

July 2, 2020

Mr. Christopher Bittner Standards Coordinator Utah Dept. of Environmental Quality 195 N 1950 W Salt Lake City, UT 84116

Dr. Gary Belovsky Environ. Res. Center & Dept. Biol Sci. University of Notre Dame Notre Dame, IN 46556

Subject: Results of Analytical Data for Experiment #20

Mr. Bittner/ Dr. Belovsky:

Below is a summary of the analytical data for the short-term chronic brine shrimp experiment initiated on May 21, 2020. Total zinc samples were collected in new solutions at test initiation and on day 6. Total zinc samples were also collected in old solutions on day 1.

### **Characterization of Recon Water**

Sample No.	рН	Hard. (mg/L) <sup>a</sup>	Alk. (mg/L) <sup>a</sup>	Spec. Cond. (μS/cm)	TRC (mg/L) <sup>b</sup>	NH <sub>3</sub> -N (mg/L)	Salinity (ppt)
RW#13948	7.9	NM	NM	129,700	NM	NM	120

### **Results of Zinc Analysis**

		Total Zinc (mg/L)			
Nominal Value (mg/L)	Day 0 New Solution	Day 1 Old Solution	Day 6 New Solution	Mean Value	Percent of Nominal
0	0.021 U	0.021 U	0.021 U	0.021	
0.5	0.386	0.401	0.398	0.395	79%
1	0.819	0.920	0.692	0.810	81%
2	1.62	1.81	1.43	1.62	81%
4	3.15	3.66	2.80	3.20	80%
8	6.80	7.76	5.34	6.63	83%
16	13.6	15.6	11.0	13.40	84%

U= below method detection limit (0.021 mg/L)

<sup>&</sup>lt;sup>a</sup>As CaCO3 <sup>b</sup>Total residual chlorine

Average measured zinc concentrations were then used to recalculate test survival and growth endpoints on a measured basis.

### **Test Endpoints**

Basis	Survival NOEC	Survival IC20	Growth NOEC	Growth IC20
Nominal	>16	>16	1	1.31 (0.518-1.78)
Measured	>13.4	>13.4	0.81	1.061 (0.442-1.403)

We greatly appreciate the opportunity to complete this study for you. Please do not hesitate to call if you have any questions or concerns.

Sincerely,

Amanda Bidlack Project Specialist / QA Officer

bidlackac.tre@gmail.com

Rami B. Naddy, Ph.D.

Manager / Environmental Toxicologist

naddyrb.tre@gmail.com

17001-474-076

Attachment

cc: David Pillard, TRE

	Percent of Nominal	100%	79.00%	81.03%	81.00%	80.08%	82.83%	83.75%
	Mean (mg)	0.21	968:0	0.81	1.62	3.20	6.63	13.40
(mg/L)	Day 6 New (mg)	<0.21 (ND)	0.398	0.692	1.43	2.8	5.34	11
Zinc Chronic (mg/L)	Day 1 Old (mg)	<0.21 (ND)	0.401	0.92	1.81	3.66	92.7	15.6
	Day 0 New (mg)	<0.21 (ND)	0.386	0.819	1.62	3.15	6.8	13.6
	Nominal Value (mg)	0	0.5	1	2	4	8	16

# TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

120		la:	_		•	1 -	<del> </del>	<u> </u>		ا جم					-c '									. = "				
OA: OP 7/120	Mean Wt./ Treatment (mg) (Surviving)	0.1092				0 1069				0.0933					0.0673					0.0389				0.0215				
ð	Mean Wt./ Surviving Organism (mg)	0.124	0.110	0.107	0.096	0 000	0.111	0.103	0.121	0.087	0.104	0.094	0.088		0.076	0.062	0.062	0.069	1	0.037	0.040	0.044	0.034	0.019	0.028	0.018	0.021	
	Number of Surv. Organisms			10	10	10	6	6	10	10	10	10	10	:	10	10	10	10		2	10	6	10	10	10	10	10	
	Mean Wt./ Treatment (mg) (Original)	0.1065				0.1015				0.0933					0.0673					0.03/8				0.0215				
Artemia franciscana	Mean Wt./ Original Organism (mg)	0.124	660.0	0.107	960.0	260.0	0.100	0.093	0.121	0.087	0.104	0.094	0.088		0.076	0.062	0.062	690.0	1	0.037	0.040	0.040	0.034	0.019	0.028	0.018	0.021	
Artemia fra	No of Orig. Organisms	10	10	10	10	10	100	10	10	10	10	10	10		10	10	10	10		2	10	10	10	10	10	10	10	
Species:	Adjusted et Weight (9)	0.00124	66000.0	0.00107	0.00096	0 0000	0.00100	0.00093	0.00121	0.00087	0.00104	0.00094	0.00088		0.00076	0.00062	0.00062	69000.0	1000	0.00037	0.00040	0.00040	0.00034	0.00019	0.00028	0.00018	0.00021	
	Net Weight (g)	0.00124	0.00099	0.00107	96000'0	0 000	0.00100	0.00093	0.00121	0.00087	0.00104	0.00094	0.00088		0.00076	0.00062	0.00062	69000.0	10000	0.00037	0.00040	0.00040	0.00034	0.00019	0.00028	0.00018	0.00021	
	Gross Weight (g)	1.12335	1.13558	1.13669	1.13075	1 13936	1.12569	1.12966	1.13020	1.13671	1.14679	1.13659	1.13115		1.13229	1.13742	1.14340	1.13395	1	1.11539	1.13612	1.15220	1.13468	1.14087	1.12908	1.13688	1.13636	
14001-474	Tare Weight (g)	1.12211	1.13459	1.13562	1.12979	1 13844	1.12469	1.12873	1.12899	1.13584	1.14575	1.13565	1.13027		1.13153	1.13680	1.14278	1.13326	0	1.11502	1.13572	1.15180	1.13434	1.14068	1.12880	1.13670	1.13615	
	Length Units:																											
ımber:	Rep	٨	В	ပ		₫	m	ပ	٥	А	В	ပ		_	⋖	М	ပ	Δ	·	<	В	ပ	□	4	В	ပ		
Project Number:	Treatment		Ç	ار اروکا			L	0.5 mg/L			, ma, l	- - - - - - -				1/pm c	ا اع/د ا				/ wu /	+ - - - - - -			7,500 8	0 - 19/L		

4		1 13263	1 13288	0 00025	0.00025	10	0.025	0.0215	10	0.025	0.0229
		1.14322	1.14341	0.00019	0.00019	9	0.019	2	2 &	0.024	
J Mg/L C		1.13565	1.13598	0.00033	0.00033	10	0.033		10	0.033	
Ω		1.14116	1.14125	60000.0	60000.0	10	600.0		റ	0.010	
Blank		1.13452	1.13454	0.00002							•
Project Number:	jr.	14001-474		S	Species:	Artemia franciscana	nciscana		: :		8 7 7
•					1					QA,	QA; 120 1/1/20
	Summary Si	Summary Statistics for Survival I	Survival Data	æ							
	<u>Treatment</u>	Z  4	Min 9	Max	<u>Mean</u> 0.9750	<u>SD</u>	C.V. 5 128%				
	0.5 mg/L	4	6.0	1.0	0.9500	0.0577	6.077%				
	1 mg/L	4	1.0	1.0	1.0000	0.0000	0.000%				
	2 mg/L	4	1.0	1.0	1.0000	0.000	0.000%				
	4 mg/L	4	6.0	1.0	0.9750	0.0500	5.128%				
	8 mg/L	4	1.0	1.0	1.0000	0.0000	0.000%				
	16 mg/L	4	0.8	1.0	0.9250	0.0957	10.351%				
	Summary St	Summary Statistics for Growth Data (dry wt per original)	iowth Data	(dry wt per	· original)						
	<b>Treatment</b>	Z	Min	Max	Mean	SD	).    - 				
	rGSL	4	960.0	0.124	0.1065	0.0126	11.790%				
	0.5 mg/L	4	0.092	0.121	0.1015	0.0135	13.279%				
	1 mg/L	4	0.087	0.104	0.0933	0.0078	8.370%				
	2 mg/L	4	0.062	0.076	0.0673	0.0067	8.966%				
	4 mg/L	4	0.034	0.040	0.0378	0.0029	7.609%				
	8 mg/L 16 mg/l	4 4	0.018	0.028	0.0215	0.0045	20.973%				
	) - - -	•			2.7	- - - - - -	2				
	Summary St	Summary Statistics for Growth Data (dry wt per surviving organism)	Frowth Data	(dry wt per	surviving c	organism)					
	Treatment	ZI V	Min Sec	Max 0 124	<u>Mean</u>	<u>SD</u>	10 553%				
	0.5 ma/L	4	0.092	0.121	0.1069	0.0123	11.477%				
	1 mg/L	4	0.087	0.104	0.0933	0.0078	8.370%				
	2 mg/L	4	0.062	0.076	0.0673	0.0067	%996.6				
	4 mg/L	4	0.034	0.044	0.0389	0.0045	11.466%				
	8 mg/L	4	0.018	0.028	0.0215	0.0045	20.973%				
	16 mg/L	4	0.010	0.033	0.0229	0.0095	41.630%				

## **CETIS Analytical Report** Brine Shrimp

Report Date:

30 Jun-20 10:35 (p 1 of 2)

TRE Environmental Strategies

Test Code:

474-076 | 07-1158-8845

### Fathead Minnow 7-d Larval Survival and Growth Test

S Version:	CETISV1.8.7

Analysis ID: Analyzed:	19-6092-5070 30 Jun-20 10:34	Endpoint: Analysis:	Mean Dry Biomass-mg Linear Interpolation (ICPIN)	CETIS Vei Official Re	rsion: CETISv1.8.7 esults: Yes
Batch ID:	04-2472-1259	Test Type:	Growth-Survival (7d)	Analyst:	Lab Tech
Start Date:	04 Jun-20 13:45	Protocol:	EPA/821/R-02-013 (2002)	Diluent:	rGSL
Ending Date:	11 Jun-20 13:20	Species:	Artemia franciscana (i)	Brine:	Crystal Sea
Duration:	7d	Source:	-Hog Island Oyster Co. TRE	Age:	48h
Sample ID:	00-8320-5339	Code:	4F59CDB	Client:	Notre Dame
Sample Date:	04 Jun-20 10:35	Material:	Zinc sulfate	Project:	Special Studies
Receive Date:	: 13 Jun-20 13:45	Source:	Discharge Monitoring Report		

Sample Age: 3h

Station:

### **Linear Interpolation Options**

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	586445	200	Yes	Two-Point Interpolation

### **Point Estimates**

Level	μg/L	95% LCL	95% UCL	
IC5	0.4113	0.1772	1.133	
IC10	0.6792	0.1045	1.168	
IC15	0.8949	0.0631	1.256	
IC20	1.061	0.4422	1.403	
IC25	1.227	0.7176	1.563	
IC40	1.799	1.271	2.292	
IC50	2.37	1.723	2.721	

Ca	Icula	ated \	Varia	te

Mean Dry	Biomass-mg Sum	mary			C	alculated Vai	riate		
C-µg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0.21	Dilution Water	4	0.1065	0.096	0.124	0.006278	0.01256	11.8%	0.0%
0.395		4	0.1015	0.092	0.121	0.006739	0.01348	13.3%	4.69%
0.81		4	0.09325	0.087	0.104	0.003902	0.007805	8.37%	12.4%
1.62		4	0.06725	0.062	0.076	0.003351	0.006702	9.97%	36.9%
3.2		4	0.03775	0.034	0.04	0.001436	0.002872	7.61%	64.6%
6.63		4	0.0215	0.018	0.028	0.002255	0.004509	21.0%	79.8%
13.4		4	0.0215	0.009	0.033	0.005058	0.01012	47.1%	79.8%

### Mean Dry Biomass-mg Detail

C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0.21	Dilution Water	0.124	0.099	0.107	0.096
0.395		0.092	0.1	0.093	0.121
0.81		0.087	0.104	0.094	0.088
1.62		0.076	0.062	0.062	0.069
3.2		0.037	0.04	0.04	0.034
6.63		0.019	0.028	0.018	0.021
13.4		0.025	0.019	0.033	0.009

ODSP 7/1/20 E

Page 6 of 7

Analyst: My QA: 040 7//20

000-470-187-3

CETIS™ v1.8.7.16

### **CETIS Analytical Report**

Brine Strimp

Report Date:

30 Jun-20 10:35 (p 2 of 2) 474-076 | 07-1158-8845

Test Code:

TRE Environmental Strategies

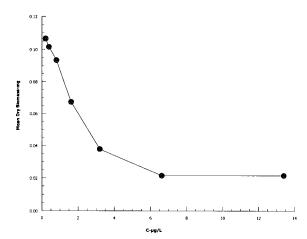
Fathead Minnow 7-d Larval Survival and Growth Test

Analysis ID: Analyzed:

19-6092-5070 30 Jun-20 10:34 Endpoint: Mean Dry Biomass-mg Analysis: Linear Interpolation (ICPIN) **CETIS Version:** Official Results: Yes

CETISv1.8.7

Graphics



ODAP 7/1/20 E

Page 7 of 7 Analyst: M. QA: DA 7/1/20

# TRE Environmental Strategies, LLC 100 Racquette Drive, Unit A, Fort Collins, Colorado, 80524 T 970.416.0916 F 970.490.2963



June 17, 2020

Mr. Christopher Bittner Standards Coordinator Utah Dept. of Environmental Quality 195 N 1950 W Salt Lake City, UT 84116 Dr. Gary Belovsky Environ. Res. Center & Dept. Biol Sci. University of Notre Dame Notre Dame, IN 46556

### **Subject: Results of Short-term Chronic Brine Shrimp Experiment #20**

Mr. Bittner/ Dr. Belovsky:

Below is a summary of the short-term chronic brine shrimp experiment initiated on June 4, 2020. The purpose of this experiment was to investigate the effect of zinc on *Artemia franciscana* toxicity in a short-term chronic test.

Along with a control, five different zinc concentrations were tested, based off of the previously conducted chronic test as sublethal endpoints were significantly lower than survival endpoints:

0.5, 1, 2, 4, 8, and 16 mg/L

The results of these studies will help understand the sub lethal toxicity of zinc to brine shrimp. The test volume was consistent at 50 ml.

Species: Artemia franciscana

### Test type:

Test duration: 7 days

• Test type: static-renewal (solutions and food renewed daily)

• Algae: Dunaliella viridis

Food concentration: 72.5 μg/L Chla and 0.3 ml YTC<sup>1</sup>

Temperature: 20°CTest volume(s): 50 ml

Replicates: 4

Organisms/Rep: 10

• Test media: 120 ppt rGSL media (per Notre Dame recipe)

**Pretest conditions**: <24-h old *A. franciscana* were hatched out in ~29 ppt artificial seawater (Crystal Sea Marine Mix) and ~200 organisms were placed in 120 ppt rGSL water and fed *Dunaliella viridis* at a density of 72.5 μg/L Chl*a* and 0.3 ml YTC. Solutions were gently aerated.

<sup>&</sup>lt;sup>1</sup> yeast-trout chow-cerophyl mixture used as a typical food for water fleas in whole effluent toxicity testing (USEPA 2002)

### **Characterization of Recon Water**

Sample No.	рН	Hard. (mg/L) <sup>a</sup>	Alk. (mg/L) <sup>a</sup>	Spec. Cond. (μS/cm)	TRC (mg/L) <sup>b</sup>	NH <sub>3</sub> -N (mg/L)	Salinity (ppt)
RW#13948	7.9	NM	NM	129,700	NM	NM	120

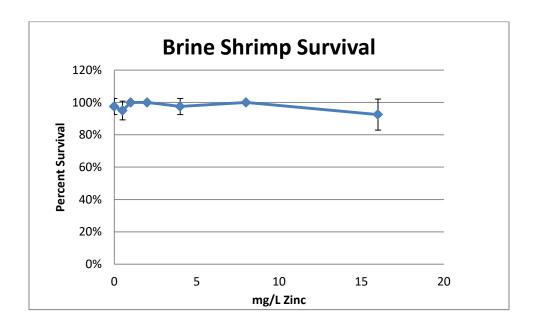
<sup>&</sup>lt;sup>a</sup>As CaCO3

### Test activities:

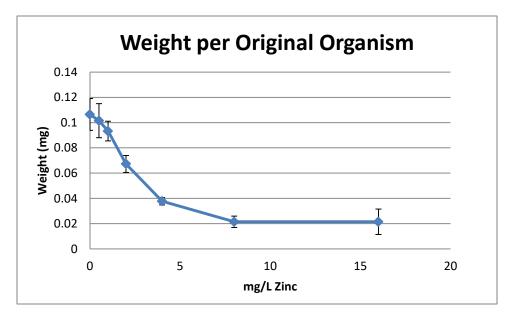
- Biological observations (primarily survival) taken daily.
- Chemistries taken on renewal days (i.e., pH, dissolved oxygen, and temperature).
- Conductivity was measured at test termination or when there was 0% survival in that treatment.
- Dry weights were determined at test termination.
- Zinc was added to 120 rGSL media containing food and allowed to equilibrate for 3 hours prior to use in the toxicity tests.

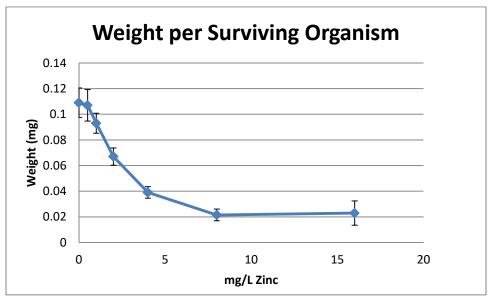
### Results:

The survival and average dry weights for the brine shrimp in the zinc (nominal) treatments are illustrated in the following figures.



<sup>&</sup>lt;sup>b</sup>Total residual chlorine





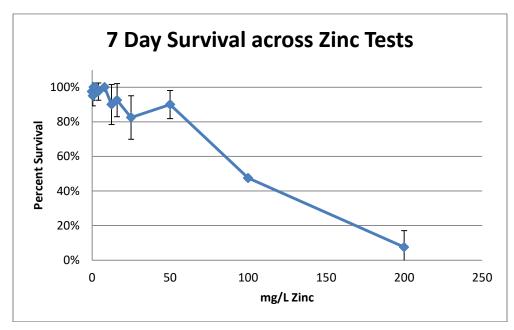
**Test Endpoints** 

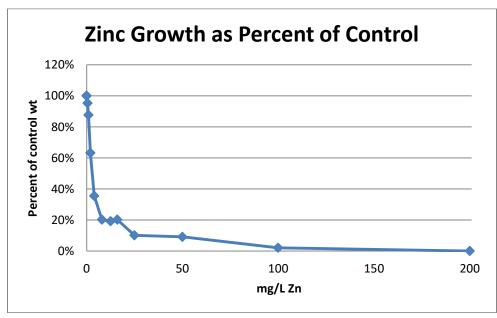
			Test End	lpoints (mg	Zn/L, nomir	nal)
Study	Survival NOEC	Survival LOEC	Survival IC20	Growth NOEC	Growth LOEC	Growth IC20
7-Day	16	>16	>16	1	2	1.31 (0.518-1.78)

Survival endpoints were determined in the previous zinc test (17001-474-071) and are summarized in the table below:

	Test Endp	oints (mg Zn	/L, nominal)
Study	Survival NOEC	Survival LOEC	Survival IC20
7-Day	50	100	60.65 (45.53-71.92)

Survival and growth data from both tests are presented in the graphs below. Growth has been normalized as percentage of control organism weight:





### Summary and findings:

- Organism survival was ≥ 90% for the control.
- No survival effect was apparent in the zinc treatments used in this test, which is consistent with the previous zinc studies.
- Growth was significantly more sensitive than survival for zinc.

Analytical samples from each treatment have been collected and sent in for zinc measurement. We will provide a summary of those results separately.

We greatly appreciate the opportunity to complete this study for you. Please do not hesitate to call if you have any questions or concerns.

Rami B. Naddy, Ph.D.

naddyrb.tre@gmail.com

Manager / Environmental Toxicologist

Sincerely,

Amanda Bidlack Project Specialist / QA Officer

bidlackac.tre@gmail.com

17001-474-076 Attachment

cc: David Pillard, TRE

### TOXICITY DATA PACKAGE COVER SHEET

Q1: Dap 6/6/20

Test Type:	Chronic		Project Number:	1	17001-474-076	
Test Substance:	Zinc (ZnSO4	-)	Species:	Artemia francis	scana	
Dilution Water:	rGSL		Organism Lot	or Batch Numbe	ber: 060220	
Concurrent Control Water:	NA		Age: 48HR	(48 hr)	Supplier: TPE	
Date and Time Test Began:	6/4/20	@ 1345	Date and Time	Test Ended:	111/20@1320 HPJAF/ES/EN	
Protocol Number:			Investigator(s)	estap	HRIAFIES/EN	
Background Information					•	
Type of Test:	Static-Renev	val (Daily)	pH control?: If yes, give % (	Yes CO <sub>2</sub> :	NO NA	
Test Temperature:	20 ± 1 °C		Env. Chmbr/Bath #: _25	_	Test Chmbrs: 147-ml cups	
Photoperiod:	16 h light : 8	h dark	Light intensity:		50-100 ft-c.	
Test Solution Vol.:	5	0 ml	Replicates per	Treatment:	4	
Length of Test:	7 days		Organisms pe	r Replicate:	10	
Type of Food and Quantity pe	r Chamber:	72.5 ug/L Chla/	0.3 ml YT Feeding Frequ	iency:	Initiation and Renwals	
Test Substance Characteriz	ation Parame	eters and Frequ	uency:			
Hardness: <u>Test Initiation</u>	Alkalinity:	Test Initiation	NH <sub>3</sub> : Test Initiation	TRC: Test Init	tiation	
pH: <u>Daily</u>	Conductivity	: Daily				
Test Concentrations (Volume:	Volume):	rGSL, 0.5, 1, 2	, 4, 8, and 16 mg/L as Zn			
Agency Summary Sheet(s)?:		None	-			
Reference Toxicant Data:	Test Dates:		to		IC <sub>25</sub> ;	
Hist. 95% Control Limits:		to	Method for Determining	Ref. Tox. Value	Linear Interpolation	
Special Procedures and Co	neideratione					
Organisms hatched 2 days pr			SL with 72.5 ug/L Chla/ 0.	3 ml YTC		
New Analytical on Days 0 and						
Appropriate correction factors	have been a	pplied to all tem	peratures recorded in this	data package		
Study Director Initials:		Date: 6 3				

### **TEST SUBSTANCE USAGE LOG**

Project	Number:
FIDIECE	, number.

17001-474-076

QA: NSP 6/16/20

	Sample 1	Sample 2	Sample 3	Sample 4
Test Substance Number	C99-093			
	From:	From:	From:	From:
Test Substance Collection	@	@	@	@
Date and Time	То:	To:	То:	To:
	@	@	@	@
Sample Type (Grab or Comp)				
Date Test Substance Received				
Dilution Water Number RW# or TRE#, circle one	13948			
Concurrent Control Water RW#	NA			
Date(s) Used	614120 614120 614120 614120 614120 614120 614120 614120			

**Preparation of Test Solutions** 

					of Test Soli				
Test	Test	Dilution	Total	Test	Dilution	Total	Test	Dilution	Total
Substance	Substance	Water	Volume	Substance	Water	Volume	Substance	Water	Volume
Conc.	Volume	Volume	(ml)	Volume	Volume	(ml)	Volume	Volume	(ml)
(mg/L)	(ml)	(mi)		(ml)	(mi)		(ml)	(mi)	
0	0	350	350						
0.5	11	339	350						
1	22	328	350						
2	44	306	350						
4	88	263	350						
8	175	175	350						
16	350	0	350						
	689	1761	2450						
Initials / Date	ex 6/4	4100 M	ixed BS						
Initials / Date	100	5/20 "	Ü						
Initials / Date		10120 "	ìc						
Initials / Date	HR U		11 1)						
Initials / Date	6 61	8/20 h	V						
Initials / Date	HP UIC	1/20 "	1 1)						
Initials / Date	W (ell	יי עפונ	n						
Initials / Date									

## Artemia franciscana CHRONIC BIOLOGICAL DATA

QX: Obr 6/16/20

Project Number: \_\_\_\_ 17001-474-076

	<del>                                     </del>					Number	of Surviv	ing Organ	nisms		
	Test	Day	Day	Day	Day	Day	Day	Day	Day		
mg/L	Replicate	0	1	2	3	4	5	6	7	Rema	arks
0	Α	10	10	10	10	10	10	10	10		97,5%
	В	10	10	9	٩	9	9	9	9		
	С	10	10	10	10	10	lo	10	10		
	D	10	10	10	10	10	w	io	10		
0.5	Α	10	10	D	10	10	10	10	0		95%
	В	(0	10	10	9	9	9	9	9		
	С	(0	9	9	9	9	9	9	Ġ		
	D	10	10	10	10	10	w	10	10		
11	Α	10	10	10	(0	10	10	(0	10*	# I weak org	100%
	В	10	10	10	(0	10	W	W	10		
	С	10	10	10	10	10	W	10	10		
	D	10	10	10	lο	10	ら	10	0		
2	Α	10	10	10	(0	10	10	10	10		100%
	В	10	10	10	ίο	10	0	Oj	10		
	С	10	10	10	10	10	W	10	10		
	D	10	10	10	10	10	W	10	Ĝí		
4	Α	10	10	10	10	10	10	10	10		97.5%
	В	10	10	10	(0	10	10	10	Oj		
	С	10	10	10	0	10-	(0-	10-	9	- I weare any	
	D	10	10	10	(0	16	lo	10	10		
8	Α	10	10	10	' 7	10	W	10	10		10000
	В	10	10	lo	[0]	10	6	10	10		
	С	10	10	10	10	10	10	10	10		
	D	10	10	10	(0	10	W	10	10		
16	Α	10	10	10	(0	10	10	10	10		92.5%
	В	10	9	9	9	9	9	9	8		
	С	10	10	10	10	10	10	10	10		
	D	10	10	10	70	10	W	10	9		
	Date:	6/4/20		6/6/20	617120		69120	6/10/10	Wille		
	Time:	1345	1450	1440	1145	1430	1906	1340	1320		
	Initials:	CP/RS	AF	CP	Es	EN	R	EY	Εή		

### **CHRONIC CHEMICAL DATA (INITIAL)**

QA: DEP 6/16/20

Project Number:	17001-474-076	
Test Species	s: Artemia franciscana	

mg/L	Day	Day	Day	Day	Day	Day	Day	Day	Meter #	Remarks
	0	1	2	3	4	5	6	<u>7</u>		
Conc.: 0									All Conc.	
pH	7.9	7.8	7.9	8.1	7.9	8.0	7.8		FM27	
D.O. (mg/L)	5.0	5.0	5.0	51	4.8	4.9	5.0		17	
Temp. (°C)	20	20	20	20	20	90	20		IP1	
Cond. (µS/cm)	129,700	132,300	128,100	129700	133100	14050s	20 19138100		15	
Hard. (mg/L)										
Alk. (mg/L)										
TRC (mg/L)										
NH <sub>3</sub> (mg/L)										
Conc.: 0.5										
рН	7.9	7.8	7.9	Ø .0	79	8.0	7.8			
D.O. (mg/L)	4.9	4.9	4.9	5.0	4.8	4.9	5.0			
Temp. (°C)	O¥20	0¥20	0×20			90	20			
Cond. (µS/cm)		133,500				135900				
Hard. (mg/L)										
Alk. (mg/L)										
TRC (mg/L)										
NH <sub>3</sub> (mg/L)										
Conc.: 1										
рН	7.9	7.8	7.8	7.9	7.9	7.9	7.8			
D.O. (mg/L)	4.9	4.9	4.9	5.0	48	4.9	50			
Temp. (°C)	⊕¥20	0×20	C* 20	20XO	20	90	20			
Cond. (µS/cm)		133.100			133400	134,400	138900			
Conc.: 2										
рН	7.8	7.8	7.8	7.9	79	7.9	7.8			
D.O. (mg/L)	4.9	4.9	4.9		48	4.9	7.8 50			
Temp. (°C)	O¥ 10	0¥20				90	26			
Cond. (µS/cm)		133,100				133,800				
Date:	6/4/20			4/7120			6/10/10			
Time:	1335	1425	1425	1125	1420	1155	1325			
Initials:	CP	AF	CP	ES	EN	0/	EN			

Note: Hardness, alkalinity, TRC, and NH3 data appearing on this page have been transcribed from the wet chemistry log QA Form No. 084.

<sup>\*</sup>Dilution/control water and effluent were brought to 25C prior to making the dilution series. The temperature of resulting effluent dilution is assumed to also be 25C. OAF 0/8/20F 0/5/20F 0/5/20F 0/5/20F

### **CHRONIC CHEMICAL DATA (INITIAL)**

QA: DAP 6/16/20

Project Number:	17001-474-076	
Test Species	: Artemia franciscana	

mg/L	Day	Day	Day 2	Day	Day	Day	Day 6	Day	Meter #	Remarks
	0	1	2	3	4	5	6	7		
Conc.: 4									All Conc.	
рН	7.8	7.8	7.8	7.9	7.8	7.9	7.8			
D.O. (mg/L)	4.9	4.9	4.9	5,0	4.8	49	50			
Temp. (°C)	mx 20	0 <del>×</del> 20	at 20	ON 20	20	<b>ુ</b> ં	20			
Cond. (µS/cm)	130,700	133,400	129,400	13 2300	133200	134,100	139100			
Conc.: 8										
рН	7.8	1.8	7.8	7.9	7.8	7.8	7.8			
D.O. (mg/L)	4.9	4.9	4.9	5.0	4.8	50	5.0			
Temp. (°C)	O¥ 20	0×20	0×20	2006	20	70	20			
Cond. (µS/cm)	130,500	133,700	127,600	130200	133500		139000			
Conc.:										
рН										
D.O. (mg/L)										
Temp. (°C)										
Cond. (µS/cm)										
Conc.:										
pH										
D.O. (mg/L)										
Temp. (°C)										
Cond. (µS/cm)										
Conc.: 16										
pH	7.8	7.8	7.7	7.8	7.8	7.8	7.7			
D.O. (mg/L)	4.9	4.9	4.9		4.8		5.0			
Temp. (°C)	*20		ax 20	0×20		20	70			
Cond. (µS/cm)	130,000	133,200		131000		185,000	138800			
Hard. (mg/L)										
Alk. (mg/L)										
TRC (mg/L)										
NH <sub>3</sub> (mg/L)										
Date:	6/4/20	U15/20	6/6/20	417170	48/20	619126	6/10/20			
Time:	1335	1425	1425	1125	1420	N55	1325			
Initials	CP	AF	СР	Es	EN	18	EN			

Note: Hardness, alkalinity, TRC, and NH3 data appearing on this page have been transcribed from the wet chemistry log QA Form No. 084.

<sup>\*</sup>Dilution/control water and effluent were brought to 25C prior to making the dilution series. The temperature of resulting effluent dilution is assumed to also be 25C.

①AF 0/0/20F

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CHRONIC CHEMICAL DATA (FINAL)

QASAAP	6/18/20
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Project Number:	17001-474-076		 	
Test Species:	Artemia franciscana			

mg/L		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Meter #	Remarks
Conc.:	0							120700		All Conc.	* conductivity 15
рН		7.8	7.9	7.6	7.7	7.8	7.7	77		FM27	•
D.O. (mg/L)		4.7	4.8	4.8	4.8	4.6	5.1	50		17	
Temp (°C)		20	20	21	20	21	19	20		113	
Conc.:	0.5							20300			* conductivity
рН		7.8	7.8	7.6	76	7.8	7.8	7.7	•		
D.O. (mg/L)		4.7	4.7	4.8	47	45	51	4.4			
Temp (°C)		20	21	21	21	91	19	20			
Conc.:	1							121100			* conductivity
рН		7.8	7.8	7.6	7.60	7.8	78	7.7			
D.O. (mg/L)		4.6	4.6	4.6	46	\$3	5.0	46			
Temp (°C)		20	21	21	21	21	19	20			
Conc.:	2							27.05			* conductivity
рН		7.8	7.8	7.6	7.6	7.8	7.8	121700			
D.O. (mg/L)		4.7	4.6	4.6	4.5	4.5	5.0	4.5			
Temp (°C)		20	21	21	21	21	19	20			
Conc.:	4							121500			* conductivity
рН		7.8	7.8	7.7	7.7	78	7.8	7.7			
D.O. (mg/L)		4.7	4.7	4,6	4.6	4.6	50	45			
Temp (°C)		20	21	21	21	16	19	20			
Conc.:	88							120800			* conductivity
рН		7.8	7.8	7.7	7.6	7.8	7.9	7.8			
D.O. (mg/L)		4.8	4.7	4.7	4.6	4.7	5.0	4.7			
Temp (°C)		20	21	21	21	اد	19	20			·
Conc.:	16							119000			* conductivity
рН		7.8	7.8	7.6	76	7.7	7.9	7.7			
D.O. (mg/L)		4.8	4.7	4.8	4.6	63	50	4.8			
Temp (°C)		20	21	21	21	21	19	20			
	Date:	615/20	6/6/20	6/7/10	4/8/2	619126	6/10/10	6/11/20			
		1455	1515	1210	1475	1205	1335	1310			
	Initials:	AF	CP	ES	EN	PS	EN	EN			

<sup>8 8 615120</sup> E 2EN WINZO WP

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DAILY TOXICITY TEST LOG

OA: DUP 6/10/20

Project Number:	17001-474-076	
Test Species:	Artemia franciscana	

	•	Feeding	Initials/Date
		72.5 ug/l Chla	
Random Chart: " " Min/Max The	rmometer# M-15	0.3 ml YTC	
Test Solution Mixed at: 1370		Fed @ 1035 Y	CP
Spiked @ 1635 %			6/4/20
Real Time: 22 °C Min-Max Ran	ige: 21-22 °C	Fed @1145 HP	AF
Spiked @ 1145			U15120
Real Time: 22 °C Min-Max Ran	ge: 21 - 22 °C	Fed @1115	CP
Spiked @ 1115		7"	6/6/20
Real Time: しょ °C Min-Max Ran	nge: 21-22 °C	Fed @ 0845	Ej
Spiked @ 0845		1112	6/7/70
Real Time: 22 °C Min-Max Ran	nge: 21 - 22 °C	Fed @ 6750	ĒΝ
Spiked @ 0750  SS transitioned in all conc	entrations blo day3lda	4	EN 48/20
		Fed @ 0750	10
	J. V. Car	HR	Rg 619/20
Spiked @ 0750			619120
Real Time: 20 °C Min-Max Rar	nge: 20 - 21 °C	Fed @ 68509	
Spiked @ 6730			6/10/20
Real Time: 2\ °C Min-Max Rar	nge: 20 - 21 °C	Fed @	EN
		None	6/11/20
	Test Solution Mixed at: 1320 Test Organisms Added at: 1346 Spiked @ 1635 K  Real Time: 22 °C Min-Max Ran Spiked @ 1145  Real Time: 22 °C Min-Max Ran Spiked @ 1115  Real Time: 22 °C Min-Max Ran Spiked @ 0845  Real Time: 22 °C Min-Max Ran Spiked @ 0750 BS transitioned in all conc Real Time: 31 °C Min-Max Ran Spiked @ 0750 Real Time: 31 °C Min-Max Ran Spiked @ 0750  Real Time: 20 °C Min-Max Ran Spiked @ 0750  Real Time: 20 °C Min-Max Ran Spiked @ 0750  Real Time: 20 °C Min-Max Ran Spiked @ 0750	Test Solution Mixed at: 1326 Test Organisms Added at: 1346 Spiked @ 1635 **  Real Time: 22 °C Min-Max Range: 21-22 °C Spiked @ 1145  Real Time: 22 °C Min-Max Range: 21-22 °C Spiked @ 1115  Real Time: 22 °C Min-Max Range: 21-22 °C Spiked @ 0845  Real Time: 22 °C Min-Max Range: 21-22 °C Spiked @ 0750 BS transitioned in all concentrations b/n day33day Real Time: 21 °C Min-Max Range: 21- 22 °C Spiked @ 0750 BS transitioned in all concentrations b/n day33day Real Time: 21 °C Min-Max Range: 21- 22 °C Spiked @ 0750  Real Time: 20 °C Min-Max Range: 20-21 °C Spiked @ 07360	Random Chart;   D

Page / of <u>\$\interprecess{\intity}\interprecess{\intity}\intity}\intity}}}}}}}}}}} \endremathrowngrees \text{Ontology} \tag{\interprecess{\intity}\intity}\interprecess{\interprecess{\intity}\intity}\intity}\intity}}}}} \endremathrowngrees \text{\interprecess{\interpreces\intity}\intity}\intity}\intity}}}} \text{Ontology} \text{Ontology} \text{\interpreces\intity}\intity}\intity} \text{\interpreces\intity}\intity}\intity}}} \endremathrowngrees \text{\interpreces\intity}\intity}\intity} \text{\interpreces\intity}\intity}\intity} \text{\interpreces\intity}\intity}} \text{\interpreces\intity\intity\intity}\intity} \text{\interpr</u>

**TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING** 

Mean Wt. per Treatment (mg) (Surviving) ot or Batch Number: Oco 220 QA; 040 6/16/20 per Surviving Organism Mean Wt. (mg Organisms No. of Surv. 0 0 0 0 0 0 0 0  $\circ$ 0 9 D Mean Wt. per Treatment (mg) (Original) AFDW (>500°C) Mean Wt. per Original Organism Blot Dry (60-90°C) Dry (>100°C) No. of Orig. Organisms Date/Time of Gross Wt.: U / 13/20 ❷ 1 € CC Analyst Gross: AF Test Substance: ZINC (ZMSD4) Loading Rate: Adjusted Net Weight (g)<sup>1</sup> Net Weight (g) . 12873 1.129 July 0.00093 13027 1.13115 0.00088 13562 1.3400 00:00T WP000 0 27 06 1.1 PT 121. 20000.00202061.174881. 17469 1.125/09 0.00100 13565 1.13 just 10.00094 13459 1.13558 0.00099 1358/1.13v71 0.00087 13452 1.13454 HO.00002 1.14575/2.141079/0.00104 H2100:0 SEEZY 11221. 1288911.13020 10.00121 Analyst Tare:  $\delta k$ Weight Type (Circle): Wet Tare Gross Weight (g) Weight (g) Date/Time of Tare Wt.: 6/11/20 @ 6940 Add in weight loss of blank boat, if appropriate. Project Number: 17001 - 474 -076 Species: Artemia trunciscand Length Units: Treatment Rep.  $\mathcal{C}$ 0 \$  $\infty$ S  $\bigcirc$ Ø  $\boldsymbol{\omega}$ ≰ Test Solution Volume: C. 0 Range Mean Boat No. Blank

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QA: 446 6/16/10

# TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

Project	Project Number. [7001-474-076	1001	-474-	076	Test Substance:		7inc (2n504)	4)		Comments:		7	
Species:	Arten	110	Artemia franciscana	scana	Analyst Tare: Sil	e: Sle	Analyst G	Analyst Gross: AF	,	Analytical Balance ID: $\delta \alpha t = 1$ Dried in Oven # $3$ from Date: $\alpha t = 1505$	nce ID: SWT # 3_from Da	- #* ∖ ate:t <u>@//1/2</u> ©Tir	ne: 1505
Date/Tir	Date/Time of Tare Wt.: し/11   20 @ 0940	h: 6/	11/200	0460	Date/Time c	of Gross Wt.:	Date/Time of Gross Wt.:Ø  (3/20 @ \ 000	00016			to Da	ate: <i>(⊈[12)</i> ,⊅Fl	me: <i>O<b>SiO</b></i>
Boat	Treatment	Rep.	Length	Weight Type (Circle):		Wet Blot D	Blot Dry (60-90°¢) Dry (>100°C)	(2) Dry (>1		AFDW (>500°C)	Lot or Bater	Lot or Bater Number: 060720	00220
o Z				Tare Weight (g)	Gross Weight (g)	Net Weight (g)	Adjusted Net Weight (g)	No. of Orig. Organisms	Mean Wt. per Original Organism (mg)	Mean Wt. per Treatment (mg) (Original)	No. of Surv. Organisms	Mean Wt. per Surviving Organism (ma)	Mean Wt. per Treatment (mg) (Surviving)
	2	A		1.13153	1.13153 1.150	0.00c1@					01	6	
		$\mathcal{B}$		1.13680	1.136801.137470.00002	2000000					01		
		၁	ļ	1.14278	1. 14278 1. 14340 0.00002	20,000.0					91		
		Δ		1.13326	1.133261.13395 0.00009	0.0000		Vilent			0		
	4	Q		1.11502	11502 1.1539 0.00037	D.00037					i 0		
		$\infty$		1.13572	1. 13572 1.13412 0.00040	0.00040					10		
		೦		1.15/80	0.15180 1.15220 0.00040	0.0004d					0		
		0		1.13434	1.13434 1.154108 0.0034	HE0000					10		
	200	U		1.14068	P1000 1 19041 1 89041	6.00019					10		
	-	æ	. »	1.12880	32000.0000011.1 08821.	0.00028					01		
		S	•	1.13670	1. 13670 1.130000 00010	0.000.0					QI		
		$\Box$		1.13615	12615 1.130340.00021	12000.0					01		
Blank													
Range													
Mean													
Test Sol	Test Solution Volume:	7.					Loading Rate:						
Add in v	Add in weight loss of blank boat, if appropriate.	f blank	boat. if ap	propriate.									

OAFUII3/20F

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TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

Project	Project Number: 17001-474-076	1001-	474-(	276	Test Substance:	- 1	ZINC (20,504)	4		Comments:	ا	<del>  # t</del>	
Species	Species: Artemia franciscana	42	uncisa	ence	Analyst Tare: 36	e: 34	Analyst G	Analyst Gross: AF		Analytical Balance ID: 3 CVI 11 TO TIME: 1505	nce ID: U S	te: <b>1////2</b> 2/Tin	ne: <b>15.07</b>
Date/Tir	Date/Time of Tare Wt.: $(o/ti/2cc)$ 0940	. <u>©</u> .	111/2000	0440	Date/Time c	of Gross Wt.:	Date/Time of Gross Wt.: U   13/200 1000	0001			to Da	te: <i><b>∟412/</b></i> 0Tir	me: 0.010
Boat	Treatment Rep.	Rep.	Length	Weight Type (Circle):	(Circle):	Wet Blot D	Blot Dry Dry (60-90°C) Dry (5100°C)	1°C) DAY (211		AFDW (>500°C)	Lot or Batch	Lot op Batch Number: 060220	00200
ġ Z			Units:	Tare Weight (g)	<u>~</u>	Net Weight (g)	Adjusted Net Weight (g)	No. of Orig. Organisms	n Wt. per riginal ganism (mg)	Mean Wt. per Treatment (mg) (Original)		Mean Wft. per Surviving Organism (mg)	Mean Wt. per Treatment (mg) (Surviving)
	2	A		1.13263	132631.132830.00025	6.00025					01		
		B		1.14322	1.143221.14341 0.00019	0.0001A					Ø		
		C		1.13565	135651.135981.00033	0.00033					10		
		D		1.14116	1.1416 1.14125 00009	0.00009					0		
										~			
Blank													
Range													
Mean													
Test Sol	Test Solution Volume:	.: :e					Loading Rate:						
Add in	Add in weight loss of blank boat, if appropriate.	of blank	boat, if ap	propriate.									

Page  $\frac{4}{4}$  of  $\frac{5}{5}$  QA Form No. 010a
Revision 1
Effective 02/14  $\bigcirc$ A: 46  $\iota$ [15] $\lambda$ 

# TEST ORGANISM LENGTHS, WEIGHTS, AND LOADING

Project Number: 14001-474

Species:

S: Artemia franciscana

Mean Wt./ Surviving Treatment Organism (Surviving)	24		0.107	960.0		0.092 0.1069	0 103	0.121	0.087 0.0933		0.094	0.088		0.076 0.0673		0.062	0.069	7000	0.037	0.040	0.034	0.019 0.0215		0.018	0.021	
Number of Sur Surv. Orga		6	10	10		2 0	0	10	10	10	10	10		10	10	10	10					10	10	10	10	
Mean Wt./ Treatment (mg)	0.1065					0.101.0			0.0933					0.0673				0.0378				0.0215				
Mean Wt./ Original Organism (ma)	0 124	0.099	0.107	0.096	000	0.092	0.093	0.121	0.087	0.104	0.094	0.088		0.076	0.062	0.062	690.0	0.037	0.00	0.040	0.034	0.019	0.028	0.018	0.021	
No of Orig. Organisms	4		10	10	,			10		10	10	10		10	10	10	10	Ç	2 2	200	10	10	10	10	10	
Adjusted Net Weight (a)		l	0.00107	96000'0				0.00121	0.00087	0.00104	0.00094	0.00088		0.00076	0.00062	0.00062	0.00069	0.00037	0.00040	0.00040	0.00034	0.00019	0.00028	0.00018	0.00021	_
Net Weight (a)	ľ			96000.0	60000			0.00121	0.00087	0.00104	0.00094	0.00088		0.00076	0.00062	0.00062	0.00069	0.00037	0.00040	0.00040	0.00034	0.00019	0.00028	0.00018	0.00021	_
Gross Weight (g)	1.12335	1.13558		$\bot$		1.12569	L	1.13020	1.13671			1.13115		1.13229	1.13742	1.14340	1.13395	1 11539	1 13612	1.15220	1.13468	1.14087	1.12908	1.13688	1.13636	_
Tare Weight (g)	1.12211	1.13459	1.13562	1.12979	1 13844	1.12469	1.12873	1.12899	1.13584	1.14575	1.13565	1.13027		1.13153	1.13680	1.14278	1.13326	1.11502	1.13572	1.15180	1.13434	1.14068	1.12880	1.13670	1.13615	
Length																										
t Rep	∢	В	ပ		✓	ω	ပ		∢ (	n (	ပ			۱	<u>m</u>	ပ		∢	В	ပ	٥	∢	ш	ပ		
Treatment		1931	)			1 2 21	0.0 Hig/L			1 ma/L	•		,		2 ma/L	)			Z = 4	4 mg/L			8 ma/l	) j)		

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0.0229				
0.025	0.024	0.033	0.010	
10	8	10	6	
0.0215				
0.025	0.019	0.033	0.009	
10	10	10	10	
0.00025	0.00019	0.00033	0.00009	
0.00025	0.00019	0.00033	0.0000	0.00002
1.13288	1.14341	1.13598	1.14125	1.13454
1.13263	1.14322	1.13565	1.14116	1.13452
۷	m	ပ	Ω	
	7	To mg/L		Blank

Artemia franciscana

Species:

Project Number:

	C.V.	5.128%	6.077%	0.000%	0.000%	5.128%	0.000%	10.351%		) >	11.790%	13.279%	8.370%	8996.6	7.609%	20.973%	47.051%			>     	10.553%	11 477%	8.370%	8.966%	11.466%	20.973%	41.630%
	S	0.0500	0.0577	0.000	0.000	0.0500	0.000	0.0957		SD	0.0126	0.0135	0.0078	0.0067	0.0029	0.0045	0.0101		organism)	SD	0.0115	0.0123	0.0078	0.0067	0.0045	0.0045	0.0095
	Mean	0.9750	0.9500	1.0000	1.0000	0.9750	1.0000	0.9250	· original)	Mean	0.1065	0.1015	0.0933	0.0673	0.0378	0.0215	0.0215		surviving	Mean	0.1092	0.1069	0.0933	0.0673	0.0389	0.0215	0.0229
	Max	1.0	1.0	1.0	1.0	1.0	1.0	1.0	(dry wt per	Max	0.124	0.121	0.104	0.076	0.040	0.028	0.033		(dry wt per	Max	0.124	0.121	0.104	0.076	0.044	0.028	0.033
urvival Data	Min	6.0	6.0	1.0	1.0	6.0	1.0	0.8	rowth Data	Min	0.096	0.092	0.087	0.062	0.034	0.018	0.009	;	rowth Data	Mi	960.0	0.092	0.087	0.062	0.034	0.018	0.010
tistics for S	ZI	4	4	4	4	4	4	4	listics for G	Z	4	4	4	4	4	4	4		tistics for G	Z	4	4	4	4	4	4	4
Summary Statistics for Survival Data	Treatment	rGSL	0.5 mg/L	1 mg/L	2 mg/L	4 mg/L	8 mg/L	16 mg/L	Summary Statistics for Growth Data (dry wt per original)	Treatment	rGSL	0.5 mg/L	1 mg/L	2 mg/L	4 mg/L	8 mg/L	16 mg/L		Summary Statistics for Growth Data (dry wt per surviving organism)	Treatment	rGSL	0.5 mg/L	1 mg/L	2 mg/L	4 mg/L	8 mg/L	16 mg/L

Report Date:

15 Jun-20 15:23 (p 1 of 2)

Test Code:

474-076 | 07-1158-8845

Fathead Minnow	7-d	Larval	Survival	and	Growth	Test

TRE	<b>Environmental</b>	Strateg	jies
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Analysis ID: Analyzed:	05-2669-5393 15 Jun-20 15:23	Endpoint: Analysis:	Mean Dry Biomass-mg Parametric-Control vs Treatments	CETIS Ver Official Re	rsion: CETISv1.8.7 psults: Yes
Batch ID:	04-2472-1259	Test Type:	Growth-Survival (7d)	Analyst:	Lab Tech
Start Date:	04 Jun-20 13:45	Protocol:	EPA/821/R-02-013 (2002)	Diluent:	rGSL
Ending Date:	11 Jun-20 13:20	Species:	Artemia franciscana (1)	Brine:	Crystal Sea
Duration:	7d	Source:	Hog Island Oyster Co. TRE	Age:	48h
Sample ID:	00-8320-5339	Code:	4F59CDB	Client:	Notre Dame
Sample Date:	04 Jun-20 10:35	Material:	Zinc sulfate	Project:	Special Studies
Receive Date:	13 Jun-20 13:45	Source:	Discharge Monitoring Report		

Station: Sample Age: 3h

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU	_
Untransformed	NA	C > T	NA	NA	14.7%	1	2	1.414		

### **Dunnett Multiple Comparison Test** C-jug/L Control Test Stat Critical P-Type Decision(a:5%) MSD DF P-Value Non-Significant Effect Dilution Water 0.5 0.7795 2.45 0.016 6 0.5557 CDF 2.066 2.45 0.016 6 0.1019 CDF Non-Significant Effect 1 2\* 6.119 2.45 0.016 6 < 0.0001 CDF Significant Effect 4\* 10.72 2.45 0.016 6 < 0.0001 CDF Significant Effect 8\* CDF Significant Effect 13.25 2.45 0.016 6 < 0.0001 16\* 13.25 2.45 0.016 6 < 0.0001 CDF Significant Effect

### ANOVA Table Mean Square DF F Stat P-Value Decision(a:5%) Source Sum Squares 0.005586643 67.88 < 0.0001 Significant Effect Between 0.03351986 6 0.00172825 8.229762E-05 21 Error 27 Total 0.03524811

### **Distributional Tests**

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Bartlett Equality of Variance	7.839	16.8	0.2502	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9442	0.897	0.1416	Normal Distribution

, ,	omass-mg Sumn	nary									
c.mgr. ()	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	4	0.1065	0.08652	0.1265	0.103	0.096	0.124	0.006278	11.8%	0.0%
0.5		4	0.1015	0.08005	0.1229	0.0965	0.092	0.121	0.006739	13.3%	4.69%
1		4	0.09325	0.08083	0.1057	0.091	0.087	0.104	0.003902	8.37%	12.4%
2		4	0.06725	0.05659	0.07791	0.0655	0.062	0.076	0.003351	9.97%	36.9%
4		4	0.03775	0.03318	0.04232	0.0385	0.034	0.04	0.001436	7.61%	64.6%
8		4	0.0215	0.01432	0.02868	0.02	0.018	0.028	0.002255	21.0%	79.8%
16		4	0.0215	0.005403	0.0376	0.022	0.009	0.033	0.005058	47.1%	79.8%

	omass-mg Detail	l			
c-yath (1)	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.124	0.099	0.107	0.096
0.5		0.092	0.1	0.093	0.121
1		0.087	0.104	0.094	0.088
2		0.076	0.062	0.062	0.069
4		0.037	0.04	0.04	0.034
8		0.019	0.028	0.018	0.021
16		0.025	0.019	0.033	0.009

Open 6/16/20 E

Analyst: AB QA: DAP 6/4/20

# CETIS Analytical Report

**Report Date:** Test Code:

15 Jun-20 15:23 (p 2 of 2) 474-076 | 07-1158-8845

Fathead Minnow 7-d Larval Survival and Growth Test

TRE Environmental Strategies

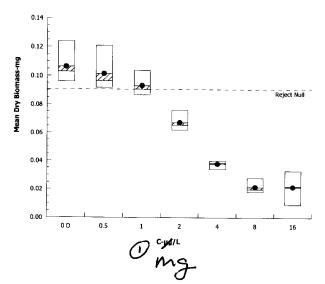
Analysis ID: Analyzed:

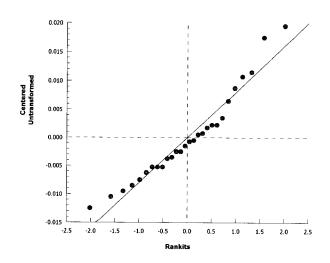
05-2669-5393 15 Jun-20 15:23 Endpoint: Mean Dry Biomass-mg

Analysis: Parametric-Control vs Treatments **CETIS Version:** Official Results:

**CETISv1.8.7** Yes

Graphics





ODAP 6/16/20 E

Page 19 of 21 QA: NA 6/14/20

# Brine shrimp

Report Date: Test Code:

15 Jun-20 15:24 (p 1 of 2)

474-076 | 07-1158-8845

### Fathead Minnow-7-d Larval Survival and Growth Test

TRE Environmental Strategie	TRE	Environmenta!	Strategies
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Analysis ID: Analyzed:	04-2727-0406 15 Jun-20 15:23	Endpoint: Analysis:	Mean Dry Biomass-mg Linear Interpolation (ICPIN)	CETIS Ver Official Re	
Batch ID: Start Date: Ending Date:	04-2472-1259 04 Jun-20 13:45 11 Jun-20 13:20	Test Type: Protocol: Species:	Growth-Survival (7d) EPA/821/R-02-013 (2002) Artemia franciscana	Analyst: Diluent: Brine:	Lab Tech rGSL Crystal Sea
Duration:	7d	Source:	Hog Island Oyster Co. TRE	Age:	48h
Sample ID:	00-8320-5339	Code:	4F59CDB	Client:	Notre Dame
Sample Date:	04 Jun-20 10:35	Material:	Zinc sulfate	Project:	Special Studies
Receive Date: Sample Age:	13 Jun-20 13:45 3h	Source: Station:	Discharge Monitoring Report		

### **Linear Interpolation Options**

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	1144646	200	Yes	Two-Point Interpolation

Poi	nt Es	stimates
		Ms (1)
		145/11

Level	Mg (1)	95% LCL	95% UCL
IC5	0.5197	N/A	1.357
IC10	0.8424	N/A	1.448
IC15	1.105	0.001624	1.618
IC20	1.31	0.5185	1.777
IC25	1.514	0.9182	1.969
IC40	2.227	1.574	2.871
IC50	2.949	2.222	3.414
	IC5 IC10 IC15 IC20 IC25 IC40	IC5 0.5197 IC10 0.8424 IC15 1.105 IC20 1.31 IC25 1.514 IC40 2.227	Level         MTC         95% LCL           IC5         0.5197         N/A           IC10         0.8424         N/A           IC15         1.105         0.001624           IC20         1.31         0.5185           IC25         1.514         0.9182           IC40         2.227         1.574

	iomass-mg Sum	С	Calculated Variate						
C WAL ()	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.1065	0.096	0.124	0.006278	0.01256	11.8%	0.0%
0.5		4	0.1015	0.092	0.121	0.006739	0.01348	13.3%	4.69%
1		4	0.09325	0.087	0.104	0.003902	0.007805	8.37%	12.4%
2		4	0.06725	0.062	0.076	0.003351	0.006702	9.97%	36.9%
4		4	0.03775	0.034	0.04	0.001436	0.002872	7.61%	64.6%
8		4	0.0215	0.018	0.028	0.002255	0.004509	21.0%	79.8%
16		4	0.0215	0.009	0.033	0.005058	0.01012	47.1%	79.8%

### Mean Dry Biomass-mg Detail

Care E(I)	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	0.124	0.099	0.107	0.096
0.5		0.092	0.1	0.093	0.121
1		0.087	0.104	0.094	0.088
2		0.076	0.062	0.062	0.069
4		0.037	0.04	0.04	0.034
8		0.019	0.028	0.018	0.021
16		0.025	0.019	0.033	0.009

Opp 6/16/20 E

# Brine Shamp

Report Date: **Test Code:** 

15 Jun-20 15:24 (p 2 of 2) 474-076 | 07-1158-8845

-Fathead Minnew 7-d Larval Survival and Growth Test

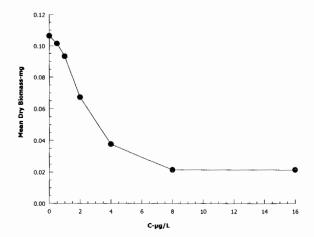
TRE Environmental Strategies

Analysis ID: Analyzed:

04-2727-0406 15 Jun-20 15:23 Endpoint: Mean Dry Biomass-mg Analysis: Linear Interpolation (ICPIN) **CETIS Version:** Official Results: Yes

CETISv1.8.7

Graphics



Opsp 6/16/20