

Chronic Toxicity Testing Results for Wyckoff Eagle Harbor Groundwater Treatment Plant

Monitoring Period: April 2019

Prepared for:

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Prepared by:

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Data Quality Assurance:

- Nautilus Environmental is accredited in accordance with NELAP by the State of Oregon Environmental Laboratory Accreditation Program (ORELAP ID 4053). It is also certified by the State of California Water Resources Control Board Environmental Laboratory Accreditation Program (Certificate No. 1802) and the State of Washington Department of Ecology (Lab ID C552). Specific fields of testing applicable to each accreditation are available upon request.
- All data have been reviewed and verified.
- All test results have met minimum test acceptability criteria under their respective US EPA protocols, unless otherwise noted in this report.
- All tests have met internal Quality Assurance Program requirements.

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Results verified by:

Eric Green, Project Manager

Introduction

A toxicity test was performed using a groundwater composite sample collected on April 23, 2019 from the Wyckoff Eagle Harbor Groundwater Treatment Plant on Bainbridge Island in Washington. This test was performed to satisfy quarterly monitoring requirements according to the project Quality Assurance Project Plan (QAPP 2013). The chronic bioassay was conducted using the bivalve *Mytilus galloprovincialis* (Mediterranean mussel). Testing was performed at Enthalpy Analytical (formerly Nautilus Environmental) located in San Diego, California between April 24 and 26, 2019.

Materials and Methods

The groundwater sample was collected into a low density polyethylene cubitainer by Jacobs personnel, packed in a cooler containing ice, and shipped overnight to Enthalpy. Appropriate chain-of-custody (COC) procedures were employed during collection and transport. Upon arrival at the laboratory, the cooler was opened, the sample inspected, and the contents verified against information on the COC form. Standard water quality parameters were measured and recorded on a sample check-in form and are summarized in Table 1. The sample was stored at 4°C in the dark until used for testing.

Sample ID	042319
Enthalpy Log-in Number	19-0517
Collection Date; Time	4/23/2019; 0944h
Receipt Date; Time	4/24/2019; 0830h
Receipt Temperature (°C)	1.0
Dissolved Oxygen (mg/L)	9.3
рН	7.46
Conductivity (µS/cm)	11,870
Salinity (ppt)	6.9
Alkalinity (mg/L CaCO ₃)	415
Total Chlorine (mg/L)	0.05
Total Ammonia (mg/L as N)	1.5

Table 1. Sample Information

Test Methods

Chronic toxicity testing was conducted according to the method set forth in USEPA (1995). This method is summarized in Table 2.

<u> </u>	
Test Period	4/24/2019, 1425h to 4/26/2019, 1400h
Test Organism	Mytilus galloprovincialis
Test Organism Source	Mission Bay (San Diego, CA)
Test Organism Age	4 hours post fertilization
Test Duration	48 ± 2 hours
Test Type	Static
Test Chamber, Test Solution Volume	30 mL glass vial, 10 mL
Test Temperature	15 ± 1°C
Dilution Water	Laboratory Seawater (Source: Scripps Institution of Oceanography [SIO] intake)
Additional Control	Brine Control (deionized water and hypersaline brine)
Test Salinity	30 ± 2 ppt
Source of Salinity	Hypersaline brine made by freezing seawater to a salinity of 90.3 ppt
Test Concentrations (% sample)	72.3 ^a , 35, 18, 9, 4, and 2%, lab and brine controls
Number of Replicates	5
Photoperiod	16 hours light/8 hours dark
Test Protocol	EPA/600/R-95/136
Test Acceptability Criteria for Controls	\geq 50% mean survival, \geq 90% mean development rate
Reference Toxicant	Copper sulfate (per project QAPP) ^b
Statistical Software	CETIS™ 1.8.7.20

Table 2. Summary of Methods for the Bivalve Larval Development Test

^a Highest concentration tested due to the addition of hypersaline brine

^b Enthalpy typically uses copper chloride for reference toxicant testing

Results

There were no statistically significant effects observed in any effluent concentration tested for the survival or development endpoint of the bivalve test. This results in a no observed effect concentration (NOEC) of 72.3 (the highest concentration tested) and a chronic toxic unit (TU_c) of less than 1.38 for both endpoints.

Results for the chronic toxicity test are summarized in Tables 3 and 4. Individual statistical summaries for the test and copies of the laboratory bench sheets are provided in Appendix A. The sample check-in sheet and COC form are provided in Appendices B and C, respectively.

Table 3. Summary of	of Statistical	Results for the	Chronic	Toxicity Tests	5
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Species	Endpoint	NOEC (% effluent)	LOEC (% effluent)	Toxic Unit (TU _c)	EC ₂₅ (% effluent)
Piyolyo	Normal Development	72.3	> 72.3	< 1.38	> 72.3
Divalve	Survival	72.3	> 72.3	< 1.38	> 72.3

NOEC = No Observed Effect Concentration

LOEC = Lowest Observed Effect Concentration

Chronic Toxic Unit (TU_c) = 100//NOEC. NOTE: Since 100% sample was not tested, the TU_c value can only be calculated up to the highest concentration tested. If no toxicity is observed at this concentration, the TU_c is reported as less than the calculated value. Effect Concentration 25 (IC₂₅) = Concentration expected to cause an effect to 25% of the organisms

Concentration (% Effluent)	Mean Survival (%)	Mean Normal Development (%)
0 (Brine Control)	92.5	98.2
0 (Lab Control)	96.0	98.6
2	96.5	97.7
4	97.2	98.4
9	99.5	98.9
18	96.1	98.4
35	94.1	98.4
72.3 ^a	98.2	98.1

Table 4. Detailed Results for the Bivalve Development Chronic Toxicity Test

^a Highest concentration tested due to the addition of hypersaline brine

Quality Assurance

The sample was received within the required 36-hour holding time, in good condition, and within the appropriate temperature range of 0-6°C. All control acceptability criteria were met and water quality parameters remained within the appropriate ranges throughout the test. Statistical analyses followed standard USEPA flowchart selections. Dose-response relationships were reviewed to ensure the reliability of the results. Based on the dose response observed, the calculated effects concentrations were deemed reliable.

Results for the reference toxicant tests used to monitor laboratory performance and test organism sensitivity are summarized in Table 5. The results for the concurrent reference toxicant test were within the acceptable range of the mean historical test results plus or minus two standard deviations. The reference toxicant statistical summaries and laboratory bench sheets are provided in Appendix D. Minor QA/QC issues that were unlikely to have any bearing on the final test results, such as slight temperature deviations, are noted on the data sheets and a list of qualifier codes used on bench data sheets is presented in Appendix E.

Table 5. Reference Toxicant Test Results

Species	Endpoint	EC₅₀ (μg/L copper)	Historical mean ± 2 SD (µg/L copper)	CV (%)
Bivalvo	Normal Development	7.59	7.57 ± 5.87	38.8
Divalve	Survival Rate	30.1	25.1 ± 5.77	11.5

Effect Concentration 50 (EC_{50}) = Concentration expected to cause an effect to 50% of the organisms CV = Coefficient of Variation.

References

- CH2MHill. 2013. Quality Assurance Project Plan Groundwater Treatment Plant Operations, Maintenance, Bainbridge, Washington. Prepared for USEPA Region 10 June 5, 2013.
- Standard Guide for Conducting Static Acute Toxicity Tests with Embryos of Four Species of Saltwater Bivalve Molluscs. 1989. ASTM Standard E 724-89.
- Tidepool Scientific Software. 2000-2013. CETIS Comprehensive Environmental Toxicity Information System Software, Version 1.8.7.20.
- USEPA. 1995. Short-Term Method for Estimating the Chronic Toxicity of Effluents and Receiving Waters to the West Coast Marine and Estuarine Organisms. EPA/600/R-95/136. pp. 209-258 and 389-465.
- Washington State Department of Ecology. 2016. Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria. Publication No. WQ-R-95-80. Revised June 2016

Appendix A Statistical Summaries and Raw Bench Sheets

Rivalve arva	al Survival and D	evelonme	nt Tost	annon - ar shara mar is far a sa annar an					Nautilue	Environm	ontal (CA)
Batch ID:	01-0697-7244	Tes	st Type: De	evelopment-S	urvival		Ana	lyst:			
Start Date:	24 Apr-19 14:2	5 Pro	otocol: EF	PA/600/R-95/136 (1995) D			Dilı	lent: Dilut	ed Natural S	Seawater	
Ending Date:	26 Apr-19 14:0) Sp	ecies: M	ytilus gallopro	vincialis		Bri	ne: Froz	en Seawate	r	
Duration:	48h	So	urce: Mi	ission Bay			Age):			
Sample ID:	17-8136-2383	Co	de: 19	-0517			Clie	ent: Jaco	bs		
Sample Date:	23 Apr-19 09:44	4 Ma	terial:(R) E f	fluent Sample	Groundu	rater	Pro	ject:			
Receive Date:	: 24 Apr-19 08:30) So	urce: Ja	cobs							
Sample Age:	29h (1 °C)	Sta	tion: W	yckoff							
Comparison S	Summary										
Analysis ID	Endpoint		NOEL	LOEL	TOEL	PMSD	TU	Method			
11-1928-6631	Development R	ate	72.3	>72.3	NA	1.82%	∠ 1.383	Dunnett M	ultiple Comp	oarison Tes	ŧ
12-6674-4267	Survival Rate		72.3	>72.3	NA	11.3%	∠ 1.383	Dunnett M	ultiple Comp	parison Tes	t
Point Estimat	te Summary									anthe menders in this	
Analysis ID	Endpoint		Level	%	95% LCL	95% UCL	TU	Method			
12-2669-1218	Development R	ate	EC25	>72.3	N/A	N/A	<1.383	Linear Inte	rpolation (IC	PIN)	
			EC50	>72.3	N/A	N/A	<1.383				
04-6863-8242	Survival Rate		EC25	>72.3	N/A	N/A	<1.383	Linear Inte	rpolation (IC	PIN)	
			EC50	>72.3	N/A	N/A	<1.383				
Test Acceptal	bility									4	
Analysis ID	Endpoint		Attribute	•	Test Stat	TAC Lim	its	Overlap	Decision		
11-1928-6631	Development R	ate	Control F	Resp	0.9819	0.9 - NL		Yes	Passes Ac	ceptability	Criteria
12-2669-1218	Development R	ate	Control F	Resp	0.9819	0.9 - NL		Yes	Passes Ac	ceptability	Criteria
04-6863-8242	Survival Rate		Control F	Resp	0.9252	0.5 - NL		Yes	Passes Ac	ceptability	Criteria
12-6674-4267	Survival Rate		Control F	Resp	0.9252	0.5 - NL		Yes	Passes Ac	ceptability	Criteria
Development	Rate Summary										
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Brine Control	5	0.9819	0.9588	1	0.9493	0.9945	0.008317	0.0186	1.89%	0.0%
0	Lab Control										
		5	0.986	0.9761	0.9958	0.9774	0.9938	0.003547	0.00793	0.8%	-0.42%
2		5 5	0.986 0.9773	0.9761 0.9603	0.9958 0.9943	0.9774 0.9559	0.9938 0.9893	0.003547 0.006109	0.00793 0.01366	0.8% 1.4%	-0.42% 0.47%
2 4		5 5 5	0.986 0.9773 0.9837	0.9761 0.9603 0.9767	0.9958 0.9943 0.9906	0.9774 0.9559 0.9787	0.9938 0.9893 0.9932	0.003547 0.006109 0.00251	0.00793 0.01366 0.005613	0.8% 1.4% 0.57%	-0.42% 0.47% -0.18%
2 4 9		5 5 5 5	0.986 0.9773 0.9837 0.9888	0.9761 0.9603 0.9767 0.9774	0.9958 0.9943 0.9906 1	0.9774 0.9559 0.9787 0.9756	0.9938 0.9893 0.9932 1	0.003547 0.006109 0.00251 0.004105	0.00793 0.01366 0.005613 0.009178	0.8% 1.4% 0.57% 0.93%	-0.42% 0.47% -0.18% -0.7%
2 4 9 18		5 5 5 5 5	0.986 0.9773 0.9837 0.9888 0.9843	0.9761 0.9603 0.9767 0.9774 0.9727	0.9958 0.9943 0.9906 1 0.9959	0.9774 0.9559 0.9787 0.9756 0.9762	0.9938 0.9893 0.9932 1 1	0.003547 0.006109 0.00251 0.004105 0.004184	0.00793 0.01366 0.005613 0.009178 0.009355	0.8% 1.4% 0.57% 0.93% 0.95%	-0.42% 0.47% -0.18% -0.7% -0.25%
2 4 9 18 35		5 5 5 5 5 5	0.986 0.9773 0.9837 0.9888 0.9843 0.9839	0.9761 0.9603 0.9767 0.9774 0.9727 0.9699	0.9958 0.9943 0.9906 1 0.9959 0.9978	0.9774 0.9559 0.9787 0.9756 0.9762 0.9699	0.9938 0.9893 0.9932 1 1 1	0.003547 0.006109 0.00251 0.004105 0.004184 0.005023	0.00793 0.01366 0.005613 0.009178 0.009355 0.01123	0.8% 1.4% 0.57% 0.93% 0.95% 1.14%	-0.42% 0.47% -0.18% -0.7% -0.25% -0.21%
2 4 9 18 35 72.3		5 5 5 5 5 5 5	0.986 0.9773 0.9837 0.9888 0.9843 0.9839 0.9812	0.9761 0.9603 0.9767 0.9774 0.9727 0.9699 0.9742	0.9958 0.9943 0.9906 1 0.9959 0.9978 0.9881	0.9774 0.9559 0.9787 0.9756 0.9762 0.9699 0.9735	0.9938 0.9893 0.9932 1 1 1 0.989	0.003547 0.006109 0.00251 0.004105 0.004184 0.005023 0.002502	0.00793 0.01366 0.005613 0.009178 0.009355 0.01123 0.005595	0.8% 1.4% 0.57% 0.93% 0.95% 1.14% 0.57%	-0.42% 0.47% -0.18% -0.7% -0.25% -0.21% 0.07%
2 4 9 18 35 72.3 Survival Rate	Summary	5 5 5 5 5 5 5	0.986 0.9773 0.9837 0.9888 0.9843 0.9839 0.9812	0.9761 0.9603 0.9767 0.9774 0.9727 0.9699 0.9742	0.9958 0.9943 0.9906 1 0.9959 0.9978 0.9881	0.9774 0.9559 0.9787 0.9756 0.9762 0.9699 0.9735	0.9938 0.9893 0.9932 1 1 1 0.989	0.003547 0.006109 0.00251 0.004105 0.004184 0.005023 0.002502	0.00793 0.01366 0.005613 0.009178 0.009355 0.01123 0.005595	0.8% 1.4% 0.57% 0.93% 0.95% 1.14% 0.57%	-0.42% 0.47% -0.18% -0.7% -0.25% -0.21% 0.07%
2 4 9 18 35 72.3 Survival Rate C-%	Summary Control Type	5 5 5 5 5 5 5 Count	0.986 0.9773 0.9837 0.9888 0.9843 0.9839 0.9839 0.9812 Mean	0.9761 0.9603 0.9767 0.9774 0.9727 0.9699 0.9742 95% LCL	0.9958 0.9943 0.9906 1 0.9959 0.9978 0.9881 95% UCL	0.9774 0.9559 0.9787 0.9756 0.9762 0.9699 0.9735 Min	0.9938 0.9893 0.9932 1 1 1 0.989 Max	0.003547 0.006109 0.00251 0.004105 0.004184 0.005023 0.002502 Std Err	0.00793 0.01366 0.005613 0.009178 0.009355 0.01123 0.005595 Std Dev	0.8% 1.4% 0.57% 0.93% 0.95% 1.14% 0.57%	-0.42% 0.47% -0.18% -0.7% -0.25% -0.21% 0.07%
2 4 9 18 35 72.3 Survival Rate C-%	Summary Control Type Brine Control	5 5 5 5 5 5 5 5 5 5	0.986 0.9773 0.9837 0.9888 0.9843 0.9843 0.9839 0.9812 Mean 0.9252	0.9761 0.9603 0.9767 0.9774 0.9727 0.9699 0.9742 95% LCL 0.8395	0.9958 0.9943 0.9906 1 0.9959 0.9978 0.9881 95% UCL	0.9774 0.9559 0.9787 0.9756 0.9762 0.9699 0.9735 Min 0.8645	0.9938 0.9893 0.9932 1 1 1 0.989 Max 1	0.003547 0.006109 0.00251 0.004105 0.004184 0.005023 0.002502 Std Err 0.03085	0.00793 0.01366 0.005613 0.009178 0.009355 0.01123 0.005595 Std Dev 0.06897	0.8% 1.4% 0.57% 0.93% 0.95% 1.14% 0.57% CV% 7.46%	-0.42% 0.47% -0.18% -0.7% -0.25% -0.21% 0.07% %Effect 0.0%
2 4 9 18 35 72.3 Survival Rate C-% 0 0	Summary Control Type Brine Control Lab Control	5 5 5 5 5 5 5 5 5 5 5 5 5	0.986 0.9773 0.9837 0.9888 0.9843 0.9839 0.9812 Mean 0.9252 0.96	0.9761 0.9603 0.9767 0.9774 0.9727 0.9699 0.9742 95% LCL 0.8395 0.8827 0.8827	0.9958 0.9943 0.9906 1 0.9959 0.9978 0.9881 95% UCL 1 1	0.9774 0.9559 0.9787 0.9756 0.9762 0.9699 0.9735 Min 0.8645 0.8581	0.9938 0.9893 0.9932 1 1 1 0.989 Max 1 1	0.003547 0.006109 0.00251 0.004105 0.004184 0.005023 0.002502 Std Err 0.03085 0.02785	0.00793 0.01366 0.005613 0.009178 0.009355 0.01123 0.005595 Std Dev 0.06897 0.06228	0.8% 1.4% 0.57% 0.93% 0.95% 1.14% 0.57% CV% 7.46% 6.49%	-0.42% 0.47% -0.18% -0.7% -0.25% -0.21% 0.07% %Effect 0.0% -3.77%
2 4 9 18 35 72.3 Survival Rate C-% 0 0 2	Summary Control Type Brine Control Lab Control	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	0.986 0.9773 0.9837 0.9888 0.9843 0.9839 0.9812 Mean 0.9252 0.96 0.9652	0.9761 0.9603 0.9767 0.9774 0.9727 0.9699 0.9742 95% LCL 0.8395 0.8827 0.8982	0.9958 0.9943 0.9906 1 0.9959 0.9978 0.9881 95% UCL 1 1	0.9774 0.9559 0.9787 0.9756 0.9762 0.9699 0.9735 Min 0.8645 0.8581 0.8774	0.9938 0.9893 0.9932 1 1 1 0.989 Max 1 1 1	0.003547 0.006109 0.00251 0.004105 0.004184 0.005023 0.002502 Std Err 0.03085 0.02785 0.02411	0.00793 0.01366 0.005613 0.009178 0.009355 0.01123 0.005595 Std Dev 0.06897 0.06228 0.0539	0.8% 1.4% 0.57% 0.93% 0.95% 1.14% 0.57% CV% 7.46% 6.49% 5.59%	-0.42% 0.47% -0.18% -0.7% -0.25% -0.21% 0.07% %Effect 0.0% -3.77% -4.32%
2 4 9 18 35 72.3 Survival Rate C-% 0 0 2 4	Summary Control Type Brine Control Lab Control	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	0.986 0.9773 0.9837 0.9888 0.9843 0.9843 0.9812 Mean 0.9252 0.96 0.9652 0.9716	0.9761 0.9603 0.9767 0.9774 0.9727 0.9699 0.9742 95% LCL 0.8395 0.8827 0.8982 0.9204	0.9958 0.9943 0.9906 1 0.9959 0.9978 0.9881 95% UCL 1 1 1	0.9774 0.9559 0.9787 0.9756 0.9762 0.9699 0.9735 Min 0.8645 0.8581 0.8774 0.9097	0.9938 0.9893 1 1 1 0.989 Max 1 1 1 1 1	0.003547 0.006109 0.00251 0.004105 0.004184 0.005023 0.002502 Std Err 0.03085 0.02785 0.02411 0.01843	0.00793 0.01366 0.005613 0.009178 0.009355 0.01123 0.005595 Std Dev 0.06897 0.06228 0.0539 0.04121	0.8% 1.4% 0.57% 0.93% 0.95% 1.14% 0.57% CV% 7.46% 6.49% 5.59% 4.24%	-0.42% 0.47% -0.18% -0.7% -0.25% -0.21% 0.07% %Effect 0.0% -3.77% -4.32% -5.02%
2 4 9 18 35 72.3 Survival Rate C-% 0 0 2 4 9 18	Summary Control Type Brine Control Lab Control	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	0.986 0.9773 0.9837 0.9888 0.9843 0.9839 0.9812 Mean 0.9252 0.96 0.9652 0.9716 0.9948 0.9212	0.9761 0.9603 0.9767 0.9774 0.9727 0.9699 0.9742 95% LCL 0.8395 0.8827 0.8982 0.9204 0.9805	0.9958 0.9943 0.9906 1 0.9959 0.9978 0.9881 95% UCL 1 1 1 1	0.9774 0.9559 0.9787 0.9756 0.9762 0.9699 0.9735 Min 0.8645 0.8581 0.8774 0.9097 0.9742 0.971	0.9938 0.9893 0.9932 1 1 1 0.989 Max 1 1 1 1 1 1	0.003547 0.006109 0.00251 0.004105 0.004184 0.005023 0.002502 Std Err 0.03085 0.02785 0.02411 0.01843 0.005161	0.00793 0.01366 0.005613 0.009178 0.009355 0.01123 0.005595 Std Dev 0.06897 0.06228 0.0539 0.04121 0.01154	0.8% 1.4% 0.57% 0.93% 0.95% 1.14% 0.57% CV% 7.46% 6.49% 5.59% 4.24% 1.16%	-0.42% 0.47% -0.18% -0.7% -0.25% -0.21% 0.07% %Effect 0.0% -3.77% -4.32% -5.02% -7.53%
2 4 9 18 35 72.3 Survival Rate C-% 0 0 2 4 9 18 35	Summary Control Type Brine Control Lab Control	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	0.986 0.9773 0.9837 0.9888 0.9843 0.9839 0.9812 Mean 0.9252 0.96 0.9652 0.9716 0.9948 0.9613 0.9406	0.9761 0.9603 0.9767 0.9774 0.9727 0.9699 0.9742 95% LCL 0.8395 0.8827 0.8982 0.9204 0.9805 0.8952 0.855	0.9958 0.9943 0.9906 1 0.9959 0.9978 0.9881 95% UCL 1 1 1 1 1	0.9774 0.9559 0.9787 0.9756 0.9762 0.9699 0.9735 Min 0.8645 0.8581 0.8774 0.9097 0.9742 0.871 0.9751	0.9938 0.9893 0.9932 1 1 1 0.989 Max 1 1 1 1 1 1 1 1 1	0.003547 0.006109 0.00251 0.004105 0.004184 0.005023 0.002502 Std Err 0.03085 0.02785 0.02411 0.01843 0.005161 0.02379 0.02250	0.00793 0.01366 0.005613 0.009178 0.009355 0.01123 0.005595 Std Dev 0.06897 0.06228 0.0539 0.04121 0.01154 0.0532 0.06617	0.8% 1.4% 0.57% 0.93% 0.95% 1.14% 0.57% 7.46% 6.49% 5.59% 4.24% 1.16% 5.53% 7.04%	-0.42% 0.47% -0.18% -0.7% -0.25% -0.21% 0.07% %Effect 0.0% -3.77% -4.32% -5.02% -7.53% -3.91% 4.67%

() EL QIE 5/17/19

Report Date:	02 May-19
Test Code:	1904-S10

Test Code:

02	May-19	14:05	(p 2	of	2)
19	04-S108	8 19-1	7850	-17	17

Bivalve Larva	al Survival and D)evelopmer	nt Test				Nautilus Environmental (CA)
Developmen	t Rate Detail						
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	
0	Brine Control	0.9493	0.9926	0.9945	0.9879	0.9851	
0	Lab Control	0.9863	0.9938	0.9785	0.9774	0.9938	
2		0.9806	0.9728	0.9559	0.9879	0.9893	
4		0.9932	0.9832	0.9787	0.9825	0.9806	
9		0.9871	0.9756	1	0.9868	0.9943	
18		1	0.9852	0.9799	0.9762	0.9801	
35		0.9866	0.9854	1	0.9699	0.9775	
72.3		0.9793	0.989	0.9814	0.9735	0.9828	
Survival Rate	e Detail						
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	
0	Brine Control	0.8903	0.871	1	1	0.8645	
0	Lab Control	0.9419	1	1	0.8581	1	
2		1	0.9484	0.8774	1	1	
4		0.9484	1	0.9097	1	1	
9		1	1	1	0.9742	1	
18		1	0.871	0.9613	1	0.9742	
35		0.9613	0.8839	1	0.8581	1	
72.3		0.9355	1	1	0.9742	1	 ×
Development	t Rate Binomials						
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	
0	Brine Control	131/138	134/135	181/182	163/165	132/134	
0	Lab Control	144/146	161/162	182/186	130/133	160/161	
2		152/155	143/147	130/136	163/165	185/187	
4		146/147	176/179	138/141	168/171	152/155	
9		153/155	160/164	174/174	149/151	175/176	
18		166/166	133/135	146/149	164/168	148/151	
35		147/149	135/137	160/160	129/133	174/178	
72.3		142/145	179/181	158/161	147/151	171/174	
Survival Rate	Binomials						
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	
0	Brine Control	138/155	135/155	155/155	155/155	134/155	
0	Lab Control	146/155	155/155	155/155	133/155	155/155	
2		155/155	147/155	136/155	155/155	155/155	
4		147/155	155/155	141/155	155/155	155/155	
9		155/155	155/155	155/155	151/155	155/155	
18		155/155	135/155	149/155	155/155	151/155	
35		149/155	137/155	155/155	133/155	155/155	
72.3		145/155	155/155	155/155	151/155	155/155	

Analyst: Ja QA: E4 5/17/19

CETIS Ana	ETIS Analytical Report							Report Date: 02 May-19 14:05 (Test Code: 1904-S108 19-78)5 (p 1 of 4) 9-7850-1717	
Bivalve Larva	al Survival and [Developn	nent Test						Nautilus	Environr	nental (CA)
Analysis ID: Analyzed:	11-1928-6631 02 May-19 14:	E 04 A	Endpoint: Dev Analysis: Par	int: Development Rate sis: Parametric-Control vs Treatments			CET Offic	CETIS Version: Official Results:		CETISv1.8.7 Yes	
Data Transfo	rm	Zeta	Alt Hyp	Trials	Seed		PMSD	NOEL	LOEL	TOEL	TU
Angular (Corre	ected)	NA	C > T	NA	NA		1.82%	72.3	>72.3	NA	1.383
Dunnett Mult	iple Compariso	n Test									
Control	vs C-%		Test Stat	Critical	MSD DF	P-Value	P-Type	Decision(a:5%)		
Brine Control	2		0.7947	2.407	0.067 8	0.5477	CDF	Non-Signif	icant Effect		
	4		0.07817	2.407	0.067 8	0.8349	CDF	Non-Signif	icant Effect		
	9		-0.87	2.407	0.067 8	0.9820	CDF	Non-Signif	icant Effect		
	18		-0.1494	2.407	0.067 8	0.8937	CDF	Non-Signif	icant Effect		
	35		-0.135	2.407	0.067 8	0.8906	CDF	Non-Signif	icant Effect		
	72.3		0.4417	2.407	0.067 8	0.7048	CDF	Non-Signif	icant Effect		
ANOVA Table)	sector tarrent a toti ilinato									
Source	Sum Squ	ares	Mean Squ	iare	DF	F Stat	P-Value	Decision(a:5%)		
Between	0.006289	693	0.0010482	.82	6	0.5422	0.7716	Non-Signif	icant Effect		
Error	0.054137	31	0.0019334	75	28						
Total	0.060427				34						
Distributiona	I Tests								#/####################################		
Attribute	Test			Test Stat	Critical	P-Value	Decision	(α:1%)			
Variances	Bartlett E	Equality o	f Variance	5.314	16.81	0.5042	Equal Var	iances			
Distribution	Shapiro-	Wilk W N	lormality	0.9761	0.9146	0.6308	Normal D	istribution			
Development	t Rate Summary										
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Brine Control	5	0.9819	0.9588	1	0.9879	0.9493	0.9945	0.008317	1.89%	0.0%
2		5	0.9773	0.9603	0.9943	0.9806	0.9559	0.9893	0.006109	1.4%	0.47%
4		5	0.9837	0.9767	0.9906	0.9825	0.9787	0.9932	0.002511	0.57%	-0.18%
9		5	0.9888	0.9774	1	0.9871	0.9756	1	0.004104	0.93%	-0.7%
18		5	0.9843	0.9727	0.9959	0.9801	0.9762	1	0.004183	0.95%	-0.25%
35		5	0.9839	0.9699	0.9978	0.9854	0.9699	1	0.005023	1.14%	-0.21%
/2.3		5	0.9812	0.9742	0.9881	0.9814	0.9735	0.989	0.002502	0.57%	0.07%
Angular (Cor	rected) Transfor	rmed Su	mmary								
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Brine Control	5	1.447	1.371	1.522	1.46	1.344	1.497	0.02715	4.2%	0.0%
2		5	1.425	1.37	1.479	1.431	1.359	1.467	0.01976	3.1%	1.53%
4		5	1.445	1.413	1.476	1.438	1.424	1.488	0.01129	1.75%	0.15%
9		5	1.471	1.415	1.527	1.457	1.414	1.533	0.02014	3.06%	-1.67%
18		5	1.451	1.393	1.509	1.429	1.416	1.532	0.02094	3.23%	-0.29%
35		5	1.45	1.387	1.514	1.45	1.396	1.531	0.02277	3.51%	-0.26%
/2.3		5	1.434	1.408	1.461	1.434	1.407	1.465	0.009449	1.47%	0.85%

Analyst: Ja QA: EL 5/17/19





CETIS Analytical Report								Report Date: Test Code:		02 May-19 14:05 (p 3 of 4) 1904-S108 19-7850-1717		
Bivalve Larv	al Survival and	Developm	ent Test						Nautilu	s Environr	nental (CA)	
Analysis ID: Analyzed:	12-6674-4267 02 May-19 14:	Ei 04 Ai	n dpoint : Sur n alysis: Par	vival Rate ametric-Cor	ntrol vs Trea	tments	CET	IS Version	: CETISv1 s: Yes	.8.7		
Data Transfo	rm	Zeta	Alt Hyp	Trials	Seed		PMSD	NOEL	LOEL	TOEL	 TU	
Angular (Corr	ected)	NA	C > T	NA	NA		11.3%	72.3	>72.3	NA	1.383	
Dunnett Mult	iple Compariso	n Test									<u> </u>	
Control	vs C-%		Test Stat	Critical	MSD DF	P-Value	P-Type	Decision	(a:5%)			
Brine Control	2		-1.071	2.407	0.205 8	0.9900	CDF	Non-Sign	ificant Effect			
	4		-1.194	2.407	0.205 8	0.9932	CDF	Non-Sian	ificant Effect			
	9		-1.978	2.407	0.205 8	0.9995	CDF	Non-Sign	ificant Effect			
	18		-0.8359	2.407	0.205 8	0.9802	CDF	Non-Sian	ificant Effect			
	35		-0.3527	2.407	0.205 8	0.9318	CDF	Non-Sign	ificant Effect			
	72.3		-1.468	2.407	0.205 8	0.9972	CDF	Non-Sign	ificant Effect			
ANOVA Table	9											
Source	Sum Squ	ares	Mean Squ	iare	DF	F Stat	P-Value	Decision	(α:5%)			
Between	0.096091	02	0.0160151	7	6	0.8873	0.5173	Non-Sign	ificant Effect			
Error	0.505379	1	0.0180492	25	28			Ū.				
Total	0.601470	1			34	anner.						
Distributiona	l Tests											
Attribute	Test			Test Stat	Critical	P-Value	Decision	(α:1%)				
Variances	Bartlett E	Equality of	Variance	5.207	16.81	0.5175	Equal Var	iances				
Distribution	Shapiro-	Wilk W No	ormality	0.9414	0.9146	0.0618	Normal D	istribution				
Survival Rate	Summary		******									
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect	
0	Brine Control	5	0.9252	0.8395	1	0.8903	0.8645	1	0.03085	7.46%	0.0%	
2		5	0.9652	0.8982	1	1	0.8774	1	0.02411	5.59%	-4.32%	
4		5	0.9716	0.9204	1	1	0.9097	1	0.01843	4.24%	-5.02%	
9		5	0.9948	0.9805	1	1	0.9742	1	0.005161	1.16%	-7.53%	
18		5	0.9613	0.8952	1	0.9742	0.871	1	0.02379	5.53%	-3.91%	
35		5	0.9406	0.8585	1	0.9613	0.8581	1	0.02959	7.04%	-1.67%	
72.3		5	0.9819	0.9468	1	1	0.9355	1	0.01264	2.88%	-6.14%	
Angular (Cor	rected) Transfor	med Sum	mary									
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect	
0	Brine Control	5	1.338	1.12	1.557	1.233	1.194	1.531	0.07877	13.16%	0.0%	
2		5	1.429	1.248	1.611	1.531	1.213	1.531	0.06528	10.21%	-6.8%	
4		5	1.44	1.282	1.598	1.531	1.266	1.531	0.0569	8.84%	-7.58%	
9		5	1.506	1.439	1.574	1.531	1.409	1.531	0.02423	3.6%	-12.56%	
18		5	1.409	1.241	1.577	1.409	1.203	1.531	0.06049	9.6%	-5.31%	
35		5	1.368	1.165	1.572	1.373	1.185	1.531	0.07335	11.99%	-2.24%	
/2.3		5	1.463	1.341	1.585	1.531	1.314	1.531	0.04404	6.73%	-9.32%	

Analyst: JCL QA: EL 5/17/19



CETIS	ETIS Analytical Report							Repo Test	ort Date: Code:	02 N 190	//ay-19 14 4-S108	1:05 (p 1 of 2) 19-7850-1717
Bivalve	Bivalve Larval Survival and Development Test Nautilus Environmental (CA)											
Analysi Analyzo	is ID: ed:	12-2669-1218 02 May-19 14:0	End 4 Ana	point: lysis:	Development R Linear Interpola	ate ition (ICPIN))	CETI Offic	S Version: ial Results:	CETISv1 Yes	.8.7	
Linear	Interpo	plation Options										
X Trans	sform	Y Transform	See	d	Resamples	Exp 95%	CL Meth	od				
Linear		Linear	1960	0171	1000	Yes	Two-	Point Interpo	olation		*******	
Point E	stimat	es										
Level	%	95% LCL	95% UCL	TU	95% LCL	95% UCL						
EC25	>72.3	3 N/A	N/A	<1.383	3 NA	NA						<u></u>
EC50	>72.3	3 N/A	N/A	<1.383	3 NA	NA						
Develo	pment	Rate Summary				Calcu	lated Variat	te(A/B)				
C-%	c	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	Α	в
0	E	Brine Control	5	0.9819	0.9493	0.9945	0.008317	0.0186	1.89%	0.0%	741	754
2			5	0.9773	3 0.9559	0.9893	0.006109	0.01366	1.4%	0.47%	773	790
4			5	0.9837	0.9787	0.9932	0.002511	0.005614	0.57%	-0.18%	780	793
9			5	0.9888	3 0.9756	1	0.004104	0.009178	0.93%	-0.7%	811	820
18			5	0.9843	3 0.9762	1	0.004183	0.009354	0.95%	-0.25%	757	769
35			5	0.9839	0.9699	1	0.005023	0.01123	1.14%	-0.21%	745	757
72.3			5	0.9812	2 0.9735	0.989	0.002502	0.005595	0.57%	0.07%	797	812
Graphi	cs											
	1.0		•		•							
	0.0											
	0.9											
	0.8											
Pate	0.7											
t	0.6											
June	0.5											
	04											
	0.3											
	0.2											
	0.1											
	0.0 E	10 20	20 40									
	0	10 20	30 40	50 6	bu /u 80							
			C-%									

Analyst: Ja QA: EG 6/17/19

Natilue Environmental CAA Natilue Environmental CAA Analysis ID: 04-6863-8242 C2 May-19 14-04 Analysis: Linear Interpolation (ICPIN) CETIS Version: CETISV1.8.7 Cffficial Results: Ves Linear Interpolation (ICPIN) CETIS Version: CETISV1.8.7 Cffficial Results: Ves Variansion: Variansindevente Varia Variansion: Variansion: Variansion: Vari	CETIS	CETIS Analytical Report Report Date: Test Code:								02 N 190	/lay-19 14:(4-S108 19)5 (p 2 of 2) 9-7850-1717
Analysis ID: 04-8683-8242 02 May-19 14-04 Endpoint: Analysis: Survival Rate Linear interpolation (ICPIN) CETIS Version: CETIS V.1.8.7 Official Results: Yes Linear interpolation rule Y Transform Y Transform Seed Resamples Exp 95% CL Method Version: Version: <td>Bivalve</td> <td>e Larval Survival and D</td> <td>evelopmen</td> <td>t Test</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Nautilus</td> <td>s Environn</td> <td>nental (CA)</td>	Bivalve	e Larval Survival and D	evelopmen	t Test						Nautilus	s Environn	nental (CA)
Linear Interpolation Options X Transform Y Transform Seed Resamples Exp 95% CL Method Linear 1896575 1000 Yes Two-Point Interpolation Point Estimates Eave 95% LCL 96% LCL	Analysi Analyzo	Analysis ID: 04-6863-8242 End Analyzed: 02 May-19 14:04 Ana			vival Rate ar Interpola	tion (ICPIN))	CET	S Version: ial Results:	CETISv1 Yes	.8.7	
X Transform Y Transform Seed Resamples Exp 95% CL Method Linear 1895575 1000 Yes Two-Point Interpolation Point Seed 95% LC 95% UC TU 96% LC 95% UC Seed Method Eevel % 95% LC 95% UC TU 95% LC 95% UC Seed 72.3 Concol Type Count N/A <1.383 NA NA NA NA Survival Control Type Count Men Max Std Err Std Dev CV% %Effect A B 0 Brine Control 5 0.9252 0.8645 1 0.03085 0.06897 7.45% 0.00% 7/17 775 2 5 0.9948 0.9742 1 0.01434 0.04121 4.24% -502% 753 775 9 5 0.9848 0.9742 1 0.01264 0.02279 0.652 5.3% -3.91% 745 775 10 5 0.9813 0.871	Linear	Interpolation Options				****			******************************			
Linear Linear 1886575 1000 Yes Two-Point Interpolation Point Interpolation Point Interpolation Point Interpolation Linear % 95% LCL V Tuo 95% LCL 95% LCL 95% LCL 95% LCL 95% LCL Linear % 95% LCL 1383 NA NA NA NA EC26 >72.3 N/A N/A 1383 NA NA NA Survival Control Ype Count Man Man NA NA NA Survival Control Ype Count Man Man Max Std Err Std Dev CV% %Effect A B 0 Brine Control 5 0.9622 0.8674 1 0.03085 0.06897 7.46% 0.0% 717 775 2 5 0.9674 0.9097 1 0.01484 0.04121 4.24% 5.02% 753 775 3 5 0.9613 0.871 1 0.02379 0.05617 7.14%	X Trans	sform Y Transform	Seed	d Res	amples	Exp 95%	CL Meth	od				
Point Jeste	Linear	Linear	1896	575 100	0	Yes	Two-	Point Interp	olation			
Level % 95% LCL 95% LC	Point E	Estimates								,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
EC25 >72.3 N/A N/A <1.383 NA NA Survival Rate Summary Calculated Variate(A/B) Calculated Variate(A/B) Calculated Variate(A/B) C-% Control Type Count Mean Min Max Std Err Std Dev CV% %Effect A B 0 Brine Control 5 0.9522 0.8645 1 0.03085 0.06937 7.46% 0.0% 717 775 2 5 0.9616 0.9097 1 0.01843 0.0411 0.6539 7.46% 7.33 775 9 5 0.9716 0.9097 1 0.01843 0.04121 4.24% -5.02% 775 775 18 5 0.9613 0.871 1 0.02259 0.06617 7.04% -1.67% 775 775 72.3 5 0.9406 0.8381 1 0.02267 2.88% -6.14% 761 775 Graphics Cemping on a transformation of a transformation of a transformation of a transformatio transformation of a transformation of a transformatio	Level	% 95% LCL	95% UCL	TU	95% LCL	95% UCL						
EC50 >72.3 N/A N/A <1.383 NA NA Survival Rate Summary Count Mean Min Max Std Err Std Dev CV% %Effect A B 0 Brine Control 5 0.9252 0.8645 1 0.03085 0.06897 7.46% 0.0% 717 775 2 5 0.9652 0.8774 1 0.02111 0.05897 7.46% 0.0% 718 775 3 5 0.9652 0.8774 1 0.02111 0.05897 7.46% 0.0% 713 775 9 5 0.9652 0.8774 1 0.02111 0.05897 7.46% 0.0% 775 9 5 0.9948 0.9742 1 0.005616 0.01154 1.16% -7.53% 775 18 5 0.9613 0.871 1 0.02259 0.06617 7.04% -1.67% 729 72.3 5 0.9819 0.9355 1 0.01264 0.02827 2.88% -6.14% 761 775 Geaphing Operation Operation Operation Operation	EC25	>72.3 N/A	N/A	<1.383	NA	NA						
Calculated Variation (Control Type Count Mean Min Max Std Err Std Dev CV% %Effect A B 0 Brine Control 5 0.9252 0.8645 1 0.03085 0.06897 7.46% 0.0% 717 775 2 5 0.9652 0.8774 1 0.02141 0.0539 5.59% 4.32% 748 775 4 5 0.9916 0.9097 1 0.01843 0.04121 4.24% -5.02% 753 775 9 5 0.9948 0.9742 1 0.002579 0.0512 5.53% -3.91% 745 775 18 5 0.9406 0.8581 1 0.02299 0.06617 7.04% -1.67% 729 775 72.3 5 0.9819 0.9355 1 0.01264 0.02827 2.88% -6.14% 761 775 6.0406 0.9819 0.9355 1 0.01264 0.02827 2.88% -6.14% 761 758 9 0.7	EC50	>72.3 N/A	N/A	<1.383	NA	NA						
C-% Control Type Count Mean Min Max Std Err Std Dev CV% %Effect A B 0 Brine Control 5 0.9252 0.8645 1 0.03085 0.06897 7.46% 0.0% 717 775 2 5 0.9552 0.8774 1 0.02111 0.0539 5.59% 4.32% 748 775 4 5 0.9948 0.9742 1 0.02116 0.01154 1.16% -7.53% 771 775 18 5 0.9613 0.871 1 0.02379 0.0532 5.53% -3.91% 745 775 35 5 0.9613 0.871 1 0.02379 0.0522 2.88% -6.14% 761 775 72.3 5 0.9819 0.9355 1 0.02879 0.0617 7.04% -1.67% 729 775 72.3 - - - - - - - - - - - - - - - -<	Surviva	al Rate Summary				Calcu	lated Variat	te(A/B)				
0 Brine Control 5 0.9252 0.8645 1 0.03085 0.06897 7.46% 0.0% 717 775 2 5 0.9652 0.8774 1 0.02411 0.0539 5.59% -4.32% 748 775 4 5 0.9716 0.9097 1 0.001843 0.04121 4.24% -5.02% 753 775 9 5 0.9948 0.9742 1 0.005161 0.01164 1.16% -7.53% 771 775 18 5 0.99406 0.8711 1 0.02959 0.0617 7.04% -1.67% 729 775 72.3 5 0.9819 0.9355 1 0.01264 0.02827 2.88% -6.14% 761 775 Graphics	C-%	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	А	в
2 5 0.9652 0.8774 1 0.02411 0.0539 5.59% -4.32% 748 775 4 5 0.9716 0.9097 1 0.01843 0.04121 4.24% 5.02% 753 775 9 5 0.9948 0.9742 1 0.005161 0.01154 1.16% -7.53% 771 775 18 5 0.9613 0.871 1 0.02379 0.0532 5.53% -3.91% 745 775 35 5 0.9819 0.9355 1 0.01264 0.02827 2.88% -6.14% 761 775 72.3 5 0.9819 0.9355 1 0.01264 0.02827 2.88% -6.14% 761 775 Graphics 6	0	Brine Control	5	0.9252	0.8645	1	0.03085	0.06897	7.46%	0.0%	717	775
4 5 0.9716 0.9097 1 0.01843 0.04121 4.24% -5.02% 753 775 9 5 0.9948 0.9742 1 0.005161 0.01154 1.16% -7.53% 771 775 18 5 0.9613 0.871 1 0.02379 0.0532 5.53% -3.91% 745 775 72.3 5 0.9406 0.8581 1 0.02827 2.88% -6.14% 761 775 Graphics	2		5	0.9652	0.8774	1	0.02411	0.0539	5.59%	-4.32%	748	775
9 5 0.9948 0.9742 1 0.005161 0.01154 1.16% -7.53% 771 775 18 5 0.9613 0.871 1 0.02379 0.0532 5.53% -3.91% 745 775 35 5 0.9406 0.8581 1 0.02959 0.06617 7.04% -1.67% 729 775 72.3 5 0.9819 0.9355 1 0.01264 0.02827 2.88% -6.14% 761 775 Graphics Graphics 6 0.7 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9	4		5	0.9716	0.9097	1	0.01843	0.04121	4.24%	-5.02%	753	775
18 5 0.9613 0.871 1 0.02379 0.0532 5.53% -3.91% 745 775 35 5 0.9406 0.8581 1 0.02299 0.06617 7.04% -1.67% 729 775 72.3 5 0.9819 0.9355 1 0.01264 0.02827 2.88% -6.14% 761 775 Graphics	9		5	0.9948	0.9742	1	0.005161	0.01154	1.16%	-7.53%	771	775
35 5 0.9406 0.8581 1 0.02959 0.06617 7.04% -1.67% 729 775 72.3 5 0.9819 0.9355 1 0.01264 0.02827 2.88% -6.14% 761 775 Graphics Graphics 0.9 0.9 0.9 0.9 0.9 0.9 0.9 0.9	18		5	0.9613	0.871	1	0.02379	0.0532	5.53%	-3.91%	745	775
$\begin{array}{c} 72.3 \\ \hline & 5 \\ \hline & 0.9819 \\ \hline & 0.9355 \\ \hline & 0.09819 \\ \hline & 0.9355 \\ \hline & 0.01264 \\ \hline & 0.02827 \\ \hline & 2.88\% \\ \hline & -6.14\% \\ \hline & 761 \\ \hline & 775 \\ \hline \\ \hline & 775 \\ \hline \\ \hline & 0.01264 \\ \hline & 0.02827 \\ \hline & 2.88\% \\ \hline & -6.14\% \\ \hline & 761 \\ \hline & 775 \\ \hline \\ \hline & 775 \\ \hline \\ \hline & 0.01264 \\ \hline & 0.02827 \\ \hline & 2.88\% \\ \hline & -6.14\% \\ \hline & 761 \\ \hline & 775 \\ \hline \\ \hline & 775 \\ \hline \\ \hline & 0.01264 \\ \hline & 0.02827 \\ \hline & 2.88\% \\ \hline & -6.14\% \\ \hline & 761 \\ \hline & 775 \\ \hline \\ \hline & 775 \\ \hline \\ \hline & 0.01264 \\ \hline & 0.02827 \\ \hline & 2.88\% \\ \hline & -6.14\% \\ \hline & 761 \\ \hline & 775 \\ \hline \\ \hline & 0.01264 \\ \hline & 0.02827 \\ \hline & 0.0287 \\ \hline & 0$	35		5	0.9406	0.8581	1	0.02959	0.06617	7.04%	-1.67%	729	775
Graphics	72.3		5	0.9819	0.9355	1	0.01264	0.02827	2.88%	-6.14%	761	775
1.0 0.0 0.7 0.6 0.7 0.6 0.7 0.6 0.7 0.6 0.7 0.6 0.7 0.6 0.7 0.6 0.7 0.6 0.7 0.6 0.7 0.6 0.7 0.6 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7 0.7	Graphi	cs										
9 9 9 9 9 9 9 9 9 9 9 9 9 9		1.0										
0.8 0.7 0.6 0.7 0.6 0.7 0.6 0.7 0.4 0.3 0.4 0.3 0.4 0.3 0.4 0.5 0.6 0.7 0.7 0.8 0.1 0.1 0.2 0.1 0.2 0.1 0.2 0.1 0.2 0.1 0.2 0.3 0.4 0.5 0.5 0.6 0.7 0.8		0.9	••••••									
0.7 0.6 0.5 0.4 0.3 0.2 0.1 0.0 0 10 20 30 40 50 60 70 80 C-%		0.8										
9 0.7 9 0.6 0.5 0.4 0.3 0.2 0.1 0.0 0 10 20 30 40 50 60 70 80 C-%		0.0										
V 0.6 0.5 0.4 0.3 0.2 0.1 0.1 0.0 C -%	4											
SOLUTION 0.5 0.4 0.3 0.2 0.1 0.0 0.1 0.0 0.1 0.0 0.2 0.1 0.0 0.2 0.1 0.0 0.2 0.1 0.0 0.2 0.1 0.0 0.2 0.1 0.2 0.1 0.2 0.2 0.2 0.1 0.2 0.2 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5		2 0.6										
5 0.4 0.3 0.2 0.1 0.0 0.10 20 30 40 50 60 70 80 C-%		0.5										
$ \begin{array}{c} 0.3 \\ 0.2 \\ 0.1 \\ 0.0 \\ 0 \\ 10 \\ 20 \\ 30 \\ 40 \\ 50 \\ 60 \\ 70 \\ 80 \\ \hline \mathbf{C}^{-}\% \end{array} $		0.4				•						
0.2 0.1 0.0 0 10 20 30 40 50 60 70 80 C-%		0.3										
0.1 0.0 0 10 20 30 40 50 60 70 80 C-%		0.2										
0.0 10 20 30 40 50 60 70 80 C-%		0.1										
0.0 10 20 30 40 50 60 70 80 C-%		0.1	1									
C-%		0.0 0 10 20	30 40	50 60	70 80							
			C-%									

Analyst: JU QA: 645/17/19

CETIS Test Data Worksheet

Bivalve Larval Survival and Development Test								Nautilus Environmental (CA		
Start Date: End Date: Sample Date	24 / 26 / e: 23 /	Apr-19 Apr-19 Apr-19))	Species: M Protocol: E Material:@	Mytilus galloprov EPA/600/R-95/13 Effluent Sample	incialis 36 (1995) G <i>rou</i> ndwot	Sample Code: 19- 0517 Sample Source: Jacobs Sample Station: Wyckoff			
C-%	Code	Rep	Pos	Initial Density	Final Density	# Counted	# Normal	Notes		
			61			137	135	Tri 5/2/19		
			62			182	181	Jue di errit		
			63			128	121			
· · · · · · · · · · · · · · · · · · ·	-		64		-	@ 1460 14	7 146			
			65			168	164			
			66			165	163			
			67			171	168			
			68			174	171			
			69			151	147			
			70			155	153			
			71			133	130			
			72			161	158			
			73			155	152			
			74			187	185			
			75			141	138			
			76			160	160			
			77			166	166			
			78			149	147			
			79			134	132			
			80			164	160			
			81		· · · · · · · · · · · · · · · · · · ·	135	134			
			82			151	148			
			83			181	179			
			84			174	174			
			85			147	143			
			86			145	142			
			87			165	163			
	-		00			149	146			
			09			186	182			
			90			135	(33			
			91			151	149			
			02			177	176			
			94			162	161			
			95			136	150	· ·		
			96			155	154			
			97			146	144			
			98			155	127			
			99			101	100			
			100			170	174			
L		1	I		1	110	110			

@ Q18 JUL 5/2/19

(B)EG Q18 5/17/19

CETIS Test Data Worksheet

Report Date:	23 Apr-19 09:50 (p 1 of 1)
Test Code: 1904-5108	19-7850-1717/75ED8A55

Bivalve Larval Survival and Development Test Nautilus Environmental (C								
Start Date:24 Apr-19End Date:26 Apr-19Sample Date:23 Apr-19		Species: M Protocol: E Material (ⓒ E	/lytilus galloprov PA/600/R-95/13	incialis 36 (1995) -Groundwał	ter	Sample Code: 19- 0517- Sample Source: Jacobs Sample Station: Wyckoff		
C-%	Code	Rep	Pos	Initial Density	Final Density	# Counted	# Normal	Notes
0	BC	1	63					
0	BC	2	81					
0	BC	3	62			164	163	RT 4/26/19
0	BC	4	87			1.6.1		
0	BC	5	79					
0	LC	1	96					
0	LC	2	93					
0	LC	3	89			185	182	pt
0	LC	4	71					
0	LC	5	98					
2		1	95					
2		2	85					
2		3	94			119	115	RT
2		4	66					
2		5	74					
4		1	64					
4		2	92			160	157	RT
4		3	75					
4		4	67					
4		5	73					
9		1	70					
9		2	80					
9		. 3	84			146	146	FT
9		4	91					•
9		5	100					
18		1	77					
18		2	90					
18		3	88			143	141	RT
18		4	65	999 9999 9999 9999 9999 9999 9999 9999 9999			•	
18		5	82					
35		1	78					
35		2	61					
35		3	76			145	145	RIT
35		4	97				1	
35		5	99					
72.3 73.5		1	86					
72,3 73.5		2	83			-		
723 73 5		3	72			147	145	RX
72.3 73.5		4	69			1 1 1		(-)
72.3 73.5		5	68					1
[©] 6	c = E	30	k.		komonenonia		L	

() EG Q18 5/17/19 () Q18 AS Y/23/19



Water Quality Measurements

Client: Jacobs	Test Species: <u>M. galloprovincialis</u>
Sample ID: Wyckoff	Start Date/Time: 4/24/2019 1425
Sample Log No.: 19- 0517	End Date/Time: 4/26/2019 1400
Test No.: 1904 - 5108	

Concentration	Salinity			Temperature		Dissolved Oxygen			рН			
(% sample)	(ppt)				(°C)			(mg/L)			(pH units)
	0	24	48	0	24	48	0	24	48	0	24	48
Lab Control	29.7	29.7	298	15,2	14.9	14.7	8.6	8.8	8.3	8.01	7.99	8.00
Brine Control	30.1	30.1	30.2	15.7	14.8	14.8	83	3.8	8.3	8.12	8.10	8.04
2	30.0	301	30.2	14.9	14.6	14.6	8.6	8.8	8.4	8,03	8.03	8.03
4	30.0	30,1	30.2	14.8	14-8	14.7	86	8.8	8.4	8,00	8.03	8.05
9	30.1	30.2	30.2	14.6	14.7	14.6	8.6	8.8	8.4	7.94	8.03	8.08
@ 19-18	30.2	30.3	30.4	14.2	14.7	14.6	8.7	8.8	8.4	7.86	8-01	8.10
35	30.5	30.6	30.7	14,0	14.8	14.7	87	8.8	8.3	7.75	8.05	8.18
72.3	30,9	3.0	31-1	14.0	14.7	M.7	8.7	8.7	8.3	7.64	8.0Z	9.22

Technician Initials:	0 24 48 WQ Readings: ^E 4 <u>B</u> T <u>B</u> T Dilutions made by: β ⁰ — —	
Comments:	0 hrs: <u>א בה פוע עוצעווק</u> 24 hrs: 48 hrs:	
QC Check:	Eh 5/17/19	Final Review: KTF 5/21/19

Nautilus Environmental. 4340 Vandever Avenue. San Diego, CA 92120.

Brine Dilution Worksheet

Project: JACOBS			Analyst: BO					
Sample ID:	ample ID: Wyckoff		Test Date : <u>4/24/2019</u>					
Test No:	st No:		-	Test Type:	Mussel Development			
Salinity of Efflu	lent	6.9	_					
Salinity of Brin	e	90.3	Date	of Brine used:	3/29/2019	_		
Target Salinity	_	30	Alkalinity of	Brine Control:	96	mg/L as CaCO3		
Test Dilution V	olume	250			1.0	-		
		Effluent	Brine Control					
Salinity Adjustment Factor: (TS - SE)/(SB - TS) = TS = target salinity SE = salinity of effluent		0.38	0.50					

SB = salinity of brine

Concentration %	Effluent Volume (ml)	Salinity Adjustment Factor	Brine Volume (ml)	Dilute to: (ml)
Control	NA	NA	NA	250
2	5.0	0.38	1.9	250
4	10.0	0.38	3.8	250
9	22.5	0.38	8.6	250
18	45.0	0.38	17.2	250
35	87.5	0.38	33.5	250
72.3	180.8	0.38	69.2	250

014949-00-01-01-01-01-01-01-01-01-01-01-01-01-	DI Volume			
Brine Control	139.0	0.50	69.2	250

Total Brine Volume Required (ml): 203.3

QC Check: EG 51719

Final Review: KTP 52119

Nautilus Environmental. 4340 Vandever Avenue. San Diego, CA 92120.

Larval Development Worksheet

Client:	Jacobs/Wyckoft
Test No.:	(904 - 5108
Test Species:	M. galloprovincialis
Animal Source:	Mission Bau
Date Received:	412319
Test Chambers:	30 mL shell wals
Sample Volume:	IDML

030

Number Spawning

8

3

Start Date/Time:	4/24/2019	1425	
End Date/Time:	4/26/2019	1400	
Technician Initials:	BOLE	à	

Spawn Information

Sex Male

Female

F

irst	Gamete	Release	Time:	
irst	Gamete	Release	Time:	

Sex	Beaker Number(s)	Condition (sperm motility, egg density, color, shape, etc.)
. Male	1.7	acad motility appart a placity
Female 1	7	Ovanap color most inormal and
Female 2	6	Ovanar color mostly vound for sy deast
Female 3		

Embryo Stock Selection

Stock Number	% of embryos at 2-cell division stage
Female 1	99%
Female 2	100%
Female 3	

Egg Fertilization Time:	1120

Stock(s) chosen for testing: 2

Embryo Inoculum Preparation

Target count on Sedgwick-Rafter slide for desired density is 6 embryos



Prepare the embryo inoculum according to the calculated dilution factor. For example, if the dilution factor is 2.25, use 100 ml of existing stock (1 part) and 125 ml of dilution water (1.25 parts).

Time Zero Control Counts d T

	No.	No. Dividing	Total	% Dividing	Mean % Dividing
	1	148	148	100	
	2	1.52	152	100	100
	3	159	160	-99	100
	4	156	156	100	
	5	143	143	(00	
:	6	169	1 169	100	
	37-	155			,

48-hQC: 152/154 = 99%

Comments:

QC Check:

EG 5/17/19

Nautilus Environmental. 4340 Vandever Avenue. San Diego, CA 92120.

19 Final Review: KTP5

Appendix B Sample Check-In Information

Nautilus Environmental Client:	JALOBS			Sample Cl	neck-In Inf	ormation
4340 Vandever Avenue Sample ID:	Wickoff	- 64-	1319			
San Diego, CA 92120 Test ID No(s).:	1904-5	108		Sample Description:		
		<u></u>		A: COLOVLESS, Mear, GOLOV	less, ho	debris
Sample (A, B, C):						
Log-in No. (19-xxxx): しらし						
Sample Collection Date & Time: 423 19 0944				COC Complete (Y/N)?		
Sample Receipt Date & Time: 1/2019 0830				A B C		
Number of Containers & Container Type: 1 1L CMb						
Approx. Total Volume Received (L): ~し				Filtration? Y		
Check-in Temperature (°C) 1.0		800, 494 - EV - Landard - Canada Angele - Canada Angele - Canada - Canada - Canada - Canada - Canada - Canada -		Pore Size:		
Temperature OK? ¹ Y N	Y N	Y N	Y N	Organisms or	Debris	
DO (mg/L) $q, 3$				u		
pH (units) 7.46				Salinity Adjustment? 🕢 N		
Conductivity (µS/cm)				Test: Mussel Source: Brit	N Target	ppt: 30
Salinity (ppt)				Test: Source:	Target	ppt:
Alkalinity (mg/L) ² 415				Test: Source:	Target	not:
Hardness (mg/L) ^{2,3}				pH Adjustment? Y N		
Total Chlorine (mg/L)				A	в	с
Technician Initials				Initial pH:		
				Amount of HCI added:		
Test Performed: MVSSEL Development Control/Dilution W	ater: 8:2 / Lab SW	/ Lab ART	Other	Final nH-		
Alkalinity:	Hardness or Sali	inity: 30 ppt		Cl ₂ Adjustment? Y (N)		
Additional Control? (P) N = Brine Cartral	Alkalinity: 96	Hardness or S	alinity: 3007+	A	в	с
				Initial Free Cl ₂ :		
Test Performed: Control/Dilution W	ater: 8:2 / Lab SW	/ Lab ART	Other:	STS added:		
Alkalinity:	Hardness or Sali	inity:		Final Free Cl ₂ :		
Additional Control? Y N =	Alkalinity:	Hardness or S	alinity:			
				Sample Aeration? Y (N)		
Test Performed: Control/Dilution W	ater: 8:2 / Lab SW	/ Lab ART	Other:	- A	В	С
Alkalinity:	Hardness or Sali	nity:	_	Initial D.O.		
Additional Control? <u>Y</u> N =	Alkalinity:	Hardness or S	alinity:	Duration & Rate		
1				Final D.O.		
Notes: <u>Temperature of sample should be 0-6°C, if received</u>	d more than 24 hours pa	ast collection tin	ie.			0
⁻ mg/L as CaCO3, ⁻ Measured for freshwater sample	es only, NA = Not Applic	able		Subsamples for Additional Chemis	try Required	?(Y) N
Additional Comments OKTOON 18 521/19				Tech Initials A HH R	<u> </u>	
					·	
				QC Chec	K: E45	17/19
				Final Review	V: VTP5	21/19

Total Ammonia Analysis Freshwater

Client Proiect	: <u>JACOBS</u> : Wyckoff					
Test Type	: Mussel Dev	velopment				
DI Blank	0.0	=		Analyst:	KL	
Test Start Date:	A/17/2019	5 4124119	A	nalysis Date:	4/29/19	
Particular					N x 1.22	
Sample ID	Nautilus ID	Sub-Sample Date	Test Day	NH3-N (mg/L)	Ammonia (mg/L)	
Blank Spike (10 mg/L NH3)		NA	NA	6.7	8.2	
Wyckoff		4/24/17/2019- 4/24/19	Check In	1.5	1-8	
						-
Spike Check (10 mg/L NH3)		NA	NA	E.L.76.7	8.2	-
						-
						-
						_
Sample Duplicate ^a		NA	NA	1.6	2.0	
		NA NA	NA	7. +	9.4	
Relative Percent Difference (F	(PD) = [sample] ([average ammor [spiked sample] nominal [spike	(mg/L) - [sample d nia] (mg/L) (mg/L) - [sample] (ə] (mg/L)	uplicate] (mg/L) mg/L) x 100	x 100	Acceptable R Acceptable R	 ange: 0-20% ange: 80-120% ^b
	-		Measured	Nominal		
QC Sample ID	[NH ₃]	[Sample Dup]	[Spike]	[Spike]	RPD	% Recovery
Blank	0.0	NA 2 A	8.2	10	NA	0 30 82
WYCROTT	<u> </u>	L.0	4.4	10	10.5	176
Comments: <u>A)EC Q18 -</u>	1/22/19	@ 615KL 4	29/19 G	018 ×5 4/201	19	
Notes: ^a Unless otherwise noted, the last ^b Acceptable range for % reco and are for information only.	sample listed on very applies only	the datasheet is ι ν to the blank spike	used for duplica e. Spike recove	te and duplicate + ries in samples m	- spike QC cheo ay vary based	<u>ck.</u> on sample matrix
^c Calculation not performed du	ue to one or both	values below the	method detection	on limit.		
Method Detection Limit = 0.5	mg/L			au		
QC Check: 154/29/19				Final Review:	1EG 5	17/19
Nautilus Environmental. 4340 Vandever Aven	ue. San Diego, CA	92120.			·	

Appendix C Chain-of-Custody Form Page 1 of 1

Enthalpy Analytical (REGION COPY)

DateShipped: 4/23/2019 CarrierName: FedEx

AirbillNo: 775037485152

CHAIN OF CUSTODY RECORD

No: 10-042319-102126-0363

Wyckoff Eagle Harbor GWTP 2019/WA Project Code: WEH-029A Cooler #: 1 of 1 2019T10P000DD210W2LA00 Contact Name: Keith Allers Contact Phone: 206-780-1711

Sample Identifier	CLP Sample No.	Matrix/Sampler	Coll. Method	Analysis/Turnaround (Days)	Tag/Preservative/Bottles	Location	Collection Date/Time	Sample Type	
042319		Ground Water/ K.Allers	Composite	CHRTOX(8 Weeks)	(< 6 C) (1)	SP-11	04/23/2019 09:44	Field Sample	
			· · · · · · · · · · · · · · · · · · ·						
			5 1 1 11 10 10 10 10 10 10 10 10 10 10 10			10			-
· · · · · · · · · · · · · · · · · · ·									
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	· · · · · · · · · · · · · · · · · · ·					1999 1999 1999 1999 1999 1999 1999 199		12° 100 100 100 100 100 100 100 100 100 10	and the second se
n - 1999-beldebaar - sakabaanka sika aankaska ni 1990 - 1990 - 1990 - 1990 - 1990			· · · · · · · · · · · · · · · · · · ·			na Malana alakti Anti-Alakti Anti-Anti-Anti-Anti-Anti-Anti-Anti-Anti-			
reasonable i na manine managara tan'nana arawa i wanana						Shipment for Ca	se Complete? N	 construction of the maximum order construction means and 	
Special Instructions	:					Samples Transfe	rred From Chain of	Custody #	
Analysis Key: CHR	FOX=Chronic T	oxicity							
Items/Reason	Relinquished b	y (Signature and O	rganization)	Date/Time Receive	d by (Signature and Organization) Date/Time	Sample Conditio	n Upon Receipt	
	Korth A	1/1 JA	COBS	4-23-2019	014 incutins	4/24/19	temp:1.0°	С	19-051
	leas U	(Jan V		1323 July M		003			
						n 1 1 1 1 1 1 1 1 1 1 1	10		
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Appendix D Reference Toxicant Test Results

Report Date: Test Code: 09 May-19 13:26 (p 1 of 3) 190424msdvSO | 14-4098-8496

Bivalve Larva	Survival and Developm	nent Test						Nautilus Environmental (CA)
Batch ID: Start Date: Ending Date: Duration:	04-0967-6710 T 24 Apr-19 14:25 P 26 Apr-19 14:00 S 48h S	est Type: Protocol: Species: Source:	Development-S EPA/600/R-95/ Mytilus gallopro Mission Bay	Survival (136 (1995) ovincialis			Analyst: Diluent: Brine: Age:	Diluted Natural Seawater Not Applicable
Sample ID: Sample Date: Receive Date: Sample Age:	04-6938-7195 C 24 Apr-19 N 24 Apr-19 S 14h S	Code: /laterial: Source: Station:	190424msdvS Copper sulfate Reference Tox Copper Sulfate	O icant			Client: Project:	Internal
Comparison S	Summary							(
Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	τu	Meth	hod
14-3870-8526	Combined Development	t Ra 5	10	7.071	5.85%		Dunr	nett Multiple Comparison Test
00-7240-4995	Development Rate	5	10	7.071	1.96%		Dunr	nett Multiple Comparison Test
12-9807-3384	Survival Rate	20	40	28.28	6.92%		Dunr	nett Multiple Comparison Test
Point Estimate	e Summary							
Analysis ID	Endpoint	Level	μg/L	95% LCL	95% UCL	τu	Meth	hod
15-6766-2617	Combined Development	t Ra EC25 EC50	6.247 7 <i>.</i> 565	5.964 7.378	6.342 7.649		Linea	ar Interpolation (ICPIN)
17-2116-2275	Development Rate	EC25	6.279	6.205	6.325		Linea	ar Interpolation (ICPIN)
		EC50	7.586	7.511	7.64			
03-3240-7186	Survival Rate	EC25	24.99	24.05	25.14		Linea	ar Interpolation (ICPIN)
		EC50	30.08	29.44	30.23			
Test Acceptab	ility							
Analysis ID	Endpoint	Attrib	ute	Test Stat	TAC Limi	ts	Over	rlap Decision
00-7240-4995	Development Rate	Contro	ol Resp	0.9864	0.9 - NL		Yes	Passes Acceptability Criteria
17-2116-2275	Development Rate	Contro	ol Resp	0.9864	0.9 - NL		Yes	Passes Acceptability Criteria
03-3240-7186	Survival Rate	Contro	ol Resp	0.9652	0.5 - NL		Yes	Passes Acceptability Criteria
12-9807-3384	Survival Rate	Contro	ol Resp	0.9652	0.5 - NL		Yes	Passes Acceptability Criteria
14-3870-8526	Combined Development	t Ra PMSE)	0.05855	NL - 0.25		No	Passes Acceptability Criteria



Report Date: Test Code:

09 May-19 13:26 (p 2 of 3) 190424msdvSO | 14-4098-8496

Bivalve Larva	I Survival and D	evelopment	t Test						Nautilus	Environme	ental (CA)
Combined De	velopment Rate	Summary									
C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Control	5	0.9523	0.8927	1	0.8839	1	0.02149	0.04805	5.05%	0.0%
2.5		5	0.9182	0.845	0.9915	0.8516	0.9937	0.02637	0.05896	6.42%	3.58%
5		5	0.9602	0.9337	0.9866	0.9355	0.9814	0.009531	0.02131	2.22%	-0.82%
10		5	0.03637	0.02039	0.05236	0.01923	0.05161	0.005757	0.01287	35.39%	96.18%
20		5	0	0	0	0	0	0	0		100.0%
40		5	0	0	0	0	0	0	0		100.0%
Development	Rate Summary										
C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Control	5	0.9864	0.9742	0.9987	0.9786	1	0.004402	0.009844	1.0%	0.0%
2.5		5	0.9792	0.955	1	0.9517	0.9937	0.008714	0.01948	1.99%	0.73%
5		5	0.9844	0.9721	0.9968	0.9733	1	0.004437	0.009922	1.01%	0.2%
10		5	0.03799	0.01966	0.05632	0.01923	0.05797	0.006602	0.01476	38.86%	96.15%
20		5	0	0	0	0	0	0	0		100.0%
40		5	0	0	0	0	0	0	0		100.0%
Survival Rate	Summary										
C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Lab Control	5	0.9652	0.9146	1	0.9032	1	0.0182	0.0407	4.22%	0.0%
2.5		5	0.9381	0.8601	1	0.8581	1	0.02809	0.06282	6.7%	2.81%
5		5	0.9755	0.9423	1	0.9355	1	0.01197	0.02676	2.74%	-1.07%
10		5	0.9677	0.9105	1	0.8903	1	0.0206	0.04607	4.76%	-0.27%
20		5	0.96	0.9288	0.9912	0.9355	1	0.01125	0.02515	2.62%	0.53%
40		5	0.0129	0.000237	0.02557	0	0.02581	0.004562	0.0102	79.06%	98.66%
Combined De	velopment Rate	Detail									
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5					
0	Lab Control	0.929	0.9548	0.8839	0.9939	1					
2.5		0.8903	0.9937	0.8516	0.9653	0.8903					
5		0.9808	0.9613	0.9355	0.9814	0.9419					
10		0.03226	0.04651	0.05161	0.01923	0.03226					
20		0	0	0	0	0					
40		0	0	0	0	0					
Development	Rate Detail										
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5					
0	Lab Control	0.9796	0.9801	0.9786	0.9939	1.					
2.5		0.9928	0.9937	0.9925	0.9653	0.9517					
5		0.9808	0.9868	1	0.9814	0.9733					
10		0.03268	0.04651	0.05797	0.01923	0.03356					
20		0	0	0	0	0					
40		0	0	0	0	0					
Survival Rate	Detail							*****			
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5					
0	Lab Control	0.9484	0.9742	0.9032	1	1					
2.5		0.8968	1	0.8581	1	0.9355					
5		1	0.9742	0.9355	1	0.9677					
10		0.9871	1	0.8903	1	0.9613					
20		0.9419	0.9355	1	0.9613	0.9613					
40		0.0129	0.02581	0	0.01935	0.006452					





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Bivalve Larval Survival and Development Test

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Test Code:	190424msdvSO 14-4098-8496
	Nautilus Environmental (CA)

Report Date:

Combined	Development Rate	e Binomials	;				
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	
0	Lab Control	144/155	148/155	137/155	162/163	158/158	
2.5		138/155	157/158	132/155	167/173	138/155	
5		153/156	149/155	145/155	158/161	146/155	
10		5/155	8/172	8/155	3/156	5/155	
20		0/155	0/155	0/216	0/155	0/155	
40		0/155	0/155	0/155	0/155	0/155	
Developme	ent Rate Binomials	6					
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	
0	Lab Control	144/147	148/151	137/140	162/163	158/158	
2.5		138/139	157/158	132/133	167/173	138/145	
5		153/156	149/151	145/145	158/161	146/150	
10		5/153	8/172	8/138	3/156	5/149	
20		0/146	0/145	0/216	0/149	0/149	
40		0/2	0/4	0/1	0/3	0/1	
Survival Ra	ate Binomials						
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	
0	Lab Control	147/155	151/155	140/155	155/155	155/155	
2.5		139/155	155/155	133/155	155/155	145/155	
5		155/155	151/155	145/155	155/155	150/155	
10		153/155	155/155	138/155	155/155	149/155	
20		146/155	145/155	155/155	149/155	149/155	

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CETIS Ana	alytical Rep	ort					Repo Test	ort Date: Code:	09 N 190424m	/lay-19 13:2 isdvSO 1	25 (p 1 of 4 4-4098-849(
Bivalve Larva	al Survival and I	Developme	ent Test						Nautilus	s Environr	nental (CA)
Analysis ID: Analyzed:	14-3870-8526 09 May-19 13:	En 24 An	dpoint : Cor alysis: Par	mbined Deve ametric-Cor	elopment Ra htrol vs Trea	ate tments	CET Offic	IS Version: cial Results	CETISv1 : Yes	.8.7	
Data Transfo	orm	Zeta	Alt Hyp	Trials	Seed		PMSD	NOEL	LOEL	TOEL	TU
Angular (Corr	ected)	NA	C > T	NA	NA		5.85%	5	10	7.071	
Dunnett Mult	tiple Compariso	n Test									
Control	vs C-µg/L		Test Stat	Critical	MSD DF	P-Value	P-Type	Decision(a:5%)		
Lab Control	2.5		1.256	2.227	0.138 8	0.2402	CDF	Non-Signi	ficant Effect		
	5		0.07948	2.227	0.138 8	0.7207	CDF	Non-Signi	ficant Effect		
	10*		19.3	2.227	0.138 8	<0.0001	CDF	Significant	Effect		
ANOVA Table	9										
Source	Sum Squ	ares	Mean Squ	lare	DF	F Stat	P-Value	Decision(α:5%)		
Between	5.09965		1.699883		3	178.4	<0.0001	Significant	Effect	<u></u>	
Error	0.152439	7	0.0095274	81	16			·			
Total	5.25209				19		<u></u>				
Distributiona	I Tests										
Attribute	Test	.		Test Stat	Critical	P-Value	Decision	(α:1%)			
Variances	Bartlett E	quality of \	/ariance	7.187	11.34	0.0662	Equal Var	iances			
	Snapiro-	VVIIK VV NOR	manty	0.9778	0.866	0.9020	Normal Di	stribution			
Combined De	evelopment Rate	Summary	/ 								
<u>C-µg/L</u>	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0 2 5	Lab Control	5	0.9523	0.8927	1	0.9548	0.8839	1	0.02149	5.05%	0.0%
2.0 5		5 5	0.9182	0.0337	0.9915	0.8903	0.8516	0.9937	0.02637	6.42%	3.58%
10		5	0.9002	0.9337	0.9000	0.9013	0.9300	0.9814	0.009531	2.22%	-0.82%
20		5	0.03037	0.02039	0.05250	0.03220 N	0.01923	0.05161	0.005757	35.39%	90.18%
40		5	0	0	0	0	0	0	0		100.0%
Angular (Cor	rected) Transfor	med Sumr	narv					-	-		
C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Frr	CV%	%Effect
0	Lab Control	5	1.381	1.22	1.541	1.357	1.223	1.531	0.0578	9.36%	0.0%
2.5		5	1.303	1.142	1.465	1.233	1.175	1.491	0.05827	10.0%	5.62%
5		5	1.376	1.306	1.446	1.373	1.314	1.434	0.02516	4.09%	0.36%
10		5	0.1894	0.1453	0.2335	0.1806	0.1391	0.2292	0.01589	18.76%	86.29%
20		5	0.03894	0.03553	0.04235	0.04017	0.03403	0.04017	0.001229	7.06%	97.18%
40		5	0.04017	0.04016	0.04018	0.04017	0.04017	0.04017	0	0.0%	97.09%
Graphics	<u></u>										
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udo						0.10	-			•	
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0.2	<u> -</u>						•				
0.1						-0.15					
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		C-110	/1 20	UF 1		-2.:	J ~2.U -1.5	-1.0 -0.5 0.0	U.S 1.0	1.5 2.0	2.5
		C-hA\	-				84	Kank			
									-	<i>C</i> 1	10-0-
00-089-187-3				C	CETIS™ v1.8	8.7.20			Analyst:	<u> </u>	A: MPS

CETIS Ana	alytical Rep	ort					Repo Test	ort Date: Code:	09 N 190424m	/lay-19 13:2 sdvSO I 1	25 (p 2 of 4 4-4098-8496
Bivalve Larva	al Survival and	Developm	ent Test						Nautilus	s Environr	nental (CA)
Analysis ID: Analyzed:	00-7240-4995 09 May-19 13:	E 24 A	ndpoint: De nalysis: Pa	velopment R rametric-Cor	Rate htrol vs Trea	tments	CET Offic	IS Version: cial Results	CETISv1 : Yes	.8.7	
Data Transfo	rm	Zeta	Alt Hyp	Trials	Seed		PMSD	NOEL	LOEL	TOEL	TU
Angular (Corr	ected)	NA	C > T	NA	NA		1.96%	5	10	7.071	
Dunnett Mult	tiple Compariso	n Test									
Control	vs C-ua/l		Test Stat	Critical		- D-Value	P-Type	Decision/	a. 5%)		
Lab Control	2.5	*****	0.6775	2.227	0.073 8	0 4664	CDF	Non-Signi	ficant Effect		Mar - 1
	5		0.2891	2.227	0.073 8	0.6363	CDF	Non-Signi	ficant Effect		
	10*		38.91	2.227	0.073 8	<0.0001	CDF	Significant	t Effect		
ANOVA Table	9										
Source	Sum Sau	lares	Mean So	Jare	DF	F Stat	P-Value	Decision(a:5%)		
Between	5.928229		1.976076		3	744.8	<0 0001	Significant	Effect		
Error	0.042448	51	0.0026530)32	16						
Total	5.970677				19						
Distributiona	Il Tests										
Attribute	Test			Test Stat	Critical	P-Value	Decision	(α:1%)			
Variances	Bartlett B	Equality of	Variance	1.143	11.34	0.7666	Equal Var	iances		6-6-11	
Distribution	Shapiro-	Wilk W No	ormality	0.958	0.866	0.5051	Normal D	istribution			
Development	t Rate Summary										
C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Control	5	0.9864	0.9742	0.9987	0.9801	0.9786	1	0.004402	1.0%	0.0%
2.5		5	0.9792	0.955	1	0.9925	0.9517	0.9937	0.008713	1.99%	0.73%
5		5	0.9844	0.9721	0.9968	0.9814	0.9733	1	0.004437	1.01%	0.2%
10		5	0.03799	0.01966	0.05632	0.03356	0.01923	0.05797	0.006602	38.86%	96.15%
20		5	0	0	0	0	0	0	0		100.0%
40		5	0	0	0	0	0	0	0		100.0%
Angular (Cor	rected) Transfor	rmed Sum	nmary								
C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Lab Control	5	1.461	1.401	1.521	1.429	1.424	1.531	0.02167	3.32%	0.0%
2.5		5	1.439	1.355	1.522	1.484	1.349	1.491	0.03006	4.67%	1.51%
5		5	1.451	1.393	1.51	1.434	1.407	1.529	0.02094	3.23%	0.64%
10 20		5	0.1931	0.1442	0.2421	0.1842	0.1391	0.2432	0.01763	20.41%	86.78%
40		5	0.03976	0.03577	0.04379	0.04097	0.03403	0.04153	0.001443	8.11%	97.28%
···			0.0000	0.2020	0.0400	0.3014	0.2327	0.5250	0.05093	32.37 %	73.25%
Graphics											
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0.2						-0.08					
0.1				۲		-0.12					
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0.0	0 LC 2.5	5	10 20	40		-2.5	5 -2.0 -1.5	-1.0 -0.5 0.	0 0.5 1.0	1.5 2.0	2.5
		C-µg/	'L					Rank	its		
			99 - 10 10 10 - 10 - 10 - 10 - 10 - 10 -								
00-089-187-3				c	CETIS™ v1	8 7 20			Analyst: T	ch o	ABRE
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CETIS Analytical Report

 Report Date:
 09 May-19 13:25 (p 3 of 4)

 Test Code:
 190424msdvSO | 14-4098-8496

Bivalve Larva	al Surviva	l and Dev	velopmen	t Test						Nautilus	Environm	nental (CA)
Analysis ID: Analyzed:	12-9807 09 May-	'-3384 -19 13:25	End Anal	point: Sur ysis: Par	vival Rate ametric-Cor	itrol vs Trea	tments	CET	S Version:	CETISv1. : Yes	.8.7	
Data Transfo	rm		Zeta	Alt Hyp	Trials	Seed		PMSD	NOEL	LOEL	TOEL	TU
Angular (Corr	ected)		NA	C > T	NA	NA		6.92%	20	40	28.28	
Dunnett Mult	iple Comp	parison T	lest .									
Control	vs C-	∙µg/L		Test Stat	Critical	MSD DF	P-Value	P-Type	Decision(α:5%)		
Lab Control	2.	5		0.7447	2.362	0.167 8	0.5365	CDF	Non-Signi	ficant Effect		
	5			-0.3058	2.362	0.167 8	0.9079	CDF	Non-Signi	ficant Effect		
	10)		-0.1624	2.362	0.167 8	0.8769	CDF	Non-Signi	ficant Effect		
	20)		0.422	2.362	0.167 8	0.6804	CDF	Non-Signi	ficant Effect		
-	40)*		18.47	2.362	0.167 8	<0.0001	CDF	Significant	t Effect		
ANOVA Table	9											
Source	Su	m Squar	es	Mean Squ	are	DF	F Stat	P-Value	Decision(α:5%)		
Between	7.0	21692		1.404338		5	112.3	<0.0001	Significant	t Effect		
Error	0.3	00084		0.0125035		24						
Total	7.3	21776				29						
Distributiona	I Tests			· · · · · · · · · · · · · · · · · · ·								
Attribute	Те	est			Test Stat	Critical	P-Value	Decision(α:1%)			
Attribute Variances	Te Ba	est artlett Equ	ality of Va	riance	Test Stat 5.222	Critical 15.09	P-Value 0.3894	Decision(Equal Var	<mark>α:1%)</mark> iances		1975	
Attribute Variances Distribution	Te Ba Sh	est artlett Equ napiro-Wil	uality of Va Ik W Norm	riance ality	Test Stat 5.222 0.964	Critical 15.09 0.9031	P-Value 0.3894 0.3904	Decision(Equal Var Normal Di	<mark>α:1%)</mark> iances stribution			
Attribute Variances Distribution Survival Rate	Te Ba Sh Sh	est artlett Equ napiro-Wil	uality of Va lk W Norm	riance ality	Test Stat 5.222 0.964	Critical 15.09 0.9031	P-Value 0.3894 0.3904	Decision(Equal Var Normal Di	α:1%) iances stribution			
Attribute Variances Distribution Survival Rate C-µg/L	Te Ba Sh Summar Control	est artlett Equ napiro-Wil y Type (uality of Va lk W Norm Count	riance ality Mean	Test Stat 5.222 0.964 95% LCL	Critical 15.09 0.9031 95% UCL	P-Value 0.3894 0.3904 Median	Decision(Equal Var Normal Di Min	α:1%) iances stribution Max	Std Err	CV%	%Effect
Attribute Variances Distribution Survival Rate C-µg/L 0	Te Ba Sh Sh Summar Control	est artlett Equ napiro-Wil y y Type (trol 5	uality of Va lk W Norm Count	riance ality Mean 0.9652	Test Stat 5.222 0.964 95% LCL 0.9146	Critical 15.09 0.9031 95% UCL 1	P-Value 0.3894 0.3904 Median 0.9742	Decision(Equal Var Normal Di Min 0.9032	α:1%) iances stribution <u>Max</u> 1	Std Err 0.0182	CV% 4.22%	%Effect 0.0%
Attribute Variances Distribution Survival Rate C-µg/L 0 2.5	Te Ba Sh Sh Summar Control Lab Cont	est artlett Equ napiro-Wil y y Type (rol §	uality of Va Ik W Norm Count 5	riance ality Mean 0.9652 0.9381	Test Stat 5.222 0.964 95% LCL 0.9146 0.8601	Critical 15.09 0.9031 95% UCL 1 1	P-Value 0.3894 0.3904 Median 0.9742 0.9355	Decision(Equal Var Normal Di Min 0.9032 0.8581	α:1%) iances stribution Max 1 1	Std Err 0.0182 0.02809	CV% 4.22% 6.7%	%Effect 0.0% 2.81%
Attribute Variances Distribution Survival Rate C-µg/L 0 2.5 5	Te Ba Sh Sh Summar Control Lab Cont	est artlett Equ napiro-Wil y Type (rrol 5 5 5	uality of Va Ik W Norm Count 5 5 5	riance ality Mean 0.9652 0.9381 0.9755	Test Stat 5.222 0.964 95% LCL 0.9146 0.8601 0.9423	Critical 15.09 0.9031 95% UCL 1 1 1	P-Value 0.3894 0.3904 Median 0.9742 0.9355 0.9742	Decision(Equal Var Normal Di Min 0.9032 0.8581 0.9355	α:1%) iances stribution Max 1 1 1	Std Err 0.0182 0.02809 0.01197	CV% 4.22% 6.7% 2.74%	%Effect 0.0% 2.81% -1.07%
Attribute Variances Distribution Survival Rate C-µg/L 0 2.5 5 10	Te Ba Sh Sh Summan Control Lab Cont	est artlett Equ napiro-Wil y Type (rol 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	uality of Va Ik W Norm Count 5 5 5 5	riance ality Mean 0.9652 0.9381 0.9755 0.9677	Test Stat 5.222 0.964 95% LCL 0.9146 0.8601 0.9423 0.9105	Critical 15.09 0.9031 95% UCL 1 1 1 1 1	P-Value 0.3894 0.3904 Median 0.9742 0.9355 0.9742 0.9871	Decision(Equal Var Normal Di Min 0.9032 0.8581 0.9355 0.8903	α:1%) iances stribution Max 1 1 1 1 1	Std Err 0.0182 0.02809 0.01197 0.0206	CV% 4.22% 6.7% 2.74% 4.76%	%Effect 0.0% 2.81% -1.07% -0.27%
Attribute Variances Distribution Survival Rate C-µg/L 0 2.5 5 10 20	Te Ba Sh Summar Control Lab Cont	est artlett Equ napiro-Wil y Type (trol 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	uality of Va Ik W Norm Count 5 5 5 5 5	riance lality 0.9652 0.9381 0.9755 0.9677 0.96	Test Stat 5.222 0.964 95% LCL 0.9146 0.8601 0.9423 0.9105 0.9288	Critical 15.09 0.9031 95% UCL 1 1 1 1 0.9912	P-Value 0.3894 0.3904 Median 0.9742 0.9355 0.9742 0.9871 0.9613	Decision(Equal Var Normal Di Min 0.9032 0.8581 0.9355 0.8903 0.9355	α:1%) iances stribution Max 1 1 1 1 1 1 1	Std Err 0.0182 0.02809 0.01197 0.0206 0.01125	CV% 4.22% 6.7% 2.74% 4.76% 2.62%	%Effect 0.0% 2.81% -1.07% -0.27% 0.53%
Attribute Variances Distribution Survival Rate C-µg/L 0 2.5 5 10 20 40	Te Ba Sh Sh Summar Control Lab Cont	est artlett Equ napiro-Wil y Type (trol 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	uality of Va Ik W Norm Count 5 5 5 5 5 5 5	riance hality 0.9652 0.9381 0.9755 0.9677 0.96 0.0129	Test Stat 5.222 0.964 95% LCL 0.9146 0.8601 0.9423 0.9105 0.9288 0.000237	Critical 15.09 0.9031 95% UCL 1 1 1 0.9912 0.02557	P-Value 0.3894 0.3904 Median 0.9742 0.9355 0.9742 0.9871 0.9613 0.9613 0.0129	Decision(Equal Var Normal Di Min 0.9032 0.8581 0.9355 0.8903 0.9355 0	α:1%) iances stribution Max 1 1 1 1 1 1 0.02581	Std Err 0.0182 0.02809 0.01197 0.0206 0.01125 0.004562	CV% 4.22% 6.7% 2.74% 4.76% 2.62% 79.06%	%Effect 0.0% 2.81% -1.07% -0.27% 0.53% 98.66%
Attribute Variances Distribution Survival Rate C-µg/L 0 2.5 5 10 20 40 Angular (Corr	Te Ba Sh Summar Control Lab Cont	est artlett Equ hapiro-Wil y Type (trol { } } } }	uality of Va Ik W Norm 5 5 5 5 5 5 5 5 5 5	riance iality 0.9652 0.9381 0.9755 0.9677 0.96 0.0129 ary	Test Stat 5.222 0.964 95% LCL 0.9146 0.8601 0.9423 0.9105 0.9288 0.000237	Critical 15.09 0.9031 95% UCL 1 1 1 0.9912 0.02557	P-Value 0.3894 0.3904 Median 0.9742 0.9355 0.9742 0.9871 0.9613 0.0129	Decision(Equal Var Normal Di 0.9032 0.8581 0.9355 0.8903 0.9355 0	α:1%) iances stribution Max 1 1 1 1 1 0.02581	Std Err 0.0182 0.02809 0.01197 0.0206 0.01125 0.004562	CV% 4.22% 6.7% 2.74% 4.76% 2.62% 79.06%	%Effect 0.0% 2.81% -1.07% -0.27% 0.53% 98.66%
Attribute Variances Distribution Survival Rate C-μg/L 0 2.5 5 10 20 40 Angular (Corr C-μg/L	Te Ba Sh Sh Sh Sh Sh Sh Sh Sh Sh Sh Sh Sh Sh	artlett Equinapiro-Wil y Type (rrol 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	uality of Va Ik W Norm 5 5 5 5 5 6 6 8 8 8 8 8 8 8 8 8 8 8 8 8	riance nality Mean 0.9652 0.9381 0.9755 0.9677 0.96 0.96 0.9129 ary Mean	Test Stat 5.222 0.964 95% LCL 0.9146 0.8601 0.9423 0.9105 0.9288 0.000237 95% LCL	Critical 15.09 0.9031 95% UCL 1 1 1 1 0.9912 0.02557 95% UCL	P-Value 0.3894 0.3904 Median 0.9742 0.9355 0.9742 0.9871 0.9613 0.9613 0.0129 Median	Decision(Equal Var Normal Di 0.9032 0.8581 0.9355 0.8903 0.9355 0 9	a:1%) iances stribution Max 1 1 1 1 1 0.02581 Max	Std Err 0.0182 0.02809 0.01197 0.0206 0.01125 0.004562 Std Err	CV% 4.22% 6.7% 2.74% 4.76% 2.62% 79.06% CV%	%Effect 0.0% 2.81% -1.07% -0.27% 0.53% 98.66% %Effect
Attribute Variances Distribution Survival Rate C-μg/L 0 2.5 5 10 20 40 Angular (Corr C-μg/L 0	Te Ba Sh Sh Sh Sh Sh Sh Sh Sh Sh Sh Sh Sh Sh	est artlett Equ hapiro-Wil y Type (frol 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	uality of Va Ik W Norm 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	riance iality 0.9652 0.9381 0.9755 0.9677 0.96 0.0129 ary Mean 1.413	Test Stat 5.222 0.964 95% LCL 0.9146 0.8601 0.9423 0.9105 0.9288 0.000237 95% LCL 1.264	Critical 15.09 0.9031 95% UCL 1 1 1 1 0.9912 0.02557 95% UCL 1.563	P-Value 0.3894 0.3904 Median 0.9742 0.9355 0.9742 0.9871 0.9613 0.0129 Median 1.409	Decision(Equal Var Normal Di Min 0.9032 0.8581 0.9355 0.8903 0.9355 0 9 Min 1.254	α:1%) iances stribution Max 1 1 1 1 1 0.02581 Max 1.531	Std Err 0.0182 0.02809 0.01197 0.0206 0.01125 0.004562 Std Err 0.05381	CV% 4.22% 6.7% 2.74% 4.76% 2.62% 79.06% CV% 8.51%	%Effect 0.0% 2.81% -1.07% -0.27% 0.53% 98.66% %Effect 0.0%
Attribute Variances Distribution Survival Rate C-μg/L 0 2.5 5 10 20 40 Angular (Corr C-μg/L 0 2.5	Te Ba Sh Sh Sh Sh Sh Sh Sh Sh Sh Sh Sh Sh Sh	est artlett Equ hapiro-Wil y Type (frol 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	uality of Va Ik W Norm 5 5 5 5 5 5 5 5 6 6 6 6 6 6 7 7 7 7 7 7	riance iality 0.9652 0.9381 0.9755 0.9677 0.96 0.0129 ary Mean 1.413 1.361	Test Stat 5.222 0.964 95% LCL 0.9146 0.8601 0.9423 0.9105 0.9288 0.000237 95% LCL 1.264 1.16	Critical 15.09 0.9031 95% UCL 1 1 1 1 0.9912 0.02557 95% UCL 1.563 1.562	P-Value 0.3894 0.3904 Median 0.9742 0.9355 0.9742 0.9871 0.9613 0.0129 Median 1.409 1.314	Decision(Equal Var Normal Di 0.9032 0.8581 0.9355 0.8903 0.9355 0 9 9 9 1.254 1.254 1.185	α:1%) iances stribution Max 1 1 1 1 1 1 0.02581 Max 1.531 1.531	Std Err 0.0182 0.02809 0.01197 0.0206 0.01125 0.004562 Std Err 0.05381 0.07234	CV% 4.22% 6.7% 2.74% 4.76% 2.62% 79.06% CV% 8.51% 11.89%	%Effect 0.0% 2.81% -1.07% 0.53% 98.66% %Effect 0.0% 3.73%
Attribute Variances Distribution Survival Rate C-µg/L 0 2.5 5 10 20 40 Angular (Corr C-µg/L 0 2.5 5	Te Ba Sh e Summary Control ⁻ Lab Cont rected) Tra Control ⁻ Lab Cont	artlett Equinapiro-Wil y Type (rol & & ansforme Type (rol &	Lality of Va Ik W Norm 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	riance ality 0.9652 0.9381 0.9755 0.9677 0.96 0.0129 ary Mean 1.413 1.361 1.435	Test Stat 5.222 0.964 95% LCL 0.9146 0.8601 0.9423 0.9105 0.9288 0.000237 95% LCL 1.264 1.16 1.318	Critical 15.09 0.9031 95% UCL 1 1 1 1 0.9912 0.02557 95% UCL 1.563 1.562 1.552	P-Value 0.3894 0.3904 Median 0.9742 0.9355 0.9742 0.9871 0.9613 0.0129 Median 1.409 1.314 1.409	Decision(Equal Var Normal Di 0.9032 0.8581 0.9355 0.8903 0.9355 0 9 Min 1.254 1.185 1.314	α:1%) iances stribution Max 1 1 1 1 1 0.02581 Max 1.531 1.531 1.531	Std Err 0.0182 0.02809 0.01197 0.0206 0.01125 0.004562 Std Err 0.05381 0.07234 0.04219	CV% 4.22% 6.7% 2.74% 4.76% 2.62% 79.06% CV% 8.51% 11.89% 6.57%	%Effect 0.0% 2.81% -1.07% 0.53% 98.66% %Effect 0.0% 3.73% -1.53%
Attribute Variances Distribution Survival Rate C-μg/L 0 2.5 5 10 20 40 Angular (Corr C-μg/L 0 2.5 5 10 2.5 5 10 20 40	Te Ba Sh Summar Control Lab Cont Control Lab Cont	est artlett Equinapiro-Wil y Type (rrol & & & & & & & & & & & & & & & & & & &	Lality of Va Ik W Norm 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	riance iality 0.9652 0.9381 0.9755 0.9677 0.96 0.0129 ary Mean 1.413 1.361 1.435 1.425	Test Stat 5.222 0.964 95% LCL 0.9146 0.9423 0.9105 0.9288 0.000237 95% LCL 1.264 1.318 1.269	Critical 15.09 0.9031 95% UCL 1 1 1 1 0.9912 0.02557 95% UCL 1.563 1.562 1.552 1.58	P-Value 0.3894 0.3904 Median 0.9742 0.9355 0.9742 0.9871 0.9613 0.0129 Median 1.409 1.314 1.409 1.457	Decision(Equal Var Normal Di 0.9032 0.8581 0.9355 0.8903 0.9355 0 9 Min 1.254 1.185 1.314 1.233	α:1%) iances stribution Max 1 1 1 1 1 1 0.02581 Max 1.531 1.531 1.531 1.531	Std Err 0.0182 0.02809 0.01197 0.0206 0.01125 0.004562 Std Err 0.05381 0.07234 0.04219 0.05605	CV% 4.22% 6.7% 2.74% 4.76% 2.62% 79.06% CV% 8.51% 11.89% 6.57% 8.8%	%Effect 0.0% 2.81% -1.07% 0.53% 98.66% %Effect 0.0% 3.73% -1.53% -0.81%
Attribute Variances Distribution Survival Rate C-µg/L 0 2.5 5 10 20 40 Angular (Corr C-µg/L 0 2.5 5 10 2.5 5 10 2.5 5 10	Te Ba Sh Sh Control Lab Cont Control Lab Cont	artlett Equinapiro-Wil Type (trol { ansforme Type (trol { trol {trol {t	Lality of Va Ik W Norm Count 5 5 5 5 5 6 6 6 5 5 5 5 5 5 5 5 5 5 5	riance hality 0.9652 0.9381 0.9755 0.9677 0.96 0.0129 ary Mean 1.413 1.361 1.435 1.425 1.384	Test Stat 5.222 0.964 95% LCL 0.9146 0.9423 0.9105 0.9288 0.000237 95% LCL 1.264 1.16 1.318 1.269 1.276	Critical 15.09 0.9031 95% UCL 1 1 1 1 0.9912 0.02557 95% UCL 1.563 1.562 1.552 1.58 1.491	P-Value 0.3894 0.3904 Median 0.9742 0.9355 0.9742 0.9871 0.9613 0.0129 Median 1.409 1.314 1.409 1.314 1.409 1.314 1.409	Decision(Equal Var Normal Di 0.9032 0.8581 0.9355 0.8903 0.9355 0 Min 1.254 1.185 1.314 1.233 1.314	a:1%) iances stribution Max 1 1 1 0.02581 Max 1.531 1.531 1.531 1.531 1.531 1.531 1.531	Std Err 0.0182 0.02809 0.01197 0.0206 0.01125 0.004562 Std Err 0.05381 0.07234 0.04219 0.05605 0.03863	CV% 4.22% 6.7% 2.74% 4.76% 2.62% 79.06% 79.06% 8.51% 11.89% 6.57% 8.8% 6.24%	%Effect 0.0% 2.81% -1.07% 0.53% 98.66% %Effect 0.0% 3.73% -1.53% -0.81% 2.11%

Analyst: JU QA: 4776/10/19



CETIS	6 Analy	tical Repo	ort					Rep Test	ort Date: Code:	09 M 190424n	Vlay-19 13 nsdvSO	3:25 (p 1 of 3) 14-4098-8496
Bivalve	Larval S	urvival and D	evelop	ment Test						Nautilu	s Enviro	nmental (CA)
Analysi Analyza	is ID: 1: ed: 0	5-6766-2617 9 May-19 13:2	ا 25 ء	Endpoint: Analysis:	Combined D Linear Interp	evelopment I oolation (ICPI	Rate N)	CET	IS Version: cial Results:	CETISv1 Yes	.8.7	
Linear	Interpolat	tion Options		*****					*******			
X Trans	sform	Y Transform	1	Seed	Resamples	Exp 95	% CL Meth	nod				
Linear		Linear		1685698	1000	Yes	Two-	Point Interp	olation			······
Point E	stimates	95% Cl	95%									
EC25	6.247	5.964	6.342									
EC50	7.565	7.378	7.649									
Combir	ned Devel	opment Rate	Summ	ary		Calo	ulated Varia	te(A/B)				
C-µg/L	Con	trol Type	Count	. Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	Α	В
0	Lab	Control	5	0.952	3 0.8839	1	0.02149	0.04805	5.05%	0.0%	749	786
2.5			5	0.918	2 0.8516	0.9937	0.02637	0.05896	6.42%	3.58%	732	796
5			5	0.960	2 0.9355	0.9814	0.009531	0.02131	2.22%	-0.82%	751	782
10			5	0.036	37 0.01923	3 0.05161	0.005757	0.01287	35.39%	96.18%	29	793
20			5	0	0	0	0	0		100.0%	0	836
40			5	0	0	0	0	0		100.0%	0	775
Graphic Combined Development Rate	1.0 0.9 0.8 0.7 0.6 0.5 0.4 0.2 0.1 0.0 0	5 10	с-µg/I	0 25 L	30 35 4	● 40						



CETIS	Analy	tical Repo	ort					Repo Test	rt Date: Code:	09 N 190424m	/lay-19 13:: nsdvSO 1	25 (p 2 of 3) 4-4098-8496
Bivalve	Larval S	urvival and D	evelopmer	t Test					***********	Nautilu	s Environi	mental (CA)
Analysi Analyze	sID: 17 ed: 0	7-2116-2275 9 May-19 13:2	End 25 Ana	point: lysis:	Development F Linear Interpola	Rate ation (ICPIN)	CETI Offic	S Version: ial Results:	CETISv1 Yes	.8.7	
Linear	nterpolat	ion Options								an de la constante de la const		
X Trans	form	Y Transform	n See	d	Resamples	Exp 95%	CL Meth	nod				
Linear		Linear	444	110	1000	Yes	Two-	Point Interpo	olation			
Point E	stimates											
Level	µg/L	95% LCL	95% UCL									
EC25	6.279	6.205	6.325									
EC50	7.586	7.511	7.64									
Develo	oment Ra	te Summary				Calcu	lated Varia	te(A/B)				
C-µg/L	Con	trol Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	Α	в
0	Lab	Control	5	0.9864	0.9786	1	0.004402	0.009844	1.0%	0.0%	749	759
2.5			5	0.9792	0.9517	0.9937	0.008713	0.01948	1.99%	0.73%	732	748
5			5	0.9844	0.9733	1	0.004437	0.009921	1.01%	0.2%	751	763
10			5	0.0379	9 0.01923	0.05797	0.006602	0.01476	38.86%	96.15%	29	768
20			5	0	0	0	0	0		100.0%	0	805
40			5	0	0	0	0	0		100.0%	0	11
Graphic	s											
Development Rate	1.0 0.9 0.8 0.7 0.6 0.5 0.4 0.3 0.2 0.1 0.0 0	5 10	15 20 С-µg/L	25 3	1							

CETIS™ v1.8.7.20



CETIS	Analy	tical Repo	ort					Repo Test	ort Date: Code:	09 N 190424m	/lay-19 13:: nsdvSO 1	25 (p 3 of 3) 4-4098-8496
Bivalve	Larval S	urvival and D	evelopmen	t Test						Nautilus	s Environ	nental (CA)
Analysi Analyze	sID: 03 ed: 0	3-3240-7186 9 May-19 13:2	End 25 Ana	point: S lysis: L	Survival Rate ₋inear Interpola	tion (ICPIN)	CET	S Version: ial Results:	CETISv1 Yes	.8.7	
Linear I	nterpolat	tion Options										
X Trans	form	Y Transform	n See	l b	Resamples	Exp 95%	CL Meth	od				
Linear		Linear	1064	1279 ⁻	1000	Yes	Two-	Point Interp	olation			
Point E	stimates											
Level	µg/L	95% LCL	95% UCL									
EC25	24.99	24.05	25.14									
EC50	30.08	29.44	30.23									
Surviva	I Rate Su	Immary				Calcu	lated Variat	te(A/B)				
C-µg/L	Con	trol Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	Α	в
0	Lab	Control	5	0.9652	0.9032	1	0.0182	0.0407	4.22%	0.0%	748	775
2.5			5	0.9381	0.8581	1	0.02809	0.06282	6.7%	2.81%	727	775
5			5	0.9755	0.9355	1	0.01197	0.02676	2.74%	-1.07%	756	775
10			5	0.9677	0.8903	1	0.0206	0.04607	4.76%	-0.27%	750	775
20			5	0.96	0.9355	1	0.01125	0.02515	2.62%	0.53%	744	775 775
+0			J	0.0129	0	0.02581	0.004502	0.0102	79.00%	90.00 %	10	115
Graphic ate Invivio	1.0 0.9 0.8 0.7 0.6 0.5 0.4 0.3 0.2 0.1 0.0 0	5 10	15 20 С-µg/L	25 30	0 35 40							



CETIS QC Plot

Bivalve Larval Survival and Development Test

Test Type:Development-SurvivalProtocol:EPA/600/R-95/136 (1995)

Organism:Mytilus galloprovincialis (Bay MusselMEndpoint:Combined Development RateSo

Nautilus Environmental (CA)

Material: Copper sulfate

Source: Reference Toxicant-REF



Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2018	Dec	11	11:55	6.606	-0.8421	-0.2985			09-7408-5780	08-1757-8045
2			11	12:30	5.959	-1.489	-0.5278			01-7940-4185	15-9822-3312
3			12	13:55	5.593	-1.855	-0.6575			11-6161-8836	02-1891-3936
4	2019	Mar	20	15:25	11.63	4.184	1.483			02-0163-9394	10-2896-8877
5		Apr	24	14:25	7.565	0.1174	0.04161			14-4098-8496	15-6766-2617

000-089-187-3

CETIS QC Plot

Bivalve La	rval Survival and Development T	est			Nautilus Environmental (CA)
Test Type:	Development-Survival	Organism:	Mytilus galloprovincialis (Bay Mussel	Material:	Copper sulfate
Protocol:	EPA/600/R-95/136 (1995)	Endpoint:	Development Rate	Source:	Reference Toxicant-REF



Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2018	Dec	11	11:55	6.828	-0.7401	-0.252			09-7408-5780	03-3077-4520
2			11	12:30	5.952	-1.616	-0.5501			01-7940-4185	03-0677-9138
3			12	13:55	5.589	-1.979	-0.6737			11-6161-8836	13-7938-6780
4	2019	Mar	20	15:25	11.9	4.336	1.476			02-0163-9394	06-2977-8138
5		Apr	24	14:25	7.586	0.01777	0.006051			14-4098-8496	17-2116-2275

Bivalve Larval Survival and Development Test



CETIS QC Plot

Bivalve La	Bivalve Larval Survival and Development Test Nautilus Environmental (C									
Test Type:	Development-Survival	Organism:	Mytilus galloprovincialis (Bay Mussel	Material:	Copper sulfate					
Protocol:	EPA/600/R-95/136 (1995)	Endpoint:	Survival Rate	Source:	Reference Toxicant-REF					



14-4098-8496

03-3240-7186

5

14:25

24

Apr

30.08

5.002

1.735

CETIS Test Data Worksheet

Bivalve Larval Survival and Development Test

Nautilus Environmental (CA)

Start Date:24 Apr-19End Date:26 Apr-19Sample Date:24 Apr-19C-µg/LCodeRepPos			•	Species: Protocol: Material: (Mytilus galloprovi EPA/600/R-95/13 Copper sulfate	ncialis 6 (1995)		Sample Code: 190424msdvSO Sample Source: Reference Toxicant Sample Station: Copper Sulfate			
C-µg/L	Code	Rep	Pos	Initial Density	Final Density	# Counted	# Normal	Notes			
			31			163	162	TU, 5/9/19			
			32			153	5				
			33			138	8				
			34			173	167				
			35			140	137				
			36			145	Ø				
			37			ł	Ø	cells lysed			
			38			151	149				
			39			2	Ø	cells lysed			
			40			(45	145				
			41			4	Ð	certs lysed			
			42			139	138	× · · · · · · · · · · · · · · · · · · ·			
			43			172	8				
			44			145	138				
			45			216	$\langle \rangle$				
			46			151	148				
			47			149	Ø				
			48			158	158				
			49			150	146				
			50			3	Ø	cells lysed			
			51			158	157	l			
			52			156	3				
			53			149	5				
			54			149	\bigcirc				
			55			()	Ø	cells lysed			
			56			156	(53				
			57			161	158				
			58			147	144				
			59			146	\bigcirc				
			60			133	122				



CETIS Test Data Worksheet

Report Date:	23 Apr-19 09:49 (p 1 of 1)
Test Code:	14-4098-8496/190424msdvSO

Bivalve Larval Survival and Development Test						Nautilus Environmental (CA)		
Start Date: End Date: Sample Date	24 A 26 A e: 24 A	\pr-19 \pr-19 \pr-19	1	Species: Protocol: Material:	Mytilus galloprovi EPA/600/R-95/13 Copper sulfate	ncialis 36 (1995)		Sample Code: 190424msdvSO Sample Source: Reference Toxicant Sample Station: Copper Sulfate
C-µg/L	Code	Rep	Pos	Initial Density	Final Density	# Counted	# Normal	Notes
0	LC	1	58					
0	LC	2	46					
0	LC	3	35			174	127	RX 4/26/19
0	LC	4	31			161		(10071)
0	LC	5	48					
2.5		1	42					
2.5		2	51					
2.5		3	60			173	122	RT
2.5		4	34			100		
2.5		5	44					
5		1	56					
5		2	38					· ·
5		3	40			137	137	RT
5		4	57			1.57	19 1	
5		5	49					
10		1	32					
10		2	43					
10		3	33			174	4	RT
10		4	52			1-0	9	
10		5	53					
20		1	59					
20		2	36					
20		3	45			114	0	ETT
20		4	54			*>		μ ·).
20		5	47					
40		1	39					
40		2	41					
40		3	55			\hat{O}	0	RT
40		4	50					Į -)
40		5	37					

QC = BD





Water Quality Measurements

Client:	Internal
Sample ID:	CuG2 (uSoy
Test No.:	190424msdvSO

Test Species:M. galloprovincialisStart Date/Time:4/24/2019End Date/Time:4/26/20194/26/2019400

Concentration		Salinity (ppt)		Temperature			Dissolved Oxygen			pH		
(µg/L)	0	(ppt) 24	48	0	24	48	0	(mg/L) 24	48	0	24) 48
Lab Control	322	322	32.2	14.9	14.9	15.0	8.6	8.8	8.3	8.02	8.04	8.00
2.5	32.5	32.5	32,5	14.9	14.7	14.7	8.4	8.8	8.4	8.01	8.04	8.00
5	32.4	32.5	32.5	14.7	14.6	14.6	83	8.8	8.4	8.01	8.04	8.01
10	32.5	32.5	32.6	14,8	14-8	14.9	8.3	8.7	8.3	8.0Z	8.64	8.01
20	32.4	32,5	72.6	14.7	14.7	14.8	8.3	8.8	8,4	8.62	8.04	8.02
40	324	32,4	32.5	14.7	14.6	14.9	8.3	8.7	8.4	8.02	8.03	8.02
			0	24	48		High	conc ma	طم (سم/ا).		10	1
Technician Initials:	WQ F	Readings:	EG	RT	RT]	Vol. Cu	stock add	ded (mL):	2	.5	1
	Dilutions	made by:	BO				F	Final Volu	ime (mL):	50	00	1
						Cı	u stock co	oncentratio	on (µg/L):	8,00	0	
Comments:	0 hrs:	QUIS A	5 4/23/1	q								
	24 hrs:											
	48 hrs:											
QC Check:	KTP 5	10/19						Fina	I Review:	ĒG	5/17/10	l

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Larval Development Worksheet

Client:	Internal (CuSO4
Test No.:	190424 msdvSO
Test Species:	M. galloprovincialis
Animal Source:	Mission Bay
Date Received:	4123119
Test Chambers:	30 mL shell vials
Sample Volume:	IOML

1030

Start Date/Time:	4/24/2019	425
End Date/Time:	4/26/2019	1400
Technician Initials:	BOLEG	

Spawn Information

First Gamete Release Time:

Gamete Selection

Sex	Number Spawning
Male	3
Female	8

Sex	Beaker Number(s)	Condition (sperm motility, egg density, color, shape, etc.)	
Male	1.2	good motility, appart density	
Female 1		Ovanap color mostly much adodd	ensitu
Female 2	6	Orange infor mostly round, fair deast	J
Female 3			

Embryo Stock Selection

Stock Number	% of embryos at 2-cell division stage
Female 1	99%
Female 2	100%
Female 3	

Egg Fertilization Time: 1120

Stock(s) chosen for testing: 2

Embryo Inoculum Preparation

Target count on Sedgwick-Rafter slide for desired density is 6 embryos



(to inoculate with 0.5 ml)

Prepare the embryo inoculum according to the calculated dilution factor. For example, if the dilution factor is 2.25, use 100 ml of existing stock (1 part) and 125 ml of dilution water (1.25 parts).



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Appendix E List of Qualifier Codes



Glossary of Qualifier Codes:

- Q1 Temperatures out of recommended range; corrective action taken and recorded in Test Temperature Correction Log
- Q2 Temperatures out of recommended range; no action taken, test terminated same day
- Q3 Sample aerated prior to initiation or renewal due to dissolved oxygen (D.O.) levels below 6.0 mg/L
- Q4 Test aerated; D.O. levels dropped below 4.0 mg/L
- Q5 Test initiated with aeration due to an anticipated drop in D.O.
- Q6 Airline obstructed or fell out of replicate and replaced; drop in D.O. occurred
- Q7 Salinity out of recommended range
- Q8 Spilled test chamber/ Unable to recover test organism(s)
- Q9 Inadequate sample volume remaining, 50% renewal performed
- Q10 Inadequate sample volume remaining, no renewal performed
- Q11 Sample out of holding time; refer to QA section of report
- Q12 Replicate(s) not initiated; excluded from data analysis
- Q13 Survival counts not recorded due to poor visibility or heavy debris
- Q14 D.O. percent saturation was checked and was $\leq 110\%$
- Q15 Did not meet minimum test acceptability criteria. Refer to QA section of report.
- Q16 Percent minimum significant difference (PMSD) was <u>below</u> the lower bound limit for acceptability. This indicates that statistics may be over-sensitive in detecting a difference from the control due to low variability in the data set.
- Q17 Percent minimum significant difference (PMSD) was <u>above</u> the upper bound limit for acceptability. This indicates that statistics may be under-sensitive in detecting a difference from the control due to high variability in the data set.
- Q18 Incorrect Entry
- Q19 Illegible Entry
- Q20 Miscalculation
- Q21 Other (provide reason in comments section)
- Q22 Greater than 10% mortality observed upon receipt and/or in holding prior to test initiation. Organisms acclimated to test conditions at Nautilus and ultimately deemed fit to use for testing.
- Q23 Test organisms received at a <u>temperature</u> greater than 3°C outside the recommended test temperature range. However, due to age-specific protocol requirements and/or sample holding time constraints, the organisms were used to initiate tests upon the day of arrival. Organisms were acclimated to the appropriate test conditions upon receipt and prior to test initiation.
- Q24 Test organisms received at <u>salinity</u> greater than 3 ppt outside of the recommended test salinity range. However, due to age-specific protocol requirements and/or sample holding time constraints, the organisms were used to initiate tests upon the day of arrival. Organisms were acclimated to the appropriate test conditions upon receipt and prior to test initiation.