OAK RIDGE National Laboratory

PO Box 2008
Oak Ridge, TN 37831
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Date: March 20, 2024

To: K.G. Hanzelka (RC)

c: S. Loveless, J. Stinnett, K. Kinder, T.J. Mathews, P. Ku, T. Bordeau

From: L.M. Stevenson, 1504, MS-6351 (865-341-0398).

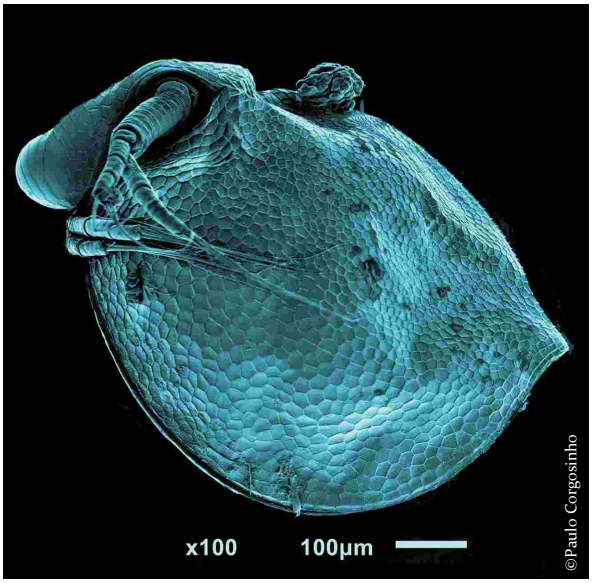
RE: **Toxicity Tests of Effluent from the Y-12 National Security Complex Outfall 200 Conducted February 21-28, 2024**

Appended are the results of toxicity tests of effluent from Outfall 200 conducted from February 21 to February 28, 2024. The effluent was evaluated for toxicity with fathead minnows (*Pimephales promelas*) and water fleas (*Ceriodaphnia dubia*). Effluent from Outfall 200 did not reduce fathead minnow survival or growth or *Ceriodaphnia* survival or reproduction by 25% or greater at any of the tested concentrations compared to the control. For both species, the Inhibition Concentration$_{25}$ (IC_{25}) for survival, growth, and/or reproduction for organisms exposed to effluent from Outfall 200 was >100% (the highest concentration of effluent tested). The NPDES permit states that toxicity will be demonstrated if the IC_{25} is less than or equal to the permit limit (50% effluent for Outfall 200). All of the results for all endpoints were within permit limits.

Outfall	Test Organism	Endpoint	IC_{25}
Outfall 200	Fathead minnow	Survival	>100%
		Growth	>100%
Outfall 200	*Ceriodaphnia*	Survival	>100%
		Reproduction	>100%

Please do not hesitate to call if you have any questions or comments.

Attachment
lms



Ceriodaphnia dubia

TOXICITY TEST REPORT

Test Number 2997 | Y-12 National Security Complex Outfall 200 | 29 February 2024

Toxicology Laboratory
Principal Investigator: Dr. Louise Stevenson
Environmental Sciences Division
Oak Ridge National Laboratory
Building 1504
P.O. Box 2008, MS 6351
Oak Ridge, TN 37831-6351
(865) 341-0398

STANDARD REPORT FORM
CERIODAPHNIA 3-BROOD SURVIVAL AND REPRODUCTION TEST

Test Number 2997 | Start Date: 21 February 2024 | End Date: 28 February 2024

1. INTRODUCTION

1.1 Permit Number: TN0002968

1.2 Toxicity testing requirements of permit: A 3-brood *Ceriodaphnia* Survival and Reproduction Test and a 7-day Fathead Minnow (*Pimephales promelas*) Larval Survival and Growth Test shall be conducted annually. All tests will be conducted using a minimum of three 24-hour composite samples of final effluent. The measured endpoint for toxicity will be the inhibition concentration causing 25% reduction (IC_{25}) in survival, reproduction, or growth of the test organisms as compared to the controls.

The permit states that toxicity is demonstrated if the IC_{25} is less than or equal to the permit limit. The permit limit for Outfall 200 is 50% whole effluent.

1.3 Plant location: Y-12 National Security Complex.

1.4 Name of receiving water body: East Fork Poplar Creek.

1.5 Contractor: Toxicology Laboratory
Environmental Sciences Division
Oak Ridge National Laboratory
P.O. Box 2008, MS 6351
Oak Ridge, TN 37831-6351
(865) 576-3459

2. SAMPLE

2.1 Sample description: Effluent from Outfall 200.

2.2 Sampling point: NPDES Outfall 200.

2.3 Sampling period: 20 February 2024 to 26 February 2024

2.4 Sampling method: Three 24-h flow-proportionate composite samples of final effluent.

2.5 Samples were used immediately then stored at 4 ± 2 °C to be used for two or three days during the daily effluent renewal process.

2.6 Sample pre-treatment: Sample temperature was raised to 25 ± 1 °C in a warm water bath prior to test initiation and daily test renewal.

2.7 Sample information:

Parameter	Sample 1	Sample 2	Sample 3
Collection Start Date	2/20/2024	2/22/2024	2/25/2024
Composite Duration	24 h	24 h	24 h
Date of Delivery to ESD Tox Lab	2/21/2024	2/23/2024	2/26/2024
Chain-of-Custody Form Number	031143	031144	031145
Sample Temperature (°C)	7.0	8.7	10.5
pH (S.U.)	8.11	8.09	8.16
Conductivity (µS/cm)	556	518	623
Alkalinity (mg/L as $CaCO_3$)	136	115	142
Hardness (mg/L as $CaCO_3$)	219	187	322
Chlorine (Free/Total) (mg/L)	0.01/0.01	0.01/0.01	0.01/0.01

3. TEST ORGANISMS

3.1 Species: *Ceriodaphnia dubia.*

3.2 Life stage: Neonates ≤24 h old; all born within 8 h of each other.

3.3 Source: Environmental Sciences Division cultures.

3.4 Incubation water for cultures: 25% DMW [2.5:7.5 (v:v) ratio of degassed mineral water to deionized distilled water augmented with trace metals].

3.5 Temperature of cultures: 25 ± 1 °C.

4. TEST METHODS

4.1 Toxicity test method: *Ceriodaphnia* survival and reproduction test. Reference: *EPA Test Method 1002.0, in P.A. Lewis et al., Short-term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to Freshwater Organisms*, EPA/821/R/02/013 (4th Ed., October 2002; or most recent version).

4.2 End points of test: Survival and reproduction.

4.3 Modifications or deviations to Method 1002.0: No modifications or deviations to Method 1002.0.

4.4 Date and time test started: 2/21/2024, 10:58

4.5 Date and time test terminated: 2/28/2024, 10:12

4.6 Type and volume of test chambers: Polystyrene microbeakers, minimum 15mL each.

4.7 Number of *Ceriodaphnia* per test chamber: 1.

4.8 Number of replicates per treatment: 10.

4.9 Dilution/control water: 25% DMW [2.5:7.5 (v:v) ratio of degassed mineral water to deionized distilled water augmented with trace metals].

4.10 Renewal period: 24 h

4.11 Test temperature: Mean = 25.4 °C; Range = 25.2 – 25.6 °C.

4.12 Treatment groups/concentrations: Control, 12.5%, 25%, 50%, 75%, and 100% of full-strength effluent.

4.13 Feeding regime during test: 100 µL of yeast-Cerophyl-trout food (YCT) mixture and 3 x 10^6 cells of the green alga *Raphidocelis subcapitata* per 15 mL of test solution every 24 h from an algal stock with a concentration 3.0 - 3.5 x 10^7 cells/mL (EPA/821/R/02/013; 4th Ed., October 2002; or most recent version).

5. QUALITY ASSURANCE

5.1 Standard toxicant used: Sodium chloride (source: Fisher Scientific).

5.2 Date of most recent chronic reference toxicant test: 2/21/2024 – 2/28/2024.

5.3 Dilution water used: 25% DMW [2.5:7.5 (v:v) ratio of degassed mineral water to deionized distilled water augmented with trace metals].

5.4 Survival IC_{25} = 2.12 g NaCl/L; 95% C.I. = 1.63-2.26 g NaCl/L.
Reproduction IC_{25} = 1.60 g NaCl/L; 95% C.I. = 1.21-1.71 g NaCl/L.
The IC_{25}s were calculated by the EPA linear interpolation method.

5.5 We report the most recent 20 tests, as recommended by EPA Chronic test guidelines (EPA, 2002).
Central tendency of IC_{25} for survival: 1.622 ± 0.925 g NaCl/L (mean ± 2 *SD*).
CV of IC_{25} for survival: 0.285 g NaCl/L
Central tendency of IC_{25} for reproduction: 1.156 ± 0.679 g NaCl/L (mean ± 2 *SD*).
CV of IC_{25} for reproduction: 0.294 g NaCl/L
A copy of the control chart is appended.

6. *CERIODAPHNIA* TEST RESULTS

Copies of the toxicity test logsheets are appended.

6.1 Summary of results from the *Ceriodaphnia* toxicity test:

Effluent Concentration	Number of replicates	Number of animals surviving for 3 broods	Mean number of offspring per female (±SD)
Control	10	10	29.6 ± 4.5
12.5%	10	10	29.9 ± 7.1
25%	10	9	27.1 ± 12
50%	10	10	29.9 ± 5.5
75%	10	10	29.2 ± 5.1
100%	10	10	29.3 ± 5.7

7. STATISTICAL ANALYSES

7.1 Survival

The calculated IC_{25} for survival was >100% effluent.

7.2 Reproduction

The calculated IC_{25} for reproduction was >100% effluent.

7.3 Summary of *Ceriodaphnia* toxicity test results:

IC_{25} for survival: >100%

IC_{25} for reproduction: >100%

8. SUMMARY OF CHEMICAL ANALYSES

8.1 Water quality of control water:

Parameter	Sample 1	Sample 2	Sample 3
pH (S.U.)	8.09	8.08	8.09
Conductivity (µS/cm)	235	230	219
Alkalinity (mg/L as $CaCO_3$)	110	110	110
Hardness (mg/L as $CaCO_3$)	120	110	110

8.2 Physical and chemical methods

pH, conductivity, and dissolved oxygen were measured using a YSI MultiLab 4010-3W.

The pH was measured by EPA method 150.1 with a YSI 4130 pH meter. The meter was calibrated with pH 4.0, 7.0, and 10.0 buffers.

Conductivity (µS/cm) was measured by EPA method 120.1 with a YSI 4310 meter. All values were corrected to 25°C. The meters were verified using certified reference standards.

Dissolved oxygen (mg/L) was measured by EPA method 360.1 with a YSI 4410W dissolved oxygen meter. The meter was calibrated in accordance with the manufacturer's instructions.

Alkalinity was measured by titrating 50-mL samples with 0.01 N HCl to an endpoint pH of 4.5 (EPA method 310.1).

Hardness was determined by titrating 50-mL samples with EDTA to a colorimetric endpoint using Eriochrome Black T (EPA method 130.2).

Chlorine was measured using a Hach SL1000 Portable Parallel Colorimeter.

Instruments were calibrated and standardized according to manufacturer's instructions.

All measurements were made on fresh samples before daily water replacement. In addition, dissolved oxygen and pH were measured on water collected after daily replenishment period.

Report prepared by: Trystan A. Bordeau Date: 8 March 2024

Report reviewed by: Louise Stevenson Louise Stevenson Date: 20 March 2024

Fathead Minnow

TOXICITY TEST REPORT

Test Number 1703 | Y-12 National Security Complex Outfall 200 | 29 February 2024

Toxicology Laboratory
Principal Investigator: Dr. Louise Stevenson
Environmental Sciences Division
Oak Ridge National Laboratory
Building 1504
P.O. Box 2008, MS 6351
Oak Ridge, TN 37831-6351
(865) 341-0398

STANDARD REPORT FORM
FATHEAD MINNOW SURVIVAL AND GROWTH TEST

Test Number 1703 | Start Date: 21 February 2024 | End Date: 28 February 2024

1. INTRODUCTION

1.1 Permit Number: TN0002968

1.2 Toxicity testing requirements of permit: A 3-brood *Ceriodaphnia* Survival and Reproduction Test and a 7-day Fathead Minnow (*Pimephales promelas*) Larval Survival and Growth Test shall be conducted annually. All tests will be conducted using a minimum of three 24-hour composite samples of final effluent. The measured endpoint for toxicity will be the inhibition concentration causing 25% reduction (IC_{25}) in survival, reproduction, or growth of the test organisms as compared to the controls.

Toxicity will be demonstrated if the IC_{25} is less than or equal to the permit limit. The permit limit for Outfall 200 is 50% whole effluent.

1.3 Plant location: Y-12 National Security Complex.

1.4 Name of receiving water body: East Fork Poplar Creek.

1.5 Contractor: Toxicology Laboratory
Environmental Sciences Division
Oak Ridge National Laboratory
P.O. Box 2008, MS 6351
Oak Ridge, TN 37831-6351
(865) 576-3459

2. SAMPLE

2.1 Sample description: Effluent from Outfall 200.

2.2 Sampling point: NPDES Outfall 200.

2.3 Sampling period: 21 February 2024 to 26 February 2024

2.4 Sampling method: Three 24-h flow-proportionate composite samples of final effluent.

2.5 Samples were used immediately then stored at 4 ± 2 °C to be used for two or three days during the daily effluent renewal process. Samples were used within sample holding time guidance outlined in EPA Test Method 1000.

2.6 Sample pre-treatment: Sample temperature was raised to 25 ± 1 °C in a warm water bath prior to test initiation and daily test renewal.

2.7 Sample information:

Parameter	Sample 1	Sample 2	Sample 3
Collection Start Date	2/20/2024	2/22/2024	2/25/2024
Composite Duration	24 h	24 h	24 h
Date of Delivery to ESD Tox Lab	11/1/2023	11/3/2023	11/6/2023
Chain-of-Custody Form Number	031104	031141	031142
Sample Temperature (°C)	7.0	8.7	10.5
pH (S.U.)	8.11	8.09	8.16
Conductivity (µS/cm)	556	518	623
Alkalinity (mg/L as $CaCO_3$)	136	115	142
Hardness (mg/L as $CaCO_3$)	219	187	322
Chlorine (Free/Total) (mg/L)	0.01/0.01	0.01/0.01	0.01/0.01

3. TEST ORGANISMS

3.1 Species: Fathead minnow (*Pimephales promelas*).

3.2 Hatch date: 19 February 2024 .

3.3 Life stage: Newly hatched larvae less than 48 h old.

3.4 Incubation water: Dechlorinated tap water.

3.5 Incubation temperature: 25 ± 1 °C.

3.6 Source: Cultures from Aquatic BioSystems, Inc., Fort Collins, CO.

3.7 Mean dry weight at test initiation: 0.136 ± 0.007 mg (mean ± SD).

3.8 Diseases and treatment: None.

4. TEST METHODS

4.1 Toxicity test method: Fathead minnow larval survival and growth test. Reference: EPA Test Method 1000.0, in P.A. Lewis et al., *Short-term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to Freshwater Organisms*, EPA/821/R/02/013 (4th Ed., October 2002; or most recent version).

4.2 End points of test: Survival and growth.

4.3 Modifications or deviations to Method 1000.0: Used the dilution series suggest by the EPA WET method manuals: Control, 12.50%, 25%, 50%, 75%, and 100% of full-strength effluent.

4.4 Date and time test started: 2/21/2024, 13:59

4.5 Date and time test terminated: 2/28/2024, 13:48

4.6 Type and volume of test chambers: 600-mL borosilicate beakers, minimum 250 mL each.

4.7 Number of organisms per test chamber: 10.

4.8 Number of replicates per treatment: 4.

4.9 Dilution/control water: 25% DMW [2.5:7.5 (v:v) ratio of degassed mineral water to deionized distilled water augmented with trace metals].

4.10 Renewal period: 24 h

4.11 Acclimation of test organisms: Received larvae on 20 February 2024 at 11.6 °C.

4.12 Test temperature: Mean = 25.6 °C; range = 25.1 – 26.0 °C.

4.13 Treatment groups/concentrations: Control, 12.5%, 25%, 50%, 75%, and 100% of full-strength effluent.

4.14 Feeding regime during test: Brine shrimp (*Artemia*) nauplii less than 24 h old; fed 1500 ± 100 shrimp per beaker twice daily.

5. QUALITY ASSURANCE

5.1 Standard toxicant used: Potassium chloride (source: Fisher Scientific).

5.2 Date of most recent chronic reference toxicant test: 02/21/2024 – 02/28/2024.

5.3 Dilution water used: 25% DMW [2.5:7.5 (v:v) ratio of degassed mineral water to deionized distilled water augmented with trace metals].

5.4 Survival IC_{25} = 0.82 g KCl/L; 95% C.I. = 0.75 – 0.91 g KCl/L.

Growth IC_{25} = 1.01 g KCl/L; 95% C.I. = 0.82 – 1.05 g KCl/L.

The IC_{25}s were calculated by the EPA linear interpolation method.

5.5 We report the most recent 20 tests, as recommended by EPA Chronic test guidelines (EPA, 2002).

Central tendency of IC_{25} for survival: 0.882 ± 0.262 g KCl/L (mean ± 2 *SD*).

CV of IC_{25} for survival: 0.149 g KCl/L

Central tendency of IC_{25} for growth: 0.914 ± 0.227 g KCl/L (mean ± 2 *SD*).

CV of IC_{25} for growth: 0.124 g KCl/L

A copy of the control chart is appended.

6. FATHEAD MINNOW TEST RESULTS

Copies of the toxicity test logsheets are appended.

6.1 Summary of results from the fathead minnow toxicity test:

Survival

Concentration	Proportion surviving per replicate				Mean
	1	2	3	4	
Control	1	1	1	1	1
12.5%	1	1	1	1	1
25%	1	1	1	1	1
50%	1	1	1	1	1
75%	1	1	1	1	1
100%	1	1	1	1	1

Dry Weight

Concentration	Weight (mg) per replicate				Mean ± SD
	1	2	3	4	
Control	0.65	0.67	0.74	0.82	0.72 ± 0.08
12.5%	0.74	0.71	0.71	0.66	0.71 ± 0.03
25%	0.74	0.66	0.65	0.78	0.71 ± 0.06
50%	0.63	0.77	0.6	0.73	0.68 ± 0.08
75%	0.55	0.73	0.67	0.69	0.66 ± 0.08
100%	0.5	0.75	0.71	0.79	0.69 ± 0.13

7. STATISTICAL ANALYSES

7.1 Survival

The calculated IC_{25} for survival was >100% effluent.

7.2 Growth

The calculated IC_{25} for growth was >100% effluent.

7.3 Summary of fathead minnow toxicity test results:

IC_{25} for survival: >100%

IC_{25} for growth: >100%

8. SUMMARY OF CHEMICAL ANALYSES

8.1 Water quality of control water:

Parameter	Sample 1	Sample 2	Sample 3
pH (S.U.)	8.09	8.08	8.09
Conductivity (µS/cm)	235	230	219
Alkalinity (mg/L as $CaCO_3$)	110	110	110
Hardness (mg/L as $CaCO_3$)	120	110	110

8.2 Physical and chemical methods

The pH was measured by EPA method 150.1 with a YSI 4130 pH meter. The meter was calibrated with pH 4.0, 7.0, and 10.0 buffers.

Conductivity (µS/cm) was measured by EPA method 120.1 with a YSI 4310 meter. All values were corrected to 25°C. The meters were verified using certified reference standards.

Dissolved oxygen (mg/L) was measured by EPA method 360.1 with a YSI 4410W dissolved oxygen meter. The meter was calibrated in accordance with the manufacturer's instructions.

Alkalinity was measured by titrating 50-mL samples with 0.01 N HCl to an endpoint pH of 4.5 (EPA method 310.1).

Hardness was determined by titrating 50-mL samples with EDTA to a colorimetric endpoint using Eriochrome Black T (EPA method 130.2).

Chlorine was measured using a Hach SL1000 Portable Parallel Colorimeter.

Instruments were calibrated and standardized according to manufacturer's instructions.

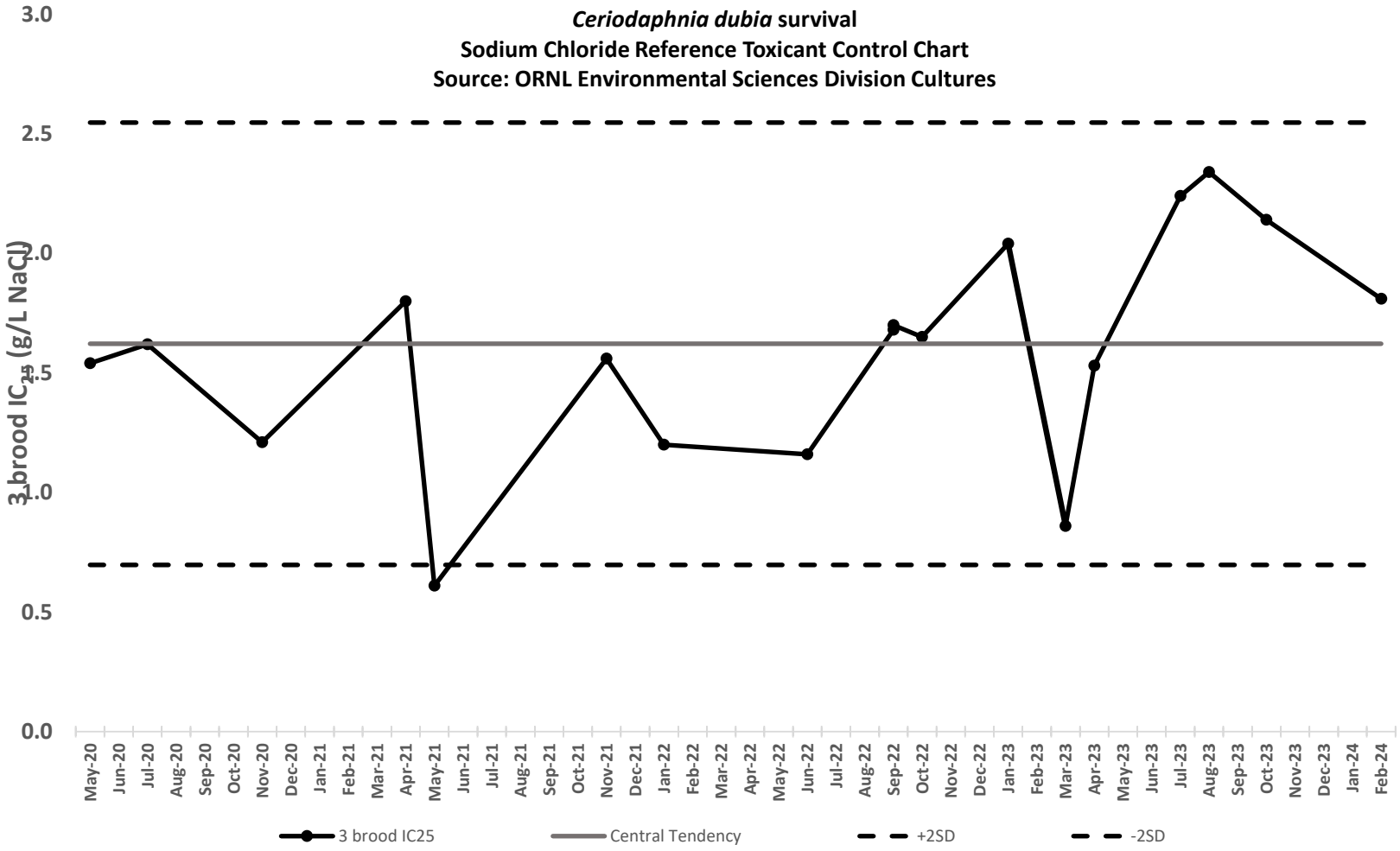
All measurements were made on fresh samples before daily water replacement. In addition, dissolved oxygen and pH were measured on water collected after daily replenishment period.

Report prepared by: Trystan A. Bordeau Date: 8 March 2024

Report reviewed by: Louise Stevenson Date: 20 March 2024

Louise Stevenson

REFERENCE TOXICANT CONTROL CHARTS


Ceriodaphnia dubia survival
Sodium Chloride Reference Toxicant Control Chart
Source: ORNL Environmental Sciences Division Cultures
3 brood IC25 (g/L NaCl)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
May-20
Jun-20
Jul-20
Aug-20
Sep-20
Oct-20
Nov-20
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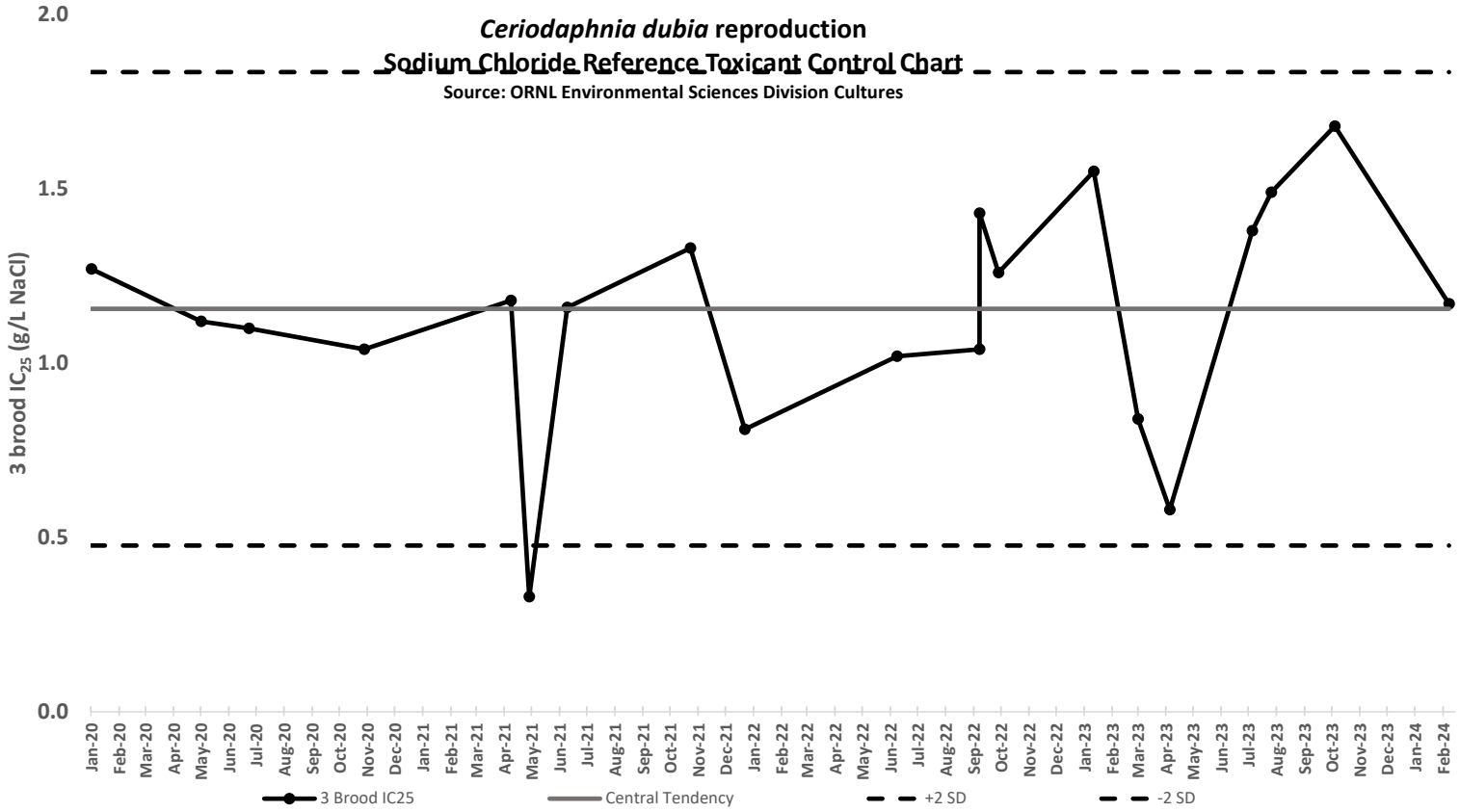
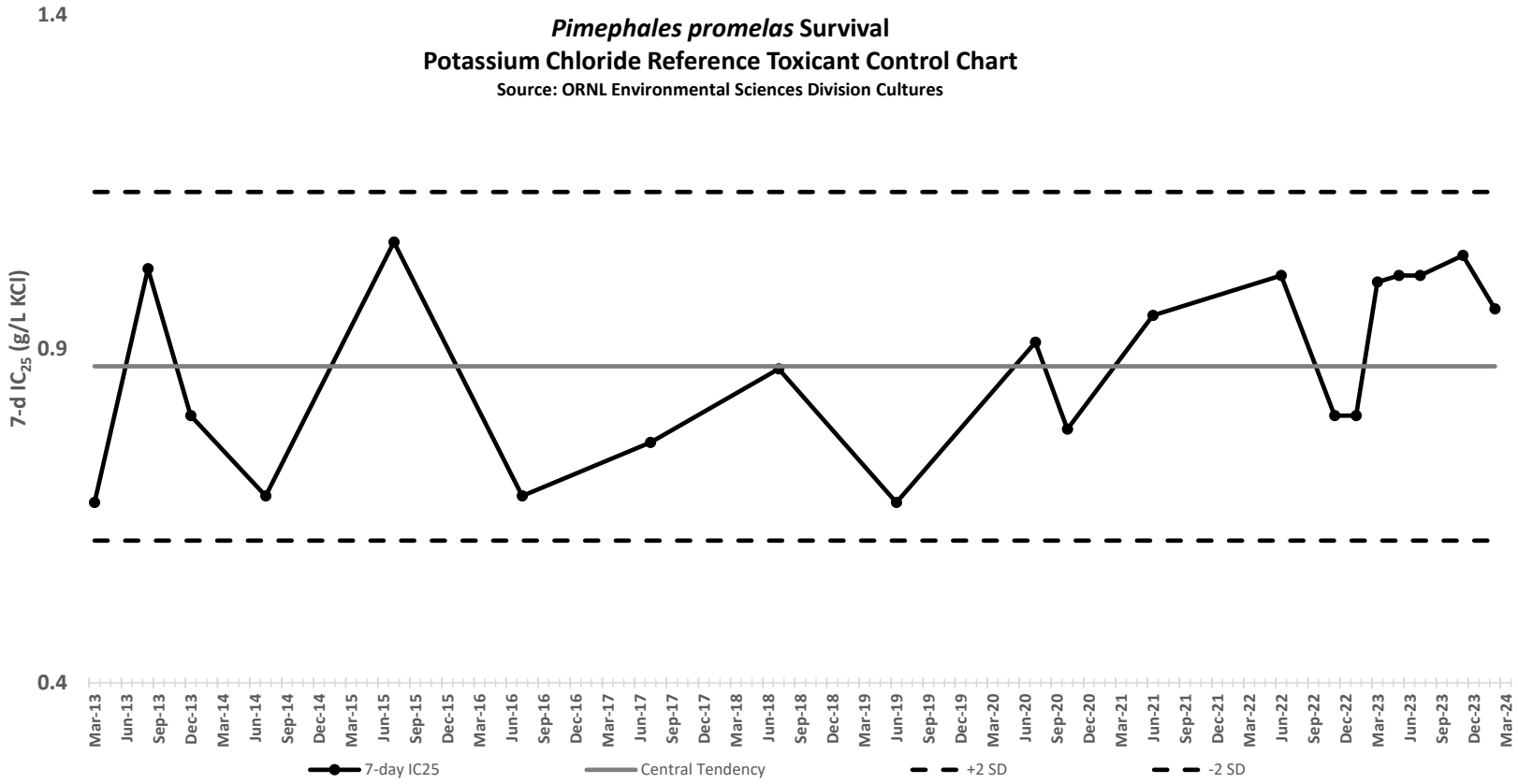
Dec-23
Jan-24
Feb-24
3 brood IC25
Central Tendency
+2SD
-2SD


Ceriodaphnia dubia reproduction
Sodium Chloride Reference Toxicant Control Chart
Source: ORNL Environmental Sciences Division Cultures
3 brood IC25 (g/L NaCl)
2.0
1.5
1.0
0.5
0.0
Jan-20 Feb-20 Mar-20 Apr-20 May-20 Jun-20 Jul-20 Aug-20 Sep-20 Oct-20 Nov-20 Dec-20 Jan-21 Feb-21 Mar-21 Apr-21 May-21 Jun-21 Jul-21 Aug-21 Sep-21 Oct-21 Nov-21 Dec-21 Jan-22 Feb-22 Mar-22 Apr-22 May-22 Jun-22 Jul-22 Aug-22 Sep-22 Oct-22 Nov-22 Dec-22 Jan-23 Feb-23 Mar-23 Apr-23 May-23 Jun-23 Jul-23 Aug-23 Sep-23 Oct-23 Nov-23 Dec-23 Jan-24 Feb-24
3 Brood IC25
Central Tendency
+2 SD
-2 SD


1.4
Pimephales promelas Survival
Potassium Chloride Reference Toxicant Control Chart
Source: ORNL Environmental Sciences Division Cultures
7-d IC25 (g/L KCl)
0.9
0.4
Mar-13
Jun-13
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Jun-22
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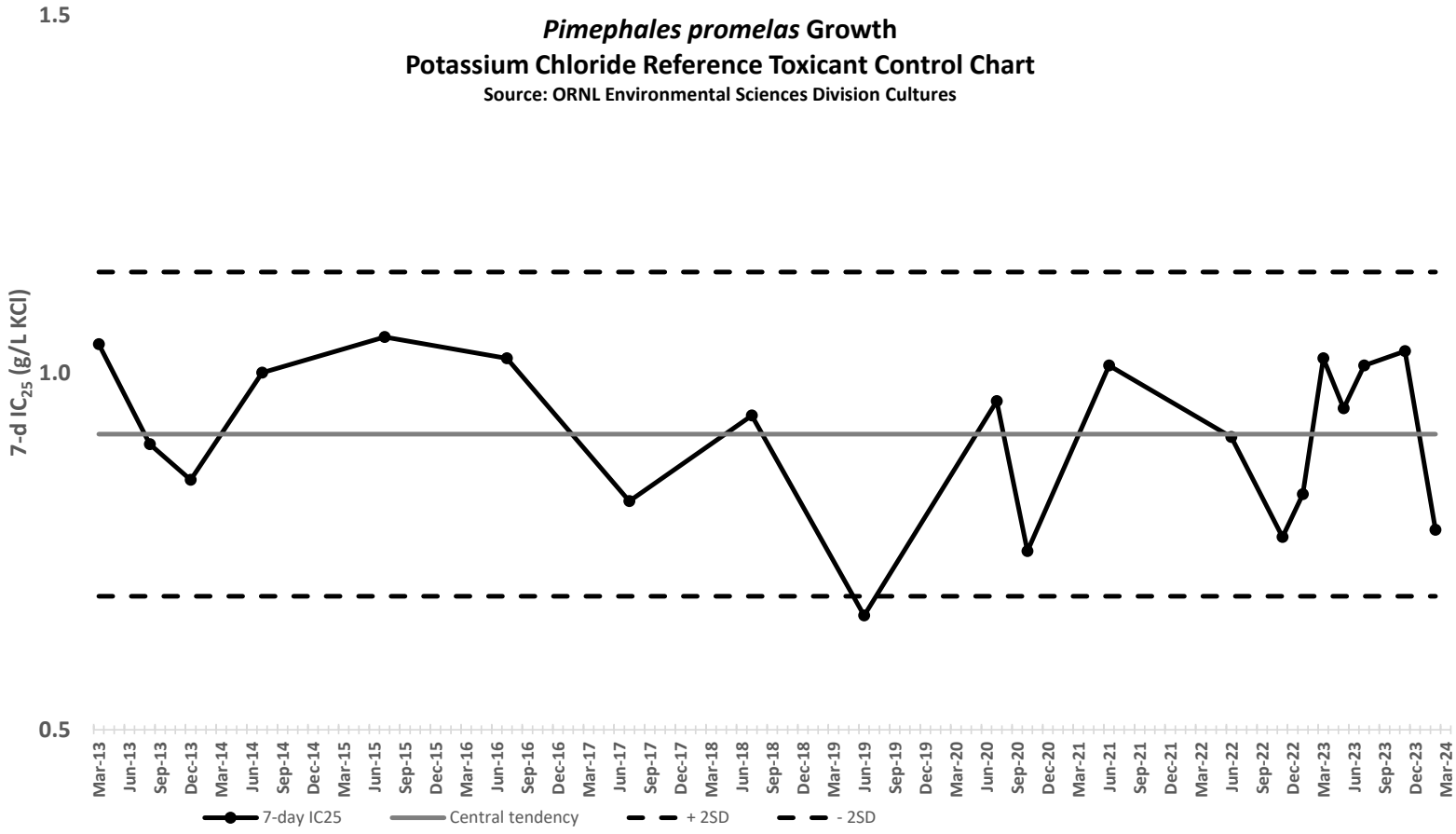
Sep-23
Dec-23
Mar-24
7-day IC25
Central Tendency
+2 SD
-2 SD


Pimephales promelas Growth
Potassium Chloride Reference Toxicant Control Chart
Source: ORNL Environmental Sciences Division Cultures
1.5
1.0
0.5
7-d IC25 (g/L KCl)
Mar-13
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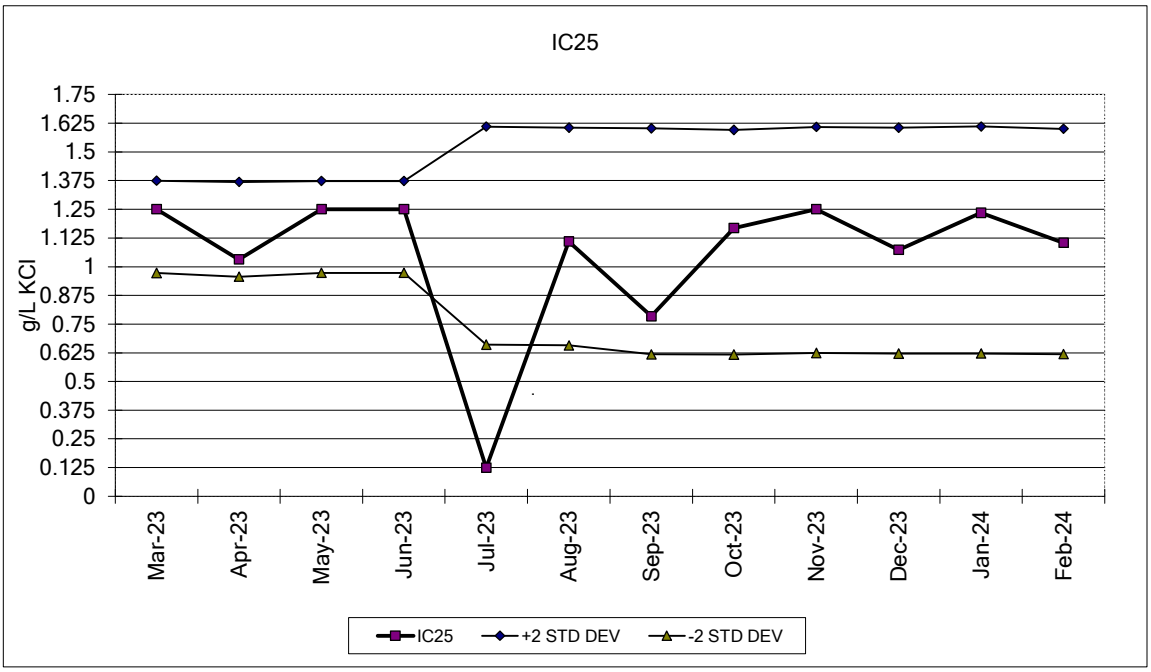
Jun-23
Sep-23
Dec-23
Mar-24
7-day IC25
Central tendency
+ 2SD
- 2SD

1300 Blue Spruce Drive, Suite C
Fort Collins, Colorado 80524

Toll Free: 800/331-5916
Tel:970/484-5091 Fax:970/484-2514

Pimephales promelas



Chronic 7 Day Survival Test Data

Date	NOEC (g/L KCl)	LOEC (g/L KCl)
Sep-23	0.50	1.0
Oct-23	0.50	1.0
Nov-23	0.50	1.0
Dec-23	0.50	1.0
Jan-24	0.50	1.0
Feb-24	0.50	1.0

IC 25 for Growth Test

Date	IC25 g/L KCl	95% Confidence (upper)	95% Confidence (lower)	Avg. IC25 g/L KCl	+2 STD DEV	-2 STD DEV
Sep-23	0.785	0.868	0.709	1.110	1.603	0.618
Oct-23	1.169	1.287	0.796	1.107	1.596	0.617
Nov-23	1.250	1.250	1.142	1.116	1.608	0.624
Dec-23	1.074	1.244	-0.446	1.113	1.605	0.621
Jan-24	1.235	1.259	1.048	1.117	1.611	0.622
Feb-24	1.104	1.338	-0.448	1.110	1.601	0.619

**Current Test Dates: 1/30-2/6/2024

WATER CHEMISTRY DATA LOGSHEETS

168

Daily Water Chemistry Log

Sponsor: Y-12 Site/Treatment: OF200 Associated test numbers: FHM 1703 , CD 2097

Note: Not all parameters are required for all tests. All unused cells should be lined through or marked "NA."

		Observation Day:	0	1	2	3 TMB	4	5	6 TMB	7 TMB
		Date/Initials:	2/21/24	2/22/24	2/23/24	2/24/24	2/25/24	2/26/24	2/27/24	2/28/24
		5-digit ORNL ID	33822	33822	33823	33823	33823	33824	33824	
		Rec. temp. (°C) (New ✓)	SecCoc ☐	SecCoc ☐	SecCoc ☐	SecCoc ☐	SecCoc ☐	SecCoc ☐	SecCoc ☐	☐
①	Control: 25% DMW	DMW Batch #	1005	1005	1005	1005	1005	1005	1005	
		Conductivity (µS/cm)	235	222	284	230	225	219	232	
		Alkalinity (mg/L)	110			110			110	
		Hardness (mg/L)	120			110			110	
		pH (S.U.) Initial	8.09	8.03	8.02	8.08	8.00	8.09	8.00	
		Final CD/FHM		8.36/8.02	8.47/7.99	8.42/7.92	8.30/7.97	8.46/7.86	8.48/7.84	8.47/7.87
		DO (mg/L) Initial	8.80	8.67	8.54	8.57	8.74	8.72	8.56	
		Final CD/FHM		8.86/7.93	8.83/6.94	8.83/7.04	8.69/7.13	8.97/7.07	8.68/6.30	8.38/6.23
②	12.5%	Conductivity (µS/cm)	275	262	244	267	263	269	290	
		Alkalinity (mg/L)								
		Hardness (mg/L)								
		Chlorine (mg/L)								
		pH (S.U.) Initial	7.89	7.94	8.00	8.10	7.94	8.08	8.20	
		Final CD/FHM		8.39/7.92	8.56/7.97	8.49/7.92	8.43/7.97	8.48/7.92	8.50/7.86	8.47/7.95
		DO (mg/L) Initial	8.83	8.84	8.63	8.71	9.09	8.86	8.71	
		Final CD/FHM		8.90/6.50	8.79/6.74	9.03/6.97	8.85/6.96	9.01/6.92	8.68/6.36	8.41/6.41
③	25%	Conductivity (µS/cm)	316	306	284	295	301	322	338	
		Alkalinity (mg/L)								
		Hardness (mg/L)								
		Chlorine (mg/L)								
		pH (S.U.) Initial	8.02	8.03	8.01	8.10	7.96	8.09	8.20	
		Final CD/FHM		8.45/8.00	8.51/8.01	8.50/7.95	8.47/7.98	8.52/7.96	8.53/7.91	8.52/7.99
		DO (mg/L) Initial	9.13	9.06	8.78	8.94	9.21	9.08	8.89	
		Final CD/FHM		9.03/6.66	8.77/6.75	9.06/6.96	8.98/6.88	9.17/6.95	8.73/6.37	8.60/6.65
④	50%	Conductivity (µS/cm)	397	393	365	371	376	427	434	
		Alkalinity (mg/L)								
		Hardness (mg/L)								
		Chlorine (mg/L)								
		pH (S.U.) Initial	8.05	8.07	8.03	8.08	7.99	8.10	8.19	
		Final CD/FHM		8.50/8.09	8.65/8.10	8.52/8.00	8.51/8.01	8.54/8.03	8.57/8.01	8.54/8.04
		DO (mg/L) Initial	9.50	9.07	9.27	9.38	9.70	9.50	9.36	
		Final CD/FHM		9.01/6.93	8.84/6.72	9.03/6.88	9.05/6.81	9.21/6.95	8.75/6.44	8.61/6.83
⑤	75%	Conductivity (µS/cm)	485	474	443	447	448	522	526	
		Alkalinity (mg/L)						*142		
		Hardness (mg/L)						322		
		Chlorine (mg/L) F/T						0.01/0.01		
		pH (S.U.) Initial	8.07	8.09	8.03	8.10	8.02	8.12	8.19	
		Final CD/FHM		8.53/8.15	8.58/8.25	8.54/8.09	8.51/8.04	8.55/8.07	8.60/8.05	8.58/8.08
		DO (mg/L) Initial	10.01	10.15	9.80	9.92	10.24	10.07	10.05	
		Final CD/FHM		9.03/7.00	8.83/6.94	9.07/6.97	9.03/6.74	9.21/7.16	8.77/6.48	8.63/7.01
⑥	100%	Conductivity (µS/cm)	556	553	518	519	518	623	619	
		Alkalinity (mg/L)	136		115					
		Hardness (mg/L)	219	223	187					
		Chlorine (mg/L) T/F	0.01/0.01		0.01/0.01					
		pH (S.U.) Initial	8.11	8.16	8.09	8.14	8.07	8.16	8.20	
		Final CD/FHM		8.54/8.20	8.58/8.23	8.54/8.15	8.51/8.07	8.55/8.13	8.64/8.08	8.58/8.11
		DO (mg/L) Initial	10.45	10.65	10.40	10.39	11.04	10.49	10.65	
		Final CD/FHM		9.03/7.00	8.79/6.86	9.10/6.99	9.05/6.85	9.23/7.31	8.80/6.53	8.65/7.09

Environmental Sciences Division * OF200 Effluent (Treatment 6) water parameters Rev. 04 2021-02-05

CHAIN OF CUSTODY FORMS

ENVIRONMENTAL SCIENCES DIVISION TOXICOLOGY LABORATORY
CHAIN-OF-CUSTODY

DATE (MM/DD/YY): 02/21/24 | ESD TEST NAME: TOX TEST | NAME OF SAMPLERS: A. GARLAND / J. WILLIAMS | CHAIN-OF-CUSTODY NO.: 031143

SAMPLE NAME	OUTFALL NUMBER	SAMPLING TIME	SAMPLE TYPE *	NO. OF CONTAINERS	TOTAL VOLUME	TEMP (°C) FRIG	REMARKS #7009 TEMP	REMARKS #5102 Cl2
OUTFALL #200	200	0730	C	1	~17L	4°	7°	<0.05

2/21/24

THERMOMETER NO.

SAMPLES RELINQUISHED BY: A. L. Garland — DATE: 2/21/24 — TIME: 0810 ☒ AM ☐ PM

SAMPLES RECEIVED BY: [signature] — DATE: 2/21/24 — TIME: 0810 ☒ AM ☐ PM

UCN-18631 (3 3-92)

* GRAB (G), 24 HR. COMPOSITE (C), OR OTHER (O; DESCRIBE)

ENVIRONMENTAL SCIENCES DIVISION TOXICOLOGY LABORATORY
CHAIN-OF-CUSTODY

DATE (MM/DD/YY)	ESD TEST NAME	NAME OF SAMPLERS	CHAIN-OF-CUSTODY NO.
02/23/24	TOX TEST	D. CRAZE / J. WILLIAMS	031144

SAMPLE NAME	OUTFALL NUMBER	SAMPLING TIME	SAMPLE TYPE *	NO. OF CONTAINERS	TOTAL VOLUME	FRIG. TEMP (°C)	YSI # 7009 Temp / REMARKS / ORION # 5102 Cl_2
OUTFALL #200	200	0700	C	1	~17L	3°	8.7° / <0.05

QTW 2/23/24

THERMOMETER NO.

SAMPLES RELINQUISHED BY: J. T. Williams	DATE: 2/23/24	TIME: 0745	☑ AM ☐ PM
SAMPLES RECEIVED BY: I. Rose	DATE: 2/23/24	TIME: 0745	☒ AM ☐ PM

UCN-18631 (3 3-92)

* GRAB (G), 24 HR. COMPOSITE (C), OR OTHER (O; DESCRIBE)

ENVIRONMENTAL SCIENCES DIVISION TOXICOLOGY LABORATORY
CHAIN-OF-CUSTODY

DATE (MM/DD/YY): 02/26/24 | ESD TEST NAME: TOX TEST | NAME OF SAMPLERS: A. GARLAND/J. WILLIAMS | CHAIN-OF-CUSTODY NO.: 031145

FRIG

SAMPLE NAME	OUTFALL NUMBER	SAMPLING TIME	SAMPLE TYPE *	NO. OF CONTAINERS	TOTAL VOLUME	TEMP (°C)	REMARKS #7009 TEMP	REMARKS #5102 C/2
OUTFALL # 200	200	0730	C	1	~17L	3°	10.5	<0.05

A&Y. 2/26/24

THERMOMETER NO.

SAMPLES RELINQUISHED BY: C. L. Garland — DATE: 2/26/24 — TIME: 0810 ☒ AM ☐ PM

SAMPLES RECEIVED BY: [signature] — DATE: 2/26/24 — TIME: 0810 ☒ AM ☐ PM

UCN-18631 (3 3-92)

* GRAB (G), 24 HR. COMPOSITE (C), OR OTHER (O; DESCRIBE)

TOXICITY TEST LOGSHEETS

Toxicity Test Information Sheet

Test number: 2997

Sponsor: Y-12 **Site/Treatment:** OF200

Test begin date (Day 0)	Test end date	Test duration	Template number
02/21/24	02/28/24	7 ☐ hours ☒ days	TAB 2/21/24 ~~☒~~ NA ☒ 4

Test Organism: ☒ *Ceriodaphnia dubia* ☐ Fathead minnow ☐ Other: _____

Isolated from:

Date:	02/20/24	Hatch date:	
Time:	0745	1545	Delivery date:

Notes:

Test period	Test purpose	Test stage	Test type
☒ Chronic	☒ Regulatory	☐ Preliminary	☒ Effluent
☐ Acute	☐ Investigative	☒ Analytical	☐ Received waters
		☐ Re-test	☐ Substance

Treatment descriptions:

Number	Treatment Description*	Type**	Number	Treatment Description*	Type**
1 =	25% DMW	☒C ☐T	4 =	TAB 2/21/24 ~~50%~~ 50%	☐C ☒T
2 =	12.5%	☐C ☒T	5 =	75%	☐C ☒T
3 =	25%	☐C ☒T	6 =	100%	☐C ☒T

*If DMW, include Batch number **C = Control, T= Treatment

Dilution Water Type:

☐ Not applicable ☐ Other (describe): _____

☒ 25% Dilute Mineral Water (DMW) + Trace Metals Batch number: 1005, 1007-1008

Source of Test Organisms:

☒ ESD cultures: Board numbers: TAB, 2/21/24 ~~☒~~ NA ☒ 4823 - 4824

☐ Vendor: _____ ☐ Other (describe): _____

TAB 02/21/24

Water delivery dates:

☐ Not applicable

Sample ID: 33822 Date: 2/21/24 COC #: 031143
Sample ID: 33823 Date: 2/23/24 COC #: 031144
Sample ID: 33824 Date: 2/26/24 COC #: 031145

Record of Deviations from Method and/or Test Non-Conformities

Date	Description	Initial
03/06/24	No deviations observed	TAB

Quality Assurance (QA) Record

Procedure	Name	Initial	Date
Test run by:	Trystan A. Bordlee	TAB	03/05/24
Data sheets QA:	Nikki Jones	NJS	03-05-24
Data entered:	Trystan A. Bordlee	TAB	03/05/24
Data entry QA:	Nikki Jones	NJS	03-05-24

TAB 2/21/24

CHRONIC Daily Water/Feeding Log

Sponsor: Y-12 Test site/treatment: OF200 Begin Date: 2/21/24 End Date: 2/28/24 Test Number: 2997

Daily Test Info		Temperature Information Therm. #: DD20		Feeding Information (Food codes: YCT = yeast-cerophyl-trout, R= *Raphidocelis*, B=Brine shrimp) Acceptable algal cell density range = 3.0 - 3.5 x10^7/mL					Test Initiation, Water Change, or Test Termination				Sample Info
Test day	Date	Env. Chamber (°C)	Test Chamber (°C)	Food Type	Food Prep Date	Volume (µL)	Confirm cell density	Feed Time	Start Time	End Time	Sample ID	Control Water Batch Number	Analyte
Day 0	2/21/24 TAB	26.2 am / — pm	25.3 am / — pm	YCT R	100 ⇔ 2/16/24 92 ⇔ 2/20/24		☒Yes 3.25E7	1110 am / — pm	1058	1123	33822	1005	NA
Day 1	2/22/24 TAB	26.2 am / — pm	25.2 am / — pm	YCT R	2/16/24 2/20/24	100 92	☒Yes 3.25E7	1102 am / — pm	1050	1102	33822	1005	
Day 2	2/23/24 TAB	26.1 am / — pm	25.6 am / — pm	YCT R	2/16/24 2/20/24	100 95	☒Yes 3.14E7	1106 am / — pm	1058	1131	33823	1005	
Day 3	2/24/24 TAB	26.1 am / — pm	25.5 am / — pm	YCT R	2/16/24 2/20/24	100 96	☒Yes 3.18E7	1111 am / — pm	1100	1156	33823	1007 ~~1006~~ *	
Day 4	2/25/24 TAB	26.1 am / — pm	25.2 am / — pm	YCT R	2/16/24 2/20/24	100 95	☒Yes 3.16E7	1113 am / — pm	1101	1144	33823	1007 1006 *	
Day 5	2/26/24 TAB	26.2 am / — pm	25.3 am / — pm	YCT R	2/16/24 2/20/24	100 91	☒Yes 3.30E7	1121 am / — pm	1105	1204	33824	1007 ~~1006~~ *	
Day 6	2/27/24 TAB	26.1 am / — pm	25.4 am / — pm	YCT R	2/16/24 2/20/24	100 91	☒Yes 3.28E7	1120 am / — pm	1109	1201	33824	1008	
Day 7	2/28/24 TAB	___ am / ___ pm	___ am / ___ pm				☐Yes	___ am / ___ pm	0931	1012			

Notes:

* 1007, not 1006. TAB 2/27/24

27

Ceriodaphnia Chronic Daily Survival & Reproduction Log

Project: Y-12 Test site/chemical: OF200 Test Number: 2997

Begin Date: 02/21/24 End Date: 02/28/24 Template Number: 4

Codes: (-) Alive and No Reproduction; (*N*) Alive and Reproduction; (*xN*) Dead and Reproduction; (M) Male

TAB 2/21/24

Test Chamber	Treatment Number	Day: 1 TAB Date: 2/22/24	2 TAB 2/23/24	3 TAB 2/24/24	4 TAB 2/25/24	5 TAB 2/26/24	6 TAB 2/27/24	7 TAB 2/28/24
1	3	—	x (Kinod)					
2	6	—	—	4	—	9	18	—
3	3	—	—	2	—	—	4	—
4	4	—	—	5	—	11	17	—
5	6	—	—	4	8	—	17	21
6	6	—	—	5	7	—	12	16
7	3	—	—	6	—	14	17	—
8	4	—	—	7	—	9	18	14
9	1	—	—	6	—	4	19	—
10	2	—	—	7	—	2	19	16
11	2	—	—	7	1	—	21	18
12	3	—	—	8	—	13	17	—
13	4	—	—	—	—	3	5	—
14	1	—	—	3	—	11	18	—
15	3	—	—	6	—	11	17	—
16	1	—	—	6	5	—	17	17
17	4	—	—	5	—	9	18	15
18	5	—	—	4	5	—	20	22
19	3	—	—	6	—	2	16	18
20	1	—	—	1	—	—	21	6
21	6	—	—	4	6	—	17	21
22	5	—	—	6	—	14	19	12
23	5	—	—	—	—	—	10	2
24	5	—	—	5	—	11	17	14
25	2	—	—	7	—	10	21	—
26	4	—	—	6	7	—	21	16
27	1	—	—	5	—	12	17	16
28	6	—	—	4	—	11	18	16
29	4	—	—	4	—	4	15	17
30	4	—	—	5	—	—	17	20
31	1	—	—	8	—	—	18	14
32	1	—	—	8	—	8	20	—
33	1	—	—	2	—	2	14	—
34	2	—	—	4	—	9	10	—
35	1	—	—	—	11	3	12	18
36	3	—	—	7	—	7	18	16
37	5	—	—	6	—	10	15	15
38	3	—	—	6	—	—	20	19
39	5	—	—	3	—	8	19	11
40	5	—	—	5	—	—	18	22
41	4	—	—	5	2	—	17	20
42	4	—	—	8	—	11	18	12
43	2	—	—	1	—	—	—	—
44	3	—	—	4	—	12	18	16
45	5	—	—	4	—	—	18	17
46	2	—	—	6	6	—	19	—
47	6	—	—	5	—	14	18	17
48	1	—	—	6	10	—	17	21
49	2	—	—	3	—	2	11	—
50	3	—	—	6	—	—	13	17
51	5	—	—	5	4	—	18	21
52	2	—	—	5	—	7	22	18
53	6	—	—	3	—	1	1	11
54	6	—	—	4	—	14	16	17
55	4	—	—	5	10	—	15	15
56	5	—	—	5	5	—	19	18
57	2	—	—	6	—	13	19	13
58	2	—	—	5	—	9	18	—
59	6	—	—	5	—	2	11	11
60	6	—	—	4	—	10	17	—

Toxicity Test Information Sheet

Sponsor: Y-12 **Site/Treatment:** OF200 **Test number:** 1703

Test begin date (Day 0)	Test end date	Test duration	Template number
02/21/24	02/28/24	7 ☐ hours ☒ days	☒ NA ☐ _____

TAB 2/24/24

Test Organism: ☐ *Ceriodaphnia dubia* ☒ Fathead minnow ☐ Other: _____

Isolated from: Date: _____ Time: _____

Hatch date: 02/19/24

Delivery date: 02/20/24

Notes:

Test period	Test purpose	Test stage	Test type
☒ Chronic	☒ Regulatory	☐ Preliminary	☒ Effluent
☐ Acute	☐ Investigative	☒ Analytical	☐ Received waters
		☐ Re-test	☐ Substance

Treatment descriptions:

Number	Treatment Description*	Type**	Number	Treatment Description*	Type**
1 =	25% DMW	☒ C ☐ T	4 =	50%	☐ C ☒ T
2 =	12.5%	☐ C ☒ T	5 =	75%	☐ C ☒ T
3 =	25%	☐ C ☒ T	6 =	100%	☐ C ☒ T

*If DMW, include Batch number **C = Control, T= Treatment

Dilution Water Type:

☐ Not applicable ☐ Other (describe): _____

☒ 25% Dilute Mineral Water (DMW) + Trace Metals Batch number: 1005

Source of Test Organisms:

☐ ESD cultures: Board numbers: ☐ NA ☐ _____

☒ Vendor: ABS ☐ Other (describe): _____

Water delivery dates:

☐ Not applicable

Sample ID: 33822 Date: 2/21/24 COC #: 031143

Sample ID: 33823 Date: 2/23/24 COC #: 031144

Sample ID: 33824 Date: 2/26/24 COC #: 031145

Record of Deviations from Method and/or Test Non-Conformities		
Date	*Description*	*Initial*
03/06/24	No Deviations observed	TAB

Quality Assurance (QA) Record			
Procedure	*Name*	*Initial*	*Date*
Test run by:	Trystan A. Bordeau	TAB	3/5/24
Data sheets QA:	[illegible]	[illegible]	3-6-24
Data entered:	Trystan A. Bordeau	TAB	3/5/24
Data entry QA:	[illegible]	[illegible]	3-6-24

CHRONIC Daily Water/Feeding Log

Sponsor: Y-12 Test site/treatment: OF200 Begin Date: 02/21/24 End Date: 02/28/24 Test Number: 1703

Daily Test Info		Temperature Information Therm. #: DD-20		Feeding Information (Food codes: YCT = yeast-cerophyl-trout, R= *Raphidocelis*, B=Brine shrimp) Acceptable algal cell density range = 3.0 - 3.5 x10^7/mL					Test Initiation, Water Change, or Test Termination				Sample Info
Test day	Date	Env. Chamber (C)	Test Chamber (C)	Food Type	Food Prep Date	Volume (µL)	Confirm cell density	Feed Time	Start Time	End Time	Sample ID	Control Water Batch Number	Analyte
Day 0	2/21/24 TAB	— am 26.2 pm	— am 25.6 pm	B	2/20/24	88	☒Yes	— am 1609 pm	1359	1446	33822	1005	N/A
Day 1	2/22/24 TAB	26.1 am 26.2 pm	25.7 am 25.2 pm	B B	2/21/24 2/21/24	79 68	☒Yes	0956 am 1601 pm	1334	1425	33822	1005	
Day 2	2/23/24 TAB	26.3 am 26.2 pm	26.0 am 25.3 pm	B B	2/22/24 2/22/24	70 55	☒Yes	1002 am 1510 pm	1352	1438	33823	1005	
Day 3	2/24/24 TAB	26.4 am 25.9 pm	25.9 am 25.3 pm	B B	2/23/24 2/23/24	68 54	☒Yes	1100 am 1602 pm	1427	1501	33823	1007 * ~~1006~~	
Day 4	2/25/24 TAB	26.1 am 26.0 pm	25.7 am 25.1 pm	B B	2/24/24 2/24/24	60 84	☒Yes	1055 am 1604 pm	1345	1427	33823	1007 * ~~1006~~	
Day 5	2/26/24 TAB	26.1 am 26.2 pm	25.5 am 25.8 pm	B B	2/25/24 2/25/24	68 75	☒Yes	1107 am 1642 pm	1348	1421	33824	1007 * ~~1006~~	
Day 6	2/27/24 TAB	26.2 am 26.1 pm	25.9 am 25.7 pm	B B	2/26/24 2/26/24	66 71	☒Yes	1100 am 1404 pm	1356	1423	33824	1008	
Day 7	2/28/24 TAB	26.1 am — pm	25.8 am — pm				☐Yes	— am — pm	1348	1522			

Notes:

* 1007, not 1006. TAB 2/27/24

TAB 2/20/24

Fathead Minnow Chronic Daily Survival Log

Sponsor: Y-12 Test site/chemical: 6F200 Test Number: 1703

Begin Date: 02/21/24 End Date: 02/28/24

Comment Codes: C = Clear; D = Dead; Fg = Fungus; K = Killed by siphoning; M = Missing; Sk = Sick; SM = Small; SOR = Siphoned and returned; W = Wounded

Treatment Number and Desc.	Replicate Number	Position Number	Day 1 Date TAB 2/22/24	Day 2 Date TAB 2/23/24	Day 3 Date TAB 2/24/24	Day 4 Date TAB 2/25/24	Day 5 Date TAB 2/26/24	Day 6 Date TAB 2/27/24	Day 7 Date TAB 2/28/24
1: Control 25% Dilw	1	23	10	10	10	10	10	10	10
	2	11	10	10	10	10	10	10	10
	3	9	10	10	10	10	10	10	10
	4	13	10	10	10	10	10	10	10
2: 12.5%	1	16	10	10	10	10	10	10	10
	2	12	10	10	10	10	10	10	10
	3	18	10	10	10	10	10	10	10
	4	17	10	10	10	10	10	10	10
3: 25%	1	14	10 1SM	10 1SM	10 1SM	10 1SM	10 1SM	10 1SM	10
	2	22	10	10	10	10	10	10	10
	3	19	10	10	10	10	10	10	10
	4	15	10	10	10	10	10	10	10
4: 50%	1	21	10	10	10	10	10	10	10
	2	4	10	10	10	10	10	10	10
	3	24	10	10	10	10	10	10	10
	4	6	10	10	10	10	10	10	10
5: 75%	1	8	10	10	10	10	10	10	10
	2	20	10	10	10	10	10	10	10
	3	3	10	10	10	10	10	10	10
	4	5	10	10	10	10	10	10	10
6: 100%	1	7	10	10	10	10	10	10	10
	2	2	10	10	10	10	10	10	10
	3	10	10	10	10	10	10	10	10
	4	1	10	10	10	10	10	10	10

TAB 2/26/24

Random assignment of test chambers

Project: 4-12 OF200 Test site/chemical: OF200 Test number: 1703

Position	Treatment #	Replicate	Sample ID
1	6	4	100%.
2	6	2	100%.
3	5	3	75%.
4	4	2	50%.
5	5	4	75%.
6	4	4	50%.
7	6	1	100%.
8	5	1	75%.
9	1	3	25%. DMW
10	6	3	100%.
11	1	2	25%. DMW
12	2	2	12.5%.
13	1	4	25%. DMW
14	3	1	25%.
15	3	4	25%.
16	2	1	12.5%.
17	2	4	12.5%.
18	2	3	12.5%.
19	3	3	25%.
20	5	2	75%.
21	4	1	50%.
22	3	2	25%.
23	1	1	25%. DMW
24	4	3	50%.

TAB 2/10/17

Random assignment of larvae to test chambers

Project: 4-12 Test site/chemical: OF200 Test number: 1703

TAB 2/20/24

Treatment	Replicate	Cup 1	Cup 2
Treatment #1 TMB 2/21/24 ~~12.5 l.~~ 25 l. DMSO control			
1	1	11 ✓	17 ✓
1	2	13 ✓	9 ✓
1	3	48 ✓	2 ✓
1	4	6 ✓	36 ✓
Treatment #2 TMB 2/21/24 ~~25 l.~~ 12.5 l.			
2	1	29 ✓	41 ✓
2	2	7 ✓	8 ✓
2	3	1 ✓	37 ✓
2	4	27 ✓	45 ✓
Treatment #3 TMB 2/21/24 ~~50 l.~~ 25 l.			
3	1	28 ✓	15 ✓
3	2	14 ✓	43 ✓
3	3	40 ✓	25 ✓
3	4	22 ✓	16 ✓
Treatment #4 50 l.			
4	1	42 ✓	3 ✓
4	2	38 ✓	39 ✓
4	3	19 ✓	21 ✓
4	4	33 ✓	24 ✓
Treatment #5 75 l.			
5	1	10 ✓	46 ✓
5	2	20 ✓	35 ✓
5	3	30 ✓	34 ✓
5	4	44 ✓	31 ✓
Treatment #6 100 l.			
6	1	5 ✓	18 ✓
6	2	12 ✓	4 ✓
6	3	47 ✓	23 ✓
6	4	26 ✓	32 ✓

Fathead Minnow Weight and Survival Data

TMB
2/20/24

Sponsor: Y-12	Test number: 1703
Test site/chemical: OF200	Balance ID: A009820
Test Start Date: 2/21/24	Test End Date: 2/28/24
Start Drying Date/Time: 2/28/24 1530	End Drying Date/time: 2/29/24 1015

Treatment	Replicate	Pan Wt. (mg) Date: 2/25/24 Balance check: ☒	Pan + Larvae (mg) Date: 2/29/24 Balance check: ☒	Number Surviving
Initial	1	15.2465		10
	2	15.5390		10
	3	15.4340		10
	4	15.3980		10
1. 25 l. DMW	1	15.4545	21.9275	10
	2	15.4000	22.1175	10
	3	15.4385	22.8150	10
	4	15.3935	23.6390	10
2. 12.5 l.	1	15.3615	22.7440	10
	2	15.3670	22.4485	10
	3	15.3935	22.5430	10
	4	15.5375	22.1555	10
3. 25 l.	1	15.5310	22.9125	10
	2	15.4810	22.0895	10
	3	15.5425	22.0080	10
	4	15.4775	23.3125	10
4. 50 l.	1	15.5080	21.7845	10
	2	15.5485	23.2135	10
	3	15.5015	21.4520	10
	4	14.9360	22.2380	10
5. 75 l.	1	14.4455	19.9545	10
	2	14.1345	21.4220	10
	3	14.7470	21.4195	10
	4	14.7145	21.6025	10
6. 100 l.	1	14.7265	19.7085	10
	2	14.7140	22.1780	10
	3	14.7500	21.8575	10
	4	14.8705	22.7655	10