >30%
M_T = Treatment 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). A test treatment fails SQS criteria if MIG is statistically lower in the test treatment, relative to the reference, and MIG in the test treatment is <70% that of the reference. The treatments will fail CSL criteria if MIG is significantly lower than the reference treatment and is <50% that of the treatment.

Based on AFDW, all samples passed both SQS and CSL criteria.

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

Treatment	MIG (mg/ind/day)	Comparison To:	Statistically Less than Reference?	MIG Relative to Reference MIGT/MIGR (%)	Fails SQS?[1] < 70%	Fails CSL?[2] < 50%
Ash-Free Dry Weight						
Control	0.509					
Ref_Carr	0.503					
Carr 20	0.500					
SD-WB-56	0.493	Ref_Carr	No	98	No	No
SD-WB-57	0.537	Ref_Carr	No	107	No	No
SD-WB-58	0.507	Ref_Carr	No	101	No	No
SD-WB-59	0.469	Carr 20	No	94	No	No

[1]SQS: Statistical Significance and MIG_T/MIG_R <70%
[2]CSL: Statistical Significance and MIG_T/MIG_R <50%
MIG_T = Treatment Mean Individual Growth
MIG_R = Reference Mean Individual Growth

4.3 LARVAL TEST SUITABILITY DETERMINATION

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 the normal larval development in the test treatment is less than 85% of the normal development in the reference. Treatments fail CSL criteria if the percentage of normal larvae in the test treatment is significantly lower than that of the reference and if the normal larval development in the test treatment is less than 70% of the normal development in the reference.

All samples pass the SQS and CSL criteria for larval development (Table 4-3).

Table 4-3. SMS Comparison for *Mytilus galloprovincialis*.

Treatment	Mean Normal Survival (%)	Comparison To:	Statistically Less than Reference?	Normal Survival Comparison to Reference NT/NR (%)	Fails SQS?[1] < 85%	Fails CSL?[2] < 70%
Control	88.0					
Ref_Carr	95.9					
Carr 20	96.5					
SD-WB-56	84.0	Ref_Carr	Yes	88	No	No
SD-WB-57	96.3	Ref_Carr	No	100	No	No
SD-WB-58	97.8	Ref_Carr	No	102	No	No
SD-WB-59	94.9	Carr 20	No	98	No	No

[1]SQS: Statistical Significance and N_T/N_R<85%
[2]CSL: Statistical Significance and N_T/N_R <70%
N_T =Treatment Normal Survivorship (Control Normalized)
N_R =Reference Normal Survivorship (Control Normalized)

5.0 SUMMARY

Samples SD-WB-56, SD-WB-57, SD-WB-58, and SD-WB-59 pass both SQS and CSL criteria established under the Sediment Management Standards (SMS). Table 5-1 summarizes the interpretive results of the biological tests conducted on the West Bay sediments.

Table 5-1. Summary of West Bay SMS Evaluation.

Treatment	Sediment Quality Standards			Cleanup Screening Levels			Overall Determination
	Amphipod	Polychaete	Larval	Amphipod	Polychaete	Larval	
SD-WB-56	Pass	Pass	Pass	Pass	Pass	Pass	Pass
SD-WB-57	Pass	Pass	Pass	Pass	Pass	Pass	Pass
SD-WB-58	Pass	Pass	Pass	Pass	Pass	Pass	Pass
SD-WB-59	Pass	Pass	Pass	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
Pioneer Technologies	West Bay
JOB NUMBER	PROJECT MANAGER
0	Bill Gardiner

SPECIES		LABORATORY	PROTOCOL
Eohaustorius estuarius		Port Gamble	PSEP 1995
TEST START DATE	TIME	TEST END DATE	TIME ②
14-Nov-14	1425	24-Nov-14	~~13~~ 0930

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
Sample ID	Day	Rep	Jar#	meter	mg/L	meter	deg C	meter	ppt	meter	unit		
SD-WB-57	0	WQ	7	8	8.1	8	16.0	8	28	8	7.9	CR	11/14/14
SD-WB-56	0	WQ	24	↓	8.2	↓	16.0	↓	28	↓	7.9	↓	↓
SD-WB-59	0	WQ	26	↓	8.3	↓	16.0	↓	28	↓	7.9	↓	↓
Control	0	WQ	27	↓	8.1	↓	16.0	↓	28	↓	7.8	↓	↓
Carr 20	0	WQ	30	↓	8.1	↓	16.0	↓	27	↓	7.8	↓	↓
Ref Carr	0	WQ	35	↓	8.2	↓	16.0	↓	28	↓	7.9	↓	↓
SD-WB-58	0	WQ	37	↓	7.9	↓	16.0	↓	28	↓	7.7	↓	↓
SD-WB-57	1	WQ	7	8	8.1	8	15.7	8	28	8	7.9	JL	11/15
SD-WB-56	1	WQ	24	↓	8.2	↓	15.8	↓	27	↓	7.9	↓	↓
SD-WB-59	1	WQ	26	↓	8.3	↓	15.7	↓	28	↓	7.9	↓	↓
Control	1	WQ	27	↓	8.4	↓	15.8	↓	28	↓	8.0	↓	↓
Carr 20	1	WQ	30	↓	8.5	↓	~~15.9~~ ①	↓	28	↓	8.0	↓	↓
Ref Carr	1	WQ	35	↓	8.5	↓	15.7	↓	28	↓	8.0	↓	↓
SD-WB-58	1	WQ	37	↓	8.4	↓	15.7	↓	28	↓	8.0	↓	↓

① Stray mark 15.9 °C. JL 11/15.
② WP. MK. 11/18.

ENVIRON

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TEST START DATE	TIME	TEST END DATE	TIME
14-Nov-14	1425	24-Nov-14	0930

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
Sample ID	Day	Rep	Jar#	meter	mg/L	meter	deg C	meter	ppt	meter	unit		
SD-WB-57	2	WQ	7	8	8.2	8	15.9	8	28	8	7.9	JL	11/16/14
SD-WB-56	2	WQ	24		8.4		15.9		27		8.0		
SD-WB-59	2	WQ	26		8.4		15.7		28		7.9		
Control	2	WQ	27		8.6		15.8		28		8.0		
Carr 20	2	WQ	30		8.6		15.8		28		8.0		
Ref Carr	2	WQ	35		8.6		15.8		28		8.0		
SD-WB-58	2	WQ	37		8.5		15.8		28		8.0		
SD-WB-57	3	WQ	7	8	7.9	8	16.0	8	① ~~29~~ 28	8	7.8	KMB	11/17/14
SD-WB-56	3	WQ	24		8.2		15.8		~~28~~ 27		7.9		
SD-WB-59	3	WQ	26		8.2		15.7		~~29~~ 28		7.8		
Control	3	WQ	27		8.3		15.9		~~30~~ 28		7.9		
Carr 20	3	WQ	30		8.3		16.0		~~30~~ 28		7.9		
Ref Carr	3	WQ	35		8.3		15.8		~~30~~ 29		8.0		
SD-WB-58	3	WQ	37		8.2		15.8		~~30~~ 28		8.0		

① MR. Meter recal due to suspected deviation. KMB. 11/17/14

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TEST START DATE	TIME	TEST END DATE	TIME
14-Nov-14	1425	24-Nov-14	0930

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
Sample ID	Day	Rep	Jar#	meter	mg/L	meter	deg C	meter	ppt	meter	unit		
SD-WB-57	4	WQ	7	8	7.9	8	16.0	8	28	8	7.9	KE	11/18/14
SD-WB-56	4	WQ	24	8	8.2	8	16.0	8	27	8	8.0	↓	↓
SD-WB-59	4	WQ	26	8	8.2	8	15.9	8	28	8	8.0		
Control	4	WQ	27	8	8.4	8	15.8	8	28	8	8.0		
Carr 20	4	WQ	30	8	8.3	8	16.0	8	29	8	8.0		
Ref Carr	4	WQ	35	8	8.4	8	15.8	8	29	8	8.1		
SD-WB-58	4	WQ	37	8	8.2	8	16.0	8	28	8	8.0	↓	
SD-WB-57	5	WQ	7	8	7.4	8	16.0	8	28	8	7.9	KMB	11/19/14
SD-WB-56	5	WQ	24	↓	8.1	↓	16.0	↓	27	↓	7.9	↓	↓
SD-WB-59	5	WQ	26		8.1		16.0		28		7.9		
Control	5	WQ	27		8.1		16.0		28		8.0		
Carr 20	5	WQ	30		8.1		16.0		28		8.0		
Ref Carr	5	WQ	35		8.2		16.0		29		7.9		
SD-WB-58	5	WQ	37	↓	8.1	↓	16.0	↓	28	↓	8.0	↓	↓

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Eohaustorius estuarius		Port Gamble	PSEP 1995
TEST START DATE	TIME	TEST END DATE	TIME
14-Nov-14	1425	24-Nov-14	0930

				WATER QUALITY DATA									
			Test Conditions	DO (mg/L) >4.6 mg/L		Temperature (°C) 15±1		Salinity (ppt) 28±1		pH 7 - 9		Tech	Date
Sample ID	Day	Rep	Jar#	meter	mg/L	meter	deg C	meter	ppt	meter	unit		
SD-WB-57	6	WQ	7	8	8.0	8	15.8	8	28	8	8.1	JL	11/20
SD-WB-56	6	WQ	24	↓	8.2	↓	15.9	↓	27	↓	8.1	↓	↓
SD-WB-59	6	WQ	26		8.1		15.8		28		8.1		
Control	6	WQ	27		8.4		15.8		28		8.1		
Carr 20	6	WQ	30		8.3		15.9		28		8.1		
Ref Carr	6	WQ	35		8.4		15.7		29		8.1		
SD-WB-58	6	WQ	37	↓	8.2	↓	15.8	↓	28	↓	8.1	↓	↓
SD-WB-57	7	WQ	7	8	7.8	8	15.9	8	28	8	8.0	KB	11/21/14
SD-WB-56	7	WQ	24	↓	8.1	↓	15.9	↓	27	↓	8.0	↓	↓
SD-WB-59	7	WQ	26		8.1		15.6		28		8.0		
Control	7	WQ	27		8.3		15.5		28		8.0		
Carr 20	7	WQ	30		8.3		15.6		28		8.0		
Ref Carr	7	WQ	35		8.3		15.6		29		8.0		
SD-WB-58	7	WQ	37	↓	8.2	↓	15.5	↓	28	↓	8.0	↓	↓

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CLIENT	PROJECT
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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
14-Nov-14	1425	24-Nov-14	0930

				WATER QUALITY DATA									
				DO (mg/L) >4.6 mg/L		Temperature (°C) 15±1		Salinity (ppt) 28±1		pH 7 - 9		Tech	Date
Sample ID	Day	Rep	Jar#	meter	mg/L	meter	deg C	meter	ppt	meter	unit		
SD-WB-57	8	WQ	7	8	7.8	8	15.8	8	27	8	8.1	HH	11/22
SD-WB-56	8	WQ	24		8.0		15.8		27		8.1		
SD-WB-59	8	WQ	26		8.1		15.4		28		8.1		
Control	8	WQ	27		8.2		15.5		28		8.1		
Carr 20	8	WQ	30		8.2		15.8		28		8.1		
Ref Carr	8	WQ	35		8.3		15.3		① ~~29~~ 29		8.0		
SD-WB-58	8	WQ	37		8.1		15.5		28		8.1		
SD-WB-57	9	WQ	7	8	7.6	8	15.6	8	28	8	8.1	JL	11/23
SD-WB-56	9	WQ	24		8.3		15.7		27		8.1		
SD-WB-59	9	WQ	26		8.4		15.5		28		8.2		
Control	9	WQ	27		8.4		15.4		28		8.1		
Carr 20	9	WQ	30		8.5		15.6		28		8.2		
Ref Carr	9	WQ	35		8.5		15.5		29		8.1		
SD-WB-58	9	WQ	37		8.4		15.5		28		8.2		

① MR HH 11/22

ENVIRON

10 DAY SOLID PHASE BIOASSAY
WATER QUALITY DATA SHEET

CLIENT	PROJECT
Pioneer Technologies	West Bay
JOB NUMBER	PROJECT MANAGER
0	Bill Gardiner

SPECIES		LABORATORY	PROTOCOL
Eohaustorius estuarius		Port Gamble	PSEP 1995
TEST START DATE	TIME	TEST END DATE	TIME
14-Nov-14	1425	24-Nov-14	0930

	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
Sample ID	Day	Rep	Jar#	meter	mg/L	meter	deg C	meter	ppt	meter	unit		
SD-WB-57	10	WQ	7	8	8.0	8	15.9	8	27	8	8.1	KMB	11/24/14
SD-WB-56	10	WQ	24	↓	8.5	↓	15.6	↓	26	↓	8.0	↓	↓
SD-WB-59	10	WQ	26		8.5		15.4		27		8.1		
Control	10	WQ	27		8.5		15.4		28		7.9		
Carr 20	10	WQ	30		8.6		15.6		28		8.1		
Ref Carr	10	WQ	35		8.6		15.4		28		7.9		
SD-WB-58	10	WQ	37	↓	8.5	↓	15.3	↓	27	↓	8.1	↓	↓

ENVIRON

10-DAY SOLID PHASE TEST OBSERVATION DATA

CLIENT	PROJECT	SPECIES	ENVIRON LABORATORY	PROTOCOL
Pioneer Technologies	West Bay	*Eohaustorius estuarius*	Port Gamble	PSEP 1995
ENVIRON JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE**	**TEST END DATE**	
0	Bill Gardiner	14-Nov-14	24-Nov-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/ENVIRON 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 11/15	Date 11/16	Date 11/17	Date 11/18	Date 11/19/14	Date 11/20	Date 11/21	Date 11/22	Date 11/23	Date 11/24		
			20	Tech. JL	Tech. JL	Tech. MK	Tech. [illegible]	Tech. KMB	Tech. [illegible]	Tech. KB	Tech. [illegible]	Tech. JL	Tech. MK		
Control	1	6		N	N	N	N	N	N	N	N	N	N	20	
	2	19												20	
	3	39												20	
	4	42												20	
	5	10							↓	↓	↓	↓	↓	20	
Ref Carr	1	3							G	G	G	G	G	16	
	2	2						↓	N	N				20	
	3	31						G	G	G				19	
	4	2						N	N	N	↓			20	
	5	11						↓	G	G		↓	↓	20	
Carr 20	1	9						G	G	G	G	G	G	19	
	2	38						G						20	
	3	21						N						19	
	4	20						G				G, Im		18	
	5	1						① ~~2F~~ G	↓	↓	↓	G	↓	20	
SD-WB-56	1	12		↓				N	N	N	N	N	N	18	
	2	29		1E						↓		↓	↓	19	
	3	16		1F		↓			↓	1F		1F	1F	19	
	4	4		N		1F			↓	N		N	2F	20	
	5	17		↓	↓	1F	↓	↓	1F	↓	↓	↓	N	19	

① WC. KMB. 11/19/14

ENVIRON

10-DAY SOLID PHASE TEST OBSERVATION DATA

CLIENT	PROJECT	SPECIES	ENVIRON LABORATORY	PROTOCOL
Pioneer Technologies	West Bay	*Eohaustorius estuarius*	Port Gamble	PSEP 1995
ENVIRON JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE**	**TEST END DATE**	
0	Bill Gardiner	14-Nov-14	24-Nov-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/ENVIRON 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 11/15	Date 11/16	Date 11/17	Date 11/18	Date 11/19/14	Date 11/20	Date 11/21	Date 11/22	Date 11/23	Date 11/24		
				Tech. JL	Tech. JL	Tech. MK	Tech. HG	Tech. KMB	Tech. [illegible]	Tech. KMB	Tech. [illegible]	Tech. JL	Tech. MK		
SD-WB-57	1	14	20	N	N	N	N	N	N	N	N	N	N	18	
	2	22		↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	19	
	3	25		↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	19	
	4	18		↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	20	
	5	40		↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	19	
SD-WB-58	1	5		4F	2F	1F	↓	2F	↓	↓	↓	↓	↓	16	
	2	28		N	N	N	↓	N	↓	↓	↓	↓	↓	20	
	3	41		↓	↓	↓	↓	↓	2F	↓	↓	↓	↓	18	
	4	33		↓	↓	↓	2F	↓	N	↓	↓	↓	1F	18	
	5	36		↓	↓	↓	N	↓	↓	↓	↓	↓	N	19	1
SD-WB-59	1	15		↓	G	↓	N	↓	↓	↓	↓	↓	↓	19	
	2	13		↓	N	↓	↓	↓	1F	↓	↓	↓	↓	17	
	3	34		↓	↓	↓	↓	↓	N	↓	↓	↓	↓	19	
	4	23		↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	17	
	5	8		↓	↓	1F	↓	↓	↓	1F	↓	↓	↓	20	

ENVIRON

Ammonia and Sulfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
Pioneer / West Bay	Eoh / ~~Neanthes~~ ①	10

PRETEST / ~~INITIAL~~ / ~~FINAL~~ / OTHER (circle one) DAY of TEST: 0

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:	Temperature:	
11/14/14	21.6°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)
OV	Ø	OV	11/14/14 KMB	0.00	22.0	11/14/14 KMB	N			10mL	0.0	1	0.0 mg/L
	Ref Carr			0.00	22.3						0.0		0.0 mg/L
	Carr 20			0.00	22.5						0.0		0.0 mg/L
	SD. WB · 56			0.00	22.5						0.001		0.001 mg/L
	" 57			2.47	22.5						0.001		0.001 mg/L
	" 58			0.126	22.2						~~0.000~~ 0.015		0.015 mg/L
	" 59			0.00	22.2						0.016		0.016 mg/L
PW	Ø	PW	11/14/14 MK	0.00	22.6	11/14/14 KMB	N	7.7	27	Insuff. pw amt.			
	Ref Carr			20.6	22.2	11/14/14 KMB		7.5	28	3mL	0.027	3.33	0.09 mg/L
	Carr 20			1.54	22.1			7.7	28	3mL	0.149	3.33	0.497 mg/L
	SD. WB · 56			5.28	21.9			7.6	22	10mL	0.015	1	0.015 mg/L
	" 57			2.01	21.2			7.5	29		0.128		0.128 mg/L
	" 58			8.25	21.4			7.6	28		0.059		0.059 mg/L
	" 59			0.563	21.5			7.4	27		0.037		0.037 mg/L

① IE.KB. 11/14/14

ENVIRON

Ammonia and Sulfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
Pioneer / West Bay	Eoh e.	10d.

PRETEST / INITIAL / FINAL / OTHER (circle one) DAY of TEST: 10

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:	Temperature:	
11/24/14	21.8°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)
OV	Ø	OV	11/24/14 MK	0.00	21.0	11/24/14 MK + KB	N			10mL	0.0	1	0.0 mg/L
	REF - CARR			0.00	21.1					10 mL	0.001	1	0.001 mg/L
	CARR 20			0.00	22.0					10mL	0.0	1	0.0 mg/L
	SD · WB · 56			0.00	21.9					10mL	0.006	1	0.006 mg/L
	" 57			0.781	21.0					10mL	0.003	1	0.003 mg/L
	" 58			0.00	21.0					10mL	0.009	1	0.009 mg/L
	" 59			0.00	21.1					10mL	0.005	1	0.005 mg/L
PW	Ø	PW	11/24/14 MK	0.082	21.0	11/24/14 MK + KB	N	7.6	30	1mL	0.010	10	0.10 mg/L
	REF - CARR			0.00	21.0			7.4	30	5mL	0.169	2	0.338 mg/L
	CARR-20			0.374	21.0			7.4	30	5mL	0.201	2	0.402 mg/L
	SD · WB · 56			2.86	21.2			7.5	30	2mL	0.209	5	1.045 mg/L
	" .57			2.31	21.1			7.4	30	2mL	0.051	5	0.255 mg/L
	" .58			2.75	21.4			7.4	30	2mL	0.063	5	0.315 mg/L
	" .59			0.818	20.9			7.2	30	2mL	0.061	5	0.305 mg/L

ENVIRON

ORGANISM RECEIPT LOG

Date:		Time:	Batch No.
11/14/14		1240	NAS8492

Organism / Project:	Source:
Eohs / West Bay	Northwestern Aquatic Scienc

Address:	Invoice Attached
On File	(Yes) No

Phone:	Contact:
On File	On File

No. Ordered:	No. Received:	Source Batch:
1200	1320	Field

Condition of Organisms:	Approximate Size or Age:
Good	3-5 mm

Shipper:	B of L (Tracking No.)
FedEx	8043 2993 8492

Condition of Container:	Received By:
Good	DE

Container	D.O. (mg/L)		Temp. (°C)	Conductivity or Salinity (Include Units)	pH (Units)	Technician (Initials)
* →			4.4	* →		MMB

Notes: *: recieved w/ very little of water; no WQ

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

Brian Hester/Collin Ray
360.297.6044
Mary Bacon
360.297.6058

FedEx# 5507-1540-6

DATE OF SHIPMENT: 11-13-14

ANIMAL HISTORY

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

WATER QUALITY AT TIME OF SHIPMENT

Temperature (°C): 13.9	pH: 8.1	Salinity (ppt): 19.0	D.O. (mg/L): 9.1
Other:			

PACKAGED BY: Lauren Brady **DATE:** 11-13-14

FIELD COLLECTION/CULTURE NOTES

Collected 11-12-14 from Yaquina Bay, OR.
Interstitial WQ: Temp: 3.0°C, Salinity 12.0 ppt.; salinity adjusted up ~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

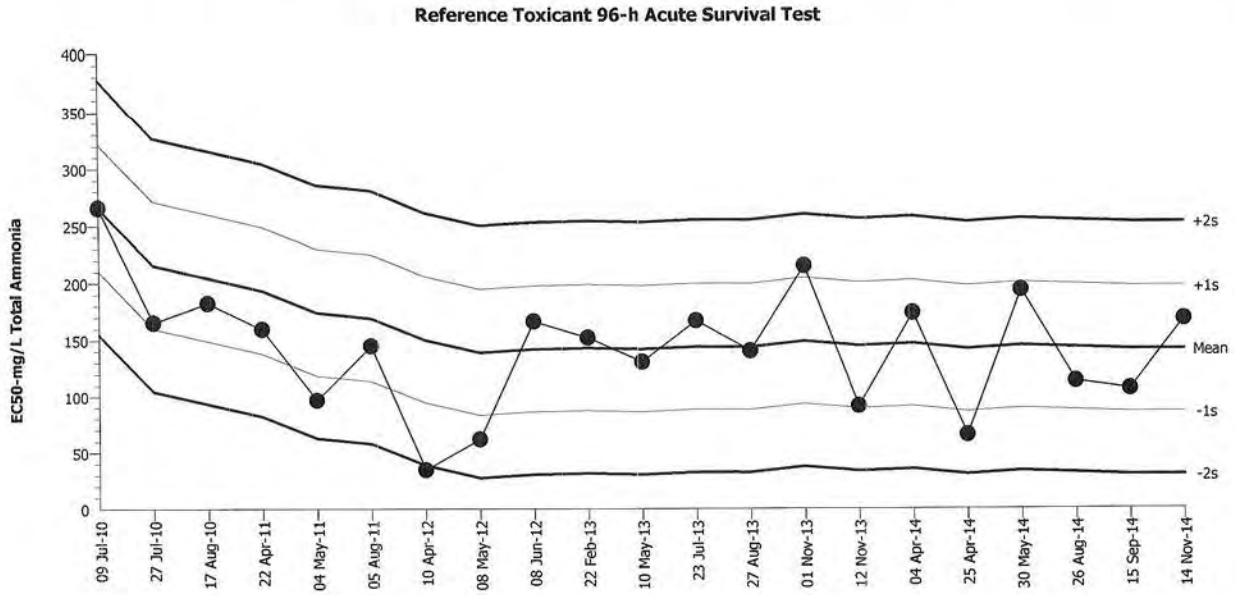
Reference Toxicant Test

CETIS QC Plot

Report Date: 30 Nov-14 17:38 (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:	141.4	**Count:**	20	**-1s Warning Limit:**	85.8	**-2s Action Limit:**	30.17
Sigma:	55.63	**CV:**	39.30%	**+1s Warning Limit:**	197.1	**+2s Action Limit:**	252.7

Quality Control Data

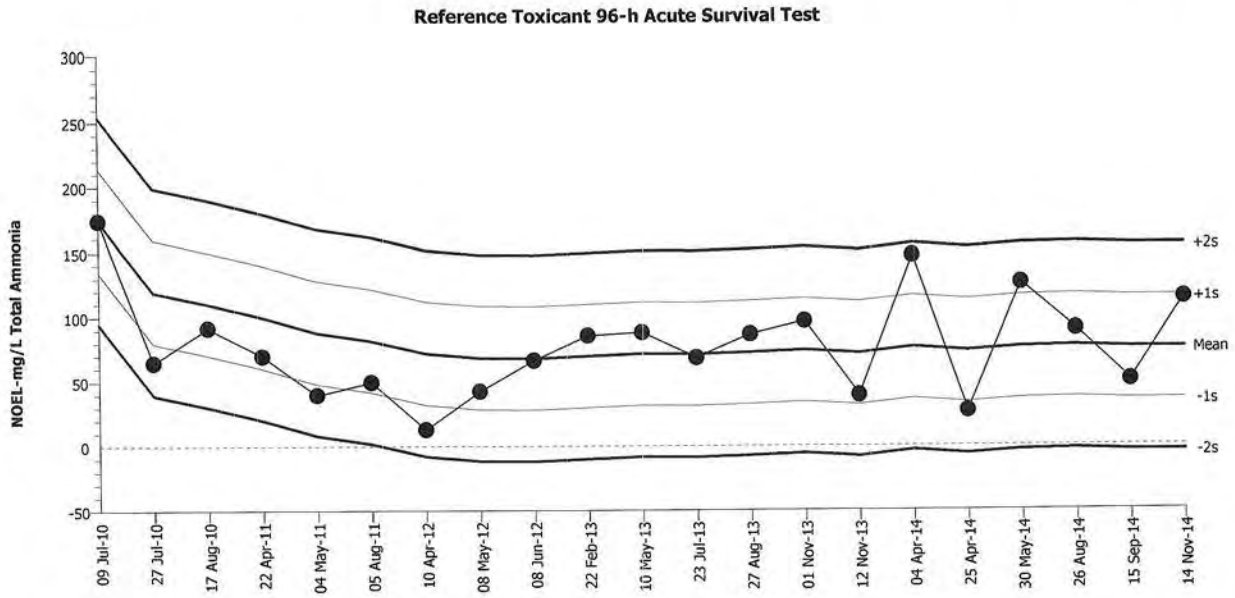
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2010	Jul	9	15:20	265.9	124.5	2.239	(+)	(+)	02-9263-1875	13-7083-7088	NewFields
2			27	14:50	165.5	24.12	0.4336			16-3262-6250	12-1070-3879	NewFields
3		Aug	17	16:00	182.5	41.14	0.7396			00-5947-2918	13-7468-5586	NewFields
4	2011	Apr	22	16:45	159.7	18.26	0.3283			12-3251-7366	15-6923-8618	NewFields
5		May	4	14:20	96.78	-44.62	-0.802			15-9053-5291	03-3498-4458	NewFields
6		Aug	5	14:35	144.9	3.459	0.06218			05-3970-3796	17-5474-7748	NewFields
7	2012	Apr	10	15:10	34.72	-106.7	-1.918	(-)		02-5902-8958	20-3951-0452	NewFields
8		May	8	14:30	61.87	-79.53	-1.43	(-)		20-1853-8108	14-9890-9529	NewFields
9		Jun	8	15:30	166.5	25.09	0.4509			03-4756-9479	07-8270-3224	NewFields
10	2013	Feb	22	11:40	152.2	10.82	0.1945			09-9358-3146	14-0757-4516	NewFields
11		May	10	14:20	130.8	-10.64	-0.1913			01-9831-6628	02-4493-3987	NewFields
12		Jul	23	15:10	167.1	25.74	0.4627			15-9850-7427	05-2897-2730	NewFields
13		Aug	27	12:10	140.4	-1.007	-0.0181			20-8540-9997	05-1258-2331	NewFields
14		Nov	1	13:30	215	73.61	1.323	(+)		15-9765-5224	08-6656-9431	NewFields
15			12	13:45	91.52	-49.88	-0.8967			12-4327-2465	06-0504-8497	NewFields
16	2014	Apr	4	19:15	173.9	32.45	0.5833			13-5617-0473	14-6315-5154	NewFields
17			25	13:00	65.78	-75.62	-1.359	(-)		11-2394-9115	16-6351-0798	NewFields
18		May	30	15:30	193.9	52.52	0.9441			11-1744-7543	02-6036-0984	ENVIRON
19		Aug	26	15:45	113.3	-28.08	-0.5047			15-5557-5937	00-0529-4993	ENVIRON
20		Sep	15	15:10	106.3	-35.06	-0.6301			07-1282-2061	01-5984-9612	ENVIRON
21		Nov	14	14:25	168	26.6	0.4781			09-0717-5355	19-7840-9499	ENVIRON

CETIS QC Plot

Report Date: 30 Nov-14 17:38 (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:	75.8	**Count:**	20	**-1s Warning Limit:**	35.97	**-2s Action Limit:**	-3.875
Sigma:	39.84	**CV:**	52.60%	**+1s Warning Limit:**	115.6	**+2s Action Limit:**	155.5

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	98.2	2.465	(+)	(+)	02-9263-1875	21-0926-0699	NewFields
2			27	14:50	64.7	-11.1	-0.2786			16-3262-6250	07-8105-4494	NewFields
3		Aug	17	16:00	91.6	15.8	0.3966			00-5947-2918	19-8213-9681	NewFields
4	2011	Apr	22	16:45	69.8	-6	-0.1506			12-3251-7366	16-4565-4919	NewFields
5		May	4	14:20	39.8	-36	-0.9036			15-9053-5291	14-1177-0441	NewFields
6		Aug	5	14:35	49.6	-26.2	-0.6576			05-3970-3796	20-5970-4725	NewFields
7	2012	Apr	10	15:10	13	-62.8	-1.576	(-)		02-5902-8958	03-7154-8292	NewFields
8		May	8	14:30	42.6	-33.2	-0.8333			20-1853-8108	20-5519-2940	NewFields
9		Jun	8	15:30	66.4	-9.4	-0.2359			03-4756-9479	03-6674-9041	NewFields
10	2013	Feb	22	11:40	85.6	9.8	0.246			09-9358-3146	06-2817-6220	NewFields
11		May	10	14:20	88	12.2	0.3062			01-9831-6628	03-9560-5903	NewFields
12		Jul	23	15:10	68.3	-7.5	-0.1883			15-9850-7427	18-8212-0119	NewFields
13		Aug	27	12:10	86.4	10.6	0.2661			20-8540-9997	03-1133-2124	NewFields
14		Nov	1	13:30	96.4	20.6	0.5171			15-9765-5224	03-3609-7670	NewFields
15			12	13:45	39.3	-36.5	-0.9162			12-4327-2465	09-6874-0351	NewFields
16	2014	Apr	4	19:15	147	71.2	1.787	(+)		13-5617-0473	16-0396-5073	NewFields
17			25	13:00	27	-48.8	-1.225	(-)		11-2394-9115	19-2434-9439	NewFields
18		May	30	15:30	126	50.2	1.26	(+)		11-1744-7543	06-3985-7474	ENVIRON
19		Aug	26	15:45	90.1	14.3	0.3589			15-5557-5937	08-3094-4388	ENVIRON
20		Sep	15	15:10	50.5	-25.3	-0.635			07-1282-2061	16-3885-0935	ENVIRON
21		Nov	14	14:25	114	38.2	0.9588			09-0717-5355	07-0500-8008	ENVIRON

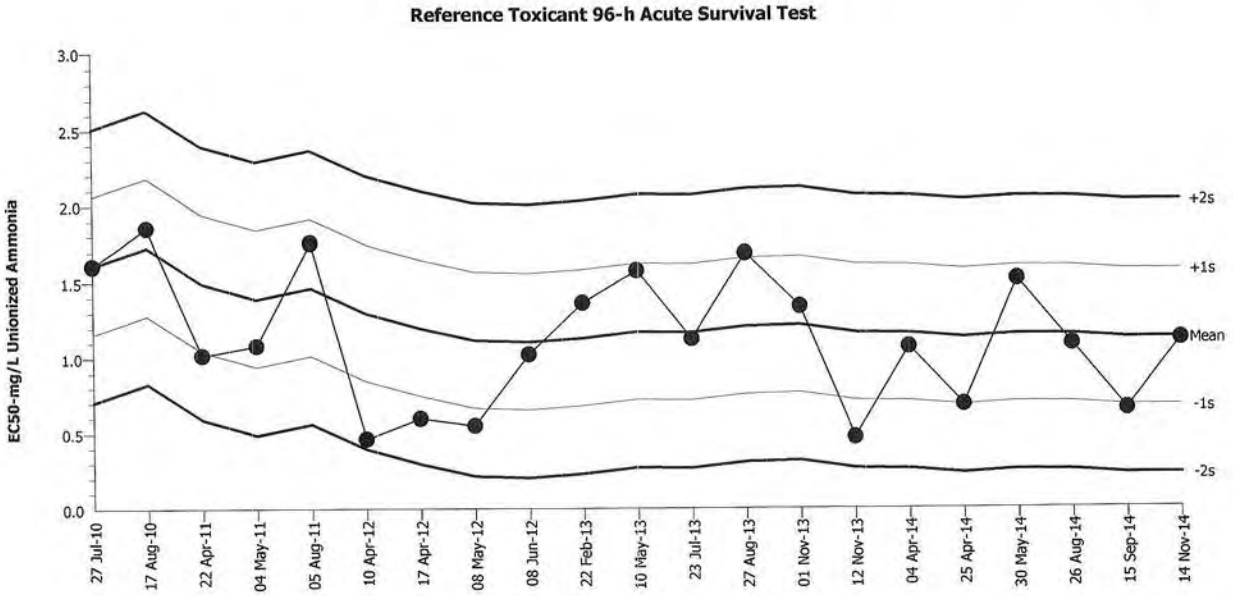
Analyst: JL QA: BH

CETIS QC Plot

Report Date: 30 Nov-14 17:51 (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:	1.127	**Count:**	20	**-1s Warning Limit:**	0.6763	**-2s Action Limit:**	0.2255
Sigma:	0.4508	**CV:**	40.00%	**+1s Warning Limit:**	1.578	**+2s Action Limit:**	2.029

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2010	Jul	27	14:50	1.608	0.4814	1.068	(+)		00-7007-0295	03-9110-2709	NewFields
2		Aug	17	16:00	1.854	0.7273	1.613	(+)		04-9660-1658	10-4250-3896	NewFields
3	2011	Apr	22	16:45	1.017	-0.1096	-0.2431			03-6965-3395	14-3447-2473	NewFields
4		May	4	14:20	1.081	-0.04576	-0.1015			18-8723-9922	17-9305-2155	NewFields
5		Aug	5	14:35	1.76	0.6332	1.405	(+)		17-9542-0646	06-2792-7024	NewFields
6	2012	Apr	10	15:10	0.4636	-0.6634	-1.472	(-)		18-7283-5013	07-7471-6807	NewFields
7			17	15:45	0.5982	-0.5288	-1.173	(-)		18-5229-3668	10-4921-5938	NewFields
8		May	8	14:30	0.5509	-0.5761	-1.278	(-)		15-4565-2403	06-1396-7211	NewFields
9		Jun	8	15:30	1.024	-0.1027	-0.2279			03-7901-3036	07-6844-7156	NewFields
10	2013	Feb	22	11:40	1.364	0.2372	0.5261			10-3861-9695	21-2507-0831	NewFields
11		May	10	14:20	1.578	0.4508	1	(+)		05-8857-3753	18-2954-4563	NewFields
12		Jul	23	15:10	1.126	-0.00111	-0.00247			08-8059-3744	12-6137-6954	NewFields
13		Aug	27	12:10	1.689	0.5623	1.247	(+)		18-3860-3992	18-0374-3993	NewFields
14		Nov	1	13:30	1.339	0.2116	0.4693			01-7225-6737	09-1642-9045	NewFields
15			12	13:45	0.4715	-0.6555	-1.454	(-)		15-7445-3893	06-3812-4989	NewFields
16	2014	Apr	4	19:15	1.072	-0.05535	-0.1228			02-4910-1045	07-9486-3041	NewFields
17			25	13:00	0.6871	-0.4399	-0.9758			05-3931-3196	11-2528-6540	NewFields
18		May	30	15:30	1.517	0.3896	0.8642			03-2348-8477	19-6287-3473	ENVIRON
19		Aug	26	15:45	1.087	-0.03996	-0.08864			16-9917-4183	13-7453-5343	ENVIRON
20		Sep	15	15:10	0.6543	-0.4727	-1.049	(-)		04-2286-3837	03-1229-8693	ENVIRON
21		Nov	14	14:25	1.119	-0.00787	-0.01746			07-5753-6828	00-1415-6148	ENVIRON

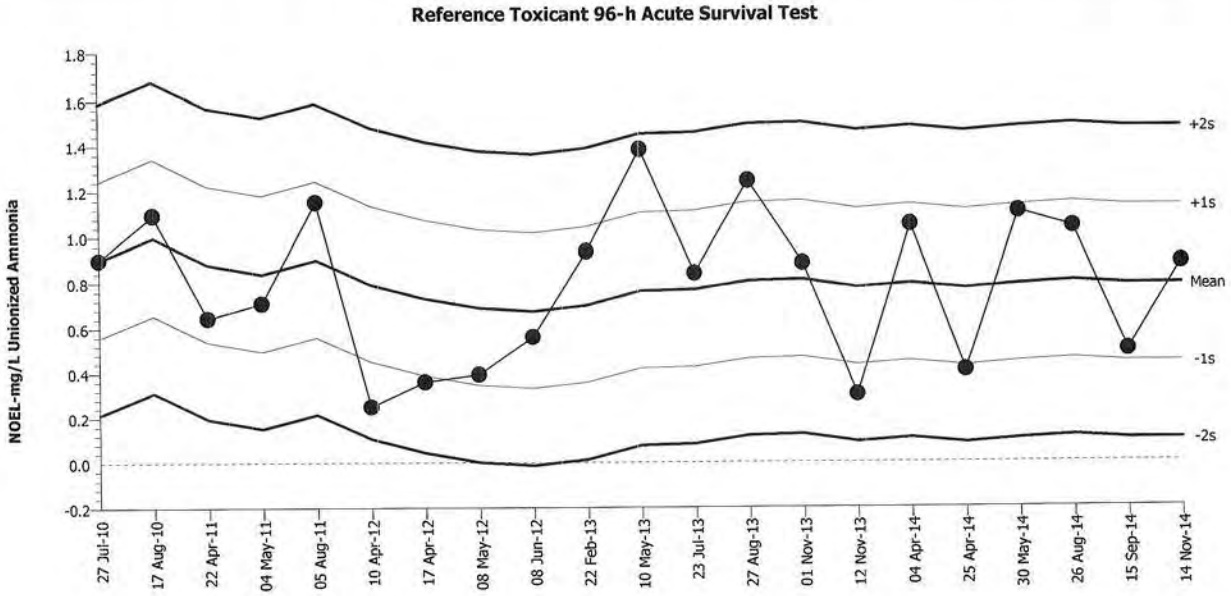
Analyst: JL QA: BH

CETIS QC Plot

Report Date: 30 Nov-14 17:51 (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:	0.7871	**Count:**	20	**-1s Warning Limit:**	0.4442	**-2s Action Limit:**	0.1013
Sigma:	0.3429	**CV:**	43.60%	**+1s Warning Limit:**	1.13	**+2s Action Limit:**	1.473

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2010	Jul	27	14:50	0.9	0.1129	0.3293			00-7007-0295	13-8034-1240	NewFields
2		Aug	17	16:00	1.096	0.3089	0.9008			04-9660-1658	04-8886-1755	NewFields
3	2011	Apr	22	16:45	0.644	-0.1431	-0.4173			03-6965-3395	08-9559-0930	NewFields
4		May	4	14:20	0.71	-0.0771	-0.2248			18-8723-9922	06-9505-1415	NewFields
5		Aug	5	14:35	1.152	0.3649	1.064	(+)		17-9542-0646	01-3764-6854	NewFields
6	2012	Apr	10	15:10	0.249	-0.5381	-1.569	(-)		18-7283-5013	17-8032-8770	NewFields
7			17	15:45	0.36	-0.4271	-1.246	(-)		18-5229-3668	21-3980-0168	NewFields
8		May	8	14:30	0.393	-0.3941	-1.149	(-)		15-4565-2403	07-1675-0393	NewFields
9		Jun	8	15:30	0.56	-0.2271	-0.6623			03-7901-3036	09-3097-7160	NewFields
10	2013	Feb	22	11:40	0.935	0.1479	0.4313			10-3861-9695	14-6175-2687	NewFields
11		May	10	14:20	1.38	0.5929	1.729	(+)		05-8857-3753	12-0577-0060	NewFields
12		Jul	23	15:10	0.839	0.0519	0.1514			08-8059-3744	14-8468-9199	NewFields
13		Aug	27	12:10	1.242	0.4549	1.327	(+)		18-3860-3992	13-4279-2307	NewFields
14		Nov	1	13:30	0.882	0.0949	0.2768			01-7225-6737	17-4499-2761	NewFields
15			12	13:45	0.302	-0.4851	-1.415	(-)		15-7445-3893	14-8429-9092	NewFields
16	2014	Apr	4	19:15	1.05	0.2629	0.7667			02-4910-1045	18-6624-7464	NewFields
17			25	13:00	0.409	-0.3781	-1.103	(-)		05-3931-3196	00-2785-8568	NewFields
18		May	30	15:30	1.105	0.3179	0.9271			03-2348-8477	17-7984-3461	ENVIRON
19		Aug	26	15:45	1.037	0.2499	0.7288			16-9917-4183	01-4278-7622	ENVIRON
20		Sep	15	15:10	0.497	-0.2901	-0.846			04-2286-3837	01-4675-9354	ENVIRON
21		Nov	14	14:25	0.881	0.0939	0.2738			07-5753-6828	01-5478-5022	ENVIRON

Reference Toxicant 96-h Acute Survival Test

ENVIRON

Batch ID:	20-1735-0446	**Test Type:**	Survival	**Analyst:**	
Start Date:	14 Nov-14 14:25	**Protocol:**	EPA/600/R-94/025 (1994)	**Diluent:**	Laboratory Seawater
Ending Date:	18 Nov-14 13:15	**Species:**	Eohaustorius estuarius	**Brine:**	Not Applicable
Duration:	95h	**Source:**	Northwestern Aquatic Science, OR	**Age:**	
Sample ID:	17-3862-3396	**Code:**	67A149A4	**Client:**	Internal Lab
Sample Date:	05 May-14	**Material:**	Total Ammonia	**Project:**	Reference Toxicant
Receive Date:	05 May-14	**Source:**	Reference Toxicant		
Sample Age:	193d 14h	**Station:**	P140505.43		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
07-0500-8008	Proportion Survived	114	207	153.6	NA		Fisher Exact Test

Point Estimate Summary

Analysis ID	Endpoint	Level	mg/L	95% LCL	95% UCL	TU	Method
19-7840-9499	Proportion Survived	EC50	168	152.3	185.3		Trimmed 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%
10.2		3	1	1	1	1	1	0	0	0.0%	0.0%
24.3		3	1	1	1	1	1	0	0	0.0%	0.0%
49.6		3	1	1	1	1	1	0	0	0.0%	0.0%
114		3	0.9333	0.7899	1	0.9	1	0.03333	0.05774	6.19%	6.67%
207		3	0.2667	0	0.6461	0.1	0.4	0.08819	0.1528	57.28%	73.33%

Proportion Survived Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	1	1	1
10.2		1	1	1
24.3		1	1	1
49.6		1	1	1
114		0.9	0.9	1
207		0.3	0.4	0.1

Proportion Survived Binomials

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	10/10	10/10	10/10
10.2		10/10	10/10	10/10
24.3		10/10	10/10	10/10
49.6		10/10	10/10	10/10
114		9/10	9/10	10/10
207		3/10	4/10	1/10

CETIS Test Data Worksheet

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

Start Date:	14 Nov-14 14:25	**Species:**	Eohaustorius estuarius	**Sample Code:**	67A149A4
End Date:	18 Nov-14 13:15	**Protocol:**	EPA/600/R-94/025 (1994)	**Sample Source:**	Reference Toxicant
Sample Date:	05 May-14	**Material:**	Total Ammonia	**Sample Station:**	P140505.43

C-mg/L	Code	Rep	Pos	# Exposed	# Survived	Notes
0	D	1	6	10	10	
0	D	2	4	10	10	
0	D	3	9	10	10	
10.2		1	10	10	10	
10.2		2	3	10	10	
10.2		3	17	10	10	
24.3		1	11	10	10	
24.3		2	18	10	10	
24.3		3	7	10	10	
49.6		1	14	10	10	
49.6		2	15	10	10	
49.6		3	12	10	10	
114		1	2	10	9	
114		2	5	10	9	
114		3	13	10	10	
207		1	8	10	3	
207		2	1	10	4	
207		3	16	10	1	

CETIS Summary Report

Reference Toxicant 96-h Acute Survival Test ENVIRON

Batch ID:	12-6920-2864	**Test Type:**	Survival	**Analyst:**	
Start Date:	14 Nov-14 14:25	**Protocol:**	EPA/600/R-94/025 (1994)	**Diluent:**	Laboratory Water
Ending Date:	18 Nov-14 13:15	**Species:**	Eohaustorius estuarius	**Brine:**	Not Applicable
Duration:	95h	**Source:**	Northwestern Aquatic Science, OR	**Age:**	
Sample ID:	14-6401-4194	**Code:**	57431572	**Client:**	Internal Lab
Sample Date:	05 May-14	**Material:**	Unionized Ammonia	**Project:**	Reference Toxicant
Receive Date:	05 May-14	**Source:**	Reference Toxicant		
Sample Age:	193d 14h	**Station:**	P140505.43		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
01-5478-5022	Proportion Survived	0.881	1.273	1.059	NA		Fisher Exact Test

Point Estimate Summary

Analysis ID	Endpoint	Level	mg/L	95% LCL	95% UCL	TU	Method
00-1415-6148	Proportion Survived	EC50	1.119	1.053	1.189		Trimmed 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%
0.157		3	1	1	1	1	1	0	0	0.0%	0.0%
0.375		3	1	1	1	1	1	0	0	0.0%	0.0%
0.609		3	1	1	1	1	1	0	0	0.0%	0.0%
0.881		3	0.9333	0.7899	1	0.9	1	0.03333	0.05774	6.19%	6.67%
1.273		3	0.2667	0	0.6461	0.1	0.4	0.08819	0.1528	57.28%	73.33%

Proportion Survived Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	1	1	1
0.157		1	1	1
0.375		1	1	1
0.609		1	1	1
0.881		0.9	0.9	1
1.273		0.3	0.4	0.1

Proportion Survived Binomials

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	10/10	10/10	10/10
0.157		10/10	10/10	10/10
0.375		10/10	10/10	10/10
0.609		10/10	10/10	10/10
0.881		9/10	9/10	10/10
1.273		3/10	4/10	1/10

CETIS Test Data Worksheet

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

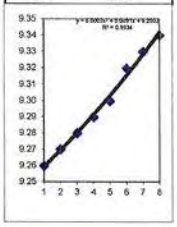
Start Date:	14 Nov-14 14:25	**Species:**	Eohaustorius estuarius	**Sample Code:**	57431572
End Date:	18 Nov-14 13:15	**Protocol:**	EPA/600/R-94/025 (1994)	**Sample Source:**	Reference Toxicant
Sample Date:	05 May-14	**Material:**	Unionized Ammonia	**Sample Station:**	P140505.43

C-mg/L	Code	Rep	Pos	# Exposed	# Survived	Notes
0	D	1	9	10	10	
0	D	2	4	10	10	
0	D	3	10	10	10	
0.157		1	8	10	10	
0.157		2	18	10	10	
0.157		3	17	10	10	
0.375		1	14	10	10	
0.375		2	6	10	10	
0.375		3	12	10	10	
0.609		1	7	10	10	
0.609		2	3	10	10	
0.609		3	2	10	10	
0.881		1	5	10	9	
0.881		2	1	10	9	
0.881		3	11	10	10	
1.273		1	13	10	3	
1.273		2	16	10	4	
1.273		3	15	10	1	

CLIENT:	Pioneer Technologies	Date of Test:	14-Nov-14
PROJECT:	West Bay	Test Type:	Eoh 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		10.2	28	7.8	16.0	289.16	9.3187		0.157
4	30		24.3	28	7.8	16.0	289.16	9.3187		0.375
5	60		49.6	28	7.7	16.0	289.16	9.3187		0.609
6	120		114	28	7.5	15.9	289.06	9.3187		0.881
7	240		207	28	7.4	15.9	289.06	9.3187		1.273
8										
9										
10										
11										
12										
13										
14										
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ENVIRON

Ammonia Reference Toxicant Test Water Quality Data Sheet

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Pioneer Technologies	West Bay	*Eohaustorius estuarius*	Port Gamble	PSEP 1995

JOB NUMBER	PROJECT MANAGER	TEST START DATE	TIME	TEST END DATE	TIME
	Bill Gardiner	14Nov14	1425	18Nov14	1315

TEST ID	LOT #:
P140505.43	

WATER QUALITY DATA

DILTIN.WAT.BATCH	TEMP REC#	REFERENCE TOX. MATERIAL	REFERENCE TOXXICANT	
FSW111314.01	NA	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/ 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	WQ TECH		AMMONIA METER	AMMONIA mg/L	Tech
Ref.Tox.-	0	mg/L	0	Stock	8	8.1	8	15.9	8	28	8	7.8	11/14				
			4	1	8	7.7	8	~~16.0~~ ①	8	28	8	7.9	11/18				
Ref.Tox.-	15	mg/L	0	Stock	8	8.1	8	16.0	8	28	8	7.8	11/14				
			4	1	8	7.7	8	15.5	8	29	8	7.9	11/18				
Ref.Tox.-	30	mg/L	0	Stock	8	8.2	8	16.0	8	28	8	7.8	11/14				
			4	1	8	7.8	8	15.4	8	29	8	7.9	11/18				
Ref.Tox.-	60	mg/L	0	Stock	8	8.2	8	16.0	8	28	8	7.7	11/14				
			4	1	8	7.8	8	15.3	8	29	8	7.9	11/18				
Ref.Tox.-	120	mg/L	0	Stock	8	8.2	8	15.9	8	28	8	7.5	11/14				
			4	1	8	7.9	8	15.3	8	29	8	7.9	11/18				
Ref.Tox.-	240	mg/L	0	Stock	8	8.2	8	15.9	8	28	8	7.4	11/14				
			4	1	8	7.8	8	15.3	8	29	8	7.8	11/18				

① MR # correct: 15.6

ENVIRON Ammonia Reference Toxicant Test Survival Data Sheet

SPECIES					
			Eohaustorius estuarius		
CLIENT	PROJECT	JOB NO.	PROJECT MANAGER	LABORATORY	PROTOCOL
Pioneer Technologies	West Bay	.	Bill Gardiner	Port Gamble	PSEP 1995

SURVIVAL & BEHAVIOR DATA

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

INITIAL # OF ORGANISMS: 10

CLIENT/ NEWFIELDS ID	CONC. value	CONC. units	REP	INITIAL NUMBER	DATE 11/15/14 TECHNICIAN JL #ALIVE	#DEAD	OBS	DATE 11/16/14 TECHNICIAN JL #ALIVE	#DEAD	OBS	DATE 11/17/14 TECHNICIAN JL #ALIVE	#DEAD	OBS	DATE 11/18/14 TECHNICIAN MK #ALIVE	#DEAD	OBS
Ref.Tox.- ammonia - TAN	0	mg/L	1		10	Ø	1F	10	Ø	N	10	Ø	N	10	Ø	N
			2		10	Ø	1F	10	Ø	↓	10	Ø	1F	10	Ø	2F
			3		10	Ø	2F	10	Ø	↓	10	Ø	N	10	Ø	N
Ref.Tox.- ammonia - TAN	15	mg/L	1		10	Ø	2F	10	Ø	1F	10	Ø	N	10	Ø	N
			2		10	Ø	2F	10	Ø	1F	10	Ø	↓	10	Ø	↓
			3		10	Ø	N	10	Ø	N	10	Ø	↓	10	Ø	↓
Ref.Tox.- ammonia - TAN	30	mg/L	1		10	Ø	N	10	Ø	N	10	Ø	N	10	Ø	N
			2		10	Ø	2F	10	Ø	2F	10	Ø	1F	10	Ø	↓
			3		10	Ø	N	10	Ø	N	10	Ø	N	10	Ø	↓
Ref.Tox.- ammonia - TAN	60	mg/L	1		10	Ø	1F	10	Ø	1F	10	Ø	N	10	Ø	N
			2		10	Ø	N	10	Ø	N	10	Ø	2F	10	Ø	2F
			3		10	Ø	↓	10	Ø	1F	10	Ø	N	10	Ø	N
Ref.Tox.- ammonia - TAN	120	mg/L	1		9	1	N	9	Ø	2F	9	Ø	N	9	Ø	N
			2		10	Ø	1F	10	Ø	2F	10	Ø	↓	9	1	2F
			3		10	Ø	N	10	Ø	1F	10	Ø	2F	10	Ø	N
Ref.Tox.- ammonia - TAN	240	mg/L	1		10	Ø	Q	9	1	Q 1F	7	2	Q	3	4	Q
			2		10	Ø	↓	9	1	Q	7	2	↓	4	3	↓
			3		10	Ø	↓	4	6	Q	3	1	↓	1	2	↓

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
9327

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
207	240	750		28.948
114	120	750		14.474
49.6	60	750		7.237
24.3	30	750		3.619
10.2	15	750		1.809
0.0	0	750		0.000
				0.000
				0.000

KMB 4/14/14 1111

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
Pioneer Technologies	West Bay	1030 / 1000	FSW111414.01	PSEP 1995	14-Nov-2014
JOB NUMBER	**PROJECT MANAGER**	**LABORATORY**	**TEMP. RECDR./HOBO#**	**TEST SPECIES**	**TEST END DATE**
0	Bill Gardiner	Port Gamble	NA	*Neanthes arenaceodentata*	4-Dec-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	8	8	7.7	8	20.0	8	28	8	8.1		JL	JL 11/14/14
Control /	1	Surr	8	8	7.8	8	20.2	8	28	8	7.8			JL 11/15
Control /	2	Surr	8	①	7.8	8	20.1	8	28	8	8.0		JL	JL 11/16
Control /	3	Surr	8	8	7.6	8	20.0	8	③ ~~30~~ 29	8	7.9	1320 KMB		KMB ~~11/17~~ 11/17
Control /	4	Surr	8	8	7.7	8	20.1	8	28	8	③ ~~8.1~~ 8.1		KMB	11/18
Control /	5	Surr	8	8	7.5	8	19.6	8	28	8	7.9			KMB 11/19/14
Control /	6	Surr	8	8	7.6	8	20.3	8	29	8	8.0	HE	HE	JL 11/20
Control /	7	Surr	8	8	7.5	8	20.2	8	28	8	8.0			KB 11/21
Control /	8	Surr	8	8	7.3	8	20.2	8	29	8	8.0			11/22
Control /	9	Surr	8	8	7.6	8	20.2	8	29	8	8.1	JL		JL 11/23
Control /	10	Surr	8	8	7.8	8	20.1	8	28	8	7.9			KB 11/24
Control /	11	Surr	8	8	7.5	8	20.4	8	28	8	7.9			MK 11/25
Control /	12	Surr	8	8	7.6	8	20.4	8	28	8	8.0			MK 11/26
Control /	13	Surr	8	8	7.6	8	20.4	8	28	8	8.0			11/27
Control /	14	Surr	8	8	7.5	8	20.2	8	28	8	8.0		JL	JL 11/28
Control /	15	Surr	8	8	7.6	8	19.8	8	28	8	8.0	JL		JL 11/29
Control /	16	Surr	8	8	7.8	8	20.0	8	28	8	8.0		JL	JL 11/30
Control /	17	Surr	8	8	7.6	8	20.1	8	28	8	8.0			MK 12/1
Control /	18	Surr	8	8	7.6	8	20.1	8	28	8	8.0			12/2
Control /	19	Surr	8	8	7.6	8	20.2	8	28	8	7.9			JL 12/03
Control /	20	Surr	8	8	8.1	8	19.6	8	28	8	7.9			MK 12/4

① Illegible. JL 11/16/14. Meter 8

② Illegible. KB. 11/17/14

③ See note ①, pg 5. KMB. 11/17/14

④ MB 11/18

ENVIRON

20 DAY SOLID PHASE BIOASSAY
WATER QUALITY DATASHEET

CLIENT	PROJECT	START TIME/ END TIME	DILUTION WATER BATCH	PROTOCOL	TEST START DATE
Pioneer Technologies	West Bay	1030 / 1000	FSW111414.01	PSEP 1995	14-Nov-2014
JOB NUMBER	**PROJECT MANAGER**	**LABORATORY**	**TEMP. RECDR./HOBO#**	**TEST SPECIES**	**TEST END DATE**
0	Bill Gardiner	Port Gamble	NA	*Neanthes arenaceodentata*	4-Dec-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
Ref Carr /	0	Surr	11	8	7.7	8	20.0	8	28	8	8.0		JL	JL 11/14/14
Ref Carr /	1	Surr	11	8	7.8	8	20.2	8	28	8	7.9			JL 11/15
Ref Carr /	2	Surr	11	8	7.9	8	20.1	8	29	8	8.1		JL	JL 11/16
Ref Carr /	3	Surr	11	8	7.5	8	20.0	8	① ~~30~~ 29	8	7.9	1320 KMB		KMB 11/17
Ref Carr /	4	Surr	11	8	7.7	8	20.2	8	29	8	8.1		KMB	HE 11/18
Ref Carr /	5	Surr	11	8	7.5	8	19.7	8	29	8	7.9			KMB 11/19/14
Ref Carr /	6	Surr	11	8	7.6	8	20.3	8	29	8	8.1	HE	HE	JL 11/20
Ref Carr /	7	Surr	11	8	7.5	8	20.3	8	29	8	8.0			KB 11/21
Ref Carr /	8	Surr	11	8	7.3	8	20.1	8	29	8	8.0		HE	HE 11/22
Ref Carr /	9	Surr	11	8	7.6	8	20.2	8	29 ~~28~~ ②	8	8.1	JL		JL 11/23
Ref Carr /	10	Surr	11	8	7.7	8	20.1	8	28	8 ③	~~8~~ 7.9		HE	KB 11/24
Ref Carr /	11	Surr	11	8	7.6	8	20.4	8	28	8	7.9			MK 11/25
Ref Carr /	12	Surr	11	8	7.6	8	20.4	8	28	8	8.1	HE	HE	MK 11/26
Ref Carr /	13	Surr	11	8	7.6	8	20.4	8	28	8	8.1			HE 11/27
Ref Carr /	14	Surr	11	8	7.6	8	20.2	8	28	8	8.1		JL	JL 11/28
Ref Carr /	15	Surr	11	8	7.7	8	19.8	8	28	8	8.1	JL		JL 11/29
Ref Carr /	16	Surr	11	8	7.8	8	20.0	8	28	8	8.0		JL	JL 11/30
Ref Carr /	17	Surr	11	8	7.7	8	20.0	8	28	8	8.0			MK 12/1
Ref Carr /	18	Surr	11	8	7.7	8	20.1	8	28	8	8.0	HE	HE	HE ④ 11/12/2
Ref Carr /	19	Surr	11	8	7.7	8	20.2	8	28	8	8.0			JL 12/03
Ref Carr /	20	Surr	11	8	8.3	8	19.7	8	28	8	7.9			MK 12/4

① See note ①, pg 5. KMB. 11/17/14 ② IE JL 11/23/14. ③ ME. KB. 11/24/14 ④ Wrong date HE 12/2

ENVIRON

20 DAY SOLID PHASE BIOASSAY
WATER QUALITY DATASHEET

CLIENT	PROJECT	START TIME/ END TIME	DILUTION WATER BATCH	PROTOCOL	TEST START DATE
Pioneer Technologies	West Bay	1030 / 1000	FSW111414.01	PSEP 1995	14-Nov-2014
JOB NUMBER	**PROJECT MANAGER**	**LABORATORY**	**TEMP. RECDR./HOBO#**	**TEST SPECIES**	**TEST END DATE**
0	Bill Gardiner	Port Gamble	NA	*Neanthes arenaceodentata*	4-Dec-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
Carr 20 /	0	Surr	20	8	7.6	8	20.1	8	28	8	8.0		JL	JL 11/14/14
Carr 20 /	1	Surr	20	8	7.6	8	20.2	8	28	8	7.9			JL 11/15
Carr 20 /	2	Surr	20	8	7.7	8	20.2	8	28	8	8.1		JL	JL 11/16
Carr 20 /	3	Surr	20	8	7.5	8	20.1	8	~~30~~ 29	8	7.9	1320 KMB		KMB 11/17
Carr 20 /	4	Surr	20	8	7.6	8	20.2	8	28	8	8.1		KMB	11/18
Carr 20 /	5	Surr	20	8	7.4	8	20.1	8	28	8	7.9			KMB 11/19/14
Carr 20 /	6	Surr	20	8	7.5	8	20.2	8	28	8	8.1	HE	HE	JL 11/20
Carr 20 /	7	Surr	20	8	7.3	8	20.2	8	28	8	8.0			KB 11/21
Carr 20 /	8	Surr	20	8	7.0	8	20.2	8	② 29 28	8	8.0			11/22
Carr 20 /	9	Surr	20	8	7.5	8	20.2	8	28	8	8.2	JL		JL 11/23
Carr 20 /	10	Surr	20	8	7.6	8	20.2	8	28	8	8.0			KB 11/24
Carr 20 /	11	Surr	20	8	7.4	8	20.4	8	28	8	8.0			MK 11/25
Carr 20 /	12	Surr	20	8	7.5	8	20.4	8	28	8	8.1	HE	HE	MK 11/26
Carr 20 /	13	Surr	20	8	7.5	8	20.4	8	28	8	8.0			11/27
Carr 20 /	14	Surr	20	8	7.4	8	20.2	8	28	8	8.1		JL	JL 11/28
Carr 20 /	15	Surr	20	8	7.6	8	19.8	8	28	8	8.1	JL		JL 11/29
Carr 20 /	16	Surr	20	8	7.7	8	20.0	8	28	8	8.0		JL	JL 11/30
Carr 20 /	17	Surr	20	8	7.6	8	20.0	8	28	8	8.0			MK 12/1
Carr 20 /	18	Surr	20	8	7.7	8	20.0	8	28	8	8.0			12/2
Carr 20 /	19	Surr	20	8	7.6	8	20.2	8	28	8	7.9			JL 12/03
Carr 20 /	20	Surr	20	8	8.3	8	19.6	8	28	8	7.9			MK 12/4

① MK. see note ①, pg. 5. KB 11/17/14 ② MK 11/22

ENVIRON

20 DAY SOLID PHASE BIOASSAY
WATER QUALITY DATASHEET

CLIENT	PROJECT	START TIME/ END TIME	DILUTION WATER BATCH	PROTOCOL	TEST START DATE
Pioneer Technologies	West Bay	1030 / 1000	FSW111414.01	PSEP 1995	14-Nov-2014
JOB NUMBER	**PROJECT MANAGER**	**LABORATORY**	**TEMP. RECDR./HOBO#**	**TEST SPECIES**	**TEST END DATE**
0	Bill Gardiner	Port Gamble	NA	*Neanthes arenaceodentata*	4-Dec-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
SD-WB-56 /	0	Surr	16	8	7.7	8	20.1	8	27	8	8.0		JL	JL 11/14/14
SD-WB-56 /	1	Surr	16	8	7.7	8	20.2	8	27	8	7.9			JL 11/15
SD-WB-56 /	2	Surr	16	8	7.8	8	20.0	8	27	8	8.1		JL	JL 11/16
SD-WB-56 /	3	Surr	16	8	7.5	8	20.1	8	0 29 28	8	7.9	1320 KMB		KMB 11/17
SD-WB-56 /	4	Surr	16	8	7.6	8	20.3	8	28	8	8.1		KMB	11/18
SD-WB-56 /	5	Surr	16	8	7.4	8	19.9	8	28	8	7.9			KMB 11/19/14
SD-WB-56 /	6	Surr	16	8	7.6	8	20.3	8	28	8	8.1	HE	HE	JL 11/20
SD-WB-56 /	7	Surr	16	8	7.4	8	20.3	8	28	8	8.0			KB 11/21
SD-WB-56 /	8	Surr	16	8	7.1	8	20.3	8	28	8	8.0		HE	HE 11/22
SD-WB-56 /	9	Surr	16	8	7.6	8	20.3	8	29	8	8.2	JL		JL 11/23
SD-WB-56 /	10	Surr	16	8	7.7	8	20.2	8	28	8	8.0		KB	KB 11/24
SD-WB-56 /	11	Surr	16	8	7.5	8	20.4	8	28	8	8.0			MK 11/25
SD-WB-56 /	12	Surr	16	8	7.6	8	20.4	8	28	8	8.1	HE	HE	MK 11/26
SD-WB-56 /	13	Surr	16	8	7.6	8	20.4	8	28	8	8.1			HE 11/27
SD-WB-56 /	14	Surr	16	8	7.6	8	20.2	8	28	8	8.2		JL	JL 11/28
SD-WB-56 /	15	Surr	16	8	7.7	8	19.9	8	28	8	8.2	JL		JL 11/29
SD-WB-56 /	16	Surr	16	8	7.8	8	20.1	8	28	8	8.2		JL	JL 11/30
SD-WB-56 /	17	Surr	16	8	7.7	8	20.0	8	28	8	8.2			MK 12/1
SD-WB-56 /	18	Surr	16	8	7.9	8	20.1	8	28	8	8.3	HE	HE	HE 12/2
SD-WB-56 /	19	Surr	16	8	7.7	8	20.2	8	28	8	8.1			JL 12/03
SD-WB-56 /	20	Surr	16	8	7.5	8	20.1	8	28	8	8.2			MK 12/4

① MK. See note ①, pg 5. KMB. 11/17/14

ENVIRON

20 DAY SOLID PHASE BIOASSAY
WATER QUALITY DATASHEET

CLIENT	PROJECT	START TIME/ END TIME	DILUTION WATER BATCH	PROTOCOL	TEST START DATE
Pioneer Technologies	West Bay	1030 / 0900 ④ 1000	FSW111414.01	PSEP 1995	14-Nov-2014
JOB NUMBER	**PROJECT MANAGER**	**LABORATORY**	**TEMP. RECDR./HOBO#**	**TEST SPECIES**	**TEST END DATE**
0	Bill Gardiner	Port Gamble	NA	*Neanthes arenaceodentata*	4-Dec-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
SD-WB-57 /	0	Surr	22	8	7.5	8	20.1	8	28	8	8.0		JL	JL 11/14/14
SD-WB-57 /	1	Surr	22	8	7.6	8	20.1	8	28	8	7.9			JL 11/15
SD-WB-57 /	2	Surr	22	8	7.8	8	20.2	8	28	8	8.1		JL	JL 11/16
SD-WB-57 /	3	Surr	22	8	7.5	8	20.1	8	~~30~~ 29	8	7.9	1320 KMB		KMB 11/17/14
SD-WB-57 /	4	Surr	22	8	7.6	8	20.0	8	29	8	8.1		KMB	MK 11/18/14
SD-WB-57 /	5	Surr	22	8	7.4	8	20.2	8	29	8	7.9			KB 11/19/14
SD-WB-57 /	6	Surr	22	8	7.5	8	20.2	8	29	8	8.2	HE	HE	JL 11/20
SD-WB-57 /	7	Surr	22	8	7.2	8	20.1	8	29	8	8.0			KB 11/21
SD-WB-57 /	8	Surr	22	8	7.0	8	20.1	8	29	8	8.1		HE	MK 11/22
SD-WB-57 /	9	Surr	22	8	7.5	8	20.2	8	29	8	8.3	JL		JL 11/23
SD-WB-57 /	10	Surr	22	8	② 8 7.6	8	20.2	8	28	8	8.0		HE	KB 11/24
SD-WB-57 /	11	Surr	22	8	7.5	8	20.4	8	28	8	8.2			MK 11/25
SD-WB-57 /	12	Surr	22	8	7.4	8	20.4	8	29	8	8.2	HE	HE	MK 11/26
SD-WB-57 /	13	Surr	22	8	7.4	8	20.4	8	28	8	8.2			MK 11/27
SD-WB-57 /	14	Surr	22	8	7.4	8	20.2	8	28	8	8.3		JL	JL 11/28
SD-WB-57 /	15	Surr	22	8	7.6	8	19.8	8	28	8	8.3	JL		JL 11/29
SD-WB-57 /	16	Surr	22	8	7.6	8	20.0	8	28	8	8.2		JL	JL 11/30
SD-WB-57 /	17	Surr	22	8	7.4	8	20.0	8	29	8	8.3			MK 12/1
SD-WB-57 /	18	Surr	22	8	7.7	8	20.0	8	29	8	8.3	HE	HE	HE ③ 12/2/14 12/2
SD-WB-57 /	19	Surr	22	8	7.5	8	20.2	8	28	8	8.1			JL 12/03
SD-WB-57 /	20	Surr	22	8	7.3	8	20.1	8	29	8	8.2			MK 12/4

① MK. Meter recal due to suspected deviation. KMB 11/17/14

② MK. KB 11/24/14

③ Illegible HE 12/2

④ HE. JL 12/04/14

ENVIRON

20 DAY SOLID PHASE BIOASSAY
WATER QUALITY DATASHEET

CLIENT	PROJECT	START TIME/ END TIME	DILUTION WATER BATCH	PROTOCOL	TEST START DATE
Pioneer Technologies	West Bay	1030 / 1000	FSW111414.01	PSEP 1995	14-Nov-2014
JOB NUMBER	**PROJECT MANAGER**	**LABORATORY**	**TEMP. RECDR./HOBO#**	**TEST SPECIES**	**TEST END DATE**
0	Bill Gardiner	Port Gamble	NA	*Neanthes arenaceodentata*	4-Dec-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
SD-WB-58 /	0	Surr	5	8	7.7	8	20.0	8	28	8	8.0		JL	JL 11/14/14
SD-WB-58 /	1	Surr	5	8	7.7	8	20.1	8	28	8	8.0			JL 11/15
SD-WB-58 /	2	Surr	5	8	7.8	8	20.2	8	28	8	8.1		JL	JL 11/16
SD-WB-58 /	3	Surr	5	8	7.5	8	20.1	8	① 3029	8	8.0	1320 KMB		KMB 11/17
SD-WB-58 /	4	Surr	5	8	7.7	8	20.0	8	29	8	8.1		KMB	HE 11/18
SD-WB-58 /	5	Surr	5	8	7.4	8	20.0	8	29	8	8.0			KMB 11/19/14
SD-WB-58 /	6	Surr	5	8	7.6	8	20.2	8	29	8	8.2	HE	HE	JL 11/20
SD-WB-58 /	7	Surr	5	8	7.4	8	20.2	8	29	8	8.1			KB 11/21
SD-WB-58 /	8	Surr	5	8	7.3	8	20.2	8	27	8	8.1		HE	HE 11/22
SD-WB-58 /	9	Surr	5	8	7.6	8	20.2	8	29	8	8.2	JL		JL 11/23
SD-WB-58 /	10	Surr	5	8	7.7	8	20.2	8	28	8	8.0		HE	KB 11/24
SD-WB-58 /	11	Surr	5	8	7.6	8	20.4	8	28	8	8.1			MK 11/25
SD-WB-58 /	12	Surr	5	8	7.6	8	20.4	8	29	8	8.2	HE	HE	MK 11/26
SD-WB-58 /	13	Surr	5	8	7.5	8	20.4	8	28	8	8.1			HE 11/27
SD-WB-58 /	14	Surr	5	8	7.5	8	20.1	8	28	8	8.2		JL	JL 11/28
SD-WB-58 /	15	Surr	5	8	7.7	8	19.8	8	28	8	8.2	JL		JL 11/29
SD-WB-58 /	16	Surr	5	8	7.7	8	20.0	8	28	8	8.1		JL	JL 11/30
SD-WB-58 /	17	Surr	5	8	7.6	8	20.0	8	28	8	8.2			MK 12/1
SD-WB-58 /	18	Surr	5	8	7.7	8	20.0	8	28	8	8.1	HE	HE	HE 12/2
SD-WB-58 /	19	Surr	5	8	7.5	8	20.1	8	28	8	8.0			JL 12/03
SD-WB-58 /	20	Surr	5	8	7.2	8	20.1	8	28	8	8.1			MK 12/4

①MK see note ①, pg 5. KMB. 11/17/14

ENVIRON

20 DAY SOLID PHASE BIOASSAY
WATER QUALITY DATASHEET

CLIENT	PROJECT	START TIME/ END TIME	DILUTION WATER BATCH	PROTOCOL	TEST START DATE
Pioneer Technologies	West Bay	1030 / 1000	FSW111414.01	PSEP 1995	14-Nov-2014
JOB NUMBER	**PROJECT MANAGER**	**LABORATORY**	**TEMP. RECDR./HOBO#**	**TEST SPECIES**	**TEST END DATE**
0	Bill Gardiner	Port Gamble	NA	*Neanthes arenaceodentata*	4-Dec-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
SD-WB-59 /	0	Surr	15	8	7.5	8	20.1	8	28	8	7.9		JL	JL 11/14/14
SD-WB-59 /	1	Surr	15	8	7.4	8	20.2	8	27	8	7.7			JL 11/15
SD-WB-59 /	2	Surr	15	8	7.7	8	20.2	8	28	8	7.9		JL	JL 11/16
SD-WB-59 /	3	Surr	15	8	7.1	8	20.0	8	① ~~30~~ 28	8	7.7	0820 KMB		KMB 11/17
SD-WB-59 /	4	Surr	15	8	7.4	8	20.2	8	28	8	8.0		KMB	11/18
SD-WB-59 /	5	Surr	15	8	7.1	8	20.1	8	28	8	7.8			KB 11/19/14
SD-WB-59 /	6	Surr	15	8	7.4	8	20.2	8	28	8	8.1	HE	HE	JL 11/20
SD-WB-59 /	7	Surr	15	8	7.2	8	20.2	8	28	8	8.0			KB 11/21
SD-WB-59 /	8	Surr	15	8	6.9	8	20.2	8	28	8	8.0		HE	11/22
SD-WB-59 /	9	Surr	15	8	7.4	8	20.3	8	28	8	8.2	JL		11/23 JL
SD-WB-59 /	10	Surr	15	8	7.4	8	20.2	8	28	8	8.0			11/24 KB
SD-WB-59 /	11	Surr	15	8	7.0	8	20.4	8	28	8	8.0			11/25 MK
SD-WB-59 /	12	Surr	15	8	7.3	8	20.4	8	28	8	8.1	HE	HE	11/26 MK
SD-WB-59 /	13	Surr	15	8	7.2	8	20.4	8	27	8	8.0			HE 11/27
SD-WB-59 /	14	Surr	15	8	7.3	8	20.2	8	27	8	8.2		JL	JL 11/28
SD-WB-59 /	15	Surr	15	8	7.3	8	19.9	8	27	8	8.2	JL		JL 11/29
SD-WB-59 /	16	Surr	15	8	7.6	8	20.1	8	27	8	8.1		JL	JL 11/30
SD-WB-59 /	17	Surr	15	8	7.4	8	20.1	8	28	8	8.1			MK 12/1
SD-WB-59 /	18	Surr	15	8	7.6	8	20.1	8	28	8	8.2	HE	HE	HE 12/2
SD-WB-59 /	19	Surr	15	8	7.5	8	20.2	8	27	8	8.0			JL 12/03
SD-WB-59 /	20	Surr	15	8	7.2	8	20.1	8	28	8	8.2			MK 12/4

① MK. See note ① on pg. 5. KMB. 11/17/14

ENVIRON

20-DAY SOLID PHASE BIOASSAY
OBSERVATION DATASHEET

CLIENT	PROJECT	JOB N0.	PROJECT MANAGER	LABORATORY	PROTOCOL	SPECIES
Pioneer Technologies	West Bay	0	Bill 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/ ENVIRON 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)
				11/15 JL	11/16 JL	11/17 MK	11/18 [illegible]	11/19 KMB	11/20 HE	11/21 KB	11/22 [illegible]	11/23 JL	11/24 KB	11/25 MK	11/26 MK	11/27 [illegible]	11/28 JL	11/29 JL	11/30 JL	12/1 MK	12/2 [illegible]	12/03 JL	12/04 JL					
Control /	1	6		U	U	U	N	U	N	N	N	N	N	N	N	G	N	N	N	E	N	N	N	5	1 198.87	313.98	259.46
	2	19											G	G	G		E	N		N		E		5	2 207.45	308.62	254.66
	3	39								N			N	N	N		N	E		N		N	N	5	3 187.64	286.40	233.22
	4	42								U			G	G	G		E	N		E		N	E	5	4 183.11	272.93	220.82
	5	10								N			G	G	G		E	E		E	V	E	N	5	5 181.61	~~287.03~~ 286.6	229.32
Ref Carr /	1	27								N	N		N	N	E	E	N	N	E	N	N	N	N	5	6 197.03	302.07	245.21
	2	3											G	G	G	G			N	E				5	7 179.84	286.74	233.32
	3	32											N	G	G	G			N	N	N			5	8 169.23	261.06	212.25
	4	31												N	N	E			E	E		E		5	9 169.20	252.62	207.60
	5	2												N	E	G		E	N	N		N		5	10 175.66	294.18	229.63
Carr 20 /	1	35						G	G	G	G	G	G	G	G				N	G	G		N	5	11 173.70	258.28	210.14
	2	26						G						E	G					G				5	12 185.31	271.79	215.44
	3	9						G						G	G					N		E	E	5	13 192.37	269.96	224.13
	4	38						G	G									E	E	G		N	N	5	14 229.27	324.79	271.94
	5	21						U	E						G			N	N		E		E	3	15 179.96	241.53	203.13

Initial Biomass	Rep	1	Tare Weight (mg)	Dry Weight (mg)	Ashed Weight (mg)
	1	27	51.21	55.26	51.53
	2	28	51.12	54.66	51.37
	3	29	51.14	54.58	51.36

Comments: In oven 12/04/14 @ 1055, 107°C
out of oven 12.5.14 @ 1400, 105°C

① Illegible HE 11/18
② INC. KMB. 11/19/14
③ Wrong date HE 11/22
④ Illegible HE 11/27
⑤ MK. KB. 12/5/14

ENVIRON

20-DAY SOLID PHASE BIOASSAY
OBSERVATION DATASHEET

CLIENT	PROJECT	JOB NO.	PROJECT MANAGER	LABORATORY	PROTOCOL	SPECIES
Pioneer Technologies	West Bay	0	Bill 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/ ENVIRON 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)
				11/15 JL	11/16 JL	11/17 MK	11/18 KMB	11/19 KMB	11/20 KMB	11/21 KS	11/22 KMB	11/23 JL	11/24 KS	11/25 MK	11/26 MK	11/27 KMB	11/28 JL	11/29 JL	11/30 JL	12/1 MK	12/2 KMB	12/03 JL	12/4 JL					
SD-WB-56 /	1	1		U	U	U	N	U	N	N	N	N	N	N	N	N	N	N	N	N	N	N	IE	N	5	16 194.85	278.24	222.00
	2	23													N	G	G			G	G	G	N	G	5	17 191.14	250.72	204.64
	3	30									G	G	IE	IE	IE	G		IE		N	IE, G	IE	IE	IE	5	18 214.52	284.75	233.48
	4	12									G	G, IE	G	IE	G	G		G	G	G	IE, G	G	N	G	5	19 199.52	280.70	222.12
	5	29									G	G	G, IE	G		G, IE		G	G, IE	G	G	IE	G	G	5	20 190.43	257.49	206.21
SD-WB-57 /	1	4									N	N	G	G	G	G	G	G	G, IE	G	G	G	N	G	5	21 200.40	280.67	225.38
	2	17									G	G			G	G		G	G	G	G		G		5	22 181.39	252.10	199.67
	3	24									G	G			G	G, IE		G	G	G	G		N		5	23 179.77	259.33	201.86
	4	341									N	N	N	N	N	N		N	G	N	G				5	24 199.02	291.47	228.27
	5	14									G	G	G	G	G	G		G	G, IE	G	G	U	N	N	5	25 199.91	283.00	225.78
SD-WB-58 /	1	25									N	N	N	N	N	N	N (5)	N	G	G	IE, G	G	G	G	5	26 216.90 (6)	296.55	236.90
	2	18														N			N	N	N	N	N		5	27 183.73	255.62	202.26
	3	40											IE			N			IE		G	G	G	G	5	28 177.15	249.52	194.44
	4	7					(1)	KS					N		2E	N			N		N	N	N		5	29 177.42	238.62	189.77
	5	13											G		G	G	G (5)		N		G	G			5	30 167.63	243.59	190.00

(1) Jar renewed, not refilled. Refilled during observations. 11/18/14 KMB
(6) wrong data
(5) wrong cell 11/27 KMB
(6) IE. JL 12/03/14. 216.90 mg.
(5) WL. JL 12/04/14.

ENVIRON

20-DAY SOLID PHASE BIOASSAY
OBSERVATION DATASHEET

CLIENT	PROJECT	JOB N0.	PROJECT MANAGER	LABORATORY	PROTOCOL	SPECIES
Pioneer Technologies	West Bay	0	Bill 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/ ENVIRON 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)
				11/15 JL	11/16 JL	11/17 MK	11/18	11/19 KMS	11/20	11/21 KMS	11/22	11/23 JL	11/24 KS	11/25 MK	11/26 MK	11/27	11/28 JL	11/29 JL	12/1 MK (2)	12/2	12/03 JL	12/04 JL	(2)					
SD-WB-59 /	1	28		U	U	N	N	U	N	N	G	G	G	G	G	G	N	N	G	G	N	N		5	31 195.52	265.74	216.17
	2	41		↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓ IE	↓	iE	↓	↓	↓	↓	↓		5 (1)	32 180.24	246.69	197.02
	3	33		↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	G	↓ IE, G	N	↓	G	↓	↓	G		5	33 191.11	258.15	205.90
	4	36		↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	G	↓	↓	↓	↓	↓	N		5	34 180.11	245.44	199.43
	5	37		↓	↓	↓	↓	↓	↓	↓	G	↓	↓	↓	↓	↓	↓	G	↓	↓	↓	↓	↓		5	35 201.77	277.15	222.87

(1) 1 worm much smaller than other 4. MK 12/4.

(2) Observations not recorded on Day 16 (12/~~2~~ 11/30), Subsequent Days Shifted one cell to the right.
JL 12/04/14.

ENVIRON

Ammonia and Sulfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
Pioneer Tech / West Bay	Nearthes	20

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

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

Calibration Standards Temperature		
Date:	Temperature:	Sample temperature should be within ±1°C of standards temperature at time and date of analysis.
11/14/14	21.6°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)
Ø	OV	11/14/14 KMB	0.0	22.5	11/14/14 KMB	N			10	0.0	1	0.0
Ref Carr			0.0	22.1						0.016		0.016
Carr 20			0.0	22.0						0.041		0.041
SD-WB-56			0.0	22.0						0.50		0.50
SD-WB-57			0.228	21.9						0.011		0.011
SD-WB-58			0.0364	① 21.5						0.035		0.035
SD-WB 59	↓	↓	0.0	21.5	↓	↓			↓	0.027	↓	0.027
Ø	PW	11/14/14 JL	0.0	22.1	11/14/14 HE+ KMB	N	7.8	28	1	0.004	10	0.04
Ref Carr			8.25	22.3			7.8	29	1	0.021	10	0.21
Carr 20			0.228	22.1			7.9	Insuff. amt.				
SD-WB-56			8.02	22.6			7.7	24	2	0.117	5	0.59
SD-WB-57			7.23	22.1			7.6	29	10	0.094	1	0.094
SD-WB-58			14.6	22.1			7.8	28	↓	0.081	↓	0.081
SD-WB-59	↓	↓	3.68	21.6	↓	↓	7.6	28	↓	0.09	↓	0.09

① IE. MK 11/14.

ENVIRON

Ammonia and Sulfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
Pioneer / West Bay	Neanthes	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: 12/04/14	Temperature: 21.0°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)
OV. Ø	Surr.	12/04/14 JL	0.00	20.0	12/04/14 JL	N			10	0.002		
Ref. Carr			0.00							0.005		
Carr. 20			0.00							0.005		
S6			0.00							0.005		
S7			0.00							0.011		
S8			0.00							0.008		
S9			0.00							0.015		
PW. Ø	Surr.	12/04/14 JL	0.411	20.3	12/04/14 JL	N	7.4	28	5	0.060	2	0.120
Ref. Carr			0.0514				7.4	28	5	0.124	2	0.248
Carr. 20			0.275				6.9	28	5	0.170	2	0.340
S6			0.00				7.4	29	5	0.049	2	0.098
S7			0.00				7.3	29	5	0.070	2	0.140
S8			0.00				7.6	29	5	0.065	2	0.130
S9			0.118				7.0	28	5	0.059	2	0.118

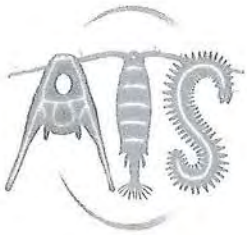
ENVIRON

ORGANISM RECEIPT LOG

Date: 11/14/14	Time: 1020	Batch No. ATS 111414
Organism / Project: Neanthes / West Bay	Source: Aquatic Tox. Support	
Address: On File		Invoice Attached: (Yes) No
Phone: On File	Contact: On File	
No. Ordered: 600	No. Received: 600 + 10 x	Source Batch: Emerged 10/22-10/27
Condition of Organisms: Good	Approximate Size or Age: 16 - 21 days	
Shipper: Courier	B of L (Tracking No.) NA	
Condition of Container: Good	Received By: JL	

Container	D.O. (mg/L)		Temp. (°C)	Conductivity or Salinity (Include Units)	pH (Units)	Technician (Initials)
1	12.0		17.3	30 ppt	7.2	JL

Notes:



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

Order Summary

Species: *Neanthes arenaceodentata**	Emerge Date: 22-27 Oct '14
Number Ordered: 600	Number Shipped: 600 + 10 %
Date Shipped: 14 Nov '14	Salinity (ppt): 30

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

APPENDIX A.2.2

Neanthes arenaceodentata

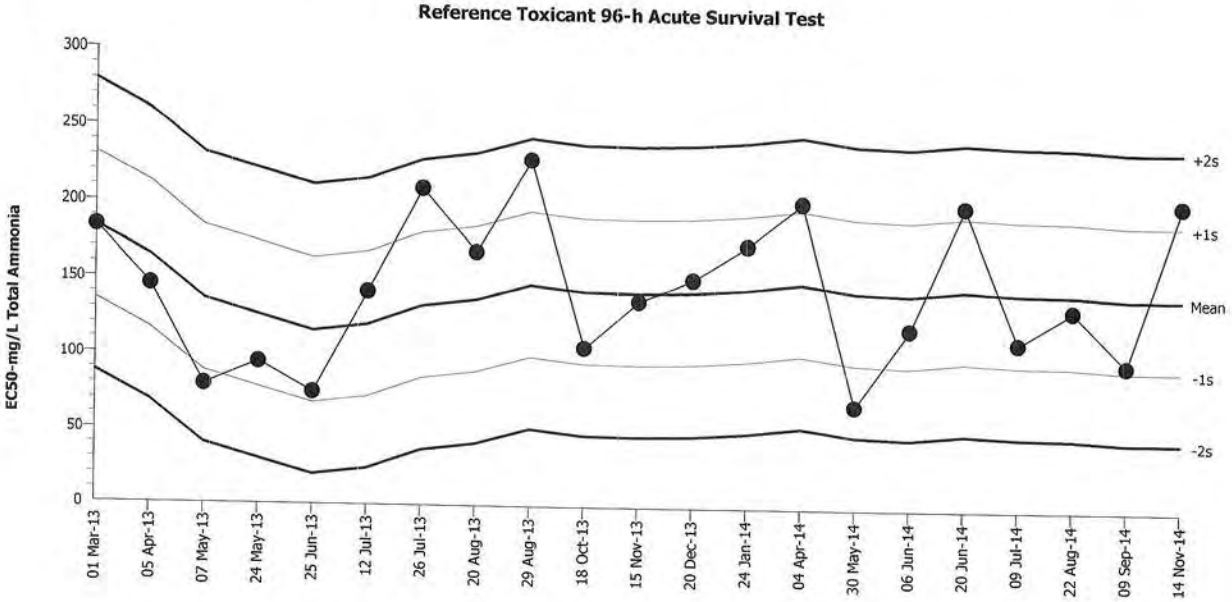
Juvenile Polychaete Bioassay

Reference Toxicant Test

CETIS QC Plot

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

Test Type: Survival | **Organism:** Neanthes arenaceodentata (Polycha | **Material:** Total Ammonia
Protocol: All Protocols | **Endpoint:** Proportion Survived | **Source:** Reference Toxicant-REF



Mean:	141.8	**Count:**	20	**-1s Warning Limit:**	93.98	**-2s Action Limit:**	46.11
Sigma:	47.87	**CV:**	33.80%	**+1s Warning Limit:**	189.7	**+2s Action Limit:**	237.6

Quality Control Data

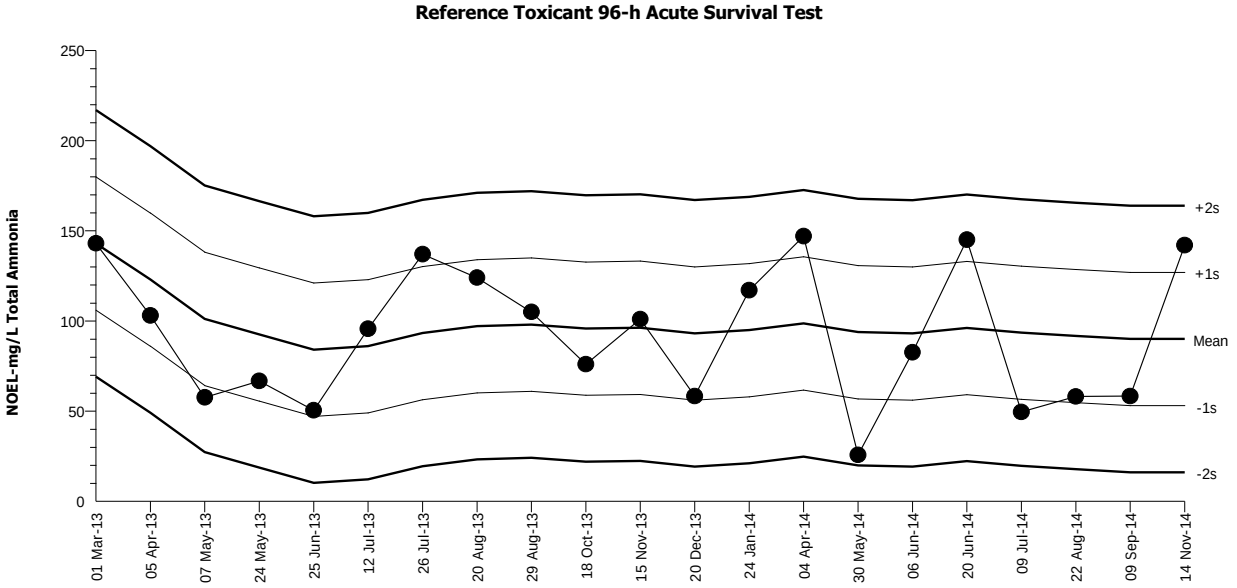
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2013	Mar	1	14:40	183.7	41.91	0.8754			16-0938-7761	05-5518-0938	NewFields
2		Apr	5	10:40	145.7	3.864	0.08072			12-4084-6308	11-0088-3368	NewFields
3		May	7	13:00	79.7	-62.1	-1.297	(-)		03-6682-4675	04-2369-0564	NewFields
4			24	11:30	94.89	-46.91	-0.9799			19-1651-0673	18-8601-2491	NewFields
5		Jun	25	14:13	75.13	-66.67	-1.393	(-)		08-9049-5052	01-8172-0753	NewFields
6		Jul	12	13:20	141.9	0.1331	0.00278			14-1288-0905	06-4191-8012	NewFields
7			26	12:00	209.7	67.91	1.419	(+)		21-1882-7830	07-5315-7472	NewFields
8		Aug	20	15:45	168.6	26.85	0.5608			00-0072-4465	03-0193-2385	NewFields
9			29	13:40	229.1	87.33	1.824	(+)		00-4506-4349	11-1553-1817	NewFields
10		Oct	18	15:35	106.3	-35.49	-0.7415			21-0368-6339	03-0733-6178	NewFields
11		Nov	15	15:30	137.4	-4.37	-0.09129			16-5727-5696	09-2903-6118	NewFields
12		Dec	20	14:00	152.2	10.37	0.2166			08-9922-1254	05-5343-6267	NewFields
13	2014	Jan	24	13:20	174.5	32.72	0.6836			20-9603-7883	05-6245-5381	NewFields
14		Apr	4	15:40	202.9	61.08	1.276	(+)		09-1443-8374	04-8864-2138	ENVIRON
15		May	30	16:25	69.43	-72.37	-1.512	(-)		18-4751-2702	06-4812-5268	ENVIRON
16		Jun	6	14:00	120.6	-21.23	-0.4435			02-4901-6395	02-6665-3375	ENVIRON
17			20	13:20	201.3	59.55	1.244	(+)		04-8899-1061	18-6388-8462	ENVIRON
18		Jul	9	15:30	112	-29.78	-0.622			00-3047-6484	19-8550-4064	ENVIRON
19		Aug	22	12:30	133.9	-7.933	-0.1657			19-3698-7324	19-8424-2994	ENVIRON
20		Sep	9	15:00	97.87	-43.93	-0.9178			04-0379-7898	08-6657-8417	ENVIRON
21		Nov	14	11:11	203.3	61.48	1.284	(+)		09-0815-7159	21-3147-5839	ENVIRON

CETIS QC Plot

Report Date: 29 Dec-14 11:24 (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:	90.04	**Count:**	20	**-1s Warning Limit:**	53.09	**-2s Action Limit:**	16.14
Sigma:	36.95	**CV:**	41.00%	**+1s Warning Limit:**	127	**+2s Action Limit:**	163.9

Quality Control Data

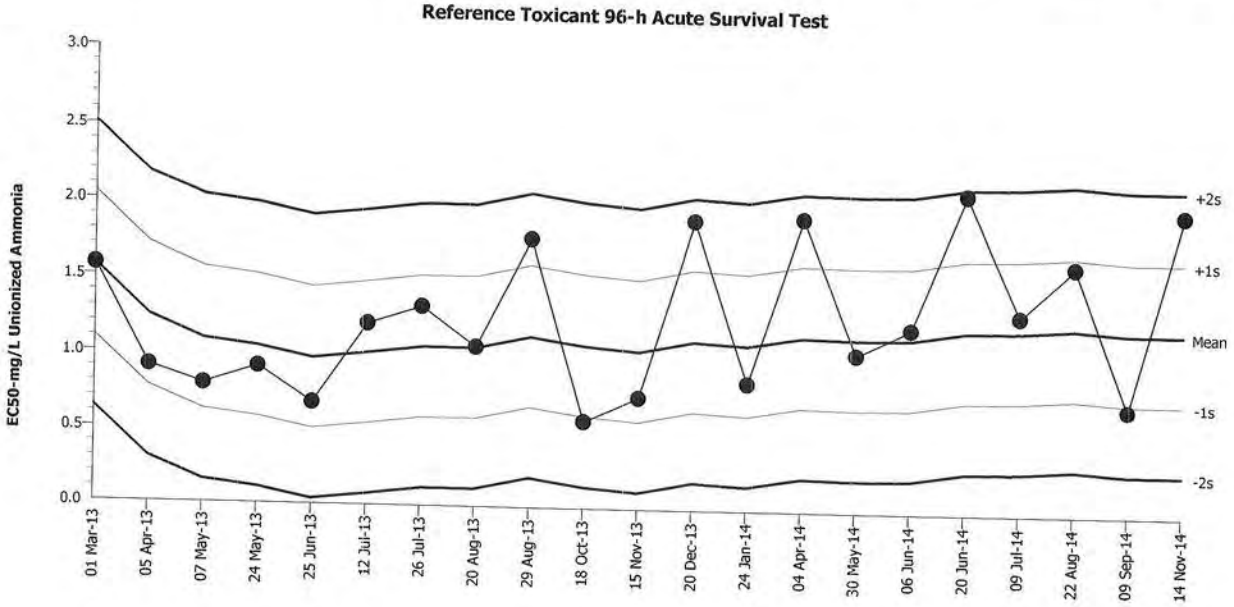
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2013	Mar	1	14:40	143	52.96	1.433	(+)		16-0938-7761	07-7870-4978	NewFields
2		Apr	5	10:40	103	12.96	0.3507			12-4084-6308	12-0348-0416	NewFields
3		May	7	13:00	57.6	-32.44	-0.8779			03-6682-4675	13-3264-9963	NewFields
4			24	11:30	66.7	-23.34	-0.6317			19-1651-0673	19-7443-7088	NewFields
5		Jun	25	14:13	50.4	-39.64	-1.073	(-)		08-9049-5052	06-0503-5931	NewFields
6		Jul	12	13:20	95.6	5.56	0.1505			14-1288-0905	07-0996-7321	NewFields
7			26	12:00	137	46.96	1.271	(+)		21-1882-7830	14-5107-6466	NewFields
8		Aug	20	15:45	124	33.96	0.9191			00-0072-4465	04-2226-9652	NewFields
9			29	13:40	105	14.96	0.4049			00-4506-4349	03-1605-8937	NewFields
10		Oct	18	15:35	76	-14.04	-0.38			21-0368-6339	09-9293-9888	NewFields
11		Nov	15	15:30	101	10.96	0.2966			16-5727-5696	19-4124-7251	NewFields
12		Dec	20	14:00	58.3	-31.74	-0.859			08-9922-1254	11-2068-6689	NewFields
13	2014	Jan	24	13:20	117	26.96	0.7296			20-9603-7883	15-6685-9407	NewFields
14		Apr	4	15:40	147	56.96	1.542	(+)		09-1443-8374	10-8829-6450	ENVIRON
15		May	30	16:25	25.7	-64.34	-1.741	(-)		18-4751-2702	12-3702-5556	ENVIRON
16		Jun	6	14:00	82.6	-7.44	-0.2014			02-4901-6395	20-5404-5146	ENVIRON
17			20	13:20	145	54.96	1.487	(+)		04-8899-1061	10-6019-5810	ENVIRON
18		Jul	9	15:30	49.5	-40.54	-1.097	(-)		00-3047-6484	08-3152-1432	ENVIRON
19		Aug	22	12:30	58.1	-31.94	-0.8644			19-3698-7324	16-9806-3196	ENVIRON
20		Sep	9	15:00	58.3	-31.74	-0.859			04-0379-7898	19-3535-3112	ENVIRON
21		Nov	14	11:11	142	51.96	1.406	(+)		09-0815-7159	10-8173-5203	ENVIRON

CETIS QC Plot

Report Date: 19 Nov-14 11:25 (1 of 1)

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

Test Type: Survival | **Organism:** Neanthes arenaceodentata (Polycha | **Material:** Unionized Ammonia
Protocol: All Protocols | **Endpoint:** Proportion Survived | **Source:** Reference Toxicant-REF



Mean:	1.218	**Count:**	20	**-1s Warning Limit:**	0.7488	**-2s Action Limit:**	0.2795
Sigma:	0.4693	**CV:**	38.50%	**+1s Warning Limit:**	1.687	**+2s Action Limit:**	2.157

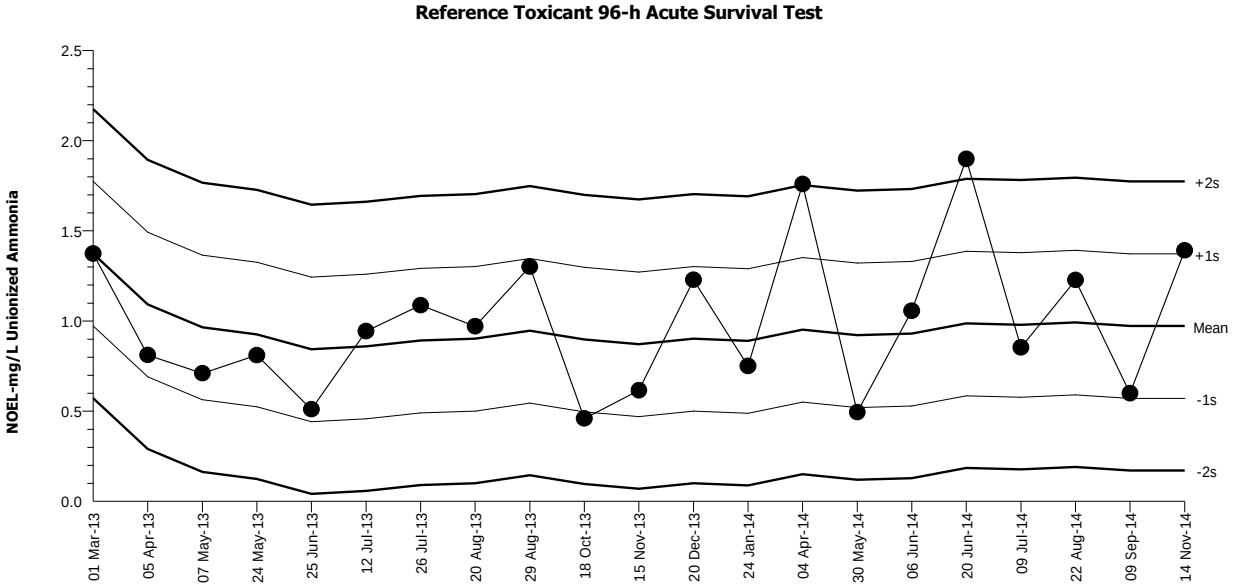
Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2013	Mar	1	14:40	1.573	0.3554	0.7573			18-8051-2966	06-9085-4102	NewFields
2		Apr	5	10:40	0.9122	-0.3058	-0.6516			03-5469-7681	20-0412-7755	NewFields
3		May	7	13:00	0.794	-0.424	-0.9034			11-4883-5754	10-2519-8358	NewFields
4			24	11:30	0.9143	-0.3037	-0.6472			03-1268-0321	17-3627-5339	NewFields
5		Jun	25	14:30	0.6782	-0.5398	-1.15	(-)		07-6412-1006	01-8270-7142	NewFields
6		Jul	12	13:20	1.207	-0.01081	-0.02303			06-2793-5359	03-5477-0692	NewFields
7			26	12:00	1.324	0.1057	0.2253			08-3568-6719	13-1071-7473	NewFields
8		Aug	20	15:45	1.065	-0.1526	-0.3251			11-8125-8700	06-3963-9074	NewFields
9			29	13:40	1.779	0.5609	1.195	(+)		06-4372-6299	20-5863-7836	NewFields
10		Oct	18	15:35	0.5812	-0.6368	-1.357	(-)		21-1191-9888	03-5569-7261	NewFields
11		Nov	15	15:30	0.746	-0.472	-1.006	(-)		09-2209-5330	09-1007-2814	NewFields
12		Dec	20	14:00	1.916	0.6976	1.487	(+)		01-5055-0133	16-3961-8899	NewFields
13	2014	Jan	24	13:20	0.8517	-0.3663	-0.7805			09-1104-1497	12-8333-6553	NewFields
14		Apr	4	15:40	1.94	0.7217	1.538	(+)		00-6512-2526	06-9520-2408	NewFields
15		May	30	16:25	1.055	-0.1632	-0.3478			04-6747-6619	11-2879-2220	ENVIRON
16		Jun	6	14:00	1.228	0.009563	0.02038			19-7971-8908	15-6482-0033	ENVIRON
17			20	13:20	2.113	0.8955	1.908	(+)		01-9511-3585	14-0146-3778	ENVIRON
18		Jul	9	15:30	1.322	0.1043	0.2222			09-1500-8488	10-4546-7656	ENVIRON
19		Aug	22	12:30	1.65	0.4318	0.9201			18-5611-8800	16-9514-3424	ENVIRON
20		Sep	9	15:00	0.7125	-0.5055	-1.077	(-)		18-5349-8839	17-4717-4294	ENVIRON
21		Nov	14	11:11	1.998	0.7804	1.663	(+)		17-3054-3443	08-9007-7058	ENVIRON

CETIS QC Plot

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:	0.9726	**Count:**	20	**-1s Warning Limit:**	0.5717	**-2s Action Limit:**	0.1708
Sigma:	0.4009	**CV:**	41.20%	**+1s Warning Limit:**	1.374	**+2s Action Limit:**	1.774

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2013	Mar	1	14:40	1.373	0.4004	0.9988			18-8051-2966	09-6023-4535	NewFields
2		Apr	5	10:40	0.811	-0.1616	-0.4031			03-5469-7681	20-7653-9268	NewFields
3		May	7	13:00	0.71	-0.2626	-0.655			11-4883-5754	20-7240-7121	NewFields
4			24	11:30	0.81	-0.1626	-0.4056			03-1268-0321	20-4684-2719	NewFields
5		Jun	25	14:30	0.51	-0.4626	-1.154	(-)		07-6412-1006	18-2969-6397	NewFields
6		Jul	12	13:20	0.943	-0.0296	-0.07383			06-2793-5359	18-9450-4090	NewFields
7			26	12:00	1.087	0.1144	0.2854			08-3568-6719	20-5296-6252	NewFields
8		Aug	20	15:45	0.97	-0.0026	-0.00649			11-8125-8700	00-8450-2616	NewFields
9			29	13:40	1.301	0.3284	0.8192			06-4372-6299	17-0691-0612	NewFields
10		Oct	18	15:35	0.459	-0.5136	-1.281	(-)		21-1191-9888	08-6606-1702	NewFields
11		Nov	15	15:30	0.615	-0.3576	-0.892			09-2209-5330	09-5248-1072	NewFields
12		Dec	20	14:00	1.228	0.2554	0.6371			01-5055-0133	05-3710-3857	NewFields
13	2014	Jan	24	13:20	0.75	-0.2226	-0.5553			09-1104-1497	11-9980-1624	NewFields
14		Apr	4	15:40	1.759	0.7864	1.962	(+)		00-6512-2526	16-4646-7758	NewFields
15		May	30	16:25	0.494	-0.4786	-1.194	(-)		04-6747-6619	20-5692-2184	ENVIRON
16		Jun	6	14:00	1.056	0.0834	0.208			19-7971-8908	15-9945-9119	ENVIRON
17			20	13:20	1.898	0.9254	2.308	(+)	(+)	01-9511-3585	21-4292-7262	ENVIRON
18		Jul	9	15:30	0.853	-0.1196	-0.2983			09-1500-8488	15-2291-7760	ENVIRON
19		Aug	22	12:30	1.227	0.2544	0.6346			18-5611-8800	02-5634-5468	ENVIRON
20		Sep	9	15:00	0.599	-0.3736	-0.9319			18-5349-8839	09-1071-5088	ENVIRON
21		Nov	14	11:11	1.391	0.4184	1.044	(+)		17-3054-3443	03-6925-5177	ENVIRON

CETIS Analytical Report

Reference Toxicant 96-h Acute Survival Test

ENVIRON

Analysis ID:	21-3147-5839	**Endpoint:**	Proportion Survived	**CETIS Version:**	CETISv1.8.7
Analyzed:	19 Nov-14 10:16	**Analysis:**	Binomial Method	**Official Results:**	Yes
Batch ID:	03-6338-5363	**Test Type:**	Survival	**Analyst:**	
Start Date:	14 Nov-14 11:11	**Protocol:**	PSEP (1995)	**Diluent:**	Laboratory Seawater
Ending Date:	18 Nov-14 09:40	**Species:**	Neanthes arenaceodentata	**Brine:**	Not Applicable
Duration:	94h	**Source:**	Aquatic Toxicology Support	**Age:**	
Sample ID:	12-3580-7048	**Code:**	49A8EB48	**Client:**	Internal Lab
Sample Date:	14 Nov-14	**Material:**	Total Ammonia	**Project:**	Reference Toxicant
Receive Date:		**Source:**	Reference Toxicant		
Sample Age:	11h	**Station:**	P140505.42		

Binomial/Graphical Estimates

Threshold Option	Threshold	Trim	Mu	Sigma	EC50	95% LCL	95% UCL
Control Threshold	0	0.00%	2.308	0	203.3	142	291

Proportion Survived Summary

			Calculated Variate(A/B)								
C-mg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
0	Dilution Water	3	1	1	1	0	0	0.0%	0.0%	30	30
20		3	1	1	1	0	0	0.0%	0.0%	30	30
37.1		3	1	1	1	0	0	0.0%	0.0%	30	30
70.9		3	1	1	1	0	0	0.0%	0.0%	30	30
142		3	1	1	1	0	0	0.0%	0.0%	30	30
291		3	0	0	0	0	0		100.0%	0	30

Proportion Survived Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	1	1	1
20		1	1	1
37.1		1	1	1
70.9		1	1	1
142		1	1	1
291		0	0	0

Proportion Survived Binomials

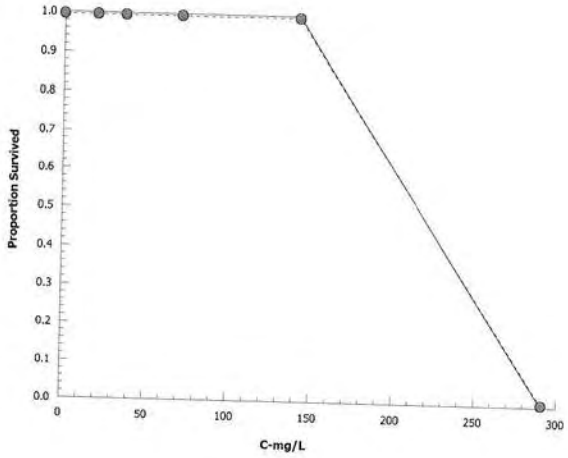
C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	10/10	10/10	10/10
20		10/10	10/10	10/10
37.1		10/10	10/10	10/10
70.9		10/10	10/10	10/10
142		10/10	10/10	10/10
291		0/10	0/10	0/10

Reference Toxicant 96-h Acute Survival Test

ENVIRON

Analysis ID:	21-3147-5839	**Endpoint:**	Proportion Survived	**CETIS Version:**	CETISv1.8.7
Analyzed:	19 Nov-14 10:16	**Analysis:**	Binomial Method	**Official Results:**	Yes

Graphics



CETIS Analytical Report

Reference Toxicant 96-h Acute Survival Test

ENVIRON

Analysis ID:	10-8173-5203	**Endpoint:**	Proportion Survived	**CETIS Version:**	CETISv1.8.7
Analyzed:	19 Nov-14 10:15	**Analysis:**	Single 2x2 Contingency Table	**Official Results:**	Yes
Batch ID:	03-6338-5363	**Test Type:**	Survival	**Analyst:**	
Start Date:	14 Nov-14 11:11	**Protocol:**	PSEP (1995)	**Diluent:**	Laboratory Seawater
Ending Date:	18 Nov-14 09:40	**Species:**	Neanthes arenaceodentata	**Brine:**	Not Applicable
Duration:	94h	**Source:**	Aquatic Toxicology Support	**Age:**	
Sample ID:	12-3580-7048	**Code:**	49A8EB48	**Client:**	Internal Lab
Sample Date:	14 Nov-14	**Material:**	Total Ammonia	**Project:**	Reference Toxicant
Receive Date:		**Source:**	Reference Toxicant		
Sample Age:	11h	**Station:**	P140505.42		

Data Transform	Zeta	Alt Hyp	Trials	Seed	NOEL	LOEL	TOEL	TU
Untransformed		C > T	NA	NA	142	291	203.3	

Fisher Exact Test

Control	vs	C-mg/L	Test Stat	P-Value	P-Type	Decision(α:5%)
Dilution Water		20	1	1.0000	Exact	Non-Significant Effect
		37.1	1	1.0000	Exact	Non-Significant Effect
		70.9	1	1.0000	Exact	Non-Significant Effect
		142	1	1.0000	Exact	Non-Significant Effect

Data Summary

C-mg/L	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
0	Dilution Water	30	0	30	1	0	0.0%
20		30	0	30	1	0	0.0%
37.1		30	0	30	1	0	0.0%
70.9		30	0	30	1	0	0.0%
142		30	0	30	1	0	0.0%
291		0	30	30	0	1	100.0%

Proportion Survived Detail

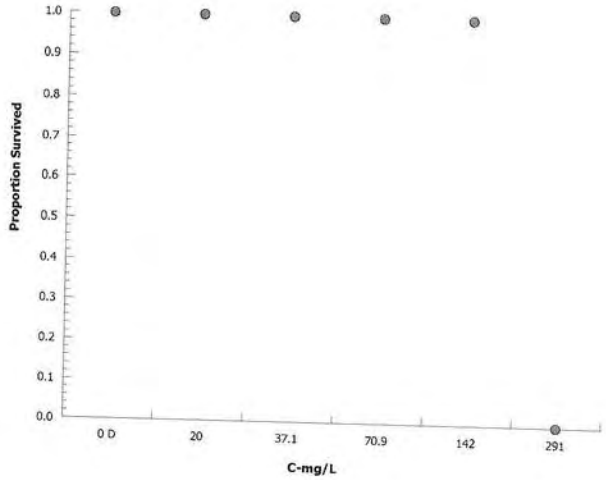
C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	1	1	1
20		1	1	1
37.1		1	1	1
70.9		1	1	1
142		1	1	1
291		0	0	0

Proportion Survived Binomials

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	10/10	10/10	10/10
20		10/10	10/10	10/10
37.1		10/10	10/10	10/10
70.9		10/10	10/10	10/10
142		10/10	10/10	10/10
291		0/10	0/10	0/10

Analysis ID:	10-8173-5203	**Endpoint:**	Proportion Survived	**CETIS Version:**	CETISv1.8.7
Analyzed:	19 Nov-14 10:15	**Analysis:**	Single 2x2 Contingency Table	**Official Results:**	Yes

Graphics



Analyst: CR QA:

CETIS Test Data Worksheet

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

Start Date:	14 Nov-14 11:11	**Species:**	Neanthes arenaceodentata
End Date:	18 Nov-14 09:40	**Protocol:**	PSEP (1995)
Sample Date:	14 Nov-14	**Material:**	Total Ammonia
Sample Code:	49A8EB48		
Sample Source:	Reference Toxicant		
Sample Station:	P140505.42		

C-mg/L	Code	Rep	Pos	# Exposed	# Survived	Notes
0	D	1	18	10	10	
0	D	2	6	10	10	
0	D	3	7	10	10	
20		1	11	10	10	
20		2	5	10	10	
20		3	8	10	10	
37.1		1	9	10	10	
37.1		2	17	10	10	
37.1		3	3	10	10	
70.9		1	14	10	10	
70.9		2	16	10	10	
70.9		3	2	10	10	
142		1	12	10	10	
142		2	4	10	10	
142		3	1	10	10	
291		1	10	10	0	
291		2	15	10	0	
291		3	13	10	0	

Analyst: CR QA:_____

CETIS Analytical Report

Reference Toxicant 96-h Acute Survival Test

ENVIRON

Analysis ID:	08-9007-7058	**Endpoint:**	Proportion Survived	**CETIS Version:**	CETISv1.8.7
Analyzed:	19 Nov-14 11:23	**Analysis:**	Binomial Method	**Official Results:**	Yes
Batch ID:	03-6338-5363	**Test Type:**	Survival	**Analyst:**	
Start Date:	14 Nov-14 11:11	**Protocol:**	PSEP (1995)	**Diluent:**	Laboratory Seawater
Ending Date:	18 Nov-14 09:40	**Species:**	Neanthes arenaceodentata	**Brine:**	Not Applicable
Duration:	94h	**Source:**	Aquatic Toxicology Support	**Age:**	
Sample ID:	10-3660-4075	**Code:**	3DC952AB	**Client:**	Internal Lab
Sample Date:	14 Nov-14	**Material:**	Unionized Ammonia	**Project:**	Reference Toxicant
Receive Date:		**Source:**	Reference Toxicant		
Sample Age:	11h	**Station:**	P140505.42		

Binomial/Graphical Estimates

Threshold Option	Threshold	Trim	Mu	Sigma	EC50	95% LCL	95% UCL
Control Threshold	0	0.00%	0.3007	0	1.998	1.391	2.871

Proportion Survived Summary

			Calculated Variate(A/B)								
C-mg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
0	Dilution Water	3	1	1	1	0	0	0.0%	0.0%	30	30
0.384		3	1	1	1	0	0	0.0%	0.0%	30	30
0.568		3	1	1	1	0	0	0.0%	0.0%	30	30
0.866		3	1	1	1	0	0	0.0%	0.0%	30	30
1.391		3	1	1	1	0	0	0.0%	0.0%	30	30
2.871		3	0	0	0	0	0		100.0%	0	30

Proportion Survived Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	1	1	1
0.384		1	1	1
0.568		1	1	1
0.866		1	1	1
1.391		1	1	1
2.871		0	0	0

Proportion Survived Binomials

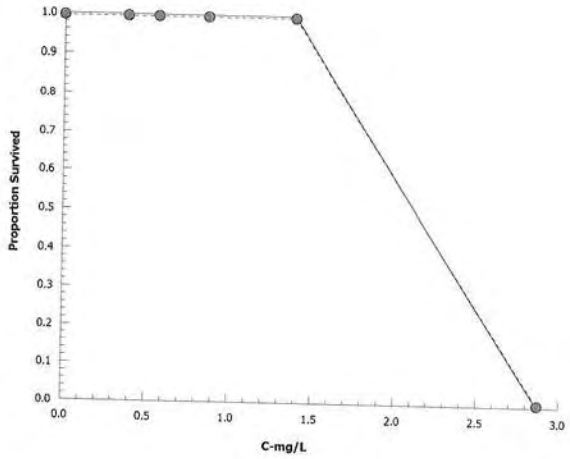
C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	10/10	10/10	10/10
0.384		10/10	10/10	10/10
0.568		10/10	10/10	10/10
0.866		10/10	10/10	10/10
1.391		10/10	10/10	10/10
2.871		0/10	0/10	0/10

Reference Toxicant 96-h Acute Survival Test

ENVIRON

Analysis ID:	08-9007-7058	**Endpoint:**	Proportion Survived	**CETIS Version:**	CETISv1.8.7
Analyzed:	19 Nov-14 11:23	**Analysis:**	Binomial Method	**Official Results:**	Yes

Graphics



CETIS Analytical Report

Reference Toxicant 96-h Acute Survival Test

ENVIRON

Analysis ID:	03-6925-5177	**Endpoint:**	Proportion Survived	**CETIS Version:**	CETISv1.8.7
Analyzed:	19 Nov-14 11:22	**Analysis:**	Single 2x2 Contingency Table	**Official Results:**	Yes
Batch ID:	03-6338-5363	**Test Type:**	Survival	**Analyst:**	
Start Date:	14 Nov-14 11:11	**Protocol:**	PSEP (1995)	**Diluent:**	Laboratory Seawater
Ending Date:	18 Nov-14 09:40	**Species:**	Neanthes arenaceodentata	**Brine:**	Not Applicable
Duration:	94h	**Source:**	Aquatic Toxicology Support	**Age:**	
Sample ID:	10-3660-4075	**Code:**	3DC952AB	**Client:**	Internal Lab
Sample Date:	14 Nov-14	**Material:**	Unionized Ammonia	**Project:**	Reference Toxicant
Receive Date:		**Source:**	Reference Toxicant		
Sample Age:	11h	**Station:**	P140505.42		

Data Transform	Zeta	Alt Hyp	Trials	Seed	NOEL	LOEL	TOEL	TU
Untransformed		C > T	NA	NA	1.391	2.871	1.998	

Fisher Exact Test

Control	vs	C-mg/L	Test Stat	P-Value	P-Type	Decision(α:5%)
Dilution Water		0.384	1	1.0000	Exact	Non-Significant Effect
		0.568	1	1.0000	Exact	Non-Significant Effect
		0.866	1	1.0000	Exact	Non-Significant Effect
		1.391	1	1.0000	Exact	Non-Significant Effect

Data Summary

C-mg/L	Control Type	NR	R	NR + R	Prop NR	Prop R	%Effect
0	Dilution Water	30	0	30	1	0	0.0%
0.384		30	0	30	1	0	0.0%
0.568		30	0	30	1	0	0.0%
0.866		30	0	30	1	0	0.0%
1.391		30	0	30	1	0	0.0%
2.871		0	30	30	0	1	100.0%

Proportion Survived Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	1	1	1
0.384		1	1	1
0.568		1	1	1
0.866		1	1	1
1.391		1	1	1
2.871		0	0	0

Proportion Survived Binomials

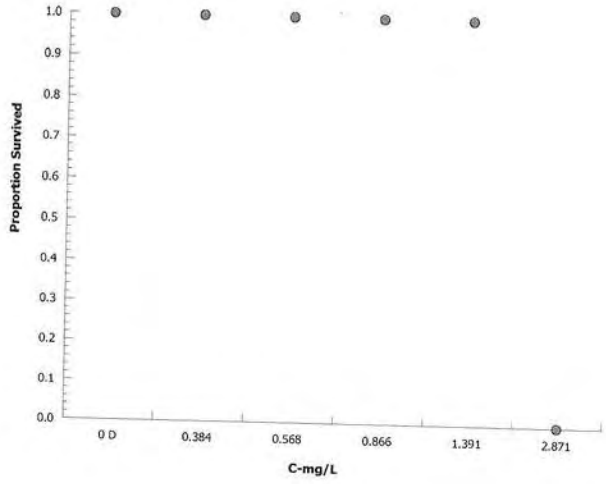
C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	10/10	10/10	10/10
0.384		10/10	10/10	10/10
0.568		10/10	10/10	10/10
0.866		10/10	10/10	10/10
1.391		10/10	10/10	10/10
2.871		0/10	0/10	0/10

Reference Toxicant 96-h Acute Survival Test

ENVIRON

Analysis ID:	03-6925-5177	**Endpoint:**	Proportion Survived	**CETIS Version:**	CETISv1.8.7
Analyzed:	19 Nov-14 11:22	**Analysis:**	Single 2x2 Contingency Table	**Official Results:**	Yes

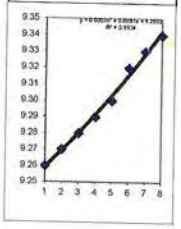
Graphics



CLIENT:	Pioneer Technologies	Date of Test:	14-Nov-14
PROJECT:	West Bay	Test Type:	Neathes 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		20	28	7.8	19.0	292.16	9.3187		0.384
4	30		37.1	28	7.7	19.0	292.16	9.3187		0.568
5	60		70.9	28	7.6	19.0	292.16	9.3187		0.866
6	120		142	28	7.5	19.1	292.26	9.3187		1.391
7	240		291	28	7.5	19.2	292.36	9.3187		2.871
8										
9										
10										
11										
12										
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ENVIRON

96-HOUR REFERENCE TOXICANT TEST WATER QUALITY DATASHEET

CLIENT	PROJECT	SPECIES	LABORATORY		PROTOCOL
Pioneer Technologies	West Bay	*Neanthes arenaceodentata*	Port Gamble		PSEP 1995
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE:**	**TIME**	**TEST END DATE**	**TIME**
0	Bill Gardiner	14Nov14	1111	18Nov14	0940
Test ID	**LOT #:**				
P140505.42	44C535				

WATER QUALITY DATA

DILTIN.WAT.BATCH	TEMP REC#	REFERENCE TOX. MATERIAL	REFERENCE TOXICANT
FSW111414.01		ammonium chloride	ammonia - TAN

TEST CONDITIONS	DO (mg/L)	TEMP(C)	SAL (ppt)	pH	TECHNICIAN
	> 4.6	20 ± 1	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	7.8	8	19.0	8	28	8	7.8	HE 11/14
	Actual:			4	Rep 3	8	7.4	8	19.9	8	29	8	7.9	11/18
Ref.Tox.-ammonia - TAN	Target:	15	mg/L	0	Stock	8	8.0	8	19.0	8	28	8	7.8	11/14
	Actual:	20.0		4	Rep 3	8	7.3	8	20.1	8	29	8	7.9	11/18
Ref.Tox.-ammonia - TAN	Target:	30	mg/L	0	Stock	8	8.1	8	19.0	8	28	8	7.7	11/14
	Actual:	37.1		4	Rep 3	8	7.2	8	20.1	8	29	8	7.9	11/18
Ref.Tox.-ammonia - TAN	Target:	60	mg/L	0	Stock	8	8.1	8	19.0	8	28	8	7.6	11/14
	Actual:	70.9		4	Rep 3	8	7.0	8	20.1	8	29	8	7.8	11/18
Ref.Tox.-ammonia - TAN	Target:	120	mg/L	0	Stock	8	8.1	8	19.1	8	28	8	7.5	11/14
	Actual:	142		4	Rep 3	8	7.0	8	20.1	8	29	8	7.8	11/18
Ref.Tox.-ammonia - TAN	Target:	240	mg/L	0	Stock	8	8.1	8	19.2	8	28	8	7.5	11/14
	Actual:	291		4	Rep									

ENVIRON

96 HOUR REFERENCE TOXICANT TEST
OBSERVATION DATASHEET

CLIENT	PROJECT	JOB NUMBER	SPECIES		
Pioneer Technologies	West Bay	0	*Neanthes arenaceodentata*		
			PROJECT MANAGER: Bill Gardiner	LABORATORY: Port Gamble	PROTOCOL: 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: 11/15/14 TECHNICIAN: JL #ALIVE	DAY 1 #DEAD	DAY 1 OBS	DAY 2 DATE: 11/16/14 TECHNICIAN: JL #ALIVE	DAY 2 #DEAD	DAY 2 OBS	DAY 3 DATE: 11/17/14 TECHNICIAN: JL #ALIVE	DAY 3 #DEAD	DAY 3 OBS	DAY 4 DATE: 11/18/14 TECHNICIAN: MK #ALIVE	DAY 4 #DEAD	DAY 4 OBS
Ref.Tox.-ammonia - TAN	0	mg/L	1		10	0	N	10	0	N	10	0	N	10	0	N
			2		10	0	↓	10	0	↓	10	0	↓	10	0	N
			3		10	0	↓	10	0	↓	10	0	↓	10	0	↓
Ref.Tox.-ammonia - TAN	15	mg/L	1		10	0	N	10	0	N	10	0	N	10	0	N
			2		10	0	↓	10	0	↓	10	0	↓	10	0	↓
			3		10	0	↓	10	0	↓	10	0	↓	10	0	↓
Ref.Tox.-ammonia - TAN	30	mg/L	1		10	0	N	10	0	N	10	0	N	10	0	N
			2		10	0	↓	10	0	↓	10	0	↓	10	0	↓
			3		10	0	↓	10	0	↓	10	0	↓	10	0	↓
Ref.Tox.-ammonia - TAN	60	mg/L	1		10	0	N	10	0	N	10	0	N	10	0	Q
			2		10	0	↓	10	0	↓	10	0	↓	10	0	↓
			3		10	0	↓	10	0	↓	10	0	↓	10	0	↓
Ref.Tox.-ammonia - TAN	120	mg/L	1		10	0	Q	10	0	Q	10	0	Q	10	0	Q
			2		10	0	↓	10	0	↓	10	0	↓	10	0	↓
			3		10	0	↓	10	0	↓	10	0	↓	10	0	↓
Ref.Tox.-ammonia - TAN	240	mg/L	1		10	0	Q	10	0	Q	0	10	NA	—	—	—
			2		10	0	↓	10	0	↓	0	10	↓	—	—	—
			3		10	0	↓	10	0	↓	5	5	Q	0	5	—

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 9327

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)
291	240	750		28.948
142	120	750		14.474
70.9	60	750		7.237
37.1	30	750		3.619
20.0	15	750		1.809
0	0			

APPENDIX A.3.1

Mytilus galloprovincialis

Benthic Larval Bioassay

Laboratory Data Sheets

ENVIRON

LARVAL DEVELOPMENT TEST INITIATION DATA SHEET

CLIENT	PROJECT	JOB NUMBER	PROJECT MANAGER	LABORATORY	PROTOCOL
Pioneer Technologies	West Bay	—	Bill Gardiner	Port Gamble .	PSEP (1995)

TEST ORGANISM SPAWNING DATA

SPECIES			
Mytilus galloprovincialis			
SUPPLIER: Taylor Shellfish			ORGANISM BATCH: TS4821
DATE RECEIVED: 11/19/14	TIME RECEIVED: 0935		DATE USED: 11/19/14
SPAWNING METHOD: fed 1308 heat shock	INITIAL SPAWNING TIME: 1426		FINAL SPAWNING TIME: 1515
MALES: 10	FEMALES: 4	SPERM VIABILITY: Good	EGG CONDITION: Good
BEGIN FERTILIZATION: 1525	END FERTILIZATION: ~~1540~~ 1740		CONDITION OF EMBRYOS: Good

SAMPLE STORAGE
4 Degrees Celsius - dark
SEDIMENT TREATMENT: none
TEST CHAMBERS: 1 L Mason Jars
EXPOSURE VOLUME: 900mL seawater / 18g Sediment
TIME OF SHAKE: 1045
TIME OF INITIATION: 1740

SPECIAL CONDITIONS

UV LIGHT EXPOSURE (YES/NO)	AERATION FROM TEST INITIATION (YES/NO)
NO	No
SCREEN TUBE TEST (YES/NO)	OTHER (EXPLAIN)
No	

EMBRYO DENSITY CALCULATIONS

ess stock

$78 \cdot 100 = 7800$ ess/mL

PSEP

$\frac{27000}{7800} = 3.5$ mL/jar

Deliver

Make Adj; stock

RT/

$\frac{2700}{7800} = 0.35 \cdot 40$

Dilute- $\frac{14\text{ mL ess stock}}{26\text{ mL seawater}}$

Deliver 0.100mL

ENVIRON

LARVAL DEVELOPMENT TEST
ENDPOINT DATA

CLIENT	PROJECT	JOB NUMBER	SPECIES		
			Mytilus galloprovincialis		
Pioneer Technologies	West Bay	—	PROJECT MANAGER: Bill Gardiner	LAB / LOCATION: Port Gamble / .	PROTOCOL: PSEP (1995)
ORGANISM BATCH	TEST START DATE:	TIME	TEST END DATE:	TIME	
TS4821	19 NOV 14	1740	21 NOV 14	1700	

LARVAL OBSERVATION DATA

CLIENT/ ID	REP	NUMBER NORMAL	NUMBER	DATE	TECHNICIAN	COMMENTS
STOCKING DENSITY	1	NA	379	11/25/14	JW	
	2	↓	354	↓	↓	
	3		410			
	4		402			
	5		381			
Control /	1	303	8			
	2	364	19			
	3	364	16			
	4	319	16			
	5	345	13			
Ref Carr /	1	348	12			
	2	287	13			
	3	354	12			
	4	359	11			
	5	322	7			
Carr 20 /	1	324	14			
	2	323	9			
	3	374	4			
	4	340	12			
	5	311	4			
SD-WB-56 /	1	320	8			
	2	250	9			
	3	270	8			
	4	303	8			
	5	281	13	↓	↓	

ENVIRON

LARVAL DEVELOPMENT TEST
ENDPOINT DATA

SPECIES					
Mytilus galloprovincialis					
CLIENT	PROJECT	JOB NUMBER	PROJECT MANAGER	LAB / LOCATION	PROTOCOL
Pioneer Technologies	West Bay		Bill Gardiner	Port Gamble / .	PSEP (1995)
ORGANISM BATCH	TEST START DATE:	TIME	TEST END DATE:	TIME	
TS4821	19 NOV 14	1740	21 NOV 14	1700	

LARVAL OBSERVATION DATA

CLIENT/ ID	REP	NUMBER NORMAL	NUMBER	DATE	TECHNICIAN	COMMENTS
SD-WB-57 /	1	347	7	11/25/14	UW	
	2	298	26			
	3	357	14			
	4	337	14			
	5	320	6			
SD-WB-58 /	1	325	6			
	2	331	5			
	3	349	6			
	4	336	4			
	5	326	7			
SD-WB-59 /	1	343	4			
	2	334	12			
	3	302	24			
	4	322	13			
	5	311	16			

ENVIRON

LARVAL DEVELOPMENT TEST
WATER QUALITY DATA

CLIENT	PROJECT	SPECIES		LAB / LOCATION	PROTOCOL
Pioneer Technologies	West Bay	*Mytilus galloprovincialis*		Port Gamble / .	PSEP (1995)
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE**	**TIME**	**TEST END DATE**	**TIME**
—	Bill Gardiner	19Nov14	1740	21 NOV 14	1700

* 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	8	WQ Surr	8	7.9	8	16.2	8	28	8	7.8	HE	0.00	MMB	0.00	KB	11/19/14
Control /	1	↓	WQ Surr	8	7.5	8	16.6	8	28	8	7.8					JL	11/20
Control /	2	↓	WQ Surr	8	~~7.7~~ 6.0	8	~~16.0~~ 16.9 ②	8	28	8	~~7.8~~ 7.8 ②	KB	0.00	HE	0.005	KB	11/21
Control /	3	↓	WQ Surr														
Control /	4	↓	WQ Surr														
Ref Carr /	0	11	WQ Surr	8	7.7	8	16.5	8	28	8	7.7	HE	0.00	MMB	0.019	KB	11/19/14
Ref Carr /	1	↓	WQ Surr	8	7.5	8	17.2 ①	8	28	8	7.8					JL	11/20
Ref Carr /	2	↓	WQ Surr	8	7.8	8	16.7	8	28	8	7.8	KB	0.00	HE	0.001	KB	11/21
Ref Carr /	3	↓	WQ Surr														
Ref Carr /	4	↓	WQ Surr														
Carr 20 /	0	20	WQ Surr	8	7.9	8	16.4	8	28	8	7.7	HE	0.00	MMB	0.055	KB	11/19/14
Carr 20 /	1	↓	WQ Surr	8	6.7	8	16.6	8	28	8	7.8					JL	11/20
Carr 20 /	2	↓	WQ Surr	8	6.8	8	16.3	8	28	8	7.7	KB	0.00	HE	0.012	KB	11/21
Carr 20 /	3	↓	WQ Surr														
Carr 20 /	4	↓	WQ Surr														

① Bath temp. decreased by 0.5°C. JL 11/20

② WC. KB. 11/21/14

ENVIRON

LARVAL DEVELOPMENT TEST
WATER QUALITY DATA

CLIENT	PROJECT	SPECIES		LAB / LOCATION	PROTOCOL
Pioneer Technologies	West Bay	*Mytilus galloprovincialis*		Port Gamble / .	PSEP (1995)
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE**	**TIME**	**TEST END DATE**	**TIME**
—	Bill Gardiner	19Nov14	1740	21 NOV 14	1700

* 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)		
SD-WB-56 /	0	16	WQ Surr	8	7.6	8	16.5	8	28	8	7.7	HE	0.00	MMB	0.114	KB	11-14-14
SD-WB-56 /	1	↓	WQ Surr	8	6.4	8	17.1 ①	8	28	8	7.7					JL	11/20
SD-WB-56 /	2	↓	WQ Surr	8	7.0	8	17.0	8	28	8	7.7	KB	0.00	HE	0.016	KB	11/21
SD-WB-56 /	3	↓	WQ Surr														
SD-WB-56 /	4	↓	WQ Surr														
SD-WB-57 /	0	22	WQ Surr	8	7.4	8	16.4	8	28	8	7.7	HE	0.00	MMB	0.082	KB	11-19-14
SD-WB-57 /	1	↓	WQ Surr	8	6.6	8	17.1 ①	8	28	8	7.7					JL	11/20
SD-WB-57 /	2	↓	WQ Surr	8	6.1	8	16.8	8	28	8	7.6	KB	0.00	HE	0.010	KB	11/21
SD-WB-57 /	3	↓	WQ Surr														
SD-WB-57 /	4	↓	WQ Surr														
SD-WB-58 /	0	5	WQ Surr	8	7.7	8	16.4	8	28	8	7.8	HE	0.00	MMB	0.111	KB	11-19-14
SD-WB-58 /	1	↓	WQ Surr	8	5.9	8	16.4	8	28	8	7.7					JL	11/20
SD-WB-58 /	2	↓	WQ Surr	8	6.0	8	16.9	8	28	8	7.6	KB	0.00	HE	0.008	KB	11/21
SD-WB-58 /	3	↓	WQ Surr														
SD-WB-58 /	4	↓	WQ Surr														

① Bath temp. ~~increased~~ decreased by 0.5°C. JL 11/20.

ENVIRON

LARVAL DEVELOPMENT TEST
WATER QUALITY DATA

CLIENT	PROJECT	SPECIES		LAB / LOCATION	PROTOCOL
Pioneer Technologies	West Bay	*Mytilus galloprovincialis*		Port Gamble / .	PSEP (1995)
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE**	**TIME**	**TEST END DATE**	**TIME**
—	Bill Gardiner	19Nov14	1740	21 NOV 14	1700

* 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)		
SD-WB-59 /	0	15	WQ Surr	8	7.6	8	16.3	8	28	8	7.7	HP	0.00	MMB	0.098	KB	11.19.14
SD-WB-59 /	1	↓	WQ Surr	8	6.5	8	17.0	8	28	8	7.7					JL	11/20
SD-WB-59 /	2		WQ Surr	8	6.5	8	16.5	8	28	8	7.6	KB	0.00	HP	0.008	KB	11/21
SD-WB-59 /	3		WQ Surr														
SD-WB-59 /	4		WQ Surr														

ENVIRON

Ammonia and Sulfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
Pioneer/West Bay	Mytilus spp. larval	2

PRETEST / INITIAL / FINAL / OTHER (circle one) DAY of TEST: 0

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:	Temperature:	
11/19/14	21.5	

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
Control	SWW.	11/19/14 MMB	0.00	21.5	AE 11/19/14	N			0.00
Ref Carr	↓	↓	0.00	↓	↓	↓			0.019
Carr 20			0.00						0.055
SD-WB-56			0.00						0.114
SD-WB-57			0.00						0.082
SD-WB-58			0.00						0.111
SD-WB-59			0.00						0.098

ENVIRON

Ammonia and Sulfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
PIONEER / WEST BAY	MYTILUS	2 DAY

PRETEST / INITIAL / FINAL / OTHER (circle one) **DAY of TEST:** 2
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:	**Temperature:**	
11/21/14	21.1°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
0	SURR.	11/21/14 KMB	0.00	20.6	11/21/14 DKB	N			0.005
REF-CAKR			0.00	20.1					0.001
CAKR 20			0.00	20.1					0.012
SD. WB - 56			0.00	20.1					0.016
" 57			0.00	20.1					0.010
" 58			0.00	20.1					0.008
" 59			0.00	20.1					0.008

ENVIRON

ORGANISM RECEIPT LOG

Date:		Time:	Batch No.
11/19/14		0935	TS4821

Organism / Project:	Source:
Mytilus / West Bay & Evnport	Taylor Shellfish

Address:	Invoice Attached
On File	Yes (No)

Phone:	Contact:
On File	On File

No. Ordered:	No. Received:	Source Batch:

Condition of Organisms:	Approximate Size or Age:
Good	Adult

Shipper:	B of L (Tracking No.)
UPS	1Z98X6850131004821

Condition of Container:	Received By:
Good	MMB

Container	D.O. (mg/L)	Temp. (°C)	Conductivity or Salinity (Include Units)	pH (Units)	Technician (Initials)
1	* →			→	MMB

Notes: *: received dry @ 7.3°C

APPENDIX A.3.2

Mytilus galloprovincialis

Benthic Larval Bioassay

Reference Toxicant Test

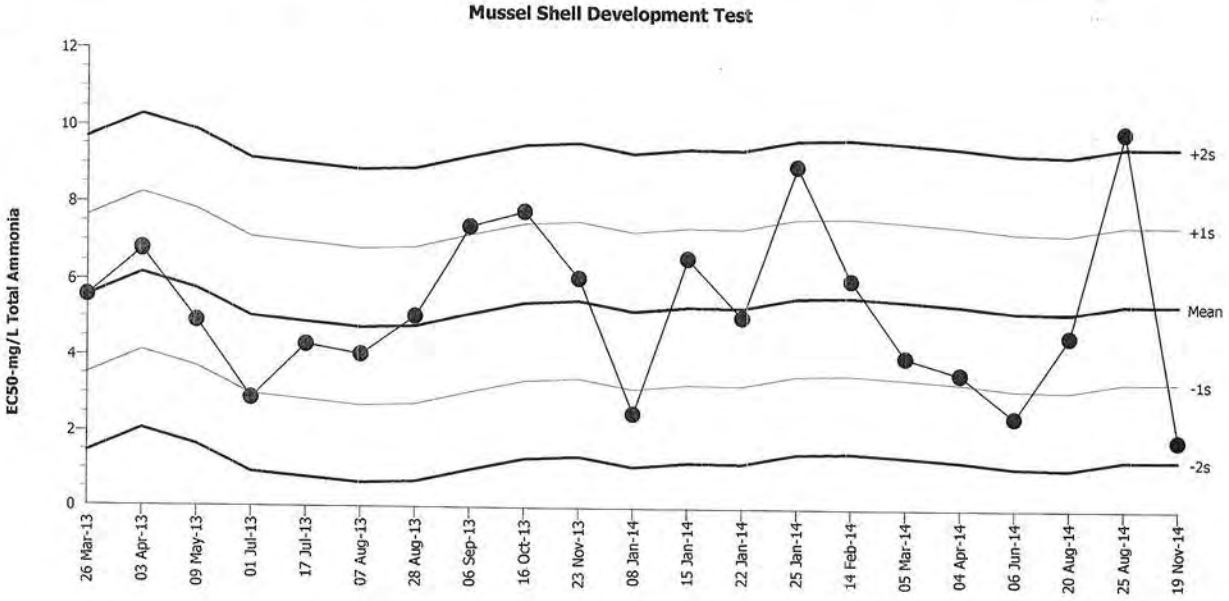
CETIS QC Plot

Report Date: 29 Dec-14 10:17 (1 of 1)

Mussel Shell Development Test

All Matching Labs

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



Mean:	5.445	**Count:**	20	**-1s Warning Limit:**	3.387	**-2s Action Limit:**	1.329
Sigma:	2.058	**CV:**	37.80%	**+1s Warning Limit:**	7.503	**+2s Action Limit:**	9.561

Quality Control Data

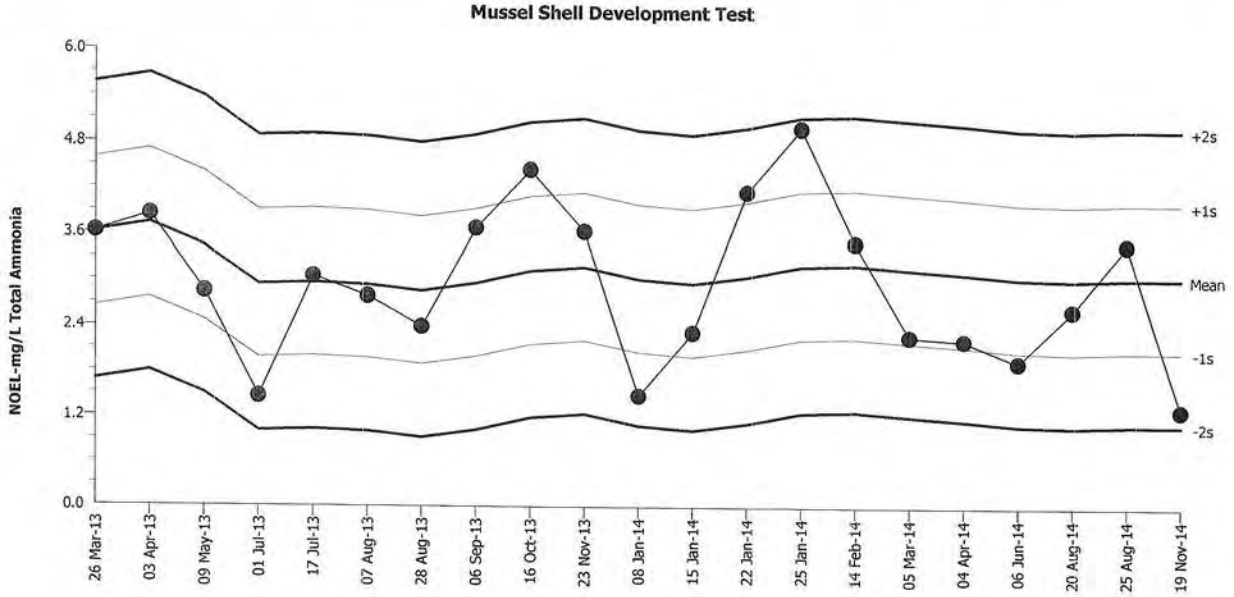
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2013	Mar	26	18:15	5.579	0.1341	0.06518			03-8532-3895	00-6308-0782	NewFields
2		Apr	3	0:00	6.805	1.36	0.661			10-3604-5723	04-8356-0800	NewFields
3		May	9	17:15	4.927	-0.5183	-0.2518			00-6360-9095	16-4147-0802	NewFields
4		Jul	1	19:00	2.895	-2.55	-1.239	(-)		19-5961-2730	13-0986-6895	NewFields
5			17	17:55	4.313	-1.132	-0.5499			18-2536-1347	00-8750-2223	NewFields
6		Aug	7	19:00	4.051	-1.394	-0.6774			04-7788-4843	09-8595-7999	NewFields
7			28	16:55	5.063	-0.3823	-0.1857			19-6611-9162	04-7207-2891	NewFields
8		Sep	6	18:55	7.413	1.968	0.9563			15-9826-4846	08-5407-1877	NewFields
9		Oct	16	20:15	7.813	2.368	1.15	(+)		06-1596-0976	02-5933-8680	NewFields
10		Nov	23	17:25	6.092	0.6465	0.3141			16-7309-8662	15-4529-5520	NewFields
11	2014	Jan	8	18:22	2.527	-2.918	-1.418	(-)		17-8058-8048	06-8566-9958	NewFields
12			15	18:45	6.625	1.18	0.5732			13-6807-1804	14-8094-6245	NewFields
13			22	18:47	5.072	-0.3729	-0.1812			13-2808-9359	13-2338-2483	NewFields
14			25	20:20	9.018	3.573	1.736	(+)		14-2680-8854	01-2301-1257	NewFields
15		Feb	14	15:45	6.063	0.618	0.3003			00-9581-0604	10-3047-2486	NewFields
16		Mar	5	19:35	4.03	-1.415	-0.6876			00-1473-4954	06-0848-4308	NewFields
17		Apr	4	19:30	3.594	-1.851	-0.8993			00-0374-9463	01-3815-4471	NewFields
18		Jun	6	18:15	2.465	-2.98	-1.448	(-)		06-9491-1560	12-3152-8677	ENVIRON
19		Aug	20	18:55	4.595	-0.8497	-0.4129			03-3666-4351	12-9663-9075	ENVIRON
20			25	19:45	9.954	4.509	2.191	(+)	(+)	18-5120-4553	05-8275-9550	ENVIRON
21		Nov	19	17:40	1.863	-3.582	-1.741	(-)		16-6497-0143	19-4546-4847	ENVIRON

CETIS QC Plot

Report Date: 29 Dec-14 10:17 (1 of 1)

Mussel Shell 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:	3.037	**Count:**	20	**-1s Warning Limit:**	2.068	**-2s Action Limit:**	1.099
Sigma:	0.969	**CV:**	31.90%	**+1s Warning Limit:**	4.006	**+2s Action Limit:**	4.975

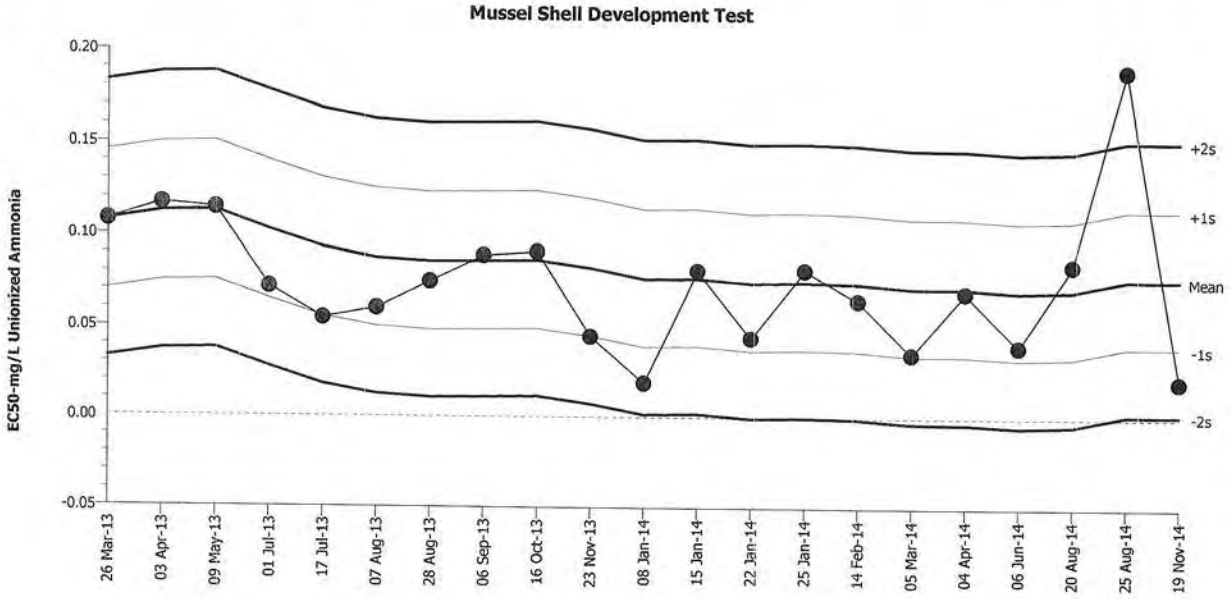
Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2013	Mar	26	18:15	3.62	0.583	0.6017			03-8532-3895	01-1639-1779	NewFields
2		Apr	3	0:00	3.85	0.813	0.839			10-3604-5723	13-5448-8759	NewFields
3		May	9	17:15	2.85	-0.187	-0.193			00-6360-9095	00-7540-8630	NewFields
4		Jul	1	19:00	1.46	-1.577	-1.627	(-)		19-5961-2730	20-9160-8614	NewFields
5			17	17:55	3.05	0.013	0.01342			18-2536-1347	04-3468-0815	NewFields
6		Aug	7	19:00	2.79	-0.247	-0.2549			04-7788-4843	18-8631-2521	NewFields
7			28	16:55	2.39	-0.647	-0.6677			19-6611-9162	06-3129-4473	NewFields
8		Sep	6	18:55	3.68	0.643	0.6636			15-9826-4846	11-1511-0674	NewFields
9		Oct	16	20:15	4.445	1.408	1.453	(+)		06-1596-0976	11-9282-8356	NewFields
10		Nov	23	17:25	3.64	0.603	0.6223			16-7309-8662	17-7125-0481	NewFields
11	2014	Jan	8	18:22	1.48	-1.557	-1.607	(-)		17-8058-8048	14-0659-1138	NewFields
12			15	18:45	2.32	-0.717	-0.7399			13-6807-1804	20-8888-7287	NewFields
13			22	18:47	4.16	1.123	1.159	(+)		13-2808-9359	09-9457-8825	NewFields
14			25	20:20	4.99	1.953	2.015	(+)	(+)	14-2680-8854	19-4144-0794	NewFields
15		Feb	14	15:45	3.5	0.463	0.4778			00-9581-0604	14-2175-7836	NewFields
16		Mar	5	19:35	2.27	-0.767	-0.7915			00-1473-4954	06-9188-5839	NewFields
17		Apr	4	19:30	2.22	-0.817	-0.8431			00-0374-9463	13-5593-8276	NewFields
18		Jun	6	18:15	1.93	-1.107	-1.142	(-)		06-9491-1560	15-1591-7876	ENVIRON
19		Aug	20	18:55	2.62	-0.417	-0.4303			03-3666-4351	02-5771-3266	ENVIRON
20			25	19:45	3.48	0.443	0.4572			18-5120-4553	02-0328-1110	ENVIRON
21		Nov	19	17:40	1.3	-1.737	-1.793	(-)		16-6497-0143	01-0463-0999	ENVIRON

CETIS QC Plot

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:	0.07694	**Count:**	20	**-1s Warning Limit:**	0.03938	**-2s Action Limit:**	0.00182
Sigma:	0.03756	**CV:**	48.80%	**+1s Warning Limit:**	0.1145	**+2s Action Limit:**	0.1521

Quality Control Data

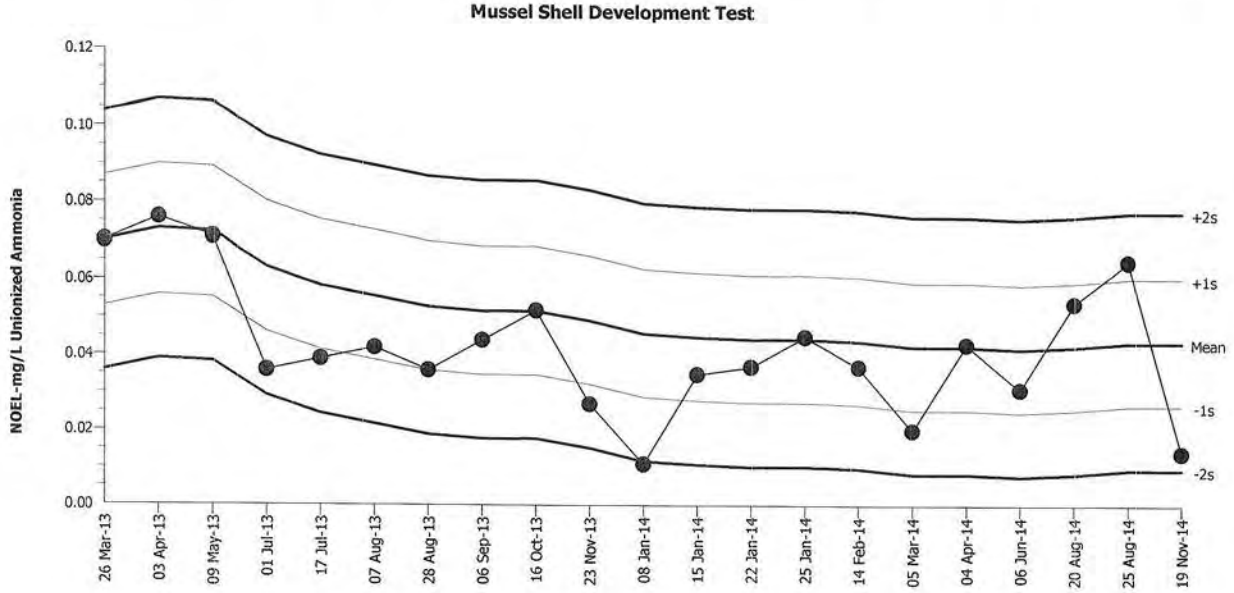
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2013	Mar	26	18:15	0.1079	0.03094	0.8238			10-2444-9875	09-9596-0674	NewFields
2		Apr	3	0:00	0.1168	0.03991	1.062	(+)		20-6076-9735	05-3848-1619	NewFields
3		May	9	17:15	0.1144	0.03746	0.9973			14-3450-0734	06-3515-6667	NewFields
4		Jul	1	19:00	0.07187	-0.00507	-0.1349			10-8846-7294	05-7595-2849	NewFields
5			17	17:55	0.0548	-0.02214	-0.5895			10-3414-5102	08-1738-2772	NewFields
6		Aug	7	19:00	0.06027	-0.01667	-0.4438			10-7217-0339	06-7338-0554	NewFields
7			28	16:55	0.07491	-0.00204	-0.05418			19-6745-0030	16-9398-7287	NewFields
8		Sep	6	18:55	0.08923	0.01229	0.3272			20-4996-9287	13-4360-8251	NewFields
9		Oct	16	20:15	0.0914	0.01446	0.3849			08-6327-9927	19-9515-4386	NewFields
10		Nov	23	17:25	0.04496	-0.03198	-0.8514			13-8738-6674	02-5355-5019	NewFields
11	2014	Jan	8	18:22	0.01919	-0.05775	-1.538	(-)		02-3576-5336	17-1917-6754	NewFields
12			15	18:45	0.0814	0.004458	0.1187			06-9099-5939	00-9901-2590	NewFields
13			22	18:47	0.04434	-0.0326	-0.868			15-7285-0453	02-5494-3481	NewFields
14			25	20:20	0.08179	0.004845	0.129			04-0859-3739	09-7301-2928	NewFields
15		Feb	14	15:45	0.0653	-0.01164	-0.3099			15-0233-5150	16-5673-1462	NewFields
16		Mar	5	19:35	0.03552	-0.04142	-1.103	(-)		02-2074-6026	13-5083-6151	NewFields
17		Apr	4	19:30	0.06967	-0.00727	-0.1935			08-9987-7352	06-2075-5011	NewFields
18		Jun	6	18:15	0.03982	-0.03712	-0.9882			20-1079-3686	12-0135-9289	ENVIRON
19		Aug	20	18:55	0.08475	0.007807	0.2078			14-9751-1227	04-1532-7472	ENVIRON
20			25	19:45	0.1905	0.1136	3.023	(+)	(+)	00-8792-7550	08-9753-5531	ENVIRON
21		Nov	19	17:40	0.0203	-0.05664	-1.508	(-)		06-3984-9090	13-7269-9515	ENVIRON

CETIS QC Plot

Report Date: 29 Dec-14 10:19 (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:	0.04355	**Count:**	20	**-1s Warning Limit:**	0.02655	**-2s Action Limit:**	0.00955
Sigma:	0.017	**CV:**	39.00%	**+1s Warning Limit:**	0.06055	**+2s Action Limit:**	0.07755

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2013	Mar	26	18:15	0.07	0.02645	1.556	(+)		10-2444-9875	00-8976-6127	NewFields
2		Apr	3	0:00	0.076	0.03245	1.909	(+)		20-6076-9735	14-2423-4592	NewFields
3		May	9	17:15	0.071	0.02745	1.615	(+)		14-3450-0734	19-5425-3899	NewFields
4		Jul	1	19:00	0.036	-0.00755	-0.4441			10-8846-7294	11-2659-9719	NewFields
5			17	17:55	0.039	-0.00455	-0.2676			10-3414-5102	05-6701-2859	NewFields
6		Aug	7	19:00	0.042	-0.00155	-0.09118			10-7217-0339	15-9321-6181	NewFields
7			28	16:55	0.036	-0.00755	-0.4441			19-6745-0030	11-4907-1298	NewFields
8		Sep	6	18:55	0.044	0.00045	0.02647			20-4996-9287	08-7464-1360	NewFields
9		Oct	16	20:15	0.052	0.00845	0.4971			08-6327-9927	20-4743-8794	NewFields
10		Nov	23	17:25	0.027	-0.01655	-0.9735			13-8738-6674	05-6624-9800	NewFields
11	2014	Jan	8	18:22	0.011	-0.03255	-1.915	(-)		02-3576-5336	15-3876-8049	NewFields
12			15	18:45	0.035	-0.00855	-0.5029			06-9099-5939	01-3042-8920	NewFields
13			22	18:47	0.037	-0.00655	-0.3853			15-7285-0453	12-0010-0113	NewFields
14			25	20:20	0.045	0.00145	0.08529			04-0859-3739	20-3446-9116	NewFields
15		Feb	14	15:45	0.037	-0.00655	-0.3853			15-0233-5150	19-2470-0896	NewFields
16		Mar	5	19:35	0.02	-0.02355	-1.385	(-)		02-2074-6026	10-8335-1484	NewFields
17		Apr	4	19:30	0.043	-0.00055	-0.03235			08-9987-7352	01-2582-7818	NewFields
18		Jun	6	18:15	0.031	-0.01255	-0.7382			20-1079-3686	02-2339-8824	ENVIRON
19		Aug	20	18:55	0.054	0.01045	0.6147			14-9751-1227	13-4768-2245	ENVIRON
20			25	19:45	0.065	0.02145	1.262	(+)		00-8792-7550	14-4895-9621	ENVIRON
21		Nov	19	17:40	0.014	-0.02955	-1.738	(-)		06-3984-9090	04-2355-4660	ENVIRON

Mussel Shell Development Test **ENVIRON**

Batch ID:	02-7927-0323	**Test Type:**	Development-Survival	**Analyst:**	
Start Date:	19 Nov-14 17:40	**Protocol:**	EPA/600/R-95/136 (1995)	**Diluent:**	Laboratory Seawater
Ending Date:	21 Nov-14 17:00	**Species:**	Mytilus galloprovincialis	**Brine:**	Not Applicable
Duration:	47h	**Source:**	Taylor Shellfish	**Age:**	
Sample ID:	09-2254-4068	**Code:**	36FCE7C4	**Client:**	Internal Lab
Sample Date:	05 May-14	**Material:**	Total Ammonia	**Project:**	Reference Toxicant
Receive Date:	05 May-14	**Source:**	Reference Toxicant		
Sample Age:	198d 18h	**Station:**	p140505.57		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
01-0463-0999	Combined Proportion Norm	1.3	2.63	1.849	10.7%		Dunnett Multiple Comparison Test
12-3890-7500	Proportion Survived	20.1	>20.1	NA	28.3%		Dunnett Multiple Comparison Test

Point Estimate Summary

Analysis ID	Endpoint	Level	mg/L	95% LCL	95% UCL	TU	Method
19-4546-4847	Combined Proportion Norm	EC50	1.863	1.855	1.871		Spearman-Kärber
17-7898-0696	Proportion Survived	EC5	>20.1	N/A	N/A		Linear Interpolation (ICPIN)
		EC10	>20.1	N/A	N/A		
		EC15	>20.1	N/A	N/A		
		EC20	>20.1	N/A	N/A		
		EC25	>20.1	N/A	N/A		
		EC40	>20.1	N/A	N/A		
		EC50	>20.1	N/A	N/A		

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
12-3890-7500	Proportion Survived	Control Resp	0.8511	0.5 - NL	Yes	Passes Acceptability Criteria
17-7898-0696	Proportion Survived	Control Resp	0.8511	0.5 - NL	Yes	Passes Acceptability Criteria
01-0463-0999	Combined Proportion Norm	PMSD	0.107	NL - 0.25	No	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	0.8139	0.6622	0.9655	0.7532	0.8753	0.03524	0.06104	7.5%	0.0%
0.573		3	0.8312	0.6938	0.9685	0.7714	0.8805	0.03192	0.05528	6.65%	-2.13%
1.3		3	0.858	0.7927	0.9233	0.8416	0.8883	0.01517	0.02628	3.06%	-5.43%
2.63		3	0.002597	0	0.00905	0	0.005195	0.0015	0.002597	100.0%	99.68%
5.36		3	0.006061	0	0.01351	0.002597	0.007792	0.001732	0.002999	49.49%	99.26%
11.1		3	0	0	0	0	0	0	0		100.0%
20.1		3	0	0	0	0	0	0	0		100.0%

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	0.8511	0.6865	1	0.7844	0.9169	0.03824	0.06624	7.78%	0.0%
0.573		3	0.8701	0.7047	1	0.8	0.9325	0.03844	0.06658	7.65%	-2.24%
1.3		3	0.9082	0.8504	0.9661	0.8935	0.9351	0.01344	0.02328	2.56%	-6.71%
2.63		3	0.884	0.705	1	0.8234	0.9636	0.04159	0.07204	8.15%	-3.87%
5.36		3	0.9004	0.5724	1	0.7506	1	0.07623	0.132	14.66%	-5.8%
11.1		3	0.8788	0.6475	1	0.7714	0.9377	0.05376	0.09312	10.6%	-3.26%
20.1		3	0.8684	0.6641	1	0.774	0.9247	0.04748	0.08223	9.47%	-2.04%

Mussel Shell Development Test **ENVIRON**

Combined Proportion Normal Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	0.813	0.7532	0.8753
0.573		0.7714	0.8805	0.8416
1.3		0.8416	0.8442	0.8883
2.63		0	0.002597	0.005195
5.36		0.007792	0.002597	0.007792
11.1		0	0	0
20.1		0	0	0

Proportion Survived Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	0.8519	0.7844	0.9169
0.573		0.8	0.9325	0.8779
1.3		0.8961	0.8935	0.9351
2.63		0.8649	0.8234	0.9636
5.36		0.9506	0.7506	1
11.1		0.9273	0.7714	0.9377
20.1		0.9247	0.774	0.9065

Combined Proportion Normal Binomials

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	313/385	290/385	337/385
0.573		297/385	339/385	324/385
1.3		324/385	325/385	342/385
2.63		0/385	1/385	2/385
5.36		3/385	1/385	3/385
11.1		0/385	0/385	0/385
20.1		0/385	0/385	0/385

Proportion Survived Binomials

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	328/385	302/385	353/385
0.573		308/385	359/385	338/385
1.3		345/385	344/385	360/385
2.63		333/385	317/385	371/385
5.36		366/385	289/385	385/385
11.1		357/385	297/385	361/385
20.1		356/385	298/385	349/385

CETIS Test Data Worksheet

Mussel Shell Development Test **ENVIRON**

Start Date: 19 Nov-14 17:40 **Species:** Mytilus galloprovincialis **Sample Code:** 36FCE7C4
End Date: 21 Nov-14 17:00 **Protocol:** EPA/600/R-95/136 (1995) **Sample Source:** Reference Toxicant
Sample Date: 05 May-14 **Material:** Total Ammonia **Sample Station:** p140505.57

C-mg/L	Code	Rep	Pos	Initial Density	Final Density	# Counted	# Normal	Notes
0	D	1	21	385	328	328	313	
0	D	2	18	385	302	302	290	
0	D	3	5	385	353	353	337	
0.573		1	8	385	308	308	297	
0.573		2	9	385	359	359	339	
0.573		3	4	385	338	338	324	
1.3		1	2	385	345	345	324	
1.3		2	12	385	344	344	325	
1.3		3	15	385	360	360	342	
2.63		1	11	385	333	333	0	
2.63		2	14	385	317	317	1	
2.63		3	1	385	371	371	2	
5.36		1	7	385	366	366	3	
5.36		2	10	385	289	289	1	
5.36		3	3	385	404	404	3	
11.1		1	13	385	357	357	0	
11.1		2	20	385	297	297	0	
11.1		3	19	385	361	361	0	
20.1		1	17	385	356	356	0	
20.1		2	16	385	298	298	0	
20.1		3	6	385	349	349	0	

Mussel Shell Development Test **ENVIRON**

Batch ID:	06-7743-6136	**Test Type:**	Development-Survival	**Analyst:**	
Start Date:	19 Nov-14 17:40	**Protocol:**	EPA/600/R-95/136 (1995)	**Diluent:**	Laboratory Seawater
Ending Date:	21 Nov-14 17:00	**Species:**	Mytilus galloprovincialis	**Brine:**	Not Applicable
Duration:	47h	**Source:**	Taylor Shellfish	**Age:**	
Sample ID:	16-4767-5590	**Code:**	623588C6	**Client:**	Internal Lab
Sample Date:	05 May-14	**Material:**	Unionized Ammonia	**Project:**	Reference Toxicant
Receive Date:	05 May-14	**Source:**	Reference Toxicant		
Sample Age:	198d 18h	**Station:**	p140505.57		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
04-2355-4660	Combined Proportion Norm	0.014	0.029	0.02015	10.7%		Dunnett Multiple Comparison Test
06-0313-6726	Proportion Survived	0.222	>0.222	NA	28.3%		Dunnett Multiple Comparison Test

Point Estimate Summary

Analysis ID	Endpoint	Level	mg/L	95% LCL	95% UCL	TU	Method
13-7269-9515	Combined Proportion Norm	EC50	0.0203	0.02021	0.02039		Spearman-Kärber
02-7795-6681	Proportion Survived	EC5	>0.222	N/A	N/A		Linear Interpolation (ICPIN)
		EC10	>0.222	N/A	N/A		
		EC15	>0.222	N/A	N/A		
		EC20	>0.222	N/A	N/A		
		EC25	>0.222	N/A	N/A		
		EC40	>0.222	N/A	N/A		
		EC50	>0.222	N/A	N/A		

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
02-7795-6681	Proportion Survived	Control Resp	0.8511	0.5 - NL	Yes	Passes Acceptability Criteria
06-0313-6726	Proportion Survived	Control Resp	0.8511	0.5 - NL	Yes	Passes Acceptability Criteria
04-2355-4660	Combined Proportion Norm	PMSD	0.107	NL - 0.25	No	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	0.8139	0.6622	0.9655	0.7532	0.8753	0.03524	0.06104	7.5%	0.0%
0.006		3	0.8312	0.6938	0.9685	0.7714	0.8805	0.03192	0.05528	6.65%	-2.13%
0.014		3	0.858	0.7927	0.9233	0.8416	0.8883	0.01517	0.02628	3.06%	-5.43%
0.029		3	0.002597	0	0.00905	0	0.005195	0.0015	0.002597	100.0%	99.68%
0.059		3	0.006061	0	0.01351	0.002597	0.007792	0.001732	0.002999	49.49%	99.26%
0.121		3	0	0	0	0	0	0	0		100.0%
0.222		3	0	0	0	0	0	0	0		100.0%

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	0.8511	0.6865	1	0.7844	0.9169	0.03824	0.06624	7.78%	0.0%
0.006		3	0.8701	0.7047	1	0.8	0.9325	0.03844	0.06658	7.65%	-2.24%
0.014		3	0.9082	0.8504	0.9661	0.8935	0.9351	0.01344	0.02328	2.56%	-6.71%
0.029		3	0.884	0.705	1	0.8234	0.9636	0.04159	0.07204	8.15%	-3.87%
0.059		3	0.9004	0.5724	1	0.7506	1	0.07623	0.132	14.66%	-5.8%
0.121		3	0.8788	0.6475	1	0.7714	0.9377	0.05376	0.09312	10.6%	-3.26%
0.222		3	0.8684	0.6641	1	0.774	0.9247	0.04748	0.08223	9.47%	-2.04%

Mussel Shell Development Test **ENVIRON**

Combined Proportion Normal Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	0.813	0.7532	0.8753
0.006		0.7714	0.8805	0.8416
0.014		0.8416	0.8442	0.8883
0.029		0	0.002597	0.005195
0.059		0.007792	0.002597	0.007792
0.121		0	0	0
0.222		0	0	0

Proportion Survived Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	0.8519	0.7844	0.9169
0.006		0.8	0.9325	0.8779
0.014		0.8961	0.8935	0.9351
0.029		0.8649	0.8234	0.9636
0.059		0.9506	0.7506	1
0.121		0.9273	0.7714	0.9377
0.222		0.9247	0.774	0.9065

Combined Proportion Normal Binomials

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	313/385	290/385	337/385
0.006		297/385	339/385	324/385
0.014		324/385	325/385	342/385
0.029		0/385	1/385	2/385
0.059		3/385	1/385	3/385
0.121		0/385	0/385	0/385
0.222		0/385	0/385	0/385

Proportion Survived Binomials

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	328/385	302/385	353/385
0.006		308/385	359/385	338/385
0.014		345/385	344/385	360/385
0.029		333/385	317/385	371/385
0.059		366/385	289/385	385/385
0.121		357/385	297/385	361/385
0.222		356/385	298/385	349/385

CETIS Test Data Worksheet

Mussel Shell Development Test **ENVIRON**

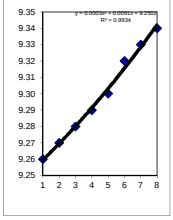
Start Date: 19 Nov-14 17:40 **Species:** Mytilus galloprovincialis **Sample Code:** 623588C6
End Date: 21 Nov-14 17:00 **Protocol:** EPA/600/R-95/136 (1995) **Sample Source:** Reference Toxicant
Sample Date: 05 May-14 **Material:** Unionized Ammonia **Sample Station:** p140505.57

C-mg/L	Code	Rep	Pos	Initial Density	Final Density	# Counted	# Normal	Notes
0	D	1	13	385	328	328	313	
0	D	2	18	385	302	302	290	
0	D	3	20	385	353	353	337	
0.006		1	6	385	308	308	297	
0.006		2	8	385	359	359	339	
0.006		3	2	385	338	338	324	
0.014		1	17	385	345	345	324	
0.014		2	3	385	344	344	325	
0.014		3	14	385	360	360	342	
0.029		1	12	385	333	333	0	
0.029		2	10	385	317	317	1	
0.029		3	9	385	371	371	2	
0.059		1	7	385	366	366	3	
0.059		2	4	385	289	289	1	
0.059		3	21	385	404	404	3	
0.121		1	5	385	357	357	0	
0.121		2	16	385	297	297	0	
0.121		3	1	385	361	361	0	
0.222		1	19	385	356	356	0	
0.222		2	15	385	298	298	0	
0.222		3	11	385	349	349	0	

CLIENT:	Pioneer Tech.	Date of Test:	19-Nov-14
PROJECT:	West Bay	Test Type:	Mytilus 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		0.573	30	7.7	14.5	287.66	9.3242		0.006
4	1.5		1.3	30	7.7	14.5	287.66	9.3242		0.014
5	3		2.63	30	7.7	14.6	287.76	9.3242		0.029
6	6		5.36	30	7.7	14.6	287.76	9.3242		0.059
7	12		11.1	30	7.7	14.5	287.66	9.3242		0.121
8	18		20	30	7.7	14.7	287.86	9.3242		0.222
9										
10										
11										
12										
13										
14										
15										
16										
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ENVIRON

LARVAL DEVELOPMENT TEST
AMMONIA REF TOX WQ

CLIENT	PROJECT	SPECIES	LAB / LOCATION		PROTOCOL
Pioneer Technologies	West Bay	*Mytilus galloprovincialis*	Port Gamble / Incubator		PSEP (1995)
JOB NUMBER	PROJECT MANAGER	TEST START DATE:	TIME	TEST END DATE	TIME
—	Bill Gardiner	19Nov14	1740	21 NOV 14	1700
TEST ID	LOT #:				
P1405.05.57	3244C535				

WATER QUALITY DATA

DILTIN.WAT.BATCH	ORGANISM BATCH	REFERENCE TOX. MATERIAL	REFERENCE TOXICANT
FSW111914.01		Ammonium chloride	Ammonia - TAN

					DO (mg/L)		TEMP(C)		SAL (ppt)		pH		TECH.	DATE
					>5.0		16 ± 1		28 ± 1		7 - 9			
CLIENT/ ID	CONCENTRATION value	CONCENTRATION units	DAY	REP	D.O.		TEMP.		SALINITY		pH			
					meter	mg/L	meter	°C	meter	ppt	meter	unit		
Ref.Tox.-Ammonia - TAN	Target:		0	Stock	8	7.8	8	14.9	8	29	8	7.7	CR	11/19
	0	mg/L	1	Stock	8	8.3	8	16.3	8	30	8	8.0	JL	11/20
	Actual:		2	Stock	8	7.8	8	16.3	8	29	8	7.9	KB	11/21
			3	Stock										
			4	Stock										
Ref.Tox.-Ammonia - TAN	Target:		0	Stock	8	8.0	8	14.5	8	30	8	7.7	CR	11/19
	0.75	mg/L	1	Stock	8	8.2	8	16.3	8	30	8	7.9	JL	11/20
	Actual:		2	Stock	8	8.1	8	16.1	8	30	8	7.9	KB	11/21
			3	Stock										
			4	Stock										
Ref.Tox.-Ammonia - TAN	Target:		0	Stock	8	8.0	8	14.5	8	30	8	7.7	CR	11/19
	1.5	mg/L	1	Stock	8	8.2	8	16.3	8	30	8	7.9	JL	11/20
	Actual:		2	Stock	8	8.1	8	16.1	8	30	8	7.9	KB	11/21
			3	Stock										
			4	Stock										
Ref.Tox.-Ammonia - TAN	Target:		0	Stock	8	8.1	8	14.6	8	30	8	7.7	CR	11/19
	3	mg/L	1	Stock	8	8.2	8	16.3	8	30	8	7.9	JL	11/20
	Actual:		2	Stock	8	8.1	8	16.2	8	30	8	7.9	KB	11/21
			3	Stock										
			4	Stock										
Ref.Tox.-Ammonia - TAN	Target:		0	Stock	8	8.2	8	14.6	8	30	8	7.7	CR	11/19
	6	mg/L	1	Stock	8	8.2	8	16.3	8	30	8	7.9	JL	11/20
	Actual:		2	Stock	8	8.1	8	16.2	8	30	8	7.9	KB	11/21
			3	Stock										
			4	Stock										
Ref.Tox.-Ammonia - TAN	Target:		0	Stock	8	8.2	8	14.5	8	30	8	7.7	CR	11/19
	12	mg/L	1	Stock	8	8.2	8	16.3	8	30	8	7.9	JL	11/20
	Actual:		2	Stock	8	8.1	8	16.2	8	30	8	7.9	KB	11/21
			3	Stock										
			4	Stock										
Ref.Tox.-Ammonia - TAN	Target:		0	Stock	8	8.2	8	14.7	8	30	8	7.7	CR	11/19
	18	mg/L	1	Stock	8	8.2	8	16.3	8	30	8	7.9	JL	11/20
	Actual:		2	Stock	8	8.1	8	16.3	8	30	8	7.9	KB	11/21
			3	Stock										
			4	Stock										

ENVIRON

LARVAL DEVELOPMENT TEST
AMMONIA REF TOX OBSERVATION SHEET

SPECIES					
Mytilus galloprovincialis					
CLIENT	**PROJECT**	**JOB NUMBER**	**PROJECT MANAGER**	**LAB / LOCATION**	**PROTOCOL**
Pioneer Technologies	West Bay		Bill Gardiner	Port Gamble / Incubator	PSEP (1995)
TEST ID	**ORGANISM BATCH**	**TEST START DATE:**	**TIME**	**TEST END DATE:**	**TIME**
P140505.57	TS4821	19 NOV 14	1740	21 NOV 14	1700

LARVAL OBSERVATION DATA

CLIENT/ ID	CONC. value	CONC. units	VIAL NUMBER	REP	NUMBER NORMAL	NUMBER ABNORMAL	DATE	TECHNICIAN	COMMENTS
Ref.Tox. - Ammonia - TAN	0	mg/L		1	313	15	11/25/14	JW	
				2	290	12			
				3	337	16			
Ref.Tox. - Ammonia - TAN	0.75	mg/L		1	297	11			
				2	339	20			
				3	324	14			
Ref.Tox. - Ammonia - TAN	1.5	mg/L		1	324	21			
				2	325	19			
				3	342	18			
Ref.Tox. - Ammonia - TAN	3	mg/L		1	6	333			
				2	1	316			
				3	2	369			
Ref.Tox. - Ammonia - TAN	6	mg/L		1	3	363			
				2	1	288			
				3	3	401			
Ref.Tox. - Ammonia - TAN	12	mg/L		1	0	357			
				2	0	297			
				3	0	361			
Ref.Tox. - Ammonia - TAN	18	mg/L		1	0	356			
				2	0	298			
				3	0	349	↓	↓	
STOCKING DENSITY				1		379	—	4	402
				2		354	—	5	381
				3		410	—	—	—

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
9327

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
0.573	**0.75**	250		**0.030**
1.3	**1.5**	250		**0.060**
2.63	**3**	250		**0.121**
5.36	**6**	250		**0.241**
11.1 ~~12.7~~ ①	**12**	250		**0.482**
20.1	**18**	250		**0.724**

① MR ~~BE~~ 11/19

APPENDIX B

STATISTICAL COMPARISONS

Project Name: West Bay Eohs

Sample:	x1	Ref Samp:	x2
Samp ID:	SD-WB-56	Ref ID:	Ref Carr
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	95	Mean:	95
SD:	3.536	SD:	8.66
Tr Mean:	83.479	Tr Mean:	96.858
Trans SD:	17.556	Trans SD:	24.758

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	13.926
SS:	3684.557
K:	5
b:	58.684
Alpha Level:	0.05
Calculated Value:	0.9347
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	12.445
Test Residual SD:	10.705
Ref. Residual Mean:	21.281
Ref. Residual SD:	6.845
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.5548
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:	0.05
Calculated Value:	0.9857
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	90	71.565	80	63.435	11.914	33.423			-33.423
2	95	77.079	100	114.592	6.4	17.734			-19.779
3	95	77.079	95	77.079	6.4	19.779			-11.914
4	100	114.592	100	114.592	31.113	17.734			-6.4
5	95	77.079	100	114.592	6.4	17.734			-6.4
6									-6.4
7									17.734
8									17.734
9									17.734
10									31.113

Project Name: West Bay Eohs

Sample:	x1	Ref Samp:	x2
Samp ID:	SD-WB-57	Ref ID:	Ref Carr
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	95	Mean:	95
SD:	3.536	SD:	8.66
Tr Mean:	83.479	Tr Mean:	96.858
Trans SD:	17.556	Trans SD:	24.758

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	13.926
SS:	3684.557
K:	5
b:	58.684
Alpha Level:	0.05
Calculated Value:	0.9347
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	12.445
Test Residual SD:	10.705
Ref. Residual Mean:	21.281
Ref. Residual SD:	6.845
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.5548
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:	0.05
Calculated Value:	0.9857
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	90	71.565	80	63.435	11.914	33.423			-33.423
2	95	77.079	100	114.592	6.4	17.734			-19.779
3	95	77.079	95	77.079	6.4	19.779			-11.914
4	100	114.592	100	114.592	31.113	17.734			-6.4
5	95	77.079	100	114.592	6.4	17.734			-6.4
6									-6.4
7									17.734
8									17.734
9									17.734
10									31.113

Project Name: West Bay Eohs

Sample:	x1	Ref Samp:	x2
Samp ID:	SD-WB-58	Ref ID:	Ref Carr
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	91	Mean:	95
SD:	7.416	SD:	8.66
Tr Mean:	79.647	Tr Mean:	96.858
Trans SD:	20.132	Trans SD:	24.758

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	14.641
SS:	4072.928
K:	5
b:	62.229
Alpha Level:	0.05
Calculated Value:	0.9508
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	13.978
Test Residual SD:	12.691
Ref. Residual Mean:	21.281
Ref. Residual SD:	6.845
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.1324
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:	0.05
Calculated Value:	1.206
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	80	63.435	80	63.435	16.212	33.423			-33.423
2	100	114.592	100	114.592	34.944	17.734			-19.779
3	90	71.565	95	77.079	8.082	19.779			-16.212
4	90	71.565	100	114.592	8.082	17.734			-8.082
5	95	77.079	100	114.592	2.568	17.734			-8.082
6									-2.568
7									17.734
8									17.734
9									17.734
10									34.944

Project Name: West Bay Eohs

Sample:	x1	Ref Samp:	x2
Samp ID:	SD-WB-59	Ref ID:	Carr 20
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	92	Mean:	96
SD:	6.708	SD:	4.183
Tr Mean:	N/A	Tr Mean:	N/A
Trans SD:	N/A	Trans SD:	N/A

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	13.411
SS:	3417.036
K:	5
b:	52.608
Alpha Level:	0.05
Calculated Value:	0.81
Critical Value:	<= 0.842
Normally Distributed:	No
Override Option:	Not Invoked

Levene's Results:

Test Residual Mean:	13.582
Test Residual SD:	12.412
Ref. Residual Mean:	18.888
Ref. Residual SD:	4.863
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.89
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:	17
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	5.5	95	5.5	3.556	13.902	1.5		-19.416
2	85	1.5	100	9	13.422	23.61	1.5		-13.902
3	95	5.5	95	5.5	3.556	13.902	3		-13.902
4	85	1.5	90	3	13.422	19.416	5.5		-13.422
5	100	9	100	9	33.956	23.61	5.5		-13.422
6							5.5		-3.556
7							5.5		-3.556
8							9		23.61
9							9		23.61
10							9		33.956

Project Name: West Bay Neanthes

Sample:	x1	Ref Samp:	x2
Samp ID:	SD-WB-56	Ref ID:	Ref Carr
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	0.493	Mean:	0.503
SD:	0.049	SD:	0.075
Tr Mean:	0.493	Tr Mean:	0.503
Trans SD:	0.049	Trans SD:	0.075

Shapiro-Wilk Results:

Residual Mean:	0	Alpha Level:	0.05
Residual SD:	0.041	Calculated Value:	0.977
SS:	0.032	Critical Value:	<= 0.842
K:	5		
b:	0.177		

Normally Distributed: Yes

Override Option: N/A

Levene's Results:

Test Residual Mean:	0.038	Alpha Level:	0.1
Test Residual SD:	0.024	Calculated Value:	0.8245
Ref. Residual Mean:	0.056	Critical Value:	>= 1.860
Ref. Residual SD:	0.042		
Deg. of Freedom:	8		

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:	0.2498
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	0.534	0.534	0.035	0.031			-0.087
2	0.427	0.427	0.5	0.5	0.066	0.003			-0.066
3	0.479	0.479	0.454	0.454	0.014	0.049			-0.049
4	0.552	0.552	0.416	0.416	0.059	0.087			-0.014
5	0.479	0.479	0.611	0.611	0.014	0.108			-0.014
6									-0.003
7									0.031
8									0.035
9									0.059
10									0.108

Project Name: West Bay Neanthes

Sample:	x1	Ref Samp:	x2
Samp ID:	SD-WB-57	Ref ID:	Ref Carr
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	0.537	Mean:	0.503
SD:	0.04	SD:	0.075
Tr Mean:	0.537	Tr Mean:	0.503
Trans SD:	0.04	Trans SD:	0.075

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.039
SS:	0.029
K:	5
b:	0.168
Alpha Level:	0.05
Calculated Value:	0.9732
Critical Value:	<= 0.842

Normally Distributed: Yes

Override Option: N/A

Levene's Results:

Test Residual Mean:	0.026
Test Residual SD:	0.027
Ref. Residual Mean:	0.056
Ref. Residual SD:	0.042
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.3168
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:	-0.9001
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	0.519	0.519	0.534	0.534	0.018	0.031			-0.087
2	0.49	0.49	0.5	0.5	0.047	0.003			-0.049
3	0.541	0.541	0.454	0.454	0.004	0.049			-0.047
4	0.598	0.598	0.416	0.416	0.061	0.087			-0.018
5	0.538	0.538	0.611	0.611	0.001	0.108			-0.003
6									0.001
7									0.004
8									0.031
9									0.061
10									0.108

Project Name: West Bay Neanthes

Sample:	x1	Ref Samp:	x2
Samp ID:	SD-WB-58	Ref ID:	Ref Carr
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	0.507	Mean:	0.503
SD:	0.039	SD:	0.075
Tr Mean:	0.507	Tr Mean:	0.503
Trans SD:	0.039	Trans SD:	0.075

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.039
SS:	0.029
K:	5
b:	0.167
Alpha Level:	0.05
Calculated Value:	0.9726
Critical Value:	<= 0.842
Normally Distributed:	Yes

Levene's Results:

Test Residual Mean:	0.026
Test Residual SD:	0.026
Ref. Residual Mean:	0.056
Ref. Residual SD:	0.042
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.3335
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:	-0.1004
Critical Value:	>= 1.860
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Override Option: N/A

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	0.562	0.562	0.534	0.534	0.055	0.031			-0.087
2	0.499	0.499	0.5	0.5	0.008	0.003			-0.053
3	0.517	0.517	0.454	0.454	0.01	0.049			-0.049
4	0.454	0.454	0.416	0.416	0.053	0.087			-0.008
5	0.502	0.502	0.611	0.611	0.005	0.108			-0.005
6									-0.003
7									0.01
8									0.031
9									0.055
10									0.108

Project Name: West Bay Neanthes

Sample:	x1	Ref Samp:	x2
Samp ID:	SD-WB-59	Ref ID:	Carr 20
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	0.47	Mean:	0.5
SD:	0.031	SD:	0.072
Tr Mean:	0.47	Tr Mean:	0.5
Trans SD:	0.031	Trans SD:	0.072

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.036
SS:	0.025
K:	5
b:	0.154
Alpha Level:	0.05
Calculated Value:	0.9595
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.023
Test Residual SD:	0.017
Ref. Residual Mean:	0.054
Ref. Residual SD:	0.039
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.6121
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:	0.867
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	0.462	0.462	0.447	0.447	0.008	0.053			-0.076
2	0.463	0.463	0.529	0.529	0.007	0.029			-0.053
3	0.488	0.488	0.424	0.424	0.018	0.076			-0.044
4	0.426	0.426	0.494	0.494	0.044	0.006			-0.008
5	0.509	0.509	0.606	0.606	0.039	0.106			-0.007
6									-0.006
7									0.018
8									0.029
9									0.039
10									0.106

Project Name: West Bay Mytilus

Sample:	x1	Ref Samp:	x2
Samp ID:	SD-WB-56	Ref ID:	Ref Carr
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	84	Mean:	95.94
SD:	8.124	SD:	6.646
Tr Mean:	67.036	Tr Mean:	97.566
Trans SD:	6.731	Trans SD:	23.586

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	11.254
SS:	2406.429
K:	5
b:	46.835
Alpha Level:	0.05
Calculated Value:	0.9115
Critical Value:	<= 0.842
Normally Distributed:	Yes

Levene's Results:

Test Residual Mean:	5.295
Test Residual SD:	3.202
Ref. Residual Mean:	20.431
Ref. Residual SD:	5.874
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	5.0588
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:	5
Experimental Alpha Level:	0.1
Calculated Value:	2.7832
Critical Value:	>= 1.476
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Override Option: N/A

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	94.4	76.311	100	114.592	9.275	17.026			-30.592
2	73.7	59.147	84.7	66.974	7.889	30.592			-20.486
3	79.6	63.15	100	114.592	3.887	17.026			-7.889
4	89.4	70.999	100	114.592	3.963	17.026			-3.887
5	82.9	65.574	95	77.079	1.463	20.486			-1.463
6									3.963
7									9.275
8									17.026
9									17.026
10									17.026

Project Name:	West Bay Mytilus				
Sample:	x1		Ref Samp:	x2	
Samp ID:	SD-WB-57		Ref ID:	Ref Carr	
Alias:			Alias:		
Replicates:		5	Replicates:		5
Mean:		96.34	Mean:		95.94
SD:		5.271	SD:		6.646
Tr Mean:	N/A		Tr Mean:	N/A	
Trans SD:	N/A		Trans SD:	N/A	

Shapiro-Wilk Results:

Residual Mean:	0	Alpha Level:	0.05
Residual SD:	14.57	Calculated Value:	0.8407
SS:	4033.29	Critical Value:	<= 0.842
K:	5		
b:	58.229		
Normally Distributed:	No		
Override Option:	Not Invoked		

Levene's Results:

Test Residual Mean:	17.962	Alpha Level:	0.1
Test Residual SD:	6.981	Calculated Value:	0.6052
Ref. Residual Mean:	20.431	Critical Value:	>= 1.860
Ref. Residual SD:	5.874		
Deg. of Freedom:	8		
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:	0.1
Calculated Value:	14
Critical Value:	>= 20.000
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	100	8	100	8	22.452	17.026	1		-30.592
2	87.9	2	84.7	1	22.495	30.592	2		-22.495
3	100	8	100	8	22.452	17.026	3		-20.486
4	99.4	5	100	8	6.582	17.026	4		-15.828
5	94.4	3	95	4	15.828	20.486	5		-6.582
6							8		17.026
7							8		17.026
8							8		17.026
9							8		22.452
10							8		22.452

Project Name: West Bay Mytilus

Sample:	x1	Ref Samp:	x2
Samp ID:	SD-WB-58	Ref ID:	Ref Carr
Alias:		Alias:	
Replicates:	5	Replicates:	5
Mean:	97.76	Mean:	95.94
SD:	1.784	SD:	6.646
Tr Mean:	87.462	Tr Mean:	97.566
Trans SD:	15.366	Trans SD:	23.586

Shapiro-Wilk Results:

Residual Mean:	0	Alpha Level:	0.05
Residual SD:	12.916	Calculated Value:	0.9324
SS:	3169.653	Critical Value:	<= 0.842
K:	5		
b:	54.362		

Normally Distributed: Yes

Override Option: N/A

Levene's Results:

Test Residual Mean:	10.852	Alpha Level:	0.1
Test Residual SD:	9.429	Calculated Value:	1.9282
Ref. Residual Mean:	20.431	Critical Value:	>= 1.860
Ref. Residual SD:	5.874		
Deg. of Freedom:	8		

Variances Homogeneous: No

Test Results:

Statistic:	Approximate t
Balanced Design:	Yes
Transformation:	ArcSin
	Experimental Hypothesis
Null:	x1 >= x2
Alternate:	x1 < x2

Degrees of Freedom:	7
Experimental Alpha Level:	0.1
Calculated Value:	0.8025
Critical Value:	>= 1.415
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	95.9	78.318	100	114.592	9.145	17.026			-30.592
2	97.6	81.088	84.7	66.974	6.375	30.592			-20.486
3	100	114.592	100	114.592	27.129	17.026			-9.145
4	99.1	84.556	100	114.592	2.906	17.026			-8.703
5	96.2	78.759	95	77.079	8.703	20.486			-6.375
6									-2.906
7									17.026
8									17.026
9									17.026
10									27.129

Project Name:	West Bay Mytilus				
Sample:	x1		Ref Samp:	x2	
Samp ID:	SD-WB-59		Ref ID:	Carr 20	
Alias:			Alias:		
Replicates:		5	Replicates:		5
Mean:		94.86	Mean:		96.52
SD:		4.551	SD:		3.528
Tr Mean:	N/A		Tr Mean:	N/A	
Trans SD:	N/A		Trans SD:	N/A	

Shapiro-Wilk Results:

Residual Mean:		0
Residual SD:		12.685
SS:		3057.209
K:		5
b:		49.944
Alpha Level:		0.05
Calculated Value:		0.8159
Critical Value:	<= 0.842	
Normally Distributed:	No	

Levene's Results:

Test Residual Mean:		12.348
Test Residual SD:		11.334
Ref. Residual Mean:		18.424
Ref. Residual SD:		4.579
Deg. of Freedom:		8
Alpha Level:		0.1
Calculated Value:		1.1114
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:	0.1
Calculated Value:	16.5
Critical Value:	>= 20.000
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Override Option: Not Invoked

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	100	9	95.6	6	30.869	13.67	1		-18.306
2	98.5	7	95.3	5	0.758	14.083	2.5		-14.083
3	89.1	1	100	9	13.001	23.03	2.5		-13.67
4	95	4	100	9	6.644	23.03	4		-13.001
5	91.7	2.5	91.7	2.5	10.467	18.306	5		-10.467
6							6		-6.644
7							7		-0.758
8							9		23.03
9							9		23.03
10							9		30.869

APPENDIX C

CHAIN-OF-CUSTODY FORMS

CHAIN OF CUSTODY

ENVIRON

1029

Shipping: 4770 NE View Dr. Mail: P.O. Box 216
Port Gamble, WA. 98364
Tel: (360) 297-6045, Fax: (360)297-6901

Destination: ENVIRON	Sample Originator (Organization): PIONEER TECHNOLOGIES	Report Results To: SHELLA SWAIN	Phone: 360-570-1700
Destination Contact: BRIAN HESTER	PERSON WHO COLLECTED SAMPLE: SHELLA SWAIN	Contact Name: SHELLA SWAIN	Fax: 360-570-1777
Date: 11/1/2014	Address: 5205 CORPORATE CENTER CRT SE OLYMPIA, WA 98503	Address:	Email: swains@uspioneer.com
Turn-Around-Time:			
Project Name: WEST BAY	Phone: 360-570-1700	Analyses:	Invoicing To:
Contract/PO:	Fax: 360-5700-1777		Comments or Special Instructions: Please wait for sulfide & ammonia test. 1-DAY TAT from analytical lab.
	E-mail: swains@uspioneer.com		

No.	Sample ID	Matrix	Volume & Type of Container	Date & Time	10-day amphipod	20-day Juv. Polychaete	Larval development bioassay				Preservation	Sample Temp Upon Receipt	LAB ID
1	SD-WB-56-110114-0-0.5	SED	~2ga/bags	11/1/14; 8:50	X	X	X						P141104.01
2	SD-WB-57-110114-0-0.5	SED	~2ga/bags	11/1/14; 8:00	X	X	X						P141104.02
3	SD-WB-58-110114-0-0.5	SED	~2ga/bags	11/1/14; 8:30	X	X	X						P141104.03
4	SD-WB-59-110114-0-0.5	SED	~2ga/bags	11/1/14; 7:30	X	X	X						P141104.04
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													

Relinquished by:	Recieved by:	Relinquished by:	Recieved by:	Matrix Codes
Print Name: SHELLA SWAIN	Print Name: Jay Word	Print Name:	Print Name:	
Signature:	Signature:	Signature:	Signature:	FW = Fresh Water
Affiliation: PIONEER	Affiliation: ENVIRON	Affiliation:	Affiliation:	SB = Salt & Brackish Water
Date/Time: 11/3/14; 11:00	Date/Time: 11/4/14 1300	Date/Time:	Date/Time:	SS = Soil & Sediment

ENVIRON

Ammonia and Sulfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
Westbay	NA	NA

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

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:	Temperature:	
11/7/14	20.1	

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
SD-WB-56	/	11/7/14 MK/HK	1.23	19.9	11/7/14 MK	N	7.9	10	/
SD-WB-57	/	↓	9.65	19.8	↓	↓	7.9	22	/
SD-WB-58	/	↓	11.6	19.8	↓	↓	7.5	25	/
SD-WB-59	/	↓	1.50	19.9	↓	↓	7.3	24	/

ENVIRON

Ammonia and ulfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
Pioneer Technologies	Neanthes	20 Days

~~PRETEST~~ / INITIAL / FINAL / OTHER (circle one) DAY of TEST: pre-test

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: NA	Temperature: NA	

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)
SD-WB-56	Bulk Sed.	11/13/14 KMB	NA	19.0	11/13/14 KMB	N	8.0	10	1 mL	0.060 mg/L	10	0.60 mg/L
SD-WB-57	↓	↓	↓	↓	↓	↓	7.6	24	1 mL	0.078 mg/L	10	0.78 mg/L
SD-WB-58							7.5	26	10 mL	0.051 mg/L	1	0.051 mg/L
SD-WB-59							7.2	25	10mL	0.038 mg/L	1	0.038 mg/L

ENVIRON

Ammonia and ılfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
Pioneer Technologies	Eoh	10 Days

~~PRETEST~~ / INITIAL / FINAL / OTHER (circle one) DAY of TEST: pre-test

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: NA	Temperature: NA	

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)
SD-WB-56	Bulk sed.	11/13/14 KLB	NA	19.0	11/13/14 KLB	N	8.0	10	1mL	0.060 mg/L	10	0.60 mg/L
SD-WB-57	↓	↓	↓	↓	↓	↓	7.6	24	1mL	0.078 mg/L	10	0.78 mg/L
SD-WB-58							7.5	26	10mL	0.051 mg/L	1	0.051 mg/L
SD-WB-59	↓	↓	↓	↓	↓	↓	7.2	25	10mL	0.038 mg/L	1	0.038 mg/L