Arkansas Analytical, Inc.

Toxicity Test Results

MAGCOBAR MINE SITE
NPDES PERMIT NUMBER: AR0049794
December 2008
AFIN# 00-00348

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

Ceriodaphnia dubia, Survival and Reproduction Test
Test 1002.0

Prepared for: **Mr. David Friedman**
EEMA O&M Services Group
P.O. Box 232
Kulpsville, PA 19443

Prepared by: Arkansas Analytical, Inc.
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Little Rock, Arkansas 72209
Lab Number K812007

Tuesday, December 30, 2008

Introduction

This report contains test results for toxicity testing for the Magcobar Mine Site. The NPDES permit number is AR0049794. The facility is located one mile northeast of Magnet Cove in Sections 10, 11, 14, & 15, Township 3 South, Range 17 West in Hot Springs County, Arkansas. The facility discharges into Chamberlain Creek, thence to Cove Creek, thence to Ouachita River in Segment 2F of the Ouachita River Basin.

The permit requires chronic biomonitoring testing bi-monthly for both *Ceriodaphnia dubia* and *Pimephales promelas*. The test results in this report represent the testing for December of 2008.

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:	12-11-08, 0935	12-11-08, 0935
Sample #2:	12-12-08, 0825	12-12-08, 0825
Sample #3:	12-16-08, 1315	12-16-08, 1315

The samples were composites collected at the final discharge from the Magcobar mine site.

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:	12-11-08, 1426	1
Sample #2:	12-12-08, 1258	4
Sample #3:	12-17-08, 1328	4

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. Synthetic dilution water was substituted either because zero flow conditions existed or due to an earlier characterization of the receiving water as being toxic.

Each sample 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	80%	X	
Average of 15 or more young per surviving female	17.3	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	29.0%	X	

TEST ACCEPTANCE CRITERIA for *Pimephales promelas*

Control Criteria	Results	Pass	Fail
Greater than or equal to 80% survival	100%	X	
The percent coefficient of variation between replicates must be 40% or less for survival	0.00%	X	
Minimum of 0.25 mg average dry weight of surviving controls	0.498	X	
The percent coefficient of variation between replicates must be 40% or less for growth	8.48%	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		*Pimephales promelas*	
NOEC Survival:	250 ppm KCl	NOEC Survival:	500 ppm KCl
LOEC Survival:	500 ppm KCl	LOEC Survival:	1000 ppm KCl
NOEC Reproduction:	250 ppm KCl	NOEC Growth:	500 ppm KCl
LOEC Reproduction:	500 ppm KCl	LOEC Growth:	1000 ppm KCl

Quality Assurance charts are provided in Appendix F.

Summary of Results
Magcobar Mine Site

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)	13.8	%CV survival (critical dilution)	5.73%
%CV Reproduction (critical dilution)	29.7%	Mean dry weight (critical dilution) in milligrams	0.556
		%CV growth (critical dilution)	3.96%
PMSD Reproduction	40.4	PMSD Growth	12.2

Conclusion

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

The permit issued to the Magcobar Mine Site, AR0049794, 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.

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

The permit issued to the Magcobar Mine Site, AR0049794, 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:

Ken Pigue

Melissa Green

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

PERMITTEE: Magcobar Mine Site **NPDES #: AR0049794**

Sample Collection:	Date, Time Started	Date, Time Ended
Sample #1:	12-11-08, 0935	12-11-08, 0935
Sample #2:	12-12-08, 0825	12-12-08, 0825
Sample #3:	12-16-08, 1315	12-16-08, 1315

Test initiated (date, time): 12-11-08, 1610 Test terminated (date, time): 12-18-08, 1515

Dilution water used: Soft 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%	100	100	100	100	100		100	100	100	0.00
32%	100	100	100	100	100		100	100	100	
42%	100	100	100	100	100		100	100	100	
56%	87.5	100	100	100	100		100	100	97.5	
75%	100	100	100	100	100		100	100	100	
100%	100	100	100	87.5	100		100	100	97.5	5.73

DATA TABLE FOR GROWTH OF FATHEAD MINNOWS

SUMMARY

Effluent Conc %	A	B	C	D	E		Mean Dry Weight	CV%
0%	0.507	0.493	0.565	0.456	0.470		0.498	8.48
32%	0.540	0.556	0.506	0.489	0.496		0.517	
42%	0.551	0.551	0.556	0.421	0.443		0.504	
56%	0.495	0.506	0.591	0.527	0.536		0.531	
75%	0.564	0.510	0.550	0.486	0.533		0.529	
100%	0.546	0.535	0.570	0.587	0.541		0.556	3.94

Coefficient of Variation = standard deviation / mean * 100

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)= _____**8.48**_____%

SUMMARY REPORTING FORMS FOR CHRONIC BIOMONITORING
Ceriodaphnia dubia SURVIVAL AND REPRODUCTION

Permittee: Magcobar Mine Site **NPDES #: AR0049794**

Sample Collection:	Date, Time Started	Date, Time Ended
Sample #1:	12-11-08, 0935	12-11-08, 0935
Sample #2:	12-12-08, 0825	12-12-08, 0825
Sample #3:	12-16-08, 1315	12-16-08, 1315

Test initiated (date, time): 12-11-08, 1550 Test terminated (date, time): 12-18-08, 0945

Dilution water used: Soft Synthetic

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

Replicate	0%	32%	42%	56%	75%	100%
A	19	15	22	9	21	15
B	14	18	20	x0	16	x0
C	16	14	20	12	11	11
D	17	23	14	16	15	14
E	18	28	21	21	27	11
F	15	24	12	18	14	9
G	28	23	17	17	21	13
H	11	22	x7	16	16	11
I	x15	20	13	20	25	22
J	x0	16	28	25	17	18
Mean	15.3	20.3	17.3	15.4	18.3	12.4
Mean/surviving female	17.3	20.3	18.6	17.1	18.3	13.8
CV%*	29.0					29.7

X= Dead Adult; M= Male (Not considered in statistics)

*Coefficient of Variation = standard deviation/ mean * 100; CV% calculation based on young per surviving female

SUMMARY REPORTING FORMS FOR CHRONIC BIOMONITORING
Ceriodaphnia dubia SURVIVAL AND REPRODUCTION

Permittee: Magcobar Mine Site **NPDES #: AR0049794**

PERCENT SURVIVAL

PERCENT EFFLUENT	0%	32%	42%	56%	75%	100%
Time of Reading: 24 HOURS	100	100	100	90	100	90
48 HOURS	100	100	100	90	100	90
Test termination	80	100	90	90	100	90

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)= _____**29.7**_____%

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		Project Description	Turnaround Time
EEMA O & M Services Group	EEMA O & M Services Group	Magcobar Mine Site	24 Hour
Magcobar Mine Site	P.O. Box 699	**Reporting Information**	48 Hour
2000 Darby Lane	Malvern, AR 72104	Telephone: 501-467-8355	72 Hour
Malvern, AR 72104		FAX: 501-467-8687	Routine (5 Day)
Attn: Bill Mc Alister		Bill to/P.O. #:	Preservative Code
			Bottle Type

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

Bill McAlister
Sampler(s) Signature

Bill McAlister
Sampler(s) Printed

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
								1										G = Glass; P = Plastic
								P										V = Septum; A = Amber
FD1Comp	12/11/2008	9:35 AM		X	4	W	Facility Discharge FD-1	X										A

Arkansas Analytical Work Order Number: K812007

1. Relinquished by: (Signature)	Date/Time	2. Received by: (Signature)
Bill McAlister	12-11-08 1426	
3. Relinquished by: (Signature)	Date/Time	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

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		Project Description	Turnaround Time	Preservation Codes:	
EEMA O & M Services Group	EEMA O & M Services Group	Magcobar Mine Site	24 Hour	1. Cool, 4 Degrees Centigrade	4. Thiosulfate for Dechlorination
Magcobar Mine Site	P.O. Box 699	Reporting Information	48 Hour	2. Sulfuric Acid (H_2SO_4), pH < 2	5. Hydrochloric Acid(HCl)
2000 Darby Lane	Malvern, AR 72104	Telephone: 501-467-8355	72 Hour	3. Nitric Acid (HNO_3), pH < 2	6. Sodium Hydroxide (NaOH), pH > 12
Malvern, AR 72104		FAX: 501-467-8687	Routine (5 Day)	TEST PARAMETERS	Bottle Type Code
Attn: Bill Mc Alister		Bill to/P.O. #:	Preservative Code: 1		G = Glass; P = Plastic
			Bottle Type: P		V = Septum; A = Amber

Sampler(s) Signature: Bill McAlister

Sampler(s) Printed: Bill McAlister

Arkansas Analytical Work Order Number: K812007B

Field Number	SAMPLE COLLECTION Date/s	Time/s	Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION	Chronic Biomonitoring
FD2Comp	12/12/2008	8:25 AM		X	3	W	Facility Discharge FD-2	X

1. Relinquished by: (Signature)	Date/Time	2. Received by: (Signature)
Bill McAlister	12-12-08 1258	
3. Relinquished by: (Signature)	Date/Time	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: 4 °C

FOR COMPLETION BY LAB ONLY

REMARKS / SAMPLE COMMENTS

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		Project Description	Turnaround Time
EEMA O & M Services Group	EEMA O & M Services Group	Magcobar Mine Site	24 Hour
Magcobar Mine Site	P.O. Box 699	Reporting Information	48 Hour
2000 Darby Lane	Malvern, AR 72104	Telephone: 501-467-8355	72 Hour
Malvern, AR 72104		FAX: 501-467-8687	Routine (5 Day)
Attn: Bill Mc Alister		Bill to/P.O. #:	Preservative Code
			Bottle Type

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: Bill McAlister

Sampler(s) Printed: Bill McAlister

Field Number	SAMPLE COLLECTION Date/s	Time/s	Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION	Chronic Biomonitoring	TEST PARAMETERS	Arkansas Analytical Work Order Number:
								Preservative Code	1	
								Bottle Type	P	
FD2Comp	12/16/2008	1:15 PM		X	3	W	Facility Discharge FD-2	X		K812007 C

1. Relinquished by: (Signature)	Date/Time	2. Received by: (Signature)
Bill McAlister	12-17-08 1328	
3. Relinquished by: (Signature)	Date/Time	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:	4°C	

FOR COMPLETION BY LAB ONLY

REMARKS / SAMPLE COMMENTS

APPENDIX B

Effluent and Dilution Water Data

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING									Fathead Minnow
Lab # / Sample ID		18/2907			Test Start (Date/Time)		12/11/08		
Client		Weston (EEMA)			Test End (Date/Time)		12/18/08		
		Day of Test							
		1	2	3	4	5	6	7	notes/remarks
Control	SS 200	12/11	12/12	12/13	12/14	12/15	12/16	12/17	
D.O. (mg/L)	INITIAL	8.2	8.1	8.2	8.0	8.5	8.3	7.6	
	FINAL	6.7	7.4	8.0	8.4	~~8.3~~ 8.25	7.7	6.3	
pH (s.u.)	INITIAL	7.8	7.8	7.9	7.8	7.7	7.5	7.4	
	FINAL	7.2	7.3	7.4	7.9	7.8	7.6	7.7	
temp (C)	INITIAL	22.6	22.6	22.0	22.1	21.4	21.5	21.5	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
ALKALINITY (mg/L)		34							
HARDNESS (mg/L)		36							
CONDUCTIVITY (umhos/cm)		140							
CHLORINE (mg/L)		<0.05							
CONC:	32								
D.O. (mg/L)	INITIAL	8.4	8.3	8.2	8.1	8.2	8.2	7.9	
	FINAL	7.2	7.4	7.9	8.4	~~8.35~~ 8.25	7.7	6.3	
pH (s.u)	INITIAL	7.7	7.5	7.6	7.7	7.7	7.5	7.5	
	FINAL	7.0	7.3	7.5	7.8	7.5	7.5	7.5	
temp (C)	INITIAL	22.0	22.6	22.1	22.1	21.5	21.8	21.3	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
CONC:	42								
D.O. (mg/L)	INITIAL	8.4	8.5	8.3	8.1	8.2	8.2	8.2	
	FINAL	7.3	7.3	7.8	8.3	7.3	7.6	6.4	
pH (mg/L)	INITIAL	7.6	7.5	7.5	7.6	7.6	7.4	7.5	
	FINAL	7.1	7.4	7.5	7.7	7.5	7.4	7.5	
temp (C)	INITIAL	22.2	22.6	22.3	22.1	21.5	21.9	21.3	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
CONC:	56								
D.O. (mg/L)	INITIAL	8.4	8.5	8.4	8.2	8.3	8.2	8.4	
	FINAL	7.5	7.4	7.8	8.3	7.4	7.5	7.4	
pH (s.u.)	INITIAL	7.6	7.5	7.5	7.6	7.5	7.3	7.4	
	FINAL	7.1	7.3	7.4	7.7	7.4	7.4	7.4	
temp (C)	INITIAL	22.4	22.7	22.6	22.1	21.5	22.1	21.4	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
CONC:	75								
D.O. (mg/L)	INITIAL	8.4	8.5	8.4	8.3	8.3	8.1	8.5	
	FINAL	7.4	7.4	7.7	8.3	7.4	7.5	6.4	
pH (s.u.)	INITIAL	7.5	7.5	7.4	7.5	7.3	7.3	7.3	
	FINAL	7.0	7.3	7.3	7.6	7.3	7.4	7.3	
temp (C)	INITIAL	22.6	22.8	22.7	22.1	21.4	22.2	21.3	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
CONC:	100								
D.O. (mg/L)	INITIAL	8.5	8.6	8.5	8.4	8.3	8.1	8.7	
	FINAL	7.4	7.4	7.8	8.1	7.4	7.5	6.7	
pH (s.u.)	INITIAL	7.4	7.4	7.4	7.5	7.3	7.2	7.0	
	FINAL	7.0	7.3	7.2	7.4	7.4	7.2	7.2	
temp (C)	INITIAL	22.6	22.7	23.0	22.0	21.4	21.5	21.5	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
CONC:	100%	A	A	A	B	B	B	C	
ALKALINITY (mg/L)		10			12			6	
HARDNESS (mg/L)		>600			>600			>600	
CONDUCTIVITY (umhos/cm)		21100			21500			21600	
CHLORINE (mg/L)		<0.05			<0.05			<0.05	

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING — Cerodaphnia Dubia

Lab # / Sample ID: K8I2007 — Test Start (Date/Time): 12/11/08

Client: Weston (CEEMA) — Test End (Date/Time): 12/18/08

		Day of Test							
		1	2	3	4	5	6	7	notes/remarks
Control	SS 200	12/11	12/12	12/13	12/14	12/15	12/16	12/17	
D.O. (mg/L)	INITIAL	82	81	8.2	8.0	85	83	76	
	FINAL	77	76	77	76	75	75		
pH (s.u.)	INITIAL	78	78	79	78	77	77	79	
	FINAL	77	77	79	78	78	79		
temp (C)	INITIAL	226	226	22.0	22.1	214	215	45	
	FINAL	250	250	250	250	250	250		
ALKALINITY (mg/L)		34							
HARDNESS (mg/L)		36							
CONDUCTIVITY (umhos/cm)		140							
CHLORINE (mg/L)		<0.05							
CONC:	32								
D.O. (mg/L)	INITIAL	84	83	8.2	8.1	82	82	79	
	FINAL	77	76	75	75	75	74		
pH (s.u)	INITIAL	77	75	7.4	77	77	75	75	
	FINAL	74	75	7.5	75	75	75		
temp (C)	INITIAL	220	226	22.1	22.1	215	218	213	
	FINAL	250	250	250	250	250	250		
CONC:	42								
D.O. (mg/L)	INITIAL	84	85	8.3	8.1	82	82	82	
	FINAL	77	76	75	75	75	74		
pH (mg/L)	INITIAL	76	75	7.5	7.6	76	74	75	
	FINAL	74	75	75	75	75	75		
temp (C)	INITIAL	222	226	223	22.1	215	219	213	
	FINAL	250	250	250	250	250	250		
CONC:	56								
D.O. (mg/L)	INITIAL	84	85	8.4	8.2	83	82	84	
	FINAL	76	76	76	75	74	75		
pH (s.u.)	INITIAL	76	75	7.5	7.4	75	73	74	
	FINAL	74	74	75	75	75	75		
temp (C)	INITIAL	224	227	22.4	22.1	215	221	214	
	FINAL	250	250	250	250	250	250		
CONC:	75								
D.O. (mg/L)	INITIAL	84	85	8.4	8.3	83	81	85	
	FINAL	77	76	75	74	74	74		
pH (s.u.)	INITIAL	75	75	7.4	75	73	73	73	
	FINAL	73	74	74	74	74	74		
temp (C)	INITIAL	226	228	22.7	22.1	214	222	213	
	FINAL	250	250	250	250	250	250		
CONC:	100								
D.O. (mg/L)	INITIAL	85	86	8.5	8.4	83	81	87	
	FINAL	77	76	75	75	74	74		
pH (s.u.)	INITIAL	74	74	7.4	7.5	73	72	70	
	FINAL	72	73	7.3	72	73	73		
temp (C)	INITIAL	226	227	23.0	22.0	214	225	45	
	FINAL	250	250	250	250	250	250		
CONC:	**100%**	A	A	A	B	B	B	C	
ALKALINITY (mg/L)		10			12			6	
HARDNESS (mg/L)		>600			>600			>600	
CONDUCTIVITY (umhos/cm)		21100			21500			21600	
CHLORINE (mg/L)		<0.05			<0.05			<0.05	

APPENDIX C

Fathead minnow raw data and statistics

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID K812007 TEST START DATE 12/11/08 TIME 1610

CLIENT Weston (EEMA) TEST END DATE 12/18/08 TIME 1515

AGE AND SOURCE OF MINNOWS

D A Y (NUMBER SURVIVING) SURVIVAL

	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: C	A	8	8	8	8	8	8	8	8		100	0.00
	B	8	8	8	8	8	8	8	8			
	C	8	8	8	8	8	8	8	8			
	D	8	8	8	8	8	8	8	8			
	E	8	8	8	8	8	8	8	8			
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 3C	A	8	8	8	8	8	8	8	8		100	
	B	8	8	8	8	8	8	8	8			
	C	8	8	8	8	8	8	8	8			
	D	8	8	8	8	8	8	8	8			
	E	8	8	8	8	8	8	8	8			
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 42	A	8	8	8	8	8	8	8	8		100	
	B	8	8	8	8	8	8	8	8			
	C	8	8	8	8	8	8	8	8			
	D	8	8	8	8	8	8	8	8			
	E	8	8	8	8	8	8	8	8			
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 56	A	8	8	8	8	8	8	8	7		97.5	
	B	8	8	8	8	8	8	8	8			
	C	8	8	8	8	8	8	8	8			
	D	8	8	8	8	8	8	8	8			
	E	8	8	8	8	8	8	8	8			
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 75	A	8	8	8	8	8	8	8	8		100	
	B	8	8	8	8	8	8	8	8			
	C	8	8	8	8	8	8	8	8			
	D	8	8	8	8	8	8	8	8			
	E	8	8	8	8	8	8	8	8			
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 100	A	8	8	8	8	8	8	8	8		97.5	5.73
	B	8	8	8	8	8	8	8	8			
	C	8	8	8	8	8	8	8	8			
	D	8	8	8	8	8	8	8	7			
	E	8	8	8	8	8	8	8	8			
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 | TEST START DATE 12/11/08 TIME 1610

CLIENT Weston (EEMA) | TEST END DATE TIME

Replicate A | AGE AND SOURCE OF MINNOWS

D A Y (NUMBER SURVIVING) | SURVIVAL

	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: C	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D	1	1	1	1	1	1	1	1			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 37	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D	1	1	1	1	1	1	1	1			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 42	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D	1	1	1	1	1	1	1	1			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 56	A	2	2	2	2	2	2	2	2			
	B											
	C								2			
	D	1	1	1	1	1	1	1	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											
	C											
	D	1	1	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	1	1	1	1	1	1	1	1			
	E											
ANALYST		KP	KP			KP	KP	KP	KP			
DATE:		12/11/08	12/12	12/13	12/14	12/15	12/16	12/17	12/18			
TIME:		1610	1310			1420	1400	1510	1515			

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 12/11/10	TIME								
CLIENT Weston				TEST END	DATE	TIME								
Replicate B				AGE AND SOURCE OF MINNOWS										
				D A Y (NUMBER SURVIVING)								SURVIVAL		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: C	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D	1	1	1	1	1	1	1	1			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 32	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D	1	1	1	1	1	1	1	1			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 42	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D	1	1	1	1	1	1	1	1			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 56	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D	1	1	1	1	1	1	1	1			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 75	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D	1	1	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	1	1	1	1	1	1	1	1			
	E											
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			TEST START DATE		TIME							
CLIENT Weston (EEMA)			TEST END DATE		TIME							
Replicate C			AGE AND SOURCE OF MINNOWS									
			D A Y (NUMBER SURVIVING)							SURVIVAL		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: C	A	7	7	7	7	7	7	7	7			
	B											
	C											
	D	1	1	1	1	1	1	1	1			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 32	A	7	7	7	7	7	7	7	7			
	B											
	C											
	D	1	1	1	1	1	1	1	1			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 42	A	7	7	7	7	7	7	7	7			
	B											
	C											
	D	1	1	1	1	1	1	1	1			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 56	A	7	7	7	7	7	7	7	7			
	B											
	C											
	D	1	1	1	1	1	1	1	1			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 75	A	7	7	7	7	7	7	7	7			
	B											
	C											
	D	1	1	1	1	1	1	1	1			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 100	A	7	7	7	7	7	7	7	7			
	B											
	C											
	D	1	1	1	1	1	1	1	1			
	E											
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				TEST START	DATE		TIME						
CLIENT Weston (EEMA)				TEST END	DATE		TIME						
Replicate D				AGE AND SOURCE OF MINNOWS									
				D A Y (NUMBER SURVIVING)							SURVIVAL		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: C	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D											
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 37	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D											
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 42	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D											
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 56	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D											
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 75	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D											
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 100	A	2	2	2	2	2	2	2	1			
	B								2			
	C								2			
	D								1			
	E											
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				TEST START	DATE		TIME						
CLIENT Weston (EEMA)				TEST END	DATE		TIME						
Replicate E				AGE AND SOURCE OF MINNOWS									
				D A Y (NUMBER SURVIVING)							SURVIVAL		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: C	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D	+	+	+	+	+	+	+	+			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 37	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D	+	+	+	+	+	+	+	+			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 42	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D	+	+	+	+	+	+	+	+			
	E								-			
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 56	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D	+	+	+	+	+	+	+	+			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 75	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D	+	+	+	+	+	+	+	+			
	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												
DATE:												
TIME:												

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:	K812007	TEST DATES (BEGIN / END):	12/11-18/08
CLIENT:	EEMA	WEIGHING DATE / TIME:	12/22/08, 1630
ANALYSTS:	KP	DRYING TEMP (DEGREES C):	60
SAMPLE ID:	SEE COC	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	1.03000	1.02594	0.00406	8	0.507	AVG DRY	
	B	1.00806	1.00412	0.00394	8	0.493	WEIGHT (mg)	
	C	1.02773	1.02321	0.00452	8	0.565		0.498
	D	1.01145	1.00780	0.00365	8	0.456	CV	
	E	1.02391	1.02015	0.00376	8	0.470		8.48
CONC:	A	1.02102	1.01670	0.00432	8	0.540	AVG DRY	
	B	1.02766	1.02321	0.00445	8	0.556	WEIGHT (mg)	
32%	C	1.02532	1.02127	0.00405	8	0.506		0.518
	D	1.00805	1.00414	0.00391	8	0.489	CV	
	E	1.02606	1.02209	0.00397	8	0.496		
CONC:	A	1.02776	1.02335	0.00441	8	0.551	AVG DRY	
	B	1.02777	1.02336	0.00441	8	0.551	WEIGHT (mg)	
42%	C	1.02379	1.01934	0.00445	8	0.556		0.505
	D	1.02633	1.02296	0.00337	8	0.421	CV	
	E	1.02108	1.01754	0.00354	8	0.443		
CONC:	A	1.02760	1.02364	0.00396	8	0.495	AVG DRY	
	B	1.01961	1.01556	0.00405	8	0.506	WEIGHT (mg)	
56%	C	1.01458	1.00985	0.00473	8	0.591		0.531
	D	1.01300	1.00878	0.00422	8	0.527	CV	
	E	1.03011	1.02582	0.00429	8	0.536		
CONC:	A	0.99413	0.98962	0.00451	8	0.564	AVG DRY	
	B	0.99921	0.99513	0.00408	8	0.510	WEIGHT (mg)	
75%	C	0.99965	0.99525	0.00440	8	0.550		0.529
	D	0.95531	0.95142	0.00389	8	0.486	CV	
	E	0.97589	0.97163	0.00426	8	0.533		
CONC:	A	0.97209	0.96772	0.00437	8	0.546	AVG DRY	
	B	0.99471	0.99043	0.00428	8	0.535	WEIGHT (mg)	
100%	C	0.97388	0.96932	0.00456	8	0.570		0.556
	D	1.00738	1.00268	0.00470	8	0.587	CV	
	E	1.00206	0.99773	0.00433	8	0.541		3.96

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

Pimephales promelas **FATHEAD MINNOW** TEST 1000.0

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s: K812007
CLIENT: Weston CEEM 17
ANALYSTS: KP
SAMPLE ID:

TEST DATES (BEGIN / END): 12/11-18/08
WEIGHING DATE / TIME: 12/22/08, 1630
DRYING TEMP (DEGREES C): 60
DRYING TIME (HOURS): 24

	REP#	FINAL DRY WEIGHT TIN+LARVAE (g)	INTIAL WEIGHT TIN (g)	TOTAL DRY WEIGHT OF LARVAE (g)	NUMBER OF LARVAE	DRY WEIGHT OF LARVAE (mg)	
CONTROL	A 31	1.03000	1.02594				AVG DRY WEIGHT (mg)
	B 32	1.00806	1.00412				
	C 33	1.02773	1.02321				
	D 34	1.01145	1.00790				CV
	E 35	1.02491	1.02015				
CONC: 32	A 36	1.02107	1.01670				AVG DRY WEIGHT (mg)
	B 37	1.02766	1.02321				
	C 38	1.02532	1.02127				
KP	D 39	~~1.00738~~	1.00414	1.00805			CV
	E 40	1.02606	1.02209				
CONC: 42	A 41	1.02776	1.02335				AVG DRY WEIGHT (mg)
	B 42	1.02777	1.02336				
	C 43	1.02379	1.01934				
	D 44	1.02633	1.02296				CV
	E 45	1.02108	1.01754				
CONC: 56	A 46	1.02760	1.02364				AVG DRY WEIGHT (mg)
	B 47	1.01961	1.01556				
	C 48	1.01458	1.00985				
	D 49	1.01300	1.00878				CV
	E 50	1.03011	1.02582				
CONC: 75	A 51	0.99413	0.98962				AVG DRY WEIGHT (mg)
	B 52	0.99971	0.99513				
	C 53	0.99965	0.99525				
	D 54	0.95531	0.95142				CV
	E 55	0.97589	0.97163				
CONC: 100	A 56	0.97709	0.96772				AVG DRY WEIGHT (mg)
	B 57	0.99471	0.99043				
	C 58	0.97388	0.96932				
	D 59	1.00738	1.00268				CV
	E 60	1.00206	0.99773				

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

AA# K812007, FATHEAD MINNOW SURVIVAL, CHRONIC 12-11-08
File: J:\TOXSTAT\MONTE\FHSURV~1. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.054

W = 0.547

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# K812007, FATHEAD MINNOW SURVIVAL, CHRONIC 12-11-08
File: J:\TOXSTAT\MONTE\FHSURV~1. Transform: ARC SINE(SQUARE ROOT(Y))

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

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

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

TITLE: AA# K812007, FATHEAD MINNOW SURVIVAL, CHRONIC 12-11-08
FILE: J:\TOXSTAT\MONTE\FHSURV~1.
TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	1.0000	1.3931
1	CONTROL	2	1.0000	1.3931
1	CONTROL	3	1.0000	1.3931
1	CONTROL	4	1.0000	1.3931
1	CONTROL	5	1.0000	1.3931
2	32 % EFFLUENT	1	1.0000	1.3931
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	1.0000	1.3931
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	1.0000	1.3931
4	56	% EFFLUENT	3	1.0000	1.3931
4	56	% EFFLUENT	4	1.0000	1.3931
4	56	% EFFLUENT	5	1.0000	1.3931
5	75	% EFFLUENT	1	1.0000	1.3931
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	1.0000	1.3931
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# K812007, FATHEAD MINNOW SURVIVAL, CHRONIC 12-11-08
File: J:\TOXSTAT\MONTE\FHSURV~1. Transform: ARC SINE(SQUARE ROOT(Y))

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

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	1.393				
2	32 % EFFLUENT	1.393	27.50	16.00	5.00	
3	42 % EFFLUENT	1.393	27.50	16.00	5.00	
4	56 % EFFLUENT	1.356	25.00	16.00	5.00	
5	75 % EFFLUENT	1.393	27.50	16.00	5.00	
6	100 % EFFLUENT	1.356	25.00	16.00	5.00	

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

AA# K812007, FATHEAD MINNOW GROWTH CHRONIC, 12-11-08
File: J:\TOXSTAT\MONTE\FHGROWTH. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.040

W = 0.979

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# K812007, FATHEAD MINNOW GROWTH CHRONIC, 12-11-08
File: J:\TOXSTAT\MONTE\FHGROWTH. Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 5.58

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# K812007, FATHEAD MINNOW GROWTH CHRONIC, 12-11-08
FILE: J:\TOXSTAT\MONTE\FHGROWTH.
TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.5070	0.7924
1	CONTROL	2	0.4930	0.7784
1	CONTROL	3	0.5650	0.8506
1	CONTROL	4	0.4560	0.7413
1	CONTROL	5	0.4700	0.7554
2	32 % EFFLUENT	1	0.5400	0.8254
2	32 % EFFLUENT	2	0.5560	0.8415
2	32 % EFFLUENT	3	0.5060	0.7914
2	32 % EFFLUENT	4	0.4890	0.7744
2	32 % EFFLUENT	5	0.4960	0.7814
3	42 % EFFLUENT	1	0.5510	0.8365
3	42 % EFFLUENT	2	0.5510	0.8365
3	42 % EFFLUENT	3	0.5560	0.8415
3	42 % EFFLUENT	4	0.4210	0.7061
3	42 % EFFLUENT	5	0.4430	0.7283
4	56 % EFFLUENT	1	0.4950	0.7804

4	56 % EFFLUENT	2	0.5060	0.7914
4	56 % EFFLUENT	3	0.5910	0.8769
4	56 % EFFLUENT	4	0.5270	0.8124
4	56 % EFFLUENT	5	0.5360	0.8214
5	75 % EFFLUENT	1	0.5640	0.8496
5	75 % EFFLUENT	2	0.5100	0.7954
5	75 % EFFLUENT	3	0.5500	0.8355
5	75 % EFFLUENT	4	0.4860	0.7714
5	75 % EFFLUENT	5	0.5330	0.8184
6	100 % EFFLUENT	1	0.5460	0.8315
6	100 % EFFLUENT	2	0.5350	0.8204
6	100 % EFFLUENT	3	0.5700	0.8556
6	100 % EFFLUENT	4	0.5870	0.8728
6	100 % EFFLUENT	5	0.5410	0.8264

AA# K812007, FATHEAD MINNOW GROWTH CHRONIC, 12-11-08
File: J:\TOXSTAT\MONTE\FHGROWTH. Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.011	0.002	1.309
Within (Error)	24	0.040	0.002	
Total	29	0.051		

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

AA# K812007, FATHEAD MINNOW GROWTH CHRONIC, 12-11-08
File: J:\TOXSTAT\MONTE\FHGROWTH. 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	0.784	0.498		
2	32 % EFFLUENT	0.803	0.517	-0.745	
3	42 % EFFLUENT	0.790	0.504	-0.238	
4	56 % EFFLUENT	0.817	0.531	-1.275	
5	75 % EFFLUENT	0.814	0.529	-1.180	
6	100 % EFFLUENT	0.841	0.556	-2.239	

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

AA# K812007, FATHEAD MINNOW GROWTH CHRONIC, 12-11-08
File: J:\TOXSTAT\MONTE\FHGROWTH. 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	0.061	12.2	-0.019
3	42 % EFFLUENT	5	0.061	12.2	-0.006
4	56 % EFFLUENT	5	0.061	12.2	-0.033
5	75 % EFFLUENT	5	0.061	12.2	-0.030
6	100 % EFFLUENT	5	0.061	12.2	-0.058

APPENDIX D

Ceriodaphnia dubia Raw Data and Statistics

Cerodaphnia dubia

SURVIVAL AND REPRODUCTION TEST

Discharger: Weston CEEMA
Location:
Date Sample Collected: SeeOC

Lab Number/s

Analyst: KP
Test Start - Date/ Time: 12/11/08 1550
Test Stop - Date/Time: 12/18/08 0945

Conc 1 (Control)

%	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	KP
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	MG
	3	0	0	1	4	3	4	5	2	2	0	21	10	2.1	KP
	4	6	7	3	7	4	5	8	1	3	X	44	9	4.8	KP
	5	6	5	8	4	6	4	5	3	1	—	47	8	5.3	KP
	6	9	7	4	2	5	6	10	5	—	—	46	8	5.8	KP
	7														
	8													X= 17.3	
	Total	19	14	16	17	18	15	28	11	X15	X0	153		CV=29.0	

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	5	2	5	3	5	6	6	5	4	6	42	10	4.2	
	4	3	4	0	5	6	4	4	8	5	3	42	10	4.2	
	5	6	5	1	3	8	5	5	7	3	5	57	10	5.7	
	6	6	7	8	7	4	4	4	2	8	2	62	10	6.2	
	7														
	8														
	Total	15	18	14	23	28	24	23	22	20	16	203			

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	2	5	3	3	4	2	5	3	1	4	32	10	3.2	
	4	5	3	4	2	3	3	5	4	0	3	32	9	3.6	3.6
	5	5	4	8	3	7	1	7	#	8	8	53	9	5.9	
	6	10	8	5	6	7	6	0	—	1	3	56	9	6.2	
	7														
	8														
	Total	22	20	20	14	21	12	17	X7	13	18	209			

X= DEAD; Y= MALE

173

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	X	0	0	0	0	0	0	0	0	0	9	0	
	2	0	—	0	0	0	0	0	0	0	0	0	9	0	
	3	1	—	3	3	2	3	5	0	3	4	24	9	2.7	
	4	0	—	0	4	5	3	6	4	3	8	33	9	3.7	
	5	6	—	5	6	7	9	6	6	7	7	52	9	5.8	
	6	8	—	4	3	7	3	1	6	7	6	45	9	5.0	
	7														
	8														
	Total	9	X0	12	16	21	18	17	16	20	25	154			

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	4	0	0	2	5	1	3	2	5	6	28	10	2.8	
	4	6	3	3	3	4	7	3	4	6	2	41	10	4.1	
	5	5	6	3	5	9	1	8	5	9	7	64	10	6.4	
	6	4	7	5	3	4	5	7	3	5	2	50	10	5.0	
	7														
	8														
	Total	21	16	11	15	27	14	21	16	25	17	183			

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	X0	0	0	0	0	0	0	0	0	0	9	0	
	2	0	—	0	0	0	0	0	0	0	0	0	9	0	
	3	1	—	3	3	1	0	3	3	4	1	18	9	1.0	
	4	6	—	1	3	0	0	1	0	5	3	19	9	2.1	
	5	5	—	3	3	4	6	4	7	5	5	42	9	4.7	
	6	3	—	4	5	6	3	5	2	8	9	45	9	5.0	
	7														
	8														
	Total	15	X0	11	14	11	9	13	11	22	18	124			

X=13.8
CV=29.7

AA # K812007, C. DUBIA CHRONIC, REPRODUCION, 12-11-08
File: J:\TOXSTAT\MONTE\C.DUB Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

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

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

Total number of replicates = 60

AA # K812007, C. DUBIA CHRONIC, REPRODUCION, 12-11-08
File: J:\TOXSTAT\MONTE\C.DUB Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 2.59

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 DEAD	NUMBER OF ALIVE	TOTAL ANIMALS
CONTROL	2	8	10
32%	0	10	10
TOTAL	2	18	20

CRITICAL FISHER'S VALUE (10,10,2) (p=0.05) IS LESS THAN 0. b VALUE IS 0.
NO SIGNIFICANT DIFFERENCE

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF DEAD	NUMBER OF ALIVE	TOTAL ANIMALS
CONTROL	2	8	10
42%	1	9	10
TOTAL	3	17	20

CRITICAL FISHER'S VALUE (10,10,2) (p=0.05) IS LESS THAN 0. b VALUE IS 1.
NO SIGNIFICANT DIFFERENCE

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF DEAD	NUMBER OF ALIVE	TOTAL ANIMALS
CONTROL	2	8	10
56%	1	9	10
TOTAL	3	17	20

CRITICAL FISHER'S VALUE (10,10,2) (p=0.05) IS LESS THAN 0. b VALUE IS 1.
NO SIGNIFICANT DIFFERENCE

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF DEAD	NUMBER OF ALIVE	TOTAL ANIMALS
CONTROL	2	8	10
75%	0	10	10
TOTAL	2	18	20

CRITICAL FISHER'S VALUE (10,10,2) (p=0.05) IS LESS THAN 0. b VALUE IS 0.
NO SIGNIFICANT DIFFERENCE

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF DEAD	NUMBER OF ALIVE	TOTAL ANIMALS
CONTROL	2	8	10
100%	1	9	10
TOTAL	3	17	20

CRITICAL FISHER'S VALUE (10,10,2) (p=0.05) IS LESS THAN 0. b VALUE IS 1.
NO SIGNIFICANT DIFFERENCE

SUMMARY OF FISHER'S EXACT TESTS

GROUP	IDENTIFICATION	NUMBER EXPOSED	NUMBER DEAD	SIG (P=.05)
	CONTROL	10	2	
1	32%	10	0	
2	42%	10	1	

3	56%	10	1
4	75%	10	0
5	100%	10	1

TITLE: AA # K812007, C. DUBIA CHRONIC, REPRODUCION, 12-11-08
FILE: J:\TOXSTAT\MONTE\C.DUB
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	19.0000	19.0000
1	CONTROL	2	14.0000	14.0000
1	CONTROL	3	16.0000	16.0000
1	CONTROL	4	17.0000	17.0000
1	CONTROL	5	18.0000	18.0000
1	CONTROL	6	15.0000	15.0000
1	CONTROL	7	28.0000	28.0000
1	CONTROL	8	11.0000	11.0000
1	CONTROL	9	15.0000	15.0000
1	CONTROL	10	0.0000	0.0000
2	32 % EFFLUENT	1	15.0000	15.0000
2	32 % EFFLUENT	2	18.0000	18.0000
2	32 % EFFLUENT	3	14.0000	14.0000
2	32 % EFFLUENT	4	23.0000	23.0000
2	32 % EFFLUENT	5	28.0000	28.0000
2	32 % EFFLUENT	6	24.0000	24.0000
2	32 % EFFLUENT	7	23.0000	23.0000
2	32 % EFFLUENT	8	22.0000	22.0000
2	32 % EFFLUENT	9	20.0000	20.0000
2	32 % EFFLUENT	10	16.0000	16.0000
3	42 % EFFLUENT	1	22.0000	22.0000
3	42 % EFFLUENT	2	20.0000	20.0000
3	42 % EFFLUENT	3	20.0000	20.0000
3	42 % EFFLUENT	4	14.0000	14.0000
3	42 % EFFLUENT	5	21.0000	21.0000
3	42 % EFFLUENT	6	12.0000	12.0000
3	42 % EFFLUENT	7	17.0000	17.0000
3	42 % EFFLUENT	8	7.0000	7.0000
3	42 % EFFLUENT	9	13.0000	13.0000
3	42 % EFFLUENT	10	28.0000	28.0000
4	56 % EFFLUENT	1	9.0000	9.0000
4	56 % EFFLUENT	2	0.0000	0.0000
4	56 % EFFLUENT	3	12.0000	12.0000
4	56 % EFFLUENT	4	16.0000	16.0000
4	56 % EFFLUENT	5	21.0000	21.0000
4	56 % EFFLUENT	6	18.0000	18.0000
4	56 % EFFLUENT	7	17.0000	17.0000
4	56 % EFFLUENT	8	16.0000	16.0000
4	56 % EFFLUENT	9	20.0000	20.0000
4	56 % EFFLUENT	10	25.0000	25.0000
5	75 % EFFLUENT	1	21.0000	21.0000
5	75 % EFFLUENT	2	16.0000	16.0000
5	75 % EFFLUENT	3	11.0000	11.0000

5	75 % EFFLUENT	4	15.0000	15.0000
5	75 % EFFLUENT	5	27.0000	27.0000
5	75 % EFFLUENT	6	14.0000	14.0000
5	75 % EFFLUENT	7	21.0000	21.0000
5	75 % EFFLUENT	8	16.0000	16.0000
5	75 % EFFLUENT	9	25.0000	25.0000
5	75 % EFFLUENT	10	17.0000	17.0000
6	100 % EFFLUENT	1	15.0000	15.0000
6	100 % EFFLUENT	2	0.0000	0.0000
6	100 % EFFLUENT	3	11.0000	11.0000
6	100 % EFFLUENT	4	14.0000	14.0000
6	100 % EFFLUENT	5	11.0000	11.0000
6	100 % EFFLUENT	6	9.0000	9.0000
6	100 % EFFLUENT	7	13.0000	13.0000
6	100 % EFFLUENT	8	11.0000	11.0000
6	100 % EFFLUENT	9	22.0000	22.0000
6	100 % EFFLUENT	10	18.0000	18.0000

AA # K812007, C. DUBIA CHRONIC, REPRODUCION, 12-11-08
File: J:\TOXSTAT\MONTE\C.DUB Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	379.483	75.897	2.124
Within (Error)	54	1929.500	35.731	
Total	59	2308.983		

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

AA # K812007, C. DUBIA CHRONIC, REPRODUCION, 12-11-08
File: J:\TOXSTAT\MONTE\C.DUB Transform: NO TRANSFORMATION

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

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	15.300	15.300		
2	32 % EFFLUENT	20.300	20.300	-1.870	
3	42 % EFFLUENT	17.400	17.400	-0.786	
4	56 % EFFLUENT	15.400	15.400	-0.037	
5	75 % EFFLUENT	18.300	18.300	-1.122	
6	100 % EFFLUENT	12.400	12.400	1.085	

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

AA # K812007, C. DUBIA CHRONIC, REPRODUCION, 12-11-08

File: J:\TOXSTAT\MONTE\C.DUB Transform: NO TRANSFORMATION

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

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	10			
2	32 % EFFLUENT	10	6.175	40.4	-5.000
3	42 % EFFLUENT	10	6.175	40.4	-2.100
4	56 % EFFLUENT	10	6.175	40.4	-0.100
5	75 % EFFLUENT	10	6.175	40.4	-3.000
6	100 % EFFLUENT	10	6.175	40.4	2.900

AA # K812007, C. DUBIA CHRONIC, REPRODUCION, 12-11-08
File: J:\TOXSTAT\MONTE\C.DUB Transform: NO TRANSFORMATION

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

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	15.300				
2	32 % EFFLUENT	20.300	129.00	75.00	10.00	
3	42 % EFFLUENT	17.400	114.50	75.00	10.00	
4	56 % EFFLUENT	15.400	110.50	75.00	10.00	
5	75 % EFFLUENT	18.300	116.50	75.00	10.00	
6	100 % EFFLUENT	12.400	86.00	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 12-10-09 Arkansas Analytical

SPECIES Pimephales promelas

QUANTITY SHIPPED 1120+ + 300+

AGE/LIFE STAGE 24hrs 12/10 + 7 Days old 12/10 (1500 of)

BROODSTOCK SOURCE Anderson-Tams, AR

CULTURE WATER Groundwater

ALKALINITY (Mg/l as $CaCO_3$) =180

HARDNESS (Mg/l as $CaCO_3$)/Salinity (ppt) =160

FEEDING Artemia

COMMENTS

PACKAGED BY

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: 4/11/06

SPECIES: Ceriodaphnia dubia

AGE: Variable

LIFE STAGE: Adult

HATCH DATE: Variable

BEGAN FEEDING: Immediately

FOOD: YTC, Selenastrum

Water Chemistry Record:	Current	Range
TEMPERATURE:	23°C	22-25°C
SALINITY/CONDUCTIVITY:	--	--
TOTAL HARDNESS (as $CaCO_3$):	124 mg/l	60-138 mg/l
TOTAL ALKALINITY (as $CaCO_3$):	100 mg/l	50-110 mg/l
pH:	7.95	7.10-8.32

Comments:

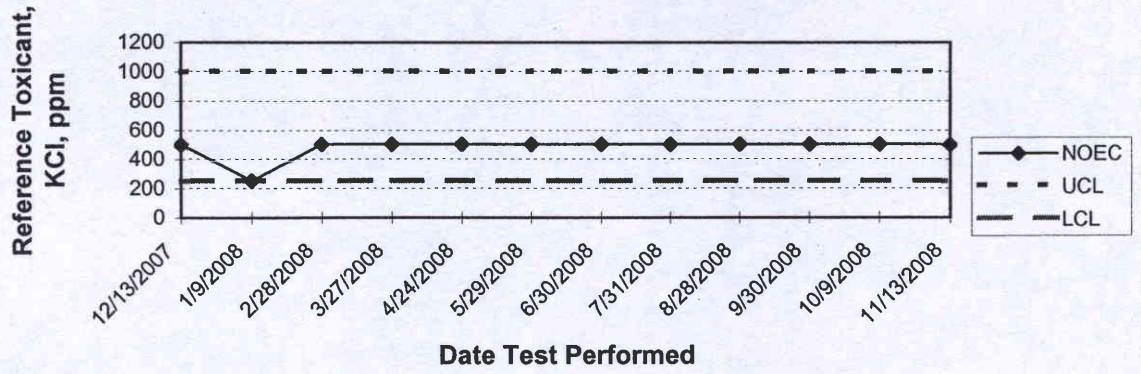
Facility Supervisor

APPENDIX F

Quality Assurance Charts

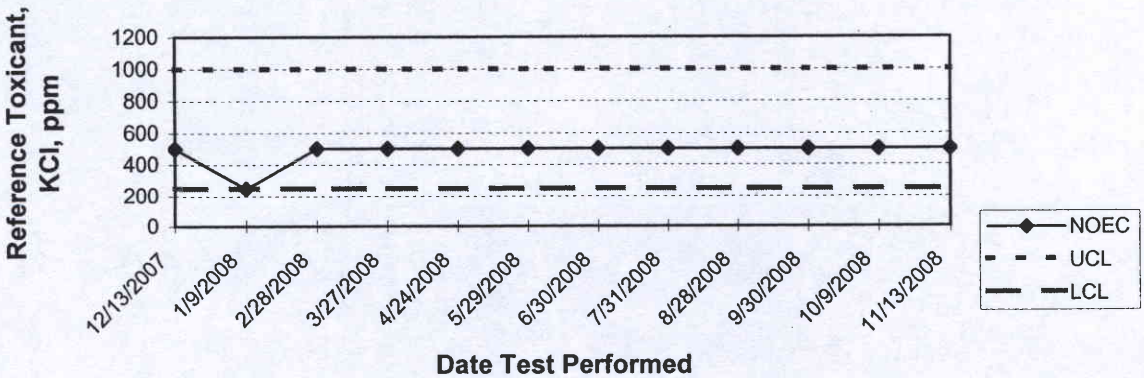
ARKANSAS ANALYTICAL, INC.

FATHEAD MINNOW SURVIVAL
QUALITY ASSURANCE



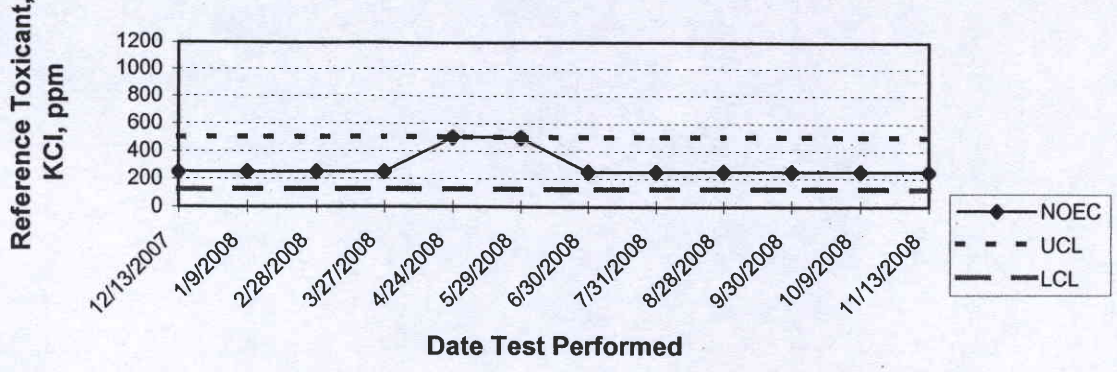
ARKANSAS ANALYTICAL, INC.

FATHEAD MINNOW GROWTH
QUALITY ASSURANCE



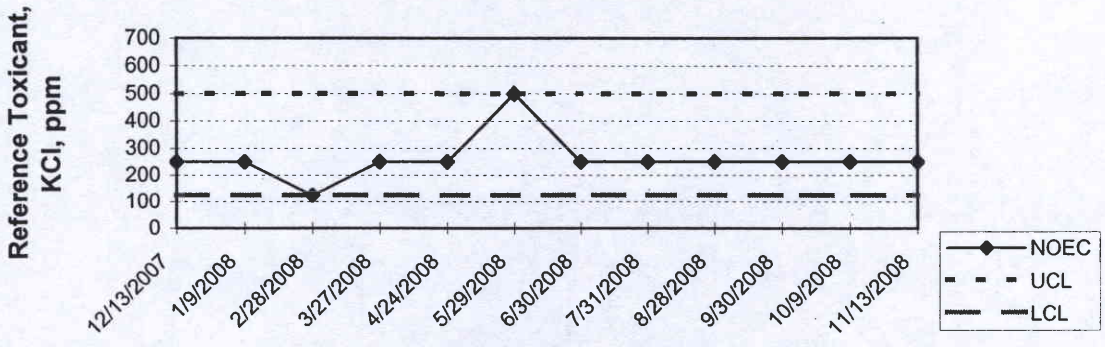
ARKANSAS ANALYTICAL, INC.

CERIODAPHNIA DUBIA SURVIVAL
QUALITY ASSURANCE



ARKANSAS ANALYTICAL, INC.

CERIODAPHNIA DUBIA REPRODUCTION
QUALITY ASSURANCE



APPENDIX G

Lab Certification

State of Arkansas
Department of Environmental Quality
Laboratory Certification Program

Arkansas Analytical, Inc.

Little Rock, AR

has earned certification by law in accordance with Code Annotated §8-2-201 et seq., the State Environmental Laboratory Certification Program Act for the following parameters:

Alkalinity	Orthophosphate	Antimony	Mercury	Explosives
Ammonia	Perchlorate	Arsenic	Molybdenum	GRO
BOD	pH	Barium	Nickel	TPH
Bromide	Phenol	Beryllium	Potassium	Acute Toxicity
CBOD	Sulfate	Boron	Selenium	Chronic Toxicity
Chloride	Sulfide	Cadmium	Silver	Herbicides
Chlorine	TDS	Calcium	Sodium	Pesticides & PCBs
COD	TKN	Chromium	Strontium	Semi-volatiles
Conductivity	TOC	Cobalt	Thallium	Volatile Organics
Cyanide	Total Phosphorus	Copper	Tin	
Fluoride	Total Solids	Hex. Chromium	Titanium	
Hardness	TSS	Iron	Vanadium	
Nitrate	Turbidity	Lead	Zinc	
Nitrite	Vol Solids	Magnesium	Fecal Coliform	
Oil & Grease	Aluminum	Manganese	DRO	

Laboratory ID: **60-1754**

Certificate Number: **08-073-0**

Issued Date: **30 October 2008**

Expired Date: **30 October 2009**

Teresa Marks

ADEQ Director