Arkansas Department of Environmental Quality
5301 Northshore Drive
North Little Rock, AR 72118

OCTOBER 22, 2012

WATER DIVISION
NPDES Enforcement Section

RE: City of De Queen Wastewater Plant, NPDES Permit AR0021733
AFIN 67-00023, Sept. 2012 DMR, SSO Report & 3rd Quarter WET

Michael Sims
City of De Queen
Wastewater Superintendent
PO Box 730
De Queen AR 71832

Sanitary Sewer Overflow Monthly Report

Facility Name: City of DeQueen **Permit Number:** AR0021733 **Reporting Period(Month/Year):** Sept 2012

☒ No Sanitary Sewer Overflows This Monitoring Period

Summary Report Code Descriptions				
Cause(s) of SSO		SSO Impact	Action(s) Taken	Ultimate Discharge Location
CO-Construction	D-Debris	NEAH-No Evidence of Adverse Health or Environmental Impact	WO-Work Order	CR-Creek/Stream/River (please specify)
E-Equipment Failure	G-Grease	OEHC-Observed or Evidence of Human Contact	EC-Environmental Cleanup	DI-Ditch
HC-Hydro Clean	LF-Line Failure/Break	EFK-Evidence of Fish Kill	HC-Hydro Cleaned	DR-Drop Inlet
R-Rainfall	RG-Roots & Grease		HR-Hand Rodded	GR-Ground Surface
RO-Roots	V-Vandalism		EN-Referred to Engineering	PA-Paved Area
			PN-Public Notification	CB-Contained in Building

Location	Manhole #	Start Date of SSO	End Date of SSO	Estimated Volume (in gallons)	Cause of SSO	Environmental Impact	Action (s) Taken to Address SSO	Ultimate Discharge Location

Signature of Cognizant or Ranking Official

10-1-12
Date

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

DATE	INF FLOW	EFF FLOW	BOD mg/l	BOD lbs/day	FECAL lbs/100ml	TSS mg/l	TSS lbs/day	pH std units	CL2 RES.	DO mg/l	NO3 mg/l	NO3 lbs/day	TP mg/l	TP lbs/day	NH3 mg/l	NH3 lbs/day
25	2.580	2.039	4.08	69.4	20	5.0	85.0	6.73	0.03	7.56	0.95	16.2	0.353	6.0	0.58	9.9
26	2.553	2.026	3.49	59.0	1	6.0	101.4	6.78	0.06	7.67	0.78	13.2	0.230	3.9	0.50	8.4
30	1.528	1.115	2.00	18.6	10	3.0	27.9	6.79	0.02	7.77	6.70	62.3	0.226	2.1	0.50	4.6

Arkansas Analytical, Inc.

Toxicity Test Results
City of DeQueen
NPDES PERMIT NUMBER: AR0021733
Third Quarter 2012
AFIN # 67-00023

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

Ceriodaphnia dubia, Survival and Reproduction Test
Test 1002.0

Prepared for: **Mr. Mike Sims**
City of DeQueen
P.O. Box 730
DeQueen, Arkansas 71832

Prepared by: Arkansas Analytical, Inc.
11701 I-30, Bldg 1, Suite 115
Little Rock, Arkansas 72209
Lab Number K1209008

Wednesday, October 10, 2012

Introduction

This report contains test results for toxicity testing for the City of DeQueen. The NPDES permit number is AR0021733. The facility is located 1/8 mile south from intersection of Coulter Ave. and south of 9th Street on Philip Cox Blvd, in Section 36, Township 8 South, Range 32 West in Sevier County, Arkansas. The discharge is to receiving waters named: an unnamed ditch around pond to Bear Creek to Little River to Red River in Segment 1C of the Red River Basin.

The permit requires chronic biomonitoring testing quarterly for both *Ceriodaphnia dubia* and *Pimephales promelas*. The test results in this report represent the testing for the third quarter of 2012.

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:	9-25-12, 0800	9-26-12, 0800
Sample #2:	9-26-12, 0800	9-27-12, 0800
Sample #3:	9-30-12, 0900	10-1-12, 0900

The samples were composites collected at the final discharge from City of DeQueen Wastewater Plant outfall.

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

Sample Receiving Information:	Date, Time Sample(s) Received	Temperature Upon Receipt (°C)
Sample #1:	9-27-12, 0945	1
Sample #2:	9-28-12, 1000	1
Sample #3:	10-3-12, 1145	12**

** As per Mary Barnett test was allowed to continue although sample #3 was received outside the temperature limits. This was due to a delay in delivery by the courier service.

Chain of custody documentation is located in Appendix A.

The permit designates the receiving water to be used as dilution water for the toxicity tests. Due to its earlier characterization as toxic, synthetic dilution water was substituted.

The dilution water used in the toxicity tests was moderately hard synthetic. 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 32%, 42%, 56%, 75%, and 100%. The low-flow effluent concentration (**critical dilution**) was defined as **100% 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 alternate method suggested in the method (11.3.4.5) for combating pathogen interference, was run in place of the original fathead minnow test. The test chambers were 30 ml plastic cups with 20 ml of test solution. Each chamber contained 2 organisms. The total number of fish was 40 per test solution. The fish were then combined to perform growth analysis. 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 also 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 ml 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 < 24 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	16.9	X	
At least 60% of surviving females should have produced 3 broods	100%	X	
The percent coefficient of variation between replicates must be 40% or less for the young of surviving females	21.9	X	

TEST ACCEPTANCE CRITERIA for *Pimephales promelas*

Control Criteria	Results	Pass	Fail
Greater than or equal to 80% survival	92.5%	X	
The percent coefficient of variation between replicates must be 40% or less for survival	7.40	X	
Minimum of 0.25 mg average dry weight of surviving controls	0.424	X	
The percent coefficient of variation between replicates must be 40% or less for growth	13.6	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

Ceriodaphnia dubia 8/9-16/12		*Pimephales promelas* 8/9-16/12	
NOEC Survival:	500 ppm KCl	NOEC Survival:	500 ppm KCl
LOEC Survival:	1000 ppm KCl	LOEC Survival:	1000 ppm KCl
NOEC Reproduction:	125 ppm KCl	NOEC Growth:	500 ppm KCl
LOEC Reproduction:	250 ppm KCl	LOEC Growth:	1000 ppm KCl

Quality Assurance charts are provided in Appendix F.

Summary of Results
City of DeQueen

Ceriodaphnia dubia		*Pimephales promelas*	
NOEC / LOEC Survival	100% / NA	NOEC / LOEC survival	100% / NA
NOEC / LOEC Reproduction	100% / NA	NOEC / LOEC growth	100%/ NA
Mean number of neonates (critical dilution)	20.1	%CV survival (critical dilution)	5.73
%CV Reproduction (critical dilution)	23.6	Mean dry weight (critical dilution) in milligrams	0.462
		%CV growth (critical dilution)	11.1
PMSD Reproduction	24.3	PMSD Growth	22.2

Conclusion

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

The permit issued to the City of DeQueen, AR0021733, specifies that the **critical dilution is 100% 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 the City of DeQueen, AR0021733, specifies that the **critical dilution is 100% effluent**. The effluent samples **did not** exhibit lethal effects or sublethal effects at the critical dilution, and, as such, **passed** both portions of the test.

Biomonitoring Analysts:

Ryan Hudgin

Melissa Bird

Kenneth Pigue

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

PERMITTEE: City of DeQueen **NPDES #: AR0021733**

Sample Collection:	Date, Time Started	Date, Time Ended
Sample #1:	9-25-12, 0800	9-26-12, 0800
Sample #2:	9-26-12, 0800	9-27-12, 0800
Sample #3:	9-30-12, 0900	10-1-12, 0900

Test initiated (date, time): 9-27-12, 1415 Test terminated (date, time): 10-4-12, 1150

Dilution water used: Moderately Hard Synthetic

DATA TABLE FOR FATHEAD MINNOW SURVIVAL

	Percent Survival in Replicate Chambers						**Mean Percent Survival**			
Effluent Conc %	A	B	C	D	E		24 hours	48 hours	7 days	CV %
0%	87.5	87.5	100	100	87.5		100	97.5	92.5	7.40
32%	87.5	100	100	100	100		97.5	97.5	97.5	
42%	87.5	100	100	100	100		100	100	97.5	
56%	87.5	87.5	100	87.5	100		97.5	95	92.5	
75%	87.5	100	100	100	87.5		100	97.5	95	
100%	100	100	100	87.5	100		100	100	97.5	5.73

DATA TABLE FOR GROWTH OF FATHEAD MINNOWS

Effluent Conc %	A	B	C	D	E		Mean Dry Weight	CV%
0%	0.433	0.340	0.400	0.490	0.459		0.424	13.6
32%	0.320	0.426	0.477	0.433	0.511		0.433	
42%	0.459	0.336	0.446	0.505	0.554		0.460	
56%	0.501	0.404	0.503	0.458	0.544		0.482	
75%	0.470	0.360	0.397	0.431	0.528		0.437	
100%	0.400	0.474	0.539	0.463	0.436		0.462	11.1

Average Dry Weight in milligrams in replicate chambers
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)= _____**100**___% effluent

   b) NOEC growth (parameter TPP6C)= _____**100**_____% effluent

   c) Coefficient of variation (parameter TQP6C)= _____**13.6** _____%

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)= _____**100**___% effluent

   b) NOEC growth (parameter TPP6C)= _____**100**_____% effluent

   c) Coefficient of variation (parameter TQP6C)= _____**13.6** _____%

SUMMARY REPORTING FORMS FOR CHRONIC BIOMONITORING
Ceriodaphnia dubia SURVIVAL AND REPRODUCTION

PERMITTEE: City of DeQueen **NPDES #: AR0021733**

PERCENT SURVIVAL

PERCENT EFFLUENT	0%	32%	42%	56%	75%	100%
Time of Reading: 24 HOURS	100	100	100	100	100	100
48 HOURS	100	100	100	100	100	100
Test termination	100	100	90	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)= _____**100**____ % effluent

   b) NOEC reproduction (parameter TPP3B)= _____**100**_____% effluent

   c) Coefficient of variation (parameter TQP3B)= _____**23.6**_____%

APPENDIX A

Chain of Custody Forms

Arkansas Analytical Inc.

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
City of DeQueen Wastewater Plant	City of DeQueen Wastewater Plan
514 South 9th	P.O. Box 730
DeQueen, AR 71832	DeQueen, AR 71832
Attn: Mike Sims	

Project Description: Chronic Toxicity

Reporting Information
Telephone: 870-642-5231
Fax: 870-642-3117
Email: msims@cityofdequeen.com

Turnaround Time: 24 Hour / 48 Hour / 72 Hour / Routine

Preservation Codes:
1. Cool, 4 Degrees Centigrade
2. Sulfuric Acid (H_2SO_4), pH < 2
3. Nitric Acid (HNO_3), pH < 2
4. Thiosulfate for Dechlorination
5. Hydrochloric Acid(HCl)
6. Sodium Hydroxide (NaOH), pH > 12

Sampler(s) Signature: MB

Sampler(s) Printed: MS

Field Number	SAMPLE COLLECTION Date/s	Time/s	Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION	TEST PARAMETERS: Chronic Biomonitoring	Bottle Type Code (G = Glass; P = Plastic; V = Septum; A = Amber)	Arkansas Analytical Work Order Number:
								Preservative Code: 1		
								Bottle Type: P		
	9-25/26-12	8:10-8:05		X		Water	DQ Bio	X		K1209-008A

1. Relinquished by: (Signature) — Date/Time: 9-26-12 11:45 am

2. Received by: (Signature) — UPS

3. Relinquished by: (Signature) — UPS — Date/Time: 9/27/12 0945

4. Received by lab: (Signature) — Sydney James

SAMPLE CONDITION UPON RECEIPT IN LAB

1. CUSTODY SEALS:	√ Yes	No
2. CONTAINERS CORRECT:	Yes	No
3. COC/LABELS AGREE:	Yes	No
4. PRESERVATION CONFIRMED:	Yes	No
5. RECEIVED ON ICE:	Yes	No
6. TEMPERATURE ON RECEIPT:	1°C	

FOR COMPLETION BY LAB ONLY

REMARKS / SAMPLE COMMENTS

P.O. Number: 67050

Revision 1
12/1/10

Arkansas Analytical Inc.

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
City of DeQueen Wastewater Plant	City of DeQueen Wastewater Plan
514 South 9th	P.O. Box 730
DeQueen, AR 71832	DeQueen, AR 71832
Attn: Mike Sims	

Project Description: Chronic Toxicity

Reporting Information
Telephone: 870-642-5231
Fax: 870-642-3117
Email: msims@cityofdequeen.com

Turnaround Time: 24 Hour / 48 Hour / 72 Hour / Routine

Preservative Code: 1
Bottle Type: P

Preservation Codes:
1. Cool, 4 Degrees Centigrade
2. Sulfuric Acid (H_2SO_4), pH < 2
3. Nitric Acid (HNO_3), pH < 2
4. Thiosulfate for Dechlorination
5. Hydrochloric Acid(HCl)
6. Sodium Hydroxide (NaOH), pH > 12

Sampler(s) Signature: [signature]
Sampler(s) Printed: NS

Field Number	SAMPLE COLLECTION Date/s	Time/s	Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION	Chronic Biomonitoring	TEST PARAMETERS	Bottle Type Code
	9-26-27-12	8:40/8:42		X		Water	DQ Bio	X		008B

Bottle Type Code: G = Glass; P = Plastic; V = Septum; A = Amber

Arkansas Analytical Work Order Number: K1209-

1. Relinquished by: (Signature)	Date/Time	2. Received by: (Signature)
[signature]	9-27-12 11:50 am	UPS
3. Relinquished by: (Signature)	Date/Time	4. Received by lab: (Signature)
UPS	9/28/12, 1000	Sydney James

SAMPLE CONDITION UPON RECEIPT IN LAB

1. CUSTODY SEALS:	✓ Yes	No
2. CONTAINERS CORRECT:	Yes	No
3. COC/LABELS AGREE:	Yes	No
4. PRESERVATION CONFIRMED:	Yes	No
5. RECEIVED ON ICE:	Yes	No
6. TEMPERATURE ON RECEIPT:	1°C	

FOR COMPLETION BY LAB ONLY

REMARKS / SAMPLE COMMENTS

P.O. Number: 67050

Revision 1
12/1/10

Arkansas Analytical Inc.

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	Project Description	Turnaround Time	Preservation Codes:
City of DeQueen Wastewater Plant	City of DeQueen Wastewater Plan	Chronic Toxicity	24 Hour	1. Cool, 4 Degrees Centigrade; 4. Thiosulfate for Dechlorination
514 South 9th	P.O. Box 730		48 Hour	2. Sulfuric Acid (H_2SO_4), pH < 2; 5. Hydrochloric Acid(HCl)
DeQueen, AR 71832	DeQueen, AR 71832	Reporting Information	72 Hour	3. Nitric Acid (HNO_3), pH < 2; 6. Sodium Hydroxide (NaOH), pH > 12
		Telephone: 870-642-5231	Routine	
Attn: Mike Sims		Fax: 870-642-3117	Preservative Code:	
		Email: msims@cityofdequeen.com	Bottle Type:	

Sampler(s) Signature	Sampler(s) Printed
[signature]	MS

Field Number	SAMPLE COLLECTION Date/s	Time/s	Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION	TEST PARAMETERS: Chronic Biomonitoring	Bottle Type Code (G = Glass; P = Plastic; V = Septum; A = Amber)	Arkansas Analytical Work Order Number:
	9:30/10-1-12	9:30/9:20		X		Water	DQ Bio	X	C	K12090 08

1. Relinquished by: (Signature)	Date/Time	2. Received by: (Signature)
[signature]	10-1-12 11:50am	UPS
3. Relinquished by: (Signature)	Date/Time	4. Received by lab: (Signature)
UPS	10-3-12 11:45	Amanda Fabush

SAMPLE CONDITION UPON RECEIPT IN LAB		
1. CUSTODY SEALS:	√ Yes	___ No
2. CONTAINERS CORRECT:	___ Yes	___ No
3. COC/LABELS AGREE:	___ Yes	___ No
4. PRESERVATION CONFIRMED:	___ Yes	___ No
5. RECEIVED ON ICE:	___ Yes	√ No
6. TEMPERATURE ON RECEIPT:	12 °C	
FOR COMPLETION BY LAB ONLY		

REMARKS / SAMPLE COMMENTS

P.O. Number: 67050

Revision 1
12/1/10

Norma James

From: Barnett, Mary [BARNETT@adeq.state.ar.us]
Sent: Thursday, October 04, 2012 7:36 AM
To: Norma James
Subject: RE: city of dequeen WET temp excursion

Norma,

Due to unintended extenuating circumstances involving the sample courier, and since the facility generally has a history of passing WET tests, the Department has determined the third sample of the 3rd quarter test is an acceptable sample.

The Department encourages the facility and laboratory to work with the couriers to ensure that all subsequent WET test samples are received within EPA's sampling handing requirements.

Mary Barnett
Ecologist
501-682-0666

From: Norma James [mailto:njames@arkansasanalytical.com]
Sent: Wednesday, October 03, 2012 12:18 PM
To: Barnett, Mary
Cc: 'Ken Pigue'; 'Lessie Redican'; 'Sydney James'
Subject: city of dequeen WET temp excursion

Mary,
As discussed with Ken earlier yesterday, we are continuing to run the current WET test for the City of DeQueen although the temperature of the third sample received was 12degrees C. We will note such in the report. Delivery of the sample was delayed by third party courier service, causing the temp to be elevated. DeQueen usually does a good job of icing down the samples.
Let me know if you need any further information.
Thank you for your assistance.
Norma

Norma James, President

Arkansas Analytical Inc

11701 Interstate 30
Bldg. 1, Ste. 115
Little Rock, AR 72209
501-455-3233
501-455-6118 (fax)
501-993-1852 (cell)

Business Hours - Mon-Thur - 8am-5pm, Fri - 8am-4pm

Think for yourselves and let others enjoy the privilege to do so too. Voltaire.

This e-mail and any attachments are confidential. If you receive this message in error or are not the intended recipient, you should not retain,

APPENDIX B

Effluent and Dilution Water Data

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING — Fathead Minnow

Lab # / Sample ID: — Test Start (Date/Time): 9-27-18 1415

Client: Dr Queen — Test End (Date/Time): 10-4-12 1150

		Day of Test							
		1	2	3	4	5	6	7	notes/remarks
Control	MHS551	9-27	9-28	9-29	9-30	10-1	10-2	10-3	
D.O. (mg/L)	INITIAL	8.6	8.5	8.5	8.6	8.7	8.9	8.9	
	FINAL	~~7.9~~ 7.5	8.0	6.6	7.7	7.4	7.4	5.9	
pH (s.u.)	INITIAL	8.0	7.8	8.0	8.2	7.9	7.9	7.8	
	FINAL	7.3	8.0	~~8.2~~ 7.6	~~8.2~~ 8.1	7.6	7.4	7	
temp (C)	INITIAL	22	22	21.3	21.0	21	21	21	
	FINAL	25	25	25	25	25	25	25	
ALKALINITY (mg/L)		62							
HARDNESS (mg/L)		84							
CONDUCTIVITY (umhos/cm)		294							
CHLORINE (mg/L)		<0.05							
CONC:									
D.O. (mg/L)	INITIAL	8.6	8.8	8.9	8.8	8.7	8.8	8.8	
	FINAL	7.5	8.1	6.7	7.7	7.3	7.5	7.4	
pH (s.u)	INITIAL	7.8	7.6	7.9	8.1	7.4	7.8	7.4	
	FINAL	7.4	7.9	7.7	7.5	7.6	7.4	7.4	
temp (C)	INITIAL	22	21	22.5	22.0	22	21	21	
	FINAL	25	25	25	25	25	25	25	
CONC:									
D.O. (mg/L)	INITIAL	8.6	8.8	9.1	9.0	8.5	8.7	8.8	
	FINAL	~~7.5~~ 7.5	8.2	6.8	7.6	7.2	7.5	7.5	
pH (mg/L)	INITIAL	7.7	7.7	8.0	7.8	7.4	7.4	7.7	
	FINAL	7.4	7.9	7.7	7.5	7.2	7.4	7.4	
temp (C)	INITIAL	22	21	23.4	24.0	22	22	21	
	FINAL	25	25	25	25	25	25	25	
CONC:									
D.O. (mg/L)	INITIAL	8.6	8.6	9.3	9.0	8.7	8.7	8.8	
	FINAL	7.5	8.1	6.6	7.9	7.4	6.9	7.1	
pH (s.u.)	INITIAL	7.7	7.3	7.8	7.7	7.4	7.2	7.3	
	FINAL	7.4	8.0	7.6	7.5	7.5	7.4	7.3	
temp (C)	INITIAL	21	21	24.1	25.2	22	22	22	
	FINAL	25	25	25	25	25	25	25	
CONC:									
D.O. (mg/L)	INITIAL	8.7	8.7	9.2	8.9	8.7	8.8	8.9	
	FINAL	7.9	8.1	6.6	7.7	7.4	7.4	6.9	
pH (s.u.)	INITIAL	7.7	7.5	7.7	7.5	7.3	7.4	7.5	
	FINAL	7.4	7.5	7.6	7.0	7.4	7.2	7.4	
temp (C)	INITIAL	22	21	24.8	26.0	23	21	21	
	FINAL	25	25	25	25	25	25	25	
CONC:									
D.O. (mg/L)	INITIAL	8.7	8.6	8.7	8.9	8.6	8.9	8.9	
	FINAL	7.6	8.2	6.6	7.6	6.9	7.3	7.5	
pH (s.u.)	INITIAL	7.5	7.2	7.7	7.4	7.3	7.2	7.2	
	FINAL	7.4	7.5	7.5	7.1	7.3	7.3	7.3	
temp (C)	INITIAL	21	22	23.5	25.2	20	22	22	
	FINAL	25	25	25	25	25	25	25	
CONC:	**100%**	A	A	A	B	B	B	C	
ALKALINITY (mg/L)		22			24			26	
HARDNESS (mg/L)		40			32			26	
CONDUCTIVITY (umhos/cm)		917			957			806	
CHLORINE (mg/L)		<0.05			<0.05			<0.05	

MHS

32

42

56

75

100

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING									Cerodaphnia Dubia
Lab # / Sample ID						Test Start (Date/Time)	9-27-12	1100	
Client: De Queen						Test End (Date/Time)	10-4-12	1030	
		Day of Test							
		1	2	3	4	5	6	7	notes/remarks
Control	MHS551	9-27	9-28	9-29	9-30	10-1	10-2	10-3	
D.O. (mg/L)	INITIAL	8.6	8.5	8.5	8.6	8.7	8.9	8.9	
	FINAL	8.1	~~7.8~~ 8.27	8.2	8.1	8.1	8.1	7.8	
pH (s.u.)	INITIAL	8.0	7.8	8.0	8.2	7.9	7.9	7.8	
	FINAL	7.7	7.8	7.9	7.8	7.7	7.7	7.5	
temp (C)	INITIAL	22	22	21.3	21	21	21	21	
	FINAL	25	25	25	25	25	25	25	
ALKALINITY (mg/L)		62	—	—	—	—	—	—	
HARDNESS (mg/L)		84	—	—	—	—	—	—	
CONDUCTIVITY (umhos/cm)		294	—	—	—	—	—	—	
CHLORINE (mg/L)		<0.05	—	—	—	—	—	—	
CONC:									
D.O. (mg/L)	INITIAL	8.6	8.8	8.9	8.8	8.7	8.8	8.8	
	FINAL	8.0	8.2	8.2	8.0	8.2	8.2	7.5	
pH (s.u)	INITIAL	7.8	7.6	7.9	8.1	7.4	7.8	7.4	
	FINAL	7.7	7.9	8.2	7.7	7.6	7.7	7.3	
temp (C)	INITIAL	22	21 ~~22~~	22.5	22	22	21	21	
	FINAL	25	25	25	25	25	25	25	
CONC:									
D.O. (mg/L)	INITIAL	8.6	8.8	9.1	9.0	8.5	8.7	8.8	
	FINAL	8.0	8.1	8.2	8.1	8.1	8.5	7.6	
pH (mg/L)	INITIAL	7.7	7.7	8.0	7.8	7.4	7.4	7.7	
	FINAL	7.7	8.0	8.0	7.8	7.5	7.7	7.1	
temp (C)	INITIAL	22	~~22~~ 21	23.4	24	22	22	21	
	FINAL	25	25	25	25	25	25	25	
CONC:									
D.O. (mg/L)	INITIAL	8.6	8.6	9.3	9.0	8.7	8.7	8.8	
	FINAL	8.3	8.1	8.4	8.2	8.1	8.2	7.6	
pH (s.u.)	INITIAL	7.7	7.3	7.8	7.7	7.4	7.2	7.3	
	FINAL	7.8	8.0	7.8	7.7	7.4	7.6	7.3	
temp (C)	INITIAL	21	21	24.1	25.2	22	22	22	
	FINAL	25	25	25	25	25	25	25	
CONC:									
D.O. (mg/L)	INITIAL	8.7	8.7	9.2	8.9	8.7	8.8	8.9	
	FINAL	8.0	8.1	8.2	8.1	8.3	8.2	7.7	
pH (s.u.)	INITIAL	7.7	7.5	7.7	7.5	7.3	7.4	7.5	
	FINAL	8.1	8.0	7.9	7.6	7.5	7.7	7.2	
temp (C)	INITIAL	22	21	24.8	26	23	21	21	
	FINAL	25	25	25	25	25	25	25	
CONC:									
D.O. (mg/L)	INITIAL	8.7	8.6	8.7	8.9	8.6	8.9	8.9	
	FINAL	8.1	8.1	8.2	8.0	8.0	8.2	7.6	
pH (s.u.)	INITIAL	7.5	7.2	7.7	7.4	7.3	7.2	7.2	
	FINAL	7.5	7.9	7.7	7.6	7.6	7.7	7.4	
temp (C)	INITIAL	21	22	23.5	25.2	20	22	22	
	FINAL	25	25	25	25	25	25	25	
CONC: 100%		A	A	A	B	B	B	C	
ALKALINITY (mg/L)		22	—	—	24	—	—	26	
HARDNESS (mg/L)		40	—	—	32	—	—	26	
CONDUCTIVITY (umhos/cm)		917	—	—	957	—	—	806	
CHLORINE (mg/L)		<0.05	—	—	<0.05	—	<0.05	<0.05	

MHS

32

42

RH 9-27

~~42~~

56

75

100

Revision 1
11/30/10

APPENDIX C

Fathead minnow raw data and statistics

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID K1709008 TEST START DATE 9/27/17 TIME 1415

CLIENT DeQuee TEST END DATE 10/4/17 TIME 1150

AGE AND SOURCE OF MINNOWS

D A Y (NUMBER SURVIVING) SURVIVAL

CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
0	A	8	8	8	8	8	8	7	7	87.5	92.5	7.40
	B	8	7	7	7	7	7	7	7	87.5		
	C	8	8	8	8	8	8	8	8	100		
	D	8	8	8	8	8	8	8	8	100		
	E	8	8	8	7	7	7	7	7	87.5		
32	A	8	7	7	7	7	7	7	7	87.5	97.5	
	B	8	8	8	8	8	8	8	8	100		
	C	8	8	8	8	8	8	8	8	100		
	D	8	8	8	8	8	8	8	8	100		
	E	8	8	8	8	8	8	8	8	100		
42	A	8	8	8	8	8	8	7	7	87.5	97.5	
	B	8	8	8	8	8	8	8	8	100		
	C	8	8	8	8	8	8	8	8	100		
	D	8	8	8	8	8	8	8	8	100		
	E	8	8	8	8	8	8	8	8	100		
56	A	8	8	7	7	7	7	7	7	87.5	KP 10/4/17 92.5	
	B	8	7	7	7	7	7	7	7	87.5		
	C	8	8	8	8	8	8	8	8	100		
	D	8	8	8	8	8	7	7	7	87.5		
	E	8	8	8	8	8	8	8	~~8~~ 7	~~87.5~~ 100		
75	A	8	8	7	7	7	7	7	7	87.5	95	
	B	8	8	8	8	8	8	8	8	100		
	C	8	8	8	8	8	8	8	8	100		
	D	8	8	8	8	8	8	8	8	100		
	E	8	8	8	8	8	7	7	7	87.5		
100	A	8	8	8	8	8	8	8	8	100	97.5	5.73
	B	8	8	8	8	8	8	8	8	100		
	C	8	8	8	8	8	8	8	8	100		
	D	8	8	8	8	8	8	7	7	87.5		
	E	8	8	8	8	8	8	8	8	100		
ANALYST												
DATE:												
TIME:												

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID: A — TEST START DATE 9-27-12 TIME 1415

CLIENT Dr. Queen — TEST END DATE 10-4-12 TIME 1150

AGE AND SOURCE OF MINNOWS

D A Y (NUMBER SURVIVING) — SURVIVAL

	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: MHS	A	2	2	2	2	2	2	2	2			
	B							1	1			
	C							2	2			
	D							2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 32	A	2	2	2	2	2	2	2	2			
	B		1	1	1	1	1	1	1			
	C		2	2	2	2	2	2	2			
	D		2	2	2	2	2	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 42	A	2	2	2	2	2	2	2	2			
	B							1	1			
	C							2	2			
	D							2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 56	A	2	2	2	2	2	2	2	2			
	B			2	2	2	2	2	2			
	C			1	1	1	1	1	1			
	D			2	2	2	2	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 75	A	2	2	2	2	2	2	2	2			
	B		2	2		2		2	2			
	C		1	2		2		2	2			
	D		2	1	1	1	1	1	1			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 100	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D											
	E											
ANALYST		RH	RH	CA	CA	RH	RH	RH	RH			
DATE:		9-27-12	9-29-12	9-29	9-30	10-1	10-2	10-3	10-4			
TIME:		1415	1100	1200	1230	1330	1530	1500	1100			

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID — TEST START DATE 9-27-12 TIME 1415

CLIENT Dr Green B — TEST END DATE 10-4-12 TIME 1150

AGE AND SOURCE OF MINNOWS

DAY (NUMBER SURVIVING) — SURVIVAL

CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
MHS	A	2	2	1	1	1	1	1	1			
	B	2	2	2	2	2	2	2	2			
	C	2	2	2	2	2	2	2	2			
	D	2	2	2	2	2	2	2	2			
	E											
32	A	2	2	2	2	2	2	2	2			
	B	2	2	2	2	2	2	2	2			
	C	2	2	2	2	2	2	2	2			
	D	2	2	2	2	2	2	2	2			
	E											
42	A	2	2	2	2	2	2	2	2			
	B	2	2	2	2	2	2	2	2			
	C	2	2	2	2	2	2	2	2			
	D	2	2	2	2	2	2	2	2			
	E											
56	A	2	2	2	2	2	2	2	2			
	B	2	2	2	2	2	2	2	2			
	C	1	1	1	1	1	1	1	1			
	D	2	2	2	2	2	2	2	2			
	E											
75	A	2	2	2	2	2	2	2	2			
	B	2	1	2	2	2	2	2	2			
	C	2	2	2	2	2	2	2	2			
	D	2	2	2	2	2	2	2	2			
	E											
100	A	2	2	2	2	2	2	2	2			
	B	2	2	2	2	2	2	2	2			
	C	2	2	2	2	2	2	2	2			
	D	2	2	2	2	2	2	2	2			
	E											
ANALYST		KH	KH	CL	CL	RH	RH	RH	RH			
DATE:		9-27-12	9-28-12	9-29-12	930	10-1	10-2	10-3	10-4			
TIME:		1415	1100	1200	1230	1350	1540	1510	1110			

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID | TEST START DATE 9-27-12 TIME 1415

CLIENT DeQueen C | TEST END DATE 10-4-12 TIME 1150

AGE AND SOURCE OF MINNOWS

DAY (NUMBER SURVIVING) | SURVIVAL

	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: mHS	A	2	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1	1			
	C	1	1	1	1	1	1	1	1			
	D	1	1	1	1	1	1	1	1			
	E											
CONC: 32	A	2	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1	1			
	C	1	1	1	1	1	1	1	1			
	D	1	1	1	1	1	1	1	1			
	E											
CONC: 42	A	2	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1	1			
	C	1	1	1	1	1	1	1	1			
	D	1	1	1	1	1	1	1	1			
	E											
CONC: 56	A	2	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1	1			
	C	1	1	1	1	1	1	1	1			
	D	1	1	1	1	1	1	1	1			
	E											
CONC: 75	A	2	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1	1			
	C	1	1	1	1	1	1	1	1			
	D	1	1	1	1	1	1	1	1			
	E											
CONC: 100	A	2	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1	1			
	C	1	1	1	1	1	1	1	1			
	D	1	1	1	1	1	1	1	1			
	E											
ANALYST		RH	RH	CH	CH	RH	RH	RH	RH			
DATE:		9-27	9-28-12	9-29-12	9-30-12	10-1	10-2	10-3	10-4			
TIME:		1415	1100	1200	1230	1345	1450	1520	1120			

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID: Dr Queen D | TEST START DATE: 9-27-12 TIME: 1415

CLIENT | TEST END DATE: 10-4-12 TIME: 1150

AGE AND SOURCE OF MINNOWS

DAY (NUMBER SURVIVING) | SURVIVAL

CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
MHS	A	2	2	2	2	2	2	2	3			
	B	1	1	1	1	1	1	1	1			
	C											
	D											
	E											
32	A	2	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1	1			
	C											
	D											
	E											
42	A	2	2	2	2	2	2	2	3			
	B	1	1	1	1	1	1	1	1			
	C											
	D											
	E											
56	A	2	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1	1			
	C						2	2	2			
	D						2	2	2			
	E											
75	A	2	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1	1			
	C											
	D											
	E											
100	A	2	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1	1			
	C											
	D							1				
	E											
ANALYST		RH	RH	↓	↓	RH	RH	RH	RH			
DATE:		9-27	9-28-12	9-29-12	9-30-12	10-1	10-2	10-3	10-4			
TIME:		1415	1100	1200	1230	1400	1600	1530	1130			

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID DeQueen E	TEST START	DATE 9-27-12	TIME 1415
CLIENT	TEST END	DATE 10-4-12	TIME 1150
AGE AND SOURCE OF MINNOWS			

D A Y (NUMBER SURVIVING) — SURVIVAL

CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
	A	2	2	2	2	2	2	2	2			
	B	"	"	"	1	2	2	2	2			
	C	"	"	"	"	"	"	"	"			
	D	"	"	"	2	2	2	2	2			
	E											

CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
	A	2	2	2	2	2	2	2	2			
	B	"	"	"	"	"	"	"	"			
	C	"	"	"	"	"	"	"	"			
	D	"	"	"	"	"	"	"	"			
	E											

CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
	A	2	2	2	2	2	2	2	2			
	B	"	"	"	"	"	"	"	"			
	C	"	"	"	"	"	"	"	"			
	D	"	"	"	"	"	"	"	"			
	E											

CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
	A	2	2	2	2	2	2	2	2			
	B	"	"	"	"	"	"	"	"			
	C	"	"	"	"	"	"	"	"			
	D	"	"	"	"	"	"	"	"			
	E											

CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
	A	2	2	2	2	2	2	2	2			
	B	"	"	"	"	"	"	"	"			
	C	"	"	"	"	"	"	"	"			
	D	"	"	"	"	"	"	"	"			
	E											

CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
	A	2	2	2	2	2	2	2	2			
	B	"	"	"	"	"	"	"	"			
	C	"	"	"	"	"	"	"	"			
	D	"	"	"	"	"	"	"	"			
	E											

ANALYST		KH	KH	ct	ct	KH	KH	RH	KH			
DATE:		9-27	9-28-12	9-29	9-30	10-1	10-1	10-3	10-4			
TIME:		1415	1100	1200	1230	1400	1610	1540	1150			

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

Pimephales promelas **FATHEAD MINNOW** TEST 1000.0

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s:	K1206003
CLIENT:	City of DeQueen
ANALYSTS:	KP
SAMPLE ID:	

TEST DATES (BEGIN / END):	9/24/12 - 10/4/12
WEIGHING DATE / TIME:	10/5/2012 1115
DRYING TEMP (DEGREES C):	60
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	1.00580	1.00234	0.00346	8	0.433	AVG DRY
	B	1.03262	1.02990	0.00272	8	0.340	WEIGHT (mg)
	C	0.98721	0.98401	0.00320	8	0.400	0.424
	D	1.01960	1.01568	0.00392	8	0.490	CV
	E	1.02724	1.02357	0.00367	8	0.459	13.58
CONC:	A	1.01555	1.01299	0.00256	8	0.320	AVG DRY
	B	1.02827	1.02486	0.00341	8	0.426	WEIGHT (mg)
32%	C	0.97371	0.96989	0.00382	8	0.477	0.433
	D	1.00540	1.00194	0.00346	8	0.433	CV
	E	0.99202	0.98793	0.00409	8	0.511	
CONC:	A	0.97725	0.97358	0.00367	8	0.459	AVG DRY
	B	0.99517	0.99248	0.00269	8	0.336	WEIGHT (mg)
42%	C	0.97587	0.97230	0.00357	8	0.446	0.460
	D	0.99737	0.99333	0.00404	8	0.505	CV
	E	1.00386	0.99943	0.00443	8	0.554	
CONC:	A	0.95360	0.94959	0.00401	8	0.501	AVG DRY
	B	0.99032	0.98709	0.00323	8	0.404	WEIGHT (mg)
56%	C	0.97688	0.97286	0.00402	8	0.503	0.482
	D	0.99259	0.98893	0.00366	8	0.458	CV
	E	0.99552	0.99117	0.00435	8	0.544	
CONC:	A	0.99861	0.99485	0.00376	8	0.470	AVG DRY
	B	1.01283	1.00995	0.00288	8	0.360	WEIGHT (mg)
75%	C	1.00485	1.00167	0.00318	8	0.397	0.437
	D	0.99846	0.99501	0.00345	8	0.431	CV
	E	0.98980	0.98558	0.00422	8	0.528	
CONC:	A	0.98223	0.97903	0.00320	8	0.400	AVG DRY
	B	0.99722	0.99343	0.00379	8	0.474	WEIGHT (mg)
100%	C	0.99329	0.98898	0.00431	8	0.539	0.462
	D	0.98640	0.98270	0.00370	8	0.463	CV
	E	0.99126	0.98777	0.00349	8	0.436	11.10

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

AA# K1209008, FATHEAD MINNOW, CHRONIC, 9-27-12
File: Z:\TOXSTAT\MONTE\FHSURV. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.202

W = 0.861

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# K1209008, FATHEAD MINNOW, CHRONIC, 9-27-12
File: Z:\TOXSTAT\MONTE\FHSURV. Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 0.45

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# K1209008, FATHEAD MINNOW, CHRONIC, 9-27-12
FILE: Z:\TOXSTAT\MONTE\FHSURV.
TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.8750	1.2094
1	CONTROL	2	0.8750	1.2094
1	CONTROL	3	1.0000	1.3931
1	CONTROL	4	1.0000	1.3931
1	CONTROL	5	0.8750	1.2094
2	32 % EFFLUENT	1	0.8750	1.2094
2	32 % EFFLUENT	2	1.0000	1.3931
2	32 % EFFLUENT	3	1.0000	1.3931
2	32 % EFFLUENT	4	1.0000	1.3931
2	32 % EFFLUENT	5	1.0000	1.3931
3	42 % EFFLUENT	1	0.8750	1.2094
3	42 % EFFLUENT	2	1.0000	1.3931
3	42 % EFFLUENT	3	1.0000	1.3931

3	42	%	EFFLUENT	4	1.0000	1.3931
3	42	%	EFFLUENT	5	1.0000	1.3931
4	56	%	EFFLUENT	1	0.8750	1.2094
4	56	%	EFFLUENT	2	0.8750	1.2094
4	56	%	EFFLUENT	3	1.0000	1.3931
4	56	%	EFFLUENT	4	0.8750	1.2094
4	56	%	EFFLUENT	5	1.0000	1.3931
5	75	%	EFFLUENT	1	0.8750	1.2094
5	75	%	EFFLUENT	2	1.0000	1.3931
5	75	%	EFFLUENT	3	1.0000	1.3931
5	75	%	EFFLUENT	4	1.0000	1.3931
5	75	%	EFFLUENT	5	0.8750	1.2094
6	100	%	EFFLUENT	1	1.0000	1.3931
6	100	%	EFFLUENT	2	1.0000	1.3931
6	100	%	EFFLUENT	3	1.0000	1.3931
6	100	%	EFFLUENT	4	0.8750	1.2094
6	100	%	EFFLUENT	5	1.0000	1.3931

AA# K1209008, FATHEAD MINNOW, CHRONIC, 9-27-12
File: Z:\TOXSTAT\MONTE\FHSURV. 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	1.283				
2	32 % EFFLUENT	1.356	32.50	16.00	5.00	
3	42 % EFFLUENT	1.356	32.50	16.00	5.00	
4	56 % EFFLUENT	1.283	27.50	16.00	5.00	
5	75 % EFFLUENT	1.320	30.00	16.00	5.00	
6	100 % EFFLUENT	1.356	32.50	16.00	5.00	

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

AA# K1209008, FATHEAD MINNOW GROWTH CHRONIC, 9-27-12
File: Z:\TOXSTAT\MONTE\FHGR. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.102

W = 0.963

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# K1209008, FATHEAD MINNOW GROWTH CHRONIC, 9-27-12
File: Z:\TOXSTAT\MONTE\FHGR. Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 1.27

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# K1209008, FATHEAD MINNOW GROWTH CHRONIC, 9-27-12
FILE: Z:\TOXSTAT\MONTE\FHGR.
TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.4330	0.7182
1	CONTROL	2	0.3400	0.6225
1	CONTROL	3	0.4000	0.6847
1	CONTROL	4	0.4900	0.7754
1	CONTROL	5	0.4590	0.7444
2	32 % EFFLUENT	1	0.3200	0.6013
2	32 % EFFLUENT	2	0.4260	0.7111
2	32 % EFFLUENT	3	0.4770	0.7624
2	32 % EFFLUENT	4	0.4330	0.7182
2	32 % EFFLUENT	5	0.5110	0.7964
3	42 % EFFLUENT	1	0.4590	0.7444
3	42 % EFFLUENT	2	0.3360	0.6183
3	42 % EFFLUENT	3	0.4460	0.7313
3	42 % EFFLUENT	4	0.5050	0.7904
3	42 % EFFLUENT	5	0.5540	0.8395
4	56 % EFFLUENT	1	0.5010	0.7864

4	56 % EFFLUENT	2	0.4040	0.6888
4	56 % EFFLUENT	3	0.5030	0.7884
4	56 % EFFLUENT	4	0.4580	0.7433
4	56 % EFFLUENT	5	0.5440	0.8295
5	75 % EFFLUENT	1	0.4700	0.7554
5	75 % EFFLUENT	2	0.3600	0.6435
5	75 % EFFLUENT	3	0.3970	0.6817
5	75 % EFFLUENT	4	0.4310	0.7162
5	75 % EFFLUENT	5	0.5280	0.8134
6	100 % EFFLUENT	1	0.4000	0.6847
6	100 % EFFLUENT	2	0.4740	0.7594
6	100 % EFFLUENT	3	0.5390	0.8244
6	100 % EFFLUENT	4	0.4630	0.7484
6	100 % EFFLUENT	5	0.4360	0.7212

AA# K1209008, FATHEAD MINNOW GROWTH CHRONIC, 9-27-12
File: Z:\TOXSTAT\MONTE\FHGR. Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.012	0.002	0.571
Within (Error)	24	0.102	0.004	
Total	29	0.114		

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

AA# K1209008, FATHEAD MINNOW GROWTH CHRONIC, 9-27-12
File: Z:\TOXSTAT\MONTE\FHGR. Transform: ARC SINE(SQUARE ROOT(Y))

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

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	0.709	0.424		
2	32 % EFFLUENT	0.718	0.433	-0.214	
3	42 % EFFLUENT	0.745	0.460	-0.866	
4	56 % EFFLUENT	0.767	0.482	-1.411	
5	75 % EFFLUENT	0.722	0.437	-0.315	
6	100 % EFFLUENT	0.748	0.462	-0.935	

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

AA# K1209008, FATHEAD MINNOW GROWTH CHRONIC, 9-27-12
File: Z:\TOXSTAT\MONTE\FHGR. Transform: ARC SINE(SQUARE ROOT(Y))

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	32 % EFFLUENT	5	0.094	22.2	-0.009
3	42 % EFFLUENT	5	0.094	22.2	-0.036
4	56 % EFFLUENT	5	0.094	22.2	-0.058
5	75 % EFFLUENT	5	0.094	22.2	-0.013
6	100 % EFFLUENT	5	0.094	22.2	-0.038

APPENDIX D

Ceriodaphnia dubia Raw Data and Statistics

Cerodaphnia dubia

SURVIVAL AND REPRODUCTION TEST

Discharger: De Queen
Location:
Date Sample Collected:
Lab Number/s: K1209008

Analyst: RH
Test Start - Date/ Time: 9-27-12 1100
Test Stop - Date/Time: 10-4-12 1030

Conc 1 — % MHS

Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adult	Young/Adult	Analyst
1	0	0	0	0	0	0	0	0	0	0	0	10	0	
2	0	0	0	0	0	0	0	0	0	0	0	10	0	
3	1	2	0	0	0	3	2	0	4	3	15	10	1.5	
4	5	2	4	3	8	7	0	4	2	7	36	10	3.6	
5	7	5	6	6	3	7	9	8	4	5	60	10	6.0	
6	5	7	0	1	8	7	1	1	4	0	34	10	3.4	
7	4	0	3	2	2	0	0	3	6	4	24	10	2.4	
8													x̄=16.9	
Total	22	16	13	17	21	18	12	16	20	19	169		CV=21.9	

Conc 2 — % 32

Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adult	Young/Adult	Analyst
1	0	0	0	0	0	0	0	0	0	0	0	10	0	
2	0	0	0	0	0	0	0	0	0	0	0	10	0	
3	2	4	0	1	0	1	3	2	0	0	13	10	1.3	
4	6	0	4	5	6	4	3	0	6	2	36	10	3.6	
5	9	8	5	5	11	0	8	5	7	0	58	10	5.8	
6	1	8	10	2	0	10	5	7	5	9	57	10	5.7	
7	3	6	1	3	3	0	4	0	4	2	20	10	2.0	
8														
Total	21	20	20	16	20	15	23	14	22	13	184			

Conc 3 — % 42

Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adult	Young/Adult	Analyst
1	0	0	0	0	0	0	0	0	0	0	0	10	0	
2	0	0	0	0	0	0	0	0	0	0	0	10	0	
3	3	3	4	5	0	4	4	2	0	0	25	10	2.5	
4	3	5	0	0	3	0	0	2	3	4	20	10	2.0	
5	10	10	9	12	4	8	7	7	5	3	75	10	7.5	
6	0	1	2	3	4	5	8	8	10	4	45	10	4.5	
7	1	1	3	1	2	X	1	1	0	0	10	9	1.1	
8														
Total	17	20	18	21	13	X17	20	20	18	11	175			

X= DEAD; Y= MALE

Conc 4 — % 56

Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adult	Young/Adult	Analyst
1	0	0	0	0	0	0	0	0	0	0	0	10	0	
2	0	0	0	0	0	0	0	0	0	0	0	10	0	
3	4	5	4	2	2	2	1	0	3	0	23	10	2.3	
4	4	1	0	3	0	1	5	5	4	4	27	10	2.7	
5	5	12	6	8	6	8	8	9	0	9	71	10	7.1	
6	10	2	3	2	9	7	3	0	11	0	47	10	4.7	
7	0	1	2	0	4	0	5	5	6	10	33	10	3.3	
8														
Total	23	21	15	15	21	18	22	19	24	23	201			

Conc 5 — % 75

Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adult	Young/Adult	Analyst
1	0	0	0	0	0	0	0	0	0	0	0	10	0	
2	0	0	0	0	0	0	0	0	0	0	0	10	0	
3	2	4	0	0	0	1	4	2	0	0	13	10	1.3	
4	2	0	3	4	4	8	4	3	2	5	35	10	3.5	
5	6	9	7	6	0	0	12	8	2	11	61	10	6.1	
6	15	11	8	9	5	11	3	7	8	1	78	10	7.8	
7	0	4	0	2	3	5	1	4	4	8	31	10	3.1	
8														
Total	25	28	18	21	12	25	24	24	16	25	218			

Conc 6 — % 100

Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adult	Young/Adult	Analyst
1	0	0	0	0	0	0	0	0	0	0	0	10	0	
2	0	0	0	0	0	0	0	0	0	0	0	10	0	
3	2	0	1	3	0	0	2	0	5	2	15	10	1.5	
4	2	6	3	0	5	6	7	5	3	2	39	10	3.9	
5	8	12	9	5	4	8	11	9	8	8	82	10	8.2	
6	2	5	2	2	0	5	3	3	2	0	24	10	2.4	
7	5	0	6	4	5	2	7	6	1	6	41	10	4.1	
8														
Total	19	23	21	14	14	21	30	23	19	17	201			

x̄ = 20.1
CV = 23.6

Revision 1
11/30/10

AA # K1209008, C. DUBIA CHRONIC REPRODUCION, 9-27-12
File: Z:\TOXSTAT\MONTE\CD. 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 # K1209008, C. DUBIA CHRONIC REPRODUCION, 9-27-12
File: Z:\TOXSTAT\MONTE\CD. Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 3.18

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
32%	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
42%	9	1	10
TOTAL	19	1	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 9.
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
56%	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

	NUMBER OF		
IDENTIFICATION	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
75%	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

	NUMBER OF		
IDENTIFICATION	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
100%	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	32%	10	0	
2	42%	10	1	
3	56%	10	0	
4	75%	10	0	
5	100%	10	0	

TITLE: AA # K1209008, C. DUBIA CHRONIC REPRODUCION, 9-27-12
FILE: Z:\TOXSTAT\MONTE\CD.
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	22.0000	22.0000
1	CONTROL	2	16.0000	16.0000
1	CONTROL	3	13.0000	13.0000
1	CONTROL	4	12.0000	12.0000
1	CONTROL	5	21.0000	21.0000
1	CONTROL	6	18.0000	18.0000
1	CONTROL	7	12.0000	12.0000
1	CONTROL	8	16.0000	16.0000
1	CONTROL	9	20.0000	20.0000
1	CONTROL	10	19.0000	19.0000
2	32 % EFFLUENT	1	21.0000	21.0000
2	32 % EFFLUENT	2	20.0000	20.0000
2	32 % EFFLUENT	3	20.0000	20.0000
2	32 % EFFLUENT	4	16.0000	16.0000
2	32 % EFFLUENT	5	20.0000	20.0000
2	32 % EFFLUENT	6	15.0000	15.0000
2	32 % EFFLUENT	7	23.0000	23.0000
2	32 % EFFLUENT	8	14.0000	14.0000
2	32 % EFFLUENT	9	22.0000	22.0000
2	32 % EFFLUENT	10	13.0000	13.0000
3	42 % EFFLUENT	1	17.0000	17.0000
3	42 % EFFLUENT	2	20.0000	20.0000
3	42 % EFFLUENT	3	18.0000	18.0000
3	42 % EFFLUENT	4	21.0000	21.0000
3	42 % EFFLUENT	5	13.0000	13.0000
3	42 % EFFLUENT	6	17.0000	17.0000
3	42 % EFFLUENT	7	20.0000	20.0000
3	42 % EFFLUENT	8	20.0000	20.0000
3	42 % EFFLUENT	9	18.0000	18.0000
3	42 % EFFLUENT	10	11.0000	11.0000
4	56 % EFFLUENT	1	23.0000	23.0000
4	56 % EFFLUENT	2	21.0000	21.0000
4	56 % EFFLUENT	3	15.0000	15.0000
4	56 % EFFLUENT	4	15.0000	15.0000
4	56 % EFFLUENT	5	21.0000	21.0000
4	56 % EFFLUENT	6	18.0000	18.0000
4	56 % EFFLUENT	7	22.0000	22.0000
4	56 % EFFLUENT	8	19.0000	19.0000

4	56 % EFFLUENT	9	24.0000	24.0000
4	56 % EFFLUENT	10	23.0000	23.0000
5	75 % EFFLUENT	1	25.0000	25.0000
5	75 % EFFLUENT	2	28.0000	28.0000
5	75 % EFFLUENT	3	18.0000	18.0000
5	75 % EFFLUENT	4	21.0000	21.0000
5	75 % EFFLUENT	5	12.0000	12.0000
5	75 % EFFLUENT	6	25.0000	25.0000
5	75 % EFFLUENT	7	24.0000	24.0000
5	75 % EFFLUENT	8	24.0000	24.0000
5	75 % EFFLUENT	9	16.0000	16.0000
5	75 % EFFLUENT	10	25.0000	25.0000
6	100 % EFFLUENT	1	19.0000	19.0000
6	100 % EFFLUENT	2	23.0000	23.0000
6	100 % EFFLUENT	3	21.0000	21.0000
6	100 % EFFLUENT	4	14.0000	14.0000
6	100 % EFFLUENT	5	14.0000	14.0000
6	100 % EFFLUENT	6	21.0000	21.0000
6	100 % EFFLUENT	7	30.0000	30.0000
6	100 % EFFLUENT	8	23.0000	23.0000
6	100 % EFFLUENT	9	19.0000	19.0000
6	100 % EFFLUENT	10	17.0000	17.0000

AA # K1209008, C. DUBIA CHRONIC REPRODUCION, 9-27-12
File: Z:\TOXSTAT\MONTE\CD. Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	171.733	34.347	2.174
Within (Error)	54	853.200	15.800	
Total	59	1024.933		

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

AA # K1209008, C. DUBIA CHRONIC REPRODUCION, 9-27-12
File: Z:\TOXSTAT\MONTE\CD. 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	16.900	16.900		
2	32 % EFFLUENT	18.400	18.400	-0.844	
3	42 % EFFLUENT	17.500	17.500	-0.338	
4	56 % EFFLUENT	20.100	20.100	-1.800	
5	75 % EFFLUENT	21.800	21.800	-2.756	
6	100 % EFFLUENT	20.100	20.100	-1.800	

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

AA # K1209008, C. DUBIA CHRONIC REPRODUCION, 9-27-12
File: Z:\TOXSTAT\MONTE\CD. 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	32 % EFFLUENT	10	4.106	24.3	-1.500
3	42 % EFFLUENT	10	4.106	24.3	-0.600
4	56 % EFFLUENT	10	4.106	24.3	-3.200
5	75 % EFFLUENT	10	4.106	24.3	-4.900
6	100 % EFFLUENT	10	4.106	24.3	-3.200

AA # K1209008, C. DUBIA CHRONIC REPRODUCION, 9-27-12
File: Z:\TOXSTAT\MONTE\CD. Transform: NO TRANSFORMATION

STEEL'S MANY-ONE RANK TEST - Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	16.900				
2	32 % EFFLUENT	18.400	118.00	75.00	10.00	
3	42 % EFFLUENT	17.500	109.50	75.00	10.00	
4	56 % EFFLUENT	20.100	129.50	75.00	10.00	
5	75 % EFFLUENT	21.800	134.00	75.00	10.00	
6	100 % EFFLUENT	20.100	126.00	75.00	10.00	

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

APPENDIX E

Organism History

AQUATOX, INC.

416 TWIN POINTS ROAD
HOT SPRINGS, ARKANSAS 71913
501-520-0560

TEST ORGANISM HISTORY

DATE SHIPPED 9-27-12 **CLIENT** Arkansas Analytical

Purchase Order #: _____

SPECIES: Pimephales promelas

Quantity Shipped: 420+ + 180+

Age: Hatched 9/26 1500CST - 7 Days old 9/3

Brood Stock Source: Anderson Farms, AR

Culture Water: Groundwater

Hardness (Mg/l CaCO3): =160

Dissolved Oxygen (Mg/1): 8.3

Temperature (°C): 25.1°C

Feeding: Artemia

Comments: _____

Shipped Via: Federal Express UPS Overnight (Shuttle)

Packaged By: CW

Bill Hall Printers 3171

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: 6/22/09

SPECIES: *Ceriodaphnia dubia*

AGE: Variable

LIFE STAGE: Adult

HATCH DATE: Variable

BEGAN FEEDING: Immediately

FOOD: YTC, *Selenastrum* sp.

Water Chemistry Record:	Current	Range
TEMPERATURE:	25°C	20-25°C
SALINITY/CONDUCTIVITY:	--	--
TOTAL HARDNESS (as $CaCO_3$):	142 mg/l	86-124 mg/l
TOTAL ALKALINITY (as $CaCO_3$):	100 mg/l	65-130 mg/l
pH:	7.92	7.56-8.35

Comments:

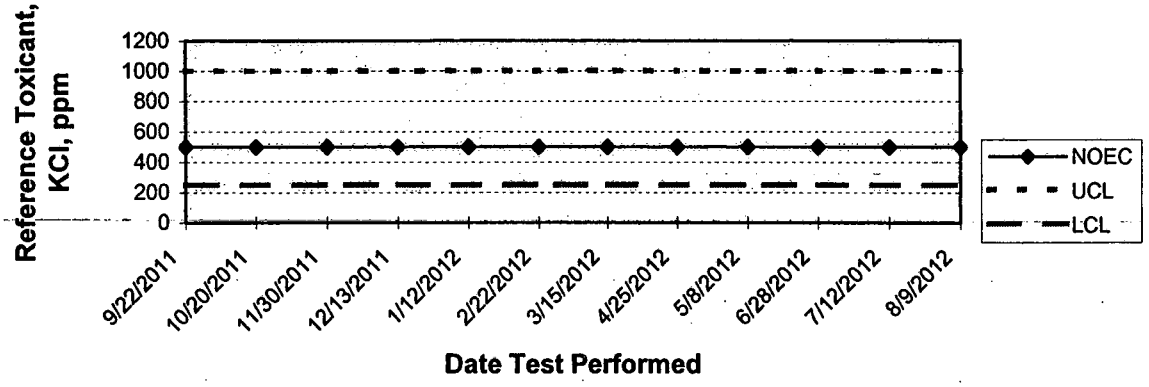
Facility Supervisor

APPENDIX F

Quality Assurance Charts

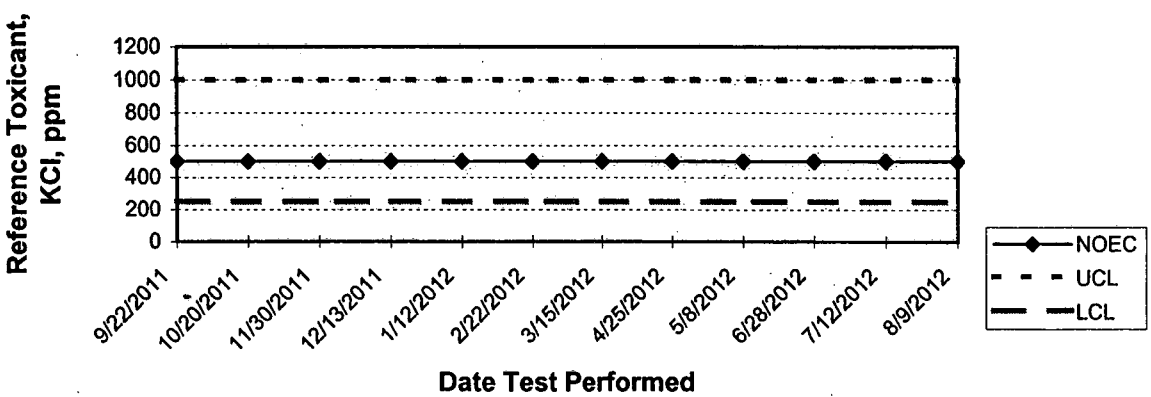
ARKANSAS ANALYTICAL, INC.

FATHEAD MINNOW SURVIVAL
QUALITY ASSURANCE



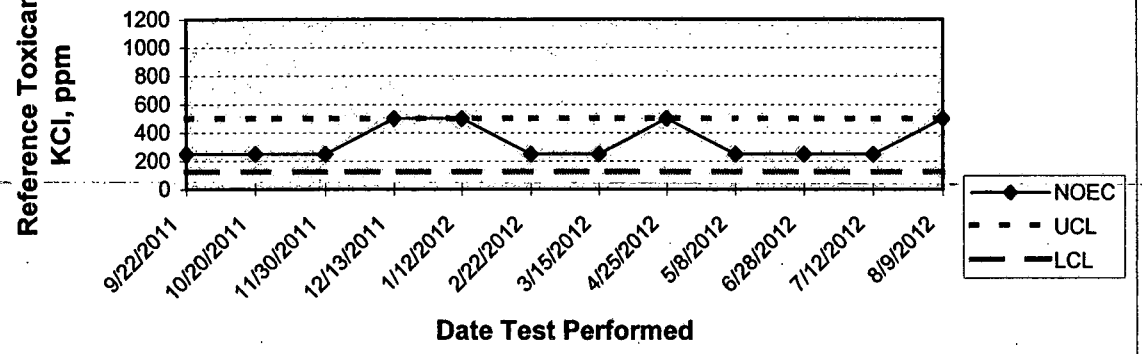
ARKANSAS ANALYTICAL, INC.

FATHEAD MINNOW GROWTH
QUALITY ASSURANCE



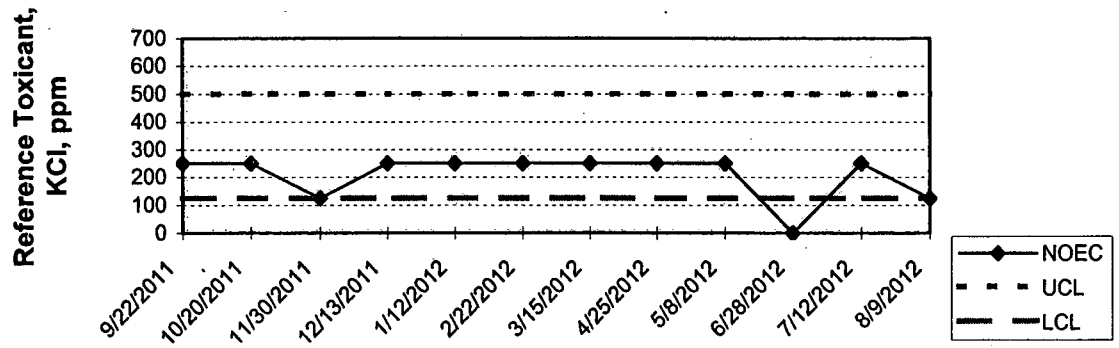
ARKANSAS ANALYTICAL, INC.

CERIODAPHNIA DUBIA SURVIVAL
QUALITY ASSURANCE



ARKANSAS ANALYTICAL, INC.

CERIODAPHNIA DUBIA REPRODUCTION
QUALITY ASSURANCE



Arkansas Analytical, Inc.

Toxicity Test Results
City of DeQueen
NPDES PERMIT NUMBER: AR0021733
Third Quarter 2012
AFIN # 67-00023

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

Ceriodaphnia dubia, Survival and Reproduction Test
Test 1002.0

Prepared for: **Mr. Mike Sims**
City of DeQueen
P.O. Box 730
DeQueen, Arkansas 71832

Prepared by: Arkansas Analytical, Inc.
11701 I-30, Bldg 1, Suite 115
Little Rock, Arkansas 72209
Lab Number K1209008

Wednesday, October 10, 2012

Introduction

This report contains test results for toxicity testing for the City of DeQueen. The NPDES permit number is AR0021733. The facility is located 1/8 mile south from intersection of Coulter Ave. and south of 9th Street on Philip Cox Blvd, in Section 36, Township 8 South, Range 32 West in Sevier County, Arkansas. The discharge is to receiving waters named: an unnamed ditch around pond to Bear Creek to Little River to Red River in Segment 1C of the Red River Basin.

The permit requires chronic biomonitoring testing quarterly for both *Ceriodaphnia dubia* and *Pimephales promelas.* The test results in this report represent the testing for the third quarter of 2012.

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:	9-25-12, 0800	9-26-12, 0800
Sample #2:	9-26-12, 0800	9-27-12, 0800
Sample #3:	9-30-12, 0900	10-1-12, 0900

The samples were composites collected at the final discharge from City of DeQueen Wastewater Plant outfall.

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

Sample Receiving Information:	Date, Time Sample(s) Received	Temperature Upon Receipt (°C)
Sample #1:	9-27-12, 0945	1
Sample #2:	9-28-12, 1000	1
Sample #3:	10-3-12, 1145	12**

** As per Mary Barnett test was allowed to continue although sample #3 was received outside the temperature limits. This was due to a delay in delivery by the courier service.

Chain of custody documentation is located in Appendix A.

The permit designates the receiving water to be used as dilution water for the toxicity tests. Due to its earlier characterization as toxic, synthetic dilution water was substituted.

The dilution water used in the toxicity tests was moderately hard synthetic. 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 32%, 42%, 56%, 75%, and 100%. The low-flow effluent concentration (**critical dilution**) was defined as **100% 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 alternate method suggested in the method (11.3.4.5) for combating pathogen interference, was run in place of the original fathead minnow test. The test chambers were 30 ml plastic cups with 20 ml of test solution. Each chamber contained 2 organisms. The total number of fish was 40 per test solution. The fish were then combined to perform growth analysis. 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 also 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 ml 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 < 24 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	16.9	X	
At least 60% of surviving females should have produced 3 broods	100%	X	
The percent coefficient of variation between replicates must be 40% or less for the young of surviving females	21.9	X	

TEST ACCEPTANCE CRITERIA for *Pimephales promelas*

Control Criteria	Results	Pass	Fail
Greater than or equal to 80% survival	92.5%	X	
The percent coefficient of variation between replicates must be 40% or less for survival	7.40	X	
Minimum of 0.25 mg average dry weight of surviving controls	0.424	X	
The percent coefficient of variation between replicates must be 40% or less for growth	13.6	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

Ceriodaphnia dubia 8/9-16/12		*Pimephales promelas* 8/9-16/12	
NOEC Survival:	500 ppm KCl	NOEC Survival:	500 ppm KCl
LOEC Survival:	1000 ppm KCl	LOEC Survival:	1000 ppm KCl
NOEC Reproduction:	125 ppm KCl	NOEC Growth:	500 ppm KCl
LOEC Reproduction:	250 ppm KCl	LOEC Growth:	1000 ppm KCl

Quality Assurance charts are provided in Appendix F.

Summary of Results
City of DeQueen

Ceriodaphnia dubia		*Pimephales promelas*	
NOEC / LOEC Survival	100% / NA	NOEC / LOEC survival	100% / NA
NOEC / LOEC Reproduction	100% / NA	NOEC / LOEC growth	100%/ NA
Mean number of neonates (critical dilution)	20.1	%CV survival (critical dilution)	5.73
%CV Reproduction (critical dilution)	23.6	Mean dry weight (critical dilution) in milligrams	0.462
		%CV growth (critical dilution)	11.1
PMSD Reproduction	24.3	PMSD Growth	22.2

Conclusion

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

The permit issued to the City of DeQueen, AR0021733, specifies that the **critical dilution is 100% 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 the City of DeQueen, AR0021733, specifies that the **critical dilution is 100% effluent**. The effluent samples **did not** exhibit lethal effects or sublethal effects at the critical dilution, and, as such, **passed** both portions of the test.

Biomonitoring Analysts:

Ryan Hudgin

Melissa Bird

Kenneth Pigue

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

PERMITTEE: City of DeQueen **NPDES #: AR0021733**

Sample Collection:	Date, Time Started	Date, Time Ended
Sample #1:	9-25-12, 0800	9-26-12, 0800
Sample #2:	9-26-12, 0800	9-27-12, 0800
Sample #3:	9-30-12, 0900	10-1-12, 0900

Test initiated (date, time): 9-27-12, 1415 Test terminated (date, time): 10-4-12, 1150

Dilution water used: Moderately Hard Synthetic

DATA TABLE FOR FATHEAD MINNOW SURVIVAL

	Percent Survival in Replicate Chambers						**Mean Percent Survival**			
Effluent Conc %	A	B	C	D	E		24 hours	48 hours	7 days	CV %
0%	87.5	87.5	100	100	87.5		100	97.5	92.5	7.40
32%	87.5	100	100	100	100		97.5	97.5	97.5	
42%	87.5	100	100	100	100		100	100	97.5	
56%	87.5	87.5	100	87.5	100		97.5	95	92.5	
75%	87.5	100	100	100	87.5		100	97.5	95	
100%	100	100	100	87.5	100		100	100	97.5	5.73

DATA TABLE FOR GROWTH OF FATHEAD MINNOWS

Effluent Conc %	A	B	C	D	E		Mean Dry Weight	CV%
0%	0.433	0.340	0.400	0.490	0.459		0.424	13.6
32%	0.320	0.426	0.477	0.433	0.511		0.433	
42%	0.459	0.336	0.446	0.505	0.554		0.460	
56%	0.501	0.404	0.503	0.458	0.544		0.482	
75%	0.470	0.360	0.397	0.431	0.528		0.437	
100%	0.400	0.474	0.539	0.463	0.436		0.462	11.1

Average Dry Weight in milligrams in replicate chambers
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)= _____**100**____% effluent

   b) NOEC growth (parameter TPP6C)= _____**100**_____% effluent

   c) Coefficient of variation (parameter TQP6C)= _____**13.6** _____%

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)= _____**100**____% effluent

   b) NOEC growth (parameter TPP6C)= _____**100**_____% effluent

   c) Coefficient of variation (parameter TQP6C)= _____**13.6** _____%

SUMMARY REPORTING FORMS FOR CHRONIC BIOMONITORING
Ceriodaphnia dubia SURVIVAL AND REPRODUCTION

PERMITTEE: City of DeQueen **NPDES #: AR0021733**

PERCENT SURVIVAL

PERCENT EFFLUENT	0%	32%	42%	56%	75%	100%
Time of Reading: 24 HOURS	100	100	100	100	100	100
48 HOURS	100	100	100	100	100	100
Test termination	100	100	90	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)= _____**100**____ % effluent

   b) NOEC reproduction (parameter TPP3B)= _____**100**_____% effluent

   c) Coefficient of variation (parameter TQP3B)= _____**23.6**_____%

APPENDIX A

Chain of Custody Forms

Arkansas Analytical Inc.

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
City of DeQueen Wastewater Plant	City of DeQueen Wastewater Plan
514 South 9th	P.O. Box 730
DeQueen, AR 71832	DeQueen, AR 71832
Attn: Mike Sims	

Project Description: Chronic Toxicity

Reporting Information
Telephone: 870-642-5231
Fax: 870-642-3117
Email: mslms@cityofdequeen.com

Turnaround Time: 24 Hour / 48 Hour / 72 Hour / Routine

Preservation Codes:
1. Cool, 4 Degrees Centigrade
2. Sulfuric Acid (H_2SO_4), pH < 2
3. Nitric Acid (HNO_3), pH < 2
4. Thiosulfate for Dechlorination
5. Hydrochloric Acid(HCl)
6. Sodium Hydroxide (NaOH), pH > 12

Bottle Type Code: G = Glass; P = Plastic; V = Septum; A = Amber

Sampler(s) Signature: B

Sampler(s) Printed: MS

Field Number	SAMPLE COLLECTION Date/s	Time/s	Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION	Preservative Code	Bottle Type	TEST PARAMETERS: Chronic Biomonitoring	Arkansas Analytical Work Order Number:
	9-25/26-12	820/820		X		Water	DQ Bio	1	P	X	K1209-008A

1. Relinquished by: (Signature)	Date/Time	2. Received by: (Signature)
	9-26-12 11:45 am	UPS
3. Relinquished by: (Signature)	Date/Time	4. Received by lab: (Signature)
UPS	9/27/12. 0945	Sydney James

Revision 1
12/1/10

SAMPLE CONDITION UPON RECEIPT IN LAB

1. CUSTODY SEALS:	√ Yes	No
2. CONTAINERS CORRECT:	Yes	No
3. COC/LABELS AGREE:	Yes	No
4. PRESERVATION CONFIRMED:	Yes	No
5. RECEIVED ON ICE:	Yes	No
6. TEMPERATURE ON RECEIPT:	1°C	

FOR COMPLETION BY LAB ONLY

REMARKS / SAMPLE COMMENTS

P.O. Number: 67050

Arkansas Analytical Inc.

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
City of DeQueen Wastewater Plant	City of DeQueen Wastewater Plan
514 South 9th	P.O. Box 730
DeQueen, AR 71832	DeQueen, AR 71832
Attn: Mike Sims	

Project Description: Chronic Toxicity

Reporting Information
Telephone: 870-642-5231
Fax: 870-642-3117
Email: msims@cityofdequeen.com

Turnaround Time: 24 Hour / 48 Hour / 72 Hour / Routine

Preservation Codes:
1. Cool, 4 Degrees Centigrade
2. Sulfuric Acid (H_2SO_4), pH < 2
3. Nitric Acid (HNO_3), pH < 2
4. Thiosulfate for Dechlorination
5. Hydrochloric Acid(HCl)
6. Sodium Hydroxide (NaOH), pH > 12

Sampler(s) Signature: [signature]

Sampler(s) Printed: NS

Field Number	SAMPLE COLLECTION Date/s	Time/s	Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION	TEST PARAMETERS: Chronic Biomonitoring	Arkansas Analytical Work Order Number:
	9-26-27-12	8:40/8:40		X		Water	DQ Bio	X	K1209-008B

Preservative Code: 1
Bottle Type: P
Bottle Type Code: G = Glass; P = Plastic; V = Septum; A = Amber

1. Relinquished by: (Signature)	Date/Time	2. Received by: (Signature)
[signature]	9-27-12 11:50 am	UPS
3. Relinquished by: (Signature)	Date/Time	4. Received by lab: (Signature)
UPS	9/28/12, 1000	Sydney James

SAMPLE CONDITION UPON RECEIPT IN LAB

1. CUSTODY SEALS:	✓ Yes	No
2. CONTAINERS CORRECT:	Yes	No
3. COC/LABELS AGREE:	Yes	No
4. PRESERVATION CONFIRMED:	Yes	No
5. RECEIVED ON ICE:	Yes	No
6. TEMPERATURE ON RECEIPT:	1°C	

FOR COMPLETION BY LAB ONLY

REMARKS / SAMPLE COMMENTS

P.O. Number: 67050

Revision 1
12/1/10

Arkansas Analytical Inc.
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
City of DeQueen Wastewater Plant	City of DeQueen Wastewater Plan
514 South 9th	P.O. Box 730
DeQueen, AR 71832	DeQueen, AR 71832
Attn: Mike Sims	

Project Description: Chronic Toxicity

Turnaround Time: 24 Hour / 48 Hour / 72 Hour / Routine

Reporting Information
Telephone: 870-642-5231
Fax: 870-642-3117
Email: msims@cityofdequeen.com

Preservative Code: 1
Bottle Type: P

Preservation Codes:
1. Cool, 4 Degrees Centigrade
2. Sulfuric Acid (H_2SO_4), pH < 2
3. Nitric Acid (HNO_3), pH < 2
4. Thiosulfate for Dechlorination
5. Hydrochloric Acid(HCl)
6. Sodium Hydroxide (NaOH), pH > 12

Sampler(s) Signature: MS

Sampler(s) Printed: MS

Field Number	SAMPLE COLLECTION Date/s	Time/s	Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION	TEST PARAMETERS: Chronic Biomonitoring	Bottle Type Code (G = Glass; P = Plastic; V = Septum; A = Amber)	Arkansas Analytical Work Order Number:
	9-30/10-1-12	9a0/9a0		X		Water	DQ Bio	X	C	K1209008

1. Relinquished by: (Signature) — Date/Time: 10-1-12 11:50 am — 2. Received by: (Signature): UPS

3. Relinquished by: (Signature): UPS — Date/Time: 10-3-12 11:45 — 4. Received by lab: (Signature): Amanda Fabush

Revision 1
12/1/10

SAMPLE CONDITION UPON RECEIPT IN LAB

1. CUSTODY SEALS:	✓ Yes	___ No
2. CONTAINERS CORRECT:	___ Yes	___ No
3. COC/LABELS AGREE:	___ Yes	___ No
4. PRESERVATION CONFIRMED:	___ Yes	___ No
5. RECEIVED ON ICE:	___ Yes	✓ No
6. TEMPERATURE ON RECEIPT:	12 °C	

FOR COMPLETION BY LAB ONLY

REMARKS / SAMPLE COMMENTS

P.O. Number: 67050

Norma James

From: Barnett, Mary [BARNETT@adeq.state.ar.us]
Sent: Thursday, October 04, 2012 7:36 AM
To: Norma James
Subject: RE: city of dequeen WET temp excursion

Norma,

Due to unintended extenuating circumstances involving the sample courier, and since the facility generally has a history of passing WET tests, the Department has determined the third sample of the 3rd quarter test is an acceptable sample.

The Department encourages the facility and laboratory to work with the couriers to ensure that all subsequent WET test samples are received within EPA's sampling handing requirements.

Mary Barnett
Ecologist
501-682-0666

From: Norma James [mailto:njames@arkansasanalytical.com]
Sent: Wednesday, October 03, 2012 12:18 PM
To: Barnett, Mary
Cc: 'Ken Pigue'; 'Lessie Redican'; 'Sydney James'
Subject: city of dequeen WET temp excursion

Mary,
As discussed with Ken earlier yesterday, we are continuing to run the current WET test for the City of DeQueen although the temperature of the third sample received was 12degrees C. We will note such in the report. Delivery of the sample was delayed by third party courier service, causing the temp to be elevated. DeQueen usually does a good job of icing down the samples.
Let me know if you need any further information.
Thank you for your assistance.
Norma

Norma James, President

Arkansas Analytical Inc

11701 Interstate 30
Bldg. 1, Ste. 115
Little Rock, AR 72209
501-455-3233
501-455-6118 (fax)
501-993-1852 (cell)

Business Hours - Mon-Thur - 8am-5pm, Fri - 8am-4pm

Think for yourselves and let others enjoy the privilege to do so too. Voltaire.

This e-mail and any attachments are confidential. If you receive this message in error or are not the intended recipient, you should not retain,

APPENDIX B

Effluent and Dilution Water Data

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING — Fathead Minnow

Lab # / Sample ID

Client: Dr Queen

Test Start (Date/Time) 9-27-12 1415

Test End (Date/Time) 10-4-12 1150

		Day of Test							
		1	2	3	4	5	6	7	notes/remarks
Control	MHS551	9-27	9-28	9-29	9-30	10-1	10-2	10-3	
MHS D.O. (mg/L)	INITIAL	8.6	8.5	8.5	8.6	8.7	8.9	8.9	
	FINAL	7.9 7.5	8.0	6.6	7.7	7.4	7.4	5.9	
pH (s.u.)	INITIAL	8.0	7.8	8.0	8.2	7.9	7.9	7.8	
	FINAL	7.3	8.0	8.2 7.6	8.2 8.1	7.6	7.4	7	
temp (C)	INITIAL	22	22	21.3	21.0	21	21	21	
	FINAL	25	25	25	25	25	25	25	
ALKALINITY (mg/L)		62							
HARDNESS (mg/L)		84							
CONDUCTIVITY (umhos/cm)		294							
CHLORINE (mg/L)		<0.05							
CONC:									
32 D.O. (mg/L)	INITIAL	8.6	8.8	8.9	8.8	8.7	8.8	8.8	
	FINAL	7.5	8.1	6.7	7.7	7.3	7.5	7.4	
pH (s.u)	INITIAL	7.8	7.6	7.9	8.1	7.4	7.8	7.4	
	FINAL	7.4	7.9	7.7	7.5	7.6	7.4	7.4	
temp (C)	INITIAL	22	21	22.5	22.0	22	21	21	
	FINAL	25	25	25	25	25	25	25	
CONC:									
42 D.O. (mg/L)	INITIAL	8.6	8.8	9.1	9.0	8.5	8.7	8.8	
	FINAL	7.5 7.5	8.2	6.8	7.6	7.2	7.5	7.5	
pH (mg/L)	INITIAL	7.7	7.7	8.0	7.8	7.4	7.4	7.7	
	FINAL	7.4	7.9	7.7	7.5	7.2	7.4	7.4	
temp (C)	INITIAL	22	21	23.4	24.0	22	22	21	
	FINAL	25	25	25	25	25	25	25	
CONC:									
56 D.O. (mg/L)	INITIAL	8.6	8.6	9.3	9.0	8.7	8.7	8.8	
	FINAL	7.5	8.1	6.6	7.9	7.4	6.9	7.1	
pH (s.u.)	INITIAL	7.7	7.3	7.8	7.7	7.4	7.2	7.3	
	FINAL	7.4	8.0	7.6	7.5	7.5	7.4	7.3	
temp (C)	INITIAL	21	21	24.1	25.2	22	22	22	
	FINAL	25	25	25	25	25	25	25	
CONC:									
75 D.O. (mg/L)	INITIAL	8.7	8.7	9.2	8.9	8.7	8.8	8.9	
	FINAL	7.9	8.1	6.6	7.7	7.4	7.4	6.9	
pH (s.u.)	INITIAL	7.7	7.5	7.7	7.5	7.3	7.4	7.5	
	FINAL	7.4	7.5	7.6	7.0	7.4	7.2	7.4	
temp (C)	INITIAL	22	21	24.8	26.0	23	21	21	
	FINAL	25	25	25	25	25	25	25	
CONC:									
100 D.O. (mg/L)	INITIAL	8.7	8.6	8.7	8.9	8.6	8.9	8.9	
	FINAL	7.4	8.2	6.6	7.6	6.9	7.3	7.5	
pH (s.u.)	INITIAL	7.5	7.2	7.7	7.4	7.3	7.2	7.2	
	FINAL	7.4	7.5	7.5	7.1	7.3	7.3	7.3	
temp (C)	INITIAL	21	22	23.5	25.2	20	22	22	
	FINAL	25	25	25	25	25	25	25	
CONC: 100%		A	A	A	B	B	B	C	
ALKALINITY (mg/L)		22			24			26	
HARDNESS (mg/L)		40			32			26	
CONDUCTIVITY (umhos/cm)		917			957			806	
CHLORINE (mg/L)		<0.05			<0.05			<0.05	

Revision 1
11/30/10

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING — Cerodaphnia Dubia

Lab # / Sample ID

Client: De Queen

Test Start (Date/Time) 9-27-12 1100

Test End (Date/Time) 10-4-12 1030

		Day of Test 1	2	3	4	5	6	7	notes/remarks
Control	MHS551	9-27	9-28	9-29	9-30	10-1	10-2	10-3	
D.O. (mg/L)	INITIAL	8.6	8.5	8.5	8.6	8.7	8.9	8.9	
	FINAL	8.1	~~7.8~~ 8.27	8.2	8.1	8.1	8.1	7.8	
pH (s.u.)	INITIAL	8.0	7.8	8.0	8.2	7.9	7.9	7.8	
	FINAL	7.7	7.8	7.9	7.8	7.7	7.7	7.5	
temp (C)	INITIAL	22	22	21.3	21	21	21	21	
	FINAL	25	25	25	25	25	25	25	
ALKALINITY (mg/L)		62	→	→	→	→	→	→	
HARDNESS (mg/L)		84	→	→	→	→	→	→	
CONDUCTIVITY (umhos/cm)		294	→	→	→	→	→	→	
CHLORINE (mg/L)		<0.05	→	→	→	→	→	→	
CONC:									
D.O. (mg/L)	INITIAL	8.6	8.8	8.9	8.8	8.7	8.8	8.8	
	FINAL	8.0	8.2	8.2	8.0	8.2	8.2	7.5	
pH (s.u)	INITIAL	7.8	7.6	7.9	8.1	7.4	7.8	7.4	
	FINAL	7.7	7.9	8.2	7.7	7.6	7.7	7.3	
temp (C)	INITIAL	22	~~21~~ ~~22~~	22.5	22	22	21	21	
	FINAL	25	25	25	25	25	25	25	
CONC:									
D.O. (mg/L)	INITIAL	8.6	8.8	9.1	9.0	8.5	8.7	8.8	
	FINAL	8.0	8.1	8.2	8.1	8.1	8.5	7.6	
pH (mg/L)	INITIAL	7.7	7.7	8.0	7.8	7.4	7.4	7.7	
	FINAL	7.7	8.0	8.0	7.8	7.5	7.7	7.1	
temp (C)	INITIAL	22	~~22~~ 21	23.4	24	22	22	21	
	FINAL	25	25	25	25	25	25	25	
CONC:									
D.O. (mg/L)	INITIAL	8.6	8.6	9.3	9.0	8.7	8.7	8.8	
	FINAL	8.3	8.1	8.4	8.2	8.1	8.2	7.6	
pH (s.u.)	INITIAL	7.7	7.3	7.8	7.7	7.4	7.2	7.3	
	FINAL	7.8	8.0	7.8	7.7	7.4	7.6	7.3	
temp (C)	INITIAL	21	21	24.1	25.2	22	22	22	
	FINAL	25	25	25	25	25	25	25	
CONC:									
D.O. (mg/L)	INITIAL	8.7	8.7	9.2	8.9	8.7	8.8	8.9	
	FINAL	8.0	8.1	8.2	8.1	8.3	8.2	7.7	
pH (s.u.)	INITIAL	7.7	7.5	7.7	7.5	7.3	7.4	7.5	
	FINAL	8.1	8.0	7.9	7.6	7.5	7.7	7.2	
temp (C)	INITIAL	22	21	24.8	26	23	21	21	
	FINAL	25	25	25	25	25	25	25	
CONC:									
D.O. (mg/L)	INITIAL	8.7	8.6	8.7	8.9	8.6	8.9	8.9	
	FINAL	8.1	8.1	8.2	8.0	8.0	8.2	7.6	
pH (s.u.)	INITIAL	7.5	7.2	7.7	7.4	7.3	7.2	7.2	
	FINAL	7.5	7.9	7.7	7.6	7.6	7.7	7.4	
temp (C)	INITIAL	21	22	23.5	25.2	20	22	22	
	FINAL	25	25	25	25	25	25	25	
CONC: 100%		A	A	A	B	B	B	C	
ALKALINITY (mg/L)		22	→	→	24	→	→	26	
HARDNESS (mg/L)		40	→	→	32	→	→	26	
CONDUCTIVITY (umhos/cm)		917	→	→	957	→	→	806	
CHLORINE (mg/L)		<0.05	→	→	<0.05	→	<0.05	<0.05	

MHS

32

42

RH 9-27 ~~42~~ 56

75

100

Revision 1
11/30/10

APPENDIX C

Fathead minnow raw data and statistics

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID K1709008 TEST START DATE 9/27/17 TIME 1415

CLIENT DeQueen TEST END DATE 10/4/17 TIME 1150

AGE AND SOURCE OF MINNOWS

D A Y (NUMBER SURVIVING) SURVIVAL

CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
0	A	8	8	8	8	8	8	7	7	87.5	92.5	7.40
	B	8	8	7	7	7	7	7	7	87.5		
	C	8	8	8	8	8	8	8	8	100		
	D	8	8	8	8	8	8	8	8	100		
	E	8	8	8	7	7	7	7	7	87.5		
32	A	8	7	7	7	7	7	7	7	87.5	97.5	
	B	8	8	8	8	8	8	8	8	100		
	C	8	8	8	8	8	8	8	8	100		
	D	8	8	8	8	8	8	8	8	100		
	E	8	8	8	8	8	8	8	8	100		
42	A	8	8	8	8	8	8	7	7	87.5	97.5	
	B	8	8	8	8	8	8	8	8	100		
	C	8	8	8	8	8	8	8	8	100		
	D	8	8	8	8	8	8	8	8	100		
	E	8	8	8	8	8	8	8	8	100		
56	A	8	8	7	7	7	7	7	7	87.5	ICP blank 0.0 92.5	
	B	8	7	7	7	7	7	7	7	87.5		
	C	8	8	8	8	8	8	8	8	100		
	D	8	8	8	8	8	7	7	7	87.5		
	E	8	8	8	8	8	8	8	~~8~~	~~87.5~~ 100		
75	A	8	8	7	7	7	7	7	7	87.5	95	
	B	8	8	8	8	8	8	8	8	100		
	C	8	8	8	8	8	8	8	8	100		
	D	8	8	8	8	8	8	8	8	100		
	E	8	8	8	8	8	7	7	7	87.5		
100	A	8	8	8	8	8	8	8	8	100	97.1	6.73
	B	8	8	8	8	8	8	8	8	100		
	C	8	8	8	8	8	8	8	8	100		
	D	8	8	8	8	8	7	7	7	87.5		
	E	8	8	8	8	8	8	8	8	100		
ANALYST												
DATE:												
TIME:												

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID	A	TEST START DATE 9-27-12 TIME 1415
CLIENT Dr Guren		TEST END DATE 10-4-12 TIME 1150

AGE AND SOURCE OF MINNOWS

			DAY (NUMBER SURVIVING)							SURVIVAL		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: MHS	A	2	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1	1			
	C	1	1	1	1	1	1	2	2			
	D	1	1	1	1	1	1	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 32	A	2	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1	1			
	C	1	2	2	2	2	2	2	2			
	D	1	2	2	0	2	2	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 42	A	2	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1	1			
	C	1	1	1	1	1	1	2	2			
	D	1	1	1	1	1	1	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 56	A	2	2	2	2	2	2	2	2			
	B	1	1	2	2	2	2	2	2			
	C	1	1	1	1	1	1	1	1			
	D	1	1	2	2	2	2	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 75	A	2	2	2	2	2	2	2	2			
	B	1	2	2	1	2	1	2	2			
	C	1	1/2	2	1	2	1	2	2			
	D	1	1/2	1	1	1	1	1	1			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 100	A	2	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1	1			
	C	1	1	1	1	1	1	1	1			
	D	1	1	1	1	1	1	1	1			
	E											
ANALYST		RH	RH	CA	CA	RH	RH	RH	RH			
DATE:		9-27-12	9-29-12	9-29	9-30	10-1	10-2	10-3	10-4			
TIME:		1415	1100	1200	1230	1330	1530	1500	1100			

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID | TEST START DATE 9-27-12 TIME 1415

CLIENT Dr Bureen B | TEST END DATE 10-4-12 TIME 1150

AGE AND SOURCE OF MINNOWS

DAY (NUMBER SURVIVING) | SURVIVAL

	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: MHS	A	2	2	1	1	1	1	1	1			
	B	1	1	2	2	2	2	2	2			
	C	1	1	1	1	1	1	1	1			
	D	1	1	1	1	1	1	1	1			
	E											
CONC: 32	A	2	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1	1			
	C											
	D	1	1	1	1	1	1	1	1			
	E											
CONC: 42	A	2	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1	1			
	C											
	D	1	1	1	1	1	1	1	1			
	E											
CONC: 56	A	2	2	2	2	2	2	2	2			
	B	1	2	2	2	2	2	2	2			
	C		1	1	1	1	1	1	1			
	D	1	2	2	2	2	2	2	2			
	E											
CONC: 75	A	2	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1	1			
	C											
	D	1	1	1	1	1	1	1	1			
	E											
CONC: 100	A	2	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1	1			
	C											
	D	1	1	1	1	1	1	1	1			
	E											
ANALYST		KH	KH	CA	CA	RH	RH	RH	RH			
DATE:		9-27-12	9-28-12	9-29-12	930	10-1	10-2	10-3	10-4			
TIME:		1415	1100	1200	1230	1350	1540	1510	1110			

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID | TEST START DATE 9-27-12 TIME 1415

CLIENT DeQueen C | TEST END DATE 10-4-12 TIME 1150

AGE AND SOURCE OF MINNOWS

D A Y (NUMBER SURVIVING)

	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: mHS	A	2	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1	1			
	C											
	D											
	E											
CONC: 32	A	2	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1	1			
	C											
	D											
	E											
CONC: 42	A	2	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1	1			
	C											
	D											
	E											
CONC: 56	A	2	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1	1			
	C											
	D											
	E											
CONC: 75	A	2	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1	1			
	C											
	D											
	E											
CONC: 100	A	2	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1	1			
	C											
	D											
	E											
ANALYST		RH	RH	CA	CA	RH	RH	RH	RH			
DATE:		9-27	9-28-12	9-29-12	9-30-12	10-1	10-2	10-3	10-4			
TIME:		1415	1100	1200	1230	1345	1450	1520	1120			

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID De Queen D TEST START DATE 9-27-12 TIME 1415

CLIENT TEST END DATE 10-4-12 TIME 1150

AGE AND SOURCE OF MINNOWS

D A Y (NUMBER SURVIVING) SURVIVAL

CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
MHS	A	2	2	2	2	2	2	2	3			
	B	1	1	1	1	1	1	1	1			
	C											
	D											
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	2	2	2	2	2	2	2	2			
32	B	1	1	1	1	1	1	1	1			
	C											
	D											
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	2	2	2	2	2	2	2	3			
42	B	1	1	1	1	1	1	1	1			
	C											
	D	1	1	1	1	1	1	1	1			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	2	2	2	2	2	2	2	2			
56	B	1	1	1	1	1	1	1	1			
	C						2	2	2			
	D	1	1	1	1	1	2	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	2	2	2	2	2	2	2	2			
75	B	1	1	1	1	1	1	1	1			
	C											
	D	1	1	1	1	1	1	1	1			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	2	2	2	2	2	2	2	2			
100	B	1	1	1	1	1	1	1	1			
	C											
	D	1	1	1	1	1	1	1	1			
	E											
ANALYST		RH	RH	↓	↓	RH	RH	RH	RH			
DATE:		9-27	9-28-12	9-29-12	9-30-12	10-1	10-2	10-3	10-4			
TIME:		1415	1100	1200	1200	1400	1600	1530	1130			

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID DeQueen E	TEST START	DATE 9-27-12	TIME 1415
CLIENT	TEST END	DATE 10-4-12	TIME 1150
AGE AND SOURCE OF MINNOWS			

D A Y (NUMBER SURVIVING) — SURVIVAL

CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
	A	2	2	2	2	2	2	2	2			
	B	″	″	″	″	2	2	2	2			
	C	″	″	″	″	″	″	″	″			
	D	″	″	″	2	2	2	2	2			
	E											

CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
	A	2	2	2	2	2	2	2	2			
	B	″	″	″	″	″	″	″	″			
	C	″	″	″	″	″	″	″	″			
	D	″	″	″	″	″	″	″	″			
	E											

CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
	A	2	2	2	2	2	2	2	2			
	B	″	″	″	″	″	″	″	″			
	C	″	″	″	″	″	″	″	″			
	D	″	″	″	″	″	″	″	″			
	E											

CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
	A	2	2	2	2	2	2	2	2			
	B	″	″	″	″	″	″	″	″			
	C	″	″	″	″	″	″	″	″			
	D	″	″	″	″	″	″	″	″			
	E											

CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
	A	2	2	2	2	2	2	2	2			
	B	″	″	″	″	″	″	″	″			
	C	″	″	″	″	″	″	″	″			
	D	″	″	″	″	″	″	″	″			
	E											

CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
	A	2	2	2	2	2	2	2	2			
	B	″	″	″	″	″	″	″	″			
	C	″	″	″	″	″	″	″	″			
	D	″	″	″	″	″	″	″	″			
	E											
ANALYST		KH	KH	U	U	KH	KH	KH	KH			
DATE:		9-27	9-28-12	9-29	9-30	10-1	10-1	10-3	10-4			
TIME:		1415	1100	1200	1230	1400	1610	1540	1150			

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

Pimephales promelas **FATHEAD MINNOW** TEST 1000.0

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s:	K1206003				TEST DATES (BEGIN / END):		9/24/12 - 10/4/12	
CLIENT:	City of DeQueen				WEIGHING DATE / TIME:		10/5/2012 1115	
ANALYSTS:	KP				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	1.00580	1.00234	0.00346	8	0.433	AVG DRY	
	B	1.03262	1.02990	0.00272	8	0.340	WEIGHT (mg)	
	C	0.98721	0.98401	0.00320	8	0.400		0.424
	D	1.01960	1.01568	0.00392	8	0.490	CV	
	E	1.02724	1.02357	0.00367	8	0.459		13.58
CONC:	A	1.01555	1.01299	0.00256	8	0.320	AVG DRY	
	B	1.02827	1.02486	0.00341	8	0.426	WEIGHT (mg)	
32%	C	0.97371	0.96989	0.00382	8	0.477		0.433
	D	1.00540	1.00194	0.00346	8	0.433	CV	
	E	0.99202	0.98793	0.00409	8	0.511		
CONC:	A	0.97725	0.97358	0.00367	8	0.459	AVG DRY	
	B	0.99517	0.99248	0.00269	8	0.336	WEIGHT (mg)	
42%	C	0.97587	0.97230	0.00357	8	0.446		0.460
	D	0.99737	0.99333	0.00404	8	0.505	CV	
	E	1.00386	0.99943	0.00443	8	0.554		
CONC:	A	0.95360	0.94959	0.00401	8	0.501	AVG DRY	
	B	0.99032	0.98709	0.00323	8	0.404	WEIGHT (mg)	
56%	C	0.97688	0.97286	0.00402	8	0.503		0.482
	D	0.99259	0.98893	0.00366	8	0.458	CV	
	E	0.99552	0.99117	0.00435	8	0.544		
CONC:	A	0.99861	0.99485	0.00376	8	0.470	AVG DRY	
	B	1.01283	1.00995	0.00288	8	0.360	WEIGHT (mg)	
75%	C	1.00485	1.00167	0.00318	8	0.397		0.437
	D	0.99846	0.99501	0.00345	8	0.431	CV	
	E	0.98980	0.98558	0.00422	8	0.528		
CONC:	A	0.98223	0.97903	0.00320	8	0.400	AVG DRY	
	B	0.99722	0.99343	0.00379	8	0.474	WEIGHT (mg)	
100%	C	0.99329	0.98898	0.00431	8	0.539		0.462
	D	0.98640	0.98270	0.00370	8	0.463	CV	
	E	0.99126	0.98777	0.00349	8	0.436		11.10

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

AA# K1209008, FATHEAD MINNOW, CHRONIC, 9-27-12
File: Z:\TOXSTAT\MONTE\FHSURV. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.202

W = 0.861

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# K1209008, FATHEAD MINNOW, CHRONIC, 9-27-12
File: Z:\TOXSTAT\MONTE\FHSURV. Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 0.45

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# K1209008, FATHEAD MINNOW, CHRONIC, 9-27-12
FILE: Z:\TOXSTAT\MONTE\FHSURV.
TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.8750	1.2094
1	CONTROL	2	0.8750	1.2094
1	CONTROL	3	1.0000	1.3931
1	CONTROL	4	1.0000	1.3931
1	CONTROL	5	0.8750	1.2094
2	32 % EFFLUENT	1	0.8750	1.2094
2	32 % EFFLUENT	2	1.0000	1.3931
2	32 % EFFLUENT	3	1.0000	1.3931
2	32 % EFFLUENT	4	1.0000	1.3931
2	32 % EFFLUENT	5	1.0000	1.3931
3	42 % EFFLUENT	1	0.8750	1.2094
3	42 % EFFLUENT	2	1.0000	1.3931
3	42 % EFFLUENT	3	1.0000	1.3931

3	42 % EFFLUENT	4	1.0000	1.3931
3	42 % EFFLUENT	5	1.0000	1.3931
4	56 % EFFLUENT	1	0.8750	1.2094
4	56 % EFFLUENT	2	0.8750	1.2094
4	56 % EFFLUENT	3	1.0000	1.3931
4	56 % EFFLUENT	4	0.8750	1.2094
4	56 % EFFLUENT	5	1.0000	1.3931
5	75 % EFFLUENT	1	0.8750	1.2094
5	75 % EFFLUENT	2	1.0000	1.3931
5	75 % EFFLUENT	3	1.0000	1.3931
5	75 % EFFLUENT	4	1.0000	1.3931
5	75 % EFFLUENT	5	0.8750	1.2094
6	100 % EFFLUENT	1	1.0000	1.3931
6	100 % EFFLUENT	2	1.0000	1.3931
6	100 % EFFLUENT	3	1.0000	1.3931
6	100 % EFFLUENT	4	0.8750	1.2094
6	100 % EFFLUENT	5	1.0000	1.3931

AA# K1209008, FATHEAD MINNOW, CHRONIC, 9-27-12
File: Z:\TOXSTAT\MONTE\FHSURV. 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	1.283				
2	32 % EFFLUENT	1.356	32.50	16.00	5.00	
3	42 % EFFLUENT	1.356	32.50	16.00	5.00	
4	56 % EFFLUENT	1.283	27.50	16.00	5.00	
5	75 % EFFLUENT	1.320	30.00	16.00	5.00	
6	100 % EFFLUENT	1.356	32.50	16.00	5.00	

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

AA# K1209008, FATHEAD MINNOW GROWTH CHRONIC, 9-27-12
File: Z:\TOXSTAT\MONTE\FHGR. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.102

W = 0.963

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# K1209008, FATHEAD MINNOW GROWTH CHRONIC, 9-27-12
File: Z:\TOXSTAT\MONTE\FHGR. Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 1.27

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# K1209008, FATHEAD MINNOW GROWTH CHRONIC, 9-27-12
FILE: Z:\TOXSTAT\MONTE\FHGR.
TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.4330	0.7182
1	CONTROL	2	0.3400	0.6225
1	CONTROL	3	0.4000	0.6847
1	CONTROL	4	0.4900	0.7754
1	CONTROL	5	0.4590	0.7444
2	32 % EFFLUENT	1	0.3200	0.6013
2	32 % EFFLUENT	2	0.4260	0.7111
2	32 % EFFLUENT	3	0.4770	0.7624
2	32 % EFFLUENT	4	0.4330	0.7182
2	32 % EFFLUENT	5	0.5110	0.7964
3	42 % EFFLUENT	1	0.4590	0.7444
3	42 % EFFLUENT	2	0.3360	0.6183
3	42 % EFFLUENT	3	0.4460	0.7313
3	42 % EFFLUENT	4	0.5050	0.7904
3	42 % EFFLUENT	5	0.5540	0.8395
4	56 % EFFLUENT	1	0.5010	0.7864

4	56 % EFFLUENT	2	0.4040	0.6888
4	56 % EFFLUENT	3	0.5030	0.7884
4	56 % EFFLUENT	4	0.4580	0.7433
4	56 % EFFLUENT	5	0.5440	0.8295
5	75 % EFFLUENT	1	0.4700	0.7554
5	75 % EFFLUENT	2	0.3600	0.6435
5	75 % EFFLUENT	3	0.3970	0.6817
5	75 % EFFLUENT	4	0.4310	0.7162
5	75 % EFFLUENT	5	0.5280	0.8134
6	100 % EFFLUENT	1	0.4000	0.6847
6	100 % EFFLUENT	2	0.4740	0.7594
6	100 % EFFLUENT	3	0.5390	0.8244
6	100 % EFFLUENT	4	0.4630	0.7484
6	100 % EFFLUENT	5	0.4360	0.7212

AA# K1209008, FATHEAD MINNOW GROWTH CHRONIC, 9-27-12
File: Z:\TOXSTAT\MONTE\FHGR. Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.012	0.002	0.571
Within (Error)	24	0.102	0.004	
Total	29	0.114		

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

AA# K1209008, FATHEAD MINNOW GROWTH CHRONIC, 9-27-12
File: Z:\TOXSTAT\MONTE\FHGR. Transform: ARC SINE(SQUARE ROOT(Y))

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

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	0.709	0.424		
2	32 % EFFLUENT	0.718	0.433	-0.214	
3	42 % EFFLUENT	0.745	0.460	-0.866	
4	56 % EFFLUENT	0.767	0.482	-1.411	
5	75 % EFFLUENT	0.722	0.437	-0.315	
6	100 % EFFLUENT	0.748	0.462	-0.935	

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

AA# K1209008, FATHEAD MINNOW GROWTH CHRONIC, 9-27-12
File: Z:\TOXSTAT\MONTE\FHGR. Transform: ARC SINE(SQUARE ROOT(Y))

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	32 % EFFLUENT	5	0.094	22.2	-0.009
3	42 % EFFLUENT	5	0.094	22.2	-0.036
4	56 % EFFLUENT	5	0.094	22.2	-0.058
5	75 % EFFLUENT	5	0.094	22.2	-0.013
6	100 % EFFLUENT	5	0.094	22.2	-0.038

APPENDIX D

Ceriodaphnia dubia Raw Data and Statistics

Cerodaphnia dubia — **SURVIVAL AND REPRODUCTION TEST**

Discharger: De Queen | Lab Number/s: K1209008

Location:

Date Sample Collected:

Analyst: RH

Test Start - Date/ Time: 9-27-12 1100

Test Stop - Date/Time: 10-4-12 1030

MHS

Conc 1 %	Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adult	Young/ Adult	Analyst
	1	0	0	0	0	0	0	0	0	0	0	0	10	0	
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	
	3	1	2	0	0	0	3	2	0	4	3	15	10	1.5	
	4	5	2	4	3	3	1	0	4	2	7	36	10	3.6	
	5	7	5	6	6	3	7	9	8	4	5	60	10	6.0	
	6	5	7	0	1	8	7	1	1	4	0	34	10	3.4	
	7	4	0	3	2	2	0	0	3	6	4	24	10	2.4	
	8												$\bar{X}$=16.9		
	Total	22	16	13	12	21	18	12	16	20	19	169	CV=21.9		

Conc 2 %	Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adult	Young/ Adult	Analyst
	1	0	0	0	0	0	0	0	0	0	0	0	10	0	
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	
	3	2	4	0	1	0	1	3	2	0	0	13	10	1.3	
	4	6	0	4	5	6	4	3	0	6	2	36	10	3.6	
	5	9	8	5	5	11	0	8	5	7	0	58	10	5.8	
	6	1	8	10	2	0	10	5	7	5	9	57	10	5.7	
	7	3	6	1	3	3	0	4	0	4	2	20	10	2.0	
	8														
	Total	21	20	20	16	20	15	23	14	22	13	184			

32

Conc 3 %	Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adult	Young/ Adult	Analyst
	1	0	0	0	0	0	0	0	0	0	0	0	10	0	
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	
	3	3	3	4	5	0	4	4	2	0	0	25	10	2.5	
	4	3	5	0	0	3	0	0	2	3	4	20	10	2.0	
	5	10	10	9	12	4	8	7	7	5	3	75	10	7.5	
	6	0	1	2	3	4	5	8	8	10	4	45	10	4.5	
	7	1	1	3	1	2	X	1	1	0	0	10	Y	1.1	
	8														
	Total	17	20	18	21	13	X17	20	20	18	11	175			

42

X= DEAD; Y= MALE

Conc 4 %	Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adult	Young/ Adult	Analyst
	1	0	0	0	0	0	0	0	0	0	0	0	10	0	
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	
	3	4	5	4	2	3	2	1	0	3	0	23	10	2.3	
	4	4	1	0	3	0	1	5	5	4	4	27	10	2.7	
	5	5	12	6	8	6	8	8	9	0	9	71	10	7.1	
	6	10	3	3	3	9	7	5	0	11	0	47	10	4.7	
	7	0	1	2	0	4	0	5	5	6	10	33	10	3.3	
	8														
	Total	23	21	15	15	22	18	22	19	24	23	201			

56

Conc 5 %	Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adult	Young/ Adult	Analyst
	1	0	0	0	0	0	0	0	0	0	0	0	10	0	
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	
	3	2	4	0	0	0	1	4	2	0	0	13	10	1.3	
	4	3	0	3	4	4	8	4	3	2	5	35	10	3.5	
	5	6	9	7	6	0	0	12	8	2	11	61	10	6.1	
	6	15	11	8	9	5	11	3	7	8	1	78	10	7.8	
	7	0	4	0	2	3	5	1	4	4	8	31	10	3.1	
	8														
	Total	25	28	18	21	12	25	24	24	16	25	218			

75

Conc 6 %	Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adult	Young/ Adult	Analyst
	1	0	0	0	0	0	0	0	0	0	0	0	10	0	
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	
	3	2	0	1	3	0	0	2	2	5	2	15	10	1.5	
	4	2	6	3	0	5	6	7	5	3	2	39	10	3.9	
	5	8	12	9	5	4	8	11	9	8	8	82	10	8.2	
	6	2	5	2	2	0	5	3	3	2	0	24	10	2.4	
	7	5	0	6	4	5	2	7	6	1	5	41	10	4.1	
	8														
	Total	19	23	21	14	14	21	30	23	19	17	201			

100

$\bar{X}$= 20.1

CV= 23.6

Revision 1
11/30/10

AA # K1209008, C. DUBIA CHRONIC REPRODUCION, 9-27-12
File: Z:\TOXSTAT\MONTE\CD. 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 # K1209008, C. DUBIA CHRONIC REPRODUCION, 9-27-12
File: Z:\TOXSTAT\MONTE\CD. Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 3.18

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
32%	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
42%	9	1	10
TOTAL	19	1	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 9.
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
56%	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	NUMBER OF DEAD	TOTAL ANIMALS
CONTROL	10	0	10
75%	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	NUMBER OF DEAD	TOTAL ANIMALS
CONTROL	10	0	10
100%	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	32%	10	0	
2	42%	10	1	
3	56%	10	0	
4	75%	10	0	
5	100%	10	0	

TITLE: AA # K1209008, C. DUBIA CHRONIC REPRODUCION, 9-27-12
FILE: Z:\TOXSTAT\MONTE\CD.
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	22.0000	22.0000
1	CONTROL	2	16.0000	16.0000
1	CONTROL	3	13.0000	13.0000
1	CONTROL	4	12.0000	12.0000
1	CONTROL	5	21.0000	21.0000
1	CONTROL	6	18.0000	18.0000
1	CONTROL	7	12.0000	12.0000
1	CONTROL	8	16.0000	16.0000
1	CONTROL	9	20.0000	20.0000
1	CONTROL	10	19.0000	19.0000
2	32 % EFFLUENT	1	21.0000	21.0000
2	32 % EFFLUENT	2	20.0000	20.0000
2	32 % EFFLUENT	3	20.0000	20.0000
2	32 % EFFLUENT	4	16.0000	16.0000
2	32 % EFFLUENT	5	20.0000	20.0000
2	32 % EFFLUENT	6	15.0000	15.0000
2	32 % EFFLUENT	7	23.0000	23.0000
2	32 % EFFLUENT	8	14.0000	14.0000
2	32 % EFFLUENT	9	22.0000	22.0000
2	32 % EFFLUENT	10	13.0000	13.0000
3	42 % EFFLUENT	1	17.0000	17.0000
3	42 % EFFLUENT	2	20.0000	20.0000
3	42 % EFFLUENT	3	18.0000	18.0000
3	42 % EFFLUENT	4	21.0000	21.0000
3	42 % EFFLUENT	5	13.0000	13.0000
3	42 % EFFLUENT	6	17.0000	17.0000
3	42 % EFFLUENT	7	20.0000	20.0000
3	42 % EFFLUENT	8	20.0000	20.0000
3	42 % EFFLUENT	9	18.0000	18.0000
3	42 % EFFLUENT	10	11.0000	11.0000
4	56 % EFFLUENT	1	23.0000	23.0000
4	56 % EFFLUENT	2	21.0000	21.0000
4	56 % EFFLUENT	3	15.0000	15.0000
4	56 % EFFLUENT	4	15.0000	15.0000
4	56 % EFFLUENT	5	21.0000	21.0000
4	56 % EFFLUENT	6	18.0000	18.0000
4	56 % EFFLUENT	7	22.0000	22.0000
4	56 % EFFLUENT	8	19.0000	19.0000

4	56 % EFFLUENT	9	24.0000	24.0000
4	56 % EFFLUENT	10	23.0000	23.0000
5	75 % EFFLUENT	1	25.0000	25.0000
5	75 % EFFLUENT	2	28.0000	28.0000
5	75 % EFFLUENT	3	18.0000	18.0000
5	75 % EFFLUENT	4	21.0000	21.0000
5	75 % EFFLUENT	5	12.0000	12.0000
5	75 % EFFLUENT	6	25.0000	25.0000
5	75 % EFFLUENT	7	24.0000	24.0000
5	75 % EFFLUENT	8	24.0000	24.0000
5	75 % EFFLUENT	9	16.0000	16.0000
5	75 % EFFLUENT	10	25.0000	25.0000
6	100 % EFFLUENT	1	19.0000	19.0000
6	100 % EFFLUENT	2	23.0000	23.0000
6	100 % EFFLUENT	3	21.0000	21.0000
6	100 % EFFLUENT	4	14.0000	14.0000
6	100 % EFFLUENT	5	14.0000	14.0000
6	100 % EFFLUENT	6	21.0000	21.0000
6	100 % EFFLUENT	7	30.0000	30.0000
6	100 % EFFLUENT	8	23.0000	23.0000
6	100 % EFFLUENT	9	19.0000	19.0000
6	100 % EFFLUENT	10	17.0000	17.0000

AA # K1209008, C. DUBIA CHRONIC REPRODUCION, 9-27-12
File: Z:\TOXSTAT\MONTE\CD. Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	171.733	34.347	2.174
Within (Error)	54	853.200	15.800	
Total	59	1024.933		

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

AA # K1209008, C. DUBIA CHRONIC REPRODUCION, 9-27-12
File: Z:\TOXSTAT\MONTE\CD. 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	16.900	16.900		
2	32 % EFFLUENT	18.400	18.400	-0.844	
3	42 % EFFLUENT	17.500	17.500	-0.338	
4	56 % EFFLUENT	20.100	20.100	-1.800	
5	75 % EFFLUENT	21.800	21.800	-2.756	
6	100 % EFFLUENT	20.100	20.100	-1.800	

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

AA # K1209008, C. DUBIA CHRONIC REPRODUCION, 9-27-12
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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	32 % EFFLUENT	10	4.106	24.3	-1.500
3	42 % EFFLUENT	10	4.106	24.3	-0.600
4	56 % EFFLUENT	10	4.106	24.3	-3.200
5	75 % EFFLUENT	10	4.106	24.3	-4.900
6	100 % EFFLUENT	10	4.106	24.3	-3.200

AA # K1209008, C. DUBIA CHRONIC REPRODUCION, 9-27-12
File: Z:\TOXSTAT\MONTE\CD. Transform: NO TRANSFORMATION

STEEL'S MANY-ONE RANK TEST - Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	16.900				
2	32 % EFFLUENT	18.400	118.00	75.00	10.00	
3	42 % EFFLUENT	17.500	109.50	75.00	10.00	
4	56 % EFFLUENT	20.100	129.50	75.00	10.00	
5	75 % EFFLUENT	21.800	134.00	75.00	10.00	
6	100 % EFFLUENT	20.100	126.00	75.00	10.00	

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

APPENDIX E

Organism History

AQUATOX, INC.

416 TWIN POINTS ROAD
HOT SPRINGS, ARKANSAS 71913
501-520-0560

TEST ORGANISM HISTORY

DATE SHIPPED 9-27-12 CLIENT Arkansas Analytical

Purchase Order #: _____

SPECIES: Pimephales promelas

Quantity Shipped: 420+ + 180+

Age: Hatched 9/26 1500ST - 7 Days old 9/3

Brood Stock Source: Anderson Farms, AR

Culture Water: Groundwater

Hardness (Mg/l CaCO3): =160

Dissolved Oxygen (Mg/1): 8.3

Temperature (°C): 25.1°C

Feeding: Artemia

Comments: _____

Shipped Via: Federal Express UPS Overnight (Shuttle)

Packaged By: CLL

Bill Hall Printers 3171

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: 6/22/09

SPECIES: *Ceriodaphnia dubia*

AGE: Variable

LIFE STAGE: Adult

HATCH DATE: Variable

BEGAN FEEDING: Immediately

FOOD: YTC, *Selenastrum* sp.

Water Chemistry Record:	Current	Range
TEMPERATURE:	25°C	20-25°C
SALINITY/CONDUCTIVITY:	--	--
TOTAL HARDNESS (as $CaCO_3$):	142 mg/l	86-124 mg/l
TOTAL ALKALINITY (as $CaCO_3$):	100 mg/l	65-130 mg/l
pH:	7.92	7.56-8.35

Comments:

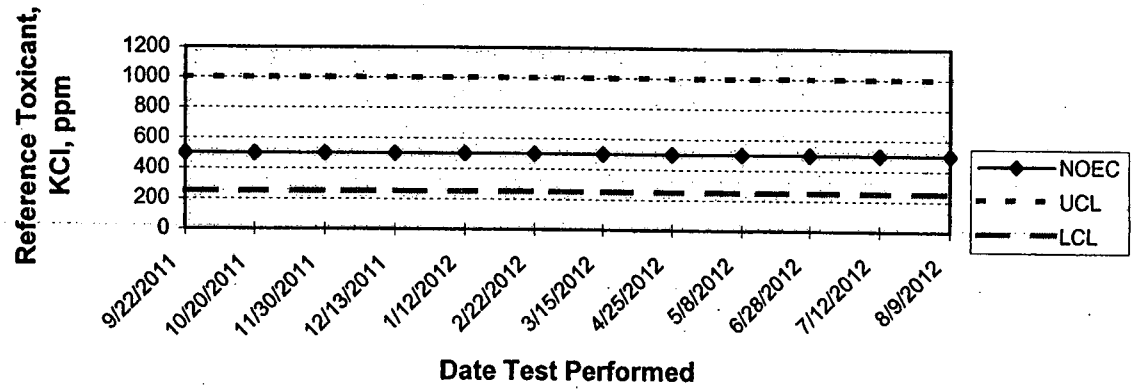
Facility Supervisor

APPENDIX F

Quality Assurance Charts

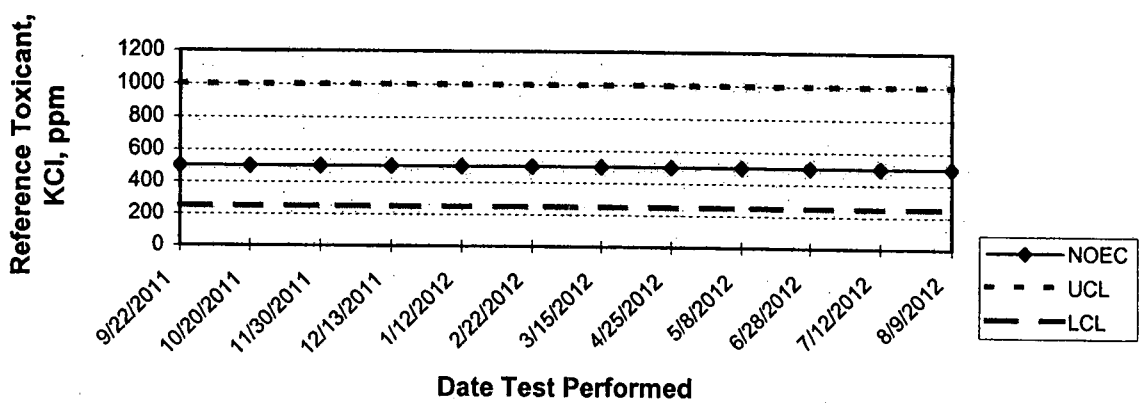
ARKANSAS ANALYTICAL, INC.

FATHEAD MINNOW SURVIVAL
QUALITY ASSURANCE



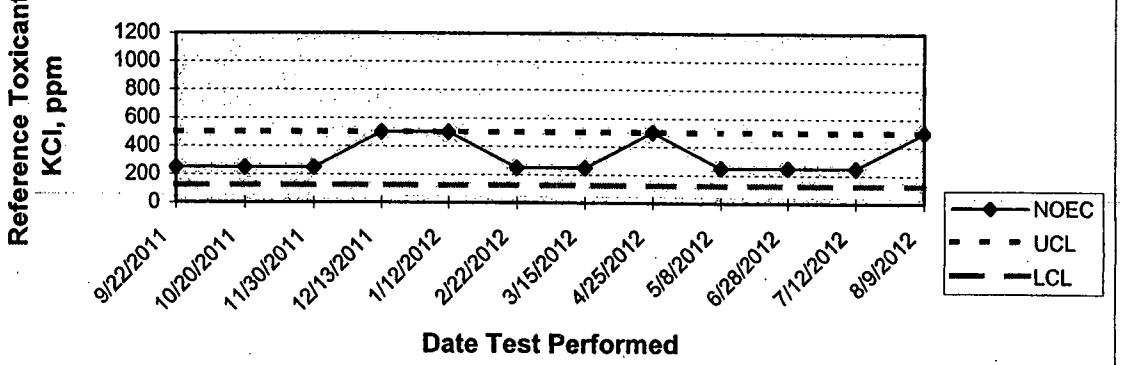
ARKANSAS ANALYTICAL, INC.

FATHEAD MINNOW GROWTH
QUALITY ASSURANCE



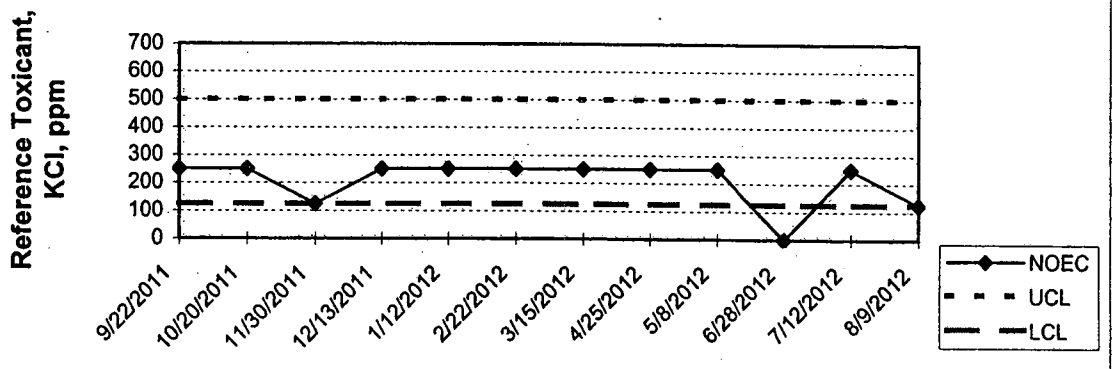
ARKANSAS ANALYTICAL, INC.

CERIODAPHNIA DUBIA SURVIVAL
QUALITY ASSURANCE



ARKANSAS ANALYTICAL, INC.

CERIODAPHNIA DUBIA REPRODUCTION
QUALITY ASSURANCE



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