

Bio-Analytical Laboratories' Executive Summary

Permittee: Nashville Public Works
Nashville, AR 71852

Project #: X8854

Outfall: 001 (treated municipal wastewater)

Permit #: AR0021776/ AFIN #31-00036

Contact: Southern Petroleum Laboratories
4720 Viking Drive, Ste A
Bossier City, LA 71111

Test Dates: July 10 - 18, 2023

Test Type: Chronic Static Renewal Survival and Reproduction Test using
Ceriodaphnia dubia (EPA Method 1002.0)
Chronic Static Renewal Survival and Growth Test using
Pimephales promelas (EPA Method 1000.0)

Results:

For *Ceriodaphnia dubia*:

1. If the NOEC for survival is less than the critical dilution (78.0%), enter a "1"; otherwise, enter a "0" for Parameter TLP3B - 0 - **Pass**
2. If the NOEC for reproduction is less than the critical dilution, enter a "1"; otherwise, enter a "0" for Parameter TGP3B - 0 - **Pass**
3. Report the NOEC value for survival, Parameter TOP3B - 78.0%.
4. Report the NOEC value for reproduction, Parameter TPP3B - 78.0%.
5. Report the largest % coefficient of variation between the control and the critical dilution, Parameter TQP3B - 15.06%
6. Chronic WET Limit, DMR CODE 51710, - 78.0%
7. PMSD Reproduction-21.18%(13.0 - 47.0%) moderate precision, acceptable for passing test.

For *Pimephales promelas*:

1. If the NOEC for survival is less than the critical dilution (78.0%), enter a "1"; otherwise, enter a "0" for Parameter TLP6C - 0 - **Pass**
2. If the NOEC for growth is less than the critical dilution, enter a "1"; otherwise, enter a "0" for Parameter TGP6C - 0 - **Pass**
3. Report the NOEC value for survival, Parameter TOP6C - 78.0%.
4. Report the NOEC value for growth, Parameter TPP6C - 78.0%.
5. Report the largest % coefficient of variation between the control and the critical dilution, Parameter TQP6C - 21.77%.
6. Chronic WET Limit, DMR CODE 51714, - 78.0%
7. **PMSD Biomass-42.45% (12.0 - 30.0%)-low precision, See Results and Discussion.**

This report contains a total of 54 pages, including this page. The results contained within pertain only to the samples listed on the chain of custody documents in Appendix A. The information meets the standards set forth by ADEQ. The chemical data in this report is for monitoring purposes only and should not be reported on discharge monitoring reports.



Bio-Analytical Laboratories

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THE RESULTS OF TWO CHRONIC DEFINITIVE TOXICITY TESTS FOR OUTFALL 001

AT

**NASHVILLE PUBLIC WORKS
Nashville, Arkansas**

**NPDES #AR0021776
AFIN #31-00036**

EPA Methods 1000.0 and 1002.0

Project X8854

Test Dates: July 10 - 18, 2023

Report Date: July 31, 2023

Prepared for:

Southern Petroleum Laboratories
4720 Viking Drive, Ste A
Bossier City, LA 71111

Prepared by:

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1.0 Introduction

Bio-Analytical Laboratories (BAL), Doyline, Louisiana conducted two chronic definitive toxicity tests for Outfall 001 at Nashville Public Works, Nashville, Arkansas. The test organisms used were the cladoceran, *Ceriodaphnia dubia*, and the fathead minnow, *Pimephales promelas*. The purpose of this study is to determine if appropriately dilute effluent samples adversely affect the survival, reproduction and/or growth of the test organisms. Toxicity is defined as a statistically significant difference at the 95 percent confidence level between the survival, reproduction and/or growth of the test organism in the critical dilution (the effluent concentration representative of the proportion of effluent in the receiving water during critical low flow or critical mixing conditions) compared to the survival, reproduction and/or growth of the test organism in the control. The test endpoint is the No-Observed-Effect-Concentration (NOEC), the highest effluent concentration that is not significantly different from the control.

2.0 Methods and Materials

2.1 Test Methods

All methods followed were according to the latest edition of “Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms” (EPA-821-R-02-013), “Standard Methods for The Examination of Water and Wastewater, 22nd Edition” (APHA 2012), and BAL’s standard operating procedure.

2.2 Test Organisms

The *Ceriodaphnia dubia* test organisms were cultured in-house at test temperature and dilution water hardness and were less than 24 hours old at test initiation. The neonates were released within the same 8-hour period. The fathead minnows were also raised in-house at test temperature and dilution water hardness and were less than 24 hours old at test initiation. Monthly chronic reference toxicant tests were conducted in order to document organism sensitivity and demonstration of capability.

2.3 Dilution Water

Moderately hard reconstituted water, made per method guidelines, was used as the dilution water and the control for the toxicity tests. Conductivity (SM 2510 B) and pH (SM 4500-H+ B) measurements, in umhos/cm and standard units, respectively, were checked on each lot of water prior to use to confirm water hardness.

2.4 Test Concentrations

The test concentrations used in the chronic toxicity tests (for a 3.5 MGD design flow) were 78.0, 59.0, 44.0, 33.0 and 25.0 percent effluent and a reconstituted water control. The critical dilution was 78.0 percent effluent. The *Ceriodaphnia* test was conducted using 10 replicates of one animal each for a total of 10 animals per concentration. The fathead minnow test was conducted using five replicates of eight animals each for a total of 40 animals per concentration.

2.5 Sample Collection

Three 24-hour composite samples of Outfall 001 were collected by Nashville Public Works personnel on July 10, 11 and 14, 2023, at 0545, 2122 and 0439 hours, respectively. Upon collection and completion of each composite, the samples were packed in ice and delivered to the laboratory the day of collection by Southern Petroleum Laboratories (SPL) personnel. The sample temperature upon arrival of each sample was 0.4, 0.6 and 2.0⁰ Celsius, respectively.

2.6 Sample Preparation

Upon arrival, the samples were logged in, given an identification number, and refrigerated unless needed. Prior to use, the samples were warmed to 25±1⁰ Celsius. Total residual chlorine levels were measured in milligrams/Liter (mg/L) using a test strip and recorded if present. Total ammonia levels were measured in mg/L using a test strip. Dissolved oxygen (SM 4500-0 G) and pH (SM 4500-H+ B) measurements, in mg/L and standard units, respectively, were measured on the control and each concentration at test initiation, at test renewal and at test termination. Conductivity (SM 2510 B) measurements, in umhos/cm, were also taken at test initiation and at each renewal. Alkalinity (SM 2320 B) and hardness (SM 2340 C) levels were measured in mg/L as CaCO₃ on the control and the undiluted effluent samples.

2.7 Monitoring of the Tests

The cladoceran test was run in a Precision^R dual-programmable, illuminated incubator at a temperature of 25±1⁰ Celsius. The fathead minnow test was run in a circulating waterbath, using a Remcor^R heated liquid circulator to keep a constant temperature of 25±1⁰ Celsius. Data-loggers were used to monitor diurnal test temperature. Test temperatures were recorded at the beginning of the day, after test renewal and at the end of the day. Light cycles and intensities were recorded twice a month.

2.8 Data Analysis

Ceriodaphnia dubia survival data was analyzed using Fisher's Exact Test, an equality test comparing concentration data to control data. Reproduction data was analyzed using Steel's Many-One Rank Test, a nonparametric test comparing concentration data to control data. Fathead minnow survival and growth data was analyzed using Dunnett's Test, a parametric test. Other endpoints were obtained by approved EPA methods of analysis.

3.0 Results and Discussion

The results of the *Ceriodaphnia dubia* test can be found in Table 1. One hundred percent survival occurred in the control and in the 78.0 percent critical dilution after seven days of exposure. The average number of neonates per female after three broods in the control and in the critical dilution was 26.0 and 23.5, respectively. The No-Observed-Effect-Concentration (NOEC) for survival and reproduction in this test was 78.0 percent effluent (p=.05).

Table 1: Results of the Chronic Definitive *Ceriodaphnia dubia* Test

Percent Effluent	Percent Survival	Sig.*	Mean # Neonates-Surviving	Mean # Neonates -Total	Sig.*
Control	100.0		26.0	26.0	
25.0	100.0		22.5	22.5	
33.0	90.0		25.3	23.1	
44.0	100.0		24.0	24.0	
59.0	90.0		22.6	20.3	
78.0	100.0		23.5	23.5	

*significant when compared to the control (p=.05). Test validity based on mean number of neonates per surviving female. NOEC value based on total mean number of neonates.

The fathead minnow test results can be found in Table 2. After seven days of exposure, 80.0 percent survival occurred in the control and 82.5 percent survival occurred in the 78.0 percent critical dilution. The average weight gained in the control and in the 78.0 percent critical dilution was 0.473 and 0.685 milligram (mg), respectively. The NOEC for survival and growth (biomass) was 78.0 percent effluent (p=.05). The PMSD biomass result was 42.45 percent, which is greater than the upper limit in Table 6 of the method. This was an indication that the test data may not be sensitive enough to detect toxic effects. Deviations from the method did not occur, the test was properly randomized and the IC₂₅ point estimate value, the preferred endpoint for NPDES reporting per the method and CFR 2002.0, was >78.0 percent. An inverse dose response occurred in the test data. The effluent outperformed the laboratory water control.

Table 2: Results of the Chronic Definitive Fathead Minnow Test

Percent Effluent	Percent Survival	Sig.*	Mean Dry Weight (mg)	Sig.*
Control	80.0		0.473	
25.0	85.0		0.615	
33.0	85.0		0.688	
44.0	87.5		0.673	
59.0	80.0		0.665	
78.0	82.5		0.685	

*significant when compared to the control (p=.05).

The most recent reference toxicant tests showed the test organisms to be within the respective sensitivity range. The graphs of the results of the chronic reference toxicant tests can be found in Appendix D- Quality Assurance Charts.

4.0 Conclusions

The three composite samples of Outfall 001 collected on July 10, 11 and 14, 2023, from Nashville Public Works, Nashville, Arkansas, were not found to be lethally toxic to the *Ceriodaphnia dubia* test organisms nor the *Pimephales promelas* test organisms in the 78.0 percent critical dilution after seven days of exposure (p=.05). Sublethal effects (i.e., lack of growth or reproduction) were not noted in the 78.0 percent critical dilution in either test (p=.05).

5.0 References

- EPA, 2002. Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms. Fourth Edition. EPA-821-R-02-013, Office of Water.
- EPA, 2000. Understanding and Accounting for Method Variability in Whole Effluent Toxicity Applications Under the National Pollutant Discharge Elimination System. EPA-833-R-00-003, Office of Wastewater Management.
- EPA, 2000. Method Guidance and Recommendations for Whole Effluent (WET) Testing. EPA-821-B-00-04, Office of Water
- APHA, 2012. Standard Methods for The Examination of Water and Wastewater. 22nd Edition.

APPENDIX A
CHAIN-OF-CUSTODY DOCUMENTS

Bio-Analytical Laboratories
 3240 Spurgeon Rd
 Doyline, LA 71023
 (318)7452772

Temperature upon arrival: 0.4°C
 Thermometer #: 29
 Tech: AM
 Date: 7/10/23

color: clear
 odor: none

Date 7.10.23 Time 0545
 Sampler Printed Name KEVIN FUNDERBURK
 Sampler Signature CLIENT
 Sampler Affiliation NASH

Please analyze the following samples:

Sample Identification	Client Code	Date	Time	Testing Required- FCSC
Bio Monitoring	NASH	7.10.23	0545	Chronic ceriodaphnia dubia Chronic pimephales promelas

Requires RUSH status (24 hr Turn Around Time) Requires E-mail as soon as completed

If you have any questions about the testing, contact Skeeter Ludewig at (903)984-0551.

Date	Time	Relinquished		Received	
7.10.23	1509	Printed Name <u>Mare Husca</u>	Affiliation <u>SPL</u>	Printed Name <u>Jim J. Brupp</u>	Affiliation <u>BA</u>
		Signature <u>[Signature]</u>		Signature	
		Printed Name	Affiliation	Printed Name	Affiliation
		Signature		Signature	
		Printed Name	Affiliation	Printed Name	Affiliation
		Signature		Signature	
		Printed Name	Affiliation	Printed Name	Affiliation
		Signature		Signature	

X8854
 C25283

Bio-Analytical Laboratories
 3240Spurgeon Rd
 Doyline, LA 71023
 (318)7452772

Temperature upon arrival: 0.6°C
 Thermometer #: 29
 Date: 7/11/23

color: clear
 odor: none

Date 7-11-23 Time 2:22

Sampler Printed Name KEVIN FUNDER BURK

Sampler Signature CLIENT

Sampler Affiliation NASH

Please analyze the following samples:

Sample Identification	Client Code	Date	Time	Testing Required- FCSC
Bio Monitoring	NASH	7.11.23	2:22	Chronic ceriodaphnia dubia Chronic pimephales promelas

Requires RUSH status (24 hr Turn Around Time) Requires E-mail as soon as completed

If you have any questions about the testing, contact Skeeter Ludewig at (903)984-0551.

Date	Time	Relinquished		Received	
7-11-23	1531	Printed Name <u>Mark Hiest</u>	Affiliation <u>SPL</u>	Printed Name <u>Kevin J. Burp</u>	Affiliation <u>BAC</u>
		Signature <u>[Signature]</u>		Signature <u>[Signature]</u>	
		Printed Name	Affiliation	Printed Name	Affiliation
		Signature		Signature	
		Printed Name	Affiliation	Printed Name	Affiliation
		Signature		Signature	
		Printed Name	Affiliation	Printed Name	Affiliation
		Signature		Signature	

Bio-Analytical Laboratories
 3240 Spurgeon Rd
 Doyline, LA 71023
 (318)7452772

Temperature upon arrival: 2.0°C
 Thermometer #: 29
 Tech: *an*
 Date: 7/14/23

Color: Clear
 Odor: none

Date 7-14-23 Time 0439

Sampler Printed Name KEVIN FUNDERBURK

Sampler Signature *CVENT*

Sampler Affiliation NASH

Please analyze the following samples:

Sample Identification	Client Code	Date	Time	Testing Required- FCSC
Bio Monitoring	NASH	7-13-23	0715	Chronic ceriodaphnia dubia
		7-14-23	0439	Chronic pimephales promelas

Requires RUSH status (24 hr Turn Around Time) Requires E-mail as soon as completed
 (skeeter@ana-lab.com)

If you have any questions about the testing, contact Skeeter Ludewig at (903)984-0551.

Date	Time	Relinquished		Received	
7-14-23	1511	Printed Name <i>MARK AROSCH</i>	Affiliation SPL	Printed Name <i>Kevin Funderburk</i>	Affiliation BAC
		Signature <i>Mark Arosch</i>		Signature	
		Printed Name	Affiliation	Printed Name	Affiliation
		Signature		Signature	
		Printed Name	Affiliation	Printed Name	Affiliation
		Signature		Signature	
		Printed Name	Affiliation	Printed Name	Affiliation
		Signature		Signature	

**APPENDIX B
RAW DATA SHEETS**

BIO-ANALYTICAL LABORATORIES CERIODAPHNIA DUBIA SURVIVAL AND REPRODUCTION TEST

Project# X8854 Date start: 7/10/23 Date end: 7/17/23

Client/Contact: NASH/Nashville Public Works

Address: 426 North Main, Nashville, AR 71852

NPDES#: AR0021776/ AFIN 31-00036

Sample Description: 001 Dilution Water: MH RECONSTITUTED

Adults isolated: Date 7/9/23 Time: 2330

Neonates collected: Date 7/10/23 Time: 0645 Board: V, MH

Dissolved Oxygen Meter#: 2

pH Meter#: 3 Conductivity Meter#: 7

ORP Meter#: — Salinity Meter#: —

Effluent Initial D.O. (mg/L & %)/Tech	Aerate?/Minutes /Final D.O. (mg/L & %)/Tech	Receiving Water Initial D.O. (mg/L & %)/Tech	Aerate?/Minutes /Final D.O. (mg/L & %)/Tech
0. <u>9.9/103.0% 1d</u>	0. <u>y/6/188/100.2% 1d</u>	0. _____	0. _____
1. <u>8.4/100.2% 1d</u>	1. <u>No/1d</u>	1. _____	1. _____
2. <u>8.8/100.1% 1d</u>	2. <u>No/1d</u>	2. _____	2. _____
3. <u>9.1/108.7% 1d</u>	3. <u>y/12/18.3/100.3% 1d</u>	3. _____	3. _____
4. <u>9.3/112.3% 1d</u>	4. <u>y/6/18.2/98.7% 1d</u>	4. _____	4. _____
5. <u>8.3/100.3% 1d</u>	5. <u>No/1d</u>	5. _____	5. _____
6. <u>8.3/99.7% 1d</u>	6. <u>No/1d</u>	6. _____	6. _____
7. _____	7. _____	7. _____	7. _____

Total Residual Chlorine (mg/L)/Tech	Dechlorinated? Amount?/Tech	Ammonia (NH3) (mg/L)/Tech	BAL Sample # Date in use
1. <u><0.5/1d</u>	1. <u>No/1d</u>	1. <u><0.5/1d</u>	1. <u>C25231 7/10/23</u>
2. <u><0.5/1d</u>	2. <u>No/1d</u>	2. <u><0.5/1d</u>	2. <u>C25283 7/13/23</u>
3. <u><0.5/1d</u>	3. <u>No/1d</u>	3. <u><0.5/1d</u>	3. <u>C25292 7/15/23</u>

Comments:
 *FILTER! Unknown organic organisms found in sample PM 7/13/23

CERIODAPHNIA DUBIA SURVIVAL AND REPRODUCTION TEST-LIVE NEONATE PRODUCTION- EPA 800-215-0061 202

Project# X8854 Client Nashville Sample ID 001
 Test started: Date 7/10/23 Time 1828 Test ended: Date 7/16/23 Time 1607
 Date/Tech: Day 0 7/10/23 1 7/11/23 2 7/12/23 3 7/13/23 4 7/14/23 5 7/15/23 6 7/16/23 7 7/17/23 8
 Time: Day 0 1828 1 1142 2 1455 3 1510 4 1240 5 1515 6 1555 7 1605 8
 Temp. (°C): Day 0 24.5 1 24.3 2 24.4 3 24.1 4 24.3 5 24.7 6 25.0 7 25.1 8

Conc %	Day	1	2	3	4	5	6	7	8	9	10	Number of Live	
0	1	0										10	
	2	0										10	
	3	0										10	
	4	1/3	1/5	1/4	1/3	1/1	1/5	1/6	1/4	0	1/3	10	
	5	0								1/5	0	10	
	6	2/10	2/12	2/11	2/17	2/19	2/13	2/17	2/19	2/12	2/13	10	
	7	3/13	3/10	3/13	3/15	3/17	3/12	3/13	3/10	3/10	3/15	10	
	8												
25.0	1	0										10	
	2	0										10	
	3	0										10	
	4	1/4	1/3	1/4	1/1	1/7	0	1/3	1/3	0	1/4	10	
	5	0	0	0	0	0	1/3	2/6	0	1/2	0	10	
	6	2/11	2/17	2/16	2/17	2/19	2/10	2/2	2/5	2/10	2/17	10	
	7	3/17	3/12	3/11	3/10	3/12	3/7	3/15	3/14	3/10	3/13	10	
	8												
33.0	1	0										10	
	2	0										10	
	3	0										10	
	4	1/4	1/5	1/5	1/3	1/1	X/3	1/2	0	1/1	1/4	9	
	5	0	0	0	0	1/3		0	1/3	1/2	0	9	
	6	2/16	2/17	2/12	2/10	2/16		2/8	2/9	2/10	2/9	9	
	7	3/11	3/12	3/14	3/16	3/13		3/12	3/14	3/15	3/11	9	
	8												
44.0	1	0										10	
	2	0										10	
	3	0										10	
	4	0	1/1	0	0	1/1	1/1	1/1	1/1	0	1/1	10	
	5	1/3	1/5	1/4	1/5	1/4	1/3	1/6	0	1/6	1/6	10	
	6	2/16	2/17	2/15	2/19	2/10	2/11	2/10	2/5	2/17	2/16	10	
	7	3/11	3/10	3/13	3/14	3/16	3/9	3/13	3/12	3/14	3/10	10	
	8												
59.0	1	0										10	
	2	0										10	
	3	0										9	
	4	0	1/2	1/2			1/3	0	1/2	1/3	0	9	
	5	1/3	0	0			0	1/4	0	1/3	1/4	9	
	6	2/15	2/17	2/18			2/17	2/16	2/11	2/9	2/10	2/12	9
	7	3/10	3/12	3/11			3/17	3/13	3/12	3/10	3/13	3/14	9
	8												
78.0	1	0										10	
	2	0										10	
	3	0										10	
	4	0	0	1/1	1/4	0	1/4	1/4	0	0	0	10	
	5	1/3	1/2/13	1/2/8	0	1/5	0	0	1/2/11	1/4	1/6	10	
	6	2/15	0	0	2/10	2/15	2/19	2/11	0	2/10	2/12	10	
	7	3/10	3/10	3/11	3/12	3/10	3/11	3/14	3/15	3/10	3/7	10	
	8												

Key: X=dead adult, Xⁿ=adult had n neonates before death, M=male.
 B/N = Brood count/#neonates

BIO-ANALYTICAL LABORATORIES CHRONIC WATER QUALITY DATA (CHR CHEM Rev. 4.0)

Project# X8854 Client Nashville

Organism C. dubius

Date	Day 0 7/10/23 5:45	Day 1 7/11/23	Day 2 7/12/23	Day 3 7/13/23 5:46	Day 4 7/14/23	Day 5 7/15/23	Day 6 7/16/23	Day 7 7/17/23	Day 8
Concentration:	0 M/L								
Temperature (°C)	24.9	23.6 24.0	23.2 23.6	24.1 23.7	23.7 23.8	24.1 23.6	24.1 23.6	25.1	
pH	8.0	7.5 7.1	7.1 7.4	7.4 7.4	7.5 7.9	7.4 7.9	7.3 7.2	7.4	
DO (mg/l)	7.8	8.6 8.1	8.3 8.0	8.6 8.0	9.0 8.5	7.9 7.5	7.2 7.9	7.3	
Cond (umhos/cm)	351	337	314	336	457	301	313		
Concentration:	25.0 %								
Temperature (°C)	24.3	23.6 23.4	23.1 24.7	23.7 23.7	25.7 23.9	24.6 23.4	25.1 23.6	24.9	
pH	7.7	7.6 7.5	7.3 7.3	7.6 7.4	7.7 7.7	7.4 7.4	7.4 7.2	7.6	
DO (mg/l)	8.0	8.6 8.0	8.1 7.6	8.6 8.0	8.9 8.3	8.4 7.5	8.3 7.7	7.9	
Cond (umhos/cm)	331	317	318	323	315	301	310		
Concentration:	33.0 %								
Temperature (°C)	24.2	23.6 23.4	23.1 24.2	23.9 23.6	23.8 24.0	24.7 23.6	25.3 23.6	25.1	
pH	7.7	7.6 7.5	7.4 7.4	7.7 7.4	7.8 7.6	7.6 7.3	7.6 7.2	7.4	
DO (mg/l)	8.2	8.6 8.0	8.3 7.6	8.7 7.9	9.1 8.2	8.4 7.5	8.2 7.1	7.6	
Cond (umhos/cm)	329	318	317	312	315	303	312		
Prerenewal Tech Initials/Time		1146 AM	1500 AM	1510 PM	1245 AM	EDW 1515	EDW 1555	EDW 1605	
Postrenewal Tech Initials/Time	1800 AM	1014 AM	EDW 0950	1047 AM	0952 AM	EDW 1055	EDW 1050		

Control Alkalinity (mg/L as CaCO₃)

Control Hardness (mg/L as CaCO₃)

ID# 5458 Result 48.0 Date Tested 7/6/23
 ID# 5465 Result 28.0 Date Tested 7/14/23
 ID# _____ Result _____ Date Tested _____

ID# 5458 Result 88.0 Date Tested 7/6/23
 ID# 5465 Result 48.0 Date Tested 7/14/23
 ID# _____ Result _____ Date Tested _____

Sample Alkalinity (mg/L as CaCO₃)

Sample Hardness (mg/L as CaCO₃)

ID# C25231 Result 64.0 Date Tested 7/14/23
 ID# C25283 Result 52.0 Date Tested 7/14/23
 ID# C25292 Result 74.0 Date Tested 7/20/23

ID# C25231 Result 96.0 Date Tested 7/14/23
 ID# C25283 Result 96.0 Date Tested 7/14/23
 ID# C25292 Result 84.0 Date Tested 7/20/23

BIO-ANALYTICAL LABORATORIES CHRONIC WATER QUALITY DATA (CHR CHEM Rev. 4.0)

Project# X8854 Client Nashville

Organism C. dubia

Date	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8
Concentration: <u>44.0%</u> <u>AM 7/11/23</u>									
Temperature (°C)	23.6	23.6	23.1	23.7	24.1	24.7	25.1	25.1	
pH	7.7	23.3	24.3	24.3	23.9	23.5	23.4		
		7.4	7.8	7.4	7.5	7.4	7.4	7.6	
DO (mg/l)	8.0	8.5	8.3	8.4	9.2	8.1	8.3	7.5	
		8.2	7.8	7.9	8.0	7.3	7.4		
Cond (umhos/cm)	331	326	322	317	320	305	311		
Concentration: <u>59.0%</u>									
Temperature (°C)	23.6	23.7	23.2	24.0	24.1	24.8	24.9	24.9	
pH	7.6	23.2	24.3	24.4	23.8	23.4	23.3		
		7.8	7.5	7.8	7.8	7.6	7.6	7.6	
DO (mg/l)	8.2	8.7	8.4	8.6	9.3	8.4	8.5	7.5	
		8.2	7.4	7.8	8.2	7.5	7.4		
Cond (umhos/cm)	334	336	338	329	320	308	313		
Concentration: <u>78.0%</u>									
Temperature (°C)	23.1	23.9	23.5	24.0	24.2	24.7	25.1	25.1	
pH	7.6	23.2	24.5	24.3	23.8	23.5	23.1		
		7.8	7.6	7.8	7.9	7.9	7.7	7.2	7.3
DO (mg/l)	8.3	7.4	7.3	7.4	7.4	7.3	7.4		
		8.4	8.5	8.6	9.3	8.3	8.5	7.4	
Cond (umhos/cm)	338	343	350	346	323	312	310		
Prerenewal Tech Initials/Time		1146 AM	1500 AM	1510 PM	1245 AM	8AM 1515	8AM 1555	8AM 1605	
Postrenewal Tech Initials/Time	1800 AM	1014 AM	8AM 0950	1047 AM	0953 AM	8AM 1055	8AM 1050		

Control Alkalinity (mg/L as CaCO₃)

Control Hardness (mg/L as CaCO₃) PM 7/13/23

ID# _____ Result _____ Date Tested _____
 ID# _____ Result _____ Date Tested _____
 ID# _____ Result _____ Date Tested _____

ID# _____ Result _____ Date Tested _____
 ID# _____ Result _____ Date Tested _____
 ID# _____ Result _____ Date Tested _____

Sample Alkalinity (mg/L as CaCO₃)

Sample Hardness (mg/L as CaCO₃)

ID# _____ Result _____ Date Tested _____
 ID# _____ Result _____ Date Tested _____
 ID# _____ Result _____ Date Tested _____

ID# _____ Result _____ Date Tested _____
 ID# _____ Result _____ Date Tested _____
 ID# _____ Result _____ Date Tested _____

CETIS Test Data Worksheet

Report Date: 10 Jul-23 09:16 (p 1 of 2)
 Test Code/ID: 320D5D76 / 08-3973-6694

Ceriodaphnia 7-d Survival and Reproduction Test				Bio-Analytical Laboratories			
Start Date:	10 Jul-23 12:25	Species:	Ceriodaphnia dubia	Sample Code:	69368D6B		
End Date:	17 Jul-23 18:50	Protocol:	EPA/821/R-02-013 (2002)	Sample Source:	AR0021776		
Sample Date:	10 Jul-23 06:15	Material:	POTW Effluent	Sample Station:	001		

Conc-%	Code	Rep	Pos	# Exposed	1d Surv	2d Surv	3d Surv	4d Surv	5d Surv	6d Surv	7d Surv	8d Surv	2d Neo	3d Neo	4d Neo	5d Neo	6d Neo	7d Neo	8d Neo	Male	Notes	
33		10	1																			
59		3	2																			
25		6	3																			
59		4	4																			
33		5	5																			
0	D	2	6																			
78		9	7																			
59		1	8																			
0	D	1	9																			
0	D	8	10																			
25		1	11																			
78		2	12																			
59		5	13																			
44		10	14																			
44		2	15																			
78		4	16																			
44		7	17																			
59		10	18																			
33		7	19																			
25		8	20																			
44		3	21																			
33		2	22																			
33		4	23																			
44		4	24																			
33		9	25																			
59		9	26																			
59		7	27																			
59		8	28																			
78		5	29																			
25		3	30																			
25		5	31																			
25		10	32																			
33		3	33																			
0	D	9	34																			
0	D	3	35																			
78		10	36																			
78		8	37																			
0	D	7	38																			
25		7	39																			
0	D	6	40																			
25		4	41																			

CETIS Test Data Worksheet

Report Date: 10 Jul-23 09:16 (p 2 of 2)
 Test Code/ID: 320D5D76 / 08-3973-6694

Conc-%	Code	Rep	Pos	# Exposed	1d Surv	2d Surv	3d Surv	4d Surv	5d Surv	6d Surv	7d Surv	8d Surv	2d Neo	3d Neo	4d Neo	5d Neo	6d Neo	7d Neo	8d Neo	Male	Notes	
78		6	42																			
25		2	43																			
59		6	44																			
44		1	45																			
33		6	46																			
25		9	47																			
78		7	48																			
0	D	10	49																			
44		9	50																			
44		5	51																			
44		8	52																			
0	D	4	53																			
33		8	54																			
78		3	55																			
33		1	56																			
44		6	57																			
0	D	5	58																			
78		1	59																			
59		2	60																			

Set #1

5,3,6,2,1,4 Parent# 2I

7110123
A1

Set #2

4,6,2,3,5,1 Parent# 2C

Set #3

3,2,1,5,6,4 Parent# 2B

Set #4

6,4,3,5,1,2 Parent# 1E

Set #5

5,2,1,3,6,4 Parent# 4C

Set #6

1,2,3,4,6,5 Parent# 1H

Set #7

4,1,5,3,6,2 Parent# 4E

Set #8

6,5,4,2,1,3 Parent# 4G

Set #9

4,6,5,1,2,3 Parent# 1I

Set #10

3,5,2,6,1,4 Parent# 3E

BIO-ANALYTICAL LABORATORIES
 PIMEPHALES PROMELAS SURVIVAL AND GROWTH DATA SHEET

Project# X8854 Date started: 7/11/23 Date ended 7/18/23

Client/Contact: NASH/Nashville Public Works

Address: 426 North Main, Nashville, AR 71852

NPDES# AR0021776/AFIN 31-00036

Sample Description: 001 Dilution Water: MH Reconstituted
 Test organism age: < 24 hours Vendor/ID# BAL071123

Feeding Times

Day	Technician/Time/Amount (per replicate)		
	AM	NOON	PM
0	---	EDW/1145/0.20ml	EDW/1815/0.20ml
1	EDW/0910/0.10ml	EDW/1155/0.10ml	EM/11820/0.1ml
2	EB/0715/0.10ml	PM/1329/0.1ml	EM/11820/0.1ml
3	MJ/0950/0.10ml	EDW/1200/0.10ml	EDW/1850/0.10ml
4	EDW/0930/0.20ml	---	EDW/1705/0.20ml
5	EDW/0925/0.20ml	---	EDW/1720/0.20ml
6	PM/0925/0.1ml	PM/1210/0.1ml	PM/1135/0.1ml

Dissolved Oxygen Meter #: 2
 pH Meter#: 3 Conductivity Meter#: 7
 ORP Meter#: --- Salinity Meter #: ---

Effluent Initial DO (mg/L & %)/Tech	Aerate?/Minutes /Final DO (mg/L & %)/Tech	Receiving Water Initial DO (mg/L & %)/Tech	Aerate?/Minutes /Final DO (mg/L & %)/Tech
0. 8.4/100.2/1.1dn	0. No/dn	0. ---	0. ---
1. 8.8/100.1/9/EDW	1. No/EDW	1. ---	1. ---
2. 9.1/108.7/1.1dn	2. y/12/8.3/100.3/1.1dn	2. ---	2. ---
3. 9.3/112.3/1.1dn	3. y/16/8.2/98.7/1.1dn	3. ---	3. ---
4. 8.7/100.3/9/EDW	4. No/EDW	4. ---	4. ---
5. 8.3/99.7/9/EDW	5. No/EDW	5. ---	5. ---
6. 9.2/110.9/9/AM	6. y/16/7.9/95.7/9/AM	6. ---	6. ---

Total Residual Chlorine (mg/L)/Tech	Dechlorinated? Amount?/Tech	Ammonia (NH3) (mg/L)/Tech	BAL Sample # Date in use
1. <0.5/1.1dn	1. No/dn	1. <0.5/1.1dn	1. C25231 7/11/23
2. <0.5/1.1dn	2. No/dn	2. <0.5/1.1dn	2. C25283 7/13/23
3. <0.5/9/EDW	3. No/EDW	3. <0.5/9/EDW	3. C25292 7/15/23

Comments:

*Filter! Unknown organic organisms found in sample. PM 7/13/23

BIO-ANALYTICAL LABORATORIES 7-DAY CHRONIC MINNOW SURVIVAL DATA- EPA 1000, OECD 210

Project# X8854 Test started: Date 7/16/23 Time 1145
 Client Nashville Sample ID 001 Test ended: Date 7/18/23 Time 1031
 Date/Tech: Day0 7/16/23 1 7/17/23 2 7/18/23 3 7/19/23 4 7/20/23 5 7/21/23 6 7/22/23 7 7/23/23
 Time: Day0 1145 1 1435 2 1320 3 25.2 4 1345 5 1157 6 61205 7 1031
 Temp (°C) Day0 25.1 1 24.8 2 23.8 3 110.2 4 25.4 5 25.6 6 26.0 7 26.5

Conc. %	Rep.	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
0 AH	1	8	8	8	8	8	8	8	5
	2	8	8	8	8	8	8	7	7
	3	8	8	8	8	8	8	7	6
	4	8	8	8	8	8	8	7	6
	5	8	8	8	8	8	8	8	8
25.0	1	8	8	8	8	8	8	8	8
	2	8	8	8	8	8	8	8	7
	3	8	8	8	8	8	8	6	6
	4	8	8	8	8	8	8	7	7
	5	8	8	8	8	8	8	6	6
33.0	1	8	8	8	7	7	7	7	7
	2	8	8	8	8	8	8	8	8
	3	8	8	8	8	8	8	7	7
	4	8	8	8	8	7	7	7	7
	5	8	8	8	8	8	8	6	5
44.0	1	8	8	8	8	8	8	6	6
	2	8	8	8	8	8	8	6	6
	3	8	8	8	8	8	8	8	8
	4	8	8	8	8	8	8	8	8
	5	8	8	8	8	8	8	7	7
59.0	1	8	8	8	8	8	8	5	5
	2	8	8	8	8	8	8	8	7
	3	8	8	8	8	8	8	7	6
	4	8	8	8	8	8	8	8	7
	5	8	8	8	8	8	8	8	7
78.0	1	8	8	8	8	8	8	7	7
	2	8	8	8	8	7	7	7	7
	3	8	8	8	8	6	6	5	4
	4	8	8	8	8	8	8	7	7
	5	8	8	8	8	8	8	8	8

BIO-ANALYTICAL LABORATORIES MINNOW LARVAL GROWTH DATA SHEET (Minnow3 Rev 2.1)

Project#/Client X8854 Temp Start (°C) 114.5 Tech AM Date: 7/18/23 Time: 1035
Nashville Temp End (°C) 109 Tech son Date: 7/19/23 Time: 0805

Conc. %	Replicate/ Pan number	Wt. of pan(g)/ Date: <u>7/11/23</u> weighed: Tech: <u>MV</u>	Wt. of pan + larvae(g)/ Date: <u>7/19/23</u> weighed: Tech: <u>son</u>	Total wt. of larvae (g)	Original # of larvae at test initiation	Mean Dry wt. of larvae (mg)	Mean Dry wt. - surviving larvae (mg) Control Only*
0 MH	1 101	1.0826	1.0861				
	2 102	1.0896	1.0936				
	3 103	1.0910	1.0956				
	4 104	1.0874	1.0917				
	5 105	1.0793	1.0818				
25%	1 106	1.0993	1.1052				
	2 107	1.0826	1.0876				
	3 108	1.0960	1.1015				
	4 109	1.0991	1.1021				
	5 110	1.0979	1.1031				
33%	1 111	1.0946	1.1001				
	2 112	1.0843	1.0904				
	3 113	1.0801	1.0856				
	4 114	1.0900	1.0965				
	5 115	1.0934	1.0973				
44%	1 116	1.0872	1.0910				
	2 117	1.0945	1.0988				
	3 118	1.0861	1.0928				
	4 119	1.0880	1.0944				
	5 120	1.1026	1.1083				
59%	1 121	1.0858	1.0912				
	2 122	1.0814	1.0872				
	3 123	1.0804	1.0845				
	4 124	1.0897	1.0939				
	5 125	1.0839	1.0907				
78%	1 126	1.0841	1.0900				
	2 127	1.0765	1.1025				
	3 128	1.1041	1.1078				
	4 129	1.0989	1.1045				
	5 130	1.0867	1.0929				

* Test acceptance of control weight based on surviving larvae at end of test.

Calculated by: ETIS

Calculations checked by: ELB 7/20/23

BIO-ANALYTICAL LABORATORIES CHRONIC WATER QUALITY DATA (CHR CHEM Rev.4.0)

Project# X8854 Client Nashville Organism P. promelas

Date	Day 0 7/16/23 5460	Day 1 7/17/23	Day 2 7/18/23 5465	Day 3 7/19/23	Day 4 7/15/23	Day 5 7/16/23	Day 6 7/17/23	Day 7 7/18/23	Day 8
Concentration:	0 mH								
Temperature (°C)	24.8	24.9 24.6	24.8 24.6	24.1 24.6	24.1 24.1	24.9 24.6	24.4 24.7	24.8	
pH	7.4	7.4 7.1	6.3 7.3	6.5 7.0	7.3 7.4	7.3 7.5	6.8 7.9	6.5	
DO (mg/l)	7.7	7.3 7.3	7.1 8.0	6.6 8.0	7.2 7.8	7.4 7.9	7.2 8.0	5.5	
Cond (umhos/cm)	300	304	307	301	300	311	310		
Concentration:	25.0%								
Temperature (°C)	24.5	25.1 24.7	24.9 24.5	24.9 24.7	24.5 24.6	25.1 24.5	25.0 24.7	24.9	
pH	7.3	7.4 7.3	6.6 7.7	6.6 7.2	7.0 7.5	7.3 7.5	6.8 7.8	6.4	
DO (mg/l)	7.7	7.3 7.6	7.0 7.9	6.8 8.3	6.9 7.7	7.3 7.8	6.5 7.8	5.4	
Cond (umhos/cm)	318	322	299	313	306	312	304		
Concentration:	33.0%								
Temperature (°C)	24.5	24.9 24.7	24.9 24.4	25.0 24.7	24.7 24.5	24.6 24.6	25.0 24.8	25.0	
pH	7.3	7.4 7.2	6.8 7.6	6.7 7.2	7.2 7.4	7.3 7.5	6.7 7.7	6.4	
DO (mg/l)	7.5	7.3 7.4	6.2 8.3	6.8 8.3	6.9 7.6	6.7 7.7	6.3 7.7	5.3	
Cond (umhos/cm)	322	324	303	317	308	313	311		
Prerenewal Tech Initials/Time		EDW 1435	1325 PM	1102 M	EDW 1345	SPM 1157	1205 PM	1040 AM	
Postrenewal Tech Initials/Time	SDW 1000	EDW 0935	1041 AM	0945 AM	SDW 1055	EDW 1053	SDW 1030		

Control Alkalinity (mg/L as CaCO₃)

Control Hardness (mg/L as CaCO₃)

ID# 5460 Result 64.0 Date Tested 7/20/23
 ID# 5465 Result 28.0 Date Tested 7/14/23
 ID# _____ Result _____ Date Tested _____

ID# 5460 Result 84.0 Date Tested 7/20/23
 ID# 5465 Result 48.0 Date Tested 7/14/23
 ID# _____ Result _____ Date Tested _____

Sample Alkalinity (mg/L as CaCO₃)

Sample Hardness (mg/L as CaCO₃)

ID# C25231 Result 64.0 Date Tested 7/14/23
 ID# C25283 Result 52.0 Date Tested 7/14/23
 ID# C25292 Result 24.0 Date Tested 7/20/23

ID# C25231 Result 96.0 Date Tested 7/14/23
 ID# C25283 Result 96.0 Date Tested 7/14/23
 ID# C25292 Result 84.0 Date Tested 7/20/23

BIO-ANALYTICAL LABORATORIES CHRONIC WATER QUALITY DATA (CHR CHEM Rev.4.0)

Project# X8854 client Nashville

Organism P. promelas

Date	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8
Concentration: <u>44.0%</u>									
Temperature (°C)	<u>24.4</u>	<u>25.6</u> <u>24.7</u>	<u>24.9</u> <u>24.4</u>	<u>25.</u> <u>24.5</u>	<u>24.1</u> <u>24.7</u>	<u>24.9</u> <u>25.0</u>	<u>25.0</u> <u>24.7</u>	<u>25.0</u>	
pH	<u>7.3</u>	<u>7.3</u> <u>7.2</u>	<u>6.9</u> <u>7.6</u>	<u>6.8</u> <u>7.2</u>	<u>7.3</u> <u>7.5</u>	<u>7.3</u> <u>7.6</u>	<u>6.7</u> <u>7.5</u>	<u>6.4</u>	
DO (mg/l)	<u>7.5</u>	<u>7.4</u> <u>7.3</u>	<u>6.5</u> <u>8.1</u>	<u>6.3</u> <u>8.1</u>	<u>7.2</u> <u>7.4</u>	<u>7.4</u> <u>7.5</u>	<u>5.9</u> <u>7.6</u>	<u>5.2</u>	
Cond (umhos/cm)	<u>330</u>	<u>332</u>	<u>305</u>	<u>323</u>	<u>311</u>	<u>314</u>	<u>313</u>		
Concentration: <u>59.0%</u>									
Temperature (°C)	<u>24.4</u>	<u>24.9</u> <u>24.8</u>	<u>24.8</u> <u>24.4</u>	<u>25.</u> <u>24.5</u>	<u>23.9</u> <u>24.6</u>	<u>25.1</u> <u>25.2</u>	<u>25.0</u> <u>24.7</u>	<u>25.0</u>	
pH	<u>7.2</u>	<u>7.4</u> <u>7.2</u>	<u>6.9</u> <u>7.6</u>	<u>6.7</u> <u>7.2</u>	<u>7.3</u> <u>7.3</u>	<u>7.3</u> <u>7.5</u>	<u>6.6</u> <u>7.5</u>	<u>6.4</u>	
DO (mg/l)	<u>7.4</u>	<u>7.2</u> <u>7.8</u>	<u>6.5</u> <u>8.2</u>	<u>6.2</u> <u>8.6</u>	<u>6.9</u> <u>7.7</u>	<u>6.7</u> <u>7.8</u>	<u>5.6</u> <u>7.7</u>	<u>5.1</u>	
Cond (umhos/cm)	<u>341</u>	<u>342</u>	<u>310</u>	<u>321</u>	<u>312</u>	<u>315</u>	<u>317</u>		
Concentration: <u>78.0%</u>									
Temperature (°C)	<u>24.4</u>	<u>25.1</u> <u>25.0</u>	<u>24.8</u> <u>24.4</u>	<u>25.0</u> <u>24.4</u>	<u>24.1</u> <u>24.8</u>	<u>25.2</u> <u>25.9</u>	<u>25.0</u> <u>24.6</u>	<u>25.0</u>	
pH	<u>7.3</u>	<u>7.4</u> <u>7.2</u>	<u>6.9</u> <u>7.6</u>	<u>6.7</u> <u>7.2</u>	<u>7.3</u> <u>7.3</u>	<u>7.0</u> <u>7.6</u>	<u>6.6</u> <u>7.5</u>	<u>6.3</u>	
DO (mg/l)	<u>7.6</u>	<u>7.3</u> <u>8.0</u>	<u>6.4</u> <u>8.3</u>	<u>6.1</u> <u>8.4</u>	<u>7.2</u> <u>7.7</u>	<u>6.8</u> <u>7.8</u>	<u>5.6</u> <u>7.7</u>	<u>5.1</u>	
Cond (umhos/cm)	<u>348</u>	<u>356</u>	<u>314</u>	<u>325</u>	<u>321</u>	<u>323</u>	<u>320</u>		
Prerenewal Tech Initials/Time		<u>EDW</u> <u>MBS</u>	<u>1325</u> <u>PM</u>	<u>1102</u> <u>MV</u>	<u>EDW</u> <u>1345</u>	<u>EDW</u> <u>1157</u>	<u>1203</u> <u>PM</u>	<u>1040</u> <u>M</u>	
Postrenewal Tech Initials/Time	<u>EDW</u> <u>1000</u>	<u>EDW</u> <u>0935</u>	<u>1041</u> <u>M</u>	<u>0945</u> <u>M</u>	<u>EDW</u> <u>1055</u>	<u>EDW</u> <u>1053</u>	<u>EDW</u> <u>1030</u>		

Control Alkalinity (mg/L as CaCO₃) _____ Control Hardness (mg/L as CaCO₃) _____

ID# _____	Result _____	Date Tested _____	ID# _____	Result _____	Date Tested _____
ID# _____	Result _____	Date Tested _____	ID# _____	Result _____	Date Tested _____
ID# _____	Result _____	Date Tested _____	ID# _____	Result _____	Date Tested _____

Sample Alkalinity (mg/L as CaCO₃) _____ Sample Hardness (mg/L as CaCO₃) _____

ID# _____	Result _____	Date Tested _____	ID# _____	Result _____	Date Tested _____
ID# _____	Result _____	Date Tested _____	ID# _____	Result _____	Date Tested _____
ID# _____	Result _____	Date Tested _____	ID# _____	Result _____	Date Tested _____

CETIS Test Data Worksheet

Report Date: 10 Jul-23 09:16 (p 1 of 1)
 Test Code/ID: 62BA1ACA / 16-5636-3722

Fathead Minnow 7-d Larval Survival and Growth Test Bio-Analytical Laboratories

Start Date: 10 Jul-23 12:10 Species: Pimephales promelas Sample Code: 2D37DD8D
 End Date: 17 Jul-23 11:00 Protocol: EPA/821/R-02-013 (2002) Sample Source: AR0021776
 Sample Date: 10 Jul-23 06:15 Material: POTW Effluent Sample Station: 001

Conc-%	Code	Rep	Pos	# Exposed	1d Survival	2d Survival	3d Survival	4d Survival	5d Survival	6d Survival	7d Survival	Weight-mg Total	Weight-mg Tare	Pan Count	Notes
44		5	1												
44		4	2												
25		5	3												
59		4	4												
33		2	5												
78		5	6												
78		2	7												
0	D	5	8												
59		2	9												
33		1	10												
44		3	11												
59		5	12												
25		4	13												
33		5	14												
25		1	15												
59		1	16												
59		3	17												
25		3	18												
0	D	1	19												
0	D	4	20												
25		2	21												
44		2	22												
78		1	23												
44		1	24												
33		4	25												
0	D	2	26												
0	D	3	27												
78		3	28												
33		3	29												
78		4	30												

APPENDIX C
STATISTICAL ANALYSES

CETIS Analytical Report

Report Date: 18 Jul-23 15:39 (p 1 of 2)
Test Code/ID: 320D5D76 / 08-3973-6694

Ceriodaphnia 7-d Survival and Reproduction Test			Bio-Analytical Laboratories		
Analysis ID: 20-4797-2470	Endpoint: 7d Survival Rate	CETIS Version: CETIS v2.1.5			
Analyzed: 18 Jul-23 15:39	Analysis: STP 2xK Contingency Tables	Status Level: 1			
Edit Date: 18 Jul-23 15:32	MD5 Hash: A75DE797FFF1DE1199274AF6E2C100DE	Editor ID: 008-522-314-5			
Batch ID: 17-9001-2151	Test Type: Reproduction-Survival (2-8d)	Analyst: Lab Tech			
Start Date: 10 Jul-23 18:28	Protocol: EPA/821/R-02-013 (2002)	Diluent: Reconstituted Water			
Ending Date: 17 Jul-23 16:05	Species: Ceriodaphnia dubia	Brine:			
Test Length: 6d 22h	Taxon: Branchiopoda	Source: In-House Culture	Age: <24		
Sample ID: 17-6518-2827	Code: X8854	Project: WET Monthly Compliance Test (JUL)			
Sample Date: 10 Jul-23 05:45	Material: POTW Effluent	Source: AR0021776 (AR0021776)			
Receipt Date: 10 Jul-23 15:09	CAS (PC):	Station: 001			
Sample Age: 13h (0.4 °C)	Client: Nashville Public Works				

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	Tox Units
Untransformed	C > T	78	>78	---	1.3

Fisher Exact/Bonferroni-Holm Test						
Control	vs	Conc-%	Test Stat	P-Type	P-Value	Decision(α:5%)
Dilution Water		25	1.0000	Exact	1.0000	Non-Significant Effect
		33	0.5000	Exact	1.0000	Non-Significant Effect
		44	1.0000	Exact	1.0000	Non-Significant Effect
		59	0.5000	Exact	1.0000	Non-Significant Effect
		78	1.0000	Exact	1.0000	Non-Significant Effect

7d Survival Rate Frequencies							
Conc-%	Code	NR	R	NR + R	Prop NR	Prop R	%Effect
0	D	10	0	10	1.0000	0.0000	0.00%
25		10	0	10	1.0000	0.0000	0.00%
33		9	1	10	0.9000	0.1000	10.00%
44		10	0	10	1.0000	0.0000	0.00%
59		9	1	10	0.9000	0.1000	10.00%
78		10	0	10	1.0000	0.0000	0.00%

7d Survival Rate Summary											
Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	10	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.00%	0.00%
25		10	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.00%	0.00%
33		10	0.9000	0.6738	1.0000	1.0000	0.0000	1.0000	0.1000	35.14%	10.00%
44		10	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.00%	0.00%
59		10	0.9000	0.6738	1.0000	1.0000	0.0000	1.0000	0.1000	35.14%	10.00%
78		10	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	0.00%	0.00%

7d Survival Rate Detail											
Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	D	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
25		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
33		1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000
44		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
59		1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
78		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

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CETIS Analytical Report

Report Date: 18 Jul-23 15:39 (p 2 of 2)
 Test Code/ID: 320D5D76 / 08-3973-6694

Ceriodaphnia 7-d Survival and Reproduction Test

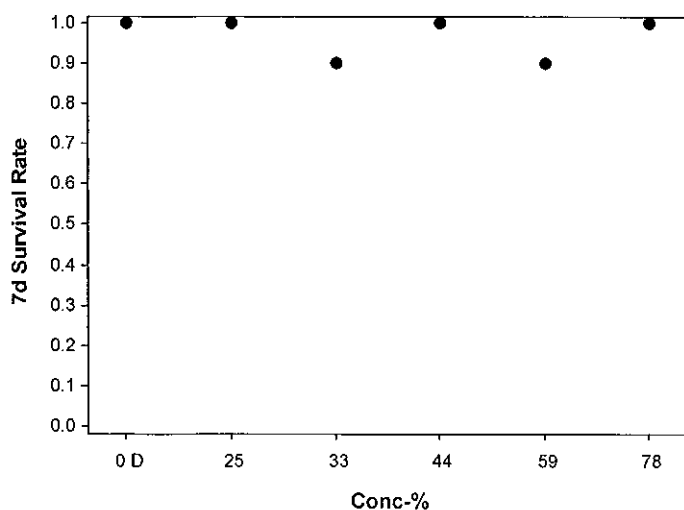
Bio-Analytical Laboratories

Analysis ID: 20-4797-2470 Endpoint: 7d Survival Rate CETIS Version: CETIS v2.1.5
 Analyzed: 18 Jul-23 15:39 Analysis: STP 2xK Contingency Tables Status Level: 1
 Edit Date: 18 Jul-23 15:32 MD5 Hash: A75DE797FFF1DE1199274AF6E2C100DE Editor ID: 008-522-314-5

7d Survival Rate Binomials

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	D	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
25		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
33		1/1	1/1	1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1
44		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1
59		1/1	1/1	1/1	0/1	1/1	1/1	1/1	1/1	1/1	1/1
78		1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1

Graphics



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7/20/23

CETIS Analytical Report

Report Date: 18 Jul-23 15:39 (p 1 of 2)
Test Code/ID: 320D5D76 / 08-3973-6694

Ceriodaphnia 7-d Survival and Reproduction Test **SURVIVING** Bio-Analytical Laboratories

Analysis ID: 16-7257-2094	Endpoint: Reproduction	CETIS Version: CETIS v2.1.5
Analyzed: 18 Jul-23 15:39	Analysis: Parametric-Multiple Comparison	Status Level: 1
Edit Date: 18 Jul-23 15:32	MD5 Hash: 26B71A27911A9B0186CFDD3CFA91158	Editor ID: 008-522-314-5
Batch ID: 17-9001-2151	Test Type: Reproduction-Survival (2-8d)	Analyst: Lab Tech
Start Date: 10 Jul-23 18:28	Protocol: EPA/821/R-02-013 (2002)	Diluent: Reconstituted Water
Ending Date: 17 Jul-23 16:05	Species: Ceriodaphnia dubia	Brine:
Test Length: 6d 22h	Taxon: Branchiopoda	Source: In-House Culture Age: <24
Sample ID: 17-6518-2827	Code: X8854	Project: WET Monthly Compliance Test (JUL)
Sample Date: 10 Jul-23 05:45	Material: POTW Effluent	Source: AR0021776 (AR0021776)
Receipt Date: 10 Jul-23 15:09	CAS (PC):	Station: 001
Sample Age: 13h (0.4 °C)	Client: Nashville Public Works	

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	Tox Units	MSDu	PMSD
Untransformed	C > T	78	>78	---	1.3	3.81	14.66%

Bonferroni Adj t Test

Control	vs	Conc-%	df	Test Stat	Critical	MSD	P-Type	P-Value	Decision(α:5%)
Dilution Water		25	18	2.205	2.4	3.81	CDF	0.0798	Non-Significant Effect
		33	17	0.4088	2.4	3.915	CDF	1.0000	Non-Significant Effect
		44	18	1.26	2.4	3.81	CDF	0.5334	Non-Significant Effect
		59	17	2.112	2.4	3.915	CDF	0.0988	Non-Significant Effect
		78	18	1.575	2.4	3.81	CDF	0.3034	Non-Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	99.7605	19.9521	5	1.583	0.1811	Non-Significant Effect
Error	655.222	12.6004	52			
Total	754.983		57			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variance	Bartlett Equality of Variance Test	1.221	15.09	0.9429	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9913	0.9443	0.9517	Normal Distribution

Reproduction Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	10	26	23.2	28.8	26.5	17	31	1.238	15.06%	0.00%
25		10	22.5	20.44	24.56	22	18	28	0.9098	12.79%	13.46%
33		9	25.33	22.73	27.94	24	21	31	1.13	13.39%	2.56%
44		10	24	21.39	26.61	23.5	18	30	1.155	15.21%	7.69%
59		9	22.56	19.45	25.66	22	17	30	1.345	17.89%	13.25%
78		10	23.5	21.11	25.89	24	18	29	1.057	14.22%	9.62%

Reproduction Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	D	26	27	28	25	17	30	26	23	27	31
25		22	22	21	18	28	20	26	22	22	24
33		21	24	31	29	23	22	26	28	24	
44		20	23	22	28	25	24	30	18	27	23
59		18	21	21	17	23	25	22	26	30	
78		18	23	20	26	20	24	29	26	24	25

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CETIS Analytical Report

Report Date: 18 Jul-23 15:40 (p 1 of 2)
Test Code/ID: 320D5D76 / 08-3973-6694

Ceriodaphnia 7-d Survival and Reproduction Test				Bio-Analytical Laboratories			
Analysis ID: 03-2489-1875	Endpoint: Reproduction	CETIS Version: CETIS v2.1.5					
Analyzed: 18 Jul-23 15:40	Analysis: Nonparametric-Control vs Treatments	Status Level: 1					
Edit Date: 18 Jul-23 15:32	MD5 Hash: C53DEE001FC9DE0D69E3CAB081EA661	Editor ID: 008-522-314-5					
Batch ID: 17-9001-2151	Test Type: Reproduction-Survival (2-8d)	Analyst: Lab Tech					
Start Date: 10 Jul-23 18:28	Protocol: EPA/821/R-02-013 (2002)	Diluent: Reconstituted Water					
Ending Date: 17 Jul-23 16:05	Species: Ceriodaphnia dubia	Brine:					
Test Length: 6d 22h	Taxon: Branchiopoda	Source: In-House Culture	Age: <24				
Sample ID: 17-6518-2827	Code: X8854	Project: WET Monthly Compliance Test (JUL)					
Sample Date: 10 Jul-23 05:45	Material: POTW Effluent	Source: AR0021776 (AR0021776)					
Receipt Date: 10 Jul-23 15:09	CAS (PC):	Station: 001					
Sample Age: 13h (0.4 °C)	Client: Nashville Public Works						

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	Tox Units	MSDu	PMSD
Untransformed	C > T	78	>78	---	1.3	5.506	21.18%

Steel Many-One Rank Sum Test									
Control	vs	Conc-%	df	Test Stat	Critical	Ties	P-Type	P-Value	Decision(α:5%)
Dilution Water		25	18	75.5	75	2	CDF	0.0505	Non-Significant Effect
		33	18	91.5	75	4	CDF	0.4046	Non-Significant Effect
		44	18	87.5	75	5	CDF	0.2759	Non-Significant Effect
		59	18	76	75	5	CDF	0.0551	Non-Significant Effect
		78	18	82	75	3	CDF	0.1407	Non-Significant Effect

ANOVA Table						
Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	174.733	34.9467	5	1.208	0.3179	Non-Significant Effect
Error	1562	28.9259	54			
Total	1736.73		59			

ANOVA Assumptions Tests						
Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)	
Variance	Bartlett Equality of Variance Test	17.82	15.09	0.0032	Unequal Variances	
Distribution	Shapiro-Wilk W Normality Test	0.8387	0.9459	<1.0E-05	Non-Normal Distribution	

Reproduction Summary												
Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect	
0	D	10	26	23.2	28.8	26.5	17	31	1.238	15.06%	0.00%	
25		10	22.5	20.44	24.56	22	18	28	0.9098	12.79%	13.46%	
33		10	23.1	17.55	28.65	24	3	31	2.452	33.56%	11.15%	
44		10	24	21.39	26.61	23.5	18	30	1.155	15.21%	7.69%	
59		10	20.3	14.52	26.08	21.5	0	30	2.556	39.82%	21.92%	
78		10	23.5	21.11	25.89	24	18	29	1.057	14.22%	9.62%	

Reproduction Detail											
Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	D	26	27	28	25	17	30	26	23	27	31
25		22	22	21	18	28	20	26	22	22	24
33		21	24	31	29	23	3	22	26	28	24
44		20	23	22	28	25	24	30	18	27	23
59		18	21	21	0	17	23	25	22	26	30
78		18	23	20	26	20	24	29	26	24	25

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CETIS Analytical Report

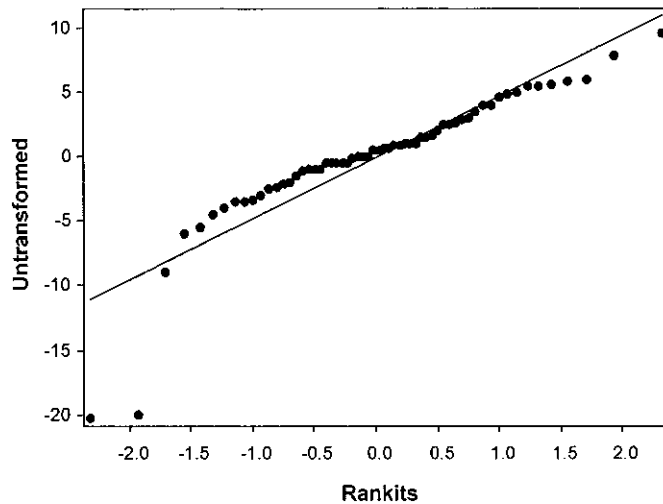
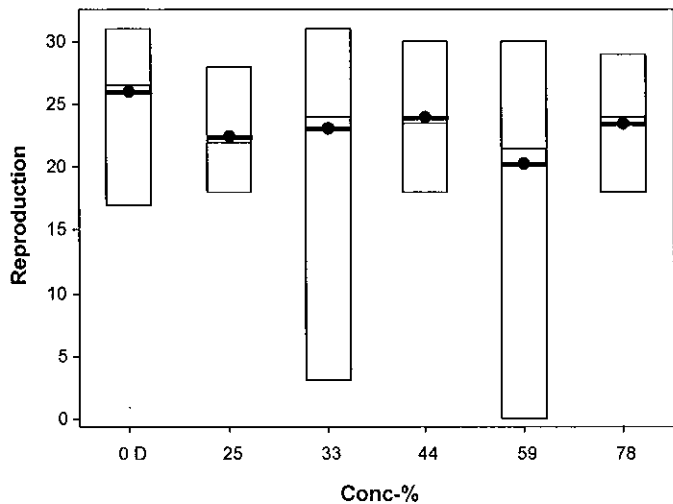
Report Date: 18 Jul-23 15:40 (p 2 of 2)
Test Code/ID: 320D5D76 / 08-3973-6694

Ceriodaphnia 7-d Survival and Reproduction Test

Bio-Analytical Laboratories

Analysis ID: 03-2489-1875	Endpoint: Reproduction	CETIS Version: CETIS v2.1.5
Analyzed: 18 Jul-23 15:40	Analysis: Nonparametric-Control vs Treatments	Status Level: 1
Edit Date: 18 Jul-23 15:32	MD5 Hash: C53DEE001FC9DE0D69E3CAB081EA661	Editor ID: 008-522-314-5

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CETIS Analytical Report

Report Date: 18 Jul-23 15:40 (p 1 of 2)
Test Code/ID: 320D5D76 / 08-3973-6694

Ceriodaphnia 7-d Survival and Reproduction Test

Bio-Analytical Laboratories

Analysis ID: 00-1535-5903 Endpoint: Reproduction CETIS Version: CETIS v2.1.5
Analyzed: 18 Jul-23 15:40 Analysis: Linear Interpolation (ICPIN) Status Level: 1
Edit Date: 18 Jul-23 15:32 MD5 Hash: C53DEE001FC9DE0D69E3CAB081EA661 Editor ID: 008-522-314-5

Batch ID: 17-9001-2151 Test Type: Reproduction-Survival (2-8d) Analyst: Lab Tech
Start Date: 10 Jul-23 18:28 Protocol: EPA/821/R-02-013 (2002) Diluent: Reconstituted Water
Ending Date: 17 Jul-23 16:05 Species: Ceriodaphnia dubia Brine:
Test Length: 6d 22h Taxon: Branchiopoda Source: In-House Culture Age: <24

Sample ID: 17-6518-2827 Code: X8854 Project: WET Monthly Compliance Test (JUL)
Sample Date: 10 Jul-23 05:45 Material: POTW Effluent Source: AR0021776 (AR0021776)
Receipt Date: 10 Jul-23 15:09 CAS (PC): Station: 001
Sample Age: 13h (0.4 °C) Client: Nashville Public Works

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	1430299	1000	Yes	Two-Point Interpolation

Point Estimates

Level	%	95% LCL	95% UCL	Tox Units	95% LCL	95% UCL
IC15	56.69	20.23	---	1.8	---	4.9
IC20	>78	---	---	<1.3	---	---
IC25	>78	---	---	<1.3	---	---
IC40	>78	---	---	<1.3	---	---
IC50	>78	---	---	<1.3	---	---

Reproduction Summary

Conc-%	Code	Count	Calculated Variate						Isotonic Variate	
			Mean	Median	Min	Max	CV%	%Effect	Mean	%Effect
0	D	10	26	26.5	17	31	15.06%	0.00%	26	0.00%
25		10	22.5	22	18	28	12.79%	13.46%	23.2	10.77%
33		10	23.1	24	3	31	33.56%	11.15%	23.2	10.77%
44		10	24	23.5	18	30	15.21%	7.69%	23.2	10.77%
59		10	20.3	21.5	0	30	39.82%	21.92%	21.9	15.77%
78		10	23.5	24	18	29	14.22%	9.62%	21.9	15.77%

Reproduction Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	D	26	27	28	25	17	30	26	23	27	31
25		22	22	21	18	28	20	26	22	22	24
33		21	24	31	29	23	3	22	26	28	24
44		20	23	22	28	25	24	30	18	27	23
59		18	21	21	0	17	23	25	22	26	30
78		18	23	20	26	20	24	29	26	24	25

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CETIS Analytical Report

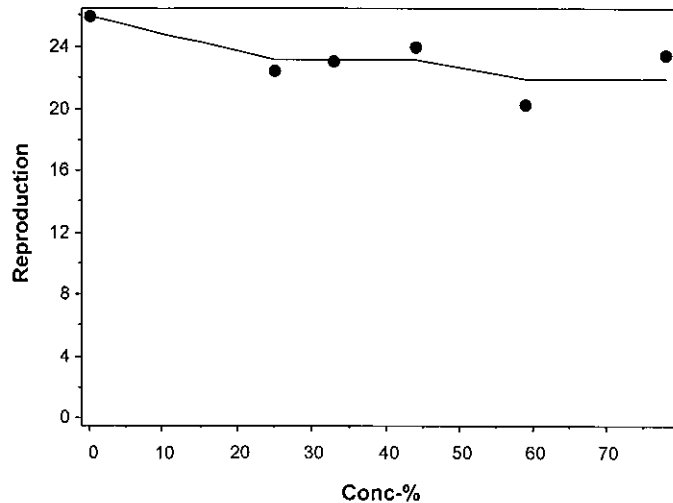
Report Date: 18 Jul-23 15:40 (p 2 of 2)
Test Code/ID: 320D5D76 / 08-3973-6694

Ceriodaphnia 7-d Survival and Reproduction Test

Bio-Analytical Laboratories

Analysis ID: 00-1535-5903	Endpoint: Reproduction	CETIS Version: CETIS v2.1.5
Analyzed: 18 Jul-23 15:40	Analysis: Linear Interpolation (ICPIN)	Status Level: 1
Edit Date: 18 Jul-23 15:32	MD5 Hash: C53DEE001FC9DE0D69E3CAB081EA661	Editor ID: 008-522-314-5

Graphics



ELB
7/20/23

CETIS Analytical Report

Report Date: 19 Jul-23 13:06 (p 1 of 2)
Test Code/ID: 62BA1ACA / 16-5636-3722

Fathead Minnow 7-d Larval Survival and Growth Test

Bio-Analytical Laboratories

Analysis ID: 12-7166-9409	Endpoint: 7d Survival Rate	CETIS Version: CETIS v2.1.5
Analyzed: 19 Jul-23 13:06	Analysis: Parametric-Control vs Treatments	Status Level: 1
Edit Date: 19 Jul-23 12:56	MD5 Hash: 6949278F64A02486E88F265B10199F42	Editor ID: 008-522-314-5
Batch ID: 18-4508-5830	Test Type: Growth-Survival (7d)	Analyst: Lab Tech
Start Date: 11 Jul-23 11:45	Protocol: EPA/821/R-02-013 (2002)	Diluent: Reconstituted Water
Ending Date: 18 Jul-23 10:31	Species: Pimephales promelas	Brine:
Test Length: 6d 23h	Taxon: Actinopterygii	Source: In-House Culture Age: <24
Sample ID: 07-5863-5917	Code: X8854	Project: WET Monthly Compliance Test (JUL)
Sample Date: 10 Jul-23 05:45	Material: POTW Effluent	Source: AR0021776 (AR0021776)
Receipt Date: 10 Jul-23 15:09	CAS (PC):	Station: 001
Sample Age: 30h (0.4 °C)	Client: Nashville Public Works	

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	Tox Units	MSDu	PMSD
Angular (Corrected)	C > T	78	>78	---	1.3	0.225	28.12%

Dunnnett Multiple Comparison Test

Control	vs	Conc-%	df	Test Stat	Critical	MSD	P-Type	P-Value	Decision(α:5%)
Dilution Water		25	8	-0.5387	2.362	0.261	CDF	0.9453	Non-Significant Effect
		33	8	-0.5871	2.362	0.261	CDF	0.9512	Non-Significant Effect
		44	8	-0.871	2.362	0.261	CDF	0.9763	Non-Significant Effect
		59	8	0.03877	2.362	0.261	CDF	0.8216	Non-Significant Effect
		78	8	-0.3585	2.362	0.261	CDF	0.9177	Non-Significant Effect

Test Acceptability Criteria

Attribute	Test Stat	TAC Limits			Decision
		Lower	Upper	Overlap	
Control Resp	0.8	0.8	>>	Yes	Passes Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0384303	0.0076861	5	0.2517	0.9348	Non-Significant Effect
Error	0.733023	0.0305426	24			
Total	0.771453		29			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variance	Bartlett Equality of Variance Test	1.24	15.09	0.9410	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9695	0.9031	0.5251	Normal Distribution

7d Survival Rate Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	5	0.8000	0.6230	0.9770	0.7500	0.6250	1.0000	0.0637	17.82%	0.00%
25		5	0.8500	0.7201	0.9799	0.8750	0.7500	1.0000	0.0468	12.30%	-6.25%
33		5	0.8500	0.6800	1.0000	0.8750	0.6250	1.0000	0.0612	16.11%	-6.25%
44		5	0.8750	0.7198	1.0000	0.8750	0.7500	1.0000	0.0559	14.29%	-9.37%
59		5	0.8000	0.6612	0.9388	0.8750	0.6250	0.8750	0.0500	13.98%	0.00%
78		5	0.8250	0.5896	1.0000	0.8750	0.5000	1.0000	0.0848	22.98%	-3.12%

Angular (Corrected) Transformed Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	5	1.1220	0.8923	1.3510	1.0470	0.9117	1.3930	0.0826	16.47%	0.00%
25		5	1.1810	1.0030	1.3590	1.2090	1.0470	1.3930	0.0642	12.15%	-5.31%
33		5	1.1870	0.9718	1.4010	1.2090	0.9117	1.3930	0.0774	14.58%	-5.79%
44		5	1.2180	1.0030	1.4330	1.2090	1.0470	1.3930	0.0774	14.20%	-8.58%
59		5	1.1170	0.9501	1.2850	1.2090	0.9117	1.2090	0.0603	12.06%	0.38%
78		5	1.1610	0.8823	1.4400	1.2090	0.7854	1.3930	0.1005	19.35%	-3.53%

EJB
7/20/23

CETIS Analytical Report

Report Date: 19 Jul-23 13:06 (p 2 of 2)
 Test Code/ID: 62BA1ACA / 16-5636-3722

Fathead Minnow 7-d Larval Survival and Growth Test

Bio-Analytical Laboratories

Analysis ID: 12-7166-9409 Endpoint: 7d Survival Rate CETIS Version: CETIS v2.1.5
 Analyzed: 19 Jul-23 13:06 Analysis: Parametric-Control vs Treatments Status Level: 1
 Edit Date: 19 Jul-23 12:56 MD5 Hash: 6949278F64A02486E88F265B10199F42 Editor ID: 008-522-314-5

7d Survival Rate Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
0	D	0.6250	0.8750	0.7500	0.7500	1.0000
25		1.0000	0.8750	0.7500	0.8750	0.7500
33		0.8750	1.0000	0.8750	0.8750	0.6250
44		0.7500	0.7500	1.0000	1.0000	0.8750
59		0.6250	0.8750	0.7500	0.8750	0.8750
78		0.8750	0.8750	0.5000	0.8750	1.0000

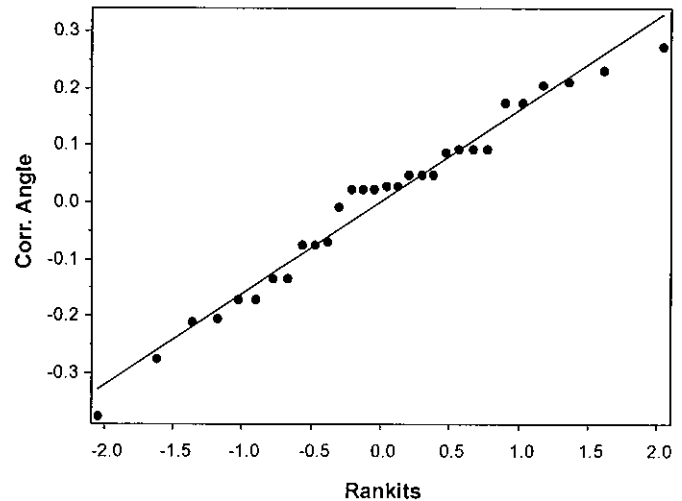
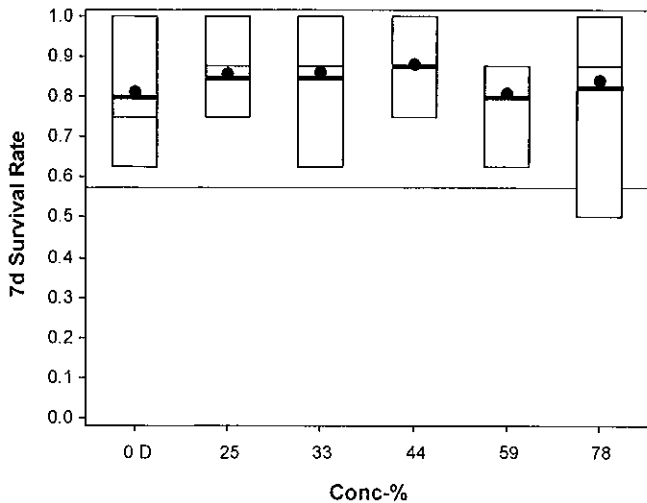
Angular (Corrected) Transformed Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
0	D	0.9117	1.2090	1.0470	1.0470	1.3930
25		1.3930	1.2090	1.0470	1.2090	1.0470
33		1.2090	1.3930	1.2090	1.2090	0.9117
44		1.0470	1.0470	1.3930	1.3930	1.2090
59		0.9117	1.2090	1.0470	1.2090	1.2090
78		1.2090	1.2090	0.7854	1.2090	1.3930

7d Survival Rate Binomials

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
0	D	5/8	7/8	6/8	6/8	8/8
25		8/8	7/8	6/8	7/8	6/8
33		7/8	8/8	7/8	7/8	5/8
44		6/8	6/8	8/8	8/8	7/8
59		5/8	7/8	6/8	7/8	7/8
78		7/8	7/8	4/8	7/8	8/8

Graphics



ELB
7/20/23

CETIS Analytical Report

Report Date: 20 Jul-23 14:42 (p 1 of 2)
Test Code/ID: 62BA1ACA / 16-5636-3722

Fathead Minnow 7-d Larval Survival and Growth Test

Bio-Analytical Laboratories

Analysis ID: 09-5556-7331	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETIS v2.1.5
Analyzed: 20 Jul-23 14:42	Analysis: Parametric-Control vs Treatments	Status Level: 1
Edit Date: 20 Jul-23 14:41	MD5 Hash: 22336307EA6BC7F5F9C5BCEE6CD0AE37	Editor ID: 008-522-314-5
Batch ID: 18-4508-5830	Test Type: Growth-Survival (7d)	Analyst: Lab Tech
Start Date: 11 Jul-23 11:45	Protocol: EPA/821/R-02-013 (2002)	Diluent: Reconstituted Water
Ending Date: 18 Jul-23 10:31	Species: Pimephales promelas	Brine:
Test Length: 6d 23h	Taxon: Actinopterygii	Source: In-House Culture Age: <24
Sample ID: 07-5863-5917	Code: X8854	Project: WET Monthly Compliance Test (JUL)
Sample Date: 10 Jul-23 05:45	Material: POTW Effluent	Source: AR0021776 (AR0021776)
Receipt Date: 10 Jul-23 15:09	CAS (PC):	Station: 001
Sample Age: 30h (0.4 °C)	Client: Nashville Public Works	

Data Transform	Alt Hyp	NOEL	LOEL	TOEL	Tox Units	MSDu	PMSD
Untransformed	C > T	78	>78	---	1.3	0.2006	42.45%

Dunnett Multiple Comparison Test

Control	vs	Conc-%	df	Test Stat	Critical	MSD	P-Type	P-Value	Decision(α:5%)
Dilution Water		25	8	-1.678	2.362	0.2006	CDF	0.9979	Non-Significant Effect
		33	8	-2.531	2.362	0.2006	CDF	0.9999	Non-Significant Effect
		44	8	-2.355	2.362	0.2006	CDF	0.9998	Non-Significant Effect
		59	8	-2.267	2.362	0.2006	CDF	0.9997	Non-Significant Effect
		78	8	-2.502	2.362	0.2006	CDF	0.9999	Non-Significant Effect

Test Acceptability Criteria

Attribute	Test Stat	TAC Limits			Decision
		Lower	Upper	Overlap	
Control Resp	0.4725	0.25	>>	Yes	Passes Criteria
PMSD	0.4245	0.12	0.3	Yes	Above Criteria

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.171722	0.0343443	5	1.905	0.1309	Non-Significant Effect
Error	0.432797	0.0180332	24			
Total	0.604519		29			

ANOVA Assumptions Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variance	Bartlett Equality of Variance Test	0.8086	15.09	0.9765	Equal Variances
Distribution	Shapiro-Wilk W Normality Test	0.9034	0.9031	0.0102	Normal Distribution

Mean Dry Biomass-mg Summary

Conc-%	Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	D	5	0.4725	0.3448	0.6002	0.5	0.3125	0.575	0.04599	21.77%	0.00%
25		5	0.615	0.4403	0.7897	0.65	0.375	0.7375	0.06292	22.88%	-30.16%
33		5	0.6875	0.5339	0.8411	0.6875	0.4875	0.8125	0.05534	18.00%	-45.50%
44		5	0.6725	0.4739	0.8711	0.7125	0.475	0.8375	0.07152	23.78%	-42.33%
59		5	0.665	0.4862	0.8438	0.7125	0.5125	0.85	0.06439	21.65%	-40.74%
78		5	0.685	0.527	0.8431	0.7375	0.4625	0.775	0.05693	18.58%	-44.98%

Mean Dry Biomass-mg Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
0	D	0.4375	0.5	0.575	0.5375	0.3125
25		0.7375	0.625	0.6875	0.375	0.65
33		0.6875	0.7625	0.6875	0.8125	0.4875
44		0.475	0.5375	0.8375	0.8	0.7125
59		0.7125	0.725	0.5125	0.525	0.85
78		0.7375	0.75	0.4625	0.7	0.775

EUB
7/20/23

CETIS Analytical Report

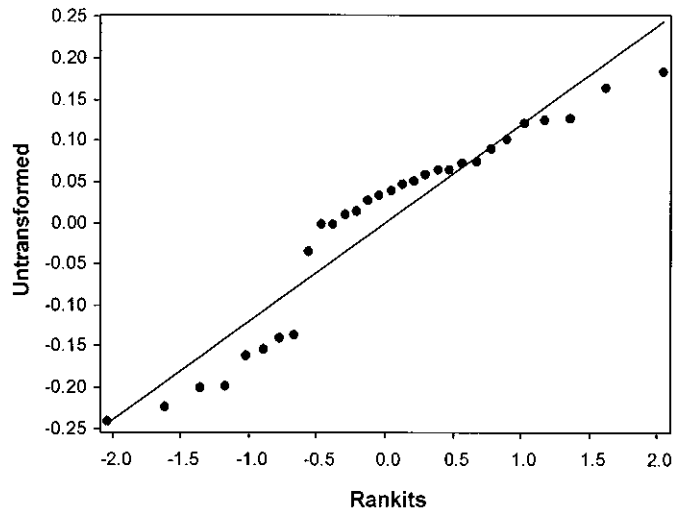
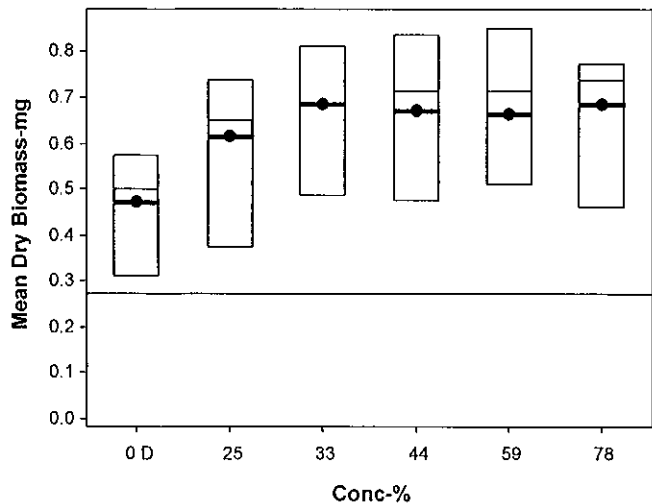
Report Date: 20 Jul-23 14:42 (p 2 of 2)
Test Code/ID: 62BA1ACA / 16-5636-3722

Fathead Minnow 7-d Larval Survival and Growth Test

Bio-Analytical Laboratories

Analysis ID: 09-5556-7331	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETIS v2.1.5
Analyzed: 20 Jul-23 14:42	Analysis: Parametric-Control vs Treatments	Status Level: 1
Edit Date: 20 Jul-23 14:41	MD5 Hash: 22336307EA6BC7F5F9C5BCEE6CD0AE37	Editor ID: 008-522-314-5

Graphics



EVB
7/20/23

CETIS Analytical Report

Report Date: 20 Jul-23 14:42 (p 1 of 2)
Test Code/ID: 62BA1ACA / 16-5636-3722

Fathead Minnow 7-d Larval Survival and Growth Test

Bio-Analytical Laboratories

Analysis ID: 14-8391-3061 Endpoint: Mean Dry Biomass-mg CETIS Version: CETIS v2.1.5
Analyzed: 20 Jul-23 14:42 Analysis: Linear Interpolation (ICPIN) Status Level: 1
Edit Date: 20 Jul-23 14:41 MD5 Hash: 22336307EA6BC7F5F9C5BCCE6CD0AE37 Editor ID: 008-522-314-5

Batch ID: 18-4508-5830 Test Type: Growth-Survival (7d) Analyst: Lab Tech
Start Date: 11 Jul-23 11:45 Protocol: EPA/821/R-02-013 (2002) Diluent: Reconstituted Water
Ending Date: 18 Jul-23 10:31 Species: Pimephales promelas Brine:
Test Length: 6d 23h Taxon: Actinopterygii Source: In-House Culture Age: <24

Sample ID: 07-5863-5917 Code: X8854 Project: WET Monthly Compliance Test (JUL)
Sample Date: 10 Jul-23 05:45 Material: POTW Effluent Source: AR0021776 (AR0021776)
Receipt Date: 10 Jul-23 15:09 CAS (PC): Station: 001
Sample Age: 30h (0.4 °C) Client: Nashville Public Works

Linear Interpolation Options

X Transform	Y Transform	Seed	Resamples	Exp 95% CL	Method
Linear	Linear	1243452	1000	Yes	Two-Point Interpolation

Test Acceptability Criteria

Attribute	Test Stat	TAC Limits		Overlap	Decision
		Lower	Upper		
Control Resp	0.4725	0.25	>>	Yes	Passes Criteria

Point Estimates

Level	%	95% LCL	95% UCL	Tox Units	95% LCL	95% UCL
IC15	>78	---	---	<1.3	---	---
IC20	>78	---	---	<1.3	---	---
IC25	>78	---	---	<1.3	---	---
IC40	>78	---	---	<1.3	---	---
IC50	>78	---	---	<1.3	---	---

Mean Dry Biomass-mg Summary

Conc-%	Code	Count	Calculated Variate						Isotonic Variate	
			Mean	Median	Min	Max	CV%	%Effect	Mean	%Effect
0	D	5	0.4725	0.5	0.3125	0.575	21.77%	0.00%	0.6329	0.00%
25		5	0.615	0.65	0.375	0.7375	22.88%	-30.16%	0.6329	0.00%
33		5	0.6875	0.6875	0.4875	0.8125	18.00%	-45.50%	0.6329	0.00%
44		5	0.6725	0.7125	0.475	0.8375	23.78%	-42.33%	0.6329	0.00%
59		5	0.665	0.7125	0.5125	0.85	21.65%	-40.74%	0.6329	0.00%
78		5	0.685	0.7375	0.4625	0.775	18.58%	-44.98%	0.6329	0.00%

Mean Dry Biomass-mg Detail

Conc-%	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
0	D	0.4375	0.5	0.575	0.5375	0.3125
25		0.7375	0.625	0.6875	0.375	0.65
33		0.6875	0.7625	0.6875	0.8125	0.4875
44		0.475	0.5375	0.8375	0.8	0.7125
59		0.7125	0.725	0.5125	0.525	0.85
78		0.7375	0.75	0.4625	0.7	0.775

*EUB
7/20/23*

CETIS Analytical Report

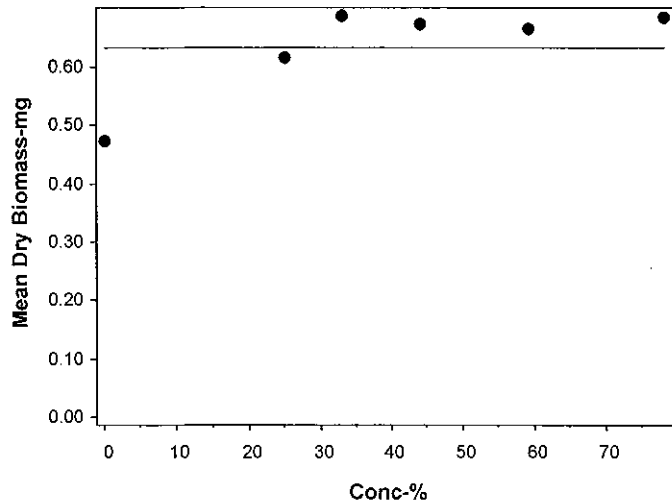
Report Date: 20 Jul-23 14:42 (p 2 of 2)
Test Code/ID: 62BA1ACA / 16-5636-3722

Fathead Minnow 7-d Larval Survival and Growth Test

Bio-Analytical Laboratories

Analysis ID: 14-8391-3061	Endpoint: Mean Dry Biomass-mg	CETIS Version: CETIS v2.1.5
Analyzed: 20 Jul-23 14:42	Analysis: Linear Interpolation (ICPIN)	Status Level: 1
Edit Date: 20 Jul-23 14:41	MD5 Hash: 22336307EA6BC7F5F9C5BCEE6CD0AE37	Editor ID: 008-522-314-5

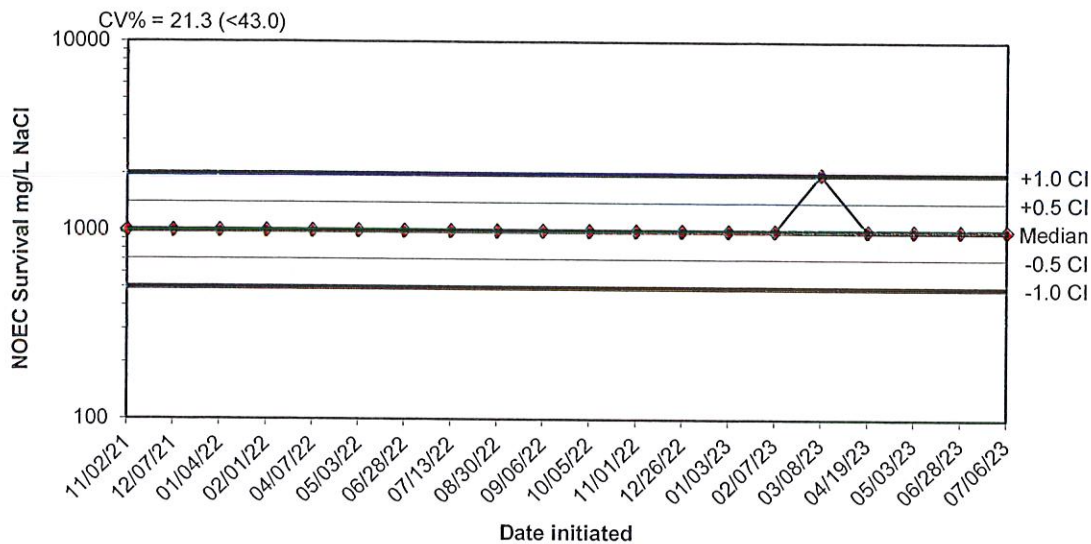
Graphics



EVB
7/20/23

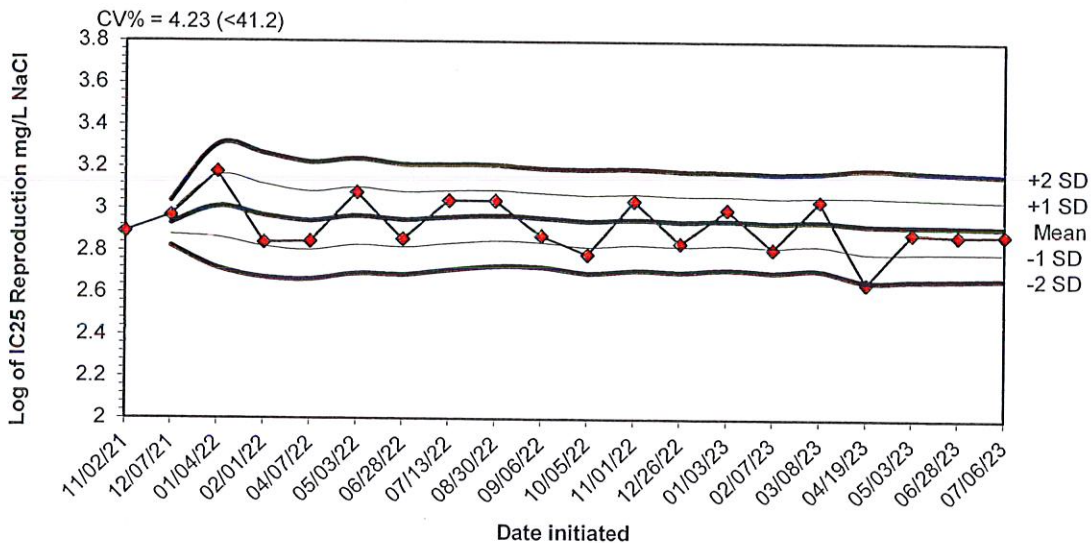
APPENDIX D
QUALITY ASSURANCE CHARTS

**CHRONIC REFERENCE TOXICANT TEST RESULTS FOR
 CERIODAPHNIA DUBIA IN MODERATELY HARD WATER**



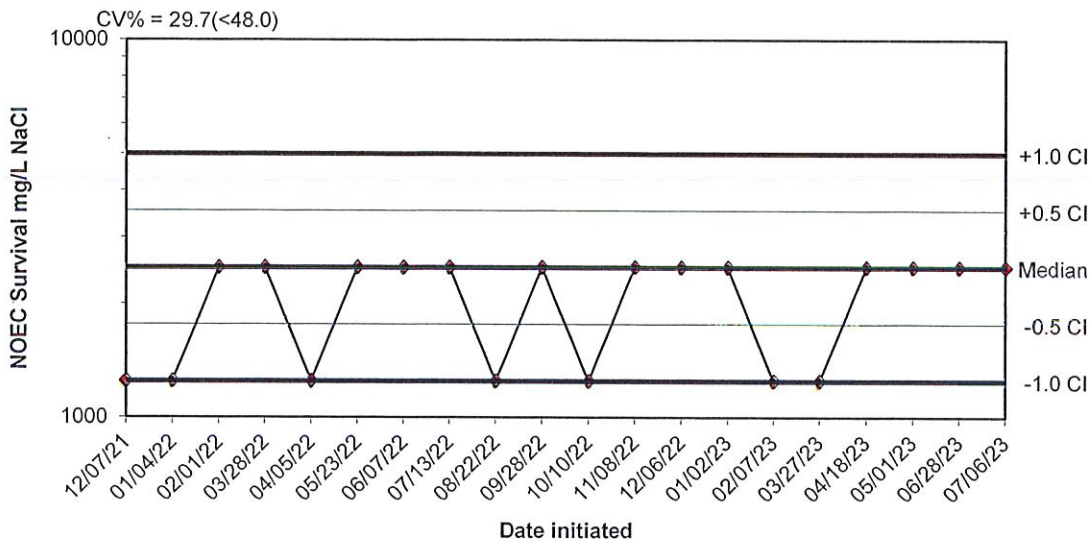
Dates	Values	Median	-0.5 CI	-1.0 CI	+0.5 CI	+1.0 CI
11/02/21	1000.0000	1000.0000	707.1068	500.0000	1414.2136	2000.0000
12/07/21	1000.0000	1000.0000	707.1068	500.0000	1414.2136	2000.0000
01/04/22	1000.0000	1000.0000	707.1068	500.0000	1414.2136	2000.0000
02/01/22	1000.0000	1000.0000	707.1068	500.0000	1414.2136	2000.0000
04/07/22	1000.0000	1000.0000	707.1068	500.0000	1414.2136	2000.0000
05/03/22	1000.0000	1000.0000	707.1068	500.0000	1414.2136	2000.0000
06/28/22	1000.0000	1000.0000	707.1068	500.0000	1414.2136	2000.0000
07/13/22	1000.0000	1000.0000	707.1068	500.0000	1414.2136	2000.0000
08/30/22	1000.0000	1000.0000	707.1068	500.0000	1414.2136	2000.0000
09/06/22	1000.0000	1000.0000	707.1068	500.0000	1414.2136	2000.0000
10/05/22	1000.0000	1000.0000	707.1068	500.0000	1414.2136	2000.0000
11/01/22	1000.0000	1000.0000	707.1068	500.0000	1414.2136	2000.0000
12/26/22	1000.0000	1000.0000	707.1068	500.0000	1414.2136	2000.0000
01/03/23	1000.0000	1000.0000	707.1068	500.0000	1414.2136	2000.0000
02/07/23	1000.0000	1000.0000	707.1068	500.0000	1414.2136	2000.0000
03/08/23	2000.0000	1000.0000	707.1068	500.0000	1414.2136	2000.0000
04/19/23	1000.0000	1000.0000	707.1068	500.0000	1414.2136	2000.0000
05/03/23	1000.0000	1000.0000	707.1068	500.0000	1414.2136	2000.0000
06/28/23	1000.0000	1000.0000	707.1068	500.0000	1414.2136	2000.0000
07/06/23	1000.0000	1000.0000	707.1068	500.0000	1414.2136	2000.0000

CHRONIC REFERENCE TOXICANT TEST RESULTS FOR CERIODAPHNIA DUBIA IN MODERATELY HARD WATER



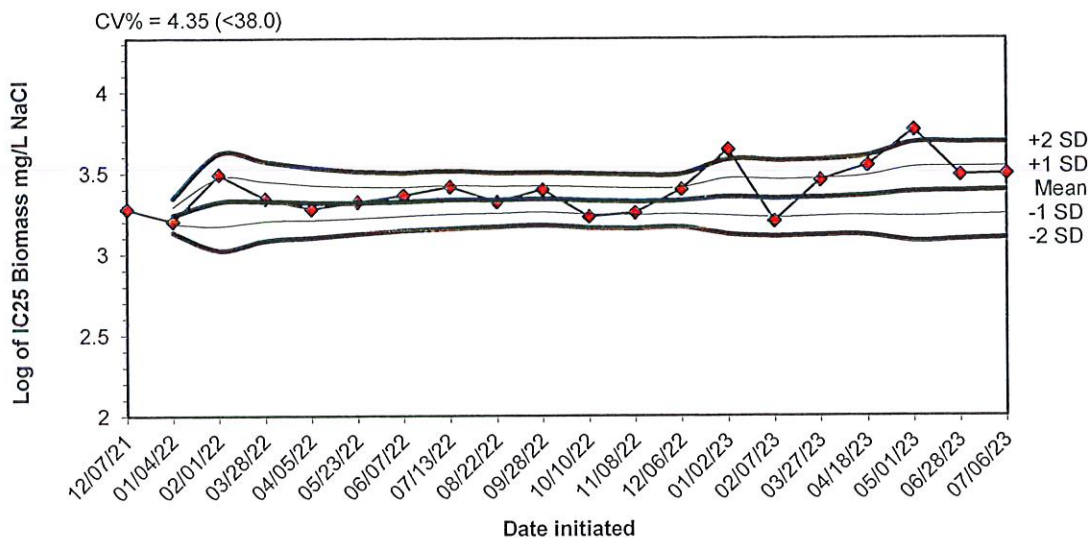
Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
11/02/21	2.8921					
12/07/21	2.9685	2.9303	2.8763	2.8223	2.9843	3.0383
01/04/22	3.1761	3.0122	2.8653	2.7183	3.1592	3.3062
02/01/22	2.8388	2.9689	2.8208	2.6728	3.1169	3.2649
04/07/22	2.8451	2.9441	2.8045	2.6648	3.0838	3.2234
05/03/22	3.0792	2.9666	2.8301	2.6936	3.1032	3.2397
06/28/22	2.8573	2.9510	2.8197	2.6884	3.0823	3.2136
07/13/22	3.0414	2.9623	2.8366	2.7109	3.0880	3.2137
08/30/22	3.0414	2.9711	2.8506	2.7301	3.0916	3.2121
09/06/22	2.8751	2.9615	2.8439	2.7263	3.0791	3.1967
10/05/22	2.7853	2.9455	2.8219	2.6984	3.0690	3.1926
11/01/22	3.0414	2.9535	2.8325	2.7114	3.0745	3.1955
12/26/22	2.8388	2.9447	2.8245	2.7044	3.0648	3.1849
01/03/23	3.0000	2.9486	2.8322	2.7159	3.0650	3.1814
02/07/23	2.8129	2.9396	2.8221	2.7046	3.0571	3.1745
03/08/23	3.0414	2.9459	2.8296	2.7133	3.0623	3.1786
04/19/23	2.6501	2.9285	2.7950	2.6614	3.0621	3.1956
05/03/23	2.8890	2.9263	2.7964	2.6666	3.0562	3.1861
06/28/23	2.8774	2.9238	2.7970	2.6703	3.0505	3.1772
07/06/23	2.8824	2.9217	2.7980	2.6743	3.0454	3.1691

**CHRONIC REFERENCE TOXICANT TEST RESULTS FOR PIMEPHALES
 PROMELAS IN MODERATELY HARD WATER**



Dates	Values	Median	-0.5 CI	-1.0 CI	+0.5 CI	+1.0 CI
12/07/21	1250.0000	2500.0000	1767.7670	1250.0000	3535.5339	5000.0000
01/04/22	1250.0000	2500.0000	1767.7670	1250.0000	3535.5339	5000.0000
02/01/22	2500.0000	2500.0000	1767.7670	1250.0000	3535.5339	5000.0000
03/28/22	2500.0000	2500.0000	1767.7670	1250.0000	3535.5339	5000.0000
04/05/22	1250.0000	2500.0000	1767.7670	1250.0000	3535.5339	5000.0000
05/23/22	2500.0000	2500.0000	1767.7670	1250.0000	3535.5339	5000.0000
06/07/22	2500.0000	2500.0000	1767.7670	1250.0000	3535.5339	5000.0000
07/13/22	2500.0000	2500.0000	1767.7670	1250.0000	3535.5339	5000.0000
08/22/22	1250.0000	2500.0000	1767.7670	1250.0000	3535.5339	5000.0000
09/28/22	2500.0000	2500.0000	1767.7670	1250.0000	3535.5339	5000.0000
10/10/22	1250.0000	2500.0000	1767.7670	1250.0000	3535.5339	5000.0000
11/08/22	2500.0000	2500.0000	1767.7670	1250.0000	3535.5339	5000.0000
12/06/22	2500.0000	2500.0000	1767.7670	1250.0000	3535.5339	5000.0000
01/02/23	2500.0000	2500.0000	1767.7670	1250.0000	3535.5339	5000.0000
02/07/23	1250.0000	2500.0000	1767.7670	1250.0000	3535.5339	5000.0000
03/27/23	1250.0000	2500.0000	1767.7670	1250.0000	3535.5339	5000.0000
04/18/23	2500.0000	2500.0000	1767.7670	1250.0000	3535.5339	5000.0000
05/01/23	2500.0000	2500.0000	1767.7670	1250.0000	3535.5339	5000.0000
06/28/23	2500.0000	2500.0000	1767.7670	1250.0000	3535.5339	5000.0000
07/06/23	2500.0000	2500.0000	1767.7670	1250.0000	3535.5339	5000.0000

CHRONIC REFERENCE TOXICANT TEST RESULTS FOR PIMEPHALES PROMELAS IN MODERATELY HARD WATER



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
12/07/21	3.2788					
01/04/22	3.2041	3.2414	3.1887	3.1359	3.2942	3.3470
02/01/22	3.4914	3.3247	3.1757	3.0267	3.4738	3.6228
03/28/22	3.3424	3.3292	3.2072	3.0851	3.4512	3.5732
04/05/22	3.2788	3.3191	3.2110	3.1030	3.4271	3.5352
05/23/22	3.3222	3.3196	3.2230	3.1263	3.4163	3.5129
06/07/22	3.3617	3.3256	3.2360	3.1463	3.4153	3.5049
07/13/22	3.4150	3.3368	3.2480	3.1592	3.4256	3.5144
08/22/22	3.3222	3.3352	3.2520	3.1687	3.4184	3.5016
09/28/22	3.3979	3.3414	3.2605	3.1796	3.4224	3.5033
10/10/22	3.2304	3.3314	3.2476	3.1639	3.4151	3.4989
11/08/22	3.2553	3.3250	3.2422	3.1594	3.4078	3.4907
12/06/22	3.3979	3.3306	3.2488	3.1670	3.4125	3.4943
01/02/23	3.6435	3.3530	3.2382	3.1234	3.4677	3.5825
02/07/23	3.2041	3.3430	3.2260	3.1089	3.4601	3.5772
03/27/23	3.4550	3.3500	3.2335	3.1170	3.4666	3.5831
04/18/23	3.5469	3.3616	3.2391	3.1166	3.4841	3.6066
05/01/23	3.7654	3.3841	3.2318	3.0795	3.5363	3.6886
06/28/23	3.4878	3.3895	3.2396	3.0898	3.5394	3.6893
07/06/23	3.4949	3.3948	3.2470	3.0993	3.5425	3.6903

**APPENDIX E
AGENCY FORMS**

**SUMMARY REPORTING FORMS
 CHRONIC BIOMONITORING
Ceriodaphnia dubia Survival and Reproduction**

Permittee: Nashville Public Works

NPDES No.: AR0021776/ AFIN 31-00036

	Time	Date		Time	Date
Composite 1 Collected From	0545	07/10/23	To	0545	07/10/23
Composite 2 Collected From	2122	07/11/23	To	2122	07/11/23
Composite 3 Collected From	0715	07/13/23	To	0439	07/14/23
Test initiated:	1828	am/pm		07/10/23	Date
Test terminated:	1605	am/pm		07/17/23	Date
Dilution water used:	Receiving		X	Reconstituted	

PERCENT SURVIVAL

Time of Reading	Percent Effluent					
	0	25.0	33.0	44.0	59.0	78.0
24h	100.0	100.0	100.0	100.0	100.0	100.0
48h	100.0	100.0	100.0	100.0	90.0	100.0
End of test	100.0	100.0	90.0	100.0	90.0	100.0

NUMBER OF YOUNG PRODUCED PER FEMALE @ END OF TEST

Rep	0	25.0	33.0	44.0	59.0	78.0
A	26	22	21	20	18	18
B	27	22	24	23	21	23
C	28	21	31	22	21	20
D	25	18	29	28	D	26
E	17	28	23	25	17	20
F	30	20	D3	24	23	24
G	26	26	22	30	25	29
H	23	22	26	18	22	26
I	27	22	28	27	26	24
J	31	24	24	23	30	25
Surv. Mean	26.0	22.5	25.3	24.0	22.6	23.5
Total Mean	26.0	22.5	23.1	24.0	20.3	23.5
CV%*	15.06	12.79	13.39	15.21	17.89	14.22

*coefficient of variation = standard deviation x 100/mean. D=dead adult

PMSD = 21.18%

Ceriodaphnia dubia
Survival and Reproduction (continued)

1. Fisher's Exact Test:

Is the mean survival at the end of the test significantly different ($p=.05$) than the control survival for the % effluent corresponding to (lethality):

- | | | | |
|---|-----|---|----|
| a) LOW FLOW OR CRITICAL DILUTION (78.0%): | YES | X | NO |
| b) ½ LOW FLOW DILUTION (NA%): | YES | | NO |

2. Dunnett's Procedure or Steel's Many-One Rank Test as appropriate:

Is the mean number of young produced per female significantly different ($p=.05$) than the control's number of young per female for the % effluent corresponding to (significant non-lethal effects):

- | | | | |
|---|-----|---|----|
| a) LOW FLOW OR CRITICAL DILUTION (78.0%): | YES | X | NO |
| b) ½ LOW FLOW DILUTION (NA%): | YES | | NO |

3. If you answered NO to 1. a) and 2. a) enter (0) otherwise enter (1): 0

4. If you answered NO to 1. b) and 2. b) enter (0) otherwise enter (1):

5. Enter response to item 3 on DMR Form, parameter #TEP3B.

6. Enter response to item 4 on DMR Form, parameter #TFP3B.

7. Enter percent effluent corresponding to each NOEC below:

- | | |
|-----------------------|-----------------|
| a) NOEC survival: | 78.0 % effluent |
| b) NOEC reproduction: | 78.0 % effluent |

Biomonitoring Form
Chronic Toxicity Summary Form for *Ceriodaphnia dubia*
Chemical Parameters Chart

Permittee: Nashville Public Works
 NPDES#: AR0021776/ AFIN 31-00036
 Contact: Larry Dunaway
 Analysts: Ware, Mitchell, Miller

Sample #1 Collected: 7/10/2023 Time: 545
 Sample #2 Collected: 7/11/2023 Time: 2122
 Sample #3 Collected: 7/14/2023 Time: 439
 Test Begin: 7/10/2023 Time: 1828
 Test End: 7/17/2023 Time: 1605

Dilution:	0%						
Day:	1	2	3	4	5	6	7
T (°C)	24.3	24.4	24.1	24.3	24.7	25.0	25.1
DO Initial	8.6	8.3	8.6	9.0	7.9	7.2	7.3
DO Final	8.1	8.0	8.0	8.5	7.5	7.9	
pH Initial	7.5	7.1	7.4	7.5	7.4	7.3	7.4
pH Final	7.1	7.4	7.4	7.9	7.9	7.2	
Conductivity	337.0	314.0	336.0	315.0	301.0	313.0	
Alkalinity	48.0		28.0				
Hardness	88.0		48.0				
Chlorine	<0.5		<0.5				
Dilution:	25.0%						
Day:	1	2	3	4	5	6	7
T (°C)	24.3	24.4	24.1	24.3	24.7	25.0	25.1
DO Initial	8.6	8.1	8.6	8.9	8.4	8.3	7.9
DO Final	8.0	7.6	8.0	8.3	7.5	7.7	
pH Initial	7.6	7.3	7.6	7.7	7.4	7.4	7.6
pH Final	7.5	7.3	7.4	7.7	7.4	7.2	
Conductivity	317.0	318.0	323.0	315.0	301.0	310.0	
Alkalinity							
Hardness							
Chlorine							
Dilution:	33.0%						
Day:	1	2	3	4	5	6	7
T (°C)	24.3	24.4	24.1	24.3	24.7	25.0	25.1
DO Initial	8.6	8.3	8.7	9.1	8.4	8.2	7.6
DO Final	8.0	7.6	7.9	8.2	7.5	7.1	
pH Initial	7.6	7.4	7.7	7.8	7.6	7.6	7.4
pH Final	7.5	7.4	7.4	7.6	7.3	7.2	
Alkalinity							
Hardness	318.0	317.0	312.0	315.0	303.0	312.0	
Conductivity							
Chlorine							
Dilution:	44.0%						
Day:	1	2	3	4	5	6	7
T (°C)	24.3	24.4	24.1	24.3	24.7	25.0	25.1
DO Initial	8.5	8.3	8.4	9.2	8.7	8.3	7.5
DO Final	8.2	7.3	7.9	8.0	7.3	7.4	
pH Initial	7.6	7.5	7.8	7.8	7.4	7.4	7.6
pH Final	7.4	7.3	7.4	7.5	7.3	7.4	
Conductivity	326.0	322.0	317.0	320.0	305.0	311.0	
Alkalinity							
Hardness							
Chlorine							
Dilution:	59.0%						
Day:	1	2	3	4	5	6	7
T (°C)	24.3	24.4	24.1	24.3	24.7	25.0	25.1
DO Initial	8.7	8.4	8.6	9.3	8.4	8.5	7.5
DO Final	8.2	7.4	7.8	8.2	7.5	7.4	
pH Initial	7.8	7.5	7.8	7.8	7.6	7.6	7.6
pH Final	7.4	7.3	7.4	7.5	7.3	7.4	
Conductivity	336.0	338.0	329.0	320.0	308.0	313.0	
Alkalinity							
Hardness							
Chlorine							
Dilution:	78.0%						
Day:	1	2	3	4	5	6	7
T (°C)	24.3	24.4	24.1	24.3	24.7	25.0	25.1
DO Initial	8.6	8.5	8.6	9.3	8.3	8.5	7.4
DO Final	8.3	7.4	7.7	8.3	7.6	7.3	
pH Initial	7.8	7.6	7.9	7.9	7.7	7.2	7.3
pH Final	7.4	7.3	7.4	7.4	7.3	7.4	
Conductivity	343.0	350.0	346.0	323.0	312.0	310.0	
Alkalinity	64.0		52.0		24.0		
Hardness	96.0		96.0		84.0		
Chlorine	<0.5		<0.5		<0.5		

Comments:

**SUMMARY REPORTING FORMS CHRONIC BIOMONITORING
 FATHEAD MINNOW LARVAE GROWTH AND SURVIVAL
 (*Pimephales promelas*)**

Permittee: Nashville Public Works NPDES No.: AR0021776/ AFIN 31-00036

	Time	Date		Time	Date
Composite 1 Collected from:	0545	07/10/23	To	0545	07/10/23
Composite 2 Collected from:	2122	07/11/23	To	2122	07/11/23
Composite 3 Collected from:	0715	07/13/23	To	0715	07/14/23
Test initiated:	1145	am/pm		07/11/23	date
Test terminated:	1031	am/pm		07/18/23	date
Dilution water used:	Receiving		X	Reconstituted	

DATA TABLE FOR SURVIVAL

Effluent Conc. %	Percent Survival in Replicate Chambers					Mean Percent Survival			CV%*
	A	B	C	D	E	24h	48h	7 days	
0	62.5	87.5	75.0	75.0	100.0	100.0	100.0	80.0	16.47
25.0	100.0	87.5	75.0	87.5	75.0	100.0	100.0	85.0	12.15
33.0	87.5	100.0	87.5	87.5	62.5	100.0	100.0	85.0	14.58
44.0	75.0	75.0	100.0	100.0	87.5	100.0	100.0	87.5	14.20
59.0	62.5	87.5	75.0	87.5	87.5	100.0	100.0	80.0	12.06
78.0	87.5	87.5	50.0	87.5	100.0	100.0	100.0	82.5	19.35

DATA TABLE FOR GROWTH

Effluent Conc. %	Average Dry Weight in milligrams in replicate chambers					Mean Dry Weight mg	CV*
	A	B	C	D	E		
0	0.438	0.500	0.575	0.538	0.313	0.473	21.77
25.0	0.738	0.625	0.688	0.375	0.650	0.615	22.88
33.0	0.688	0.763	0.688	0.813	0.488	0.688	18.00
44.0	0.475	0.538	0.838	0.800	0.713	0.673	23.78
59.0	0.713	0.725	0.513	0.525	0.850	0.665	21.65
78.0	0.738	0.750	0.463	0.700	0.775	0.685	18.58

*coefficient of variation = standard deviation x 100/mean.

PMSD: 42.45%

FATHEAD MINNOW LARVAE GROWTH AND SURVIVAL (cont)
(Pimephales promelas)

1. Dunnett's Procedure or Steels Many-One Rank Test as appropriate:

Is the mean survival at 7 days significantly different ($p=.05$) than the control survival for the % effluent corresponding to:

a) LOW FLOW OR CRITICAL DILUTION (78.0 %)	YES	X	NO
b) ½ LOW FLOW DILUTION (NA %)	YES		NO

2. Dunnett's Procedure (or appropriate test):

Is the mean dry weight (growth) at 7 days significantly different ($p=.05$) than the control's dry weight for the % effluent corresponding to (significant non-lethal effects):

a) LOW FLOW OR CRITICAL DILUTION (78.0 %)	YES	X	NO
b) ½ LOW FLOW DILUTION (NA %)	YES		NO

3. If you answered NO to 1. a) and 2. a) enter (0) otherwise enter (1): 0

4. If you answered NO to 1. b) and 2. b) enter (0) otherwise enter (1):

5. Enter response to item 3 on DMR Form, parameter #TEP6C.

6. Enter response to item 4 on DMR Form, parameter #TFP6C.

7. Enter percent effluent corresponding to each NOEC below:

a.) NOEC survival	78.0% effluent.
b.) NOEC growth	78.0% effluent.

Biomonitoring Form
Chronic Toxicity Summary Form for *Pimephales promelas*
Chemical Parameters Chart

Permittee: Nashville Public Works
 NPDES#: AR002176/ AFIN 31-00036
 Contact: Larry Dunaway
 Analysts: Ware, Mitchell, Valle, Miller

Sample #1 Collected: 7/10/2023 Time: 5:45
 Sample #2 Collected: 7/11/2023 Time: 2:22
 Sample #3 Collected: 7/14/2023 Time: 4:39
 Test Begin: 7/11/2023 Time: 11:45
 Test End: 7/18/2023 Time: 10:31

Dilution:	0%						
Day:	1	2	3	4	5	6	7
T (°C)	24.8	25.8	25.2	25.4	25.6	26.0	26.5
DO Initial	7.3	7.1	6.6	7.2	7.4	7.2	5.5
DO Final	7.3	8.0	8.0	7.8	7.9	8.0	
pH Initial	7.4	6.3	6.5	7.3	7.3	6.8	6.5
pH Final	7.1	7.3	7.0	7.4	7.5	7.9	
Conductivity	304.0	307.0	301.0	300.0	311.0	310.0	
Alkalinity	64.0	28.0					
Hardness	84.0	48.0					
Chlorine	<0.5	<0.5					
Dilution:	25.0%						
Day:	1	2	3	4	5	6	7
T (°C)	24.8	25.8	25.2	25.4	25.6	26.0	26.5
DO Initial	7.3	7.0	6.8	6.9	7.3	6.5	5.4
DO Final	7.6	7.9	8.3	7.7	7.8	7.8	
pH Initial	7.4	6.6	6.6	7.0	7.2	6.8	6.4
pH Final	7.3	7.7	7.2	7.5	7.5	7.8	
Conductivity	322.0	299.0	313.0	306.0	312.0	304.0	
Alkalinity							
Hardness							
Chlorine							
Dilution:	33.0%						
Day:	1	2	3	4	5	6	7
T (°C)	24.8	25.8	25.2	25.4	25.6	26.0	26.5
DO Initial	7.3	6.2	6.8	6.9	6.7	6.3	5.3
DO Final	7.4	8.3	8.3	7.6	7.7	7.7	
pH Initial	7.4	6.8	6.7	7.2	7.3	6.7	6.4
pH Final	7.2	7.6	7.2	7.4	7.5	7.7	
Alkalinity							
Hardness							
Conductivity	324.0	303.0	317.0	308.0	313.0	311.0	
Chlorine							
Dilution:	78.0%						
Day:	1	2	3	4	5	6	7
T (°C)	24.8	25.8	25.2	25.4	25.6	26.0	26.5
DO Initial	7.3	6.4	6.1	7.2	6.8	5.6	5.1
DO Final	8.0	8.3	8.4	7.7	7.8	7.7	
pH Initial	7.4	6.9	6.7	7.3	7.0	6.6	6.3
pH Final	7.2	7.6	7.2	7.3	7.6	7.5	
Alkalinity	64.0	52.0		24.0			
Hardness	96.0	96.0		84.0			
Conductivity	356.0	314.0	325.0	321.0	323.0	320.0	
Chlorine	<0.5	<0.5		<0.5			

Comments:

APPENDIX F
REPORT QUALITY ASSURANCE FORM



Bio-Analytical Laboratories

3240 Spurgin Road
Post Office Box 527
Doyline, LA 71023

(318) 745-2772
1-800-259-1248
Fax: (318) 745-2773

REPORT QUALITY ASSURANCE FORM

Client: Nashville Public Works

Project#: X8854

Chain of Custody Documents Checked by: Endy Moore 7/19/23
Technician/Date

Raw Data Documents Checked by: Endy Moore 7/19/23
Technician/Date

Statistical Analysis Package Checked by: EGB 7/20/23
Quality Manager/Date

Quality Control Data Checked by: EGB 7/20/23
Quality Manager/Date

Report Checked by: EGB 8/1/23
Quality Manager/Date

I certify that this document was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. The information contained in this document, to the best of my knowledge, is true, accurate and complete.

Cynthia Brupp, BS
Quality Manager

8/1/23
Date

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