

# Arkansas Analytical, Inc.

## Toxicity Test Results

**Conway Corporation: Tupelo Bayou**  
**NPDES Permit Number: AR0051951**  
**First quarter 2015**  
**AFIN # 23-01095**

Fathead Minnow, *Pimephales promelas*, Larval Survival and Growth Test  
Test 1000.0

*Ceriodaphnia dubia*, Survival and Reproduction Test  
Test 1002.0

Prepared for: **Mr. Bill Fulmer**  
**Conway Corporation**  
**P.O. Box 99**  
**Conway, Arkansas 72032**

Prepared by: Arkansas Analytical, Inc.  
11701 I-30, Bldg 1 Suite 115  
Little Rock, Arkansas 72209  
**Lab Number K1502002**

Friday, February 13, 2015

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## **Introduction**

This report contains test results for toxicity testing for Conway Corporation. The NPDES permit number is AR0051951. The facility is located as follows: from the intersection of Dave Ward Drive (Hwy. 60) and Lollie Road, drive approximately 1.3 miles south on Lollie Road, and the proposed facility location will be on the right (to the west) in Faulkner County, Arkansas. Latitude: 35° 03' 05" North & Longitude: 92° 32' 09" West.

The permit requires chronic biomonitoring testing quarterly for *Pimephales promelas* and *Ceriodaphnia dubia*. The test results in this report represent the testing for the first quarter of 2015.

\* Test solution renewal and organism feeding were inadvertently missed Day 4 of testing. Corrective action was taken and the remainder of the test was completed successfully.

## **Plant Operations**

To be provided by permittee.

## Source of Effluent and Dilution Water

Effluent samples were collected as follows:

Sample Collection:	Date, Time Started	Date, Time Ended
Sample #1:	2-1-15, 0700	2-2-15, 0700
Sample #2:	2-3-15, 0700	2-4-15, 0700
Sample #3:	2-5-15, 0700	2-6-15, 0700

Samples were composites collected at the final discharge of Outfall 001, Tupelo Bayou effluent.

The following information was collected upon immediate receipt of the samples at the laboratory:

Sample Receiving Information:	Date, Time Sample(s) Received	Temperature (°C) upon receipt
Sample #1:	2-2-15, 1113	1
Sample #2:	2-4-15, 1002	1
Sample #3:	2-6-15, 0920	4

Chain of custody documentation is located in Appendix A.

The dilution water used in the toxicity tests was synthetic soft. It was prepared using Elga Maxima ultra pure water according to EPA specifications. Each batch was analyzed for pH, hardness, total alkalinity, and conductivity. Results are provided in Appendix B.

### Dilution Series

Five dilutions in addition to a control (0% effluent) were used in the toxicity tests. The dilutions, which were made with synthetic water, were 5%, 7%, 9%, 12%, and 16%. The low-flow effluent concentration (**critical dilution**) was defined as **12% effluent**.

## Test Methods

EPA Method 1000.0, Fathead Minnow, *Pimephales promelas*, Larval Survival and Growth Test, was used in this bioassay. Larvae are exposed in a static renewal system for seven days and the results are based on the survival and growth (increase in weight) of the larvae. The test chambers were 500 ml plastic cups, and each chamber contained ten organisms in a test solution volume of 250 mls. The test temperature was 25 degrees Centigrade. Raw data and statistics are provided in Appendix C.

EPA Method 1002.0, Cladoceran, *Ceriodaphnia dubia*, Survival and Reproduction Test, was used. Neonates are exposed in a static renewal system until at least 60% of the control organisms have produced a third brood. Results are based on the survival and reproduction of the organisms. One neonate was placed in each of ten replicate chambers using a randomizing template. Test chambers were 30 ml plastic cups filled with 15 mls of test solution. The test temperature was 25 degrees Centigrade. Raw data and statistics are provided in Appendix D.

## Test Organisms

The organisms used in Test 1000.0 were < 48 hour old Fathead Minnows, *Pimephales promelas*, which were purchased from Aquatox; a copy of the organism history is provided in Appendix E.

The organisms used in Test 1002.0 were < 24 hour old *Ceriodaphnia dubia* neonates, (all born within the same eight hours), obtained from an in-house culture. An organism history is provided in Appendix E.

**Quality Assurance**

Test Acceptability

TEST ACCEPTANCE CRITERIA for *Ceriodaphnia dubia*

Control Criteria	Results	Pass	Fail
Greater than or equal to 80% survival	100%	X	
Average of 15 or more young per surviving female	16.1	X	
At least 60% of surviving females should have produced 3 broods	90%	X	
The percent coefficient of variation between replicates must be 40% or less for the young of surviving females	24.2%	X	

TEST ACCEPTANCE CRITERIA for *Pimephales promelas*

Control Criteria	Results	Pass	Fail
Greater than or equal to 80% survival	100%	X	
The percent coefficient of variation between replicates must be 40% or less for survival	0.00%	X	
Minimum of 0.25 mg average dry weight of surviving controls	0.511	X	
The percent coefficient of variation between replicates must be 40% or less for growth	7.80%	X	

Reference Toxicant

The reference toxicant used was Potassium Chloride prepared in-house. The tests were performed using moderately hard synthetic as dilution water. The results of the reference toxicant were:

REFERENCE TOXICANT

<i>Ceriodaphnia dubia</i> 1/6/15 – 1/13/15		<i>Pimephales promelas</i> 1/6/15 – 1/13/15	
NOEC Survival:	250 ppm KCl	NOEC Survival:	500 ppm KCl
LOEC Survival:	500 ppm KCl	LOEC Survival:	1000 ppm KCl
NOEC Reproduction:	250 ppm KCl	NOEC Growth:	500 ppm KCl
LOEC Reproduction:	500 ppm KCl	LOEC Growth:	1000 ppm KCl

Quality Assurance charts are provided in Appendix F.

## Summary of Results Conway Corporation – Tupelo Bayou

<i>Ceriodaphnia dubia</i>		<i>Pimephales promelas</i>	
NOEC / LOEC Survival	16% / NA	NOEC / LOEC survival	16% / NA
NOEC / LOEC Reproduction	16% / NA	NOEC / LOEC growth	16% / NA
Mean number of neonates (critical dilution)	16.5	%CV survival (critical dilution)	4.56%
%CV Reproduction (critical dilution)	22.7%	Mean dry weight (critical dilution) in milligrams	0.497
		%CV growth (critical dilution)	5.55%
PMSD Reproduction	26.8%	PMSD Growth	13.3%

### Conclusion

Chronic static renewal larval survival and growth test using fathead minnow, *Pimephales promelas*, (Method 1000.0)

The permit issued to Conway Corporation – Tupelo Bayou, specifies that the **critical dilution is 12% effluent**. The effluent samples **did not** exhibit lethal or sublethal effects at the critical dilution, and, as such, **passed** both portions of the test.


Chronic static renewal survival and reproduction test using *Ceriodaphnia dubia*, (Method 1002.0)

The permit issued to Conway Corporation – Tupelo Bayou, specifies that the **critical dilution is 12% effluent**. The effluent samples **did not** exhibit lethal or sublethal effects at the critical dilution, and, as such, **passed** both portions of the test.

Biomonitoring Analysts:

Ryan Hudgin / William Lindsey

Reviewed by:

Tracy Bounds by   
Tracy Bounds, lab manager

SUMMARY REPORTING FOR CHRONIC BIOMONITORING  
 FATHEAD MINNOW LARVAE GROWTH AND SURVIVAL  
*PIMEPHALES PROMELAS*

**PERMITTEE: Conway Corporation –Tupelo Bayou**

Sample Collection:	Date, Time Started	Date, Time Ended
Sample #1:	2-1-15, 0700	2-2-15, 0700
Sample #2:	2-3-15, 0700	2-4-15, 0700
Sample #3:	2-5-15, 0700	2-6-15, 0700

Test initiated (date, time): 2-3-15, 1420      Test terminated (date, time): 2-10-15, 1435

Dilution water used:      Soft Synthetic

**DATA TABLE FOR FATHEAD MINNOW SURVIVAL**

Effluent Conc %	Percent Survival in Replicate Chambers					Mean Percent Survival				CV %
	A	B	C	D	E	24 hours	48 hours	7 days		
0%	100	100	100	100	100	100	100	100	0.00	
5%	100	100	100	100	100	100	100	100		
7%	100	100	100	100	100	100	100	100		
9%	100	100	90	100	100	98	98	98		
12%	100	90	100	100	100	100	98	98	4.56	
16%	100	100	100	70	100	98	98	94		

**DATA TABLE FOR GROWTH OF FATHEAD MINNOWS**

**Average Dry Weight in milligrams in replicate chambers**

Effluent Conc %	A	B	C	D	E	Mean Dry Weight	CV%
0%	0.507	0.557	0.450	0.532	0.510	0.511	7.80%
5%	0.435	0.446	0.596	0.418	0.477	0.474	
7%	0.432	0.477	0.473	0.459	0.472	0.463	
9%	0.467	0.485	0.477	0.502	0.466	0.479	
12%	0.508	0.525	0.517	0.467	0.468	0.497	5.55%
16%	0.496	0.475	0.435	0.353	0.525	0.457	

Coefficient of Variation = standard deviation / mean \* 100

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

1. Dunnett's procedure or Steel's Many-One Rank Test as appropriate:  
Is the mean survival at 7 days significantly different ( $p=0.05$ ) than the control survival for:  
  
a) LOW FLOW OR CRITICAL DILUTION, (100%)    YES \_\_\_\_\_    NO   X
  
2. Dunnett's Procedure  
Is the mean dry weight (growth) at 7 days significantly different ( $p=0.05$ ) than the control's dry weight (growth) for:  
  
a) LOW FLOW OR CRITICAL DILUTION, (100%)    YES \_\_\_\_\_    NO   X
  
3. If NO was answered to 1.a) enter [0] otherwise enter [1] (parameter TLP6C):   0
  
4. If NO was answered to 2.a) enter [0] otherwise enter [1] (parameter TGP6C):   0
  
5. Enter percentage corresponding to each parameter below:  
  
a) NOEC survival (parameter TOP6C)=   16   % effluent  
b) NOEC growth (parameter TPP6C)=   16   % effluent  
c) Coefficient of variation (parameter TQP6C)=   7.80   %
  
6. Enter Whole Effluent Toxicity:   16   %



SUMMARY REPORTING FORMS FOR CHRONIC BIOMONITORING  
*Ceriodaphnia dubia* SURVIVAL AND REPRODUCTION

**PERMITTEE: Conway Corporation –Tupelo Bayou**

Sample Collection:	Date, Time Started	Date, Time Ended
Sample #1:	2-1-15, 0700	2-2-15, 0700
Sample #2:	2-3-15, 0700	2-4-15, 0700
Sample #3:	2-5-15, 0700	2-6-15, 0700

Test initiated (date, time): 2-3-15, 1445      Test terminated (date, time): 2-11-15, 0930

Dilution water used:    Soft Synthetic

*Ceriodaphnia dubia* SURVIVAL AND REPRODUCTION  
NUMBER OF YOUNG PRODUCED PER FEMALE @ TEST TERMINATION

Replicate	PERCENT EFFLUENT					
	0%	5%	7%	9%	12%	16%
A	19	18	21	15	21	8
B	19	21	18	17	13	17
C	16	16	10	17	21	17
D	21	11	11	16	18	14
E	9	9	8	14	13	14
F	14	21	15	17	18	8
G	20	16	21	12	10	13
H	16	11	6	10	14	18
I	11	11	12	12	19	10
J	16	17	14	24	18	17
Mean	16.1	15.1	13.6	15.4	16.5	13.6
Mean/surviving female	16.1	15.1	13.6	15.4	16.5	13.6
CV%*	24.2				22.7	

SUMMARY REPORTING FORMS FOR CHRONIC BIOMONITORING  
*Ceriodaphnia dubia* SURVIVAL AND REPRODUCTION

**Permittee: Conway Corporation**

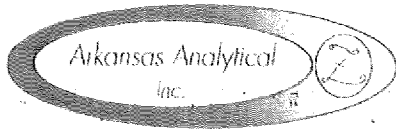
PERCENT SURVIVAL

PERCENT EFFLUENT	0%	5%	7%	9%	12%	16%
Time of Reading: 24 HOURS	100	100	100	100	100	100
48 HOURS	100	100	100	100	100	100
Test termination	100	100	100	100	100	100

1. Fisher's Exact Test:  
Is the mean survival at test termination significantly different (p=0.05) than the control survival for:
  - a) LOW FLOW OR CRITICAL DILUTION, (100%): YES \_\_\_\_\_ NO X
  
2. Dunnett's Procedure or Steel's Many One Rank Test:  
Is the mean number of young produced per female significantly different (p=0.05) than the controls number of young per female for:
  - a) LOW FLOW OR CRITICAL DILUTION, (100%): YES \_\_\_\_\_ NO X
  
3. If NO was answered to 1.a) enter [0] otherwise enter [1] (parameter TLP3B): 0
  
4. If NO was answered to 2.a) enter [0] otherwise enter [1] (parameter TGP3B): 0
  
5. Enter percentage corresponding to each parameter below:
  - a) NOEC survival (parameter TOP3B)= 16 % effluent
  - b) NOEC reproduction (parameter TPP3B)= 16 % effluent
  - c) Coefficient of variation (parameter TQP3B)= 24.2 %
  
6. Enter Whole Effluent Toxicity: 16 %


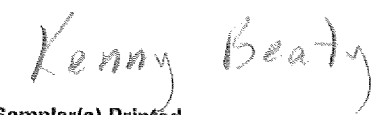



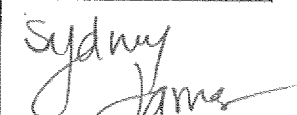
APPENDIX A

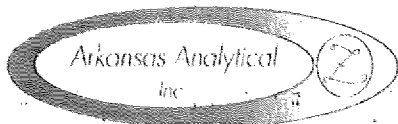
Chain of Custody Forms



11701 Interstate 30, Bldg. 1, Ste. 115  
 Little Rock, AR 72209  
 PHONE: 501-455-3233  
 FAX: 501-455-6118

# CHAIN OF CUSTODY RECORD

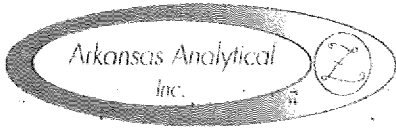
CLIENT INFORMATION		BILLING INFORMATION		Project Description		Turnaround Time		Preservation Codes:													
Conway Corporation		Conway Corporation		Chronic Toxicity		1 Day (100%)		1. Cool, 4 Degrees Centigrade				4. Thiosulfate for Dechlorination									
800 South Harkrider		P.O. Box 99				2 Day (50%)		2. Sulfuric Acid (H <sub>2</sub> SO <sub>4</sub> ), pH < 2				5. Hydrochloric Acid(HCl)									
Conway, AR 72032		Conway, AR 72032		Reporting Information		3 Day (25%)		3. Nitric Acid (HNO <sub>3</sub> ), pH < 2				6. Sodium Hydroxide (NaOH), pH > 12									
Attn: Bill Fulmer				Telephone: 501-733-4495		Routine		TEST PARAMETERS								Bottle Type Code					
				Email: Bill.Fulmer@conwaycorp.com		Preservative Code: 1										G = Glass; P = Plastic					
				Email: trey.lieblong@conwaycorp.com		Bottle Type: P										V = Septum; A = Amber					
 Sampler(s) Signature				 Sampler(s) Printed								Chronic Toxicity		Arkansas Analytical Work Order Number:							
Field Number	SAMPLE COLLECTION		Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION					Chronic Toxicity									
	Date/s	Time/s																			
	2/1-2/15	7:00A-7:00A		X	2	Water	Tupelo Bayou Effluent					X	K1502-002A								
1. Relinquished by: (Signature)		Date/Time		2. Received by: (Signature)		SAMPLE CONDITION UPON RECEIPT IN LAB						REMARKS / SAMPLE COMMENTS									
		2/2/15 11:13 AM				1. CUSTODY SEALS: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No 2. CONTAINERS CORRECT: <input type="checkbox"/> Yes <input type="checkbox"/> No 3. COC/LABELS AGREE: <input type="checkbox"/> Yes <input type="checkbox"/> No 4. RECEIVED ON ICE: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No 5. TEMPERATURE ON RECEIPT: 10°C 6. TEMPERATURE GUN ID: MHT #2															
3. Relinquished by: (Signature)		Date/Time		4. Received by lab: (Signature)		1. CUSTODY SEALS: <input type="checkbox"/> Yes <input type="checkbox"/> No 2. CONTAINERS CORRECT: <input type="checkbox"/> Yes <input type="checkbox"/> No 3. COC/LABELS AGREE: <input type="checkbox"/> Yes <input type="checkbox"/> No 4. RECEIVED ON ICE: <input type="checkbox"/> Yes <input type="checkbox"/> No 5. TEMPERATURE ON RECEIPT: 6. TEMPERATURE GUN ID:															
																					



11701 Interstate 30, Bldg. 1, Ste. 115  
 Little Rock, AR 72209  
 PHONE: 501-455-3233  
 FAX: 501-455-6118

# CHAIN OF CUSTODY RECORD

CLIENT INFORMATION		BILLING INFORMATION		Project Description		Turnaround Time		Preservation Codes:											
Conway Corporation		Conway Corporation		Chronic Toxicity		1 Day (100%)		1. Cool, 4 Degrees Centigrade				4. Thiosulfate for Dechlorination							
800 South Harkrider		P.O. Box 99				2 Day (50%)		2. Sulfuric Acid (H <sub>2</sub> SO <sub>4</sub> ), pH < 2				5. Hydrochloric Acid(HCl)							
Conway, AR 72032		Conway, AR 72032		Reporting Information		3 Day (25%)		3. Nitric Acid (HNO <sub>3</sub> ), pH < 2				6. Sodium Hydroxide (NaOH), pH > 12							
Attn: Bill Fulmer				Telephone: 501-733-4495		Routine		TEST PARAMETERS								Bottle Type Code			
				Email: Bill.Fulmer@conwaycorp.com		Preservative Code: 1										G = Glass, P = Plastic			
				Email: troy.lieblong@conwaycorp.com		Bottle Type: P										V = Septum, A = Amber			
<i>Bill Fulmer</i> Sampler(s) Signature				<i>Bill Fulmer</i> Sampler(s) Printed				Chronic Toxicity										Arkansas Analytical Work Order Number:  K1502-002B	
Field Number	SAMPLE COLLECTION		Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION												
	2-3-4-15	7 AM - 7:45		X	1	Water	Tupelo Bayou Effluent												
1. Relinquished by: (Signature)		Date/Time		2. Received by: (Signature)		SAMPLE CONDITION UPON RECEIPT IN LAB						REMARKS / SAMPLE COMMENTS							
<i>Bill Fulmer</i>		2-4-15 10:02 AM		<i>Bill Fulmer</i>		1. CUSTODY SEALS: <input checked="" type="checkbox"/> Yes ___ No 2. CONTAINERS CORRECT: <input checked="" type="checkbox"/> Yes ___ No 3. COC/LABELS AGREE: <input checked="" type="checkbox"/> Yes ___ No 4. RECEIVED ON ICE: <input checked="" type="checkbox"/> Yes ___ No 5. TEMPERATURE ON RECEIPT: 1°C 6. TEMPERATURE GUN ID: HHT #2													
3. Relinquished by: (Signature)		Date/Time		4. Received by lab: (Signature)		FOR USE BY LAB ONLY													
<i>Sydney James</i>				<i>Sydney James</i>															



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 Little Rock, AR 72209  
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# CHAIN OF CUSTODY RECORD

CLIENT INFORMATION		BILLING INFORMATION		Project Description		Turnaround Time		Preservation Codes:													
Conway Corporation		Conway Corporation		Chronic Toxicity		1 Day (100%)		1. Cool, 4 Degrees Centigrade				4. Thiosulfate for Dechlorination									
800 South Harkrider		P.O. Box 99				2 Day (50%)		2. Sulfuric Acid (H <sub>2</sub> SO <sub>4</sub> ), pH < 2				5. Hydrochloric Acid(HCl)									
Conway, AR 72032		Conway, AR 72032		Reporting Information		3 Day (25%)		3. Nitric Acid (HNO <sub>3</sub> ), pH < 2				6. Sodium Hydroxide (NaOH), pH > 12									
Attn: Bill Fulmer				Telephone: 501-733-4495		Routine		TEST PARAMETERS								Bottle Type Code					
				Email: Bill.Fulmer@conwaycorp.com		Preservative Code: 1										G = Glass, P = Plastic					
				Email: trey.heblong@conwaycorp.com		Bottle Type: P										V = Septum, A = Amber					
<i>Bill Fulmer</i> Sampler(s) Signature				<i>Bill Fulmer</i> Sampler(s) Printed								Chronic Toxicity		Arkansas Analytical Work Order Number:  K1502-062C							
Field Number	SAMPLE COLLECTION		Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION	Chronic Toxicity	TEST PARAMETERS												
	Date/s	Time/s																			
	2-5-6-15	7 AM-7 AM		X	1	Water	Tupelo Bayou Effluent	X													
1. Relinquished by: (Signature)		Date/Time		2. Received by: (Signature)		SAMPLE CONDITION UPON RECEIPT IN LAB				REMARKS / SAMPLE COMMENTS											
<i>Bill Fulmer</i>		2-6-15 9:20 AM		<i>[Signature]</i>		1. CUSTODY SEALS: <input checked="" type="checkbox"/> Yes ___ No 2. CONTAINERS CORRECT: <input checked="" type="checkbox"/> Yes ___ No 3. COC/LABELS AGREE: <input checked="" type="checkbox"/> Yes ___ No 4. RECEIVED ON ICE: <input checked="" type="checkbox"/> Yes ___ No 5. TEMPERATURE ON RECEIPT: 4°C 6. TEMPERATURE GUN ID: HHT #2															
3. Relinquished by: (Signature)		Date/Time		4. Received by lab: (Signature)		FOR COMPLETION BY LAB ONLY															
<i>[Signature]</i>				<i>Sydney James</i>																	

## APPENDIX B

### Effluent and Dilution Water Data

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Fathead Minnow

Lab # / Sample ID K1502002

Test Start (Date/Time) 2-3-15 1420

Client: Conway Tupelo Bayou

Test End (Date/Time) 2-10-15 1435

Day of Test

		1	2	3	4	5	6	7	notes
<b>Control</b>	55	2-3	2-4	2-5	2-6	2-7	2-8	2-9	
D.O. (mg/L)	INITIAL	8.7	8.5	8.8	8.6		8.5	8.9	
	FINAL	7.3	7.4	7.6	8.2		7.4	7.9	
pH (s.u.)	INITIAL	7.7	8.1	8.1	8.1		8.0	8.1	
	FINAL	7.5	7.6	7.4	8.1		8.0	7.9	
temp (C)	INITIAL	23	23	24	22		22	24	
	FINAL	25	25	25	25		25	25	
ALKALINITY (mg/L)		30	---	34	---		32	---	
HARDNESS (mg/L)		44	---	48	---		40	---	
CONDUCTIVITY (umhc)		230	---	268	---		251	---	
CHLORINE (mg/L)		<0.05	---	---	---		---	---	
<b>CONC:</b>	5								
D.O. (mg/L)	INITIAL	8.6	8.2	8.3	8.6		8.5	8.6	
	FINAL	7.2	7.3	7.6	8.1		7.9	7.9	
pH (s.u.)	INITIAL	7.8	8.0	8.1	8.0		8.0	8.1	
	FINAL	7.5	7.7	7.5	8.1		7.9	7.9	
temp (C)	INITIAL	23	23	23	22		21	24	
	FINAL	25	25	25	25		25	25	
<b>CONC:</b>	7								
D.O. (mg/L)	INITIAL	8.7	8.5	8.7	8.4		8.6	8.6	
	FINAL	7.4	7.3	7.3	7.9		7.6	7.9	
pH (mg/L)	INITIAL	7.8	8.1	8.1	8.1		8.0	8.0	
	FINAL	7.5	7.7	7.6	8.1		7.9	7.9	
temp (C)	INITIAL	23	23	23	22		22	24	
	FINAL	25	25	25	25		25	25	
<b>CONC:</b>	9								
D.O. (mg/L)	INITIAL	8.7	8.5	8.7	8.6		8.5	8.5	
	FINAL	7.6	7.5	7.6	7.9		7.6	7.8	
pH (s.u.)	INITIAL	7.9	8.1	8.1	8.0		8.1	8.1	
	FINAL	7.6	7.7	7.6	8.1		7.9	7.9	
temp (C)	INITIAL	23	23	22	21		22	23	
	FINAL	25	25	25	25		25	25	
<b>CONC:</b>	12								
D.O. (mg/L)	INITIAL	8.8	8.6	8.7	8.7		8.6	8.6	
	FINAL	7.0	7.2	7.6	7.6		7.6	7.7	
pH (s.u.)	INITIAL	7.8	8.1	8.1	8.0		8.0	7.9	
	FINAL	7.7	7.8	7.7	8.0		8.0	7.9	
temp (C)	INITIAL	23	23	22	21		22	23	
	FINAL	25	25	25	25		25	25	
<b>CONC:</b>	16								
D.O. (mg/L)	INITIAL	8.9	8.6	8.8	8.7		8.5	8.6	
	FINAL	7.1	7.2	7.7	7.7		7.5	7.8	
pH (s.u.)	INITIAL	7.9	8.1	8.0	8.0		8.1	7.9	
	FINAL	7.7	7.8	7.7	8.0		8.0	7.8	
temp (C)	INITIAL	23	23	21	21		23	23	
	FINAL	25	25	25	25		25	25	
<b>CONC:</b>	100 %	A	A	A	B	B	C	C	
ALKALINITY (mg/L)		142	---	---	124	---	144	---	
HARDNESS (mg/L)		58	---	---	48	---	60	---	
CONDUCTIVITY (umhc)		670	---	---	602	---	702	---	
CHLORINE (mg/L)		0.06	---	---	<0.05	---	<0.05	---	



CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Ceriodaphnia Dubia

Lab # / Sample ID K1502002 Test Start (Date/Time) 2-3-15 1445

Client Conway Tule Bayou Test End (Date/Time) 2-11-15 0930

Day of Test

		1	2	3	4	5	6	7	notes
<b>Control</b>	SS	2-3	2-4	2-5	2-6	2-7	2-8	2-9	2-10
D.O. (mg/L)	INITIAL	8.7	8.5	8.8	8.6		8.5	8.4	8.7
	FINAL	8.0	8.3	8.4	8.4		8.4	8.8	8.5
pH (s.u.)	INITIAL	7.7	8.1	8.1	8.1		8.0	8.1	7.9
	FINAL	8.0	8.1	8.1	8.0		7.7	7.5	8.2
temp (C)	INITIAL	23	23	24	22		22	24	23
	FINAL	25	25	25	25		25	25	25
ALKALINITY (mg/L)		30	—	34	—		PH 2532	—	30
HARDNESS (mg/L)		44	—	48	—		PH 3240	—	40
CONDUCTIVITY (umhc)		250	—	268	—		251	—	216
CHLORINE (mg/L)		0.05	—	—	—		—	—	—
<b>CONC: 5</b>									
D.O. (mg/L)	INITIAL	8.6	8.2	8.3	8.6		8.5	8.4	8.8
	FINAL	7.9	8.1	8.6	8.4		8.4	8.8	8.5
pH (s.u.)	INITIAL	7.8	8.0	8.1	8.0		8.0	7.9	7.9
	FINAL	8.0	8.1	8.0	8.0		7.8	7.8	8.1
temp (C)	INITIAL	23	23	23	22		21	24	23
	FINAL	25	25	25	25		25	25	25
<b>CONC: 7</b>									
D.O. (mg/L)	INITIAL	8.7	8.5	8.7	8.6		8.6	8.4	8.4
	FINAL	8.1	8.4	8.4	8.3		8.4	8.9	8.6
pH (mg/L)	INITIAL	7.8	8.1	8.1	8.1		8.0	8.0	7.9
	FINAL	8.0	8.0	8.0	8.0		7.9	7.9	8.1
temp (C)	INITIAL	23	23	23	22		22	24	23
	FINAL	25	25	25	25		25	25	25
<b>CONC: 9</b>									
D.O. (mg/L)	INITIAL	8.7	8.5	8.7	8.6		8.5	8.4	8.8
	FINAL	8.1	8.3	8.5	8.4		8.5	9.0	8.7
pH (s.u.)	INITIAL	7.9	8.1	8.1	8.0		8.1	7.9	7.9
	FINAL	8.0	8.1	8.0	7.9		7.9	8.0	8.0
temp (C)	INITIAL	23	23	22	21		22	24	22
	FINAL	25	25	25	25		25	25	25
<b>CONC: 12</b>									
D.O. (mg/L)	INITIAL	8.8	8.6	8.7	8.7		8.6	8.4	8.8
	FINAL	8.1	8.4	8.4	8.5		8.5	8.9	8.6
pH (s.u.)	INITIAL	7.8	8.1	8.1	8.0		8.0	8.0	7.9
	FINAL	8.0	8.1	8.0	7.9		8.0	8.1	8.1
temp (C)	INITIAL	23	23	22	21		22	23	22
	FINAL	25	25	25	25		25	25	25
<b>CONC: 16</b>									
D.O. (mg/L)	INITIAL	8.9	8.6	8.8	8.7		8.5	8.3	8.9
	FINAL	8.1	8.4	8.4	8.5		8.4	9.0	8.7
pH (s.u.)	INITIAL	7.9	8.1	8.0	8.0		8.1	7.9	7.8
	FINAL	8.0	8.1	8.1	8.0		8.0	8.1	8.0
temp (C)	INITIAL	23	23	21	21		23	23	22
	FINAL	25	25	25	25		25	25	25
<b>CONC: 100 %</b>		A	A	A	B	B	C	B	C
ALKALINITY (mg/L)		142	—	—	124	—	144	124	144
HARDNESS (mg/L)		58	—	—	48	—	60	48	60
CONDUCTIVITY (umhc)		670	—	—	602	—	702	602	702
CHLORINE (mg/L)		0.06	—	—	0.05	—	0.05	0.05	0.05

APPENDIX C

Fathead minnow raw data and statistics

*Pimephales promelas*

FATHEAD MINNOW

SURVIVAL DATA FOR LARVAL SURVIVAL AND GROWTH TEST (CHRONIC)

LAB #: K1502002			TEST START		DATE	2/3/15	TIME	1420				
CLIENT: Conway - Tupelo Bayou			TEST END		DATE	2/10/15	TIME	1435				
ANALYST: RH / WL			AGE AND SOURCE OF MINNOWS		< 48 hrs old, Aquatox							
DAY(NUMBER SURVIVING)												
SURVIVAL												
	REP #	START	1	2	3	4	5	6	7	%	MEAN %	CV
CONTROL	A	10	10	10	10		10	10	10	100%	100.0%	0.00
	B	10	10	10	10		10	10	10	100%		
	C	10	10	10	10		10	10	10	100%		
	D	10	10	10	10		10	10	10	100%		
	E	10	10	10	10		10	10	10	100%		
SS	REP #	START	1	2	3		5	6	7	%	MEAN %	CV
	A	10	10	10	10		10	10	10	100%	100.0%	
	B	10	10	10	10		10	10	10	100%		
	C	10	10	10	10		10	10	10	100%		
	D	10	10	10	10		10	10	10	100%		
E	10	10	10	10		10	10	10	100%			
CONC:	REP #	START	1	2	3		5	6	7	%	MEAN %	CV
	A	10	10	10	10		10	10	10	100%	100.0%	
	B	10	10	10	10		10	10	10	100%		
	C	10	10	10	10		10	10	10	100%		
	D	10	10	10	10		10	10	10	100%		
E	10	10	10	10		10	10	10	100%			
5%	REP #	START	1	2	3		5	6	7	%	MEAN %	CV
	A	10	10	10	10		10	10	10	100%	100.0%	
	B	10	10	10	10		10	10	10	100%		
	C	10	10	10	10		10	10	10	100%		
	D	10	10	10	10		10	10	10	100%		
E	10	10	10	10		10	10	10	100%			
CONC:	REP #	START	1	2	3		5	6	7	%	MEAN %	CV
	A	10	10	10	10		10	10	10	100%	100.0%	
	B	10	10	10	10		10	10	10	100%		
	C	10	10	10	10		10	10	10	100%		
	D	10	10	10	10		10	10	10	100%		
E	10	10	10	10		10	10	10	100%			
7%	REP #	START	1	2	3		5	6	7	%	MEAN %	CV
	A	10	10	10	10		10	10	10	100%	100.0%	
	B	10	10	10	10		10	10	10	100%		
	C	10	10	10	10		10	10	10	100%		
	D	10	10	10	10		10	10	10	100%		
E	10	10	10	10		10	10	10	100%			
CONC:	REP #	START	1	2	3		5	6	7	%	MEAN %	CV
	A	10	10	10	10		10	10	10	100%	98.0%	
	B	10	10	10	10		10	10	10	100%		
	C	10	9	9	9		9	9	9	90%		
	D	10	10	10	10		10	10	10	100%		
E	10	10	10	10		10	10	10	100%			
9%	REP #	START	1	2	3		5	6	7	%	MEAN %	CV
	A	10	10	10	10		10	10	10	100%	98.0%	4.56
	B	10	10	9	9		9	9	9	90%		
	C	10	10	10	10		10	10	10	100%		
	D	10	10	10	10		10	10	10	100%		
E	10	10	10	10		10	10	10	100%			
CONC:	REP #	START	1	2	3		5	6	7	%	MEAN %	CV
	A	10	10	10	10		10	10	10	100%	94.0%	
	B	10	10	10	10		10	10	10	100%		
	C	10	10	10	10		10	10	10	100%		
	D	10	9	9	9		8	8	7	70%		
E	10	10	10	10		10	10	10	100%			
12%	REP #	START	1	2	3		5	6	7	%	MEAN %	CV
	A	10	10	10	10		10	10	10	100%	94.0%	
	B	10	10	10	10		10	10	10	100%		
	C	10	10	10	10		10	10	10	100%		
	D	10	9	9	9		8	8	7	70%		
E	10	10	10	10		10	10	10	100%			
16%	REP #	START	1	2	3		5	6	7	%	MEAN %	CV
	A	10	10	10	10		10	10	10	100%	94.0%	
	B	10	10	10	10		10	10	10	100%		
	C	10	10	10	10		10	10	10	100%		
	D	10	9	9	9		8	8	7	70%		
E	10	10	10	10		10	10	10	100%			
ANALYST:		RH	RH	RH	RH		WL	RH	RH			
DATE:		2/3/15	2/4/15	2/5/15	2/6/15		2/8/15	2/9/15	2/10/15			
TIME:		1420	1330	1345	1030		1930	1540	1435			

CV= PERCENT COEFFICIENT OF VARIATION: STANDARD DEVIATION/MEAN \* 100

REMARKS:

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AA# K1502002,FATHEAD MINNOW SURV.,CHRONIC, 2-3-15  
File: C:\COPYTO~1\TOXSTAT\FHSURV~1. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

-----  
D = 0.184

W = 0.642

Critical W (P = 0.05) (n = 30) = 0.927

Critical W (P = 0.01) (n = 30) = 0.900  
-----

Data FAIL normality test. Try another transformation.

Warning - The first three homogeneity tests are sensitive to non-normal data and should not be performed.

AA# K1502002,FATHEAD MINNOW SURV.,CHRONIC, 2-3-15  
File: C:\COPYTO~1\TOXSTAT\FHSURV~1. Transform: ARC SINE(SQUARE ROOT(Y))

Hartley's test for homogeneity of variance  
Bartlett's test for homogeneity of variance

-----  
These two tests can not be performed because at least one group has zero variance.

Data FAIL to meet homogeneity of variance assumption.  
Additional transformations are useless.  
-----

TITLE: AA# K1502002, FATHEAD MINNOW SURV., CHRONIC, 2-3-15  
 FILE: C:\COPYTO~1\TOXSTAT\FHSURV~1.  
 TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	1.0000	1.4120
1	CONTROL	2	1.0000	1.4120
1	CONTROL	3	1.0000	1.4120
1	CONTROL	4	1.0000	1.4120
1	CONTROL	5	1.0000	1.4120
2	5 % EFFLUENT	1	1.0000	1.4120
2	5 % EFFLUENT	2	1.0000	1.4120
2	5 % EFFLUENT	3	1.0000	1.4120
2	5 % EFFLUENT	4	1.0000	1.4120
2	5 % EFFLUENT	5	1.0000	1.4120
3	7 % EFFLUENT	1	1.0000	1.4120
3	7 % EFFLUENT	2	1.0000	1.4120
3	7 % EFFLUENT	3	1.0000	1.4120
3	7 % EFFLUENT	4	1.0000	1.4120
3	7 % EFFLUENT	5	1.0000	1.4120
4	9 % EFFLUENT	1	1.0000	1.4120
4	9 % EFFLUENT	2	1.0000	1.4120
4	9 % EFFLUENT	3	0.9000	1.2490
4	9 % EFFLUENT	4	1.0000	1.4120
4	9 % EFFLUENT	5	1.0000	1.4120
5	12 % EFFLUENT	1	1.0000	1.4120
5	12 % EFFLUENT	2	0.9000	1.2490
5	12 % EFFLUENT	3	1.0000	1.4120
5	12 % EFFLUENT	4	1.0000	1.4120
5	12 % EFFLUENT	5	1.0000	1.4120
6	16 % EFFLUENT	1	1.0000	1.4120
6	16 % EFFLUENT	2	1.0000	1.4120
6	16 % EFFLUENT	3	1.0000	1.4120
6	16 % EFFLUENT	4	0.7000	0.9912
6	16 % EFFLUENT	5	1.0000	1.4120

AA# K1502002, FATHEAD MINNOW SURV., CHRONIC, 2-3-15  
 File: C:\COPYTO~1\TOXSTAT\FHSURV~1. Transform: ARC SINE(SQUARE ROOT(Y))

STEEL'S MANY-ONE RANK TEST

Ho: Control < Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	1.412				
2	5 % EFFLUENT	1.412	27.50	16.00	5.00	
3	7 % EFFLUENT	1.412	27.50	16.00	5.00	
4	9 % EFFLUENT	1.379	25.00	16.00	5.00	
5	12 % EFFLUENT	1.379	25.00	16.00	5.00	
6	16 % EFFLUENT	1.328	25.00	16.00	5.00	

Critical values use k = 5, are 1 tailed, and alpha = 0.05

*Pimephales promelas*

**FATHEAD MINNOW**

TEST 1000.0

**WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST**

LAB # / #s:		K1502002			TEST DATES (BEGIN / END):		2/3/15 - 2/10/15	
CLIENT:		Conway- Tupelo Bayou			WEIGHING DATE / TIME:		2/11/15 1015	
ANALYSTS:		RH			DRYING TEMP (DEGREES C):		60	
SAMPLE ID:					DRYING TIME (HOURS):		24	
	REP #	FINAL DRY WEIGHT TIN+LARVAE (g)	INITIAL WEIGHT TIN (g)	TOTAL DRY WEIGHT OF LARVAE (g)	NUMBER OF LARVAE	DRY WEIGHT OF LARVAE (mg)		
CONTROL	A	1.00548	1.00041	0.00507	10	0.507	AVG DRY	
	B	1.02891	1.02334	0.00557	10	0.557	WEIGHT (mg)	
	C	1.00355	0.99905	0.00450	10	0.450	0.511	
	D	1.01415	1.00883	0.00532	10	0.532	CV	
	E	1.00237	0.99727	0.00510	10	0.510	7.8	
5%	A	0.99815	0.99380	0.00435	10	0.435	AVG DRY	
	B	0.97019	0.96573	0.00446	10	0.446	WEIGHT (mg)	
	C	1.01488	1.00892	0.00596	10	0.596	0.474	
	D	0.98146	0.97728	0.00418	10	0.418	CV	
	E	1.00474	0.99997	0.00477	10	0.477		
7%	A	0.98863	0.98431	0.00432	10	0.432	AVG DRY	
	B	1.00154	0.99677	0.00477	10	0.477	WEIGHT (mg)	
	C	0.98895	0.98422	0.00473	10	0.473	0.463	
	D	1.01759	1.01300	0.00459	10	0.459	CV	
	E	0.98288	0.97816	0.00472	10	0.472		
9%	A	0.99800	0.99333	0.00467	10	0.467	AVG DRY	
	B	1.00666	1.00181	0.00485	10	0.485	WEIGHT (mg)	
	C	1.01228	1.00751	0.00477	10	0.477	0.479	
	D	0.99149	0.98647	0.00502	10	0.502	CV	
	E	0.99943	0.99477	0.00466	10	0.466		
12%	A	0.99426	0.98918	0.00508	10	0.508	AVG DRY	
	B	0.99249	0.98724	0.00525	10	0.525	WEIGHT (mg)	
	C	0.98561	0.98044	0.00517	10	0.517	0.497	
	D	1.00003	0.99536	0.00467	10	0.467	CV	
	E	1.01358	1.00890	0.00468	10	0.468	5.55	
16%	A	0.99800	0.99304	0.00496	10	0.496	AVG DRY	
	B	1.00178	0.99703	0.00475	10	0.475	WEIGHT (mg)	
	C	0.96732	0.96297	0.00435	10	0.435	0.457	
	D	0.96624	0.96271	0.00353	10	0.353	CV	
	E	0.99358	0.98833	0.00525	10	0.525		

CV = (STANDARD DEVIATION/MEAN)\*100

REMARKS:

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AA# K1502002, FATHEAD MINNOW GROWTH CHRONIC, 2-3-15  
File: C:\COPYTO~1\TOXSTAT\FHGWGROWTH. Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

D = 0.050

W = 0.960

Critical W (P = 0.05) (n = 30) = 0.927

Critical W (P = 0.01) (n = 30) = 0.900

Data PASS normality test at P=0.01 level. Continue analysis.

AA# K1502002, FATHEAD MINNOW GROWTH CHRONIC, 2-3-15  
File: C:\COPYTO~1\TOXSTAT\FHGWGROWTH. Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance  
Calculated B1 statistic = 13.36

Table Chi-square value = 15.09 (alpha = 0.01, df = 5)  
Table Chi-square value = 11.07 (alpha = 0.05, df = 5)

Data PASS B1 homogeneity test at 0.01 level. Continue analysis.

TITLE: AA# K1502002, FATHEAD MINNOW GROWTH CHRONIC, 2-3-15  
 FILE: C:\COPYTO~1\TOXSTAT\FHGWGROWTH.  
 TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.5070	0.5070
1	CONTROL	2	0.5570	0.5570
1	CONTROL	3	0.4500	0.4500
1	CONTROL	4	0.5320	0.5320
1	CONTROL	5	0.5100	0.5100
2	5 % EFFLUENT	1	0.4350	0.4350
2	5 % EFFLUENT	2	0.4460	0.4460
2	5 % EFFLUENT	3	0.5960	0.5960
2	5 % EFFLUENT	4	0.4180	0.4180
2	5 % EFFLUENT	5	0.4770	0.4770
3	7 % EFFLUENT	1	0.4320	0.4320
3	7 % EFFLUENT	2	0.4770	0.4770
3	7 % EFFLUENT	3	0.4730	0.4730
3	7 % EFFLUENT	4	0.4590	0.4590
3	7 % EFFLUENT	5	0.4720	0.4720
4	9 % EFFLUENT	1	0.4670	0.4670
4	9 % EFFLUENT	2	0.4850	0.4850
4	9 % EFFLUENT	3	0.4770	0.4770
4	9 % EFFLUENT	4	0.5020	0.5020
4	9 % EFFLUENT	5	0.4660	0.4660
5	12 % EFFLUENT	1	0.5080	0.5080
5	12 % EFFLUENT	2	0.5250	0.5250
5	12 % EFFLUENT	3	0.5170	0.5170
5	12 % EFFLUENT	4	0.4670	0.4670
5	12 % EFFLUENT	5	0.4680	0.4680
6	16 % EFFLUENT	1	0.4960	0.4960
6	16 % EFFLUENT	2	0.4750	0.4750
6	16 % EFFLUENT	3	0.4350	0.4350
6	16 % EFFLUENT	4	0.3530	0.3530
6	16 % EFFLUENT	5	0.5250	0.5250

AA# K1502002, FATHEAD MINNOW GROWTH CHRONIC, 2-3-15  
 File: C:\COPYTO~1\TOXSTAT\FHGWGROWTH. Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.011	0.002	1.031
Within (Error)	24	0.050	0.002	
Total	29	0.060		

Critical F value = 2.62 (0.05,5,24)  
 Since F < Critical F FAIL TO REJECT Ho: All equal



AA# K1502002, FATHEAD MINNOW GROWTH CHRONIC, 2-3-15  
 File: C:\COPYTO~1\TOXSTAT\FHGWGROWTH. Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	0.511	0.511		
2	5 % EFFLUENT	0.474	0.474	1.279	
3	7 % EFFLUENT	0.463	0.463	1.689	
4	9 % EFFLUENT	0.479	0.479	1.105	
5	12 % EFFLUENT	0.497	0.497	0.493	
6	16 % EFFLUENT	0.457	0.457	1.891	

Dunnnett table value = 2.36 (1 Tailed Value, P=0.05, df=24,5)

AA# K1502002, FATHEAD MINNOW GROWTH CHRONIC, 2-3-15  
 File: C:\COPYTO~1\TOXSTAT\FHGWGROWTH. Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	5			
2	5 % EFFLUENT	5	0.068	13.3	0.037
3	7 % EFFLUENT	5	0.068	13.3	0.049
4	9 % EFFLUENT	5	0.068	13.3	0.032
5	12 % EFFLUENT	5	0.068	13.3	0.014
6	16 % EFFLUENT	5	0.068	13.3	0.054

APPENDIX D

*Ceriodaphnia dubia* Raw Data and Statistics

### SURVIVAL AND REPRODUCTION TEST

*Ceriodaphnia dubia*

Discharger: Conway - Tupelo Bayou		Lab Number/s K1502002													
Location: Outfall 001															
Date Sample Collected: 2 - 2/4/6 - 15															
Conc	1	Replicate										No. of Young	No. of Adult	Young /Adult	Analyst
%	Day	A	B	C	D	E	F	G	H	I	J				
SS	1	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	2	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	3	0	0	0	0	0	0	1	0	0	1	2	10	0.2	RH
	4											0	10	0.0	RH
	5	8	6	5	7	4	5	2	8	6	3	54	10	5.4	RH
	6	6	5	4	6	0	0	4	0	0	4	29	10	2.9	RH
	7	0	4	2	0	2	6	7	4	5	0	30	10	3.0	RH
	8	5	4	5	8	3	3	6	4	0	8	46			
	Total	19	19	16	21	9	14	20	16	11	16	161		Avg. = 16.1	
													C.V. = 24.2		

Conc	2	Replicate										No. of Young	No. of Adult	Young /Adult	Analyst
%	Day	A	B	C	D	E	F	G	H	I	J				
5%	1	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	2	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	3	0	0	0	0	0	0	1	0	0	0	1	10	0.1	RH
	4											0	10	0.0	RH
	5	11	12	8	3	5	10	4	5	6	8	72	10	7.2	RH
	6	0	3	3	0	1	0	0	0	3	1	11	10	1.1	RH
	7	5	3	5	1	3	4	5	1	2	0	29	10	2.9	RH
	8	2	3	0	7	0	7	6	5	0	8	38			
	Total	18	21	16	11	9	21	16	11	11	17	151		Avg. = 15.1	
													C.V. = 28.9		

Conc	3	Replicate										No. of Young	No. of Adult	Young /Adult	Analyst
%	Day	A	B	C	D	E	F	G	H	I	J				
7%	1	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	2	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	3	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	4											0	10	0.0	RH
	5	11	7	6	7	3	10	9	3	2	5	63	10	6.3	RH
	6	4	1	1	2	1	1	0	2	2	0	14	10	1.4	RH
	7	4	4	3	1	4	4	8	0	4	7	39	10	3.9	RH
	8	2	6	0	1	0	0	4	1	4	2	20			
	Total	21	18	10	11	8	15	21	6	12	14	136		Avg. = 13.6	
													C.V. = 38.2		

Analyst: RH															
Test Start - Date/Time: 2-3-15, 1445															
Test Stop - Date/Time: 2-11-15, 0930															
Conc	4	Replicate										No. of Young	No. of Adult	Young /Adult	Analyst
%	Day	A	B	C	D	E	F	G	H	I	J				
9%	1	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	2	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	3	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	4											0	10	0.0	RH
	5	8	7	7	10	7	5	4	0	9	7	64	10	6.4	RH
	6	2	2	1	0	1	3	0	4	0	2	15	10	1.5	RH
	7	4	3	1	2	6	9	6	5	1	7	44	10	4.4	RH
	8	1	5	8	4	0	0	2	1	2	8	31			
	Total	15	17	17	16	14	17	12	10	12	24	154		Avg. = 15.4	
													C.V. = 25.3		

Conc	5	Replicate										No. of Young	No. of Adult	Young /Adult	Analyst
%	Day	A	B	C	D	E	F	G	H	I	J				
12%	1	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	2	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	3	0	0	1	0	0	0	0	0	0	0	1	10	0.1	RH
	4											0	10	0.0	RH
	5	9	7	8	10	10	10	3	4	12	10	83	10	8.3	RH
	6	3	1	4	2	0	1	5	3	0	2	21	10	2.1	RH
	7	5	5	5	1	3	4	2	0	4	0	29	10	2.9	RH
	8	4	0	3	5	0	3	0	7	3	6	31			
	Total	21	13	21	18	13	18	10	14	19	18	165		Avg. = 16.5	
													C.V. = 22.7		

Conc	6	Replicate										No. of Young	No. of Adult	Young /Adult	Analyst
%	Day	A	B	C	D	E	F	G	H	I	J				
18%	1	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	2	0	0	0	0	0	0	0	0	0	0	0	10	0.0	RH
	3	1	0	0	0	0	0	0	0	0	0	1	10	0.1	RH
	4											0	10	0.0	RH
	5	0	7	4	5	9	8	5	9	5	11	63	10	6.3	RH
	6	5	1	0	5	1	0	2	3	1	0	18	10	1.8	RH
	7	0	3	4	0	4	0	0	5	4	2	22	10	2.2	RH
	8	2	6	9	4	0	0	8	1	0	4	32			
	Total	8	17	17	14	14	8	13	18	10	17	136		Avg. = 13.6	
													C.V. = 28.0		

AA # K1502002, C.DUBIA CHRONIC, REPRODUCCION, 2-3-15  
File: C:\COPYTO~1\TOXSTAT\C.DUB Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

-----  
\*\*\*\*\* Shapiro - Wilk's Test is aborted \*\*\*\*\*

This test can not be performed because total number of replicates  
is greater than 50.

Total number of replicates = 60  
-----

AA # K1502002, C.DUBIA CHRONIC, REPRODUCCION, 2-3-15  
File: C:\COPYTO~1\TOXSTAT\C.DUB Transform: NO TRANSFORMATION

-----  
Bartlett's test for homogeneity of variance  
Calculated B1 statistic = 1.46

-----  
Table Chi-square value = 15.09 (alpha = 0.01, df = 5)  
Table Chi-square value = 11.07 (alpha = 0.05, df = 5)

Data PASS B1 homogeneity test at 0.01 level. Continue analysis.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
5	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.  
 Since b is greater than 6 there is no significant difference  
 between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
7	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.  
 Since b is greater than 6 there is no significant difference  
 between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
9	10	0	10

TOTAL 20 0 20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.  
 Since b is greater than 6 there is no significant difference  
 between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
12	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.  
 Since b is greater than 6 there is no significant difference  
 between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
16	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.  
 Since b is greater than 6 there is no significant difference  
 between CONTROL and TREATMENT at the 0.05 level.

SUMMARY OF FISHER'S EXACT TESTS

NUMBER NUMBER SIG

GROUP	IDENTIFICATION	EXPOSED	DEAD	(P=.05)
	CONTROL	10	0	
1	5	10	0	
2	7	10	0	
3	9	10	0	
4	12	10	0	
5	16	10	0	

TITLE: AA # K1502002, C.DUBIA CHRONIC, REPRODUCCION, 2-3-15  
FILE: C:\COPYTO~1\TOXSTAT\C.DUB  
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	19.0000	19.0000
1	CONTROL	2	19.0000	19.0000
1	CONTROL	3	16.0000	16.0000
1	CONTROL	4	21.0000	21.0000
1	CONTROL	5	9.0000	9.0000
1	CONTROL	6	14.0000	14.0000
1	CONTROL	7	20.0000	20.0000
1	CONTROL	8	16.0000	16.0000
1	CONTROL	9	11.0000	11.0000
1	CONTROL	10	16.0000	16.0000
2	5 % EFFLUENT	1	18.0000	18.0000
2	5 % EFFLUENT	2	21.0000	21.0000
2	5 % EFFLUENT	3	16.0000	16.0000
2	5 % EFFLUENT	4	11.0000	11.0000
2	5 % EFFLUENT	5	9.0000	9.0000
2	5 % EFFLUENT	6	21.0000	21.0000
2	5 % EFFLUENT	7	16.0000	16.0000
2	5 % EFFLUENT	8	11.0000	11.0000
2	5 % EFFLUENT	9	11.0000	11.0000
2	5 % EFFLUENT	10	17.0000	17.0000
3	7 % EFFLUENT	1	21.0000	21.0000
3	7 % EFFLUENT	2	18.0000	18.0000
3	7 % EFFLUENT	3	10.0000	10.0000
3	7 % EFFLUENT	4	11.0000	11.0000
3	7 % EFFLUENT	5	8.0000	8.0000
3	7 % EFFLUENT	6	15.0000	15.0000
3	7 % EFFLUENT	7	21.0000	21.0000
3	7 % EFFLUENT	8	6.0000	6.0000
3	7 % EFFLUENT	9	12.0000	12.0000
3	7 % EFFLUENT	10	14.0000	14.0000
4	9 % EFFLUENT	1	15.0000	15.0000
4	9 % EFFLUENT	2	17.0000	17.0000
4	9 % EFFLUENT	3	17.0000	17.0000
4	9 % EFFLUENT	4	16.0000	16.0000
4	9 % EFFLUENT	5	14.0000	14.0000
4	9 % EFFLUENT	6	17.0000	17.0000
4	9 % EFFLUENT	7	12.0000	12.0000
4	9 % EFFLUENT	8	10.0000	10.0000

4	9 %	EFFLUENT	9	12.0000	12.0000
4	9 %	EFFLUENT	10	24.0000	24.0000
5	12 %	EFFLUENT	1	21.0000	21.0000
5	12 %	EFFLUENT	2	13.0000	13.0000
5	12 %	EFFLUENT	3	21.0000	21.0000
5	12 %	EFFLUENT	4	18.0000	18.0000
5	12 %	EFFLUENT	5	13.0000	13.0000
5	12 %	EFFLUENT	6	18.0000	18.0000
5	12 %	EFFLUENT	7	10.0000	10.0000
5	12 %	EFFLUENT	8	14.0000	14.0000
5	12 %	EFFLUENT	9	19.0000	19.0000
5	12 %	EFFLUENT	10	18.0000	18.0000
6	16 %	EFFLUENT	1	8.0000	8.0000
6	16 %	EFFLUENT	2	17.0000	17.0000
6	16 %	EFFLUENT	3	17.0000	17.0000
6	16 %	EFFLUENT	4	14.0000	14.0000
6	16 %	EFFLUENT	5	14.0000	14.0000
6	16 %	EFFLUENT	6	8.0000	8.0000
6	16 %	EFFLUENT	7	13.0000	13.0000
6	16 %	EFFLUENT	8	18.0000	18.0000
6	16 %	EFFLUENT	9	10.0000	10.0000
6	16 %	EFFLUENT	10	17.0000	17.0000

AA # K1502002, C.DUBIA CHRONIC, REPRODUCCION, 2-3-15  
 File: C:\COPYTO~1\TOXSTAT\C.DUB Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	75.350	15.070	0.863
Within (Error)	54	943.500	17.472	
Total	59	1018.850		

Critical F value = 2.45 (0.05,5,40)  
 Since F < Critical F FAIL TO REJECT Ho: All equal

AA # K1502002, C.DUBIA CHRONIC, REPRODUCCION, 2-3-15  
 File: C:\COPYTO~1\TOXSTAT\C.DUB Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	16.100	16.100		
2	5 % EFFLUENT	15.100	15.100	0.535	
3	7 % EFFLUENT	13.600	13.600	1.337	
4	9 % EFFLUENT	15.400	15.400	0.374	
5	12 % EFFLUENT	16.500	16.500	-0.214	
6	16 % EFFLUENT	13.600	13.600	1.337	



Dunnett table value = 2.31 (1 Tailed Value, P=0.05, df=40,5)

AA # K1502002, C.DUBIA CHRONIC, REPRODUCTION, 2-3-15

File: C:\COPYTO~1\TOXSTAT\C.DUB

Transform: NO TRANSFORMATION

DUNNETT'S TEST - TABLE 2 OF 2

Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	10			
2	5 % EFFLUENT	10	4.318	26.8	1.000
3	7 % EFFLUENT	10	4.318	26.8	2.500
4	9 % EFFLUENT	10	4.318	26.8	0.700
5	12 % EFFLUENT	10	4.318	26.8	-0.400
6	16 % EFFLUENT	10	4.318	26.8	2.500

## APPENDIX E

### Organism History

**AQUATOX, INC.**  
416 TWIN POINTS ROAD  
HOT SPRINGS, ARKANSAS 71913  
501-520-0560

**TEST ORGANISM HISTORY**

DATE SHIPPED 2-3-15 CLIENT Arkansas Analytical

Purchase Order #: \_\_\_\_\_

SPECIES: Pimephales promelas

Quantity Shipped: 550

Age: hatched 2-1 15-1600CST

Brood Stock Source: Anderson Farms, AR

Culture Water: Groundwater

Hardness (Mg/l CaCO<sub>3</sub>): ≈ 1000

Dissolved Oxygen (Mg/l): 8.4

Temperature (°C): 25.4

Feeding: ARTEMIA

Comments: \_\_\_\_\_

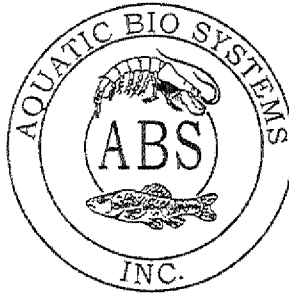
\_\_\_\_\_

\_\_\_\_\_

Shipped Via:  Federal Express  UPS Overnight  Shuttle

Packaged By: lll

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



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

### ORGANISM HISTORY

DATE: 11/25/2013

SPECIES: Ceriodaphnia dubia

AGE: > 3 day

LIFE STAGE: Adult

HATCH DATE: Variable

BEGAN FEEDING: Immediately

FOOD: YTC, Selenastrum sp.

### Water Chemistry Record:

	Current	Range
TEMPERATURE:	<u>22°C</u>	<u>22-26°C</u>
SALINITY/CONDUCTIVITY:	<u>--</u>	<u>--</u>
TOTAL HARDNESS (as CaCO <sub>3</sub> ):	<u>94 mg/l</u>	<u>76-130 mg/l</u>
TOTAL ALKALINITY (as CaCO <sub>3</sub> ):	<u>65 mg/l</u>	<u>65-100 mg/l</u>
pH:	<u>7.98</u>	<u>7.50-8.20</u>

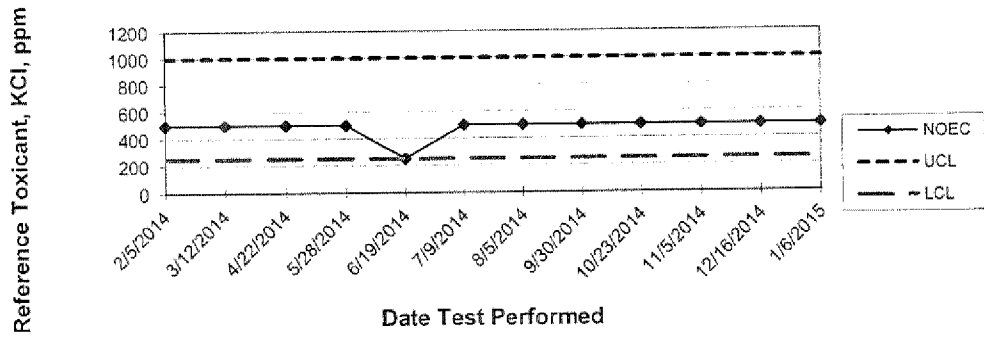
### Comments:

  
\_\_\_\_\_  
Facility Supervisor

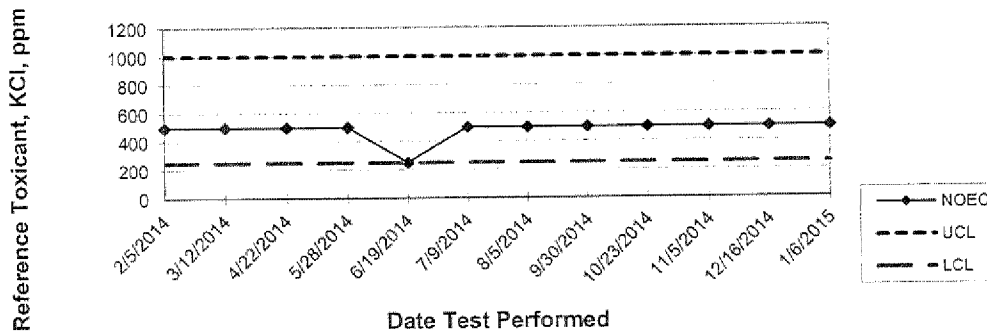
## APPENDIX F

### Quality Assurance Charts

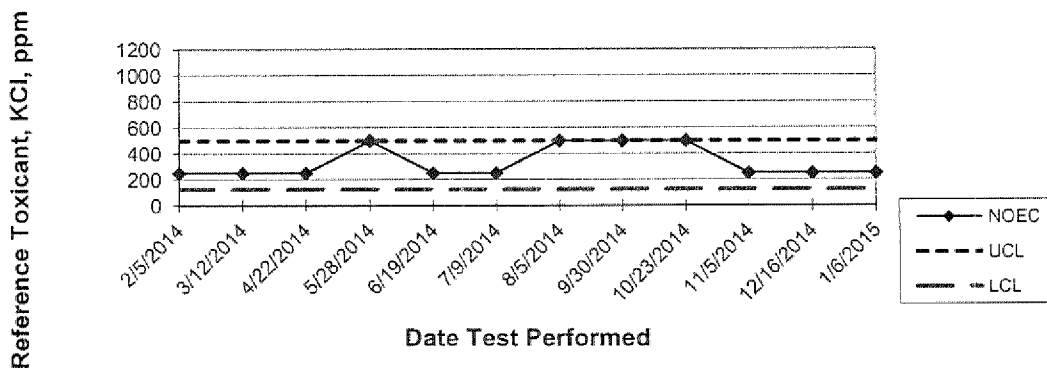
**ARKANSAS ANALYTICAL, INC.**  
**FATHEAD MINNOW SURVIVAL 7 Day**  
**QUALITY ASSURANCE**



**ARKANSAS ANALYTICAL, INC.**  
**FATHEAD MINNOW GROWTH 7 Day**  
**QUALITY ASSURANCE**



**ARKANSAS ANALYTICAL, INC.**  
**CERIODAPHНИЯ DUBIA SURVIVAL**  
**QUALITY ASSURANCE**



**ARKANSAS ANALYTICAL, INC.**  
**CERIODAPHНИЯ DUBIA REPRODUCTION**  
**QUALITY ASSURANCE**

