

Bio-Analytical Laboratories (BAL)
ADEQ Certificate #88-0630
Project X5466

Bio-Analytical Laboratories' Executive Summary

Permittee: Magnolia Wastewater System
P.O. Box 666
Magnolia, AR 71753

Project #: X5466

Outfall: 001 (treated municipal wastewater)

Permit #: AR0043613/ AFIN #14-00059

Contact: Russell Thomas

Dates: June 24 - July 2, 2014

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 (100.0%), 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 - 100.0%.
4. Report the NOEC value for reproduction, Parameter TPP3B - 100.0%.
5. Report the largest % coefficient of variation between the control and the critical dilution, Parameter TQP3B - 24.51%.

For *Pimephales promelas*:

1. If the NOEC for survival is less than the critical dilution (100.0%), 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 - 100.0%.
4. Report the NOEC value for reproduction, Parameter TPP6C - 100.0%.
5. Report the largest % coefficient of variation between the control and the critical dilution, Parameter TQP6C - 30.68%.

This report contains a total of 42 pages, including this page. The results contained within pertains 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

3240 Spurgin Road
Post Office Box 527
Doyline, LA 71023

(318) 745-2772
1-800-259-1246
Fax: (318) 745-2773

THE RESULTS OF TWO CHRONIC DEFINITIVE TOXICITY TESTS FOR OUTFALL 001

AT

**MAGNOLIA WASTEWATER SYSTEM
Magnolia, Arkansas**

**NPDES #AR0043613
AFIN #14-00059**

EPA Methods 1000.0 and 1002.0

Project X5466

Test Dates: June 24 - July 2, 2014

Report Date: July 15, 2014

Prepared for:
Russell Thomas
Magnolia Wastewater System
P.O. Box 666
Magnolia, AR 71753

Prepared by:
Ginger Briggs
Bio-Analytical Laboratories
P.O. Box 527
Doyline, LA 71023
ADEQ #88-0630

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Project X5466

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BAL
ADEQ #88-0630
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1.0 Introduction

Bio-Analytical Laboratories (BAL), Doyline, Louisiana conducted two chronic definitive toxicity tests for Outfall 001 at Magnolia Wastewater System, Magnolia, 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. 20th Edition" (APHA 1998. Chemical results using this edition are listed in the report as SM 1997), 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 minnow test organisms were obtained from Aquatic Biosystems, Fort Collins, Colorado (ABS) and were less than 48 hours old at test initiation. The minnows were acclimated to test temperature and dilution water hardness prior to test initiation. Monthly chronic reference toxicant tests were conducted in order to document organism sensitivity and demonstration of capability.

2.3 Dilution Water

Soft reconstituted water, made per method guidelines, was used as the dilution water and the control for the toxicity tests.

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2.4 Test Concentrations

The test concentrations used in the chronic toxicity tests were 100.0, 80.0, 56.0, 42.0 and 32.0 percent effluent and a reconstituted water control. The critical dilution was 100.0 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 Magnolia personnel on June 23, 25 and 27, 2014. Upon collection and completion of each composite, the samples were packed in ice and delivered to the laboratory the day of collection by BAL personnel. The sample temperature upon arrival of each sample was 4.1, 0.6 and 2.1^o 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±1^o Celsius. Total residual chlorine levels were measured with a Capital Controls^R amperometric titrator (SM 4500-Cl D 1997) and recorded if present. Total ammonia levels were measured using a HACH^R test strip. Dissolved oxygen (SM 4500-O G 1997) and pH (SM 4500-H+ B 1997) measurements were measured on the control and each concentration at test initiation, at test renewal and at test termination. Conductivity (SM 2510 B 1997) measurements were also taken at test initiation and at each renewal. Alkalinity (SM 2320 B 1997) and hardness (SM 2340 C 1997) levels were measured 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±1^o 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±1^o Celsius. AEMC^R 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 Dunnett's Test, a parametric test comparing concentration data to control data.

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Fathead minnow survival data was analyzed using Steel's Many-One Rank Test, a non-parametric test comparing concentration data to control data, while the growth data was analyzed using Dunnett's Test. The chronic endpoints in the reference toxicant tests 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. Ninety percent survival occurred in the control and in the critical dilution after eight days of exposure. The average number of neonates per female after three broods in the control was 14.3 and the average in the critical dilution was 18.1. The No-Observed-Effect-Concentration (NOEC) for survival and reproduction in this test was 100.0 percent effluent ($p=.05$).

The fathead minnow test results can be found in Table 2. Eighty percent survival occurred in the control and 82.5 percent survival occurred in the critical dilution after seven days of exposure. The average weight gained in the control was 0.525 milligram (mg) and the average weight gained in the critical dilution was 0.563 mg. The NOEC for survival and growth in this test was 100.0 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	90.0		15.7	14.3	
32.0	100.0		19.9	19.9	
42.0	100.0		20.4	20.4	
56.0	90.0		18.0	17.0	
80.0	100.0		20.7	20.7	
100.0	90.0		19.0	18.1	

*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.

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Table 2: Results of the Chronic Definitive Fathead Minnow Test

Percent Effluent	Percent Survival	Sig.*	Mean Dry Weight (mg)	Sig.*
Control	80.0		0.525/0.652+	
32.0	92.5		0.628	
42.0	92.5		0.618	
56.0	95.0		0.660	
80.0	95.0		0.715	
100.0	82.5		0.563	

*significant when compared to the control (p=.05).+Test validity based on mean dry weight per surviving larvae in the control.

The chronic reference toxicant tests conducted this month showed the *Ceriodaphnia dubia* test organisms to be within the respective sensitivity range; however, the minnows were too sensitive. This did not seem to affect this test. 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 June 23, 25 and 27, 2014, from Magnolia Wastewater System, Magnolia, Arkansas, were not found to be lethally toxic to the fathead minnow test organisms nor the *Ceriodaphnia dubia* test organisms in the 100.0 percent critical dilution after seven and eight days of exposure, respectively (p=.05). Sub-lethal effects (i.e. lack of growth or reproduction) were not noted in the critical dilution in either test (p=.05).

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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, 1998. Standard Methods for The Examination of Water and Wastewater. 20th Edition.

APPENDIX A
CHAIN-OF-CUSTODY DOCUMENTS



Bio-Analytical Laboratories

3240 Spurgin Road
Post Office Box 527
Doyline, LA 71029

(318) 745-2772
1-800-265-1248
Fax: (318) 745-2773

NELAP/LELAP 01975, ADEQ 88-0630, TCEQ T104704278

Laboratory Use Only:

Company: City of Magnolia		Phone: (870) 234-2955		Analysis:				Project Number: X5466 Temp. upon arrival: Temperature upon arrival: 4.1 Thermometer #: 29 Tech: RC Date: 6/23/14 Lab Control Number: C9233 Preservative: (below) cco				
Address: P.O. Box 666, Magnolia, AR 71753		Fax: (870) 234-2203		Chronic Ceriodaphnia	Chronic minnow	Acute minnow (fresh/marine)	Acute Daphnia species			Acute Mysid	Acute Ceriodaphnia	Fecal Coliform
Permit #: AR0043613/AFIN 14-00059		Purchase Order:										
Sampler's Signature/Printed Name/Affiliation: <i>David Richards</i> DAVID Richards mwus												
Date Start Date End	Time Start Time End	C	G	# and type of container	Sample Identification							
6/22/14 6/23/14	7:00 2:00	X		6 half gallons	001	X	X					
Relinquished by/Affiliation: <i>David Richards</i> mwus				Date: 6/23/14	Time: 0930	Received by/Affiliation: <i>[Signature]</i>				Date: 6/23/14	Time: 0930	
Relinquished by/Affiliation:				Date:	Time:	Received by/Affiliation:				Date:	Time:	
Relinquished by/Affiliation: <i>[Signature]</i>				Date: 6/23/14	Time: 12:30	Received by/Affiliation: <i>R. Calhoun</i>				Date: 6/23/14	Time: 1130	
Method of Shipment: <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Bus <input type="checkbox"/> Fed Ex <input type="checkbox"/> DHL <input type="checkbox"/> UPS <input type="checkbox"/> Client <input type="checkbox"/> Other Tracking # _____												
Comments: Samples Taken @ & Kept @ 4°C <i>wa</i>												

COC Rev. 3.0

**Bio-Analytical Laboratories**3240 Spurgin Road
Post Office Box 527
Doyline, LA 71023(318) 745-2772
1-800-259-1248
Fax: (318) 745-2773

NELAP/LELAP 01975, ADEQ 88-0630, TCEQ T104704278

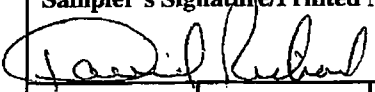
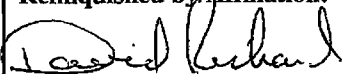
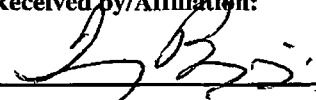

Laboratory Use Only:

Company: City of Magnolia		Phone: (870) 234-2955		Analysis:						Project Number: X5466		
Address: P.O. Box 666, Magnolia, AR 71753		Fax: (870) 234-2203		<div>Chronic Ceriodaphnia Chronic minnow Acute minnow(fresh/marine) Acute Daphnia species Acute Mysid Acute Ceriodaphnia Fecal Coliform</div>						Temp. upon arrival: Temperature upon arrival: 0.6 °C		
Permit #: AR0043613/AFIN 14-00059		Purchase Order:		Sampler's Signature/Printed Name/Affiliation: David Richards David Richards mnws						Thermometer #: 29 Tech: AH Date: 6/25/14 Lab Control Number:		
Date Start Date End	Time Start Time End	C	G	# and type of container	Sample Identification							Preservative: (below)
6/24/14 6/25/14	7:00 7:00	X		6 half gallons	001	X	X					C9279 C9
Relinquished by/Affiliation: David Richards mnws						Date: 6/25/14	Time: 0914	Received by/Affiliation: J. B. S.		Date: 6/25/14	Time: 0914	
Relinquished by/Affiliation:						Date:	Time:	Received by/Affiliation:		Date:	Time:	
Relinquished by/Affiliation: J. B. S.						Date: 6/25/14	Time: 1105	Received by/Affiliation: A. S. S.		Date: 6/25/14	Time: 1105	
Method of Shipment: <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Bus <input type="checkbox"/> Fed Ex <input type="checkbox"/> DHL <input type="checkbox"/> UPS <input type="checkbox"/> Client <input type="checkbox"/> Other Tracking # _____												
Comments:												
COC Rev. 3.0												

**Bio-Analytical Laboratories**3240 Spurgin Road
Post Office Box 527
Daytine, LA 71023(510) 746-2772
1-800-269-1249
Fax: (510) 746-2773

NELAP/LELAP 01975, ADEQ 88-0630, TCEQ T104704278

Laboratory Use Only:

Company: City of Magnolia		Phone: (870) 234-2955		Analysis:						Project Number: X5466			
Address: P.O. Box 666, Magnolia, AR 71753		Fax: (870) 234-2203		Chronic Ceriodaphnia	Chronic minnow	Acute minnow (fresh/marine)	Acute Daphnia species	Acute Mysid	Acute Ceriodaphnia		Fecal Coliform		
Permit #: AR0043613/AFIN 14-00059		Purchase Order:											
Sampler's Signature/Printed Name/Affiliation:  David Richards mwus													
Date Start Date End	Time Start Time End	C	G	# and type of container	Sample Identification							Temperature upon arrival: 2.1 Thermometer #: 29 Tech: RC Date: 6/27/14 Lab Control Number: C9301	Temp. upon arrival: Preservative: (below) ice
6/26/14 6/27/14	7:00 7:00	X		6 half gallons	001	X	X						
Relinquished by/Affiliation:  mwus				Date: 6/27/14	Time: 0930	Received by/Affiliation: 				Date: 6/27/14	Time: 0930		
Relinquished by/Affiliation:				Date:	Time:	Received by/Affiliation:				Date:	Time:		
Relinquished by/Affiliation: 				Date: 6/27/14	Time: 1110	Received by/Affiliation: R Callahan				Date: 6/27/14	Time: 1110		
Method of Shipment: <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Bus <input type="checkbox"/> Fed Ex <input type="checkbox"/> DHL <input type="checkbox"/> UPS <input type="checkbox"/> Client <input type="checkbox"/> Other Tracking # _____													
Comments:													
COC Rev. 3.0													

APPENDIX B
RAW DATA SHEETS

BIO-ANALYTICAL LABORATORIES CERIODAPHNIA DUBIA SURVIVAL AND
REPRODUCTION TEST

Project# X5466 Date start: 6/24/14 Date end: 7/2/14

Client/Contact: MAGN/Magnolia Waste Water

Address: P.O. Box 666 Magnolia AR 71753

NPDES#: AR0043613

Sample Description: 001

Dilution Water: Soft Reconstituted

Test Temperature(°C) 25±1°

Technicians: EGB/AH/RC/AC

Adults isolated: Date 6/23/14 Time: 2330

Neonates collected: Date 6/24/14 Time: 0630 Board: Y205

Dissolved Oxygen Meter: Model YSI55D Serial #06E2089 AU

pH Meter: Model Orion 230A+ Serial #105253

Conductivity Meter: Model Control Company Serial# 80277924

Amperometric Titrator: Model Fischer-Porter Serial # 92W445766

Effluent	Aerate?/Minutes	Receiving Water	Aerate?/Minutes
Initial D.O.	/Final D.O.	Initial D.O.	/Final D.O.
(mg/L & %)/Tech	(mg/L & %)/Tech	(mg/L & %)/Tech	(mg/L & %)/Tech
0. <u>10.0/126.50/AH</u>	0. <u>Y/25/7.9/94.20/RC</u>	0. <u>NA</u>	0. <u>NA</u>
1. <u>10.3/119.40/AH</u>	1. <u>Y/25/8.2/95.90/AH</u>	1. <u>NA</u>	1. <u>NA</u>
2. <u>9.5/110.9%/RC</u>	2. <u>Y/25/8.1/95.10/RC</u>	2. <u>NA</u>	2. <u>NA</u>
3. <u>9.7/115.0%/RC</u>	3. <u>Y/25/8.0/94.50/RC</u>	3. <u>NA</u>	3. <u>NA</u>
4. <u>10.0/113.50/EGB</u>	4. <u>Y/15/8.0/94.90/EGB</u>	4. <u>NA</u>	4. <u>NA</u>
5. <u>10.1/121.50/EGB</u>	5. <u>Y/15/8.0/96.50/EGB</u>	5. <u>NA</u>	5. <u>NA</u>
6. <u>10.2/119.80/RC</u>	6. <u>Y/25/8.2/96.70/RC</u>	6. <u>NA</u>	6. <u>NA</u>
7. <u>9.2/111.30/RC</u>	7. <u>Y/15/8.0/95.90/RC</u>	7. <u>NA</u>	7. <u>NA</u>

Total Residual
Chlorine(mg/L)/
Tech

Dechlorinated?
Amount?/Tech

Ammonia (NH3)
(mg/L)/Tech

BAL Sample #
Date in Use

1. <0.01/AH
2. <0.01/RC
3. <0.01/EGB

1. NO/AH
2. No/RC
3. NO/EGB

1. 0.25/AH
2. 0.25/RC
3. 0.50/EGB

1. C9233 6/24/14
2. C9279 6/26/14
3. C9301 6/28/14

Comments:

BIO-ANALYTICAL LABORATORIES
NUMBER NEONATES PER BROOD CERIODAPHNIA

Project # X5466 Test Dates 6/24 - 7/2/14

Client Magnolia

Replicate	% Concentration								
	0	32	42	56	80	100			
A	10	19	25	18	22	22			
B	11	17	18	14	23	15			
C	14	26	25	X ⁸	16	²² 15/14 17/16			
D	X ²	15	10	13	15	18			
E	16	24	22	12	24	17			
F	15	19	20	27	22	24			
G	16	21	24	11	26	X ¹⁰ 14/14			
H	17	17	18	24	22	20			
I	20	20	25	22	23	22			
J	22	21	17	21	14	17			
Surviving Mean	15.7	19.9	20.4	18.0	20.7	19.0			
Total Mean	14.3	19.9	20.4	17.0	20.7	18.1			
CV%*	24.51	16.66	23.70	32.16	19.99	16.43			

*coefficient of variation = standard deviation x 100/mean (calculation based on young of the surviving adults)

Key: M=male; X=dead adult

Calculated by: RC 7/2/14

Calculations checked by: AH 7/2/14

BIO-ANALYTICAL LABORATORIES

CERIODAPHNIA DUBIA SURVIVAL AND REPRODUCTION TEST-LIVE NEONATE PRODUCTION

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Project# X5466

Test started: Date 6/24/14 Time 1435

Client Magnolia

Test ended: Date 7/2/14 Time 1330

Technician: Day0 AH 1 RC 2 AH 3 EBB 4 EBB 5 EBB 6 RC 7 AH 8 RC

Time: Day0 1435 1 1355 2 1525 3 1230 4 1000 5 0950 6 1545 7 1535 8 1330

Temp. (°C): Day0 25.0 1 25.0 2 25.0 3 24.7 4 24.7 5 24.7 6 24.6 7 25.0 8 24.0

Conc %	Day	A	B	C	D	E	F	G	H	I	J	Number of Live Adults
0	1	9										10
	2	9										10
	3	9										10
	4	3	1	0	0	3	1	1	3	3	2	10
	5	0	0	4	2	0	0	0	0	0	0	10
	6	1	3	1	X	4	3	2	0	4	2	9
	7	0	0	0	1	4	1	13	0	6	7	9
	8	0	7	9	1	0	10	0	7	7	11	9
32	1	9										10
	2	9										10
	3	9										10
	4	3	0	3	0	0	2	0	0	0	0	10
	5	3	2	0	3	0	0	0	0	1	3	10
	6	0	0	7	0	0	7	4	3	3	6	10
	7	0	0	16	0	14	10	5	0	16	1	10
	8	10	10	0	0	0	0	0	10	0	11	10
42	1	9										10
	2	9										10
	3	9										10
	4	0	0	0	0	0	0	2	0	0	0	10
	5	0	0	0	4	0	0	0	0	2	0	10
	6	0	0	0	0	0	4	0	4	0	3	10
	7	0	0	0	0	0	5	7	4	0	1	10
	8	1	13	0	6	0	0	0	0	0	9	10
56	1	9										10
	2	9										10
	3	9										10
	4	0	0	0	0	1	2	0	1	0	0	10
	5	0	0	0	4	0	0	0	0	0	0	10
	6	0	0	0	0	0	0	1	0	0	0	10
	7	0	0	0	0	0	0	0	0	0	0	10
	8	0	1	X2	1	0	0	0	0	0	13	10
80	1	9										10
	2	9										10
	3	9										10
	4	0	0	1	0	0	0	0	0	1	0	10
	5	0	0	0	0	0	0	0	0	0	0	10
	6	0	3	6	2	0	7	7	0	8	3	10
	7	0	0	0	0	0	0	0	0	0	0	10
	8	0	0	0	0	0	0	0	0	0	0	10
100	1	9										10
	2	9										10
	3	9										10
	4	0	0	1	0	3	1	0	0	0	1	10
	5	0	0	0	3	3	0	3	0	0	1	10
	6	0	4	3	4	0	8	3	8	6	2	10
	7	0	0	0	0	0	0	0	0	0	0	10
	8	0	0	0	0	0	0	0	0	0	0	10

Key: X=dead adult, X'=adult had n neonates before death, M=male CERIO2 Rev.2.0

Day/# water used	1	2	3	4	5	6	7	8
Concentration: Control 50%								
pH	7.2	7.2	7.2	7.2	7.4	7.3	7.0	6.9
DO (mg/l)	8.2	8.4	8.4	8.4	8.2	8.2	8.1	8.0
Cond (umhos/cm)	165.0	164.8	164.7	162.1	164.4	166.6	175.0	174.1
Alkalinity (mg/L)	32.0							
Hardness (mg/L)	48.0							
Concentration: 82%								
pH	7.1	7.2	7.1	7.1	7.3	7.2	7.1	6.9
DO (mg/l)	8.2	8.4	8.2	8.2	8.2	8.2	8.1	7.8
Cond (umhos/cm)	225	215	219	218	223	225	235	236
Concentration: 42%								
pH	7.1	7.3	7.2	7.2	7.2	7.1	7.2	6.9
DO (mg/l)	8.1	8.3	8.2	8.2	8.2	8.2	8.1	7.8
Cond (umhos/cm)	239	230	234	232	238	240	249	252
Concentration: 50%								
pH	7.1	7.4	7.3	7.2	7.2	7.1	7.3	6.9
DO (mg/l)	8.1	8.2	8.2	8.1	8.1	8.1	8.1	7.9
Cond (umhos/cm)	260	252	255	257	264	263	274	276
Concentration: 80%								
pH	7.1	7.4	7.3	7.3	7.2	7.2	7.3	7.0
DO (mg/l)	8.0	8.1	8.1	8.0	8.1	8.1	8.1	7.9
Cond (umhos/cm)	304	294	296	294	310	308	319	322
Concentration: 100%								
pH	7.2	7.3	7.4	7.3	7.2	7.2	7.1	7.0
DO (mg/l)	7.9	8.1	7.9	7.9	8.1	8.1	8.1	7.9
Cond (umhos/cm)	339	336	329	327	335	342	362	359
Tech-prerenewal		RC	PH	EB	EB	EB	RC	PH
Tech-postrenewal	RC	PH	RC	RC	EB	EB	RC	AC
Alkalinity (mg/L)	34.0		32.0		36.0			
Hardness (mg/L)	60.0		60.0		40.0			

Key: prerenewal/postrenewal

BIO-ANALYTICAL LABORATORIES
PIMEPHALES PROMELAS SURVIVAL AND GROWTH DATA SHEET

X5466
Page 18 of 42

Project# X5466 Date started: 6/24/14 Date ended 7/1/14

Client/Contact MAGN/Magnolia Waste Water

Address P.O. Box 666 Magnolia AR 71753

NPDES# AR0043613 AFIN14-00059

Sample Description 001 Dilution Water Soft Reconstituted

Test Temperature(°C) 25+1° Celsius Technicians EGB/AH/RC/AC

Test organism age < 48 hr Vendor/ID# ABS/787

Feeding Times

Day	Technician/Time/Amount (per replicate)		
	AM	NOON	PM
0			RC/1705/0.20ml
1	AH/0850/0.10ml	AH/1105/0.10ml	AC/1105/0.10ml
2	RC/1020/0.10ml	RC/1110/0.10ml	AH/1105/0.10ml
3	EGB/0710/0.10ml	RC/1125/0.10ml	RC/1125/0.10ml
4	EGB/0955/0.20ml	-	EGB/1105/0.20ml
5	EGB/0930/0.20ml	-	EGB/1105/0.20ml
6	RC/0900/0.10ml	RC/1055/0.10ml	AH/1715/0.10ml

Dissolved Oxygen Meter: Model YSI55D

Serial #06E2089 AU

pH Meter: Model Orion 230A+

Serial #105253

Conductivity Meter: Model Control Company

Serial #80277924

Amperometric Titrator: Model Fischer-Porter

Serial #92W445766

Effluent	Aerate?/Minutes	Receiving Water	Aerate?/Minutes
Initial	/Final DO	Initial DO	/Final DO
DO(mg/L & %)/Tech	(mg/L & %)/Tech	(mg/L & %)/Tech	(mg/L & %)/Tech
0. 10.6/126.5%/RC	Y/25/7.9/94.2%/RC	0. <u>NA</u>	0. <u>NA</u>
1. 10.3/119.6%/AH	1. Y/25/8.2/95.9%/AH		1.
2. 9.5/116.9%/RC	2. Y/25/8.1/95.1%/RC		2.
3. 9.7/115.0%/RC	3. Y/25/8.0/94.5%/RC		3.
4. 10.0/113.5%/EGB	4. Y/15/8.0/94.9%/EGB		4.
5. 10.1/121.5%/EGB	5. Y/15/8.0/96.5%/EGB		5.
6. 10.2/119.8%/RC	6. Y/25/8.2/96.7%/RC		6.

Total Residual
Chlorine(mg/L)/
Tech

Dechlorinated?
Amount?/Tech

Ammonia (NH3)
(mg/L)/Tech

BAL Sample #
Date in use

1. <0.01/RC
2. <0.01/RC
3. <0.01/EGB

1. No/RC
2. No/RC
3. No/EGB

1. 0.25/RC
2. 0.25/RC
3. 0.50/EGB

1. C9233 6/24/14
2. C9279 6/26/14
3. C9301 6/26/14

Comments:

BIO-ANALYTICAL LABORATORIES 7-DAY CHRONIC MINNOW SURVIVAL DATA

Project# X5466 Test started: Date 6/24/14 Time 1555
 Client Magnolia Test ended: Date 7/1/14 Time 1040
 Technician: Day0 AC 1 RC 2 RC 3 RC 4 ECB 5 ECB 6 RC 7 RC
 Time: Day0 1555 1 1025 2 1400 3 1240 4 0940 5 0915 6 1550 7 1040
 Temperature Day0 25.2 1 25.9 2 25.1 3 25.5 4 25.1 5 25.1 6 24.2 7 24.8

Conc. %	Rep.	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
0	A	8	8	8	8	8	8	6	6
	B	8	8	7	7	7	7	7	4
	C	8	8	8	8	8	8	8	8
	D	8	8	8	8	8	8	8	8
	E	8	8	8	8	7	7	6	6
32	A	8	8	8	8	8	8	8	8
	B	8	8	8	8	6	6	6	6
	C	8	8	8	8	8	8	8	8
	D	8	7	7	7	7	7	7	7
	E	8	8	8	8	8	8	8	8
42	A	8	8	8	8	8	8	7	7
	B	8	8	8	8	8	8	8	8
	C	8	8	8	8	8	7	7	7
	D	8	8	8	8	8	8	8	8
	E	8	8	8	8	8	8	8	8
56	A	8	7	7	7	7	7	7	7
	B	8	8	8	8	8	8	8	8
	C	8	8	8	8	8	8	8	8
	D	8	7	7	7	7	7	7	7
	E	8	8	8	8	8	8	8	8
80	A	8	8	8	8	8	8	8	8
	B	8	8	8	8	8	8	8	8
	C	8	8	8	8	8	8	8	8
	D	8	8	8	8	8	8	8	8
	E	8	8	8	8	8	8	7	7
100	A	8	8	8	8	8	8	8	8
	B	8	8	7	7	7	7	7	7
	C	8	8	7	7	6	6	6	6
	D	8	8	8	8	8	8	8	8
	E	8	7	7	7	7	7	7	7

Minnow2

Project#/Client: X5466/Magnolia Temp Start (°C): 107.0 Tech: AM Date: 7/11/14 Time: 1040 X5466
 Temp End (°C): 102.6 Tech: ED Date: 7/21/14 Time: 0703 Page 20 of 42

Conc.	Replicate/ Pan number	Wt. of pan(g)/ Date weighed: <u>6/30/14</u> Tech: <u>AC</u>	Wt. of pan + larvae(g)/ Date weighed: <u>7/21/14</u> Tech: <u>AC</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	A 1	0.9165	0.9208	0.0043	8	0.538	6/0.717
	B 2	0.9135	0.9158	0.0023	8	0.288	4/0.575
	C 3	0.9178	0.9223	0.0045	8	0.563	
	D 4	0.9241	0.9300	0.0059	8	0.738	
	E 5	0.9259	0.9299	0.0040	8	0.500	9/0.667
32	A 6	0.9204	0.9264	0.0060	8	0.750	
	B 7	0.9218	0.9254	0.0036	8	0.450	
	C 8	0.9278	0.9328	0.0050	8	0.625	
	D 9	0.9243	0.9288	0.0045	8	0.563	
	E 10	0.9240	0.9300	0.0060	8	0.750	
42	A 11	0.9279	0.9330	0.0051	8	0.638	
	B 12	0.9267	0.9312	0.0045	8	0.563	
	C 13	0.9246	0.9293	0.0047	8	0.588	
	D 14	0.9230	0.9285	0.0055	8	0.688	
	E 15	0.9214	0.9263	0.0049	8	0.613	
56	A 16	0.9237	0.9283	0.0046	8	0.575	
	B 17	0.9236	0.9293	0.0057	8	0.713	
	C 18	0.9252	0.9304	0.0052	8	0.650	
	D 19	0.9244	0.9296	0.0052	8	0.650	
	E 20	0.9226	0.9283	0.0057	8	0.713	
80	A 21	0.9248	0.9299	0.0051	8	0.638	
	B 22	0.9289	0.9343	0.0054	8	0.675	
	C 23	0.9196	0.9258	0.0062	8	0.775	
	D 24	0.9239	0.9298	0.0059	8	0.738	
	E 25	0.9172	0.9232	0.0060	8	0.750	
100	A 26	0.9162	0.9223	0.0061	8	0.763	
	B 27	0.9202	0.9253	0.0051	8	0.638	
	C 28	0.9222	0.9254	0.0032	8	0.400	
	D 29	0.9208	0.9248	0.0040	8	0.500	
	E 30	0.9198	0.9239	0.0041	8	0.513	

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

Calculated by: RC 7/2/14Calculations checked by: AM 7/2/14

Day/# water used	3628	1	2	3	4	5	6	7	8
Concentration: Control 504									
pH	7.2	6.9/7.2	6.8/7.2	6.8/7.2	7.0/7.4	6.8/7.3	6.4/7.1	6.6/6.6	
DO (mg/l)	8.2	7.4/8.4	5.9/8.4	6.6/8.4	6.8/8.2	5.5/8.2	5.4/8.1	6.7/6.7	
Cond (umhos/cm)	165.0	160.8	164.7	162.1	166.4	166.6	175.0		
Alkalinity (mg/L)	32.0								
Hardness (mg/L)	48.0								
Concentration: 322									
pH	7.1	6.9/7.2	6.9/7.1	6.9/7.1	6.8/7.3	6.7/7.2	6.5/7.1	6.6/6.6	
DO (mg/l)	8.2	7.8/8.4	6.0/8.2	6.8/8.2	6.6/8.2	5.5/8.2	5.1/8.1	6.3/6.3	
Cond (umhos/cm)	225	215	219	218	223	225	235		
Concentration: 422									
pH	7.1	7.0/7.3	6.8/7.2	6.9/7.2	6.7/7.2	6.6/7.1	6.6/7.2	6.6/6.6	
DO (mg/l)	8.1	7.7/8.3	6.1/8.2	6.6/8.2	6.6/8.2	5.6/8.2	5.3/8.1	6.2/6.2	
Cond (umhos/cm)	239	280	234	232	238	240	249		
Concentration: 502									
pH	7.1	7.0/7.4	6.8/7.3	6.9/7.2	6.6/7.2	6.6/7.1	6.6/7.3	6.6/6.6	
DO (mg/l)	8.1	7.7/8.2	6.2/8.2	6.7/8.1	6.4/8.1	5.4/8.1	5.0/8.1	6.1/6.1	
Cond (umhos/cm)	260	252	255	257	264	263	274		
Concentration: 802									
pH	7.1	7.0/7.4	6.8/7.3	6.8/7.3	6.6/7.2	6.5/7.2	6.6/7.3	6.6/6.6	
DO (mg/l)	8.0	7.7/8.1	6.2/8.1	6.3/8.0	6.6/8.1	5.3/8.1	5.1/8.1	5.9/5.9	
Cond (umhos/cm)	304	294	296	294	310	308	319		
Concentration: 1002									
pH	7.2	6.9/7.3	6.7/7.4	6.8/7.3	6.7/7.2	6.5/7.2	6.7/7.1	6.5/6.5	
DO (mg/l)	7.9	7.8/8.1	6.0/7.9	6.4/7.9	6.4/8.1	5.6/8.1	5.0/8.1	5.7/5.7	
Cond (umhos/cm)	339	330	329	327	335	342	362		
Tech-prerenewal		RC	RC	RC	EBB	EBB	RC		
Tech-postrenewal	RC	DH	RC	RC	EBB	EBB	RC	DH	
Alkalinity (mg/l)	240		32.0		36.0				
Hardness (mg/l)	600		162.0		40.0				

Key: prerenewal/postrenewal

APPENDIX C
STATISTICAL ANALYSES

Ceriodaphnia Survival and Reproduction Test-7 Day Survival

X5466

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Start Date: 6/24/2014 Test ID: X5466CD Sample ID: 1
 End Date: 7/2/2014 Lab ID: ADEQ880630 Sample Type: EFF1-POTW
 Sample Date: 6/24/2014 Protocol: EPAFW02-EPA/821/R-02-01 Test Species: CD-Ceriodaphnia dubia
 Comments:

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
32	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
42	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
56	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
80	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical
D-Control	0.9000	1.0000	1	9	10	10		
32	1.0000	1.1111	0	10	10	10	0.5000	0.0500
42	1.0000	1.1111	0	10	10	10	0.5000	0.0500
56	1.0000	1.1111	0	10	10	10	0.5000	0.0500
80	1.0000	1.1111	0	10	10	10	0.5000	0.0500
100	0.9000	1.0000	1	9	10	10	0.7632	0.0500

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	100	>100		1
Treatments vs D-Control				

Ceriodaphnia Survival and Reproduction Test-Reproduction

X5466

Start Date: 6/24/2014

Test ID: X5466CD

Sample ID: 1

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End Date: 7/2/2014

Lab ID: ADEQ880630

Sample Type: EFF1-POTW

Sample Date: 6/24/2014

Protocol: EPAFW02-EPA/821/R-02-01 Test Species: CD-Ceriodaphnia dubia

Comments:

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	10.000	11.000	14.000	16.000	15.000	16.000	17.000	20.000	22.000	
32	19.000	17.000	26.000	15.000	24.000	19.000	21.000	17.000	20.000	21.000
42	25.000	18.000	25.000	10.000	22.000	20.000	24.000	18.000	25.000	17.000
56	18.000	14.000	13.000	12.000	27.000	11.000	24.000	22.000	21.000	
80	22.000	23.000	16.000	15.000	24.000	22.000	26.000	22.000	23.000	14.000
100	22.000	15.000	16.000	18.000	17.000	24.000	20.000	22.000	17.000	

Conc-%	Transform: Untransformed							1-Tailed		
	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	15.667	1.0000	15.667	10.000	22.000	24.514	9			
32	19.900	1.2702	19.900	15.000	26.000	16.658	10	-2.161	2.402	4.706
42	20.400	1.3021	20.400	10.000	25.000	23.701	10	-2.416	2.402	4.706
56	18.000	1.1489	18.000	11.000	27.000	32.155	9	-1.161	2.402	4.828
80	20.700	1.3213	20.700	14.000	26.000	19.990	10	-2.569	2.402	4.706
100	19.000	1.2128	19.000	15.000	24.000	16.434	9	-1.658	2.402	4.828

Auxiliary Tests					Statistic	Critical	Skew	Kurt						
Kolmogorov D Test indicates normal distribution (p > 0.05)					0.54132	0.895	-0.1876	-0.4321						
Bartlett's Test indicates equal variances (p = 0.50)					4.3853	15.0863								
Hypothesis Test (1-tail, 0.05)					NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test					100	>100		1	4.82796	0.30817	33.1165	18.1843	0.12528	5, 51
Treatments vs D-Control														

Ceriodaphnia Survival and Reproduction Test-Reproduction

X5466

Start Date: 6/24/2014 Test ID: X5466CD Sample ID: 1 Page 25 of 42
 End Date: 7/2/2014 Lab ID: ADEQ880630 Sample Type: EFF1-POTW
 Sample Date: 6/24/2014 Protocol: EPAFW02-EPA/821/R-02-01 Test Species: CD-Ceriodaphnia dubia
 Comments:

Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	10.000	11.000	14.000	2.000	16.000	15.000	16.000	17.000	20.000	22.000
32	19.000	17.000	26.000	15.000	24.000	19.000	21.000	17.000	20.000	21.000
42	25.000	18.000	25.000	10.000	22.000	20.000	24.000	18.000	25.000	17.000
56	18.000	14.000	8.000	13.000	12.000	27.000	11.000	24.000	22.000	21.000
80	22.000	23.000	16.000	15.000	24.000	22.000	26.000	22.000	23.000	14.000
100	22.000	15.000	16.000	18.000	17.000	24.000	10.000	20.000	22.000	17.000

Conc-%	Mean	N-Mean	Transform: Untransformed					t-Stat	1-Tailed	
			Mean	Min	Max	CV%	N		Critical	MSD
D-Control	14.300	1.0000	14.300	2.000	22.000	39.428	10			
32	19.900	1.3916	19.900	15.000	26.000	16.658	10	-2.594	2.287	4.937
42	20.400	1.4266	20.400	10.000	25.000	23.701	10	-2.826	2.287	4.937
56	17.000	1.1888	17.000	8.000	27.000	37.100	10	-1.251	2.287	4.937
80	20.700	1.4476	20.700	14.000	26.000	19.990	10	-2.965	2.287	4.937
100	18.100	1.2657	18.100	10.000	24.000	22.623	10	-1.760	2.287	4.937

Auxiliary Tests					Statistic		Critical		Skew	Kurt	
Kolmogorov D Test indicates normal distribution (p > 0.05)					0.67247		0.895		-0.4036	-0.0019	
Bartlett's Test indicates equal variances (p = 0.46)					4.66567		15.0863				
Hypothesis Test (1-tail, 0.05)		NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test		100	>100		1	4.93663	0.34522	60.8	23.3037	0.03479	5, 54
Treatments vs D-Control											

Ceriodaphnia Survival and Reproduction Test-Reproduction

X5466

Start Date: 6/24/2014

Test ID: X5466CD

Sample ID: 1

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End Date: 7/2/2014

Lab ID: ADEQ880630

Sample Type: EFF1-POTW

Sample Date: 6/24/2014

Protocol: EPAFW02-EPA/821/R-02-01 Test Species: CD-Ceriodaphnia dubia

Comments:

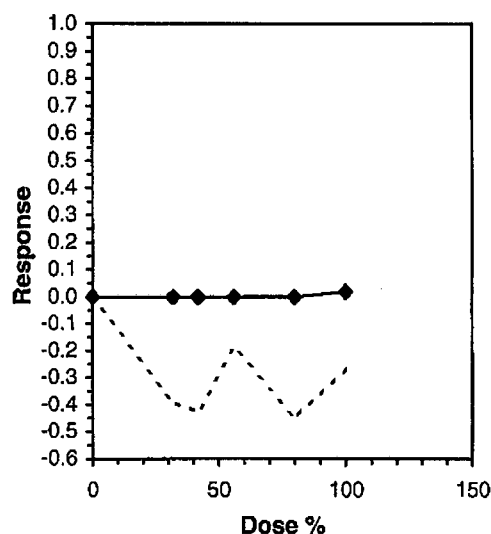
Conc-%	1	2	3	4	5	6	7	8	9	10
D-Control	10.000	11.000	14.000	2.000	16.000	15.000	16.000	17.000	20.000	22.000
32	19.000	17.000	26.000	15.000	24.000	19.000	21.000	17.000	20.000	21.000
42	25.000	18.000	25.000	10.000	22.000	20.000	24.000	18.000	25.000	17.000
56	18.000	14.000	8.000	13.000	12.000	27.000	11.000	24.000	22.000	21.000
80	22.000	23.000	16.000	15.000	24.000	22.000	26.000	22.000	23.000	14.000
100	22.000	15.000	16.000	18.000	17.000	24.000	10.000	20.000	22.000	17.000

Conc-%	Transform: Untransformed							Isotonic	
	Mean	N-Mean	Mean	Min	Max	CV%	N	Mean	N-Mean
D-Control	14.300	1.0000	14.300	2.000	22.000	39.428	10	18.460	1.0000
32	19.900	1.3916	19.900	15.000	26.000	16.658	10	18.460	1.0000
42	20.400	1.4266	20.400	10.000	25.000	23.701	10	18.460	1.0000
56	17.000	1.1888	17.000	8.000	27.000	37.100	10	18.460	1.0000
80	20.700	1.4476	20.700	14.000	26.000	19.990	10	18.460	1.0000
100	18.100	1.2657	18.100	10.000	24.000	22.623	10	18.100	0.9805

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution ($p > 0.05$)	0.67247	0.895	-0.4036	-0.0019
Bartlett's Test indicates equal variances ($p = 0.46$)	4.66567	15.0863		

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL	Skew
IC05	>100			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Larval Fish Growth and Survival Test-7 Day Survival

X5466

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Start Date: 6/24/2014 Test ID: X5466PP Sample ID: 1
 End Date: 7/1/2014 Lab ID: ADEQ880630 Sample Type: EFF2-Industrial
 Sample Date: 6/24/2014 Protocol: EPAFW02-EPA/821/R-02-01 Test Species: PP-Pimephales promelas
 Comments:

Conc-%	1	2	3	4	5
D-Control	0.7500	0.5000	1.0000	1.0000	0.7500
32	1.0000	0.7500	1.0000	0.8750	1.0000
42	0.7500	1.0000	0.8750	1.0000	1.0000
56	0.8750	1.0000	1.0000	0.8750	1.0000
80	1.0000	0.8750	1.0000	1.0000	0.8750
100	1.0000	0.8750	0.6250	0.7500	0.8750

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root					Rank Sum	1-Tailed Critical
			Mean	Min	Max	CV%	N		
D-Control	0.8000	1.0000	1.1332	0.7854	1.3931	22.963	5		
32	0.9250	1.1563	1.2872	1.0472	1.3931	12.116	5	32.00	16.00
42	0.9250	1.1563	1.2872	1.0472	1.3931	12.116	5	32.00	16.00
56	0.9500	1.1875	1.3196	1.2094	1.3931	7.623	5	33.00	16.00
80	0.9500	1.1875	1.3196	1.2094	1.3931	7.623	5	33.00	16.00
100	0.8250	1.0313	1.1542	0.9117	1.3931	15.823	5	28.00	16.00

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution ($p \leq 0.05$)	0.92673	0.927	-0.3517	-0.3299
Bartlett's Test indicates equal variances ($p = 0.44$)	4.84251	15.0863		
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1
Treatments vs D-Control				

Larval Fish Growth and Survival Test-7 Day Growth

X5466

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Start Date: 6/24/2014 Test ID: X5466PP Sample ID: 1
 End Date: 7/1/2014 Lab ID: ADEQ880630 Sample Type: EFF2-Industrial
 Sample Date: 6/24/2014 Protocol: EPAFW02-EPA/821/R-02-01 Test Species: PP-Pimephales promelas
 Comments:

Conc-%	1	2	3	4	5
D-Control	0.5375	0.2875	0.5625	0.7375	0.5000
32	0.7500	0.4500	0.6250	0.5625	0.7500
42	0.6375	0.5625	0.5875	0.6875	0.6125
56	0.5750	0.7125	0.6500	0.6500	0.7125
80	0.6375	0.6750	0.7750	0.7375	0.7500
100	0.7625	0.6375	0.4000	0.5000	0.5125
0-SN	0.7167	0.5750	0.5625	0.7375	0.6667

Conc-%	Mean	N-Mean	Transform: Untransformed					1-Tailed		
			Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
D-Control	0.5250	1.0000	0.5250	0.2875	0.7375	30.676	5			
32	0.6275	1.1952	0.6275	0.4500	0.7500	20.432	5	-1.543	2.409	0.1600
42	0.6175	1.1762	0.6175	0.5625	0.6875	7.788	5	-1.393	2.409	0.1600
56	0.6600	1.2571	0.6600	0.5750	0.7125	8.617	5	-2.033	2.409	0.1600
80	0.7150	1.3619	0.7150	0.6375	0.7750	7.954	5	-2.861	2.409	0.1600
100	0.5625	1.0714	0.5625	0.4000	0.7625	24.895	5	-0.565	2.409	0.1600
0-SN	0.6517	1.2413	0.6517	0.5625	0.7375	12.287	5	-1.907	2.409	0.1600

Auxiliary Tests	Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test Indicates normal distribution (p > 0.05)	0.98001	0.934	-0.1034	0.70002		
Bartlett's Test indicates equal variances (p = 0.13)	9.95581	16.8119				
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test indicates no significant differences Treatments vs D-Control	0.15995	0.30467	0.01997	0.01103	0.13297	6, 28

Larval Fish Growth and Survival Test-7 Day Growth

X5466

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Start Date: 6/24/2014 Test ID: X5466PP Sample ID: 1
 End Date: 7/1/2014 Lab ID: ADEQ880630 Sample Type: EFF2-Industrial
 Sample Date: 6/24/2014 Protocol: EPAFW02-EPA/821/R-02-01 Test Species: PP-Pimephales promelas
 Comments:

Conc-%	1	2	3	4	5
D-Control	0.5375	0.2875	0.5625	0.7375	0.5000
32	0.7500	0.4500	0.6250	0.5625	0.7500
42	0.6375	0.5625	0.5875	0.6875	0.6125
56	0.5750	0.7125	0.6500	0.6500	0.7125
80	0.6375	0.6750	0.7750	0.7375	0.7500
100	0.7625	0.6375	0.4000	0.5000	0.5125
0-SN	0.7167	0.5750	0.5625	0.7375	0.6667

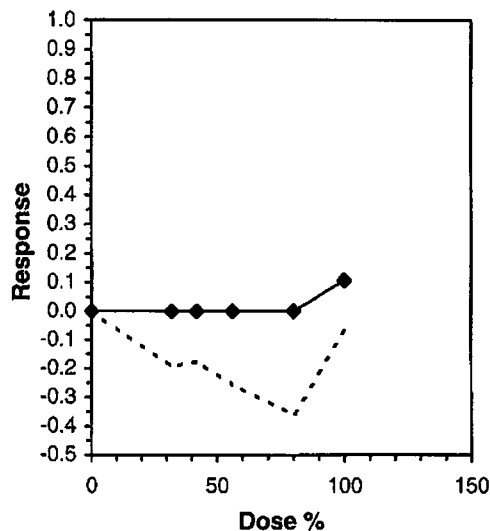
Conc-%	Mean	N-Mean	Transform: Untransformed					N	Isotonic	
			Mean	Min	Max	CV%	Mean		N-Mean	
D-Control	0.5250	1.0000	0.5250	0.2875	0.7375	30.676	5	0.6290	1.0000	
32	0.6275	1.1952	0.6275	0.4500	0.7500	20.432	5	0.6290	1.0000	
42	0.6175	1.1762	0.6175	0.5625	0.6875	7.788	5	0.6290	1.0000	
56	0.6600	1.2571	0.6600	0.5750	0.7125	8.617	5	0.6290	1.0000	
80	0.7150	1.3619	0.7150	0.6375	0.7750	7.954	5	0.6290	1.0000	
100	0.5625	1.0714	0.5625	0.4000	0.7625	24.895	5	0.5625	0.8943	
0-SN	0.6517	1.2413	0.6517	0.5625	0.7375	12.287	5			

Auxiliary Tests

	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution ($p > 0.05$)	0.97384	0.927	-0.1003	0.75417
Bartlett's Test indicates equal variances ($p = 0.09$)	9.43626	15.0863		

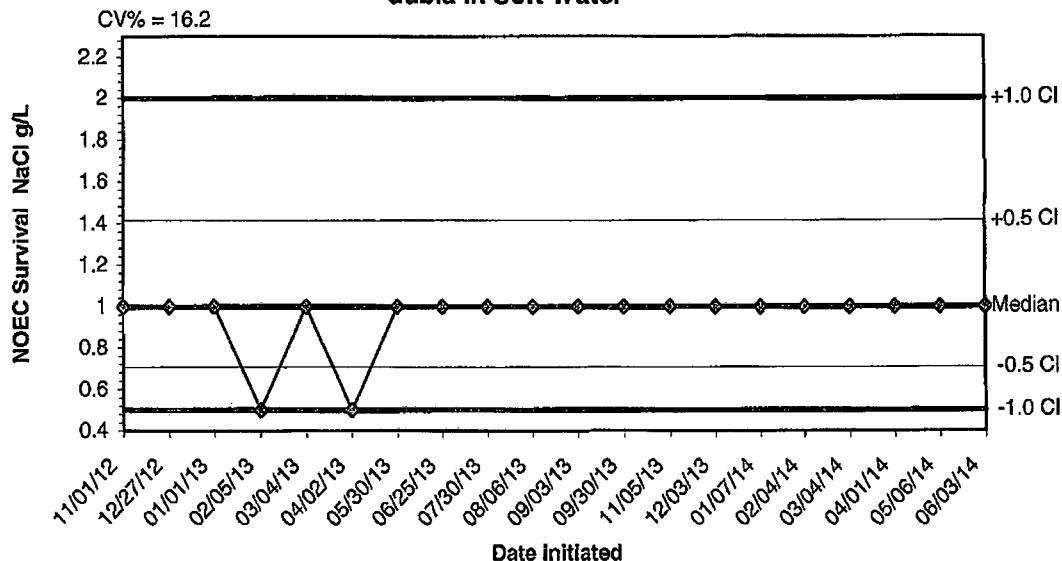
Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05	89.459			
IC10	98.917			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



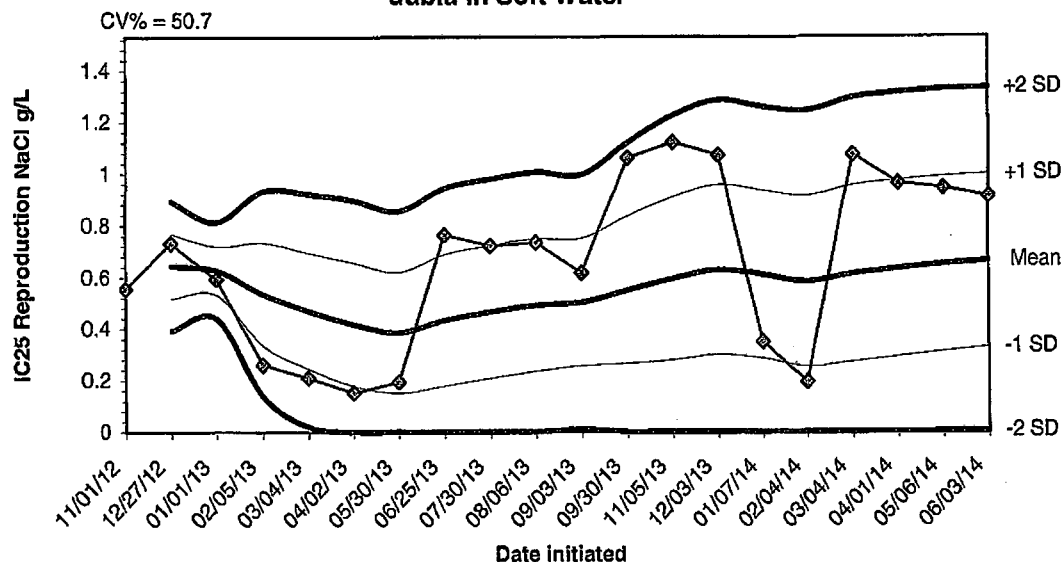
APPENDIX D
QUALITY ASSURANCE CHARTS

**2014 Chronic Reference Toxicant Test Results Using Ceriodaphnia
dubia in Soft Water**



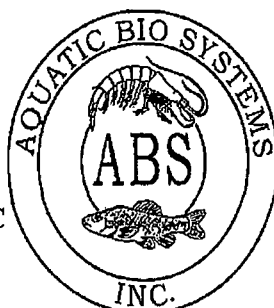
Dates	Values	Median	-0.5 CI	-1.0 CI	+0.5 CI	+1.0 CI
11/01/12	1.0000	1.0000	0.7071	0.5000	1.4142	2.0000
12/27/12	1.0000	1.0000	0.7071	0.5000	1.4142	2.0000
01/01/13	1.0000	1.0000	0.7071	0.5000	1.4142	2.0000
02/05/13	0.5000	1.0000	0.7071	0.5000	1.4142	2.0000
03/04/13	1.0000	1.0000	0.7071	0.5000	1.4142	2.0000
04/02/13	0.5000	1.0000	0.7071	0.5000	1.4142	2.0000
05/30/13	1.0000	1.0000	0.7071	0.5000	1.4142	2.0000
06/25/13	1.0000	1.0000	0.7071	0.5000	1.4142	2.0000
07/30/13	1.0000	1.0000	0.7071	0.5000	1.4142	2.0000
08/06/13	1.0000	1.0000	0.7071	0.5000	1.4142	2.0000
09/03/13	1.0000	1.0000	0.7071	0.5000	1.4142	2.0000
09/30/13	1.0000	1.0000	0.7071	0.5000	1.4142	2.0000
11/05/13	1.0000	1.0000	0.7071	0.5000	1.4142	2.0000
12/03/13	1.0000	1.0000	0.7071	0.5000	1.4142	2.0000
01/07/14	1.0000	1.0000	0.7071	0.5000	1.4142	2.0000
02/04/14	1.0000	1.0000	0.7071	0.5000	1.4142	2.0000
03/04/14	1.0000	1.0000	0.7071	0.5000	1.4142	2.0000
04/01/14	1.0000	1.0000	0.7071	0.5000	1.4142	2.0000
05/06/14	1.0000	1.0000	0.7071	0.5000	1.4142	2.0000
06/03/14	1.0000	1.0000	0.7071	0.5000	1.4142	2.0000

2014 Chronic Reference Toxicant Test Results Using Ceriodaphnia dubia in Soft Water



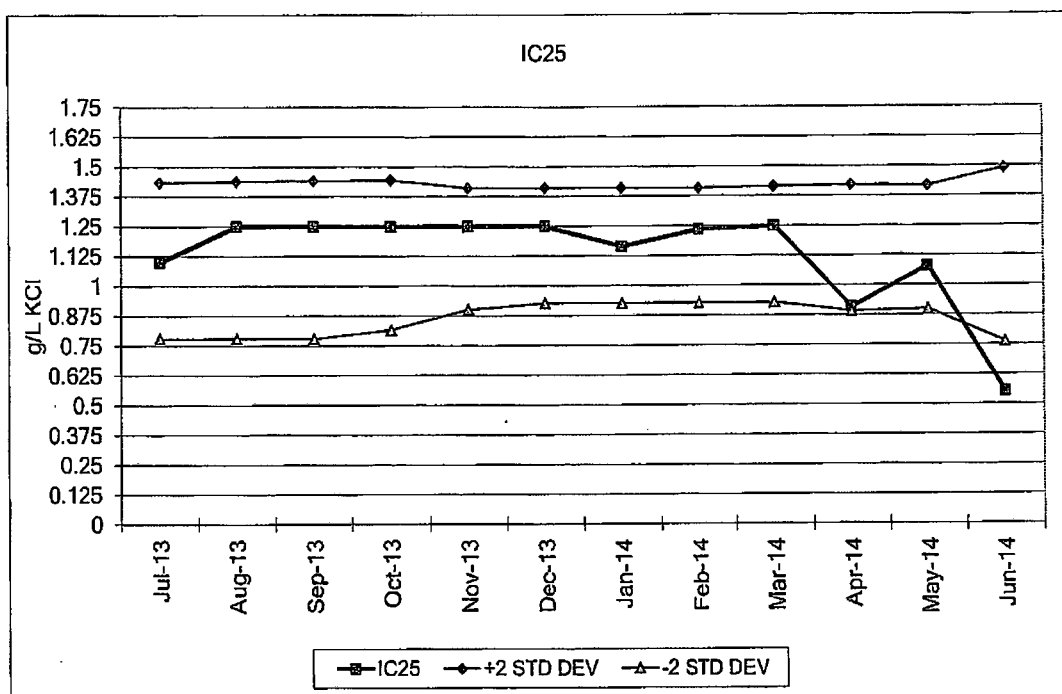
Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
11/01/12	0.5553					
12/27/12	0.7326	0.6440	0.5186	0.3932	0.7693	0.8947
01/01/13	0.5948	0.6276	0.5345	0.4414	0.7206	0.8137
02/05/13	0.2615	0.5361	0.3379	0.1397	0.7342	0.9324
03/04/13	0.2108	0.4710	0.2460	0.0210	0.6960	0.9210
04/02/13	0.1529	0.4180	0.1785	0.0000	0.6575	0.8970
05/30/13	0.1943	0.3860	0.1516	0.0000	0.6204	0.8548
06/25/13	0.7643	0.4333	0.1784	0.0000	0.6882	0.9431
07/30/13	0.7212	0.4653	0.2083	0.0000	0.7223	0.9794
08/06/13	0.7333	0.4921	0.2354	0.0000	0.7488	1.0056
09/03/13	0.6178	0.5035	0.2570	0.0106	0.7500	0.9965
09/30/13	1.0600	0.5499	0.2652	0.0000	0.8346	1.1192
11/05/13	1.1200	0.5938	0.2787	0.0000	0.9088	1.2239
12/03/13	1.0700	0.6278	0.2994	0.0000	0.9562	1.2846
01/07/14	0.3490	0.6092	0.2846	0.0000	0.9337	1.2583
02/04/14	0.1943	0.5833	0.2530	0.0000	0.9135	1.2437
03/04/14	1.0727	0.6120	0.2710	0.0000	0.9531	1.2942
04/01/14	0.9620	0.6315	0.2905	0.0000	0.9725	1.3135
05/06/14	0.9423	0.6478	0.3088	0.0000	0.9868	1.3258
06/03/14	0.9083	0.6609	0.3258	0.0000	0.9959	1.3310

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)
Jan-14	0.50	1.0
Feb-14	0.50	1.0
Mar-14	0.50	1.0
Apr-14	0.50	1.0
May-14	0.50	1.0
Jun-14	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
Jan-14	1.165	1.301	0.344	1.168	1.410	0.927
Feb-14	1.236	1.258	1.180	1.168	1.409	0.927
Mar-14	1.250	1.250	1.096	1.172	1.415	0.929
Apr-14	0.909	1.441	0.582	1.156	1.421	0.891
May-14	1.079	1.171	-0.376	1.159	1.418	0.900
Jun-14	0.555	0.667	0.427	1.127	1.490	0.764

**Current Test Dates: 06/19-26/2014

Aquatic BioSystems, Inc • Quality Research Organisms

APPENDIX E
AGENCY FORMS

SUMMARY REPORTING FORMS CHRONIC BIOMONITORING

Ceriodaphnia dubia Survival and Reproduction

Permittee: City of Magnolia

NPDES No.: AR0043613/ AFIN 14-00059

	Time	Date	To	Time	Date
Composite 1 Collected From	0700	6/22/14	To	0700	6/23/14
Composite 2 Collected From	0700	6/24/14	To	0700	6/25/14
Composite 3 Collected From	0700	6/26/14	To	0700	6/27/14
Test initiated:	1435 am/pm			6/24/14	date
Test terminated:	1330 am/pm			7/2/14	date
Dilution water used:	Receiving				

Reconstituted

PERCENT SURVIVAL

Time of Reading	Percent Effluent					
	0	32.0	42.0	56.0	80.0	100.0
24h	100.0	100.0	100.0	100.0	100.0	100.0
48h	100.0	100.0	100.0	100.0	100.0	90.0
End of test	90.0	100.0	100.0	90.0	100.0	90.0

NUMBER OF YOUNG PRODUCED PER FEMALE @ END OF TEST

Rep	0	32.0	42.0	56.0	80.0	100.0
A	10	19	25	18	22	22
B	11	17	18	14	23	15
C	14	26	24	D8	16	16
D	D2	15	10	13	15	18
E	16	24	22	12	24	17
F	15	19	20	27	22	24
G	16	21	24	11	25	D10
H	17	17	18	24	22	20
I	20	20	25	22	23	22
J	22	21	17	21	14	17
Surv. Mean	15.7	19.9	20.4	18.0	20.7	19.0
Total Mean	14.3	19.9	20.4	17.0	20.7	18.1
CV%*	24.51	16.66	23.70	32.16	19.99	16.43

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

PMSD = 34.5%

Ceriodaphnia dubia
Survival and Reproduction (cont)

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 (100.0%):	YES	X	NO
b) 1/2 LOW FLOW DILUTION (N/A %):	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 (100.0%):	YES	X	NO
b) 1/2 LOW FLOW DILUTION (N/A %):	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): N/A

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 and circle lowest number:

a) NOEC survival:	100.0% effluent
b) NOEC reproduction:	100.0% effluent
c) LOEC survival:	N/A % effluent
d) LOEC reproduction:	N/A % effluent

Biomonitoring Form
Chronic Toxicity Summary Form
Ceriodaphnia dubia
Chemical Parameters Chart

Permittee: City of Magnolia
 NPDES No.: AR0043613/ APIN 14-00059
 Contact: Russell Thomas
 Analyst: Houghton, Callahan, Briggs

Sample No. 1 Collected: Date: 6/23/14
 Sample No. 2 Collected: Date: 6/25/14
 Sample No. 3 Collected: Date: 6/27/14
 Test Begin: Date: 6/24/14
 Test End: Date: 7/2/14

Time: 0700
 Time: 0700
 Time: 0700
 Time: 1435
 Time: 1330

Dilution: 0									Dilution: 56.0								
	Day:									Day:							
	1	2	3	4	5	6	7	Comments		1	2	3	4	5	6	7	Comments
Temp (C)	25.0	25.0	24.7	24.7	24.7	24.6	25.0		Temp (C)	25.0	25.0	24.7	24.7	24.7	24.6	25.0	
DO Initial	8.3	7.8	7.9	7.8	8.2	7.3	6.9		DO Initial	8.2	7.7	7.9	7.8	8.2	7.7	6.9	
DO Final	8.4	8.4	8.4	8.2	8.2	8.1	8.0		DO Final	8.2	8.2	8.1	8.1	8.1	8.1	7.9	
pH Initial	7.3	7.5	7.0	7.5	7.3	7.0	6.9		pH Initial	7.3	7.4	7.0	7.3	7.1	7.3	6.7	
pH Final	7.2	7.2	7.2	7.4	7.3	7.1	7.4		pH Final	7.4	7.3	7.2	7.2	7.1	7.3	7.5	
Alkalinity	32.0								Alkalinity								
Hardness	48.0								Hardness								
Conductivity	164.8	164.7	162.1	164.4	166.6	175.0	174.1		Conductivity	252.0	255.0	257.0	264.0	263.0	274.0	276.0	
Chlorine	<.01								Chlorine								

Dilution: 32.0									Dilution: 80.0								
	Day:									Day:							
	1	2	3	4	5	6	7	Comments		1	2	3	4	5	6	7	Comments
Temp (C)	25.0	25.0	24.7	24.7	24.7	24.6	25.0		Temp (C)	25.0	25.0	24.7	24.7	24.7	24.6	25.0	
DO Initial	8.2	7.8	7.9	7.8	8.2	7.6	6.9		DO Initial	8.2	7.7	7.9	7.8	8.1	7.7	6.9	
DO Final	8.4	8.2	8.2	8.2	8.2	8.1	7.9		DO Final	8.1	8.1	8.0	8.1	8.1	8.1	7.9	
pH Initial	7.3	7.5	6.9	7.3	7.2	7.1	6.8		pH Initial	7.2	7.3	7.0	7.3	7.1	7.3	6.7	
pH Final	7.2	7.1	7.1	7.3	7.2	7.1	7.4		pH Final	7.4	7.3	7.3	7.2	7.2	7.3	7.5	
Alkalinity									Alkalinity								
Hardness									Hardness								
Conductivity	215.0	219.0	218.0	223.0	225.0	235.0	236.0		Conductivity	294.0	296.0	294.0	310.0	308.0	319.0	322.0	
Chlorine									Chlorine								

Dilution: 42.0									Dilution: 100.0								
	Day:									Day:							
	1	2	3	4	5	6	7	Comments		1	2	3	4	5	6	7	Comments
Temp (C)	25.0	25.0	24.7	24.7	24.7	24.6	25.0		Temp (C)	25.0	25.0	24.7	24.7	24.7	24.6	25.0	
DO Initial	8.2	7.8	7.9	7.8	8.2	7.6	6.9		DO Initial	8.2	7.7	7.9	7.8	8.1	7.6	6.9	
DO Final	8.3	8.2	8.2	8.2	8.2	8.1	7.9		DO Final	8.1	7.9	7.9	8.1	8.1	8.1	7.8	
pH Initial	7.3	7.4	6.9	7.2	7.1	7.2	6.8		pH Initial	7.2	7.2	7.0	7.3	7.1	7.3	6.7	
pH Final	7.3	7.2	7.2	7.2	7.1	7.2	7.4		pH Final	7.3	7.4	7.3	7.2	7.2	7.1	7.5	
Alkalinity									Alkalinity	24.0	32.0		36.0				
Hardness									Hardness	60.0	60.0		40.0				
Conductivity	230.0	234.0	232.0	238.0	240.0	249.0	252.0		Conductivity	336.0	329.0	327.0	335.0	342.0	362.0	359.0	
Chlorine									Chlorine	<.01	<.01		<.01				

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

Permittee: City of Magnolia

NPDES No.: AR0043613/AFIN 14-00059

	Time	Date	Time	Date
Composite 1 Collected from:	0700	6/22/14 To	0700	6/23/14
Composite 2 Collected from:	0700	6/24/14 To	0700	6/25/14
Composite 3 Collected from:	0700	6/26/14 To	0700	6/27/14

Test initiated: 1555 am/pm 6/24/14 date
 Test terminated: 1040 am/pm 7/1/14 date
 Dilution water used: Receiving 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	75.0	50.0	100.0	100.0	75.0	100.0	97.5	80.0	22.96
32.0	100.0	75.0	100.0	87.5	100.0	97.5	97.5	92.5	12.12
42.0	75.0	100.0	87.5	100.0	100.0	100.0	100.0	92.5	12.12
56.0	87.5	100.0	100.0	87.5	100.0	97.5	95.0	95.0	7.62
80.0	100.0	100.0	100.0	100.0	87.5	100.0	100.0	95.0	7.62
100.0	100.0	87.5	62.5	75.0	87.5	100.0	92.5	82.5	15.82

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	0.538	0.288	0.563	0.738	0.500	0.525	30.68
32.0	0.750	0.450	0.625	0.563	0.750	0.628	20.43
42.0	0.638	0.563	0.588	0.688	0.613	0.618	7.79
56.0	0.575	0.713	0.650	0.650	0.713	0.660	8.62
80.0	0.638	0.675	0.775	0.738	0.750	0.715	7.95
100.0	0.763	0.638	0.400	0.500	0.513	0.563	24.90
0-SN	0.717	0.575	0.563	0.738	0.667	0.652	12.29

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

PMSD = 30.4%

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 (100.0%)	YES	X	NO
b) 1/2 LOW FLOW DILUTION (N/A%)	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 (100.0%)	YES	X	NO
b) 1/2 LOW FLOW DILUTION (N/A%)	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): N/A

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 and circle lowest number:

a.) NOEC survival	100.0% effluent.
b.) NOEC growth	100.0% effluent.
c.) LOEC survival	N/A % effluent
d.) LOEC growth	N/A % effluent

Biomonitoring Form
Chronic Toxicity Summary Form
Pimephales promelas
Chemical Parameters Chart

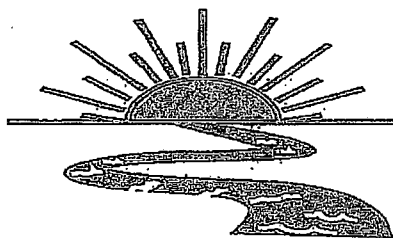
Permittee: City of Magnolia
 NPDES No.: AR0043613/ APIN 14-00059
 Contact: Russell Thomas
 Analyst: Briggs, Houghton, Callahan, Callahan

Sample No. 1 Collected: Date: 6/23/14
 Sample No. 2 Collected: Date: 6/25/14
 Sample No. 3 Collected: Date: 6/27/14
 Test Begin: Date: 6/24/14
 Test End: Date: 7/1/14

Time: 0700
 Time: 0700
 Time: 0700
 Time: 1555
 Time: 1040

Dilution: 0									Dilution: 56.0								
Day:									Day:								
	1	2	3	4	5	6	7	Comments		1	2	3	4	5	6	7	Comments
Temp (C)	25.9	25.1	25.5	25.1	25.1	24.2	24.8		Temp (C)	25.9	25.1	25.5	25.1	25.1	24.2	24.8	
DO Initial	7.4	5.9	6.6	6.8	5.5	5.4	6.7		DO Initial	7.7	6.2	6.7	6.4	5.4	5.0	6.1	
DO Final	8.4	8.41	8.4	8.2	8.2	8.1			DO Final	8.2	8.2	8.1	8.1	8.1	8.1		
pH Initial	6.9	6.8	6.8	7.0	6.8	6.4	6.6		pH Initial	7.0	6.8	6.9	6.6	6.6	6.6	6.6	
pH Final	7.2	7.2	7.2	7.4	7.3	7.1			pH Final	7.4	7.3	7.2	7.2	7.1	7.3		
Alkalinity	32.0								Alkalinity								
Hardness	48.0								Hardness								
Conductivity	164.8	164.7	162.1	164.4	166.6	175.0			Conductivity	252.0	255.0	257.0	264.0	263.0	274.0		
Chlorine	<.01								Chlorine								
Dilution: 32.0									Dilution: 80.0								
Day									Day								
	1	2	3	4	5	6	7	Comments		1	2	3	4	5	6	7	Comments
Temp (C)	25.9	25.1	25.5	25.1	25.1	24.2	24.8		Temp (C)	25.9	25.1	25.5	25.1	25.1	24.2	24.8	
DO Initial	7.8	6.0	6.8	6.6	5.5	5.1	6.3		DO Initial	7.7	6.2	6.3	6.6	5.3	5.1	5.9	
DO Final	8.4	8.2	8.2	8.2	8.2	8.1			DO Final	8.1	8.1	8.0	8.1	8.1	8.1		
pH Initial	6.9	6.9	6.9	6.8	6.7	6.5	6.6		pH Initial	7.0	6.8	6.8	6.6	6.5	6.6	6.6	
pH Final	7.2	7.1	7.1	7.3	7.2	7.1			pH Final	7.3	7.4	7.3	7.2	7.2	7.1		
Alkalinity									Alkalinity								
Hardness									Hardness								
Conductivity	215.0	219.0	218.0	223.0	225.0	235.0			Conductivity	336.0	329.0	327.0	335.0	342.0	362.0		
Chlorine									Chlorine								
Dilution: 42.0									Dilution: 100.0								
Day									Day								
	1	2	3	4	5	6	7	Comments		1	2	3	4	5	6	7	Comments
Temp (C)	25.9	25.1	25.5	25.1	25.1	24.2	24.8		Temp (C)	25.9	25.1	25.5	25.1	25.1	24.2	24.8	
DO Initial	7.7	6.1	6.6	6.6	5.6	5.3	6.2		DO Initial	7.8	6.0	6.4	6.4	5.6	5.0	5.7	
DO Final	8.3	8.2	8.2	8.2	8.2	8.1			DO Final	8.1	7.9	7.9	8.1	8.1	8.1		
pH Initial	7.0	6.8	6.9	6.7	6.6	6.6	6.6		pH Initial	6.9	6.7	6.8	6.7	6.5	6.7	6.5	
pH Final	7.3	7.2	7.2	7.2	7.1	7.2			pH Final	7.3	7.4	7.3	7.2	7.2	7.1		
Alkalinity									Alkalinity	24.0	32.0		36.0				
Hardness									Hardness	60.0	60.0		40.0				
Conductivity	230.0	234.0	232.0	238.0	240.0	249.0			Conductivity	336.0	329.0	327.0	335.0	342.0	362.0		
Chlorine									Chlorine	<.01	<.01		<.01				

APPENDIX F
REPORT QUALITY ASSURANCE FORM



Bio-Analytical Laboratories

3240 Spurgin Road
Post Office Box 527
Doyline, LA 71023

(318) 745-2772
1-800-259-1246
Fax: (318) 745-2773

REPORT QUALITY ASSURANCE FORM

Client: Magnolia

Project#: X5466

Chain of Custody Documents Checked by: AH 7/3/14
Technician/Date

Raw Data Documents Checked by: AH 7/3/14
Technician/Date

Statistical Analysis Package Checked by: EGG 7/11/14
Quality Manager/Date

Quality Control Data Checked by: EGG 7/11/14
Quality Manager/Date

Report Checked by: EGG 7/15/14
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.

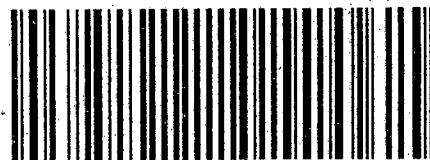
Quinn H. Beapp, BS
Quality Manager

7/15/14
Date

No part of this work may be altered in any form or by any means without written permission from Bio-Analytical Laboratories.

City of Magnolia Big Creek WWTP
P.O. Box 666
Magnolia, AR 71754-0666
Permit # AR0043613
AFIN # 14-00059

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Water Division
Arkansas Department of Environmental Quality
5301 N. Shore Dr.
North Little Rock, Arkansas 72118-5317