Wyckoff Groundwater Treatment Plant: Third Quarter 2023 Bioassay Monitoring

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1. Introduction

This technical memorandum summarizes information obtained from the second quarter 2023 sampling event performed at the U.S. Environmental Protection Agency (EPA) Wyckoff/Eagle Harbor Superfund Site (the Site) groundwater treatment plant (GWTP) located at 5350 Creosote Place NE, Bainbridge Island, Washington. CH2M HILL Engineers, Inc. (CH2M)[1] conducted this sampling event to support the current biomonitoring requirements of the Site's National Pollutant Discharge Elimination System (NPDES).

Sampling was generally conducted in accordance with the final *Quality Assurance Project Plan, Groundwater Treatment Plant Operations and Maintenance* (QAPP; CH2M, 2022). While there were deviations from the QAPP as noted in the Laboratory Quality Data Review section, the data is deemed usable, and the sampling is considered to have met the monitoring requirements of the NPDES permit.

The current NPDES permit does not include effluent limits for chronic toxicity. Chronic toxicity testing was conducted on the effluent samples per the requirements outlined in the NPDES permit. The current NPDES permit does not include specific dilution series for chronic toxicity tests. For the mussel larvae chronic toxicity testing conducted during the third quarter 2023 sampling event, 65 percent effluent is the highest concentration tested due to the addition of hypersaline brine to achieve a salinity of 30 parts per trillion (ppt) per the *Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to West Coast Marine and Estuarine Organisms* (EPA/600/R-95/136, 1995).

No statistically significant effects on the survival or development endpoints were observed for all test concentrations, indicating no evidence of the presence of chronic toxicity.

As stated above, the current NPDES permit does not include effluent limit for chronic toxicity. The chronic toxicity test requirement section of the permit (Section II.8) specifies the following:

"*EPA and Ecology will evaluate the results to determine whether they indicate the occurrence of chronic toxicity outside the mixing zone. If it appears that this may be occurring, a toxicity evaluation and reduction plan will be prepared within 90 days. The evaluation portion of the plan may include additional toxicity testing if needed to follow up on initial results or gather information for a possible toxicity limit in the future.*"

The observed results for the chronic developmental endpoint would not trigger this requirement.

[1] CH2M HILL Engineers, Inc. is now a wholly owned subsidiary of Jacobs Engineering Group Inc.

2. Sampling and Analysis Results

Biomonitoring samples were collected per the monitoring frequency included in the NPDES permit. Samples were collected from a 24-hr. autosampler collection point at the effluent tank of the treatment system. Water samples were collected on July 11, 2023. Chemical testing was conducted on a split of each sample collected for bioassay testing per the NPDES permit requirement. The bioassays were performed by EcoAnalysts, Inc. (EcoAnalysts), Port Gamble, Washington, a Washington State Department of Ecology accredited lab. Table 1 lists the sample Laboratory ID and sampling analysis methods. EcoAnalysts sampling analysis report for chronic toxicity testing is provided in Attachment 1.

Table 1. Biological Testing Summary

Laboratory	Laboratory ID	Method	Test Type/Descriptor/Species
EcoAnalysts	P230711.01	EPA/600/R-95-136 Method 1005.0; ASTM E724-89 TOX042.12	Chronic/48-hr Survival and Development/*Mytilus galloprovincialis* (Mussel)

No statistically significant effects were detected in any effluent concentration tested for the survival or development endpoint of the bivalve test. This result indicates a No Observed Effect Concentration of 65 percent (the highest concentration tested) of the effluent concentration and a chronic toxic unit of 1.5 for both endpoints. The Effect Concentration 50 is expected to affect 50 percent of the organisms and determined to be greater than 65 percent of the effluent concentration.

3. Laboratory Quality Data Review

A CH2M chemist validated the bioassay results Stage 2A in accordance with the QAPP. The QAPP (CH2M 2022) was cited by EcoAnalysts and the appropriate species of mussel specified in the QAPP was used for the analytical testing.

The data were 100 percent complete, and method and QAPP quality control requirements were met, with the following exceptions noted:

> The QAPP reference toxicant copper sulfate was not used. The reference toxicant utilized was ammonia. A review of the total and unionized ammonia quality control data indicates the ammonia reference toxicant test results were within two standard deviations of the laboratory mean at the time of testing. There is no impact to the data and an addendum to the QAPP to utilize ammonia as reference toxicant has been requested in May 2023 after these samples were collected and analyzed.

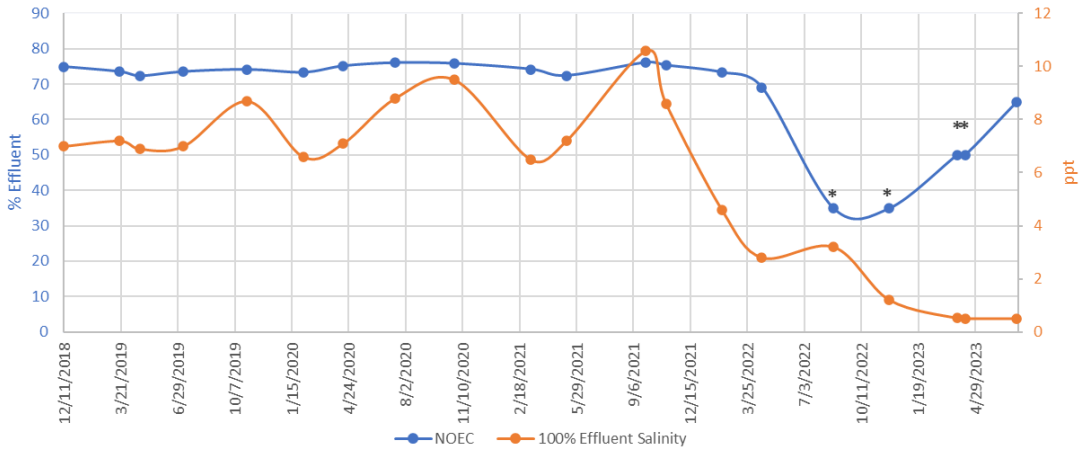
4. Trends

A review of bioassay data collected from 2007 through the third quarter of 2023 indicated there were no statistically significant effect detected for the survival endpoint for any test concentrations and species. No statistically significant effect was detected for the sublethal endpoints with the exception for the sampling events from the third quarter of 2022 through second quarter of 2023. For these four sampling events, statistically significant effects were detected in the maximum test concentrations for the developmental endpoint of the chronic bioassay test.

Figure 1 shows the bivalve chronic bioassay NOEC and salinity for the 100 percent effluent samples from December 2018 through July 2023. NOEC for bivalve chronic bioassay tests conducted prior to December 2018 were 70 percent. Hypersaline brine (HSB) with a fixed concentration was used for the salinity adjustment for chronic toxicity testing conducted prior to December 2018, therefore the maximum test concentrations remained the same for that test period. The laboratories that conducted

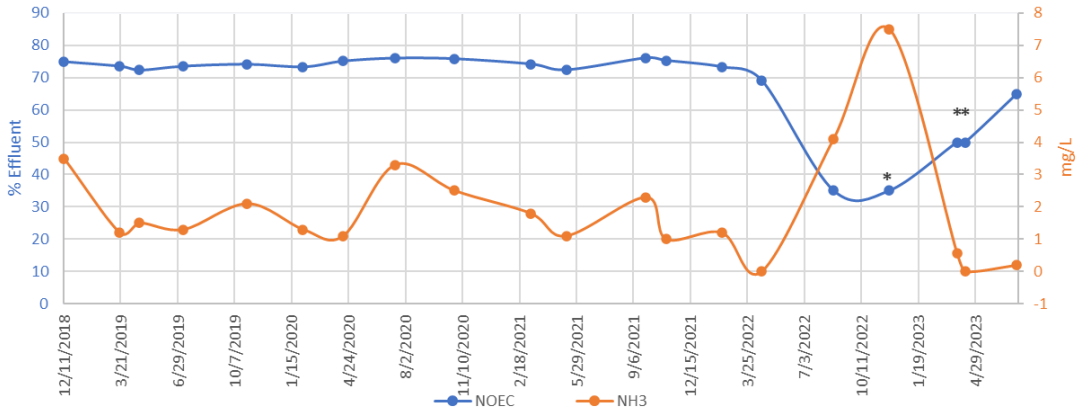
the testing from December 2018 to November 2022 used HSB created at their laboratory (i.e. concentration varies slightly from batch to batch), therefore the resulting maximum test concentrations varies slightly for the different monitoring events. The maximum test concentration for the first and second quarter of 2023 is higher than previous monitoring events as well as third quarter of 2023 (i.e. 100 percent versus ~70 percent) due to the use of artificial sea salts as opposed to HSB. This resulted in a higher NOEC than those reported for the third and fourth quarter of 2022 despite a statistically significant effect was only observed in the maximum test concentration in the samples in all four sampling events. A review of the water quality parameters measured for the bioassay samples indicated the lowest detected salinity levels were detected in the samples collected from the most recent five sampling events (see Figure 1). While the elevated ammonia concentrations detected in the third and fourth quarter 2022 may have contributed to the observed toxicity during those sampling events, ammonia does not appear to be contributing to the toxicity observed in the monitoring events for the first and second quarter of 2023 (see Figure 2).

Figure 1. Trends in Bivalve (*Mytilus galloprovincialis*) Chronic Bioassay NOEC and 100% Effluent Salinity (Dec 2018- July 2023)



* Statistically significant effect detected in the maximum test concentration

Figure 2. Trends in Bivalve (*Mytilus galloprovincialis*) Chronic Bioassay NOEC and 100% Effluent Ammonia Concentration (Dec 2018- July 2023)



* Statistically significant effect detected in the maximum test concentration

5. Overall Assessment

While the current NPDES permit does not include specific whole effluent toxicity (WET) limits, the Washington Administrative Code (WAC) 173-205-020 specifies the following:

> *"Whole effluent toxicity performance standard" means a level of effluent toxicity that is consistently so much lower than is necessary to meet state water quality standards (chapter 173-201A WAC) that no reasonable potential exists to violate the water quality standards. For acute toxicity, the performance standard is the median survival in one hundred percent effluent being equal to or greater than eighty percent and no individual test result showing less than sixty-five percent survival in one hundred percent effluent. For chronic toxicity, the performance standard is no chronic toxicity test demonstrating a statistically significant difference in response between the control and a test concentration equal to the acute critical effluent concentration. For permittees that are ineligible for an approved mixing zone, the performance standard will equal or be close to equal (in the case of acute toxicity) the water quality-based effluent toxicity limit.*

Based on sampling results, the survival and development endpoints of the chronic toxicity test met the WET performance standard because survival rates and proportion normal development were within acceptable limits. Due to the recently observed toxicity from third quarter 2022 through second quarter of 2023, CH2M recommends triggering of an accelerated testing if the next testing meets EPA test acceptability criteria and a statistically significant effect is detected when compared to the lab control. As there are no established chronic toxicity criteria included in the permit, CH2M recommends an accelerated schedule of WET testing to establish whether a pattern of chronic toxicity exists. Consistent with WAC 173-205-090(1)(b), it is recommended that the accelerated testing to be conducted monthly for three months using the same toxicity test as in the routine effluent WET testing where a statistically significant effect is detected.

The NPDES permit does not include dilution series or indicate whether brine or artificial salt should be used for salinity adjustment for the chronic toxicity test. The NPDES permit Section II.5(b) and the QAPP specifies ASTM E 724-89 and EPA/600/R-95/136 as the protocol for the mussel chronic bioassay test, respectively. The bioassay lab currently uses natural seawater/hypersaline brine as control water/diluent, follows the EPA/600/R-95-136 Method 1005.0, and reference the older ASTM E724-89 method in conjunction with the EPA manual. There is no preference in brine or artificial salt stated in the ASTM E 724-89 method. EPA/600/R-95-136 states that salinity adjustment with brine is the preferred method (Sec 13.6.23.7.1) and that the use of artificial sea salts is necessary only when high effluent concentration preclude salinity adjustment by brine alone (Sec 13.6.23.1). To better understand the potential toxicity and the effects of using artificial salt for salinity adjustment, CH2M recommends conducting concurrent mussel chronic bioassay tests using both artificial salt and brine for salinity adjustments in 2023 Q4. The following lists the recommended test dilution series:

<u>Brine</u>
Maximum test concentration, 50%, 25%, 12.5%, 6.25%, and control

<u>Artificial Salt</u>
100%, Maximum test concentration for the chronic toxicity testing using brine for salinity adjustment, 50%, 25%, 12.5%, 6.25%, and control.

Statistical analysis for monitoring events from December 2018 to November 2022 compared chronic test samples to HSB data as opposed to the dilution water control (i.e. lab control) per the recommendation included in EPA/600/R96-136 Section 13.10.8.4.2 "*Statistical analysis should use the appropriate dilution*

water control data." To allow for an accurate comparison with data collected during these monitoring events, CH2M recommends including statistical comparison to both lab and brine controls for all future chronic toxicity testing.

6. References

ASTM. 1989. Standard Guide for Conducting Static Acute Toxicity Tests Starting with Embryos of

Saltwater Bivalve Molluscs, E724-89. ASTM International, West Conshohocken, PA.

CH2M HILL Engineers, Inc. (CH2M, now a wholly owned subsidiary of Jacobs Engineering Group Inc.). 2022. *Quality Assurance Project Plan, Groundwater Treatment Plant Operations and Maintenance.* Final. Prepared for Wyckoff/Eagle Harbor Superfund Site, Bainbridge Island, Washington, U.S. Environmental Protection Agency, Region 10, Seattle, Washington. January.

EPA. 1995. *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to West Coast Marine and Estuarine Organisms, 1st ed.* EPA/600/R-95/136. U.S. Environmental Protection Agency, National Exposure Research Laboratory, Cincinnati, OH.

Washington Administrative Code (WAC) 173-205-020, "*Definitions*." Available at: https://app.leg.wa.gov/WAC/default.aspx?cite=173-205-020

WAC 173-205-090, "*Response to noncompliance with whole effluent toxicity limits.*" Available at: https://app.leg.wa.gov/WAC/default.aspx?cite=173-205-090

Attachment 1
EcoAnalysts Toxicity Testing Results
Wyckoff/Eagle Harbor Superfund Groundwater Treatment Plant

EcoAnalysts, Inc.

TOXICITY TESTING RESULTS

WYCKOFF/EAGLE HARBOR SUPERFUND SITE GROUNDWATER TREATMENT PLANT
BAINBRIDGE ISLAND, WA

NPDES TOXICITY TESTING: 3RD QUARTER 2023

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Contract: 68HE0318D0004
Task Order No: 68HE0722F0011

EcoAnalysts Report ID: PG1799Q3.01

Original Submittal Date: July 27, 2023
Revision Date: October 18, 2023

NELAP ACCREDITED TNI LABORATORY
Accredited in accordance with NELAP, ORELAP ID 4165

All testing reported herein was performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and EcoAnalysts is not responsible for use of less than the complete report. The test results summarized in this report apply only to the sample(s) evaluated. This document is uncontrolled when printed or accessed from electronic distribution.

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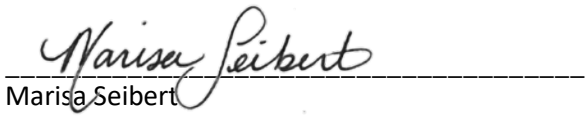

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ACRONYMS AND ABBREVIATIONS

EC_{50}:	Effect Concentration to 50% of test population
EPA:	Environmental Protection Agency
LC_{50}:	Lethal Concentration to 50% of test population
LOEL:	Lowest Observed Effect Level
NOEL:	No Observed Effect Level
NPDES:	National Pollutant Discharge Elimination System
PMSD:	Percent Minimum Significant Difference
QAPP:	Quality Assurance Project Plan
QM:	Quality Manual
SOP:	Standard Operating Procedures
WET:	Whole Effluent Toxicity

1. EXECUTIVE SUMMARY

EcoAnalysts conducted Whole Effluent Toxicity (WET) testing as part of the biological compliance monitoring for Wyckoff/Eagle Harbor Superfund Site, in Bainbridge Island, Washington. The objective of this program was to assess the potential toxicity of discharge water to selected aquatic organisms following procedures defined under the facility's Quality Assurance Project Plan (QAPP) (CH2M HILL 2022). The results of the toxicity testing are contained in this report.

A statistically significant biological response of the test organisms was not detected at the 65% effluent sample concentration, the highest concentration tested, for the proportion survived or proportion normal endpoints (Table 1-1).

Table 1-1. Toxicity Test Results Summary.

Test		NOEL (%)	LOEL (%)	LC_{50}/EC_{50} (%)
Chronic	*Mytilus galloprovincialis* 48-Hour Proportion Survived	65	>65	>65
	Mytilus galloprovincialis 48-Hour Proportion Normal	65	>65	>65

NOEL = No Observed Effect Level
LOEL = Lowest Observed Effect Level
LC_{50}/EC_{50} = Lethal/Effect Concentration to 50% of test population

2. METHODS

The sample was analyzed for toxicity using criteria outlined in ASTM E724-89 and the Environmental Protection Agency's (EPA) most recently promulgated effluent guidance documents outlined in Section 4.

To evaluate the relative sensitivity of the organisms, reference toxicity tests were performed using standard reference toxicants (Lee 1980).

2.1 Sample Collection and Storage

Jacobs personnel collected a sample on July 11, 2023. The sample was transported by EcoAnalysts personnel and received at the laboratory on the same day as collection. The sample temperature upon receipt was within the recommended temperature range, at 6.0°C.

Additional sample conditions are summarized in Table 2-1. The samples were held in a walk-in cold room at 4 ± 2 °C in the dark until utilized for testing.

Table 2-1. Sample Conditions upon Receipt

Sample	071123
Laboratory ID	P230711.01
Date/Time sampled	7/11/23; 0110
Date/Time received	7/11/23; 1100
Dissolved Oxygen (mg/L) Recommended: >4.0 mg/L	6.6
Temperature (°C) Recommended: 0 – 6°C	6.0
pH (units) Recommended: 6 – 9	7.5
Conductivity (µS/cm)	939
Salinity (ppt)	0.5
Total Chlorine (mg/L)	ND[1]
Total Ammonia (mg/L)	0.190

[1]ND: No detectable value

2.2 Bioassay Testing

Bioassay testing for this project consisted of one chronic bioassay. The test conducted in support of this project is summarized in Table 2-2.

Table 2-2. Biological Testing Performed

Test Type	Test Descriptor	Species	Method
Chronic	48-Hour Survival and Development	*Mytilus galloprovincialis* (Mussel)	EPA/600/R-95-136 Method 1005.0; ASTM E724-89; TOX042.12

2.3 Organisms for Testing

Adult mussels (*Mytilus galloprovincialis*) were obtained from Taylor Shellfish in Shelton, Washington on June 6 and 27, 2023. They were delivered via Taylor Shellfish personnel and maintained under ambient seawater flow-through conditions at 12 ± 3˚C until utilized for testing. The overall health of the organisms was visually confirmed by a laboratory technician.

2.4 Water for Bioassay Testing

Seawater diluent used in this study came from the northern Hood Canal at Port Gamble, Washington. This water source has been used successfully on similar bioassay testing programs. Extensive testing on a variety of test species has shown that there is no significant potential for toxicity or bioaccumulation from this water supply. Chemical analysis of each water source is conducted and reviewed on an annual basis.

2.5 Sample Adjustment

The effluent sample was received at a salinity of 0.5 ppt. The salinity of the effluent sample was increased by the addition of hypersaline brine for the 48-hour Survival and Development test (targeted test salinity of 30 ± 2 ppt). Table 2-3 summarizes the salinity adjustment performed on the project sample in relation to marine test species.

A "Brine Control" was also prepared for the bivalve test that included an equal proportion of hypersaline brine added to a mixture of natural seawater (Lab Control) and deionized water. The results of this additional control are discussed in the sections below.

Table 2-3. Salinity Adjustment of Project Samples

Sample ID: 071123	Sample Salinity Upon Receipt	Sample Salinity Adjustment (ppt)	Salinity Adjustment Media
Sample 1: Collected 7/11/23	0.5 ppt	30 ± 2	Hypersaline brine

2.6 Data Management and Analysis

Endpoint data was calculated for each replicate, and the mean value and standard deviation were determined for each sample concentration. 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 was reviewed for errors. Review counts were conducted on any apparent outliers.

Statistical comparisons were made according to the EPA guidance. Statistical comparisons were performed using CETIS™ software.

2.7 Quality Assurance/Quality Control

The quality assurance objectives for toxicity testing conducted by the testing laboratory are detailed in the method specific guidance documents and the laboratory's quality manual (QM). These objectives for accuracy and precision involve all aspects of the testing process, including the following:

- Source and Condition of Test Organisms
- Condition of Equipment
- Test Conditions
- Instrument Calibration
- Use of Reference Toxicants
- Record Keeping

- Data Evaluation

The batch of test organisms obtained was evaluated in a reference toxicant test that was run concurrently with the test period to establish the sensitivity of the test organisms. The reference toxicant LC_{50} or EC_{50} should fall within two standard deviations of the historical laboratory mean. Water quality measurements were monitored to ensure that they fell within prescribed limits.

The methods employed in every phase of the toxicity testing program are detailed in the EcoAnalysts Standard Operating Procedures (SOP). All EcoAnalysts staff members receive regular, documented training in all SOPs and test methods. Finally, all data collected and produced because of these analyses were recorded on approved data sheets. If an aspect of a test deviated from protocol, the test was evaluated to determine whether it was valid according to the regulatory agencies responsible for approval of the proposed permitting action.

3. RESULTS

The results of the effluent testing are presented in this section. Statistical comparisons and laboratory documents are provided in Appendix A. Chain-of-custody and sample receipt logs are provided in Appendix B.

3.1 *Mytilus galloprovincialis* Test Results

The chronic toxicity test with *M. galloprovincialis* was conducted on July 12, 2023. The test met EPA test acceptability criteria of ≥50% survival, ≥90% normal shell development and <25% Percent Minimum Significant Difference (PMSD) with 92.2% proportion survived, 93.7% proportion normal, and 3.5% PMSD for proportion normal in the laboratory control. Mean survival and proportion normal are summarized in Table 3-1. The test conditions are summarized in Table 3-2.

Concentrations of 6.25, 12.5, 25, 50, and 65% effluent were prepared utilizing laboratory water. Sample P230711.01 (received 7/11/23) was used for test initiation. Water quality parameters were within the acceptable limits throughout the duration of the 48-hour static test.

No significant difference was observed between the laboratory (dilution water) control and the brine control, indicating that the addition of hypersaline brine did not contribute to any negative biological effects.

The EC_{50} for the ammonia reference toxicant test was 9.89 mg/L total ammonia and was within two standard deviations of the laboratory mean (Table 3-2) at the time of testing. This indicates that the organisms are of a similar sensitivity to those previously tested at the EcoAnalysts laboratory.

Table 3-1. Results Summary for *Mytilus galloprovincialis* Embryo Development Test

Conc. (%)	Mean Proportion Survived (%)	Standard Deviation	NOEL (%)	LOEL (%)	EC_{50} Value (%)
Control	92.2	7.2	65	>65	>65
Brine Control	91.3	7.4			
6.25	96.0	5.0			
12.5	99.2	1.5			
25	88.2	11.4			
50	94.7	7.9			
65	88.6	4.5			
Conc. (%)	**Mean Proportion Normal (%)**	**Standard Deviation**	**NOEL (%)**	**LOEL (%)**	**EC_{50} Value (%)**
Control	93.7	1.7	65	>65	>65
Brine Control	95.5	0.8			
6.25	94.8	2.3			
12.5	95.1	1.4			
25	96.5	0.3			
50	95.4	1.6			
65	95.3	1.5			

NOEL = No Observed Effect Level;
LOEL = Lowest Observed Effect Level;
LC_{50}/EC_{50} = Lethal/Effect Concentration to 50% of test population;
Proportion survived = total counted / stocking density;
Proportion normal = number normal/total counted;

Table 3-2. Test Condition Summary for *Mytilus galloprovincialis* Embryo Development Test.

Test Duration / Type	**48-Hour; Static**	
Species	*Mytilus galloprovincialis*	
Supplier	Taylor Shellfish	
Date acquired	6/06/23 & 6/27/23	
Test Dates	7/12/23 – 7/14/23	
Age at test initiation Recommended: <4-hour embryos	<4 hours	
Sample(s) used:	071123; P230711.01	
Holding Time at Initiation: Recommended: < 36 hours	35 hours	
Test Procedures	**EPA/600/R-95-136, Method 1005.0; SOP: TOX042.12**	
Test location	EcoAnalysts, Port Gamble, WA	
Control water / Diluent	0.45 µm-filtered, North Hood Canal seawater	
Test Lighting	16 hour light / 8 hour dark	
Test Chamber	30-mL Chamber	
Exposure volume	10 mL	
Organisms/replicate	Recommended: 150 –300	Actual: 261
Replicates/treatment	4	
Concentration/treatment	6.25, 12.5, 25, 50 and 65%	
Feeding	None	
Test solution renewal	None	
Test Water Quality		
Test Dissolved Oxygen	Recommended: > 4.0 mg/L	Actual: 7.8 – 8.2 mg/L
Test Temperature	Recommended: 16 ± 1°C	Actual: 16.0 – 16.8 °C
Test pH	Recommended: 7 – 9	Actual: 7.6 – 8.2
Test Salinity	Recommended: 30 ± 2 ppt	Actual: 30 – 31 ppt
Control performance standard (Survival, Normal shell development, PMSD)	Recommended: ≥50% survival, ≥90% normal development, <25% PMSD	Actual: 92.2% survival, 93.7% normal development, 3.5% PMSD; Pass
Reference Toxicant Date	7/12/23	
Reference Toxicant EC_{50}	9.89 mg/L total ammonia	
Laboratory Mean EC_{50}	6.95 mg/L total ammonia	
Acceptable Range EC_{50} (± 2 SD)	4.02 – 12.0 mg/L total ammonia (within range)	
Deviations from Test Protocol	None	

4. REFERENCES

ASTM. 1989. Standard Guide for Conducting Static Acute Toxicity Tests Starting with Embryos of Saltwater Bivalve Molluscs, E724-89. ASTM International, West Conshohocken, PA.

CETIS. 2022. CETIS™ Comprehensive Environmental Toxicity Information System User's Guide. Tidepool Scientific Software. McKinleyville, CA.

CH2M HILL. 2022. Quality Assurance Project Plan, Groundwater Treatment Plant Operations and Maintenance, Final. Wyckoff/Eagle Harbor Superfund Site. Bainbridge Island, Washington.

USEPA. 1995. Short Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to West Coast Marine Organisms and Estuarine Organisms, First Edition. EPA-600-R-95-136.

APPENDIX A

STATISTICAL COMPARISONS AND LABORATORY DOCUMENTS

APPENDIX A.1

MYTILUS GALLOPROVINCIALIS 48-HOUR SURVIVAL AND DEVELOPMENT TEST

STATISTICAL COMPARISON AND LABORATORY DATA SHEETS

CETIS Summary Report

Bivalve Larval Survival and Development Test

EcoAnalysts

Batch ID:	03-7618-7990	**Test Type:**	Development-Survival	**Analyst:**			
Start Date:	12 Jul-23 11:53	**Protocol:**	EPA/600/R-95/136 (1995)	**Diluent:**	Laboratory Seawater		
Ending Date:	14 Jul-23 11:10	**Species:**	Mytilus galloprovincialis	**Brine:**	Crystal Sea Marine Mix		
Test Length:	47h	**Taxon:**	Bivalvia	**Source:**	Taylor Shellfish	**Age:**	
Sample ID:	01-8254-2759	**Code:**	P230711.01	**Project:**	WEH-031Z		
Sample Date:	11 Jul-23 01:10	**Material:**	Treated Groundwater	**Source:**	Jacobs Wyckoff		
Receipt Date:	11 Jul-23 11:00	**CAS (PC):**		**Station:**	71123		
Sample Age:	35h (6 °C)	**Client:**	Jacobs Wyckoff				

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
19-2088-3693	Combined Proportion Norma	Equal Variance t Two-Sample Test	0.3643	Brine Control passed combined proportion	1
01-5968-2812	Proportion Normal	Equal Variance t Two-Sample Test	0.9458	Brine Control passed proportion normal	1
17-3418-1206	Proportion Survived	Equal Variance t Two-Sample Test	0.3943	Brine Control passed proportion survived	1

Multiple Comparison Summary

Analysis ID	Endpoint	Comparison Method	✓	NOEL	LOEL	TOEL	PMSD	TU	S
01-2864-3417	Proportion Normal	Dunnett Multiple Comparison Test		65	>65	---	3.48%	1.5	1
02-4245-1825	Proportion Survived	Dunnett Multiple Comparison Test		65	>65	---	17.0%	1.5	1

Point Estimate Summary

Analysis ID	Endpoint	Point Estimate Method	✓	Level	%	95% LCL	95% UCL	TU	S
19-0849-7751	Proportion Normal	Linear Interpolation (ICPIN)	✓	EC15	>65	---	---	<1.5	1
			✓	EC20	>65	---	---	<1.5	
			✓	EC25	>65	---	---	<1.5	
			✓	EC40	>65	---	---	<1.5	
			✓	EC50	>65	---	---	<1.5	
00-0209-0608	Proportion Survived	Linear Interpolation (ICPIN)	✓	EC15	>65	---	---	<1.5	1
			✓	EC20	>65	---	---	<1.5	
			✓	EC25	>65	---	---	<1.5	
			✓	EC40	>65	---	---	<1.5	
			✓	EC50	>65	---	---	<1.5	

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits Lower	TAC Limits Upper	Overlap	Decision
01-2864-3417	Proportion Normal	Control Resp	0.9372	0.9	<<	Yes	Passes Criteria
01-5968-2812	Proportion Normal	Control Resp	0.9372	0.9	<<	Yes	Passes Criteria
	Proportion Normal	Control Resp	0.9549	0.9	<<	Yes	Passes Criteria
19-0849-7751	Proportion Normal	Control Resp	0.9372	0.9	<<	Yes	Passes Criteria
00-0209-0608	Proportion Survived	Control Resp	0.9215	0.5	<<	Yes	Passes Criteria
02-4245-1825	Proportion Survived	Control Resp	0.9215	0.5	<<	Yes	Passes Criteria
17-3418-1206	Proportion Survived	Control Resp	0.9215	0.5	<<	Yes	Passes Criteria
	Proportion Survived	Control Resp	0.9128	0.5	<<	Yes	Passes Criteria
19-2088-3693	Combined Proportion Norma	PMSD	0.1609	<<	0.25	No	Passes Criteria

Bivalve Larval Survival and Development Test

EcoAnalysts

Combined Proportion Normal Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	D	4	0.8774	0.7194	1.0350	0.7701	1.0000	0.0497	0.0993	11.32%	0.00%
0	BC	4	0.8716	0.7601	0.9832	0.7816	0.9310	0.0351	0.0701	8.05%	0.66%
6.25		4	0.9167	0.8326	1.0010	0.8697	0.9732	0.0264	0.0529	5.77%	-4.48%
12.5		4	0.9588	0.9245	0.9931	0.9310	0.9808	0.0108	0.0215	2.25%	-9.28%
25		4	0.8611	0.6660	1.0560	0.7241	1.0000	0.0613	0.1226	14.24%	1.86%
50		4	0.9205	0.7857	1.0550	0.8008	1.0000	0.0424	0.0847	9.20%	-4.91%
65		4	0.8448	0.7618	0.9279	0.7778	0.8966	0.0261	0.0522	6.18%	3.71%

Proportion Normal Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	D	4	0.9372	0.9100	0.9644	0.9195	0.9556	0.0085	0.0171	1.82%	0.00%
0	BC	4	0.9549	0.9425	0.9673	0.9488	0.9652	0.0039	0.0078	0.82%	-1.89%
6.25		4	0.9479	0.9109	0.9849	0.9268	0.9701	0.0116	0.0232	2.45%	-1.14%
12.5		4	0.9509	0.9285	0.9733	0.9301	0.9605	0.0070	0.0141	1.48%	-1.46%
25		4	0.9652	0.9602	0.9702	0.9611	0.9677	0.0016	0.0031	0.33%	-2.99%
50		4	0.9541	0.9279	0.9802	0.9311	0.9683	0.0082	0.0164	1.72%	-1.80%
65		4	0.9532	0.9295	0.9768	0.9435	0.9750	0.0074	0.0149	1.56%	-1.70%

Proportion Survived Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	D	4	0.9215	0.8075	1.0350	0.8314	1.0000	0.0358	0.0717	7.78%	0.00%
0	BC	4	0.9128	0.7958	1.0300	0.8238	0.9732	0.0368	0.0735	8.05%	0.94%
6.25		4	0.9598	0.8800	1.0390	0.8966	1.0000	0.0251	0.0501	5.22%	-4.16%
12.5		4	0.9923	0.9680	1.0170	0.9693	1.0000	0.0077	0.0153	1.54%	-7.69%
25		4	0.8822	0.7014	1.0630	0.7510	1.0000	0.0568	0.1136	12.88%	4.26%
50		4	0.9473	0.8221	1.0720	0.8314	1.0000	0.0393	0.0787	8.30%	-2.81%
65		4	0.8860	0.8140	0.9580	0.8238	0.9195	0.0226	0.0453	5.11%	3.85%

Bivalve Larval Survival and Development Test

EcoAnalysts

Combined Proportion Normal Detail

MD5: 3855CE37BB97039E79A06A86221E93CB

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.7701	0.8314	1.0000	0.9080
0	BC	0.7816	0.8506	0.9310	0.9234
6.25		0.9502	0.8697	0.8736	0.9732
12.5		0.9540	0.9310	0.9693	0.9808
25		0.8008	0.9195	1.0000	0.7241
50		0.9464	0.8008	0.9349	1.0000
65		0.7778	0.8966	0.8314	0.8736

Proportion Normal Detail

MD5: C72EC66A58998BBB3105460D9B7E5957

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.9263	0.9195	0.9474	0.9556
0	BC	0.9488	0.9652	0.9567	0.9488
6.25		0.9288	0.9701	0.9268	0.9658
12.5		0.9540	0.9605	0.9301	0.9588
25		0.9676	0.9677	0.9611	0.9643
50		0.9537	0.9631	0.9683	0.9311
65		0.9442	0.9750	0.9435	0.9500

Proportion Survived Detail

MD5: 949C5C41CAC03B2A43E0374FC22ACF55

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.8314	0.9042	1.0000	0.9502
0	BC	0.8238	0.8812	0.9732	0.9732
6.25		1.0000	0.8966	0.9425	1.0000
12.5		1.0000	0.9693	1.0000	1.0000
25		0.8276	0.9502	1.0000	0.7510
50		0.9923	0.8314	0.9655	1.0000
65		0.8238	0.9195	0.8812	0.9195

Bivalve Larval Survival and Development Test

EcoAnalysts

Combined Proportion Normal Binomials

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	201/261	217/261	270/270	237/261
0	BC	204/261	222/261	243/261	241/261
6.25		248/261	227/261	228/261	254/261
12.5		249/261	243/261	253/261	256/261
25		209/261	240/261	272/272	189/261
50		247/261	209/261	244/261	284/284
65		203/261	234/261	217/261	228/261

Proportion Normal Binomials

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	201/217	217/236	270/285	237/248
0	BC	204/215	222/230	243/254	241/254
6.25		248/267	227/234	228/246	254/263
12.5		249/261	243/253	253/272	256/267
25		209/216	240/248	272/283	189/196
50		247/259	209/217	244/252	284/305
65		203/215	234/240	217/230	228/240

Proportion Survived Binomials

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	217/261	236/261	261/261	248/261
0	BC	215/261	230/261	254/261	254/261
6.25		261/261	234/261	246/261	261/261
12.5		261/261	253/261	261/261	261/261
25		216/261	248/261	261/261	196/261
50		259/261	217/261	252/261	261/261
65		215/261	240/261	230/261	240/261

CETIS Test Data Worksheet

Bivalve Larval Survival and Development Test — EcoAnalysts

Start Date:	12 Jul-23 11:53	**Species:**	Mytilus galloprovincialis
End Date:	14 Jul-23 11:10	**Protocol:**	EPA/600/R-95/136 (1995)
Sample Date:	11 Jul-23 01:10	**Material:**	Treated Groundwater
Sample Code:	P230711.01		
Sample Source:	Jacobs Wyckoff		
Sample Station:	71123		

Conc-%	Code	Rep	Pos	Initial Density	Final Density	# Counted	# Normal	Notes
0	BC	1	9	261	215	215	204	
0	BC	2	20	261	230	230	222	
0	BC	3	2	261	254	254	243	
0	BC	4	1	261	254	254	241	
0	D	1	13	261	217	217	201	
0	D	2	5	261	236	236	217	
0	D	3	23	261	285	285	270	
0	D	4	11	261	248	248	237	
6.25		1	12	261	267	267	248	
6.25		2	19	261	234	234	227	
6.25		3	28	261	246	246	228	
6.25		4	3	261	263	263	254	
12.5		1	4	261	261	261	249	
12.5		2	25	261	253	253	243	
12.5		3	22	261	272	272	253	
12.5		4	27	261	267	267	256	
25		1	21	261	216	216	209	
25		2	10	261	248	248	240	
25		3	6	261	283	283	272	
25		4	15	261	196	196	189	
50		1	18	261	259	259	247	
50		2	24	261	217	217	209	
50		3	7	261	252	252	244	
50		4	8	261	305	305	284	
65		1	17	261	215	215	203	
65		2	16	261	240	240	234	
65		3	26	261	230	230	217	
65		4	14	261	240	240	228	

EcoAnalysts, Inc.

48-Hour Chronic WET Test

Version V.2

GENERAL

Client	Jacobs- Wyckoff
Project	WEH-031Z
Project Number	PG1799
Project Manager	Marisa Seibert
Date Sample Received	7/11/2023
Test type	48-Hour Chronic Toxicity Using Bivalve Larvae
Matrix	Liquid
Test Acceptability	≥90% normal shell development, ≥50% survival (mussels) or ≥70% survival (oysters), MSD <25%
Test Start Date	07/12/23
Test Species	Mytilus spp.
Organism Batch	TS060623.01 & TS062723.01
Organism Acquired	6/6/23 & 6/27/23
Organism Acclimation	#VALUE!
Organism Age	<4 hr old embryos
Test Protocol	TOX 042
Test Location	Incubator 1
Light Intensity	50-100 foot candles
Light Cycle	16L:8D
Water Description	0.45 um filtered seawater
Organisms per Replicate	150 - 300
Test Chamber Size	30 mL
Exposure Volume	10 mL
Test Dissolved Oxygen	> 4.0
Test Temperature	16 ± 1
Test Salinity	30 ± 2
Test pH	8 ± 1

Note: input lowest and highest decimal for temp

Test Parameters		
	Min	Max
DO	4.0	
Temp	15	17
Salinity	28	32
pH	7	9

TEST START TIME/INIT:	1153 NL/SZ
TEST END TIME/INIT:	1110 MS

CLIENT SAMPLE ID	LAB ID
71123	P230711.01

Salinity Adjustment CSMM Batch #
NA

Formalin Lot #
220304-50

Rose Bangel Batch #
5135

	Concentrations
1	Control
2	Brine Control
3	6.25%
4	12.5%
5	25%
6	50%
7	65%
8	.
9	.

ECO ANALYSTS, INC.

48-Hour Chronic WET Test

v.2

CLIENT	Jacobs- Wyckoff	**DATE RECEIVED**	7/11/23	**PROTOCOL**	TOX 042
PROJECT	WEH-031Z	**TEST START DATE**	7/12/23	**PROJECT MANAGER**	Marisa Seibert
CLIENT SAMPLE ID	71123	**TEST END DATE**	7/14/23	**SPECIES**	*Mytilus spp.*
LAB SAMPLE ID	P230711.01	**MATRIX**	Liquid	**NO. OF ORGANISMS**	150 - 300

48-Hour Chronic Toxicity Using Bivalve Larvae

		DO (mg/L)	TEMP (°C)	SALINITY (ppt)	pH
	Concentration (%)	> 4.0	15 - 17	28 - 32	7 - 9
Day 0	Control	8.1	16.8	30	7.9
Stock	Brine Control	8.0	16.5	31	7.7
Date 7/12/23	6.25%	8.1	16.6	30	7.9
Time 1118	12.5%	8.2	16.5	30	7.9
Tech MS	25%	8.2	16.3	30	7.8
Meter # 7	50%	8.2	16.2	31	7.7
	65%	8.2	16.0	31	7.6
Day 1	Control		16.3 ①		
Surrogate	Brine Control		16.3 ①		
Date 7/13/23	6.25%		16.3 ①		
Time 0928	12.5%		16.3 ①		
Tech SR	25%		16.3 ①		
Meter # T16	50%		16.3 ①		
	65%		16.3 ①		
Day 2	Control	7.9	16.0	30	7.8
Surrogate	Brine Control	7.8	16.1	31	7.9
Date 7/14/23	6.25%	8.0	16.2	31	8.0
Time 1040	12.5%	8.0	16.1	30	8.0
Tech MS	25%	8.0	16.2	31	8.1
Meter # 7	50%	8.0	16.3	31	8.1
	65%	8.0	16.2	31	8.2

① Temp from temp blank- SR/SL 7/13/23

ECO ANALYSTS, INC.

48-Hour Chronic WET Test

V.2

CLIENT	Jacobs- Wyckoff	DATE RECEIVED	7/11/23	PROTOCOL	TOX 042
PROJECT	WEH-031Z	TEST START DATE	7/12/23	PROJECT MANAGER	Marisa Seibert
CLIENT SAMPLE ID	71123	TEST END DATE	7/14/23	SPECIES	*Mytilus spp.*
LAB SAMPLE ID	P230711.01	MATRIX	Liquid	NO. OF ORGANISMS	150 - 300

48-Hour Chronic Toxicity Using Bivalve Larvae

Concentration (%)	REP	Normal	Abnormal	Date	Tech	Comments/QA Counts
Stocking Density	1	264		7/17	NS	
	2	240		7/17	NS	
	3	276		7/17	NS	
	4	254		7/17	NS	
	5	271		7/13	NL	
	6	250		7/17	NS	
Control	1	201	16	7/16	NL	N: 203 201/217 = .926 % diff = 1.4 SZ 7/19 A: 13 203/216 = .940
	2	217	19	7/16	NL	
	3	270	15	7/16	NL	
	4	237	11	7/16	NL	
Brine Control	1	204	4	7/17	MK	
	2	222	8	7/17	MK	
	3	243	11	7/17	MK	
	4	241	13	7/17	MK	
6.25%	1	248	19	7/17	MK	
	2	227	7	7/17	MK	N: 226 A: 7 % diff = .01 SZ 7/19/23
	3	228	18	7/17	MK	
	4	254	9	7/17	MK	
12.5%	1	249	12	7/17	MK	
	2	243	10	7/17	MK	
	3	253	19	7/17	MK	
	4	256	11	7/17	MK	N: 190 A: 7 ~~% diff =~~ ①
25%	1	209	7	7/17	MK	
	2	240	8	7/17	MK	
	3	272	11	7/17	MK	
	4	189	7	7/17	MK	N: 190 A: 7 % diff = .02 SZ 7/19/23
50%	1	247	12	7/17	MK	
	2	209	9	7/17	MK	
	3	244	8	7/17	MK	
	4	284	21	7/17	MK	
65%	1	203	12	7/16	NL	N: 203 A: 9 % diff = 1.3 SZ 7/19/23
	2	234	6	7/16	NL	
	3	217	13	7/16	NL	
	4	228	12	7/16	NL	

①WC- SZ 7/19/23

48-Hour Chronic WET Test

V.2

CLIENT	Jacobs- Wyckoff	DATE RECEIVED	7/11/23	PROTOCOL	TOX 042
PROJECT	WEH-031Z	TEST START DATE	7/12/23	PROJECT MANAGER	Marisa Seibert
CLIENT SAMPLE ID	71123	TEST END DATE	7/14/23	SPECIES	*Mytilus spp.*
LAB SAMPLE ID	P230711.01	MATRIX	Liquid	NO. OF ORGANISMS	150 - 300

48-Hour Chronic Toxicity Using Bivalve Larvae

SPAWNING METHOD Heat Shock		INITIAL SPAWNING TIME 856		FINAL SPAWNING TIME 930
MALES 2	FEMALES 5	SPERM VIABILITY GOOD		EGG CONDITION GOOD
BEGIN FERTILIZATION 930		END FERTILIZATION 1153		CONDITION OF EMBRYOS Good

TIME OF INITIATION	INITIALS
1153	NL/SZ

EMBRYO DENSITY CALCULATIONS

of embryos in 1 mL of 100X diluted embryo stock

Count 1	Count 2	Mean
137	147	142

embryos in original stock = # of embryos in diluted stock x 100

14200

Percentage of embryo stock needed = 2700 embryos per 1 mL/# embryos in original stock

0.19

mL of egg stock to add to FSW to achieve total volume = percentage of embro stock needed * 40 mL (or desired volume of embryo stock)

7.605633803 Add this volume to beaker and dilute to 40 mL (or desired volume of embryo stock) with FSW = final embryo stock

Add 0.1 mL of final embryo stock to test chambers

ECO ANALYSTS, INC.

48-Hour Chronic WET Test

v.2

CLIENT	Jacobs- Wyckoff	**DATE RECEIVED**	7/11/23	**PROTOCOL**	TOX 042
PROJECT	WEH-031Z	**TEST START DATE**	7/12/23	**PROJECT MANAGER**	Marisa Seibert
CLIENT SAMPLE ID	71123	**TEST END DATE**	7/14/23	**SPECIES**	*Mytilus spp.*
LAB SAMPLE ID	P230711.01	**MATRIX**	Liquid	**NO. OF ORGANISMS**	150 - 300

48-Hour Chronic Toxicity Using Bivalve Larvae

Day of Test	Concentration	Vol. Effluent Sample Added (mL)	Vol. Diluent Added (mL)	Total Volume (mL)	Diluent Type	FSW
0	0%	0	200.0	200		
	Brine Control	#VALUE!	#VALUE!	200		
	6.25%	12.5	187.5	200		
	12.5%	25	175.0	200		
	25%	50	150.0	200		
	50%	100	100.0	200		
	65%	130	70.0	200		

Test Dilution Prep

Date	Balance ID	Sample ID (P#)	Water Batch ID	Initials
7/12/23	7	P230711.01	FSW071223.01	MB

SALINITY ADJUSTMENT AND TEST DILUTION PREPARATION WORKSHEET

Only red characters and green cells are changeable.

ORGANISM	CLIENT	CLIENT SAMPLE ID	DATE
Mytilus spp.	Jacobs- Wyckoff	71123	7/12/23

Volume per Concentration (mls) - 200

Test Parameters	ppt
Salinity of Brine	87.00
Salinity of Sample	0.50
Test Salinity	30.00

Salinity Adjustment Multiplier = **0.52**

		grams added
mls. Sample*	500.00	499.3
mls. Brine	258.77	275.6
*Adjust volume so C16>F19		**774.88**
Post Adjustment Concentration (%) =		**65.90**

Test Dilution Preparation **(List highest to lowest!)**

Concentration (%)	Amount of Adjusted Sample (gms.)	Amount of Seawater (gms.)
65.00	201.5	2.8
50.00	155.0	49.3
25.00	77.5	126.8
12.50	38.7	165.5
6.25	19.4	184.9
	0.0	204.2
	492.05	

Brine Control Preparation

Salinity Adjustment			highest	Amount Brine	Amount DI	Amount Seawater
Sample Number/Name	Multiplier	Volume BC	concentration	(grams)	(grams)	(grams)
71123	0.52	200	65.0	70.2	125.2	8.9

Worksheet Preparation Date / Initials

7/12/2023	MS

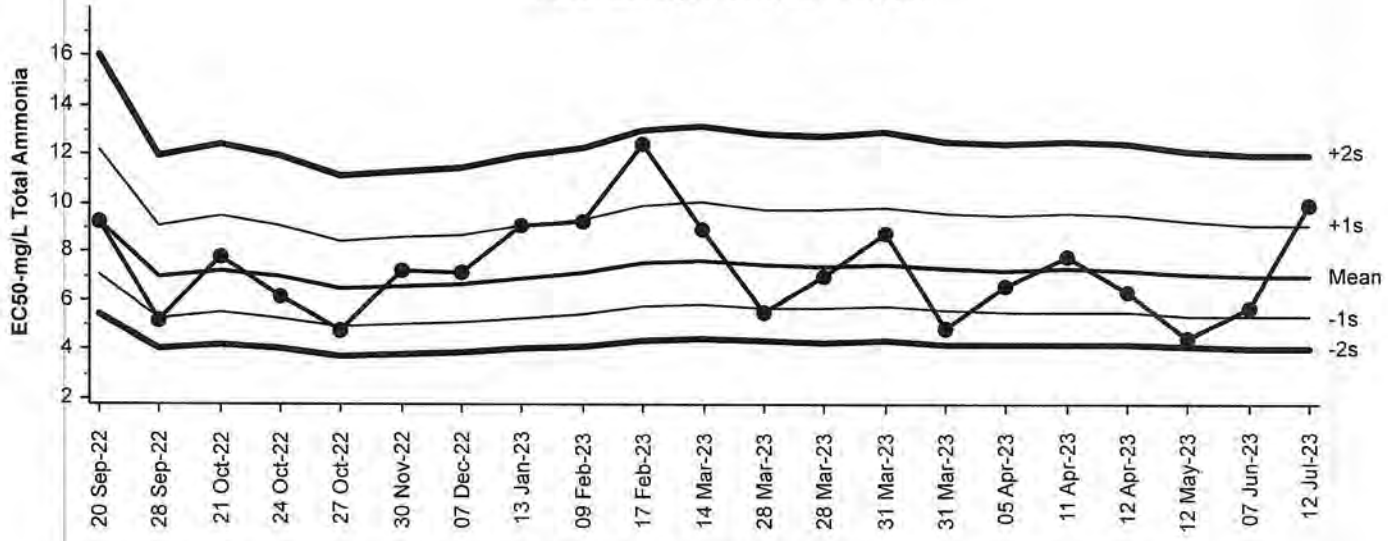
Dilution Preparation Date / Initials

7/12/2023	MS

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

Test Type:	Development-Survival	**Organism:**	Mytilus galloprovincialis	**Material:**	Total Ammonia
Protocol:	All Protocols	**Endpoint:**	Combined Proportion Normal	**Source:**	Reference Toxicant-REF

Bivalve Larval Survival and Development Test
Combined Proportion Normal Endpoint



Lognormal Cumulative Mean Plot

Mean:	6.945	**Count:**	20	**-1s Warning Limit:**	5.28	**-2s Action Limit:**	4.02
Sigma:	NA	**CV:**	27.80%	**+1s Warning Limit:**	9.12	**+2s Action Limit:**	12

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2022	Sep	20	16:02	9.267	2.322	1.057	(+)		11-7896-9547	00-7476-6700	EcoAnalysts
2			28	16:31	5.182	-1.763	-1.073	(-)		10-3818-0354	11-9896-8834	EcoAnalysts
3		Oct	21	14:16	7.804	0.8596	0.4276			05-2022-4267	03-4308-3965	EcoAnalysts
4			24	15:17	6.15	-0.795	-0.4455			01-4864-2336	19-5269-5566	EcoAnalysts
5			27	17:02	4.776	-2.169	-1.372	(-)		12-4527-0974	13-7457-7890	EcoAnalysts
6		Nov	30	14:32	7.166	0.2208	0.1147			11-2220-4195	10-4569-3704	EcoAnalysts
7		Dec	7	17:43	7.159	0.214	0.1112			19-4874-8030	20-9525-0017	EcoAnalysts
8	2023	Jan	13	15:30	9.078	2.133	0.9813			14-2219-3979	18-3945-1944	EcoAnalysts
9		Feb	9	15:28	9.246	2.301	1.049	(+)		00-8572-7368	10-5325-0783	EcoAnalysts
10			17	14:30	12.4	5.452	2.123	(+)	(+)	20-3891-7103	06-7296-3936	EcoAnalysts
11		Mar	14	15:15	8.955	2.01	0.9316			00-9622-9067	21-3408-3763	EcoAnalysts
12			28	15:46	5.455	-1.49	-0.8848			02-2233-3890	16-3797-4494	EcoAnalysts
13			28	15:47	6.941	-0.00424	-0.00224			01-6969-0938	06-4639-7696	EcoAnalysts
14			31	16:52	8.774	1.829	0.8567			21-2826-5425	10-8042-3972	EcoAnalysts
15			31	16:54	4.818	-2.127	-1.34	(-)		13-8989-7877	05-5295-3514	EcoAnalysts
16		Apr	5	15:18	6.581	-0.3638	-0.1972			05-6481-1975	07-2069-0121	EcoAnalysts
17			11	16:37	7.809	0.8644	0.4299			14-1713-1401	15-2064-5147	EcoAnalysts
18			12	15:13	6.298	-0.6464	-0.358			21-2394-6995	12-4981-2785	EcoAnalysts
19		May	12	15:35	4.42	-2.525	-1.656	(-)		02-3839-1595	05-0285-3181	EcoAnalysts
20		Jun	7	16:24	5.621	-1.324	-0.7748			16-8311-5218	04-7873-2197	EcoAnalysts
21		Jul	12	12:57	9.89	2.945	1.296	(+)		02-0009-8192	04-6529-8407	EcoAnalysts

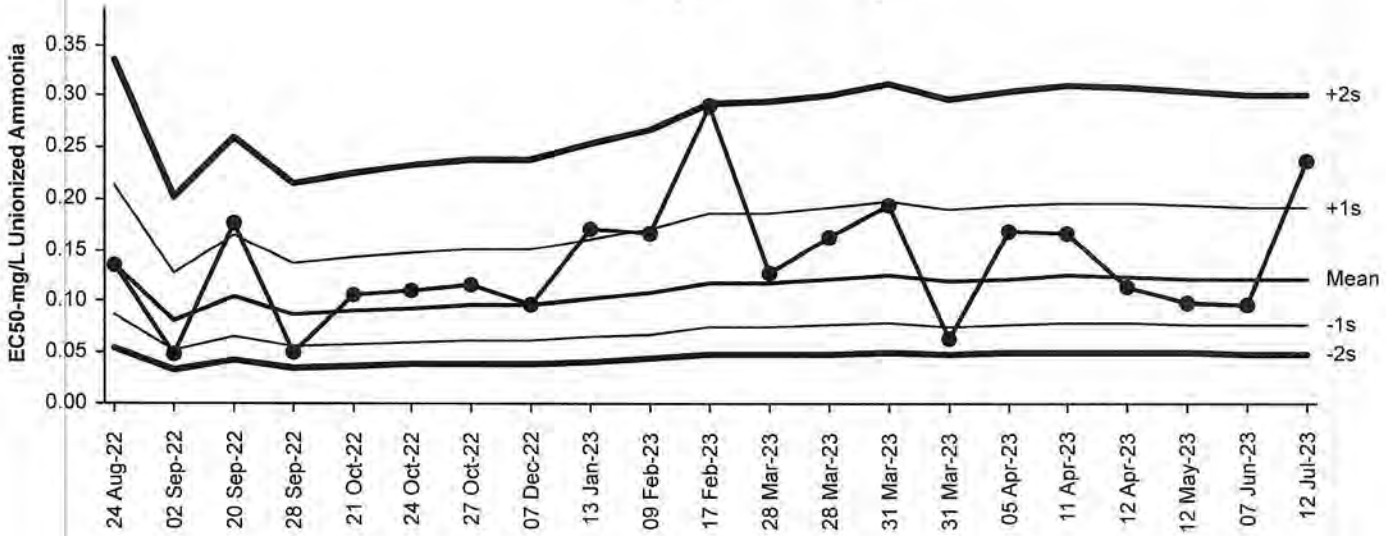
CETIS QC Plot

Report Date: 25 Jul-23 11:53 (1 of 1)

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

Test Type:	Development-Survival	**Organism:**	Mytilus galloprovincialis	**Material:**	Unionized Ammonia
Protocol:	All Protocols	**Endpoint:**	Combined Proportion Normal	**Source:**	Reference Toxicant-REF

Bivalve Larval Survival and Development Test
Combined Proportion Normal Endpoint



Lognormal Cumulative Mean Plot

Mean:	0.1216	**Count:**	20	**-1s Warning Limit:**	0.0773	**-2s Action Limit:**	0.0492
Sigma:	NA	**CV:**	47.70%	**+1s Warning Limit:**	0.191	**+2s Action Limit:**	0.301

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2022	Aug	24	16:43	0.1359	0.01427	0.245			00-7678-9875	07-1760-4646	EcoAnalysts
2		Sep	2	14:54	0.04851	-0.07309	-2.03	(-)	(-)	13-9573-6141	09-4475-1376	EcoAnalysts
3			20	16:02	0.1767	0.05514	0.826			13-8303-2046	02-4939-5521	EcoAnalysts
4			28	16:31	0.04973	-0.07187	-1.975	(-)		14-4835-8902	06-7637-8760	EcoAnalysts
5		Oct	21	14:16	0.1071	-0.01451	-0.2808			20-9426-4253	15-1656-6246	EcoAnalysts
6			24	15:17	0.1096	-0.01201	-0.2297			18-7734-9147	06-4748-9707	EcoAnalysts
7			27	17:02	0.1156	-0.00601	-0.112			01-3898-0369	19-9850-5740	EcoAnalysts
8		Dec	7	17:43	0.09634	-0.02527	-0.5145			15-6747-3203	15-5237-0673	EcoAnalysts
9	2023	Jan	13	15:30	0.1703	0.04872	0.7442			14-6111-3358	19-5184-9524	EcoAnalysts
10		Feb	9	15:28	0.1664	0.04476	0.6923			11-1705-9064	00-9866-2896	EcoAnalysts
11			17	14:30	0.2912	0.1696	1.929	(+)		05-8051-1741	00-4535-0428	EcoAnalysts
12		Mar	28	15:46	0.1275	0.00587	0.1041			08-8126-4059	10-2993-2407	EcoAnalysts
13			28	15:47	0.1637	0.04207	0.6563			03-3638-8838	12-4289-2851	EcoAnalysts
14			31	16:52	0.1949	0.07329	1.042	(+)		14-3337-1963	13-8011-4764	EcoAnalysts
15			31	16:54	0.06349	-0.05811	-1.436	(-)		01-2022-2925	11-3364-1842	EcoAnalysts
16		Apr	5	15:18	0.1685	0.04694	0.7211			01-0596-2964	10-8703-5300	EcoAnalysts
17			11	16:37	0.1673	0.04574	0.7053			13-1124-3474	18-0348-0749	EcoAnalysts
18			12	15:13	0.1148	-0.00681	-0.1273			18-5662-1396	07-7214-9910	EcoAnalysts
19		May	12	15:35	0.09858	-0.02302	-0.4636			08-2245-0872	03-4589-6060	EcoAnalysts
20		Jun	7	16:24	0.0976	-0.024	-0.4856			18-8939-1974	09-3314-9652	EcoAnalysts
21		Jul	12	12:57	0.2364	0.1148	1.468	(+)		13-3479-3905	05-2583-6446	EcoAnalysts

CETIS Summary Report

Bivalve Larval Survival and Development Test — EcoAnalysts

Batch ID:	03-7618-7990	**Test Type:**	Development-Survival	**Analyst:**	Sarah Zischke		
Start Date:	12 Jul-23 12:57	**Protocol:**	EPA/600/R-95/136 (1995)	**Diluent:**	Laboratory Seawater		
Ending Date:	14 Jul-23 11:11	**Species:**	Mytilus galloprovincialis	**Brine:**	Crystal Sea Marine Mix		
Test Length:	46h	**Taxon:**	Bivalvia	**Source:**	Taylor Shellfish	**Age:**	
Sample ID:	13-3784-5321	**Code:**	P220819.68	**Project:**	Reference Toxicant		
Sample Date:	19 Aug-22	**Material:**	Total Ammonia	**Source:**	Reference Toxicant		
Receipt Date:	19 Aug-22	**CAS (PC):**		**Station:**	P220819.68		
Sample Age:	327d 13h	**Client:**	Internal Lab				

Multiple Comparison Summary

Analysis ID	Endpoint	Comparison Method	✓	NOEL	LOEL	TOEL	PMSD	S
06-4445-5178	Combined Proportion Norma	Dunnett Multiple Comparison Test	✓	7.85	12.7	9.985	13.0%	1

Point Estimate Summary

Analysis ID	Endpoint	Point Estimate Method	✓	Level	mg/L	95% LCL	95% UCL	S
04-6529-8407	Combined Proportion Norma	Linear Interpolation (ICPIN)	✓	EC15	8.274	7.763	8.555	1
			✓	EC20	8.489	7.997	8.76	
			✓	EC25	8.709	8.237	8.969	
			✓	EC40	9.402	8.995	9.624	
			✓	EC50	9.89	9.535	10.08	

Test Acceptability

				TAC Limits			
Analysis ID	Endpoint	Attribute	Test Stat	Lower	Upper	Overlap	Decision
06-4445-5178	Combined Proportion Norma	PMSD	0.1297	<<	0.25	No	Passes Criteria

Combined Proportion Normal Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	D	4	0.9310	0.8608	1.0010	0.8812	0.9770	0.0221	0.0441	4.74%	0.00%
1.76		4	0.9215	0.8779	0.9650	0.8812	0.9387	0.0137	0.0274	2.97%	1.03%
3.76		4	0.9320	0.8504	1.0140	0.8621	0.9847	0.0256	0.0513	5.50%	-0.10%
7.85		4	0.8860	0.7495	1.0230	0.8161	1.0000	0.0429	0.0858	9.68%	4.84%
12.7		4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	---	100.00%
17.9		4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	---	100.00%

Combined Proportion Normal Detail — MD5: 6B29F5F2D4DB7A48CCCDB80204B8728B

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.9770	0.9080	0.9579	0.8812
1.76		0.8812	0.9387	0.9272	0.9387
3.76		0.9847	0.8621	0.9349	0.9464
7.85		1.0000	0.8161	0.9042	0.8238
12.7		0.0000	0.0000	0.0000	0.0000
17.9		0.0000	0.0000	0.0000	0.0000

Combined Proportion Normal Binomials

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	255/261	237/261	250/261	230/261
1.76		230/261	245/261	242/261	245/261
3.76		257/261	225/261	244/261	247/261
7.85		263/263	213/261	236/261	215/261
12.7		0/261	0/261	0/261	0/261
17.9		0/261	0/261	0/261	0/261

CETIS Summary Report

Bivalve Larval Survival and Development Test — EcoAnalysts

Batch ID:	03-7618-7990	**Test Type:**	Development-Survival	**Analyst:**	Sarah Zischke		
Start Date:	12 Jul-23 12:57	**Protocol:**	EPA/600/R-95/136 (1995)	**Diluent:**	Laboratory Seawater		
Ending Date:	14 Jul-23 11:11	**Species:**	Mytilus galloprovincialis	**Brine:**	Crystal Sea Marine Mix		
Test Length:	46h	**Taxon:**	Bivalvia	**Source:**	Taylor Shellfish	**Age:**	
Sample ID:	05-5724-7846	**Code:**	P220819.68UIA	**Project:**	Reference Toxicant		
Sample Date:	19 Aug-22	**Material:**	Unionized Ammonia	**Source:**	Reference Toxicant		
Receipt Date:	19 Aug-22	**CAS (PC):**		**Station:**	P220819.68UIA		
Sample Age:	327d 13h	**Client:**	Internal Lab				

Multiple Comparison Summary

Analysis ID	Endpoint	Comparison Method	✓	NOEL	LOEL	TOEL	PMSD	S
04-0420-1427	Combined Proportion Norma	Dunnett Multiple Comparison Test		0.184	0.297	0.2338	13.0%	1

Point Estimate Summary

Analysis ID	Endpoint	Point Estimate Method	✓	Level	mg/L	95% LCL	95% UCL	S
05-2583-6446	Combined Proportion Norma	Linear Interpolation (ICPIN)		EC15	0.1956	0.1807	0.2031	1
				EC20	0.2013	0.1872	0.2084	
				EC25	0.2071	0.1938	0.2138	
				EC40	0.2246	0.2138	0.23	
				EC50	0.2364	0.2273	0.2409	

Test Acceptability

				TAC Limits			
Analysis ID	Endpoint	Attribute	Test Stat	Lower	Upper	Overlap	Decision
04-0420-1427	Combined Proportion Norma	PMSD	0.1297	<<	0.25	No	Passes Criteria

Combined Proportion Normal Summary

Conc-mg/L	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	D	4	0.9310	0.8608	1.0010	0.8812	0.9770	0.0221	0.0441	4.74%	0.00%
0.041		4	0.9215	0.8779	0.9650	0.8812	0.9387	0.0137	0.0274	2.97%	1.03%
0.088		4	0.9320	0.8504	1.0140	0.8621	0.9847	0.0256	0.0513	5.50%	-0.10%
0.184		4	0.8860	0.7495	1.0230	0.8161	1.0000	0.0429	0.0858	9.68%	4.84%
0.297		4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	---	100.00%
0.419		4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	---	100.00%

Combined Proportion Normal Detail — MD5: 1956FF9BF9B63F4A58B3D5F57A60BF07

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.9770	0.9080	0.9579	0.8812
0.041		0.8812	0.9387	0.9272	0.9387
0.088		0.9847	0.8621	0.9349	0.9464
0.184		1.0000	0.8161	0.9042	0.8238
0.297		0.0000	0.0000	0.0000	0.0000
0.419		0.0000	0.0000	0.0000	0.0000

Combined Proportion Normal Binomials

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	255/261	237/261	250/261	230/261
0.041		230/261	245/261	242/261	245/261
0.088		257/261	225/261	244/261	247/261
0.184		263/263	213/261	236/261	215/261
0.297		0/261	0/261	0/261	0/261
0.419		0/261	0/261	0/261	0/261

CETIS Test Data Worksheet

Bivalve Larval Survival and Development Test — EcoAnalysts

Start Date:	12 Jul-23 12:57	**Species:**	Mytilus galloprovincialis	**Sample Code:**	P220819.68
End Date:	14 Jul-23 11:11	**Protocol:**	EPA/600/R-95/136 (1995)	**Sample Source:**	Reference Toxicant
Sample Date:	19 Aug-22	**Material:**	Total Ammonia	**Sample Station:**	P220819.68

Conc-mg/L	Code	Rep	Pos	Initial Density	Final Density	# Counted	# Normal	Notes
0	D	1	4	261	265	265	255	
0	D	2	6	261	245	245	237	
0	D	3	12	261	272	272	250	
0	D	4	16	261	241	241	230	
1.76		1	9	261	250	250	230	
1.76		2	19	261	264	264	245	
1.76		3	5	261	255	255	242	
1.76		4	10	261	261	261	245	
3.76		1	2	261	263	263	257	
3.76		2	11	261	243	243	225	
3.76		3	7	261	260	260	244	
3.76		4	22	261	256	256	247	
7.85		1	17	261	275	275	263	
7.85		2	8	261	232	232	213	
7.85		3	3	261	256	256	236	
7.85		4	15	261	233	233	215	
12.7		1	14	261	253	253	0	
12.7		2	24	261	249	249	0	
12.7		3	1	261	263	263	0	
12.7		4	13	261	240	240	0	
17.9		1	21	261	257	257	0	
17.9		2	18	261	253	253	0	
17.9		3	20	261	241	241	0	
17.9		4	23	261	266	266	0	

CETIS Test Data Worksheet

Bivalve Larval Survival and Development Test — EcoAnalysts

Start Date:	12 Jul-23 12:57	**Species:**	Mytilus galloprovincialis	**Sample Code:**	P220819.68UIA
End Date:	14 Jul-23 11:11	**Protocol:**	EPA/600/R-95/136 (1995)	**Sample Source:**	Reference Toxicant
Sample Date:	19 Aug-22	**Material:**	Unionized Ammonia	**Sample Station:**	P220819.68UIA

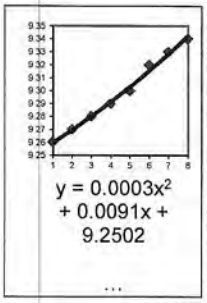
Conc-mg/L	Code	Rep	Pos	Initial Density	Final Density	# Counted	# Normal	Notes
0	D	1	7	261	265	265	255	
0	D	2	18	261	245	245	237	
0	D	3	22	261	272	272	250	
0	D	4	24	261	241	241	230	
0.041		1	13	261	250	250	230	
0.041		2	3	261	264	264	245	
0.041		3	21	261	255	255	242	
0.041		4	20	261	261	261	245	
0.088		1	5	261	263	263	257	
0.088		2	19	261	243	243	225	
0.088		3	10	261	260	260	244	
0.088		4	1	261	256	256	247	
0.184		1	16	261	275	275	263	
0.184		2	11	261	232	232	213	
0.184		3	4	261	256	256	236	
0.184		4	17	261	233	233	215	
0.297		1	12	261	253	253	0	
0.297		2	8	261	249	249	0	
0.297		3	23	261	263	263	0	
0.297		4	2	261	240	240	0	
0.419		1	9	261	257	257	0	
0.419		2	15	261	253	253	0	
0.419		3	14	261	241	241	0	
0.419		4	6	261	266	266	0	

Un-ionized Ammonia Calculator

CLIENT:	Jacobs Wyckoff	Date of Test:	July 12, 2023
PROJECT:	WEH-031Z	Test Type:	*Mytilus galloprovincialis*
COMMENTS:	P220819.68		

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

Ionic strength	pKa^s
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)*	*pKa^s*		NH_3U (mg/L)
	Target / Sample Name		Actual	Actual	Actual	Actual	Calculated	Calculated		**Calculated**
	Example 3.5		2.000	10.0	7.5	5.0	278.15	9.2520		**0.008**
1										
2	1.5		1.76	30	7.9	16.7	289.85	9.2559		**0.041**
3	3		3.76	30	7.9	16.7	289.85	9.2559		**0.088**
4	6		7.85	30	7.9	16.7	289.85	9.2559		**0.184**
5	12		12.7	30	7.9	16.7	289.85	9.2559		**0.297**
6	18		17.9	30	7.9	16.7	289.85	9.2559		**0.419**
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QA ✓ MMM

48 Hour Bivalve Development Reference Toxicant Test

Test ID: P220819.68	Replicates: 4	Study Director: M. Seibert	Location: Inc. 1
Dilution Water Batch: FSW071123.01	Organism Batch: TS062723 & TS060623	Associated Test(s): Jacobs Wyckoff	Organism: M. sp.
Chamber Size/Type: 30 ml shell vial	Exposure Volume: 10 ml		
Toxicant: Ammonium Chloride		Date Prepared: @ 12 7/11/23	Initials: NB
Target Concentrations: **See spiking worksheet**		Quantity of Stock: Target: See spiking worksheet	Quantity of Diluent: Target: 250 mL
See spiking worksheet		Actual: See spiking worksheet	Actual: 200 mL

SPAWNING DATA

Initial Spawning Time: 0856	Final Spawning Time: 0930	Fertilization Time: 0930	No. of Females: 5	No. of Males: 2
Embryo Density (count/mL):	1. 137	2. 147	3. —	Mean: 142

Stocking Volume Calculation: 142 x 100 = 14200, 2700/14200 = 0.19, 40 x 0.19 = (7.61) eggs, 40 - 7.61 = (32.39) FSW

0 Hours	Date: 7/12	WQ Time: 1256	Start Time: 1257	Initials: NL

STOCK

	Control	1.5	3	6	12	18
D.O. (%) (>4.0 mg/L)	8.1	8.0	8.0	8.1	8.0	8.0
Temperature (16 ± 1°C)	16.7	16.7	16.7	16.7	16.7	16.7
Salinity (30 ± 2 ppt)	30	30	30	30	30	30
pH (6-9)	7.9	7.9	7.9	7.9	7.9	7.9
Meter #	8	8	8	8	8	8

Day 1	Temperature (16 ± 1°C)	15.7	Meter #	T76	Initials: SR
Day 2	Date: 7/14/23	WQ Time: 1052 MS		End Time: 1111	Initials: MS
		Formalin Lot #: 220304-50		Rose Bengal Lot #: 5135	

STOCK

	Control	1.5	3	6	12	18
D.O. (%) (>4.0 mg/L)	8.1	8.1	8.1	8.1	8.0	8.0
Temperature (16 ± 1°C)	16.1	15.5	16.1	16.1	16.4	16.5
Salinity (30 ± 2 ppt)	30	31	31	31	31	31
pH (6-9)	8.1	8.0	8.0	8.0	8.0	8.0
Meter #	7	7	7	7	7	7

©IE-SZ 7/12/23

48 Hour Bivalve Development Reference Toxicant Test

P220819.68

Conc.	Rep	Number Normal	Number Abnormal	Date	Initials	
Control	1	① ~~255~~	10	7/20/23	SZ	
	2	237	8	7/20/23	SZ	
	3	250	22	7/20/23	SZ	
	4	230	11	7/21/23	MK	
1.5	1	230	20	7/21/23	MK	②
	2	245	19	7/21/23	MK	
	3	242	13	7/21/23	MK	
	4	245	16	7/21/23	MK	
3	1	257	6	7/21/23	MK	
	2	225	18	7/21/23	MK	
	3	244	16	7/21/23	MK	
	4	247	9	7/21/23	MK	
6	1	263	12	7/21/23	MK	
	2	213	19	7/21/23	MK	③
	3	236	20	7/21/23	MK	
	4	215	18	7/21/23	MK	
12	1	0	253	7/21/23	MK	
	2	0	249	7/21/23	MK	
	3	0	263	7/21/23	MK	
	4	0	240	7/21/23	MK	
18	1	0	257	7/21/23	MK	
	2	0	253	7/21/23	MK	
	3	0	241	7/21/23	MK	④
	4	0	266	7/21/23	MK	

Stocking Density

Rep	Count	Init.
1	264	NL
2	246	NL
3	276	NL
4	254	NL
5	271	NL
6	256	NL
Mean:	261	

①IE-SZ 7/20/23

②QA: 230N, 23A, 230/250 = 0.92, 230/253 = 0.91, % diff = 1.1 - SZ 7/25/23

③QA: 214N, 20A, 213/232 = 0.92, 214/234 = 0.91 % diff = 0.4 - SZ 7/25/23

④QA: 0N, 240A. 0/241 = 0, 0/240 = 0 % diff = 0 - SZ 7/26/23

Ammonia Reference Toxicant
Spiking Worksheet

Reference Toxicant ID: P220819.68
Date Prepared: 7/11/23
Technician Initials: ~~AB~~ NL (1)

Biv / Echino NH_3 RT

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

Date: 7/6/2023
Measurement: 7646.666667

Test Solutions			Volume of stock to reach desired concentration	
Measured Concentration	**Desired Concentration**	**Volume**		
mg/L	mg/L	mL	mL stock to increase	
0.00	0		[redacted]	SALT WATER
~~2.18~~ ~~1.72~~ (1) ~~2~~	1.76 **1.5**	200		**0.059**
~~2.80~~ (1)	3.76 **3**	200		**0.118**
~~5.10~~ (1)	7.85 **6**	200		**0.235**
~~13.7~~ (1)	12.7 **12**	200		**0.471**
~~19.8~~ (1)	17.9 **18**	200		**0.706**

(1) IE-NL 7/12

APPENDIX B

CHAIN-OF-CUSTODY, SAMPLE RECEIPT FORMS, AND ORGANISM RECEIPT FORMS

EcoAnalysts Inc. (REGION COPY)
DateShipped: 7/11/2023
CarrierName: EcoAaylists (hand delivery)
AirbillNo:

Jacobs, Wyckoff-
Wyckoff Eagle Harbor GWTP 2023/WA
Project Code: WEH-031Z
Cooler #: 1 of 1

No: 10-071123-103825-0710
IFD10W2LA0010PXTSDDD2
Contact Name: Daniel Baca
Contact Phone: 661-313-3807

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	Sample Type
071123		Ground Water/ D. Baca	Composite	CHRTOX(8 Weeks)	N (1)	SP-11	07/11/2023 01:10	Field Sample

Special Instructions: 2023 Week 28-Q3 Bioassay Sample

Shipment for Case Complete? N

Samples Transferred From Chain of Custody #

Analysis Key: CHRTOX=Chronic Toxicity

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	JACOBS	7-11-23 1100	EcoAnalysts	7/11/23 1100	6.0 °C Lab ID: P230711.01

SAMPLE RECEIPT

Client:	Client ID:	Lab ID:	Renewals:	
Jacobs	071123	P230711.01		
Project:				
WEA-0317				
Date/Time Received:		7/11/23 1100		
Airbill #:		NA		
Shipper Tracking Information Kept for Records: (Y/N/NA)		NA		
Collection Date/Time:		7/11/23 0110		
Sample Holding Time (must be ≤36 hours at test initiation)		✓		
Condition of Shipping Container:		Good		
Type and Capacity of Sample Container:		4L cubi		
Total Sample Volume (L):		4L		
Condition of Sampling Container:		Good		
Sample Container Appropriate: (Y/N)		Y		
Custody Seals Intact: (Intact/Broken/Not Present)		Intact		
Frozen Wet or Blue Ice Present During Shipment/Transport: (Y/N)		Y		
Sampler's Name Present on COC Form: (Print Name/Not Present)		Daniel Baca		
Color:		Clear		

TAKE THE FOLLOWING MEASUREMENTS UPON ARRIVAL

LAB ID	Meter #	Temp. (°C) (0-6°C) *	Meter #	Dissolved Oxygen (mg/L)	Meter #	pH	Meter #	Cond. (µS/cm)	Meter #	Sal. (ppt)	Hardness (mg $CaCO_3$/L)	Alkalinity (mg $CaCO_3$/L)	Total Chlorine (mg/L)	Total NH3 (mg/L)	Tech
P230711.01	9	6.0	9	6.6	9	7.5	9	939	9	0.5	—	—	ND	0.190	JL

*Notify project manager or study director of temperatures above 6°C or ≥36 hours holding time. Client must be notified ASAP.

If there are sample receipt problems, complete the following:	
Reason for unacceptability:	
Name of Client Contact:	Contacted by:
Client Response and/or Action to be Taken:	Date Action Taken:

ORGANISM RECEIPT LOG

Date:	Time:	Batch No.
6/6/23	1545	TS060623.01

Organism: M. sp.

Source / Supplier: Taylor Shellfish

No. Ordered:	No. Received:	Source Batch: Collection date, hatch date, etc.):
–	10lbs	Harvest: 6/6/23

Condition of Organisms:	Approximate Size or Age: (Days from hatch, life stage, size class, etc.):
Good	mixed ages
Shipper: Courier	**B of L (Tracking No.)** Courier
Condition of Container: Good	**Received By:** M. Seibert

Container	D.O. (mg/L)	Temp. (°C)	Cond. or Sal. (Include Units)	pH (Units)	# Dead	% Dead*	Tech. (Initials)
1	①	①	①	①	–	–	MS

*if >10% contact lab manager

Notes:

① rcvd dry - MS 6/6/23

TAYLOR SHELLFISH FARMS

SE 130 LYNCH RD, SHELTON WA 98584
PHONE # : (360) 426-6178
WASHINGTON STATE CERTIFICATE NUMBER

Harvest Hour	11 a.m.
Harvest Minute	30
Refer Date	
Refer Hour	
Refer Minute	

HARVEST DATE: 6/6/03

HARVEST AREA: [ ] [ ] Goldsborough Cove

HARVEST ITEM: [ ] [ ] Mac York

Dept ID: Tahuya 24

FARM CODE: M127

QUANTITY: 10

[ ] Dozens [ ] Tubs
[x] Pounds [ ] Sacks

All Shellstock containers in this lot have the same harvest data and area of harvest

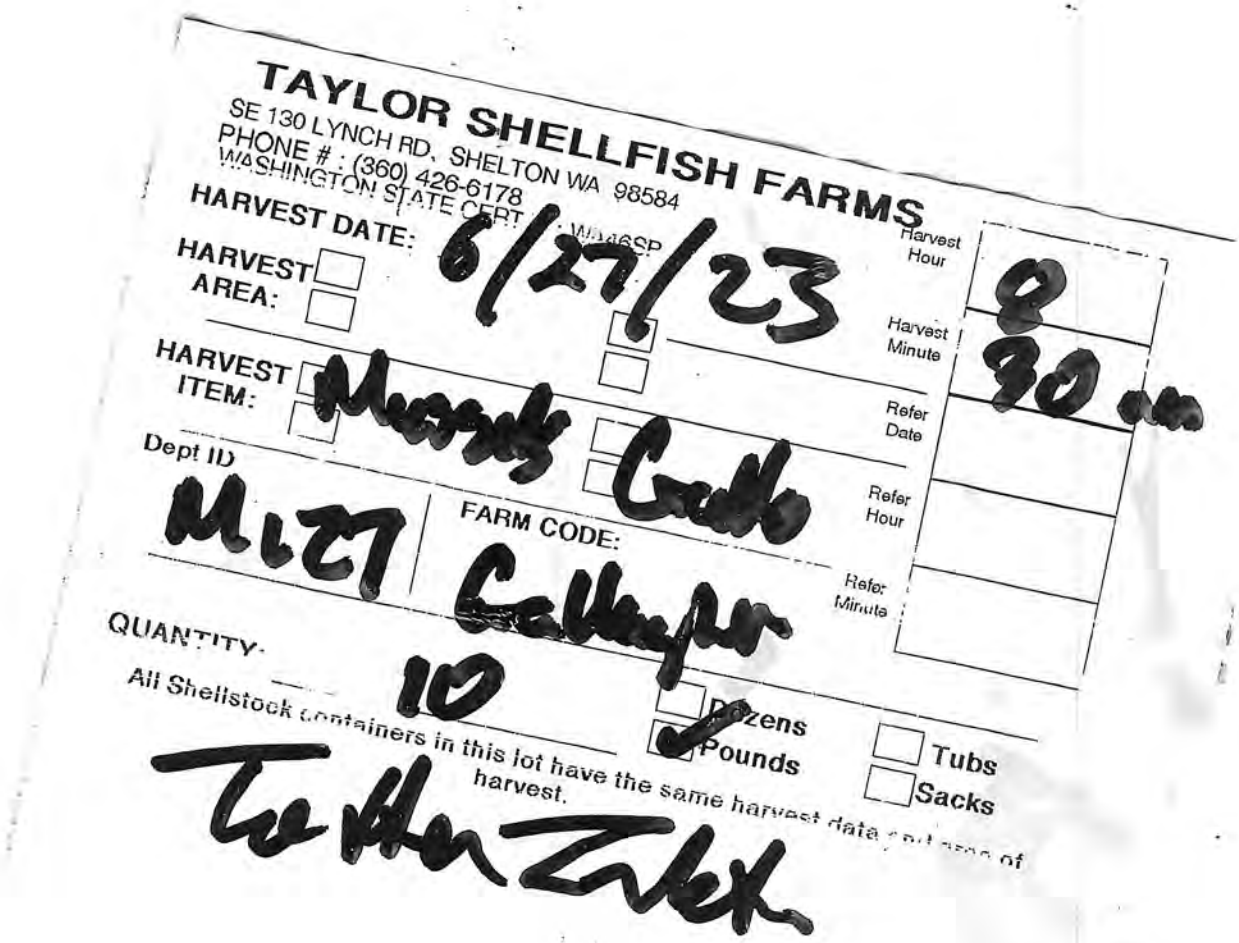
ORGANISM RECEIPT LOG

Date: 6/27/23	Time: 1415	Batch No. TS062723
Organism: Mytilus galloprovincialis		
Source / Supplier: Taylor Shellfish		
No. Ordered: 10 lbs	No. Received: 10 lbs	Source Batch: Collection date, hatch date, etc.): Collected 6/27
Condition of Organisms: Good	Approximate Size or Age: (Days from hatch, life stage, size class, etc.): Adult	
Shipper: Courier	B of L (Tracking No.) NA	
Condition of Container: Good	Received By: [illegible]	

Container	D.O. (mg/L)	Temp. (°C)	Cond. or Sal. (Include Units)	pH (Units)	# Dead	% Dead*	Tech. (Initials)
X							[illegible]

*if >10% contact lab manager

Notes: * Received on ice.



TAYLOR SHELLFISH FARMS

SE 130 LYNCH RD, SHELTON WA 98584
PHONE # : (360) 426-6178
WASHINGTON STATE CERT. # : WA46SP

HARVEST DATE: 6/27/23

HARVEST AREA:

HARVEST ITEM: Manila Gold

Dept ID: M127

FARM CODE: Gallagher

QUANTITY: 10

☐ Dozens ☑ Pounds ☐ Tubs ☐ Sacks

All Shellstock containers in this lot have the same harvest date and area of harvest.

Harvest Hour: 8

Harvest Minute: 30 ...

Refer Date:

Refer Hour:

Refer Minute:

Tag # Zlet