Wyckoff Groundwater Treatment Plant: First Quarter 2024 Bioassay Monitoring

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1. Introduction

This technical memorandum summarizes information obtained from the first quarter 2024 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 substantive condition as presented in the site's Record of Decision (EPA 2000), hereinafter referred to as "substantive condition".

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 substantive condition.

The current substantive condition does not include effluent limits for chronic toxicity. Chronic toxicity testing was conducted on the effluent samples per the requirements outlined in the substantive condition. The current substantive condition does not include specific dilution series for chronic toxicity tests. For the mussel larvae chronic toxicity testing conducted during the first quarter 2024 sampling event, 69.7 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).

Due to the recent toxicity observed in the highest test concentrations for the mussel larvae chronic toxicity testing, concurrent tests were conducted (one test using artificial salts and the other test using HSB) during the first quarter 2024 sampling event to evaluate potential toxicity for undiluted sample (i.e. salts) while maintaining comparability of results from this quarter to previous test results (i.e. HSB). 69.7 percent effluent is the highest concentration tested using the HSB for the first quarter 2024 testing.

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 substantive condition does not include effluent limit for chronic toxicity. The chronic toxicity test requirement section of the substantive condition (Section II.8) specifies the following:

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

"*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.

2. Sampling and Analysis Results

Biomonitoring samples were collected per the monitoring frequency included in the substantive condition. Samples were collected from a 24-hr. autosampler collection point at the effluent tank of the treatment system. Water samples were collected on January 30, 2024. Chemical testing was conducted on a split of each sample collected for bioassay testing per the substantive condition 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	P240130.03	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 69.7 percent (the highest concentration tested) of the effluent concentration and a chronic toxic unit of 1.4 for both endpoints. The Effect Concentration expected to affect 50 percent of the organisms (EC50) is greater than 100 percent and 69.7 percent of the effluent concentration, respectively for the salt and HSB adjusted samples, respectively.

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:

(1) 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 was requested in May 2023 after these samples were collected and analyzed.

(2) Replicate 3 of the 6.25% effluent concentration in the brine test was removed from statistical analysis because the vial was compromised from potential contamination. Test data is considered usable because no statistically significant biological response of the test organisms was not detected at any of the test concentrations.

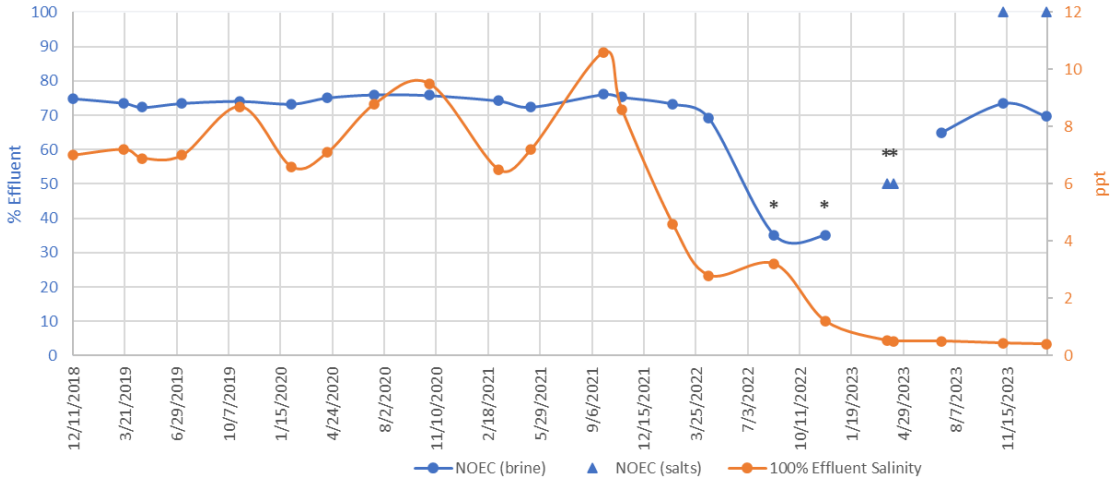
(3) No significant differences were observed between the laboratory (dilution water) control and brine control indicating that the addition of hypersaline brine did not contribute to any negative biological effects. There was a significant difference between the laboratory (dilution water) control and artificial salts control. Test data is considered usable because both the laboratory (dilution water) control and artificial salts control met EPA test acceptability criteria. In addition, there was no effect in any of the test concentrations, artificial salts did not contribute to any negative biological effects.

4. Trends

A review of bioassay data collected from 2007 through the first quarter of 2024 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.

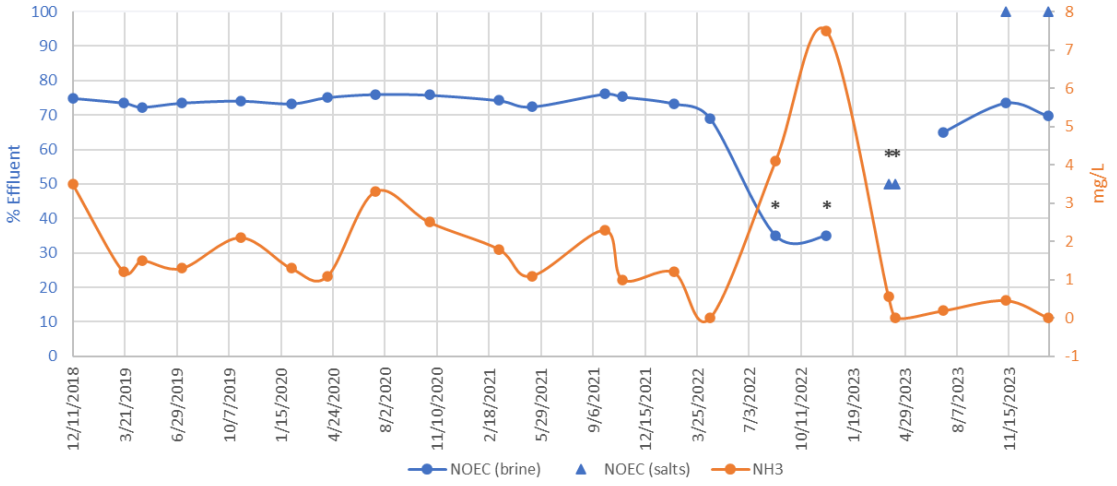
Figure 1 shows the bivalve chronic bioassay NOEC and salinity for the 100 percent effluent samples from December 2018 through January 2024. NOEC for bivalve chronic bioassay tests conducted prior to December 2018 were 70 percent. Hypersaline brine (HSB) with a fixed concentration was used for the salinity 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. For the first quarter of 2024, concurrent tests were conducted (one test using artificial salts and the other test using HSB) for the split samples (see Figure 1 for NOEC for samples with salinity adjustment using brine and salts). 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 seven 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- Jan 2024)



* 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- Jan 2024)



* Statistically significant effect detected in the maximum test concentration

5. Overall Assessment

While the current substantive condition 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 substantive condition, 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.

Due to the deviation of the QAPP quality control requirement for the artificial salts control for the mussel larvae chronic toxicity test, CH2M recommends continued concurrent mussel chronic bioassay testing using both artificial salt and brine for salinity adjustments in 2024 Q2. The following lists the recommended test dilution series:

Brine
Maximum test concentration, 50%, 25%, 12.5%, 6.25%, and control

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

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.

EPA. 2000. *Record of Decision: Wyckoff/Eagle Harbor Superfund Site Soil and Groundwater Operable Units, Bainbridge Island, Washington*. EPA/ROD/R10-00/047. U.S. Environmental Protection Agency Region 10, Seattle, WA.

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

TOXICITY TESTING RESULTS

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

NPDES TOXICITY TESTING: 1ST QUARTER 2024

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EcoAnalysts Report ID: PG1958Q1.01

Submittal Date: February 23, 2024

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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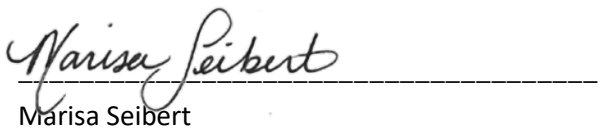

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TABLES

APPENDICES

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.

The bivalve development was conducted as a side-by-side test, with one aliquot of effluent sample adjusted to test salinity with hypersaline brine, and another aliquot adjusted with artificial salts.

A statistically significant biological response of the test organisms was not detected at the 69.7% (brine, highest concentration achievable) and 100% (salt) effluent sample concentrations, 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 - Brine	*Mytilus galloprovincialis* 48-Hour Proportion Survived	69.7	>69.7	>69.7
	Mytilus galloprovincialis 48-Hour Proportion Normal	69.7	>69.7	>69.7
Chronic - Salt	*Mytilus galloprovincialis* 48-Hour Proportion Survived	100	>100	>100
	Mytilus galloprovincialis 48-Hour Proportion Normal	100	>100	>100

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 two samples on January 30, 2024, which were used to conduct the Bivalve Survival and Development side-by-side test. The samples were transported by EcoAnalysts personnel and received at the laboratory on the same day as collection. The sample temperatures upon receipt were 5.6°C and was 6.2°C. Both samples were within the recommended temperature range since they were received within 4 hours of collection. Samples were composited and used for testing.

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	24052146_1
Laboratory ID	P240130.03
Date/Time sampled	01/30/24; 0935
Date/Time received	01/30/24; 1154
Dissolved Oxygen (mg/L) Recommended: >4.0 mg/L	9.2
Temperature (°C) Recommended: 0 – 6°C	5.6 – 6.2
pH (units) Recommended: 6 – 9	7.5
Conductivity (µS/cm)	798
Salinity (ppt)	0.4
Total Chlorine (mg/L)	0.01
Total Ammonia (mg/L)	0.00

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 December 15, 2023. They were delivered via Taylor Shellfish personnel and maintained under ambient seawater flow-through conditions at 12 ± 3˚C until utilized for testing. Water quality measurements were collected from transport containers and 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 24052146_1 was received at a salinity of 0.4 ppt. The salinity of the effluent sample was increased by the addition of Crystal Sea® MarineMix bioassay grade artificial salt for the salt portion of the side-by-side bivalve test. A separate aliquot was adjusted to the desired test salinity using hypersaline brine for the other half of the side-by-side bivalve test. Table 2-3 summarizes the salinity adjustments performed on the project sample in relation to marine test species.

An artificial salt control sample was created to evaluate any potential negative impacts to the test organisms from the salinity adjustment alone. This sample was designated “Salt Control”. 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	Test	Sample Salinity Upon Receipt	Sample Salinity Adjustment (ppt)	Salinity Adjustment Media
24052146_1: Collected 1/30/24	*Mytilus galloprovincialis* 48-Hour Survival and Development	0.4 ppt	30 ± 2	Hypersaline Brine
				Artificial Salt

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 January 30, 2024, with sample 24052146_1. The test was conducted as a side-by-side exposure with one aliquot of sample adjusted to test salinity with hypersaline brine and a second aliquot adjusted with artificial salts. Both tests met EPA test acceptability criteria of ≥90% proportion normal, ≥50% proportion survived, and <25% Percent Minimum Significant Difference (PMSD). The test conducted with hypersaline brine resulted in 96.7% proportion survived, 94.6% proportion normal, and 2.6% PMSD for proportion normal in the laboratory control. The test conducted with artificial salts resulted in 96.7% proportion survived, 94.4% proportion normal, and 2.5% PMSD for proportion normal in the laboratory control. Mean survival and proportion normal are summarized in Table 3-1 (brine) and Table 3-2 (salt). The test conditions are summarized in Table 3-3.

Concentrations of 6.25, 12.5, 25, 50, and 69.7% effluent were prepared utilizing laboratory water. A 100% test concentration was also included for the test with artificial salts. Sample P240130.03 (received 1/30/24) was used for test initiation. Water quality parameters were within the acceptable limits throughout the duration of the 48-hour static test. Replicate 3 of the 6.25% effluent concentration in the brine test was removed from statistical analysis because the vial was compromised.

No significant differences were observed between the laboratory (dilution water) control and brine control indicating that the addition of hypersaline brine did not contribute to any negative biological effects. There was a significant difference between the laboratory (dilution water) control and artificial salts control. However, since there wasn't an effect in any of the test concentrations, artificial salts did not contribute to any negative biological effects.

The EC_{50} for the ammonia reference toxicant test was 9.2 mg/L total ammonia and was within two standard deviations of the laboratory mean (Table 3-3) 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 (Brine)

Conc. (%)	Mean Proportion Survived (%)	Standard Deviation	NOEL (%)	LOEL (%)	EC_{50} Value (%)
Control	96.7	4.1	69.7	>69.7	>69.7
Brine Control	98.8	2.5			
6.25	100	0.0			
12.5	99.5	1.0			
25	96.9	2.9			
50	96.8	6.5			
69.7	96.6	4.1			
Conc. (%)	**Mean Proportion Normal (%)**	**Standard Deviation**	**NOEL (%)**	**LOEL (%)**	**EC_{50} Value (%)**
Control	94.6	1.0	69.7	>69.7	>69.7
Brine Control	93.6	1.5			
6.25	93.8	0.5			
12.5	93.6	1.8			
25	93.2	1.3			
50	95.1	0.7			
69.7	94.7	1.9			

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. Results Summary for *Mytilus galloprovincialis* Embryo Development Test (Salt)

Conc. (%)	Mean Proportion Survived (%)	Standard Deviation	NOEL (%)	LOEL (%)	EC_{50} Value (%)
Control	96.7	3.6	100	>100	>100
Salt Control	100	0.0			
6.25	96.6	1.1			
12.5	98.0	2.6			
25	98.0	2.3			
50	97.5	2.9			
69.7	96.4	4.2			
100	97.0	2.9			
Conc. (%)	**Mean Proportion Normal (%)**	**Standard Deviation**	**NOEL (%)**	**LOEL (%)**	**EC_{50} Value (%)**
Control	94.4	1.1	100	>100	>100
Salt Control	92.1	1.9			
6.25	93.9	0.7			
12.5	92.5	2.2			
25	94.7	0.7			
50	93.8	1.2			
69.7	94.5	0.5			
100	95.1	1.8			

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

Test Duration / Type	**48-Hour; Static**	
Species	*Mytilus galloprovincialis*	
Supplier	Taylor Shellfish	
Date acquired	12/15/23	
Test Dates	1/30/24 – 2/1/24	
Age at test initiation Recommended: <4-hour embryos	<4 hours	
Sample(s) used:	24052146_1; P240130.03	
Holding Time at Initiation: Recommended: < 36 hours	7 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: 262
Replicates/treatment	4	
Concentration/treatment	6.25, 12.5, 25, 50, and 69.7% (brine) 6.25, 12.5, 25, 50, 69.7 and 100% (salt)	
Feeding	None	
Test solution renewal	None	
Test Water Quality		
Test Dissolved Oxygen	Recommended: > 4.0 mg/L	Actual: 7.7 – 8.7 mg/L (brine), 7.8 – 8.1 mg/L (salt)
Test Temperature	Recommended: 16 ± 1°C	Actual: 15.3 – 17.3 °C (brine), 15.5 – 17.4 °C (salt)
Test pH	Recommended: 7 – 9	Actual: 7.6 – 8.2 (brine), 7.6 – 8.3 (salt)
Test Salinity	Recommended: 30 ± 2 ppt	Actual: 28 – 29 ppt (brine), 28 – 30 ppt (salt)
Control performance standard (Survival, Normal shell development, PMSD)	Recommended: ≥50% survival, ≥90% normal development, <25% PMSD	Actual: Brine: 96.7% survival, 94.6% normal development, 2.6% PMSD; Salt: 96.7% survival, 94.4% normal development, 2.5% PMSD
Reference Toxicant Date	1/30/24	
Reference Toxicant EC_{50}	9.2 mg/L total ammonia	
Laboratory Mean EC_{50}	7.1 mg/L total ammonia	
Acceptable Range EC_{50} (± 2 SD)	3.9 – 12.9 mg/L total ammonia (within range)	
Deviations from Test Protocol	Brine 6.25% Replicate 3 removed from analysis	

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:	13-6318-1280	**Test Type:**	Development-Survival	**Analyst:**	Danielle Mulligan
Start Date:	30 Jan-24 16:10	**Protocol:**	EPA/600/R-95/136 (1995)	**Diluent:**	Laboratory Seawater
Ending Date:	01 Feb-24 15:21	**Species:**	Mytilus galloprovincialis	**Brine:**	Evaporated Seawater
Test Length:	47h	**Taxon:**	Bivalvia	**Source:**	Taylor Shellfish **Age:** <4hr
Sample ID:	18-6559-3037	**Code:**	P240130.03BC	**Project:**	Wyckoff Eagle Harbor GWTP 2024/W
Sample Date:	30 Jan-24 09:35	**Material:**	Treated Groundwater	**Source:**	Jacobs Wyckoff
Receipt Date:	30 Jan-24 11:54	**CAS (PC):**		**Station:**	24052146_1
Sample Age:	7h (5.6 °C)	**Client:**	Jacobs Wyckoff		

SIngle Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
08-5822-2281	Proportion Normal	Equal Variance t Two-Sample Test	0.1635	Brine Control passed proportion normal	1
13-9281-0414	Proportion Survived	Equal Variance t Two-Sample Test	0.7708	Brine Control passed proportion survived	1

Multiple Comparison Summary

Analysis ID	Endpoint	Comparison Method	✓	NOEL	LOEL	TOEL	PMSD	TU	S
16-1866-4626	Proportion Normal	Bonferroni Adj t Test		69.7	>69.7	---	2.58%	1.4	1
16-5011-6400	Proportion Survived	Bonferroni Adj t Test		69.7	>69.7	---	9.25%	1.4	1

Point Estimate Summary

Analysis ID	Endpoint	Point Estimate Method	✓	Level	%	95% LCL	95% UCL	TU	S
20-2099-4460	Proportion Normal	Linear Interpolation (ICPIN)	✓	EC25	>69.7	---	---	<1.4	1
			✓	EC50	>69.7	---	---	<1.4	
11-1031-6784	Proportion Survived	Linear Interpolation (ICPIN)	✓	EC25	>69.7	---	---	<1.4	1
			✓	EC50	>69.7	---	---	<1.4	

Test Acceptability

				TAC Limits			
Analysis ID	Endpoint	Attribute	Test Stat	Lower	Upper	Overlap	Decision
08-5822-2281	Proportion Normal	Control Resp	0.9461	0.9	<<	Yes	Passes Criteria
	Proportion Normal	Control Resp	0.9364	0.9	<<	Yes	Passes Criteria
16-1866-4626	Proportion Normal	Control Resp	0.9461	0.9	<<	Yes	Passes Criteria
20-2099-4460	Proportion Normal	Control Resp	0.9461	0.9	<<	Yes	Passes Criteria
11-1031-6784	Proportion Survived	Control Resp	0.9666	0.5	<<	Yes	Passes Criteria
13-9281-0414	Proportion Survived	Control Resp	0.9666	0.5	<<	Yes	Passes Criteria
	Proportion Survived	Control Resp	0.9876	0.5	<<	Yes	Passes Criteria
16-5011-6400	Proportion Survived	Control Resp	0.9666	0.5	<<	Yes	Passes Criteria

Proportion Normal Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	D	4	0.9461	0.9309	0.9612	0.9341	0.9564	0.0048	0.0095	1.00%	0.00%
0	BC	4	0.9364	0.9125	0.9602	0.9233	0.9517	0.0075	0.0150	1.60%	1.02%
6.25		3	0.9379	0.9263	0.9496	0.9326	0.9414	0.0027	0.0047	0.50%	0.86%
12.5		4	0.9355	0.9073	0.9637	0.9097	0.9504	0.0089	0.0177	1.90%	1.12%
25		4	0.9324	0.9111	0.9538	0.9139	0.9455	0.0067	0.0134	1.44%	1.44%
50		4	0.9513	0.9410	0.9616	0.9418	0.9561	0.0032	0.0065	0.68%	-0.56%
69.7		4	0.9472	0.9165	0.9779	0.9190	0.9627	0.0096	0.0193	2.04%	-0.13%

Proportion Survived Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	D	4	0.9666	0.9013	1.0320	0.9160	1.0000	0.0205	0.0410	4.25%	0.00%
0	BC	4	0.9876	0.9481	1.0270	0.9504	1.0000	0.0124	0.0248	2.51%	-2.17%
6.25		3	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-3.46%
12.5		4	0.9952	0.9800	1.0100	0.9809	1.0000	0.0048	0.0095	0.96%	-2.96%
25		4	0.9685	0.9219	1.0150	0.9313	1.0000	0.0147	0.0293	3.02%	-0.20%
50		4	0.9676	0.8643	1.0710	0.8702	1.0000	0.0324	0.0649	6.71%	-0.10%
69.7		4	0.9656	0.9008	1.0300	0.9198	1.0000	0.0204	0.0408	4.22%	0.10%

Bivalve Larval Survival and Development Test EcoAnalysts

Proportion Normal Detail MD5: F94D12F01CA89A5B3FA16B01601E5ECE

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.9438	0.9341	0.9564	0.9500
0	BC	0.9237	0.9233	0.9517	0.9468
6.25		0.9398	0.9414	0.9326	
12.5		0.9097	0.9416	0.9401	0.9504
25		0.9139	0.9377	0.9455	0.9325
50		0.9418	0.9530	0.9544	0.9561
69.7		0.9190	0.9544	0.9627	0.9529

Proportion Survived Detail MD5: 36D6E136B1BB4042928204B65A5D1F23

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.9504	1.0000	1.0000	0.9160
0	BC	0.9504	1.0000	1.0000	1.0000
6.25		1.0000	1.0000	1.0000	
12.5		1.0000	0.9809	1.0000	1.0000
25		0.9313	0.9809	1.0000	0.9618
50		1.0000	1.0000	1.0000	0.8702
69.7		0.9427	1.0000	0.9198	1.0000

Proportion Normal Binomials

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	235/249	255/273	263/275	228/240
0	BC	230/249	265/287	256/269	267/282
6.25		250/266	257/273	249/267	
12.5		252/277	242/257	267/284	268/282
25		223/244	241/257	260/275	235/252
50		259/275	284/298	251/263	218/228
69.7		227/247	251/263	232/241	263/276

Proportion Survived Binomials

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	249/262	262/262	262/262	240/262
0	BC	249/262	262/262	262/262	262/262
6.25		262/262	262/262	262/262	
12.5		262/262	257/262	262/262	262/262
25		244/262	257/262	262/262	252/262
50		262/262	262/262	262/262	228/262
69.7		247/262	262/262	241/262	262/262

Bivalve Larval Survival and Development Test

EcoAnalysts

Analysis ID:	16-1866-4626	**Endpoint:**	Proportion Normal	**CETIS Version:**	CETISv2.1.4
Analyzed:	22 Feb-24 12:03	**Analysis:**	Parametric-Multiple Comparison	**Status Level:**	1
Edit Date:	22 Feb-24 12:02	**MD5 Hash:**	A74253BF098E20B839E1A95914D9D385	**Editor ID:**	003-841-189-5
Batch ID:	13-6318-1280	**Test Type:**	Development-Survival	**Analyst:**	Danielle Mulligan
Start Date:	30 Jan-24 16:10	**Protocol:**	EPA/600/R-95/136 (1995)	**Diluent:**	Laboratory Seawater
Ending Date:	01 Feb-24 15:21	**Species:**	Mytilus galloprovincialis	**Brine:**	Evaporated Seawater
Test Length:	47h	**Taxon:**	Bivalvia	**Source:**	Taylor Shellfish **Age:** <4hr
Sample ID:	18-6559-3037	**Code:**	P240130.03BC	**Project:**	Wyckoff Eagle Harbor GWTP 2024/W
Sample Date:	30 Jan-24 09:35	**Material:**	Treated Groundwater	**Source:**	Jacobs Wyckoff
Receipt Date:	30 Jan-24 11:54	**CAS (PC):**		**Station:**	24052146_1
Sample Age:	7h (5.6 °C)	**Client:**	Jacobs Wyckoff		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	Tox Units	MSDu	PMSD
Angular (Corrected)	C > T	69.7	>69.7	---	1.4	0.02439	2.58%

Bonferroni Adj t Test

Control	vs	Conc-%	df	Test Stat	Critical	MSD	P-Type	P-Value	Decision(α:5%)
Dilution Water		6.25	5	0.8519	2.567	0.05392	CDF	1.0000	Non-Significant Effect
		12.5	6	1.105	2.567	0.04992	CDF	0.7112	Non-Significant Effect
		25	6	1.457	2.567	0.04992	CDF	0.4082	Non-Significant Effect
		50	6	-0.6003	2.567	0.04992	CDF	1.0000	Non-Significant Effect
		69.7	6	-0.2313	2.567	0.04992	CDF	1.0000	Non-Significant Effect

Test Acceptability Criteria

		TAC Limits			
Attribute	Test Stat	Lower	Upper	Overlap	Decision
Control Resp	0.9461	0.9	<<	Yes	Passes Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0051046	0.0010209	5	1.35	0.2914	Non-Significant Effect
Error	0.012858	0.0007564	17			
Total	0.0179626		22			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variance	Bartlett Equality of Variance Test	5.335	15.09	0.3764	Equal Variances
	Levene Equality of Variance Test	1.132	4.336	0.3812	Equal Variances
	Mod Levene Equality of Variance Test	0.3019	4.437	0.9046	Equal Variances
Distribution	Anderson-Darling A2 Test	1.077	3.878	0.0081	Non-Normal Distribution
	D'Agostino Kurtosis Test	0.9658	2.576	0.3341	Normal Distribution
	D'Agostino Skewness Test	2.107	2.576	0.0351	Normal Distribution
	D'Agostino-Pearson K2 Omnibus Test	5.372	9.21	0.0681	Normal Distribution
	Kolmogorov-Smirnov D Test	0.2114	0.2097	0.0090	Non-Normal Distribution
	Shapiro-Wilk W Normality Test	0.9021	0.88	0.0280	Normal Distribution

Proportion Normal Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	4	0.9461	0.9309	0.9612	0.9469	0.9341	0.9564	0.0048	1.00%	0.00%
6.25		3	0.9379	0.9263	0.9496	0.9398	0.9326	0.9414	0.0027	0.50%	0.86%
12.5		4	0.9355	0.9073	0.9637	0.9409	0.9097	0.9504	0.0089	1.90%	1.12%
25		4	0.9324	0.9111	0.9538	0.9351	0.9139	0.9455	0.0067	1.44%	1.44%
50		4	0.9513	0.9410	0.9616	0.9537	0.9418	0.9561	0.0032	0.68%	-0.56%
69.7		4	0.9472	0.9165	0.9779	0.9536	0.9190	0.9627	0.0096	2.04%	-0.13%

Bivalve Larval Survival and Development Test EcoAnalysts

Analysis ID:	16-1866-4626	**Endpoint:**	Proportion Normal	**CETIS Version:**	CETISv2.1.4
Analyzed:	22 Feb-24 12:03	**Analysis:**	Parametric-Multiple Comparison	**Status Level:**	1
Edit Date:	22 Feb-24 12:02	**MD5 Hash:**	A74253BF098E20B839E1A95914D9D385	**Editor ID:**	003-841-189-5

Angular (Corrected) Transformed Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	4	1.3370	1.3040	1.3700	1.3380	1.3110	1.3600	0.0105	1.57%	0.00%
6.25		3	1.3190	1.2950	1.3430	1.3230	1.3080	1.3260	0.0056	0.73%	1.34%
12.5		4	1.3160	1.2600	1.3710	1.3250	1.2660	1.3460	0.0174	2.64%	1.61%
25		4	1.3090	1.2670	1.3500	1.3130	1.2730	1.3350	0.0131	2.00%	2.12%
50		4	1.3490	1.3250	1.3720	1.3540	1.3270	1.3600	0.0073	1.09%	-0.87%
69.7		4	1.3420	1.2760	1.4070	1.3540	1.2820	1.3760	0.0205	3.05%	-0.34%

Proportion Normal Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.9438	0.9341	0.9564	0.9500
6.25		0.9398	0.9414	0.9326	
12.5		0.9097	0.9416	0.9401	0.9504
25		0.9139	0.9377	0.9455	0.9325
50		0.9418	0.9530	0.9544	0.9561
69.7		0.9190	0.9544	0.9627	0.9529

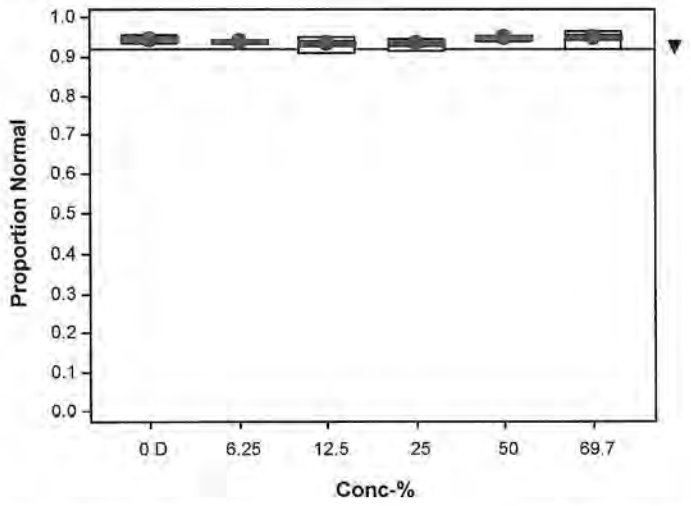
Angular (Corrected) Transformed Detail

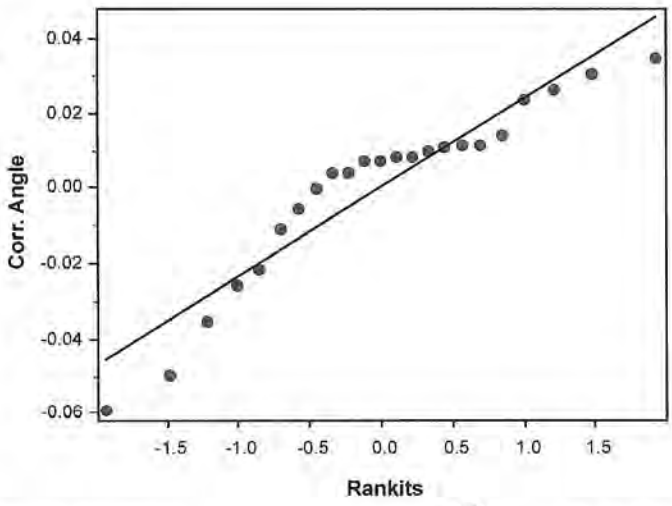
Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	1.3310	1.3110	1.3600	1.3450
6.25		1.3230	1.3260	1.3080	
12.5		1.2660	1.3270	1.3240	1.3460
25		1.2730	1.3190	1.3350	1.3080
50		1.3270	1.3520	1.3560	1.3600
69.7		1.2820	1.3560	1.3760	1.3520

Proportion Normal Binomials

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	235/249	255/273	263/275	228/240
6.25		250/266	257/273	249/267	
12.5		252/277	242/257	267/284	268/282
25		223/244	241/257	260/275	235/252
50		259/275	284/298	251/263	218/228
69.7		227/247	251/263	232/241	263/276

Graphics





Bivalve Larval Survival and Development Test EcoAnalysts

Analysis ID:	08-5822-2281	**Endpoint:**	Proportion Normal	**CETIS Version:**	CETISv2.1.4
Analyzed:	22 Feb-24 12:05	**Analysis:**	Parametric-Two Sample	**Status Level:**	1
Edit Date:	22 Feb-24 12:02	**MD5 Hash:**	BE57D742474734BD8D48921A36256946	**Editor ID:**	003-841-189-5
Batch ID:	13-6318-1280	**Test Type:**	Development-Survival	**Analyst:**	Danielle Mulligan
Start Date:	30 Jan-24 16:10	**Protocol:**	EPA/600/R-95/136 (1995)	**Diluent:**	Laboratory Seawater
Ending Date:	01 Feb-24 15:21	**Species:**	Mytilus galloprovincialis	**Brine:**	Evaporated Seawater
Test Length:	47h	**Taxon:**	Bivalvia	**Source:**	Taylor Shellfish **Age:** <4hr
Sample ID:	18-6559-3037	**Code:**	P240130.03BC	**Project:**	Wyckoff Eagle Harbor GWTP 2024/W
Sample Date:	30 Jan-24 09:35	**Material:**	Treated Groundwater	**Source:**	Jacobs Wyckoff
Receipt Date:	30 Jan-24 11:54	**CAS (PC):**		**Station:**	24052146_1
Sample Age:	7h (5.6 °C)	**Client:**	Jacobs Wyckoff		

Data Transform	Alt Hyp	Comparison Result	PMSD
Angular (Corrected)	C > T	Brine Control passed proportion normal endpoint	1.82%

Equal Variance t Two-Sample Test

Control I	vs	Control II	df	Test Stat	Critical	MSD	P-Type	P-Value	Decision(α:5%)
Dilution Water		Brine Control	6	1.067	1.943	0.0363	CDF	0.1635	Non-Significant Effect

Test Acceptability Criteria

		TAC Limits			
Attribute	**Test Stat**	**Lower**	**Upper**	**Overlap**	**Decision**
Control Resp	0.9461	0.9	<<	Yes	Passes Criteria
Control Resp	0.9364	0.9	<<	Yes	Passes Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0007948	0.0007948	1	1.139	0.3270	Non-Significant Effect
Error	0.0041879	0.000698	6			
Total	0.0049827		7			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variance	Levene Equality of Variance Test	3.624	13.75	0.1056	Equal Variances
	Mod Levene Equality of Variance Test	3.327	13.75	0.1180	Equal Variances
	Variance Ratio F Test	2.183	47.47	0.5378	Equal Variances
Distribution	Anderson-Darling A2 Test	0.5108	3.878	0.2001	Normal Distribution
	Kolmogorov-Smirnov D Test	0.2304	0.3313	0.2686	Normal Distribution
	Shapiro-Wilk W Normality Test	0.8677	0.6451	0.1431	Normal Distribution

Proportion Normal Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	BC	4	0.9364	0.9125	0.9602	0.9353	0.9233	0.9517	0.0075	1.60%	1.02%
0	D	4	0.9461	0.9309	0.9612	0.9469	0.9341	0.9564	0.0048	1.00%	0.00%

Angular (Corrected) Transformed Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	BC	4	1.3170	1.2680	1.3660	1.3140	1.2900	1.3490	0.0155	2.35%	1.49%
0	D	4	1.3370	1.3040	1.3700	1.3380	1.3110	1.3600	0.0105	1.57%	0.00%

Proportion Normal Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	BC	0.9237	0.9233	0.9517	0.9468
0	D	0.9438	0.9341	0.9564	0.9500

Bivalve Larval Survival and Development Test

EcoAnalysts

Analysis ID:	08-5822-2281	**Endpoint:**	Proportion Normal	**CETIS Version:**	CETISv2.1.4
Analyzed:	22 Feb-24 12:05	**Analysis:**	Parametric-Two Sample	**Status Level:**	1
Edit Date:	22 Feb-24 12:02	**MD5 Hash:**	BE57D742474734BD8D48921A36256946	**Editor ID:**	003-841-189-5

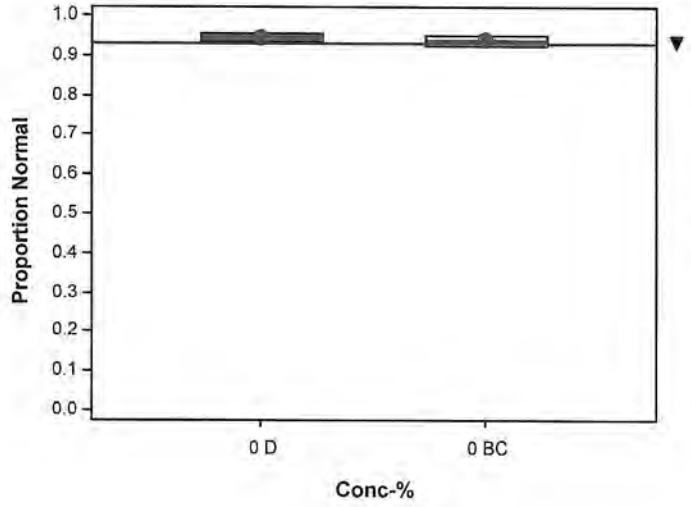
Angular (Corrected) Transformed Detail

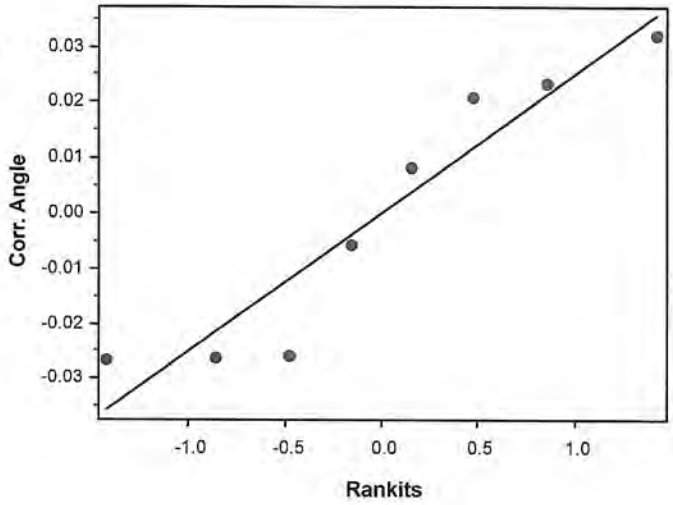
Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	BC	1.2910	1.2900	1.3490	1.3380
0	D	1.3310	1.3110	1.3600	1.3450

Proportion Normal Binomials

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	BC	230/249	265/287	256/269	267/282
0	D	235/249	255/273	263/275	228/240

Graphics





Bivalve Larval Survival and Development Test

EcoAnalysts

Analysis ID:	16-5011-6400	**Endpoint:**	Proportion Survived	**CETIS Version:**	CETISv2.1.4
Analyzed:	22 Feb-24 12:04	**Analysis:**	Parametric-Multiple Comparison	**Status Level:**	1
Edit Date:	22 Feb-24 12:02	**MD5 Hash:**	81C2B66CA08956DE2BE5695EA5097439	**Editor ID:**	003-841-189-5
Batch ID:	13-6318-1280	**Test Type:**	Development-Survival	**Analyst:**	Danielle Mulligan
Start Date:	30 Jan-24 16:10	**Protocol:**	EPA/600/R-95/136 (1995)	**Diluent:**	Laboratory Seawater
Ending Date:	01 Feb-24 15:21	**Species:**	Mytilus galloprovincialis	**Brine:**	Evaporated Seawater
Test Length:	47h	**Taxon:**	Bivalvia	**Source:**	Taylor Shellfish **Age:** <4hr
Sample ID:	18-6559-3037	**Code:**	P240130.03BC	**Project:**	Wyckoff Eagle Harbor GWTP 2024/W
Sample Date:	30 Jan-24 09:35	**Material:**	Treated Groundwater	**Source:**	Jacobs Wyckoff
Receipt Date:	30 Jan-24 11:54	**CAS (PC):**		**Station:**	24052146_1
Sample Age:	7h (5.6 °C)	**Client:**	Jacobs Wyckoff		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	Tox Units	MSDu	PMSD
Angular (Corrected)	C > T	69.7	>69.7	---	1.4	0.08937	9.25%

Bonferroni Adj t Test

Control	vs	Conc-%	df	Test Stat	Critical	MSD	P-Type	P-Value	Decision(α:5%)
Dilution Water		6.25	5	-1.275	2.567	0.2299	CDF	1.0000	Non-Significant Effect
		12.5	6	-1.053	2.567	0.2129	CDF	1.0000	Non-Significant Effect
		25	6	0.1535	2.567	0.2129	CDF	1.0000	Non-Significant Effect
		50	6	-0.3594	2.567	0.2129	CDF	1.0000	Non-Significant Effect
		69.7	6	0.03023	2.567	0.2129	CDF	1.0000	Non-Significant Effect

Test Acceptability Criteria

		TAC Limits			
Attribute	Test Stat	Lower	Upper	Overlap	Decision
Control Resp	0.9666	0.5	<<	Yes	Passes Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0493728	0.0098746	5	0.718	0.6188	Non-Significant Effect
Error	0.233814	0.0137537	17			
Total	0.283187		22			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variance	Bartlett Equality of Variance Test	54.8	15.09	<1.0E-05	Unequal Variances
	Levene Equality of Variance Test	4.292	4.336	0.0104	Equal Variances
	Mod Levene Equality of Variance Test	1.008	4.437	0.4449	Equal Variances
Distribution	Anderson-Darling A2 Test	0.6206	3.878	0.1070	Normal Distribution
	D'Agostino Kurtosis Test	0.1493	2.576	0.8813	Normal Distribution
	D'Agostino Skewness Test	1.474	2.576	0.1406	Normal Distribution
	D'Agostino-Pearson K2 Omnibus Test	2.194	9.21	0.3338	Normal Distribution
	Kolmogorov-Smirnov D Test	0.1522	0.2097	0.1795	Normal Distribution
	Shapiro-Wilk W Normality Test	0.9259	0.88	0.0890	Normal Distribution

Proportion Survived Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	4	0.9666	0.9013	1.0000	0.9835	0.9160	1.0000	0.0205	4.25%	0.00%
6.25		3	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.00%	-3.46%
12.5		4	0.9952	0.9800	1.0000	1.0000	0.9809	1.0000	0.0048	0.96%	-2.96%
25		4	0.9685	0.9219	1.0000	0.9714	0.9313	1.0000	0.0147	3.02%	-0.20%
50		4	0.9676	0.8643	1.0000	1.0000	0.8702	1.0000	0.0324	6.71%	-0.10%
69.7		4	0.9656	0.9008	1.0000	0.9809	0.9198	1.0000	0.0204	4.22%	0.10%

Bivalve Larval Survival and Development Test — EcoAnalysts

Analysis ID:	16-5011-6400	**Endpoint:**	Proportion Survived	**CETIS Version:**	CETISv2.1.4
Analyzed:	22 Feb-24 12:04	**Analysis:**	Parametric-Multiple Comparison	**Status Level:**	1
Edit Date:	22 Feb-24 12:02	**MD5 Hash:**	81C2B66CA08956DE2BE5695EA5097439	**Editor ID:**	003-841-189-5

Angular (Corrected) Transformed Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	4	1.4260	1.2110	1.6400	1.4750	1.2770	1.5400	0.0674	9.46%	0.00%
6.25		3	1.5400	1.5390	1.5410	1.5400	1.5400	1.5400	0.0000	0.00%	-8.01%
12.5		4	1.5130	1.4270	1.5990	1.5400	1.4320	1.5400	0.0269	3.56%	-6.12%
25		4	1.4130	1.2550	1.5710	1.4030	1.3060	1.5400	0.0496	7.02%	0.89%
50		4	1.4550	1.1870	1.7240	1.5400	1.2020	1.5400	0.0844	11.60%	-2.09%
69.7		4	1.4230	1.2070	1.6400	1.4700	1.2840	1.5400	0.0680	9.56%	0.18%

Proportion Survived Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.9504	1.0000	1.0000	0.9160
6.25		1.0000	1.0000	1.0000	
12.5		1.0000	0.9809	1.0000	1.0000
25		0.9313	0.9809	1.0000	0.9618
50		1.0000	1.0000	1.0000	0.8702
69.7		0.9427	1.0000	0.9198	1.0000

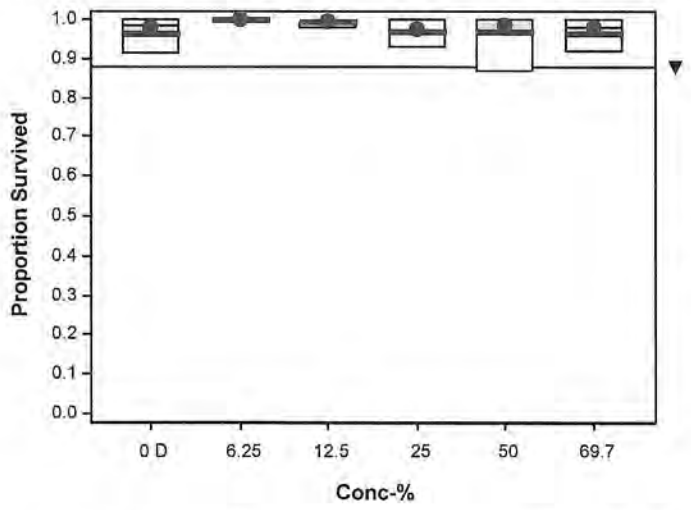
Angular (Corrected) Transformed Detail

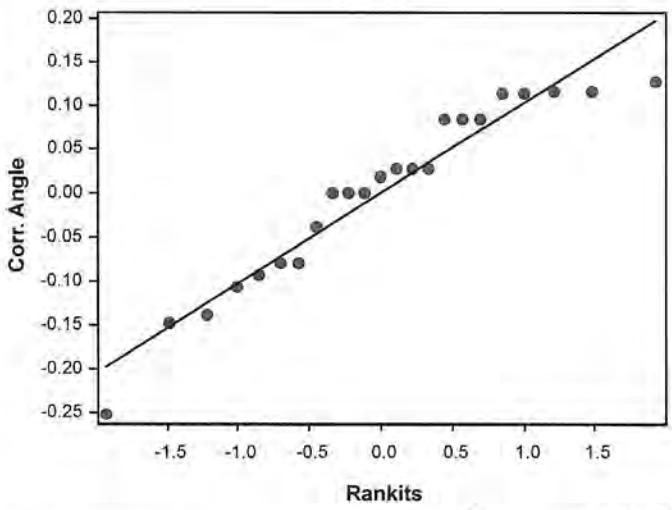
Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	1.3460	1.5400	1.5400	1.2770
6.25		1.5400	1.5400	1.5400	
12.5		1.5400	1.4320	1.5400	1.5400
25		1.3060	1.4320	1.5400	1.3740
50		1.5400	1.5400	1.5400	1.2020
69.7		1.3290	1.5400	1.2840	1.5400

Proportion Survived Binomials

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	249/262	262/262	262/262	240/262
6.25		262/262	262/262	262/262	
12.5		262/262	257/262	262/262	262/262
25		244/262	257/262	262/262	252/262
50		262/262	262/262	262/262	228/262
69.7		247/262	262/262	241/262	262/262

Graphics





Bivalve Larval Survival and Development Test

EcoAnalysts

Analysis ID:	13-9281-0414	**Endpoint:**	Proportion Survived	**CETIS Version:**	CETISv2.1.4
Analyzed:	22 Feb-24 12:05	**Analysis:**	Parametric-Two Sample	**Status Level:**	1
Edit Date:	22 Feb-24 12:02	**MD5 Hash:**	52BDD65087D82905B17CFFDB855A024A	**Editor ID:**	003-841-189-5
Batch ID:	13-6318-1280	**Test Type:**	Development-Survival	**Analyst:**	Danielle Mulligan
Start Date:	30 Jan-24 16:10	**Protocol:**	EPA/600/R-95/136 (1995)	**Diluent:**	Laboratory Seawater
Ending Date:	01 Feb-24 15:21	**Species:**	Mytilus galloprovincialis	**Brine:**	Evaporated Seawater
Test Length:	47h	**Taxon:**	Bivalvia	**Source:**	Taylor Shellfish **Age:** <4hr
Sample ID:	18-6559-3037	**Code:**	P240130.03BC	**Project:**	Wyckoff Eagle Harbor GWTP 2024/W
Sample Date:	30 Jan-24 09:35	**Material:**	Treated Groundwater	**Source:**	Jacobs Wyckoff
Receipt Date:	30 Jan-24 11:54	**CAS (PC):**		**Station:**	24052146_1
Sample Age:	7h (5.6 °C)	**Client:**	Jacobs Wyckoff		

Data Transform	Alt Hyp	Comparison Result	PMSD
Angular (Corrected)	C > T	Brine Control passed proportion survived endpoint	5.96%

Equal Variance t Two-Sample Test

Control I	vs	Control II	df	Test Stat	Critical	MSD	P-Type	P-Value	Decision(α:5%)
Dilution Water		Brine Control	6	-0.7922	1.943	0.1613	CDF	0.7708	Non-Significant Effect

Test Acceptability Criteria

		TAC Limits			
Attribute	**Test Stat**	**Lower**	**Upper**	**Overlap**	**Decision**
Control Resp	0.9666	0.5	<<	Yes	Passes Criteria
Control Resp	0.9876	0.5	<<	Yes	Passes Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0086525	0.0086525	1	0.6275	0.4584	Non-Significant Effect
Error	0.082732	0.0137887	6			
Total	0.0913845		7			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variance	Levene Equality of Variance Test	2.195	13.75	0.1890	Equal Variances
	Mod Levene Equality of Variance Test	1.635	13.75	0.2483	Equal Variances
	Variance Ratio F Test	1.939	47.47	0.6003	Equal Variances
Distribution	Anderson-Darling A2 Test	0.6526	3.878	0.0889	Normal Distribution
	Kolmogorov-Smirnov D Test	0.297	0.3313	0.0363	Normal Distribution
	Shapiro-Wilk W Normality Test	0.8404	0.6451	0.0761	Normal Distribution

Proportion Survived Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	BC	4	0.9876	0.9481	1.0000	1.0000	0.9504	1.0000	0.0124	2.51%	-2.17%
0	D	4	0.9666	0.9013	1.0000	0.9835	0.9160	1.0000	0.0205	4.25%	0.00%

Angular (Corrected) Transformed Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	BC	4	1.4910	1.3370	1.6460	1.5400	1.3460	1.5400	0.0484	6.50%	-4.61%
0	D	4	1.4260	1.2110	1.6400	1.4750	1.2770	1.5400	0.0674	9.46%	0.00%

Proportion Survived Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	BC	0.9504	1.0000	1.0000	1.0000
0	D	0.9504	1.0000	1.0000	0.9160

Bivalve Larval Survival and Development Test EcoAnalysts

Analysis ID:	13-9281-0414	**Endpoint:**	Proportion Survived	**CETIS Version:**	CETISv2.1.4
Analyzed:	22 Feb-24 12:05	**Analysis:**	Parametric-Two Sample	**Status Level:**	1
Edit Date:	22 Feb-24 12:02	**MD5 Hash:**	52BDD65087D82905B17CFFDB855A024A	**Editor ID:**	003-841-189-5

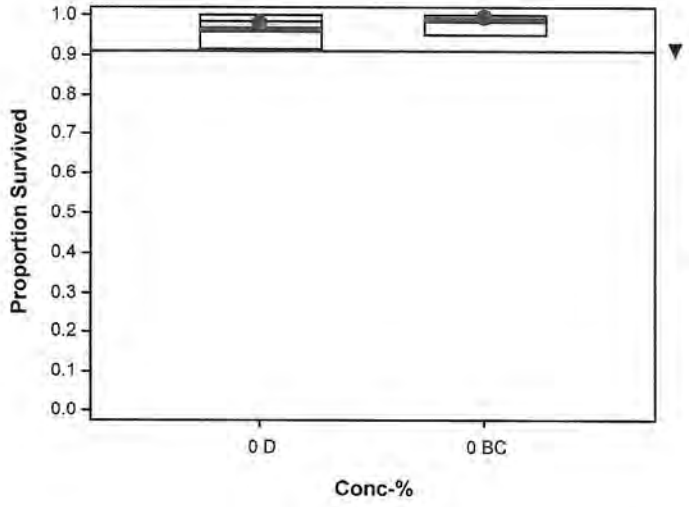
Angular (Corrected) Transformed Detail

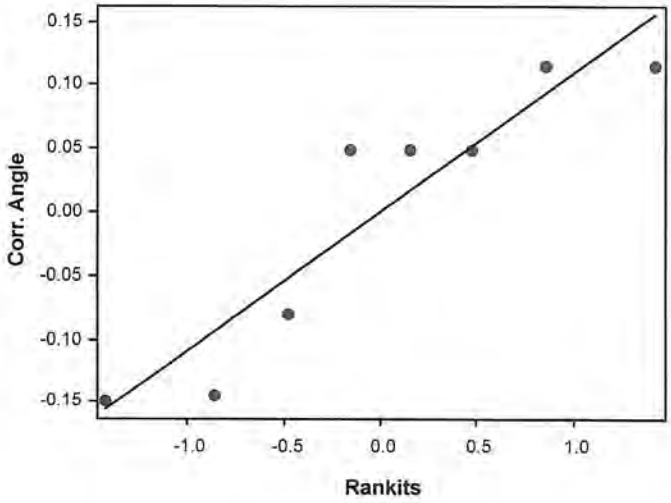
Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	BC	1.3460	1.5400	1.5400	1.5400
0	D	1.3460	1.5400	1.5400	1.2770

Proportion Survived Binomials

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	BC	249/262	262/262	262/262	262/262
0	D	249/262	262/262	262/262	240/262

Graphics





Bivalve Larval Survival and Development Test

EcoAnalysts

Analysis ID:	20-2099-4460	**Endpoint:**	Proportion Normal	**CETIS Version:**	CETISv2.1.4
Analyzed:	22 Feb-24 12:04	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1
Edit Date:	22 Feb-24 12:02	**MD5 Hash:**	A74253BF098E20B839E1A95914D9D385	**Editor ID:**	003-841-189-5
Batch ID:	13-6318-1280	**Test Type:**	Development-Survival	**Analyst:**	Danielle Mulligan
Start Date:	30 Jan-24 16:10	**Protocol:**	EPA/600/R-95/136 (1995)	**Diluent:**	Laboratory Seawater
Ending Date:	01 Feb-24 15:21	**Species:**	Mytilus galloprovincialis	**Brine:**	Evaporated Seawater
Test Length:	47h	**Taxon:**	Bivalvia	**Source:**	Taylor Shellfish **Age:** <4hr
Sample ID:	18-6559-3037	**Code:**	P240130.03BC	**Project:**	Wyckoff Eagle Harbor GWTP 2024/W
Sample Date:	30 Jan-24 09:35	**Material:**	Treated Groundwater	**Source:**	Jacobs Wyckoff
Receipt Date:	30 Jan-24 11:54	**CAS (PC):**		**Station:**	24052146_1
Sample Age:	7h (5.6 °C)	**Client:**	Jacobs Wyckoff		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	955129	200	Yes	Two-Point Interpolation

Test Acceptability Criteria

		TAC Limits			
Attribute	**Test Stat**	**Lower**	**Upper**	**Overlap**	**Decision**
Control Resp	0.9461	0.9	<<	Yes	Passes Criteria

Point Estimates

Level	%	95% LCL	95% UCL	Tox Units	95% LCL	95% UCL
EC25	>69.7	---	---	<1.4	---	---
EC50	>69.7	---	---	<1.4	---	---

Proportion Normal Summary

			Calculated Variate(A/B)							Isotonic Variate	
Conc-%	**Code**	**Count**	**Mean**	**Median**	**Min**	**Max**	**CV%**	**%Effect**	**ΣA/ΣB**	**Mean**	**%Effect**
0	D	4	0.9461	0.9469	0.9341	0.9564	1.00%	0.00%	981/1037	0.9460	0.00%
6.25		3	0.9379	0.9398	0.9326	0.9414	0.50%	0.86%	756/806	0.9410	0.53%
12.5		4	0.9355	0.9409	0.9097	0.9504	1.90%	1.12%	1029/1100	0.9410	0.53%
25		4	0.9324	0.9351	0.9139	0.9455	1.44%	1.44%	959/1028	0.9410	0.53%
50		4	0.9513	0.9537	0.9418	0.9561	0.68%	-0.56%	1012/1064	0.9410	0.53%
69.7		4	0.9472	0.9536	0.9190	0.9627	2.04%	-0.13%	973/1027	0.9410	0.53%

Proportion Normal Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.9438	0.9341	0.9564	0.9500
6.25		0.9398	0.9414	0.9326	
12.5		0.9097	0.9416	0.9401	0.9504
25		0.9139	0.9377	0.9455	0.9325
50		0.9418	0.9530	0.9544	0.9561
69.7		0.9190	0.9544	0.9627	0.9529

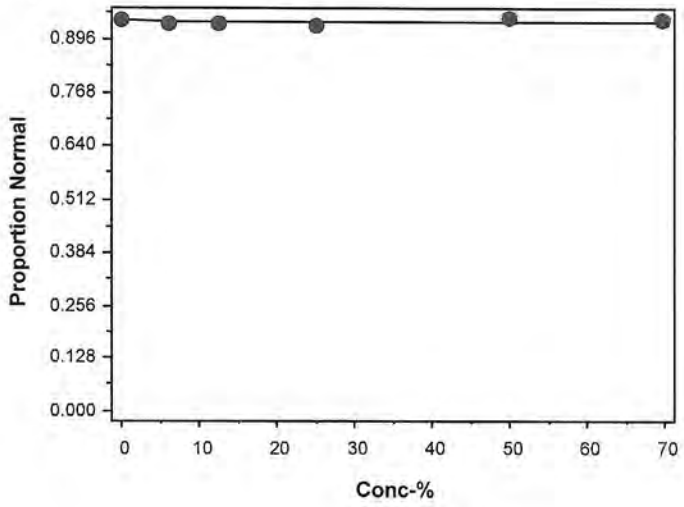
Proportion Normal Binomials

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	235/249	255/273	263/275	228/240
6.25		250/266	257/273	249/267	
12.5		252/277	242/257	267/284	268/282
25		223/244	241/257	260/275	235/252
50		259/275	284/298	251/263	218/228
69.7		227/247	251/263	232/241	263/276

Bivalve Larval Survival and Development Test — **EcoAnalysts**

Analysis ID:	20-2099-4460	**Endpoint:**	Proportion Normal	**CETIS Version:**	CETISv2.1.4
Analyzed:	22 Feb-24 12:04	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1
Edit Date:	22 Feb-24 12:02	**MD5 Hash:**	A74253BF098E20B839E1A95914D9D385	**Editor ID:**	003-841-189-5

Graphics



Bivalve Larval Survival and Development Test

EcoAnalysts

Analysis ID:	11-1031-6784	**Endpoint:**	Proportion Survived	**CETIS Version:**	CETISv2.1.4
Analyzed:	22 Feb-24 12:04	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1
Edit Date:	22 Feb-24 12:02	**MD5 Hash:**	81C2B66CA08956DE2BE5695EA5097439	**Editor ID:**	003-841-189-5
Batch ID:	13-6318-1280	**Test Type:**	Development-Survival	**Analyst:**	Danielle Mulligan
Start Date:	30 Jan-24 16:10	**Protocol:**	EPA/600/R-95/136 (1995)	**Diluent:**	Laboratory Seawater
Ending Date:	01 Feb-24 15:21	**Species:**	Mytilus galloprovincialis	**Brine:**	Evaporated Seawater
Test Length:	47h	**Taxon:**	Bivalvia	**Source:**	Taylor Shellfish **Age:** <4hr
Sample ID:	18-6559-3037	**Code:**	P240130.03BC	**Project:**	Wyckoff Eagle Harbor GWTP 2024/W
Sample Date:	30 Jan-24 09:35	**Material:**	Treated Groundwater	**Source:**	Jacobs Wyckoff
Receipt Date:	30 Jan-24 11:54	**CAS (PC):**		**Station:**	24052146_1
Sample Age:	7h (5.6 °C)	**Client:**	Jacobs Wyckoff		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	1086935	200	Yes	Two-Point Interpolation

Test Acceptability Criteria

		TAC Limits			
Attribute	**Test Stat**	**Lower**	**Upper**	**Overlap**	**Decision**
Control Resp	0.9666	0.5	<<	Yes	Passes Criteria

Point Estimates

Level	%	95% LCL	95% UCL	Tox Units	95% LCL	95% UCL
EC25	>69.7	---	---	<1.4	---	---
EC50	>69.7	---	---	<1.4	---	---

Proportion Survived Summary

			Calculated Variate(A/B)							Isotonic Variate	
Conc-%	**Code**	**Count**	**Mean**	**Median**	**Min**	**Max**	**CV%**	**%Effect**	**ΣA/ΣB**	**Mean**	**%Effect**
0	D	4	0.9666	0.9835	0.9160	1.0000	4.25%	0.00%	1013/1048	0.9873	0.00%
6.25		3	1.0000	1.0000	1.0000	1.0000	0.00%	-3.46%	786/786	0.9873	0.00%
12.5		4	0.9952	1.0000	0.9809	1.0000	0.96%	-2.96%	1043/1048	0.9873	0.00%
25		4	0.9685	0.9714	0.9313	1.0000	3.02%	-0.20%	1015/1048	0.9685	1.90%
50		4	0.9676	1.0000	0.8702	1.0000	6.71%	-0.10%	1014/1048	0.9676	2.00%
69.7		4	0.9656	0.9809	0.9198	1.0000	4.22%	0.10%	1012/1048	0.9656	2.20%

Proportion Survived Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.9504	1.0000	1.0000	0.9160
6.25		1.0000	1.0000	1.0000	
12.5		1.0000	0.9809	1.0000	1.0000
25		0.9313	0.9809	1.0000	0.9618
50		1.0000	1.0000	1.0000	0.8702
69.7		0.9427	1.0000	0.9198	1.0000

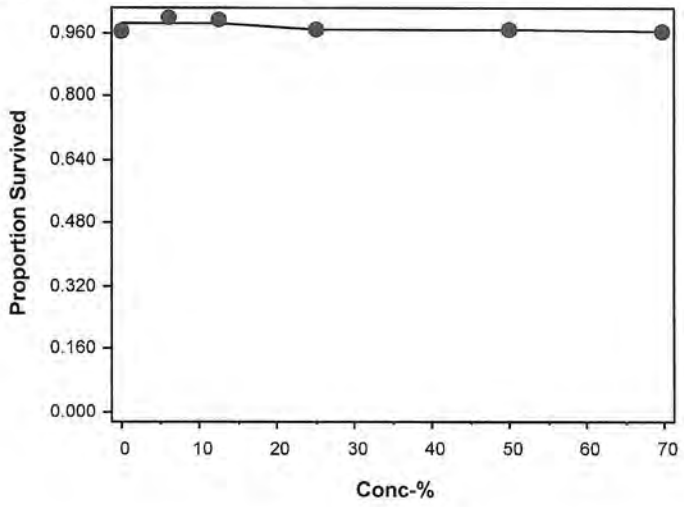
Proportion Survived Binomials

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	249/262	262/262	262/262	240/262
6.25		262/262	262/262	262/262	
12.5		262/262	257/262	262/262	262/262
25		244/262	257/262	262/262	252/262
50		262/262	262/262	262/262	228/262
69.7		247/262	262/262	241/262	262/262

Bivalve Larval Survival and Development Test — **EcoAnalysts**

Analysis ID:	11-1031-6784	**Endpoint:**	Proportion Survived	**CETIS Version:**	CETISv2.1.4
Analyzed:	22 Feb-24 12:04	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1
Edit Date:	22 Feb-24 12:02	**MD5 Hash:**	81C2B66CA08956DE2BE5695EA5097439	**Editor ID:**	003-841-189-5

Graphics



Bivalve Larval Survival and Development Test — **EcoAnalysts**

Start Date:	30 Jan-24 16:10	**Species:**	Mytilus galloprovincialis	**Sample Code:**	P240130.03BC
End Date:	01 Feb-24 15:21	**Protocol:**	EPA/600/R-95/136 (1995)	**Sample Source:**	Jacobs Wyckoff
Sample Date:	30 Jan-24 09:35	**Material:**	Treated Groundwater	**Sample Station:**	24052146_1

Conc-%	Code	Rep	Pos	Initial Density	Final Density	# Counted	# Normal	Notes
0	BC	1	9	262	249	249	230	
0	BC	2	5	262	287	287	265	
0	BC	3	24	262	269	269	256	
0	BC	4	6	262	282	282	267	
0	D	1	10	262	249	249	235	
0	D	2	2	262	273	273	255	
0	D	3	25	262	275	275	263	
0	D	4	15	262	240	240	228	
6.25		1	12	262	266	266	250	
6.25		2	8	262	273	273	257	
6.25		3	27	262	267	267	249	
12.5		1	13	262	277	277	252	
12.5		2	18	262	257	257	242	
12.5		3	21	262	284	284	267	
12.5		4	7	262	282	282	268	
25		1	19	262	244	244	223	
25		2	3	262	257	257	241	
25		3	26	262	275	275	260	
25		4	11	262	252	252	235	
50		1	4	262	275	275	259	
50		2	23	262	298	298	284	
50		3	16	262	263	263	251	
50		4	20	262	228	228	218	
69.7		1	1	262	247	247	227	
69.7		2	17	262	263	263	251	
69.7		3	22	262	241	241	232	
69.7		4	14	262	276	276	263	

ECOANALYSTS, INC.

48-Hour Chronic WET Test

Version V.2

GENERAL

Client	Jacobs Wyckoff
Project	Wyckoff Eagle Harbor GWTP 2024/WA
Project Number	PG1958
Project Manager	M. Seibert
Date Sample Received	1/30/2024
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	01/30/24
Test Species	Mytilus spp.
Organism Batch	TS121523.01
Organism Acquired	12/15/2023
Organism Acclimation	46
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:	1610 LG/MS
TEST END TIME/INIT:	1521 LG

CLIENT SAMPLE ID	LAB ID
24052146-1	P240130.03

Salinity Adjustment CSMM Batch #
62123

Formalin Lot #
230724-07

Rose Bangel Batch #
5135

	Concentrations
1	Control
2	Brine Control
3	6.25%
4	12.5%
5	25%
6	50%
7	69.7%
8	.
9	.

SALINITY ADJUSTMENT AND TEST DILUTION PREPARATION WORKSHEET

Only red characters and green cells are changeable.

ORGANISM	CLIENT	CLIENT SAMPLE ID	DATE
M. sp.	Jacobs Wyckoff	24052146-1	1/30/24

Volume per Concentration (mls) - 200

Test Parameters	ppt
Salinity of Brine	98.00
Salinity of Sample	0.40
Test Salinity	30.00

Salinity Adjustment Multiplier = **0.44**

		grams added
mls. Sample*	600.00	599.1
mls. Brine	261.18	280.4
*Adjust volume so C16>F19		**879.46**
Post Adjustment Concentration (%) =		**69.67**

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

Concentration (%)	Amount of Adjusted Sample (gms.)	Amount of Seawater (gms.)
69.7	204.2	0.0
50.00	146.6	57.7
25.00	73.3	131.0
12.50	36.6	167.6
6.25	18.3	185.9
	0.0	204.2
	479.07	

Brine Control Preparation

Salinity Adjustment			highest	Amount Brine	Amount DI	Amount Seawater
Sample Number/Name	Multiplier	Volume BC	concentration	(grams)	(grams)	(grams)
24052146-1	0.44	200	69.7	63.8	134.6	5.9

Worksheet Preparation Date / Initials

1/30/2024	MS

Dilution Preparation Date / Initials

1/30/2024	MS

ECO ANALYSTS, INC.

48-Hour Chronic WET Test

V.2

CLIENT	Jacobs Wyckoff	**DATE RECEIVED**	1/30/24	**PROTOCOL**	TOX 042
PROJECT	coff Eagle Harbor GWTP 2024/WA	**TEST START DATE**	1/30/24	**PROJECT MANAGER**	M. Seibert
CLIENT SAMPLE ID	24052146-1	**TEST END DATE**	2/1/24	**SPECIES**	*Mytilus spp.*
LAB SAMPLE ID	P240130.03	**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	① ~~8.8~~ 8.0	① ~~16.1~~ 17.2	28	① ~~7.9~~ 7.7
Stock	Brine Control	8.3	17.3	29	7.9
Date 1/30/24	6.25%	8.7	16.6	28	7.8
Time 1415	12.5%	8.7	16.7	28	7.8
Tech RG	25%	8.7	16.8	28	7.7
Meter # 9/8	50%	8.6	17.2	29	7.6
	69.7%	8.4	② ~~17.5~~ 17.3	29	7.4
Day 1	Control		15.9 ③		
Surrogate	Brine Control		15.9 ③		
Date 02/32/24	6.25%		15.9 ③		
Time 0901	12.5%		15.9 ③		
Tech SR	25%		15.9 ③		
Meter # T16	50%		15.9 ③		
	69.7%		15.9 ③		
Day 2	Control	8.0	15.6	29	7.9
Surrogate	Brine Control	7.7	15.6	29	7.8
Date 2/1/24	6.25%	7.9	15.4	28	7.9
Time 1454	12.5%	7.9	15.6	28	8.0
Tech LG	25%	7.9	15.5	28	8.0
Meter # 8	50%	7.9	15.3	29	8.1
	69.7%	8.0	15.6	29	8.2

③ Temp blank used - SR 02/32/24

① Remade DI water - LG 1/30

② re-checked temp. MS 1/30

48-Hour Chronic WET Test

V.2

CLIENT	Jacobs Wyckoff	**DATE RECEIVED**	1/30/24	**PROTOCOL**	TOX 042
PROJECT	Wyckoff Eagle Harbor GWTP 2024/WA	**TEST START DATE**	1/30/24	**PROJECT MANAGER**	M. Seibert
CLIENT SAMPLE ID	24052146-1	**TEST END DATE**	2/1/24	**SPECIES**	*Mytilus spp.*
LAB SAMPLE ID	P240130.03	**MATRIX**	Liquid	**NO. OF ORGANISMS**	150 - 300

48-Hour Chronic Toxicity Using Bivalve Larvae

SPAWNING METHOD	**INITIAL SPAWNING TIME**		**FINAL SPAWNING TIME**
Heat Shock	12:29		13:25
MALES	**FEMALES**	**SPERM VIABILITY**	**EGG CONDITION**
4	6	Good	Good
BEGIN FERTILIZATION	**END FERTILIZATION**		**CONDITION OF EMBRYOS**
13:25	14:54		Good

TIME OF INITIATION	**INITIALS**

EMBRYO DENSITY CALCULATIONS

# of embryos in 1 mL of 100X diluted embryo stock

Count 1	Count 2	Mean
400	384	392

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

39200

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

0.07

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)

2.755102041 **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**	1/30/24	**PROTOCOL**	TOX 042
PROJECT	Wyckoff Eagle Harbor GWTP 2024/WA	**TEST START DATE**	1/30/24	**PROJECT MANAGER**	M. Seibert
CLIENT SAMPLE ID	24052146-1	**TEST END DATE**	2/1/24	**SPECIES**	*Mytilus spp.*
LAB SAMPLE ID	P240130.03	**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	265		2/13/24	MARH	
	2	264		2/13/24	MARH	$\bar{X}$ = 262
	3	266		2/13/24	MARH	
	4	246		2/13/24	MARH	
	5	255		2/13/24	MARH	
	6	276		2/13/24	MARH	
Control	1	235	14	2/13/24	MK	
	2	255	18	2/13/24	MK	
	3	263	12	2/13/24	MK	
	4	228	12	2/13/24	MK	
Brine Control	1	230	19	2/7/24	MK	QA MARH N 235 A 21 Δ=0.6%
	2	265	22	2/13/24	MK	
	3	256	13	2/13/24	MK	
	4	267	15	2/13/24	MK	
6.25%	1	250	16	2/13/24	MK	
	2	257	16	2/13/24	MK	
	3	0	251	2/13/24	MK	vial compromised. Drop from stats. MK 2/13
	4	249	18	2/13/24	MK	
12.5%	1	252	25	2/13/24	MK	QA MARH 260 N 22A
	2	242	15	2/13/24	MK	Δ= 1.1%
	3	267	17	2/13/24	MK	
	4	268	14	2/13/24	MK	
25%	1	223	21	2/13/24	MK	
	2	241	16	2/13/24	MK	
	3	260	15	2/13/24	MK	
	4	235	17	2/13/24	MK	
50%	1	259	16	2/7/24	MK	
	2	284	14	2/13/24	MK	
	3	251	12	2/13/24	MK	
	4	218	10	2/13/24	MK	
69.7%	1	227	20	2/7/24	MK	QA MARH 228 N 19A
	2	251	12	2/13/24	MK	Δ= 0.4%
	3	232	9	2/13/24	MK	
	4	263	13	2/13/24	MK	

CETIS Summary Report

Bivalve Larval Survival and Development Test — EcoAnalysts

Batch ID:	03-0659-8360	**Test Type:**	Development-Survival	**Analyst:**	Danielle Mulligan		
Start Date:	30 Jan-24 16:07	**Protocol:**	EPA/600/R-95/136 (1995)	**Diluent:**	Laboratory Seawater		
Ending Date:	01 Feb-24 15:20	**Species:**	Mytilus galloprovincialis	**Brine:**	Crystal Sea Marine Mix		
Test Length:	47h	**Taxon:**	Bivalvia	**Source:**	Taylor Shellfish	**Age:**	<4h
Sample ID:	06-0001-8496	**Code:**	P240130.03SC	**Project:**	Wyckoff Eagle Harbor GWTP 2024/W		
Sample Date:	30 Jan-24 09:35	**Material:**	Treated Groundwater	**Source:**	Jacobs Wyckoff		
Receipt Date:	30 Jan-24 11:54	**CAS (PC):**		**Station:**	24052146_1		
Sample Age:	7h (5.6 °C)	**Client:**	Jacobs Wyckoff				

Single Comparison Summary

Analysis ID	Endpoint	Comparison Method	P-Value	Comparison Result	S
06-1083-4347	Proportion Normal	Equal Variance t Two-Sample Test	0.0326	Salt Control failed proportion normal	1
04-1777-5456	Proportion Survived	Unequal Variance t Two-Sample Test	0.9458	Salt Control passed proportion survived	1

Multiple Comparison Summary

Analysis ID	Endpoint	Comparison Method	✓	NOEL	LOEL	TOEL	PMSD	TU	S
09-0655-3543	Proportion Normal	Dunnett Multiple Comparison Test		100	>100	---	2.5%	1	1
04-3897-6287	Proportion Survived	Steel Many-One Rank Sum Test		100	>100	---	7.94%	1	1

Point Estimate Summary

Analysis ID	Endpoint	Point Estimate Method	✓	Level	%	95% LCL	95% UCL	TU	S
20-8186-9544	Proportion Normal	Linear Interpolation (ICPIN)	✓	EC15	>100	---	---	<1	1
			✓	EC20	>100	---	---	<1	
			✓	EC25	>100	---	---	<1	
			✓	EC40	>100	---	---	<1	
			✓	EC50	>100	---	---	<1	
15-5364-4792	Proportion Survived	Linear Interpolation (ICPIN)	✓	EC15	>100	---	---	<1	1
			✓	EC20	>100	---	---	<1	
			✓	EC25	>100	---	---	<1	
			✓	EC40	>100	---	---	<1	
			✓	EC50	>100	---	---	<1	

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits Lower	TAC Limits Upper	Overlap	Decision
06-1083-4347	Proportion Normal	Control Resp	0.9209	0.9	<<	Yes	Passes Criteria
	Proportion Normal	Control Resp	0.9442	0.9	<<	Yes	Passes Criteria
09-0655-3543	Proportion Normal	Control Resp	0.9442	0.9	<<	Yes	Passes Criteria
20-8186-9544	Proportion Normal	Control Resp	0.9442	0.9	<<	Yes	Passes Criteria
04-1777-5456	Proportion Survived	Control Resp	1	0.5	<<	Yes	Passes Criteria
	Proportion Survived	Control Resp	0.9666	0.5	<<	Yes	Passes Criteria
04-3897-6287	Proportion Survived	Control Resp	0.9666	0.5	<<	Yes	Passes Criteria
15-5364-4792	Proportion Survived	Control Resp	0.9666	0.5	<<	Yes	Passes Criteria

Bivalve Larval Survival and Development Test — **EcoAnalysts**

Proportion Normal Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	D	4	0.9442	0.9269	0.9615	0.9319	0.9544	0.0054	0.0109	1.15%	0.00%
0	SC	4	0.9209	0.8916	0.9503	0.8949	0.9377	0.0092	0.0185	2.00%	2.46%
6.25		4	0.9387	0.9279	0.9496	0.9289	0.9444	0.0034	0.0068	0.73%	0.58%
12.5		4	0.9251	0.8906	0.9595	0.9048	0.9544	0.0108	0.0216	2.34%	2.02%
25		4	0.9469	0.9354	0.9585	0.9363	0.9524	0.0036	0.0073	0.77%	-0.29%
50		4	0.9375	0.9183	0.9567	0.9200	0.9476	0.0060	0.0121	1.29%	0.71%
69.7		4	0.9448	0.9368	0.9529	0.9378	0.9496	0.0025	0.0051	0.54%	-0.07%
100		4	0.9505	0.9216	0.9793	0.9274	0.9717	0.0091	0.0181	1.91%	-0.67%

Proportion Survived Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	D	4	0.9666	0.9095	1.0240	0.9198	1.0000	0.0179	0.0359	3.71%	0.00%
0	SC	4	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.0000	0.00%	-3.46%
6.25		4	0.9656	0.9478	0.9835	0.9542	0.9809	0.0056	0.0112	1.16%	0.10%
12.5		4	0.9800	0.9393	1.0210	0.9466	1.0000	0.0128	0.0256	2.61%	-1.38%
25		4	0.9800	0.9431	1.0170	0.9580	1.0000	0.0116	0.0232	2.37%	-1.38%
50		4	0.9752	0.9293	1.0210	0.9466	1.0000	0.0144	0.0288	2.95%	-0.89%
69.7		4	0.9637	0.8964	1.0310	0.9198	1.0000	0.0212	0.0423	4.39%	0.30%
100		4	0.9695	0.9232	1.0160	0.9427	1.0000	0.0145	0.0291	3.00%	-0.30%

Proportion Normal Detail

MD5: A8ED079D90F89A7F8752D76B3DD45227

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.9319	0.9544	0.9522	0.9382
0	SC	0.9223	0.9377	0.9288	0.8949
6.25		0.9289	0.9400	0.9416	0.9444
12.5		0.9274	0.9544	0.9048	0.9137
25		0.9482	0.9509	0.9524	0.9363
50		0.9401	0.9422	0.9476	0.9200
69.7		0.9451	0.9469	0.9496	0.9378
100		0.9530	0.9498	0.9274	0.9717

Proportion Survived Detail

MD5: CFB4F24B9492BD92538C3A3446F0FA43

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	1.0000	0.9198	0.9580	0.9885
0	SC	1.0000	1.0000	1.0000	1.0000
6.25		0.9656	0.9542	0.9809	0.9618
12.5		0.9466	1.0000	1.0000	0.9733
25		0.9580	1.0000	0.9618	1.0000
50		1.0000	1.0000	0.9466	0.9542
69.7		1.0000	0.9351	1.0000	0.9198
100		1.0000	0.9885	0.9466	0.9427

Bivalve Larval Survival and Development Test EcoAnalysts

Proportion Normal Binomials

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	260/279	230/241	239/251	243/259
0	SC	261/283	271/289	261/281	247/276
6.25		235/253	235/250	242/257	238/252
12.5		230/248	251/263	247/273	233/255
25		238/251	271/285	240/252	250/267
50		251/267	261/277	235/248	230/250
69.7		258/273	232/245	264/278	226/241
100		284/298	246/259	230/248	240/247

Proportion Survived Binomials

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	262/262	241/262	251/262	259/262
0	SC	262/262	262/262	262/262	262/262
6.25		253/262	250/262	257/262	252/262
12.5		248/262	262/262	262/262	255/262
25		251/262	262/262	252/262	262/262
50		262/262	262/262	248/262	250/262
69.7		262/262	245/262	262/262	241/262
100		262/262	259/262	248/262	247/262

Bivalve Larval Survival and Development Test

EcoAnalysts

Analysis ID:	06-1083-4347	**Endpoint:**	Proportion Normal	**CETIS Version:**	CETISv2.1.4
Analyzed:	20 Feb-24 17:38	**Analysis:**	Parametric-Two Sample	**Status Level:**	1
Edit Date:	20 Feb-24 17:29	**MD5 Hash:**	8592D4BBD28C686406B250B7042C76D2	**Editor ID:**	004-244-315-2
Batch ID:	03-0659-8360	**Test Type:**	Development-Survival	**Analyst:**	Danielle Mulligan
Start Date:	30 Jan-24 16:07	**Protocol:**	EPA/600/R-95/136 (1995)	**Diluent:**	Laboratory Seawater
Ending Date:	01 Feb-24 15:20	**Species:**	Mytilus galloprovincialis	**Brine:**	Crystal Sea Marine Mix
Test Length:	47h	**Taxon:**	Bivalvia	**Source:**	Taylor Shellfish **Age:** <4h
Sample ID:	06-0001-8496	**Code:**	P240130.03SC	**Project:**	Wyckoff Eagle Harbor GWTP 2024/W
Sample Date:	30 Jan-24 09:35	**Material:**	Treated Groundwater	**Source:**	Jacobs Wyckoff
Receipt Date:	30 Jan-24 11:54	**CAS (PC):**		**Station:**	24052146_1
Sample Age:	7h (5.6 °C)	**Client:**	Jacobs Wyckoff		

Data Transform	Alt Hyp	Comparison Result	PMSD
Angular (Corrected)	C > T	Salt Control failed proportion normal endpoint	2.03%

Equal Variance t Two-Sample Test

Control I	vs	Control II	df	Test Stat	Critical	MSD	P-Type	P-Value	Decision(α:5%)
Dilution Water		Salt Control*	6	2.253	1.943	0.03969	CDF	0.0326	Significant Effect

Test Acceptability Criteria

		TAC Limits			
Attribute	**Test Stat**	**Lower**	**Upper**	**Overlap**	**Decision**
Control Resp	0.9209	0.9	<<	Yes	Passes Criteria
Control Resp	0.9442	0.9	<<	Yes	Passes Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0042333	0.0042333	1	5.074	0.0652	Non-Significant Effect
Error	0.0050058	0.0008343	6			
Total	0.0092391		7			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variance	Levene Equality of Variance Test	0.1036	13.75	0.7585	Equal Variances
	Mod Levene Equality of Variance Test	0.0552	13.75	0.8221	Equal Variances
	Variance Ratio F Test	1.99	47.47	0.5862	Equal Variances
Distribution	Anderson-Darling A2 Test	0.2899	3.878	0.6427	Normal Distribution
	Kolmogorov-Smirnov D Test	0.1956	0.3313	0.5854	Normal Distribution
	Shapiro-Wilk W Normality Test	0.9407	0.6451	0.6176	Normal Distribution

Proportion Normal Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	4	0.9442	0.9269	0.9615	0.9452	0.9319	0.9544	0.0054	1.15%	0.00%
0	SC	4	0.9209	0.8916	0.9503	0.9255	0.8949	0.9377	0.0092	2.00%	2.46%

Angular (Corrected) Transformed Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	4	1.3330	1.2950	1.3710	1.3350	1.3070	1.3550	0.0118	1.77%	0.00%
0	SC	4	1.2870	1.2340	1.3400	1.2940	1.2410	1.3190	0.0167	2.59%	3.45%

Proportion Normal Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.9319	0.9544	0.9522	0.9382
0	SC	0.9223	0.9377	0.9288	0.8949

Bivalve Larval Survival and Development Test

EcoAnalysts

Analysis ID:	06-1083-4347	**Endpoint:**	Proportion Normal	**CETIS Version:**	CETISv2.1.4
Analyzed:	20 Feb-24 17:38	**Analysis:**	Parametric-Two Sample	**Status Level:**	1
Edit Date:	20 Feb-24 17:29	**MD5 Hash:**	8592D4BBD28C686406B250B7042C76D2	**Editor ID:**	004-244-315-2

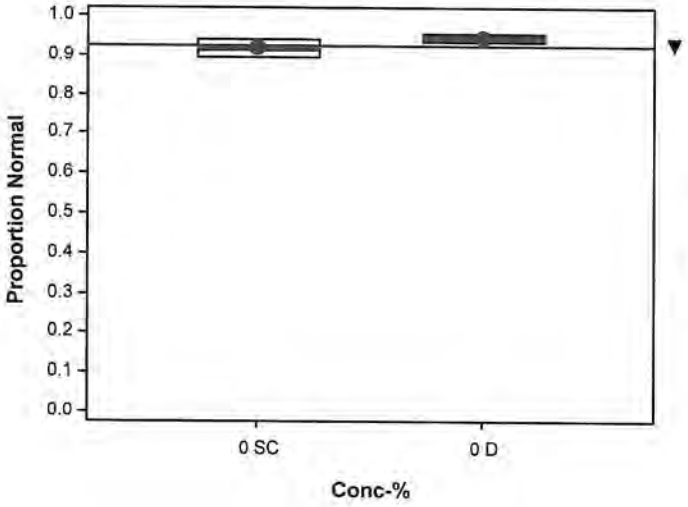
Angular (Corrected) Transformed Detail

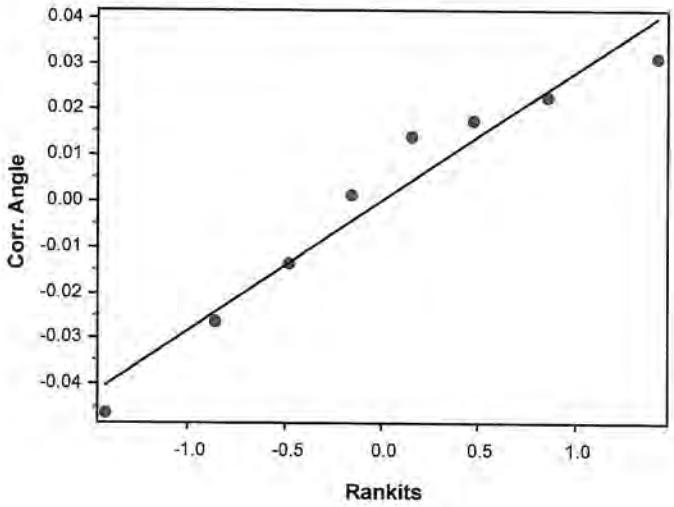
Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	1.3070	1.3550	1.3500	1.3200
0	SC	1.2880	1.3190	1.3010	1.2410

Proportion Normal Binomials

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	260/279	230/241	239/251	243/259
0	SC	261/283	271/289	261/281	247/276

Graphics





Bivalve Larval Survival and Development Test

EcoAnalysts

Analysis ID:	09-0655-3543	**Endpoint:**	Proportion Normal	**CETIS Version:**	CETISv2.1.4
Analyzed:	20 Feb-24 17:41	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1
Edit Date:	20 Feb-24 17:29	**MD5 Hash:**	EDBAE943D5835730FDDC3062F5D56BB4	**Editor ID:**	004-244-315-2
Batch ID:	03-0659-8360	**Test Type:**	Development-Survival	**Analyst:**	Danielle Mulligan
Start Date:	30 Jan-24 16:07	**Protocol:**	EPA/600/R-95/136 (1995)	**Diluent:**	Laboratory Seawater
Ending Date:	01 Feb-24 15:20	**Species:**	Mytilus galloprovincialis	**Brine:**	Crystal Sea Marine Mix
Test Length:	47h	**Taxon:**	Bivalvia	**Source:**	Taylor Shellfish **Age:** <4h
Sample ID:	06-0001-8496	**Code:**	P240130.03SC	**Project:**	Wyckoff Eagle Harbor GWTP 2024/W
Sample Date:	30 Jan-24 09:35	**Material:**	Treated Groundwater	**Source:**	Jacobs Wyckoff
Receipt Date:	30 Jan-24 11:54	**CAS (PC):**		**Station:**	24052146_1
Sample Age:	7h (5.6 °C)	**Client:**	Jacobs Wyckoff		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	Tox Units	MSDu	PMSD
Angular (Corrected)	C > T	100	>100	---	1	0.02361	2.50%

Dunnett Multiple Comparison Test

Control	vs	Conc-%	df	Test Stat	Critical	MSD	P-Type	P-Value	Decision(α:5%)
Dilution Water		6.25	6	0.6182	2.448	0.04799	CDF	0.6293	Non-Significant Effect
		12.5	6	1.899	2.448	0.04799	CDF	0.1353	Non-Significant Effect
		25	6	-0.2904	2.448	0.04799	CDF	0.9213	Non-Significant Effect
		50	6	0.7249	2.448	0.04799	CDF	0.5809	Non-Significant Effect
		69.7	6	-0.04347	2.448	0.04799	CDF	0.8685	Non-Significant Effect
		100	6	-0.8233	2.448	0.04799	CDF	0.9791	Non-Significant Effect

Test Acceptability Criteria

		TAC Limits			
Attribute	Test Stat	Lower	Upper	Overlap	Decision
Control Resp	0.9442	0.9	<<	Yes	Passes Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0071623	0.0011937	6	1.553	0.2102	Non-Significant Effect
Error	0.0161451	0.0007688	21			
Total	0.0233073		27			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variance	Bartlett Equality of Variance Test	8.474	16.81	0.2054	Equal Variances
	Levene Equality of Variance Test	1.274	3.812	0.3111	Equal Variances
	Mod Levene Equality of Variance Test	1.105	3.812	0.3923	Equal Variances
Distribution	Anderson-Darling A2 Test	0.6745	3.878	0.0783	Normal Distribution
	D'Agostino Kurtosis Test	1.124	2.576	0.2609	Normal Distribution
	D'Agostino Skewness Test	0.6371	2.576	0.5240	Normal Distribution
	D'Agostino-Pearson K2 Omnibus Test	1.67	9.21	0.4339	Normal Distribution
	Kolmogorov-Smirnov D Test	0.1474	0.1914	0.1205	Normal Distribution
	Shapiro-Wilk W Normality Test	0.953	0.8975	0.2351	Normal Distribution

Proportion Normal Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	4	0.9442	0.9269	0.9615	0.9452	0.9319	0.9544	0.0054	1.15%	0.00%
6.25		4	0.9387	0.9279	0.9496	0.9408	0.9289	0.9444	0.0034	0.73%	0.58%
12.5		4	0.9251	0.8906	0.9595	0.9206	0.9048	0.9544	0.0108	2.34%	2.02%
25		4	0.9469	0.9354	0.9585	0.9495	0.9363	0.9524	0.0036	0.77%	-0.29%
50		4	0.9375	0.9183	0.9567	0.9412	0.9200	0.9476	0.0060	1.29%	0.71%
69.7		4	0.9448	0.9368	0.9529	0.9460	0.9378	0.9496	0.0025	0.54%	-0.07%
100		4	0.9505	0.9216	0.9793	0.9514	0.9274	0.9717	0.0091	1.91%	-0.67%

Bivalve Larval Survival and Development Test

EcoAnalysts

Analysis ID:	09-0655-3543	**Endpoint:**	Proportion Normal	**CETIS Version:**	CETISv2.1.4
Analyzed:	20 Feb-24 17:41	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1
Edit Date:	20 Feb-24 17:29	**MD5 Hash:**	EDBAE943D5835730FDDC3062F5D56BB4	**Editor ID:**	004-244-315-2

Angular (Corrected) Transformed Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	4	1.3330	1.2950	1.3710	1.3350	1.3070	1.3550	0.0118	1.77%	0.00%
6.25		4	1.3210	1.2990	1.3430	1.3250	1.3010	1.3330	0.0070	1.06%	0.91%
12.5		4	1.2960	1.2270	1.3650	1.2850	1.2570	1.3560	0.0216	3.34%	2.79%
25		4	1.3390	1.3140	1.3640	1.3440	1.3160	1.3510	0.0079	1.19%	-0.43%
50		4	1.3190	1.2800	1.3570	1.3260	1.2840	1.3400	0.0121	1.84%	1.07%
69.7		4	1.3340	1.3160	1.3510	1.3360	1.3190	1.3440	0.0055	0.83%	-0.06%
100		4	1.3490	1.2820	1.4170	1.3490	1.2980	1.4020	0.0212	3.14%	-1.21%

Proportion Normal Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.9319	0.9544	0.9522	0.9382
6.25		0.9289	0.9400	0.9416	0.9444
12.5		0.9274	0.9544	0.9048	0.9137
25		0.9482	0.9509	0.9524	0.9363
50		0.9401	0.9422	0.9476	0.9200
69.7		0.9451	0.9469	0.9496	0.9378
100		0.9530	0.9498	0.9274	0.9717

Angular (Corrected) Transformed Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	1.3070	1.3550	1.3500	1.3200
6.25		1.3010	1.3230	1.3270	1.3330
12.5		1.2980	1.3560	1.2570	1.2730
25		1.3410	1.3470	1.3510	1.3160
50		1.3230	1.3280	1.3400	1.2840
69.7		1.3340	1.3380	1.3440	1.3190
100		1.3520	1.3450	1.2980	1.4020

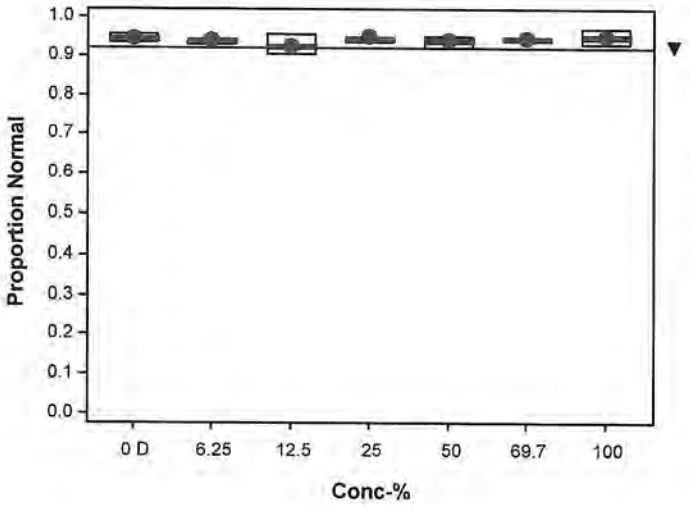
Proportion Normal Binomials

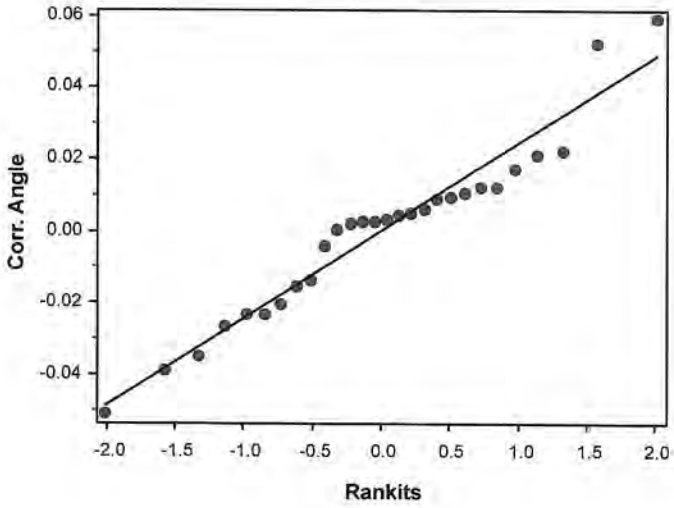
Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	260/279	230/241	239/251	243/259
6.25		235/253	235/250	242/257	238/252
12.5		230/248	251/263	247/273	233/255
25		238/251	271/285	240/252	250/267
50		251/267	261/277	235/248	230/250
69.7		258/273	232/245	264/278	226/241
100		284/298	246/259	230/248	240/247

Bivalve Larval Survival and Development Test **EcoAnalysts**

Analysis ID:	09-0655-3543	**Endpoint:**	Proportion Normal	**CETIS Version:**	CETISv2.1.4
Analyzed:	20 Feb-24 17:41	**Analysis:**	Parametric-Control vs Treatments	**Status Level:**	1
Edit Date:	20 Feb-24 17:29	**MD5 Hash:**	EDBAE943D5835730FDDC3062F5D56BB4	**Editor ID:**	004-244-315-2

Graphics





Bivalve Larval Survival and Development Test

EcoAnalysts

Analysis ID:	04-1777-5456	**Endpoint:**	Proportion Survived	**CETIS Version:**	CETISv2.1.4
Analyzed:	20 Feb-24 17:38	**Analysis:**	Parametric-Two Sample	**Status Level:**	1
Edit Date:	20 Feb-24 17:29	**MD5 Hash:**	00825521AF59237F1F1788873E549B77	**Editor ID:**	004-244-315-2
Batch ID:	03-0659-8360	**Test Type:**	Development-Survival	**Analyst:**	Danielle Mulligan
Start Date:	30 Jan-24 16:07	**Protocol:**	EPA/600/R-95/136 (1995)	**Diluent:**	Laboratory Seawater
Ending Date:	01 Feb-24 15:20	**Species:**	Mytilus galloprovincialis	**Brine:**	Crystal Sea Marine Mix
Test Length:	47h	**Taxon:**	Bivalvia	**Source:**	Taylor Shellfish **Age:** <4h
Sample ID:	06-0001-8496	**Code:**	P240130.03SC	**Project:**	Wyckoff Eagle Harbor GWTP 2024/W
Sample Date:	30 Jan-24 09:35	**Material:**	Treated Groundwater	**Source:**	Jacobs Wyckoff
Receipt Date:	30 Jan-24 11:54	**CAS (PC):**		**Station:**	24052146_1
Sample Age:	7h (5.6 °C)	**Client:**	Jacobs Wyckoff		

Data Transform	Alt Hyp	Comparison Result	PMSD
Angular (Corrected)	C > T	Salt Control passed proportion survived endpoint	4.99%

Unequal Variance t Two-Sample Test

Control I	vs	Control II	df	Test Stat	Critical	MSD	P-Type	P-Value	Decision(α:5%)
Dilution Water		Salt Control	3	-2.265	2.353	0.132	CDF	0.9458	Non-Significant Effect

Test Acceptability Criteria

		TAC Limits			
Attribute	**Test Stat**	**Lower**	**Upper**	**Overlap**	**Decision**
Control Resp	1	0.5	<<	Yes	Passes Criteria
Control Resp	0.9666	0.5	<<	Yes	Passes Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0322488	0.0322488	1	5.129	0.0641	Non-Significant Effect
Error	0.0377248	0.0062875	6			
Total	0.0699737		7			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variance	Levene Equality of Variance Test	15.35	13.75	0.0078	Unequal Variances
	Mod Levene Equality of Variance Test	15.34	13.75	0.0078	Unequal Variances
	Variance Ratio F Test				Indeterminate
Distribution	Anderson-Darling A2 Test	0.5285	3.878	0.1811	Normal Distribution
	Kolmogorov-Smirnov D Test	0.25	0.3313	0.1599	Normal Distribution
	Shapiro-Wilk W Normality Test	0.9205	0.6451	0.4336	Normal Distribution

Proportion Survived Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	4	0.9666	0.9095	1.0000	0.9733	0.9198	1.0000	0.0179	3.71%	0.00%
0	SC	4	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.00%	-3.46%

Angular (Corrected) Transformed Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	4	1.4130	1.2340	1.5910	1.4140	1.2840	1.5400	0.0561	7.94%	0.00%
0	SC	4	1.5400	1.5390	1.5400	1.5400	1.5400	1.5400	0.0000	0.00%	-8.99%

Proportion Survived Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	1.0000	0.9198	0.9580	0.9885
0	SC	1.0000	1.0000	1.0000	1.0000

Bivalve Larval Survival and Development Test

EcoAnalysts

Analysis ID:	04-1777-5456	**Endpoint:**	Proportion Survived	**CETIS Version:**	CETISv2.1.4
Analyzed:	20 Feb-24 17:38	**Analysis:**	Parametric-Two Sample	**Status Level:**	1
Edit Date:	20 Feb-24 17:29	**MD5 Hash:**	00825521AF59237F1F1788873E549B77	**Editor ID:**	004-244-315-2

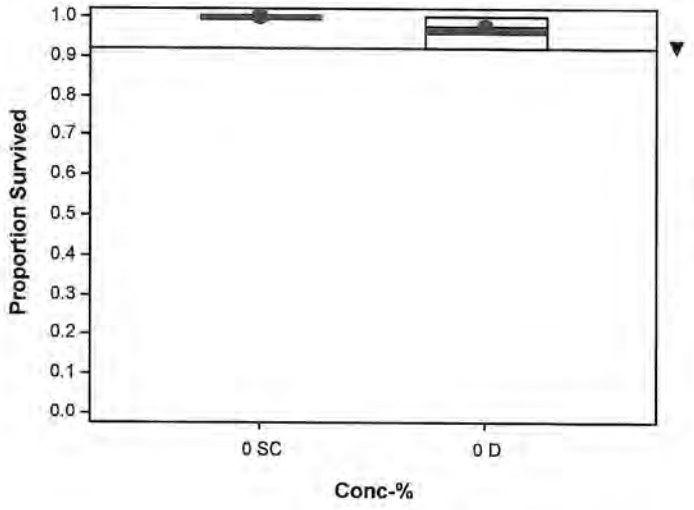
Angular (Corrected) Transformed Detail

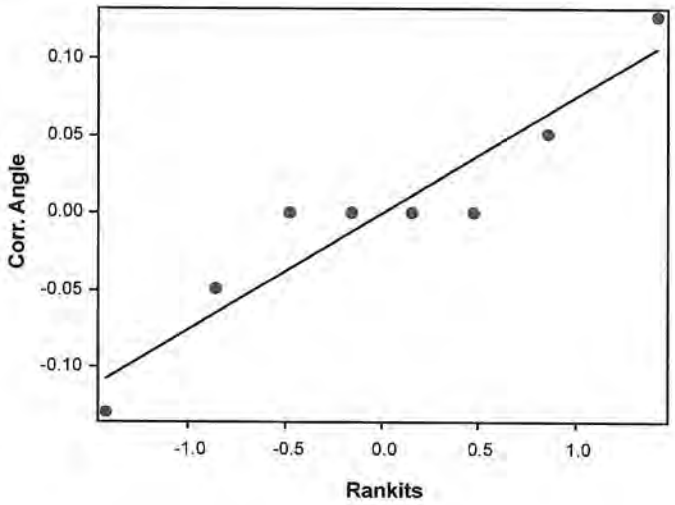
Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	1.5400	1.2840	1.3640	1.4640
0	SC	1.5400	1.5400	1.5400	1.5400

Proportion Survived Binomials

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	262/262	241/262	251/262	259/262
0	SC	262/262	262/262	262/262	262/262

Graphics





Bivalve Larval Survival and Development Test

EcoAnalysts

Analysis ID:	04-3897-6287	**Endpoint:**	Proportion Survived	**CETIS Version:**	CETISv2.1.4
Analyzed:	20 Feb-24 17:41	**Analysis:**	Nonparametric-Control vs Treatments	**Status Level:**	1
Edit Date:	20 Feb-24 17:29	**MD5 Hash:**	03B172A8E4A5CBD6CED01A944456ECE	**Editor ID:**	004-244-315-2
Batch ID:	03-0659-8360	**Test Type:**	Development-Survival	**Analyst:**	Danielle Mulligan
Start Date:	30 Jan-24 16:07	**Protocol:**	EPA/600/R-95/136 (1995)	**Diluent:**	Laboratory Seawater
Ending Date:	01 Feb-24 15:20	**Species:**	Mytilus galloprovincialis	**Brine:**	Crystal Sea Marine Mix
Test Length:	47h	**Taxon:**	Bivalvia	**Source:**	Taylor Shellfish **Age:** <4h
Sample ID:	06-0001-8496	**Code:**	P240130.03SC	**Project:**	Wyckoff Eagle Harbor GWTP 2024/W
Sample Date:	30 Jan-24 09:35	**Material:**	Treated Groundwater	**Source:**	Jacobs Wyckoff
Receipt Date:	30 Jan-24 11:54	**CAS (PC):**		**Station:**	24052146_1
Sample Age:	7h (5.6 °C)	**Client:**	Jacobs Wyckoff		

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	Tox Units	MSDu	PMSD
Angular (Corrected)	C > T	100	>100	---	1	0.07678	7.94%

Steel Many-One Rank Sum Test

Control	vs	Conc-%	df	Test Stat	Critical	Ties	P-Type	P-Value	Decision(α:5%)
Dilution Water		6.25	6	17	10	0	CDF	0.7639	Non-Significant Effect
		12.5	6	20	10	1	CDF	0.9616	Non-Significant Effect
		25	6	20.5	10	2	CDF	0.9742	Non-Significant Effect
		50	6	19	10	1	CDF	0.9219	Non-Significant Effect
		69.7	6	18.5	10	2	CDF	0.8930	Non-Significant Effect
		100	6	18	10	2	CDF	0.8571	Non-Significant Effect

Test Acceptability Criteria

		TAC Limits			
Attribute	**Test Stat**	**Lower**	**Upper**	**Overlap**	**Decision**
Control Resp	0.9666	0.5	<<	Yes	Passes Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0154108	0.0025685	6	0.2363	0.9596	Non-Significant Effect
Error	0.228305	0.0108717	21			
Total	0.243716		27			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variance	Bartlett Equality of Variance Test	4.403	16.81	0.6223	Equal Variances
	Levene Equality of Variance Test	5.556	3.812	0.0014	Unequal Variances
	Mod Levene Equality of Variance Test	4.623	3.812	0.0038	Unequal Variances
Distribution	Anderson-Darling A2 Test	1.243	3.878	0.0028	Non-Normal Distribution
	D'Agostino Kurtosis Test	4.364	2.576	1.3E-05	Non-Normal Distribution
	D'Agostino Skewness Test	0.01439	2.576	0.9885	Normal Distribution
	D'Agostino-Pearson K2 Omnibus Test	19.04	9.21	7.3E-05	Non-Normal Distribution
	Kolmogorov-Smirnov D Test	0.1764	0.1914	0.0256	Normal Distribution
	Shapiro-Wilk W Normality Test	0.8902	0.8975	0.0068	Non-Normal Distribution

Proportion Survived Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	4	0.9666	0.9095	1.0000	0.9733	0.9198	1.0000	0.0179	3.71%	0.00%
6.25		4	0.9656	0.9478	0.9835	0.9637	0.9542	0.9809	0.0056	1.16%	0.10%
12.5		4	0.9800	0.9393	1.0000	0.9911	0.9466	1.0000	0.0128	2.61%	-1.38%
25		4	0.9800	0.9431	1.0000	0.9873	0.9580	1.0000	0.0116	2.37%	-1.38%
50		4	0.9752	0.9293	1.0000	0.9847	0.9466	1.0000	0.0144	2.95%	-0.89%
69.7		4	0.9637	0.8964	1.0000	0.9784	0.9198	1.0000	0.0212	4.39%	0.30%
100		4	0.9695	0.9232	1.0000	0.9676	0.9427	1.0000	0.0145	3.00%	-0.30%

Bivalve Larval Survival and Development Test

EcoAnalysts

Analysis ID:	04-3897-6287	**Endpoint:**	Proportion Survived	**CETIS Version:**	CETISv2.1.4
Analyzed:	20 Feb-24 17:41	**Analysis:**	Nonparametric-Control vs Treatments	**Status Level:**	1
Edit Date:	20 Feb-24 17:29	**MD5 Hash:**	03B172A8E4A5CBD6CED01A944456ECE	**Editor ID:**	004-244-315-2

Angular (Corrected) Transformed Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	4	1.4130	1.2340	1.5910	1.4140	1.2840	1.5400	0.0561	7.94%	0.00%
6.25		4	1.3860	1.3340	1.4390	1.3790	1.3550	1.4320	0.0164	2.37%	1.87%
12.5		4	1.4560	1.2950	1.6170	1.4950	1.3380	1.5400	0.0505	6.93%	-3.05%
25		4	1.4550	1.2980	1.6110	1.4850	1.3640	1.5400	0.0493	6.78%	-2.95%
50		4	1.4430	1.2650	1.6210	1.4780	1.3380	1.5400	0.0560	7.76%	-2.14%
69.7		4	1.4190	1.1970	1.6420	1.4640	1.2840	1.5400	0.0700	9.86%	-0.44%
100		4	1.4180	1.2550	1.5800	1.4010	1.3290	1.5400	0.0511	7.21%	-0.33%

Proportion Survived Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	1.0000	0.9198	0.9580	0.9885
6.25		0.9656	0.9542	0.9809	0.9618
12.5		0.9466	1.0000	1.0000	0.9733
25		0.9580	1.0000	0.9618	1.0000
50		1.0000	1.0000	0.9466	0.9542
69.7		1.0000	0.9351	1.0000	0.9198
100		1.0000	0.9885	0.9466	0.9427

Angular (Corrected) Transformed Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	1.5400	1.2840	1.3640	1.4640
6.25		1.3840	1.3550	1.4320	1.3740
12.5		1.3380	1.5400	1.5400	1.4070
25		1.3640	1.5400	1.3740	1.5400
50		1.5400	1.5400	1.3380	1.3550
69.7		1.5400	1.3130	1.5400	1.2840
100		1.5400	1.4640	1.3380	1.3290

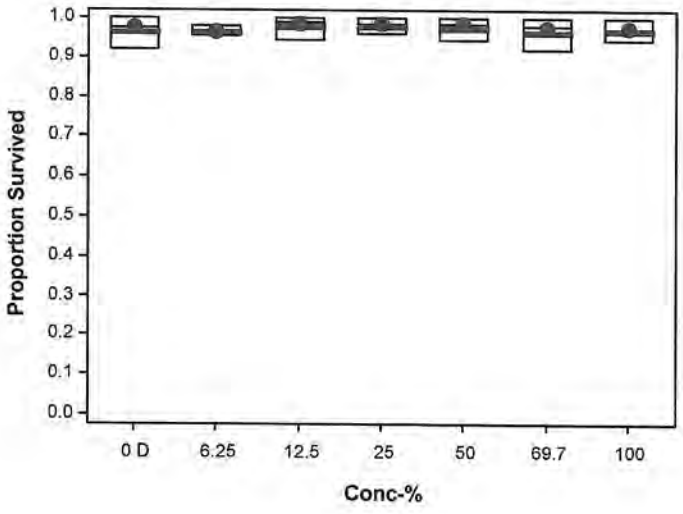
Proportion Survived Binomials

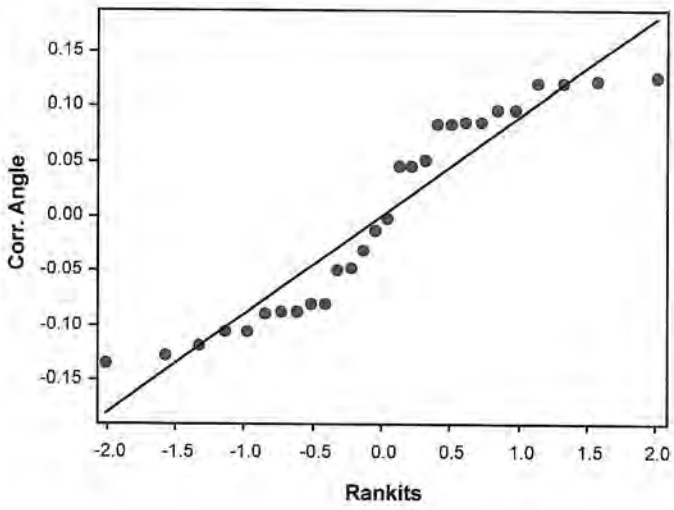
Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	262/262	241/262	251/262	259/262
6.25		253/262	250/262	257/262	252/262
12.5		248/262	262/262	262/262	255/262
25		251/262	262/262	252/262	262/262
50		262/262	262/262	248/262	250/262
69.7		262/262	245/262	262/262	241/262
100		262/262	259/262	248/262	247/262

Bivalve Larval Survival and Development Test — **EcoAnalysts**

Analysis ID:	04-3897-6287	**Endpoint:**	Proportion Survived	**CETIS Version:**	CETISv2.1.4
Analyzed:	20 Feb-24 17:41	**Analysis:**	Nonparametric-Control vs Treatments	**Status Level:**	1
Edit Date:	20 Feb-24 17:29	**MD5 Hash:**	03B172A8E4A5CBD6CED01A944456ECE	**Editor ID:**	004-244-315-2

Graphics





Bivalve Larval Survival and Development Test

EcoAnalysts

Analysis ID:	20-8186-9544	**Endpoint:**	Proportion Normal	**CETIS Version:**	CETISv2.1.4
Analyzed:	20 Feb-24 17:40	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1
Edit Date:	20 Feb-24 17:29	**MD5 Hash:**	EDBAE943D5835730FDDC3062F5D56BB4	**Editor ID:**	004-244-315-2
Batch ID:	03-0659-8360	**Test Type:**	Development-Survival	**Analyst:**	Danielle Mulligan
Start Date:	30 Jan-24 16:07	**Protocol:**	EPA/600/R-95/136 (1995)	**Diluent:**	Laboratory Seawater
Ending Date:	01 Feb-24 15:20	**Species:**	Mytilus galloprovincialis	**Brine:**	Crystal Sea Marine Mix
Test Length:	47h	**Taxon:**	Bivalvia	**Source:**	Taylor Shellfish **Age:** <4h
Sample ID:	06-0001-8496	**Code:**	P240130.03SC	**Project:**	Wyckoff Eagle Harbor GWTP 2024/W
Sample Date:	30 Jan-24 09:35	**Material:**	Treated Groundwater	**Source:**	Jacobs Wyckoff
Receipt Date:	30 Jan-24 11:54	**CAS (PC):**		**Station:**	24052146_1
Sample Age:	7h (5.6 °C)	**Client:**	Jacobs Wyckoff		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	470417	200	Yes	Two-Point Interpolation

Test Acceptability Criteria

		TAC Limits			
Attribute	**Test Stat**	**Lower**	**Upper**	**Overlap**	**Decision**
Control Resp	0.9442	0.9	<<	Yes	Passes Criteria

Point Estimates

Level	%	95% LCL	95% UCL	Tox Units	95% LCL	95% UCL
EC15	>100	---	---	<1	---	---
EC20	>100	---	---	<1	---	---
EC25	>100	---	---	<1	---	---
EC40	>100	---	---	<1	---	---
EC50	>100	---	---	<1	---	---

Proportion Normal Summary

			Calculated Variate(A/B)							Isotonic Variate	
Conc-%	**Code**	**Count**	**Mean**	**Median**	**Min**	**Max**	**CV%**	**%Effect**	**ΣA/ΣB**	**Mean**	**%Effect**
0	D	4	0.9442	0.9452	0.9319	0.9544	1.15%	0.00%	972/1030	0.9437	0.00%
6.25		4	0.9387	0.9408	0.9289	0.9444	0.73%	0.58%	950/1012	0.9406	0.33%
12.5		4	0.9251	0.9206	0.9048	0.9544	2.34%	2.02%	961/1039	0.9406	0.33%
25		4	0.9469	0.9495	0.9363	0.9524	0.77%	-0.29%	999/1055	0.9406	0.33%
50		4	0.9375	0.9412	0.9200	0.9476	1.29%	0.71%	977/1042	0.9406	0.33%
69.7		4	0.9448	0.9460	0.9378	0.9496	0.54%	-0.07%	980/1037	0.9406	0.33%
100		4	0.9505	0.9514	0.9274	0.9717	1.91%	-0.67%	1000/1052	0.9406	0.33%

Proportion Normal Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.9319	0.9544	0.9522	0.9382
6.25		0.9289	0.9400	0.9416	0.9444
12.5		0.9274	0.9544	0.9048	0.9137
25		0.9482	0.9509	0.9524	0.9363
50		0.9401	0.9422	0.9476	0.9200
69.7		0.9451	0.9469	0.9496	0.9378
100		0.9530	0.9498	0.9274	0.9717

Bivalve Larval Survival and Development Test

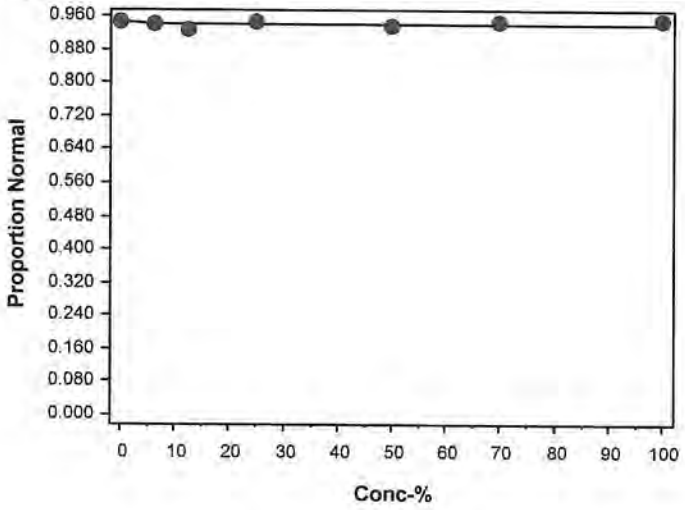
EcoAnalysts

Analysis ID:	20-8186-9544	**Endpoint:**	Proportion Normal	**CETIS Version:**	CETISv2.1.4
Analyzed:	20 Feb-24 17:40	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1
Edit Date:	20 Feb-24 17:29	**MD5 Hash:**	EDBAE943D5835730FDDC3062F5D56BB4	**Editor ID:**	004-244-315-2

Proportion Normal Binomials

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	260/279	230/241	239/251	243/259
6.25		235/253	235/250	242/257	238/252
12.5		230/248	251/263	247/273	233/255
25		238/251	271/285	240/252	250/267
50		251/267	261/277	235/248	230/250
69.7		258/273	232/245	264/278	226/241
100		284/298	246/259	230/248	240/247

Graphics



Bivalve Larval Survival and Development Test

EcoAnalysts

Analysis ID:	15-5364-4792	**Endpoint:**	Proportion Survived	**CETIS Version:**	CETISv2.1.4
Analyzed:	20 Feb-24 17:40	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1
Edit Date:	20 Feb-24 17:29	**MD5 Hash:**	03B172A8E4A5CBD6CED01A944456ECE	**Editor ID:**	004-244-315-2
Batch ID:	03-0659-8360	**Test Type:**	Development-Survival	**Analyst:**	Danielle Mulligan
Start Date:	30 Jan-24 16:07	**Protocol:**	EPA/600/R-95/136 (1995)	**Diluent:**	Laboratory Seawater
Ending Date:	01 Feb-24 15:20	**Species:**	Mytilus galloprovincialis	**Brine:**	Crystal Sea Marine Mix
Test Length:	47h	**Taxon:**	Bivalvia	**Source:**	Taylor Shellfish **Age:** <4h
Sample ID:	06-0001-8496	**Code:**	P240130.03SC	**Project:**	Wyckoff Eagle Harbor GWTP 2024/W
Sample Date:	30 Jan-24 09:35	**Material:**	Treated Groundwater	**Source:**	Jacobs Wyckoff
Receipt Date:	30 Jan-24 11:54	**CAS (PC):**		**Station:**	24052146_1
Sample Age:	7h (5.6 °C)	**Client:**	Jacobs Wyckoff		

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Log(X+1)	Linear	298675	200	Yes	Two-Point Interpolation

Test Acceptability Criteria

		TAC Limits			
Attribute	**Test Stat**	**Lower**	**Upper**	**Overlap**	**Decision**
Control Resp	0.9666	0.5	<<	Yes	Passes Criteria

Point Estimates

Level	%	95% LCL	95% UCL	Tox Units	95% LCL	95% UCL
EC15	>100	---	---	<1	---	---
EC20	>100	---	---	<1	---	---
EC25	>100	---	---	<1	---	---
EC40	>100	---	---	<1	---	---
EC50	>100	---	---	<1	---	---

Proportion Survived Summary

			Calculated Variate(A/B)							Isotonic Variate	
Conc-%	**Code**	**Count**	**Mean**	**Median**	**Min**	**Max**	**CV%**	**%Effect**	**ΣA/ΣB**	**Mean**	**%Effect**
0	D	4	0.9666	0.9733	0.9198	1.0000	3.71%	0.00%	1013/1048	0.9735	0.00%
6.25		4	0.9656	0.9637	0.9542	0.9809	1.16%	0.10%	1012/1048	0.9735	0.00%
12.5		4	0.9800	0.9911	0.9466	1.0000	2.61%	-1.38%	1027/1048	0.9735	0.00%
25		4	0.9800	0.9873	0.9580	1.0000	2.37%	-1.38%	1027/1048	0.9735	0.00%
50		4	0.9752	0.9847	0.9466	1.0000	2.95%	-0.89%	1022/1048	0.9735	0.00%
69.7		4	0.9637	0.9784	0.9198	1.0000	4.39%	0.30%	1010/1048	0.9666	0.71%
100		4	0.9695	0.9676	0.9427	1.0000	3.00%	-0.30%	1016/1048	0.9666	0.71%

Proportion Survived Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	1.0000	0.9198	0.9580	0.9885
6.25		0.9656	0.9542	0.9809	0.9618
12.5		0.9466	1.0000	1.0000	0.9733
25		0.9580	1.0000	0.9618	1.0000
50		1.0000	1.0000	0.9466	0.9542
69.7		1.0000	0.9351	1.0000	0.9198
100		1.0000	0.9885	0.9466	0.9427

Bivalve Larval Survival and Development Test

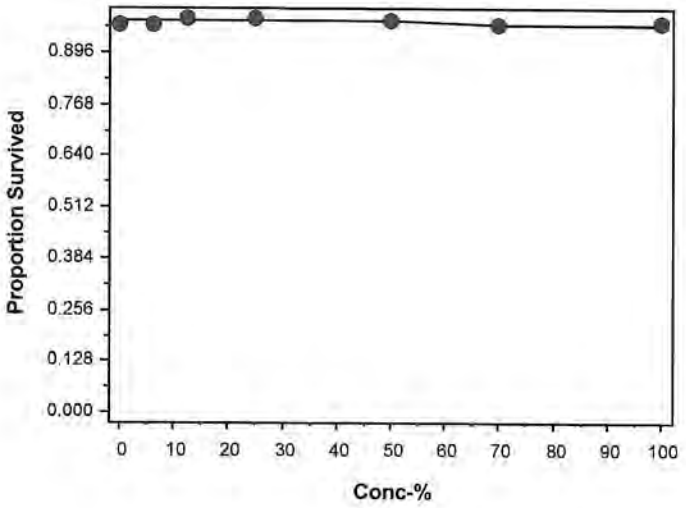
EcoAnalysts

Analysis ID:	15-5364-4792	**Endpoint:**	Proportion Survived	**CETIS Version:**	CETISv2.1.4
Analyzed:	20 Feb-24 17:40	**Analysis:**	Linear Interpolation (ICPIN)	**Status Level:**	1
Edit Date:	20 Feb-24 17:29	**MD5 Hash:**	03B172A8E4A5CBD6CED01A944456ECE	**Editor ID:**	004-244-315-2

Proportion Survived Binomials

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	262/262	241/262	251/262	259/262
6.25		253/262	250/262	257/262	252/262
12.5		248/262	262/262	262/262	255/262
25		251/262	262/262	252/262	262/262
50		262/262	262/262	248/262	250/262
69.7		262/262	245/262	262/262	241/262
100		262/262	259/262	248/262	247/262

Graphics



CETIS Test Data Worksheet

Bivalve Larval Survival and Development Test — **EcoAnalysts**

Start Date: 30 Jan-24 16:07 **Species:** Mytilus galloprovincialis **Sample Code:** P240130.03SC
End Date: 01 Feb-24 15:20 **Protocol:** EPA/600/R-95/136 (1995) **Sample Source:** Jacobs Wyckoff
Sample Date: 30 Jan-24 09:35 **Material:** Treated Groundwater **Sample Station:** 24052146_1

Conc-%	Code	Rep	Pos	Initial Density	Final Density	# Counted	# Normal	Notes
0	D	1	32	262	279	279	260	
0	D	2	3	262	241	241	230	
0	D	3	9	262	251	251	239	
0	D	4	15	262	259	259	243	
0	SC	1	19	262	283	283	261	
0	SC	2	10	262	289	289	271	
0	SC	3	24	262	281	281	261	
0	SC	4	4	262	276	276	247	
6.25		1	2	262	253	253	235	
6.25		2	14	262	250	250	235	
6.25		3	18	262	257	257	242	
6.25		4	12	262	252	252	238	
12.5		1	23	262	248	248	230	
12.5		2	26	262	263	263	251	
12.5		3	16	262	273	273	247	
12.5		4	1	262	255	255	233	
25		1	22	262	251	251	238	
25		2	21	262	285	285	271	
25		3	28	262	252	252	240	
25		4	30	262	267	267	250	
50		1	5	262	267	267	251	
50		2	7	262	277	277	261	
50		3	17	262	248	248	235	
50		4	13	262	250	250	230	
69.7		1	31	262	273	273	258	
69.7		2	8	262	245	245	232	
69.7		3	27	262	278	278	264	
69.7		4	25	262	241	241	226	
100		1	6	262	298	298	284	
100		2	29	262	259	259	246	
100		3	20	262	248	248	230	
100		4	11	262	247	247	240	

EcoAnalysts, Inc.

48-Hour Chronic WET Test

Version V.2

GENERAL

Client	Jacobs Wyckoff
Project	Wyckoff Eagle Harbor GWTP 2024/WA
Project Number	PG1958
Project Manager	**M. Seibert**
Date Sample Received	1/30/2024
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	01/30/24
Test Species	**Mytilus spp.**
Organism Batch	**TS121523.01**
Organism Acquired	12/15/2023
Organism Acclimation	46
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:	1607 LG/MS
TEST END TIME/INIT:	1520 LG

CLIENT SAMPLE ID	LAB ID
24052146-1	P240130.03

Salinity Adjustment CSMM Batch #
62123

Formalin Lot #
230724-07

Rose Bangel Batch #
5135

	Concentrations
1	Control
2	Salt Control
3	6.25%
4	12.5%
5	25%
6	50%
7	69.7%
8	100%
9	.

48-Hour Chronic WET Test

V.2

CLIENT	Jacobs Wyckoff	DATE RECEIVED	1/30/24	PROTOCOL	TOX 042
PROJECT	Wyckoff Eagle Harbor GWTP 2024/WA	TEST START DATE	1/30/24	PROJECT MANAGER	M. Seibert
CLIENT SAMPLE ID	24052146-1	TEST END DATE	2/1/24	SPECIES	*Mytilus spp.*
LAB SAMPLE ID	P240130.03	MATRIX	Liquid	NO. OF ORGANISMS	150 - 300

48-Hour Chronic Toxicity Using Bivalve Larvae

SPAWNING METHOD Heat Shock		INITIAL SPAWNING TIME 12:29	FINAL SPAWNING TIME 13:25
MALES 4	FEMALES 6	SPERM VIABILITY Good	EGG CONDITION Good
BEGIN FERTILIZATION 1325		END FERTILIZATION 14:54	CONDITION OF EMBRYOS Good

TIME OF INITIATION	INITIALS
16:07	LG/MS

EMBRYO DENSITY CALCULATIONS

of embryos in 1 mL of 100X diluted embryo stock

Count 1	Count 2	Mean
400	384	392

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

39200

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

0.07

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)

2.755102041 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**	1/30/24	**PROTOCOL**	TOX 042
PROJECT	Wyckoff Eagle Harbor GWTP 2024/WA	**TEST START DATE**	1/30/24	**PROJECT MANAGER**	M. Seibert
CLIENT SAMPLE ID	24052146-1	**TEST END DATE**	2/1/24	**SPECIES**	*Mytilus spp.*
LAB SAMPLE ID	P240130.03	**MATRIX**	Liquid	**NO. OF ORGANISMS**	150 - 300

48-Hour Chronic Toxicity Using Bivalve Larvae

Test Parameters	
Salinity of Sample	0.4
Test Salinity	30

CSMM Batch Number
62123

Salinity Adjustment Multiplier	29.6

Coarse salinity adjustment	
mLs. Sample*	1250.0
Grams CSMM	37.0

* Adjust volume so that it equals total volume of sample needed for all dilutions

Fine Salinity Adjustment	
Salinity of coarse-adjusted Sample	30
Test Salinity	30
Ratio	1.00
Grams additional CSMM needed to reach tartget salinity	0

Final salinity	30

Salinity Adjustment Date / Initials

1/30/2024	MS

ECO ANALYSTS, INC.

48-Hour Chronic WET Test

V.2

CLIENT	Jacobs Wyckoff	**DATE RECEIVED**	1/30/24	**PROTOCOL**	TOX 042
PROJECT	Wyckoff Eagle Harbor GWTP 2024/WA	**TEST START DATE**	1/30/24	**PROJECT MANAGER**	M. Seibert
CLIENT SAMPLE ID	24052146-1	**TEST END DATE**	2/1/24	**SPECIES**	*Mytilus spp.*
LAB SAMPLE ID	P240130.03	**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		
	Salt 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		
	69.7%	139.4	60.6	200		
	100%	200	0.0	200		

Test Dilution Prep

Date	Balance ID	Sample ID (P#)	Water Batch ID	Initials
1/30/24	7	P240130.03	FSW 013024 01	LG

ECO ANALYSTS, INC.

48-Hour Chronic WET Test

V.2

CLIENT	Jacobs Wyckoff	**DATE RECEIVED**	1/30/24	**PROTOCOL**	TOX 042
PROJECT	Wyckoff Eagle Harbor GWTP 2024/WA	**TEST START DATE**	1/30/24	**PROJECT MANAGER**	M. Seibert
CLIENT SAMPLE ID	24052146-1	**TEST END DATE**	2/1/24	**SPECIES**	*Mytilus spp.*
LAB SAMPLE ID	P240130.03	**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	7.8	16.3	28	7.6
Stock	Salt Control	8.1	17.3	30	8.3
Date 1/30/24	6.25%	8.1	16.6	28	7.7
Time 1542	12.5%	8.1	16.4	28	7.7
Tech LG	25%	8.1	16.5	29	7.7
Meter # 8	50%	8.1	16.8	29	7.7
	69.7%	8.1	17.1	29	7.7
	100%	8.1	17.4	29	7.7
Day 1	Control		15.9		
Surrogate	Salt Control		15.9		
Date 01/31/24	6.25%		15.9		
Time 0901	12.5%		15.9		
Tech SR	25%		15.9		
Meter # T16	50%		15.9		
	69.7%		15.9		
	100%		15.9		
Day 2	Control	8.0	15.7	28	7.9
Surrogate	Salt Control	7.9	15.5	30	8.0
Date 2/1/24	6.25%	8.1	15.9	29	7.9
Time 1502	12.5%	8.0	15.8	29	8.0
Tech LG	25%	8.0	15.7	29	8.0
Meter # 8	50%	7.9	15.9	29	8.2
	69.7%	8.0	15.9	29	8.2
	100%	8.1	15.7	30	8.3

ECO ANALYSTS, INC.

48-Hour Chronic WET Test

V.2

CLIENT	Jacobs Wyckoff	**DATE RECEIVED**	1/30/24	**PROTOCOL**	TOX 042
PROJECT	Wyckoff Eagle Harbor GWTP 2024/WA	**TEST START DATE**	1/30/24	**PROJECT MANAGER**	M. Seibert
CLIENT SAMPLE ID	24052146-1	**TEST END DATE**	2/1/24	**SPECIES**	*Mytilus spp.*
LAB SAMPLE ID	P240130.03	**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	265		2/13/24	MARH	
	2	264		2/13/24	MARH	
	3	266		2/13/24	MARH	X = 262
	4	246		2/13/24	MARH	
	5	255		2/13/24	MARH	
	6	276		2/13/24	MARH	
Control	1	260	19	2/7/24	MK	QA MARH 263 N 21 A
	2	250	11	2/7/24	MK	Δ = 0.6%.
	3	259	12	2/7/24	MK	
	4	243	16	2/7/24	MK	
Salt Control	1	261	22	2/7/24	MK	
	2	271	18	2/7/24	MK	
	3	261	20	2/7/24	MK	
	4	247	29	2/7/24	MK	
6.25%	1	235	18	2/7/24	MK	
	2	235	15	2/7/24	MK	
	3	242	15	2/7/24	MK	
	4	238	14	2/7/24	MK	
12.5%	1	①~~238~~ 230	①~~13~~ 18	2/7/24	MK	
	2	①~~251~~ 251	①~~16~~ 12	2/7/24	MK	
	3	247	26	2/7/24	MK	
	4	233	22	2/7/24	MK	
25%	1	①~~254~~ 238	①~~16~~ 13	2/7/24	MK	QA MARH 240 N 15 A
	2	271	14	2/8/24	MK	Δ = 0.7%.
	3	240	12	2/8/24	MK	
	4	250	17	2/8/24	MK	
50%	1	①~~258~~ 251	①~~15~~ 16	2/7/24	MK	
	2	261	16	2/8/24	MK	
	3	235	13	2/8/24	MK	
	4	230	20	2/8/24	MK	

① WC. MK 2/7.

ECO ANALYSTS, INC.

48-Hour Chronic WET Test

V.2

CLIENT	Jacobs Wyckoff	**DATE RECEIVED**	1/30/24	**PROTOCOL**	TOX 042
PROJECT	Wyckoff Eagle Harbor GWTP 2024/WA	**TEST START DATE**	1/30/24	**PROJECT MANAGER**	M. Seibert
CLIENT SAMPLE ID	24052146-1	**TEST END DATE**	2/1/24	**SPECIES**	*Mytilus spp.*
LAB SAMPLE ID	P240130.03	**MATRIX**	Liquid	**NO. OF ORGANISMS**	150 - 300

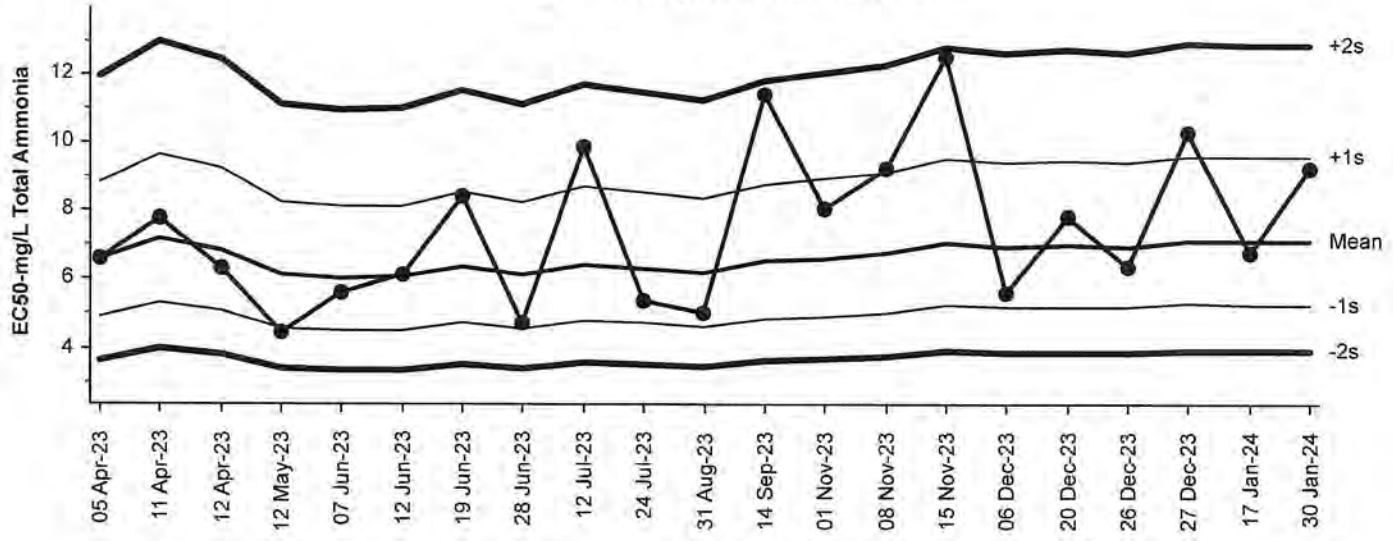
48-Hour Chronic Toxicity Using Bivalve Larvae

Concentration (%)	REP	Normal	Abnormal	Date	Tech	Comments/QA Counts
69.7%	1	258	15	2/7/24	MK	
	2	232	13	2/8/24	MK	
	3	264	14	2/8/24	MK	
	4	226	15	2/8/24	MK	
100%	1	284	14	2/7/24	MK	QA MK 286N 14A
	2	246	13	2/8/24	MK	Δ = 0.0%
	3	230	18	2/8/24	MK	
	4	240	7	2/8/24	MK	

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:	7.114	**Count:**	20	**-1s Warning Limit:**	5.28	**-2s Action Limit:**	3.93
Sigma:	NA	**CV:**	30.40%	**+1s Warning Limit:**	9.58	**+2s Action Limit:**	12.9

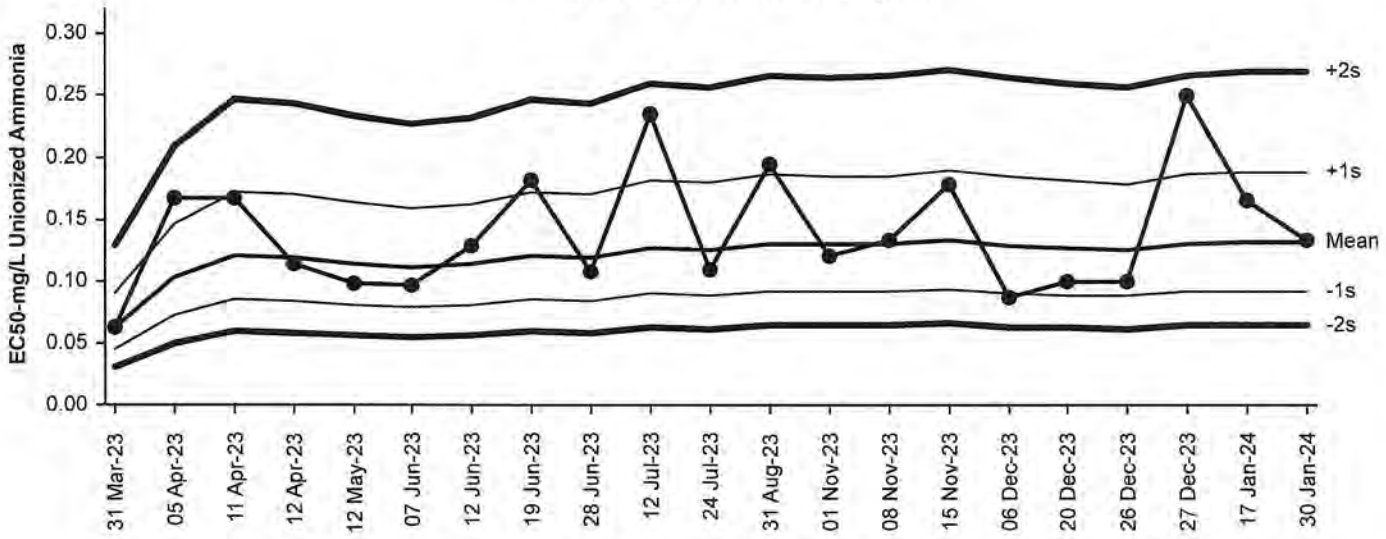
Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2023	Apr	5	15:18	6.581	-0.5325	-0.2617			05-6481-1975	07-2069-0121	EcoAnalysts
2			11	16:37	7.809	0.6957	0.3139			14-1713-1401	15-2064-5147	EcoAnalysts
3			12	15:13	6.298	-0.8151	-0.4093			21-2394-6995	12-4981-2785	EcoAnalysts
4		May	12	15:35	4.42	-2.694	-1.601	(-)		02-3839-1595	05-0285-3181	EcoAnalysts
5		Jun	7	16:24	5.621	-1.492	-0.7919			16-8311-5218	04-7873-2197	EcoAnalysts
6			12	18:29	6.154	-0.9595	-0.4874			19-7480-8941	04-9719-6422	EcoAnalysts
7			19	16:20	8.423	1.309	0.5682			16-3224-4662	15-6769-3694	EcoAnalysts
8			28	15:18	4.725	-2.389	-1.376	(-)		10-1014-4768	17-1187-2841	EcoAnalysts
9		Jul	12	12:57	9.89	2.777	1.108	(+)		02-0009-8192	04-6529-8407	EcoAnalysts
10			24	17:06	5.374	-1.739	-0.9432			05-3985-4386	13-9086-0827	EcoAnalysts
11		Aug	31	16:54	5.053	-2.061	-1.15	(-)		16-1472-3265	15-9433-1311	EcoAnalysts
12		Sep	14	13:50	11.43	4.315	1.595	(+)		10-9810-7803	01-3503-3195	EcoAnalysts
13		Nov	1	17:40	8.055	0.9413	0.418			08-2875-4322	08-8063-5388	EcoAnalysts
14			8	15:55	9.251	2.138	0.8838			13-4824-7359	00-4887-4658	EcoAnalysts
15			15	14:38	12.55	5.438	1.91	(+)		04-7650-2671	01-5035-4681	EcoAnalysts
16		Dec	6	17:35	5.604	-1.509	-0.8021			07-4908-4729	09-1248-2427	EcoAnalysts
17			20	15:50	7.826	0.7125	0.3211			21-3057-6259	03-0359-1538	EcoAnalysts
18			26	17:01	6.393	-0.7209	-0.3594			09-3076-3716	00-6627-3829	EcoAnalysts
19			27	16:43	10.27	3.159	1.236	(+)		05-3736-4406	14-3667-2208	EcoAnalysts
20	2024	Jan	17	15:15	6.76	-0.3532	-0.1713			06-5202-1140	06-9659-2949	EcoAnalysts
21			30	16:45	9.227	2.114	0.875			00-0328-6111	17-2839-1252	EcoAnalysts

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:	0.1324	**Count:**	20	**-1s Warning Limit:**	0.0928	**-2s Action Limit:**	0.0651
Sigma:	NA	**CV:**	36.70%	**+1s Warning Limit:**	0.189	**+2s Action Limit:**	0.27

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2023	Mar	31	16:54	0.06349	-0.0689	-2.067	(-)	(-)	01-2022-2925	11-3364-1842	EcoAnalysts
2		Apr	5	15:18	0.1685	0.03615	0.6791			01-0596-2964	10-8703-5300	EcoAnalysts
3			11	16:37	0.1673	0.03495	0.659			13-1124-3474	18-0348-0749	EcoAnalysts
4			12	15:13	0.1148	-0.0176	-0.4011			18-5662-1396	07-7214-9910	EcoAnalysts
5		May	12	15:35	0.09858	-0.03381	-0.8294			08-2245-0872	03-4589-6060	EcoAnalysts
6		Jun	7	16:24	0.0976	-0.03479	-0.8575			18-8939-1974	09-3314-9652	EcoAnalysts
7			12	18:29	0.1293	-0.00307	-0.06589			09-8773-2984	16-9381-4730	EcoAnalysts
8			19	16:20	0.182	0.04957	0.8945			21-4361-0458	04-8703-0787	EcoAnalysts
9			28	15:18	0.1088	-0.02354	-0.5507			16-9844-0501	06-2488-5585	EcoAnalysts
10		Jul	12	12:57	0.2364	0.104	1.63	(+)		13-3479-3905	05-2583-6446	EcoAnalysts
11			24	17:06	0.1104	-0.022	-0.5112			08-8951-5421	04-1308-9826	EcoAnalysts
12		Aug	31	16:54	0.1956	0.0632	1.098	(+)		07-4158-0358	11-0996-2376	EcoAnalysts
13		Nov	1	17:40	0.1213	-0.01104	-0.245			06-2464-1457	05-4038-7195	EcoAnalysts
14			8	15:55	0.1338	0.00137	0.02897			13-8700-3666	02-0586-1811	EcoAnalysts
15			15	14:38	0.1802	0.04777	0.8666			19-3724-7711	00-4487-8422	EcoAnalysts
16		Dec	6	17:35	0.08732	-0.04507	-1.171	(-)		11-7639-2844	02-1522-3004	EcoAnalysts
17			20	15:50	0.1006	-0.03181	-0.7731			09-2413-6838	00-3830-4602	EcoAnalysts
18			26	17:01	0.09993	-0.03246	-0.7914			07-1075-7212	13-4227-6824	EcoAnalysts
19			27	16:43	0.2498	0.1174	1.786	(+)		21-2709-9990	17-0965-3961	EcoAnalysts
20	2024	Jan	17	15:15	0.1665	0.03411	0.6449			15-5848-1090	20-9766-0257	EcoAnalysts
21			30	16:45	0.134	0.001602	0.03383			12-6773-1386	01-4900-2989	EcoAnalysts

CETIS Summary Report

Bivalve Larval Survival and Development Test — **EcoAnalysts**

Batch ID:	13-6318-1280	**Test Type:**	Development-Survival	**Analyst:**	Marisa Seibert		
Start Date:	30 Jan-24 16:45	**Protocol:**	EPA/600/R-95/136 (1995)	**Diluent:**	Laboratory Seawater		
Ending Date:	01 Feb-24 15:22	**Species:**	Mytilus galloprovincialis	**Brine:**	Evaporated Seawater		
Test Length:	47h	**Taxon:**	Bivalvia	**Source:**	Taylor Shellfish	**Age:**	<4hr
Sample ID:	11-7286-3678	**Code:**	P220819.118	**Project:**	Reference Toxicant		
Sample Date:	19 Aug-22	**Material:**	Total Ammonia	**Source:**	Reference Toxicant		
Receipt Date:	19 Aug-22	**CAS (PC):**		**Station:**	P220819.118		
Sample Age:	529d 17h	**Client:**	Internal Lab				

Multiple Comparison Summary

Analysis ID	Endpoint	Comparison Method	✓	NOEL	LOEL	TOEL	PMSD	S
00-4889-2852	Combined Proportion Norma	Dunnett Multiple Comparison Test		3.7	7.2	5.161	10.0%	1

Point Estimate Summary

Analysis ID	Endpoint	Point Estimate Method	✓	Level	mg/L	95% LCL	95% UCL	S
17-2839-1252	Combined Proportion Norma	Trimmed Spearman-Kärber		EC50	9.227	9.076	9.381	1

Test Acceptability

				TAC Limits			
Analysis ID	Endpoint	Attribute	Test Stat	Lower	Upper	Overlap	Decision
00-4889-2852	Combined Proportion Norma	PMSD	0.1001	<<	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	0.9504	0.8882	1.0130	0.9046	1.0000	0.0195	0.0391	4.11%	0.00%
1.12		4	0.9208	0.8180	1.0240	0.8626	1.0000	0.0323	0.0646	7.01%	3.11%
3.7		4	0.9733	0.8883	1.0580	0.8931	1.0000	0.0267	0.0534	5.49%	-2.41%
7.2		4	0.7872	0.7406	0.8338	0.7443	0.8092	0.0147	0.0293	3.72%	17.17%
15		4	0.0029	-0.0002	0.0059	0.0000	0.0038	0.0010	0.0019	66.67%	99.70%
24.8		4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	---	100.00%

Combined Proportion Normal Detail — MD5: 828A228D8B02667BAACC19A86D547085

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.9466	0.9046	1.0000	0.9504
1.12		0.8740	0.9466	1.0000	0.8626
3.7		1.0000	1.0000	1.0000	0.8931
7.2		0.8092	0.7443	0.8015	0.7939
15		0.0000	0.0038	0.0038	0.0038
24.8		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	248/262	237/262	269/269	249/262
1.12		229/262	248/262	263/263	226/262
3.7		263/263	281/281	264/264	234/262
7.2		212/262	195/262	210/262	208/262
15		0/262	1/262	1/262	1/262
24.8		0/262	0/262	0/262	0/262

CETIS Summary Report

Bivalve Larval Survival and Development Test — EcoAnalysts

Batch ID:	13-6318-1280	**Test Type:**	Development-Survival	**Analyst:**	Marisa Seibert		
Start Date:	30 Jan-24 16:45	**Protocol:**	EPA/600/R-95/136 (1995)	**Diluent:**	Laboratory Seawater		
Ending Date:	01 Feb-24 15:22	**Species:**	Mytilus galloprovincialis	**Brine:**	Evaporated Seawater		
Test Length:	47h	**Taxon:**	Bivalvia	**Source:**	Taylor Shellfish	**Age:**	<4hr
Sample ID:	17-4418-1481	**Code:**	P220819.118 UIA	**Project:**	Reference Toxicant		
Sample Date:	19 Aug-22	**Material:**	Unionized Ammonia	**Source:**	Reference Toxicant		
Receipt Date:	19 Aug-22	**CAS (PC):**		**Station:**	P220819.118 UIA		
Sample Age:	529d 17h	**Client:**	Internal Lab				

Multiple Comparison Summary

Analysis ID	Endpoint	Comparison Method	✓	NOEL	LOEL	TOEL	PMSD	S
04-2845-0057	Combined Proportion Norma	Dunnett Multiple Comparison Test		0.054	0.104	0.07494	10.0%	1

Point Estimate Summary

Analysis ID	Endpoint	Point Estimate Method	✓	Level	mg/L	95% LCL	95% UCL	S
01-4900-2989	Combined Proportion Norma	Trimmed Spearman-Kärber		EC50	0.134	0.1318	0.1362	1

Test Acceptability

				TAC Limits			
Analysis ID	Endpoint	Attribute	Test Stat	Lower	Upper	Overlap	Decision
04-2845-0057	Combined Proportion Norma	PMSD	0.1001	<<	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	0.9504	0.8882	1.0130	0.9046	1.0000	0.0195	0.0391	4.11%	0.00%
0.017		4	0.9208	0.8180	1.0240	0.8626	1.0000	0.0323	0.0646	7.01%	3.11%
0.054		4	0.9733	0.8883	1.0580	0.8931	1.0000	0.0267	0.0534	5.49%	-2.41%
0.104		4	0.7872	0.7406	0.8338	0.7443	0.8092	0.0147	0.0293	3.72%	17.17%
0.219		4	0.0029	-0.0002	0.0059	0.0000	0.0038	0.0010	0.0019	66.67%	99.70%
0.286		4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	---	100.00%

Combined Proportion Normal Detail — MD5: A39398A6D58D71438FA5E5E494C02EE4

Conc-mg/L	Code	Rep 1	Rep 2	Rep 3	Rep 4
0	D	0.9466	0.9046	1.0000	0.9504
0.017		0.8740	0.9466	1.0000	0.8626
0.054		1.0000	1.0000	1.0000	0.8931
0.104		0.8092	0.7443	0.8015	0.7939
0.219		0.0000	0.0038	0.0038	0.0038
0.286		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	248/262	237/262	269/269	249/262
0.017		229/262	248/262	263/263	226/262
0.054		263/263	281/281	264/264	234/262
0.104		212/262	195/262	210/262	208/262
0.219		0/262	1/262	1/262	1/262
0.286		0/262	0/262	0/262	0/262

CETIS Test Data Worksheet

Bivalve Larval Survival and Development Test — EcoAnalysts

Start Date:	30 Jan-24 16:45	**Species:**	Mytilus galloprovincialis	**Sample Code:**	P220819.118
End Date:	01 Feb-24 15:22	**Protocol:**	EPA/600/R-95/136 (1995)	**Sample Source:**	Reference Toxicant
Sample Date:	19 Aug-22	**Material:**	Total Ammonia	**Sample Station:**	P220819.118

Conc-mg/L	Code	Rep	Pos	Initial Density	Final Density	# Counted	# Normal	Notes
0	D	1	24	262	260	260	248	
0	D	2	2	262	254	254	237	
0	D	3	10	262	277	277	269	
0	D	4	21	262	262	262	249	
1.12		1	8	262	248	248	229	
1.12		2	14	262	263	263	248	
1.12		3	5	262	279	279	263	
1.12		4	18	262	239	239	226	
3.7		1	11	262	278	278	263	
3.7		2	22	262	301	301	281	
3.7		3	6	262	276	276	264	
3.7		4	16	262	250	250	234	
7.2		1	19	262	255	255	212	
7.2		2	15	262	243	243	195	
7.2		3	12	262	257	257	210	
7.2		4	9	262	242	242	208	
15		1	17	262	279	279	0	
15		2	20	262	265	265	1	
15		3	3	262	258	258	1	
15		4	13	262	267	267	1	
24.8		1	7	262	264	264	0	
24.8		2	4	262	261	261	0	
24.8		3	23	262	271	271	0	
24.8		4	1	262	260	260	0	

CETIS Test Data Worksheet

Bivalve Larval Survival and Development Test — EcoAnalysts

Start Date:	30 Jan-24 16:45	**Species:**	Mytilus galloprovincialis	**Sample Code:**	P220819.118 UIA
End Date:	01 Feb-24 15:22	**Protocol:**	EPA/600/R-95/136 (1995)	**Sample Source:**	Reference Toxicant
Sample Date:	19 Aug-22	**Material:**	Unionized Ammonia	**Sample Station:**	P220819.118 UIA

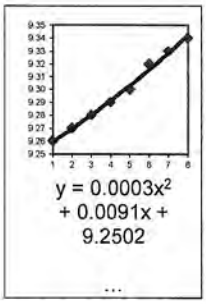
Conc-mg/L	Code	Rep	Pos	Initial Density	Final Density	# Counted	# Normal	Notes
0	D	1	3	262	260	260	248	
0	D	2	19	262	254	254	237	
0	D	3	14	262	277	277	269	
0	D	4	23	262	262	262	249	
0.017		1	24	262	248	248	229	
0.017		2	13	262	263	263	248	
0.017		3	12	262	279	279	263	
0.017		4	17	262	239	239	226	
0.054		1	18	262	278	278	263	
0.054		2	1	262	301	301	281	
0.054		3	7	262	276	276	264	
0.054		4	22	262	250	250	234	
0.104		1	15	262	255	255	212	
0.104		2	21	262	243	243	195	
0.104		3	10	262	257	257	210	
0.104		4	5	262	242	242	208	
0.219		1	16	262	279	279	0	
0.219		2	4	262	265	265	1	
0.219		3	11	262	258	258	1	
0.219		4	2	262	267	267	1	
0.286		1	8	262	264	264	0	
0.286		2	9	262	261	261	0	
0.286		3	20	262	271	271	0	
0.286		4	6	262	260	260	0	

Un-ionized Ammonia Calculator

CLIENT:	Jacobs Wyckoff	Date of Test:	January 30, 2024
PROJECT:	Wyckoff Eagle Harbor GWTP 2024/WA	Test Type:	*Mytilus galloprovincialis*
COMMENTS:	P220819.118		

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



$y = 0.0003x^2 + 0.0091x + 9.2502$

...

	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		1.12	28	7.7	16.6	289.75	9.2555		**0.017**
3	3		3.7	28	7.7	16.4	289.55	9.2555		**0.054**
4	6		7.2	28	7.7	16.2	289.35	9.2555		**0.104**
5	12		15	28	7.7	16.4	289.55	9.2555		**0.219**
6	18		24.8	28	7.6	16.3	289.45	9.2555		**0.286**
7										
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Ammonia Reference Toxicant
Spiking Worksheet

Reference Toxicant ID: P220819.118
Date Prepared: 1/30/2024
Technician Initials: CS /RG

Biv / Echino NH_3 RT

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

Date: 12/27/2023
Measurement: 9600

Test Solutions			Volume of stock to reach desired concentration	
Measured Concentration	**Desired Concentration**	**Volume**		
mg/L	mg/L	mL	mL stock to increase	
(1) 0.00/~~0.317~~(2)	Ø		[redacted]	SALT WATER
~~1.59~~/1.12	**1.5**	200		**0.047**
~~3.11~~/3.70	**3**	200		**0.094**
~~6.33~~/7.2	**6**	200		**0.188**
~~11.3~~/15.	**12**	200		**0.375**
~~17.8~~/24.8	**18**	200		**0.563**

(1) NEW DILUTIONS ; SFW Ø SAL WAS TOO LOW RG 1/30/24
(2) MC 0.280 RG 1/30/24

48 Hour Bivalve Development Reference Toxicant Test

Test ID: P220819.118	Replicates: 4	Study Director: M. Seibert	Location: Incubator 1
Dilution Water Batch: FSW013024.01	Organism Batch: TS121523.01	Associated Test(s): Jacobs Wyckoff	Organism: M. sp.
Chamber Size/Type: 30 ml shell vial	Exposure Volume: 10 ml		
Toxicant: Ammonium Chloride		Date Prepared: 1/30/24	Initials: RG
Target Concentrations: **See spiking worksheet**		Quantity of Stock: Target: See spiking worksheet	Quantity of Diluent: Target: (1) ~~250 mL~~ 200 mL
See spiking worksheet		Actual: See spiking worksheet	Actual: 200 mL

SPAWNING DATA

Initial Spawning Time: 1229	Final Spawning Time: 1325	Fertilization Time: 1325	No. of Females: 6	No. of Males: 4
Embryo Density (count/mL):	1. 400	2. 384	3. —	Mean: 392
Stocking Volume Calculation: 2900/39200 = 0.07 x 40mL = 2.76mL egg stock in 37.24 mL FSW				

0 Hours	Date: 1/30/24	WQ Time: 1631	Start Time: 1645	Initials: MS/RG

STOCK

	Control	1.5	3	6	12	18
D.O. (%) (>4.0 mg/L)	7.8	7.9	7.9	8.0	8.0	8.1
Temperature (16 ± 1°C)	16.8	16.4	16.4	16.2	16.4	16.3
Salinity (30 ± 2 ppt)	28	28	28	28	28	28
pH (6-9)	7.4	7.7	7.7	7.7	7.7	7.4
Meter #	8	8	8	8	8	8

Day 1	Temperature (16 ± 1°C)	25.9	Meter #	T16	Initials: SR
Day 2	Date: 2/1/24	WQ Time: 1440		End Time: 1522	Initials: LG
		Formalin Lot #: 230724-07		Rose Bengal Lot #: 5135	

STOCK

	Control	1.5	3	6	12	18
D.O. (%) (>4.0 mg/L)	(2) ~~7.8~~ 6.9	8.1	8.1	8.1	8.2	8.1
Temperature (16 ± 1°C)	16.4	14.9	15.3	15.2	14.8	14.8
Salinity (30 ± 2 ppt)	29	29	28	29	29	29
pH (6-9)	7.8	7.9	7.9	7.9	7.9	7.8
Meter #	8	8	8	8	8	8

(1) S'd vol. MS 1/30 (2) MR- LG 2/1

48 Hour Bivalve Development Reference Toxicant Test

Test ID: P220819.118

Conc.	Rep	Number Normal	Number Abnormal	Date	Initials
Control	1	248	12	2/7/24	DM
	2	237	17	2/7/24	DM
	3	249	8	2/7/24	DM
	4	249	13	2/21/24	MARH
1.5	1	229	19	2/21/24	MARH
	2	248	15	2/21/24	MARH
	3	263	16	2/21/24	MARH
	4	226	13	2/21/24	MARH
3	1	263	15	2/21/24	MARH
	2	281	20	2/21/24	MARH
	3	264	12	2/21/24	MARH
	4	234	16	2/21/24	MARH
6	1	212	43	2/21/24	MARH
	2	195	48	2/21/24	MARH
	3	210	47	2/21/24	MARH
	4	208	34	2/21/24	MARH
12	1	0	279	2/21/24	MARH
	2	1	264	2/21/24	MARH
	3	1	257	2/21/24	MARH
	4	1	266	2/21/24	MARH
18	1	0	264	2/21/24	MARH
	2	0	261	2/21/24	MARH
	3	0	271	2/21/24	MARH
	4	0	260	2/21/24	MARH

Stocking Density

Rep	Count	Init.
1	265	MARH
2	264	MARH
3	266	MARH
4	246	MARH
5	255	MARH
6	276	MARH
Mean:	262	

ORGANISM RECEIPT LOG

Date:	Time:	Batch No.
12/15/23	1529	TS121523.01

Organism: M.sp

Source / Supplier: Taylor Shellfish

No. Ordered:	No. Received:	Source Batch: Collection date, hatch date, etc.):
12lbs	12lbs	12/15/23

Condition of Organisms:	Approximate Size or Age: (Days from hatch, life stage, size class, etc.):
Good	Mixed Adults
Shipper: Courier	**B of L (Tracking No.)** NA
Condition of Container: Good	**Received By:** NL

Container	D.O. (mg/L)	Temp. (°C)	Cond. or Sal. (Include Units)	pH (Units)	# Dead	% Dead*	Tech. (Initials)
1	received	dry	-				NL
		10.4					

**if >10% contact lab manager*

Notes:

TAYLOR SHELLFISH FARMS

SE 130 LYNCH RD. SHELTON WA 98584
PHONE #: (360) 426-6178
WASHINGTON STATE CERT. # [illegible] MGR

HARVEST DATE:

HARVEST AREA:

HARVEST ITEM:

FARM CODE:

Dept ID

QUANTITY:

All Shellstock containers in this lot have the
harvest

Dozens

Pounds

Harvest Hour

Harvest Minute

Refer Date

Refer Hour

Refer Minute

APPENDIX B

CHAIN-OF-CUSTODY AND SAMPLE RECEIPT FORMS

E[illegible]alyst, Inc. (Region Copy)

DateShipped: 1/30/2024

CarrierName: EcoAaylists (hand delivery)

AirbillNo:

Jacobs, Wyckoff Eagle Harbor COC

Wyckoff Eagle Harbor GWTP 2024/WA

Project Code:

Cooler #: 1

No: 10-013024-110419-0771

Account Code: 2015T10P303DD210W2LA00

Contact Name: Mario Lopez Ramos

Contact Phone: 206-780-1711

Lab #	Sample #	Location	CLP Sample #	Tag	Analyses	Matrix	Collected	Numb Cont	Container	Preservative	Lab QC
(2)	24052146_1	SP-11		N	Chronic Toxicity	Ground Water	1/30/2024	2	1L Cube	< 6 C	

Special Instructions: 2024 Week 05 - 1st Quarter Bioassay -Chronic Toxicity Bivalve Test

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	[signature]	1/30/2024 1154	[signature] EcoAnalysts	1/30/24 1154	P240130.039 -5.6°C P240130.036-6.2°C

① sample collected @ 0935 on 1/30/24 - MS 1/30

② lab #: P240130.03a - temp = 5.6°C

P240130.036 - temp = 6.2°C * temp. w/in. range since rcvd w/in 4 hrs of collection - MS 1/30

SAMPLE RECEIPT

Client:	Client ID:	Lab ID:	Renewals:	
Jacobs Wyckoff	24052146-1	P240130.0②43		
Project:				
Wyckoff Eagle Harbor GWTP 2024/WA				
Date/Time Received:		1/30/24 1154		
Airbill #:		NA		
Shipper Tracking Information Kept for Records: (Y/N/NA)		NA		
Collection Date/Time:		1/30/24 0935		
Sample Holding Time (must be ≤36 hours at test initiation)		Y		
Condition of Shipping Container:		Good		
Type and Capacity of Sample Container:		1L cubi x 2		
Total Sample Volume (L):		2L		
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)		Mario Lopez		
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
	P240130.0②3④a	T4	5.6		—											MS
	P240130.0②3④b	T4	6.2		—											MS
①	P240130.0②3④	-	—	8	9.2	8	7.5	8	798	8	0.4	—	—	0.01	0.0	MS

*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:

① combined samples after obtaining temperature - MS 1/30
② corrected Lab ID - MS 1/30

V.1

MAINTENANCE LOG FOR FLOW-THROUGH CULTURE TUBS

LOCATION: Bath 10

Organism (A): M. Sp.	Batch Number: TS110623.01	Date Received: 11.6.23	Initial # of Organisms:	10% Mort =
Organism (B): M. Sp.	Batch Number: TS110623.01	Date Received: 11.6.23	Initial # of Organisms:	10% Mort =
Organism (C): M. Sp	Batch Number: TS121523.01A	Date Received: 12/15	Initial # of Organisms: 1216s	10% Mort =
Organism (D): M. Sp	Batch Number: TS121523.01B	Date Received: 12/15	Initial # of Organisms:	10% Mort =
Organism (E):	Batch Number:	Date Received:	Initial # of Organisms:	10% Mort =

Date	Feed AM	Feed PM	Organism (A, B, C, D, or E)	D.O.	Temp (°C)	Cond/ Sal	pH	H_2O Change	Organisms appear healthy (Y/N)	# Mort	Cumulative # Mort*	Init.	Comments
11.23.23		X	A	7.3	16.4	30	7.6	FT	Y	—	—	MARM	
↓		X	B	7.6	16.6	30	7.7	FT	Y	—	—	MARM	
11/26	X	—	A	7.3	15.7	32	7.7	FT	Y	—	—	TW	
11/26	X	—	B	7.7	15.6	32	7.7	FT	Y	—	—	TW	
12/3	—	✓	A	—	—	—	—	FT	Y	—	—	NJLG	fed
12/3	—	✓	B	—	—	—	—	FT	Y	—	—	NJLG	fed
12/6/23	—	→	A	6.9	15.3	30	7.5	FT	Y	0+①	0	DM	
12/6/23	—	—	B	7.5	15.4	30	7.6	FT	Y	1	1	DM	
12/10	-	✓	A	7.9	15.4	30	7.8	FT	Y	0	—	LG	
12/10	-	✓	B	7.9	15.4	30	7.9	FT	X	0	1	LG	
12/22	-	✓	A	7.6	26.0	32	7.6	FT	Y	0	—	SR	
12/22	-	✓	B	7.9	26.0	31	7.8	FT	Y	0	1	SR	
12/29/23	-	✓	A	7.8	25.9	32	7.7	FT	Y	0	—	SR	
12/29/23	-	✓	B	7.8	25.7	32	7.7	FT	Y	0	1	SR	
12/17	✓	—	C	7.7	11.9	31	7.8	FT	Y	0	—	NL	↑ 3°C

FT = Flow-through

**For all days of a given batch; if >10% notify lab manager*

① WC-DM-12/6/23

MAINTENANCE LOG FOR FLOW-THROUGH CULTURE TUBS

LOCATION: Bath 10

Organism (A): M.sp	Batch Number: TS110623.01	Date Received: 11/6	Initial # of Organisms:	10% Mort =
Organism (B): M.sp	Batch Number: TS110623.01	Date Received: 11/6	Initial # of Organisms:	10% Mort =
Organism (C): M.sp	Batch Number: TS121523.01A	Date Received: 12/15	Initial # of Organisms:	10% Mort =
Organism (D): M.sp	Batch Number: TS121523.01B	Date Received: 12/15	Initial # of Organisms:	10% Mort =
Organism (E):	Batch Number:	Date Received:	Initial # of Organisms:	10% Mort =

Date	Feed AM/PM		Organism (A, B, C, D, or E)	D.O.	Temp (°C)	Cond/ Sal	pH	H_2O Change	Organisms appear healthy (Y/N)	# Mort	Cumulative # Mort*	Init.	Comments
12/17	✓	–	D	7.7	11.9	31	7.7	FT	Y	0	–	NL	
12/17	✓	–	A	7.7	12.1	31	7.8	FT	Y	0	–	NL	
12/12	✓	–	B	8.2	12.1	31	7.8	FT	Y	0	–	NL	
12/19		✓	A	7.1	15.4	31	7.5	FT	Y	0	–	CS	
12/19		✓	B	6.9	15.7	31	7.7	FT	Y	0	–	CS	
12/19		✓	C	6.9	15.1	31	7.5	FT	Y	0	–	CS	
12/19		✓	D	6.8	15.1	31	7.5	FT	Y	0	1	CS	
12/20	–	–	C	7.1	15.7	31	7.4	FT	Y	0	–	NL	
12/20	–	–	D	7.1	15.5	31	7.4	FT	Y	0	1	NL	
12/21	–	✓	A	7.7	11.3	31	7.6	FT	Y	0	–	CS	
12/21	–	✓	C	7.4	12.4	31	7.4	FT	Y	0	–	CS	
12/21	–	✓	D	7.2	11.6	31	7.5	FT	Y	0	1 + Φ	CS	
~~12/23~~ Φ			A	~~7.7~~	~~11.3~~	~~31~~	~~7~~						
12/23			A	7.7	10.4	30	7.7	FT	Y	0	–	TT	
12/23			B	7.7	10.5	30	7.6	FT	Y	0	–	TT	

FT = Flow-through

**For all days of a given batch; if >10% notify lab manager*

Φ 1E-CS 12/21, TT 12/23

MAINTENANCE LOG FOR CULTURES

ORGANISM: M. sp.
LOCATION: Bath 10

Batch Number: TS121523.01	Date Received: 12/15/23	Initial # of Organisms: —	10% mortality = —

Date	Feed AM	Feed PM	Tub No.	D.O.	Temp (°C)	Cond/ Sal ppt	pH	H_2O Change	Organisms appear healthy (Y/N)	# Mort (per tub)	[1]Cumulative # Mort*	Init.	Comments
12/24	X	✓	B	7.2	11.1	31	7.5	FT	Y	0	-	TW	
12/25	-	-	B	7.4	11.4	30	7.6	FT	Y	0	0	SR	
12/26		✓	B	7.3	11.3	30	7.6	FT	Y	0	—	JL	
12/28	-	✓	B	7.9	12.3	30	7.7	FT	Y	0	—	CS	
12/31	-	✓	B	—	—	—	—	—	—	—	—	LG	
~~01/04 ①~~	~~-~~	~~✓~~		8.1	9.5								Too cold for salt
~~01/04 ①~~	~~-~~	~~✓~~											
01/04	-	✓	B	8.1	10.3	29	7.7	FT	Y	0	0	CS	
1/7	-	✓	B	8.8	10.3	29	7.8	FT	Y	0	0	TW	
1/10	-	✓	B	8.3	10.6	30	7.6	FT	Y	0	0	CS	
1/14	-	✓	B	8.9	9.5	31	7.8	FT	Y	0	0	LG	
1/16	✓	-	B	8.6	9.7	30	7.8	FT	Y	0	0	CS	
1/18	✓	-	B	7.6	10.2	30	7.8	FT	Y	0	0	CS	
1/21	-	✓	B	9.8	9.5	30	7.8	FT	Y	0	0	LG	
1/25	✓	-	B	8.5	10.3	30	7.8	FT	Y	0	0	TW	
1/27			B	8.4	10.2	30	7.8	FT	Y	0	0	RG	
1/28	-	-	B	8.6	11.0	29	7.8	FT	Y	0	0	TW	
2/1	-	✓	B	8.6	10.7	29	7.7	FT	Y	0	0	LG	

FT = Flow-through
*For all containers and all days for a given batch; if **>10% notify lab manager***
[1] Cumulative # Mort is the running total of the **current day's total mortality + previous cumulative culture mortality** since acquired in lab

① 1G-CS 1/4/24