

Bill,

This is in response to the invalid test of the Magobar Mine Site. I was informed by Mary Barnett that the PMSD (percent minimum significant difference) would result in the necessity of a retest for both the Ceriodaphnia dubia and the Pimephales promelas. The pmsd measures the variation within the concentrations relative to the control. This is not a failed test but rather one that is considered invalid meaning it is not statistically "reliable". When I asked for an extension of the testing time period I was informed by Mary that she had contacted enforcement and was told by Anne Roberts that you will not be granted an extension because you have two months to test and had testing been performed earlier in the time period there would have been time for a retest. Likewise I was also informed by Mary that I should not fill out the DMR until a new test has been conducted. At that time the information from the new test should be used on the DMR and copies of both the invalid test and the retest sent in at the same time.

Thanks,



Ken Pigue

Arkansas Analytical, Inc.

Toxicity Test Results

MAGCOBAR MINE SITE
NPDES PERMIT NUMBER: AR0049794
February 2009
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.
11701 I-30, Bldg 1, Suite 115
Little Rock, Arkansas 72209
Lab Number K902010

Wednesday, March 04, 2009

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 February of 2009.

Plant Operations

To be provided by permittee.

Source of Effluent and Dilution Water

Effluent samples were collected as follows:

Sample Collection:	Date, Time Started	Date, Time Ended
Sample #1:	2-18-09, 0830	2-19-09, 0830
Sample #2:	2-19-09, 1015	2-20-09, 1015
Sample #3:	2-23-09, 0915	2-24-09, 0915

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:	2-19-09, 1457	0.1
Sample #2:	2-20-09, 1101	1
Sample #3:	2-24-09, 1347	3

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	17.0	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	20.4%	X	

TEST ACCEPTANCE CRITERIA for *Pimephales promelas*

Control Criteria	Results	Pass	Fail
Greater than or equal to 80% survival	97.5%	X	
The percent coefficient of variation between replicates must be 40% or less for survival	5.73%	X	
Minimum of 0.25 mg average dry weight of surviving controls	0.399	X	
The percent coefficient of variation between replicates must be 40% or less for growth	17.5%	X	

Reference Toxicant

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

REFERENCE TOXICANT

<i>Ceriodaphnia dubia</i>		<i>Pimephales promelas</i>	
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

<i>Ceriodaphnia dubia</i>		<i>Pimephales promelas</i>	
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)	14.3	%CV survival (critical dilution)	5.73%
%CV Reproduction (critical dilution)	20.0%	Mean dry weight (critical dilution) in milligrams	1.119
		%CV growth (critical dilution)	11.6%
PMSD Reproduction	53.7	PMSD Growth	32.4

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


Allen Parker

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:	2-18-09, 0830	2-19-09, 0830
Sample #2:	2-19-09, 1015	2-20-09, 1015
Sample #3:	2-23-09, 0915	2-24-09, 0915

Test initiated (date, time): 2-19-09, 1630 Test terminated (date, time): 2-26-09, 0930

Dilution water used: Soft Synthetic

DATA TABLE FOR FATHEAD MINNOW SURVIVAL

Effluent Conc %	Percent Survival in Replicate Chambers					Mean Percent Survival				
	A	B	C	D	E	24 hours	48 hours	7 days	CV %	
0%	87.5	100	100	100	100	100	100	97.5	5.73	
32%	100	100	100	100	100	100	100	100		
42%	100	87.5	100	100	100	100	100	97.5		
56%	100	87.5	100	100	75	100	100	92.5		
75%	100	100	100	100	87.5	100	100	97.5		
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%	0.330	0.390	0.396	0.365	0.515	0.399	17.5
32%	0.679	0.637	0.604	0.591	0.739	0.650	
42%	0.769	0.699	0.728	0.615	0.869	0.736	
56%	0.859	0.778	0.776	0.858	0.795	0.813	
75%	0.905	1.054	0.867	0.848	1.035	0.942	
100%	1.174	1.027	0.989	1.090	1.314	1.119	11.6

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)= _____ 17.5 _____ %

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:	2-18-09, 0830	2-19-09, 0830
Sample #2:	2-19-09, 1015	2-20-09, 1015
Sample #3:	2-23-09, 0915	2-24-09, 0915

Test initiated (date, time): 2-19-09, 1620 Test terminated (date, time): 0850

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	22	15	10	x5	12	10
B	x8	x0	19	x15	6	12
C	13	x18	x0	19	22	18
D	18	28	11	30	x6	13
E	16	x0	18	25	14	12
F	12	31	8	18	22	14
G	17	22	28	9	10	18
H	x9	14	27	24	x2	15
I	21	19	27	32	5	17
J	17	27	10	11	15	x2
Mean	15.3	17.4	15.8	18.8	11.4	13.1
Mean/surviving female	17.0	22.3	17.6	21.0	13.3	14.3
CV%*	20.4					20.0

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	90	90	100	100	100
48 HOURS	100	80	90	100	100	100
Test termination	80	70	90	80	80	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)= 20.4 %

APPENDIX A

Chain of Custody Forms

APPENDIX B

Effluent and Dilution Water Data

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Fathead Minnow

Lab # / Sample ID *K902008*

Test Start (Date/Time) *2/19/09*

Client *Weston*

Test End (Date/Time) *2/26/09*

		Day of Test							notes/remarks
		1	2	3	4	5	6	7	
Control	<i>SS201207</i>	<i>2/19</i>	<i>2/20</i>	<i>2/21</i>	<i>2/22</i>	<i>2/23</i>	<i>2/24</i>	<i>2/25</i>	
D.O. (mg/L)	INITIAL	80	80	7.5	8.0	75	79	76	
	FINAL	79	7.2	6.9	72	73	69	76	
pH (s.u.)	INITIAL	77	75	7.0	7.7	77	79	80	
	FINAL	75	7.2	7.4	7.7	79	78	80	
temp (C)	INITIAL	20.0	21.5	21.2	21.7	21.5	21.7	22.4	
	FINAL	250	25	25	250	250	250	250	
ALKALINITY (mg/L)		30	—	28	—	—	—	—	
HARDNESS (mg/L)		58	—	32	—	—	—	—	
CONDUCTIVITY (umhos/cm)		156	—	147	—	—	—	—	
CHLORINE (mg/L)		0.05	—	0.05	—	—	—	—	
CONC:	<i>32</i>								
D.O. (mg/L)	INITIAL	80	78	8.1	8.1	80	79	77	
	FINAL	75	7.6	6.1	72	73	69	77	
pH (s.u.)	INITIAL	74	73	7.3	7.6	75	72	76	
	FINAL	76	7.4	7.2	77	76	76	75	
temp (C)	INITIAL	20.0	23.1	21.3	22.8	22.7	21.7	22.6	
	FINAL	250	25	25	250	250	250	250	
CONC:	<i>47</i>								
D.O. (mg/L)	INITIAL	80	79	8.1	8.0	82	79	78	
	FINAL	75	7.3	6.5	6.9	72	69	77	
pH (mg/L)	INITIAL	74	73	7.4	7.6	75	76	76	
	FINAL	76	7.4	7.3	76	76	75	74	
temp (C)	INITIAL	19.9	23.7	21.4	23.5	23.7	21.7	22.6	
	FINAL	250	25	25	250	250	250	250	
CONC:	<i>56</i>								
D.O. (mg/L)	INITIAL	80	83	8.3	8.0	85	77	79	
	FINAL	75	7.3	5.5	6.8	72	69	78	
pH (s.u.)	INITIAL	74	73	7.4	7.6	74	76	76	
	FINAL	76	7.4	7.2	76	76	75	74	
temp (C)	INITIAL	19.9	24.2	21.6	24.2	24.0	21.8	22.5	
	FINAL	250	25	25	250	250	250	250	
CONC:	<i>75</i>								
D.O. (mg/L)	INITIAL	80	84	8.4	8.1	85	77	81	
	FINAL	75	7.2	6.8	6.9	6.9	70	78	
pH (s.u.)	INITIAL	74	72	7.3	7.6	73	77	76	
	FINAL	75	7.3	7.2	75	76	75	74	
temp (C)	INITIAL	19.8	25.0	21.8	24.5	24.7	21.8	22.5	
	FINAL	250	25	25	250	250	250	250	
CONC:	<i>100</i>								
D.O. (mg/L)	INITIAL	80	81	8.8	7.9	85	79	83	
	FINAL	75	7.2	5.4	6.9	6.9	70	7.7	
pH (s.u.)	INITIAL	73	7.1	7.2	7.4	72	75	75	
	FINAL	74	7.3	7.0	7.4	75	74	7.2	
temp (C)	INITIAL	19.7	26.0	21.8	25	26.3	21.9	22.5	
	FINAL	250	25	25	250	250	250	250	
CONC:	100%	A	A	A	B	B	C	C	
ALKALINITY (mg/L)		8	—	—	8	—	8	—	
HARDNESS (mg/L)		2600	—	—	2600	—	2600	—	
CONDUCTIVITY (umhos/cm)		22100	—	—	22300	—	22400	—	
CHLORINE (mg/L)		0.05	—	—	0.05	—	0.05	—	

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Cerodaphnia Dubia

Lab # / Sample ID *K902008*

Test Start (Date/Time) *2/19/09*

Client *Weston*

Test End (Date/Time) *2/26/09*

		Day of Test							notes/remarks
		1	2	3	4	5	6	7	
Control	<i>SS201, 202</i>	<i>2/19/09</i>	<i>2/20</i>	<i>2/21</i>	<i>2/22</i>	<i>2/23</i>	<i>2/24</i>	<i>2/25</i>	
D.O. (mg/L)	INITIAL	80	80	7.5	85	75	79	76	
	FINAL	71	74	74	73	72	75	74	
pH (s.u.)	INITIAL	7.7	7.5	7.0	7.7	7.7	7.9	8.0	
	FINAL	7.5	7.7	7.8	8.1	8.1	7.6	7.8	
temp (C)	INITIAL	20.0	21.5	21.2	21.8	21.5	21.7	22.4	
	FINAL	25.0	25	25	25.0	25.0	25.0	25.0	
ALKALINITY (mg/L)		36	4	28				7	
HARDNESS (mg/L)		58	4	32				1	
CONDUCTIVITY (umhos/cm)		156	4	147				1	
CHLORINE (mg/L)		<0.05	4	<0.05				1	
CONC:	<i>37</i>								
D.O. (mg/L)	INITIAL	80	78	8.1	80	80	79	77	
	FINAL	70	7.1	74	73	72	75	74	
pH (s.u.)	INITIAL	7.4	7.3	7.3	7.6	7.5	7.7	7.6	
	FINAL	7.4	7.4	7.6	7.7	7.8	7.7	7.4	
temp (C)	INITIAL	20.0	23.1	21.3	22.8	22.7	21.7	22.6	
	FINAL	25.0	25	25	25.0	25.0	25.0	25.0	
CONC:	<i>42</i>								
D.O. (mg/L)	INITIAL	80	79	8.1	80	82	79	78	
	FINAL	70	7.0	71	72	74	74	73	
pH (mg/L)	INITIAL	7.4	7.3	7.4	7.6	7.5	7.6	7.6	
	FINAL	7.3	7.4	7.6	7.7	7.8	7.6	7.3	
temp (C)	INITIAL	19.9	23.1	21.4	23.8	23.2	21.7	22.6	
	FINAL	25.0	25	25	25.0	25.0	25.0	25.0	
CONC:	<i>56</i>								
D.O. (mg/L)	INITIAL	80	83	8.3	80	85	77	79	
	FINAL	70	7.0	72	72	77	74	73	
pH (s.u.)	INITIAL	7.4	7.3	7.4	7.6	7.4	7.6	7.6	
	FINAL	7.3	7.4	7.6	7.7	7.7	7.5	7.3	
temp (C)	INITIAL	19.9	24.2	21.6	24.8	24.0	21.8	22.5	
	FINAL	25.0	25	25	25.0	25.0	25.0	25.0	
CONC:	<i>75</i>								
D.O. (mg/L)	INITIAL	80	84	8.4	84	85	77	81	
	FINAL	6.9	7.0	7.2	7.2	7.6	7.4	7.3	
pH (s.u.)	INITIAL	7.4	7.2	7.3	7.6	7.3	7.7	7.6	
	FINAL	7.3	7.4	7.5	7.7	7.6	7.5	7.3	
temp (C)	INITIAL	19.8	25.0	21.8	24.5	24.7	21.8	22.5	
	FINAL	25.0	25	25	25.0	25.0	25.0	25.0	
CONC:	<i>100</i>								
D.O. (mg/L)	INITIAL	80	8.1	8.8	85A	85	79	83	
	FINAL	7.0	7.0	71	72	78	75	72	
pH (s.u.)	INITIAL	7.3	71	7.2	7.4	7.2	7.5	7.5	
	FINAL	7.2	7.3	7.4	7.6	7.5	7.4	7.2	
temp (C)	INITIAL	19.7	26.0	21.8	25	26.3	21.9	22.5	
	FINAL	25.0	25	25	25.0	25.0	25.0	25.0	
CONC:	<i>100%</i>	A	H	A	B	B	C	C	
ALKALINITY (mg/L)		8			8	4	8	4	
HARDNESS (mg/L)		>600			>600	4	>600	4	
CONDUCTIVITY (umhos/cm)		22100			22300	4	22460	4	
CHLORINE (mg/L)		<0.05			<0.05	4	<0.05	4	

APPENDIX C

Fathead minnow raw data and statistics

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID 1902010 TEST START DATE 2/19 TIME 1630
 CLIENT Weston TEST END DATE 2/26 TIME 0930
 AGE AND SOURCE OF MINNOWS

		DAY (NUMBER SURVIVING)							SURVIVAL		MEAN %	CV
CONC:	REP #	start	1	2	3	4	5	6	7 %			
CONC: 0	A	8	8	8	8	7	7	7	7	87.5	975	5.73
	B	↓	↓	↓	↓	↓	↓	↓	↓	100		
	C	↓	↓	↓	↓	↓	↓	↓	↓	100		
	D	↓	↓	↓	↓	↓	↓	↓	↓	100		
	E	↓	↓	↓	↓	↓	↓	↓	↓	100		
CONC: 32	A	8	8	8	8	8	8	8	8	100	100	
	B	↓	↓	↓	↓	↓	↓	↓	↓	100		
	C	↓	↓	↓	↓	↓	↓	↓	↓	100		
	D	↓	↓	↓	↓	↓	↓	↓	↓	100		
	E	↓	↓	↓	↓	↓	↓	↓	↓	100		
CONC: 42	A	8	8	8	8	8	8	8	8	100	975	
	B	↓	↓	↓	↓	↓	↓	↓	↓	87.5		
	C	↓	↓	↓	↓	↓	↓	↓	↓	100		
	D	↓	↓	↓	↓	↓	↓	↓	↓	100		
	E	↓	↓	↓	↓	↓	↓	↓	↓	100		
CONC: 56	A	8	8	8	8	8	8	8	8	100	925	
	B	↓	↓	↓	↓	↓	↓	↓	↓	87.5		
	C	↓	↓	↓	↓	↓	↓	↓	↓	100		
	D	↓	↓	↓	↓	↓	↓	↓	↓	100		
	E	↓	↓	↓	↓	↓	↓	↓	↓	75		
CONC: 75	A	8	8	8	8	8	8	8	8	100	975	
	B	↓	↓	↓	↓	↓	↓	↓	↓	100		
	C	↓	↓	↓	↓	↓	↓	↓	↓	100		
	D	↓	↓	↓	↓	↓	↓	↓	↓	100		
	E	↓	↓	↓	↓	↓	↓	↓	↓	87.5		
CONC: 100	A	8	8	8	8	8	8	8	8	100	975	5.73
	B	↓	↓	↓	↓	↓	↓	↓	↓	100		
	C	↓	↓	↓	↓	↓	↓	↓	↓	100		
	D	↓	↓	↓	↓	7	7	7	7	87.5		
	E	↓	↓	↓	↓	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 K902010 TEST START DATE 2/19/09 TIME 1630
 CLIENT Weston TEST END DATE 2/26/09 TIME 0930
control AGE AND SOURCE OF MINNOWS

		DAY (NUMBER SURVIVING)								SURVIVAL		
CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
A	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	2	2	2	2			
	D	↓	↓	↓	↓	2	2	2	2			
	E											
B	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓	↓			
	E											
C	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓	↓			
	E											
D	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓	↓			
	E											
E	A	2	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓	↓			
	E											
	A											
	B											
	C											
	D											
	E											
ANALYST		AP	KP	AP	AP	KP	KP	KP	KP			
DATE:		2/19	2/20	2/21	2/22	2/23	2/24	2/25	2/26			
TIME:		1630	1020			1110	1526	1020	0930			

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID K90290 TEST START DATE 2/19/09 TIME
 CLIENT Weston TEST END DATE TIME
327. AGE AND SOURCE OF MINNOWS

		DAY (NUMBER SURVIVING)							SURVIVAL		
CONC:	REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV
A	A	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓			
	E	↓	↓	↓	↓	↓	↓	↓			
B	A	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓			
	E	↓	↓	↓	↓	↓	↓	↓			
C	A	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓			
	E	↓	↓	↓	↓	↓	↓	↓			
D	A	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓			
	E	↓	↓	↓	↓	↓	↓	↓			
E	A	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓			
	E	↓	↓	↓	↓	↓	↓	↓			
	A										
	B										
	C										
	D										
	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 2/19/09 TIME
 CLIENT Weston TEST END DATE TIME
 421 AGE AND SOURCE OF MINNOWS

		DAY (NUMBER SURVIVING)							SURVIVAL	
REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV
A	CONC: A	2	2	2	2	2	2	2		
	B	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓		
	E	↓	↓	↓	↓	↓	↓	↓		
B	CONC: A	2	2	2	2	2	2	2		
	B	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓		
	E	↓	↓	↓	↓	↓	↓	↓		
C	CONC: A	2	2	2	2	2	2	2		
	B	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓		
	E	↓	↓	↓	↓	↓	↓	↓		
D	CONC: A	2	2	2	2	2	2	2		
	B	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓		
	E	↓	↓	↓	↓	↓	↓	↓		
E	CONC: A	2	2	2	2	2	2	2		
	B	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓		
	E	↓	↓	↓	↓	↓	↓	↓		
	CONC: A									
	B									
	C									
	D									
	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 K90200 TEST START DATE 7/19/09 TIME _____
 CLIENT Weston TEST END DATE _____ TIME _____
567 AGE AND SOURCE OF MINNOWS

		DAY (NUMBER SURVIVING)							SURVIVAL		
CONC:	REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV
A	A	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓			
	E	↓	↓	↓	↓	↓	↓	↓			
B	A	2	2	2	2	2	2	1	1		
	B	↓	↓	↓	↓	↓	↓	2	2		
	C	↓	↓	↓	↓	↓	↓	2	2		
	D	↓	↓	↓	↓	↓	↓	2	2		
	E	↓	↓	↓	↓	↓	↓	2	2		
C	A	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓			
	E	↓	↓	↓	↓	↓	↓	↓			
D	A	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓			
	E	↓	↓	↓	↓	↓	↓	↓			
E	A	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	2	2		
	C	↓	↓	↓	↓	↓	↓	0	0		
	D	↓	↓	↓	↓	↓	↓	2	2		
	E	↓	↓	↓	↓	↓	↓	2	2		
	A										
	B										
	C										
	D										
	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		TEST END	DATE	TIME						
AGE AND SOURCE OF MINNOWS		DAY (NUMBER SURVIVING)		SURVIVAL						
REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV
A	CONC: A	2	2	2	2	2	2	2		
	B	2	2	2	2	2	2	2		
	C	2	2	2	2	2	2	2		
	D	2	2	2	2	2	2	2		
	E	2	2	2	2	2	2	2		
B	CONC: A	2	2	2	2	2	2	2		
	B	2	2	2	2	2	2	2		
	C	2	2	2	2	2	2	2		
	D	2	2	2	2	2	2	2		
	E	2	2	2	2	2	2	2		
C	CONC: A	2	2	2	2	2	2	2		
	B	2	2	2	2	2	2	2		
	C	2	2	2	2	2	2	2		
	D	2	2	2	2	2	2	2		
	E	2	2	2	2	2	2	2		
D	CONC: A	2	2	2	2	2	2	2		
	B	2	2	2	2	2	2	2		
	C	2	2	2	2	2	2	2		
	D	2	2	2	2	2	2	2		
	E	2	2	2	2	2	2	2		
E	CONC: A	2	2	2	2	2	2	2		
	B	2	2	2	2	2	2	2		
	C	2	2	2	2	2	2	2		
	D	2	2	2	2	2	2	2		
	E	2	2	2	2	2	2	2		
	CONC: A									
	B									
	C									
	D									
	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		TEST END DATE		TIME						
AGE AND SOURCE OF MINNOWS										
100%										
DAY (NUMBER SURVIVING)										
REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV
A	CONC: A	2	2	2	2	2	2	2		
	B	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓		
	E	↓	↓	↓	↓	↓	↓	↓		
B	CONC: A	2	2	2	2	2	2	2		
	B	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓		
	E	↓	↓	↓	↓	↓	↓	↓		
C	CONC: A	2	2	2	2	2	2	2		
	B	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓		
	E	↓	↓	↓	↓	↓	↓	↓		
D	CONC: A	2	2	2	2	2	2	2		
	B	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓		
	E	↓	↓	↓	↓	↓	↓	↓		
E	CONC: A	2	2	2	2	2	2	2		
	B	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓		
	E	↓	↓	↓	↓	↓	↓	↓		
	CONC: A									
	B									
	C									
	D									
	E									
ANALYST										
DATE:										
TIME:										

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

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s:		K902010		TEST DATES (BEGIN / END):		2/19-26/09	
CLIENT:		EEMA		WEIGHING DATE / TIME:		3/4/09, 1500	
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	0.97431	0.97167	0.00264	8	0.330	AVG DRY
	B	1.00037	0.99725	0.00312	8	0.390	WEIGHT (mg)
	C	0.99924	0.99607	0.00317	8	0.396	0.399
	D	0.98633	0.98341	0.00292	8	0.365	CV
	E	0.98148	0.97736	0.00412	8	0.515	17.5
CONC:	A	0.99284	0.98741	0.00543	8	0.679	AVG DRY
	B	0.99171	0.98661	0.00510	8	0.637	WEIGHT (mg)
	C	1.00462	0.99979	0.00483	8	0.604	0.650
	D	0.98910	0.98437	0.00473	8	0.591	CV
	E	1.00136	0.99545	0.00591	8	0.739	
CONC:	A	0.99385	0.98770	0.00615	8	0.769	AVG DRY
	B	1.00156	0.99597	0.00559	8	0.699	WEIGHT (mg)
	C	1.00760	1.00178	0.00582	8	0.728	0.736
	D	1.00347	0.99855	0.00492	8	0.615	CV
	E	1.00095	0.99400	0.00695	8	0.869	
CONC:	A	1.04152	1.03465	0.00687	8	0.859	AVG DRY
	B	1.02770	1.02148	0.00622	8	0.778	WEIGHT (mg)
	C	0.98354	0.97733	0.00621	8	0.776	0.813
	D	0.99172	0.98486	0.00686	8	0.858	CV
	E	1.01512	1.00876	0.00636	8	0.795	
CONC:	A	0.99634	0.98910	0.00724	8	0.905	AVG DRY
	B	0.99264	0.98421	0.00843	8	1.054	WEIGHT (mg)
	C	1.02061	1.01367	0.00694	8	0.867	0.942
	D	0.98892	0.98214	0.00678	8	0.848	CV
	E	1.02351	1.01523	0.00828	8	1.035	
CONC:	A	1.00106	0.99167	0.00939	8	1.174	AVG DRY
	B	1.00097	0.99275	0.00822	8	1.027	WEIGHT (mg)
	C	1.00654	0.99863	0.00791	8	0.989	1.119
	D	1.00732	0.99860	0.00872	8	1.090	CV
	E	0.99973	0.98922	0.01051	8	1.314	11.6

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

Pimephales promelas

FATHEAD MINNOW

TEST 1000.0

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s:		K902010				TEST DATES (BEGIN / END):		2/19-26/09	
CLIENT:		Weston FEMA				WEIGHING DATE / TIME:		3/4/09, 1500	
ANALYSTS:						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	0.97431	0.97167				AVG DRY WEIGHT (mg)		
	B 2	1.00037	0.99725						
	C 3	0.99924	0.99607						
	D 4	0.98633	0.98341				CV		
	E 5	0.98148	0.97736						
CONC: 32	A 6	0.99284	0.98741				AVG DRY WEIGHT (mg)		
	B 7	0.99171	0.98661						
	C 8	1.00462	0.99979						
	D 9	0.98910	0.98437				CV		
	E 10	1.00136	0.99545						
CONC: 42	A 11	0.99385	0.9870				AVG DRY WEIGHT (mg)		
	B 12	1.00156	0.99597						
	C 13	1.00760	1.001878						
	D 14	1.00347	0.99855				CV		
	E 15	1.00095	0.99400						
CONC: 56	A 16	1.04152	1.03165				AVG DRY WEIGHT (mg)		
	B 17	1.02770	1.02148						
	C 18	0.98354	0.97733						
	D 19	0.99172	0.98486				CV		
	E 20	1.01514	1.00876						
CONC: 75	A 21	0.99634	0.98910				AVG DRY WEIGHT (mg)		
	B 22	0.99264	0.98421						
	C 23	1.02061	1.01367						
	D 24	0.98892	0.98214				CV		
	E 25	1.02351	1.01523						
CONC: 100	A 26	1.00106	0.99167				AVG DRY WEIGHT (mg)		
	B 27	1.00097	0.99275						
	C 28	1.00654	0.99863						
	D 29	1.00732	0.99860				CV		
	E 30	0.99973	0.98922						

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

AA# K902010, FATHEAD MINNOW SURVIVAL, CHRONIC 2-19-09
File: J:/toxstat/monte\FHSURV~1. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.241

W = 0.762

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# K902010, FATHEAD MINNOW SURVIVAL, CHRONIC 2-19-09
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# K902010, FATHEAD MINNOW SURVIVAL, CHRONIC 2-19-09
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	0.8750	1.2094
1	CONTROL	2	1.0000	1.4120
1	CONTROL	3	1.0000	1.4120
1	CONTROL	4	1.0000	1.4120
1	CONTROL	5	1.0000	1.4120
2	32 % EFFLUENT	1	1.0000	1.4120
2	32 % EFFLUENT	2	1.0000	1.4120
2	32 % EFFLUENT	3	1.0000	1.4120
2	32 % EFFLUENT	4	1.0000	1.4120
2	32 % EFFLUENT	5	1.0000	1.4120

3	42 %	EFFLUENT	1	1.0000	1.4120
3	42 %	EFFLUENT	2	0.8750	1.2094
3	42 %	EFFLUENT	3	1.0000	1.4120
3	42 %	EFFLUENT	4	1.0000	1.4120
3	42 %	EFFLUENT	5	1.0000	1.4120
4	56 %	EFFLUENT	1	1.0000	1.4120
4	56 %	EFFLUENT	2	0.8750	1.2094
4	56 %	EFFLUENT	3	1.0000	1.4120
4	56 %	EFFLUENT	4	1.0000	1.4120
4	56 %	EFFLUENT	5	0.7500	1.0472
5	75 %	EFFLUENT	1	1.0000	1.4120
5	75 %	EFFLUENT	2	1.0000	1.4120
5	75 %	EFFLUENT	3	1.0000	1.4120
5	75 %	EFFLUENT	4	1.0000	1.4120
5	75 %	EFFLUENT	5	0.8750	1.2094
6	100 %	EFFLUENT	1	1.0000	1.4120
6	100 %	EFFLUENT	2	1.0000	1.4120
6	100 %	EFFLUENT	3	1.0000	1.4120
6	100 %	EFFLUENT	4	0.8750	1.2094
6	100 %	EFFLUENT	5	1.0000	1.4120

AA# K902010, FATHEAD MINNOW SURVIVAL, CHRONIC 2-19-09
 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	1.372				
2	32 % EFFLUENT	1.412	30.00	16.00	5.00	
3	42 % EFFLUENT	1.372	27.50	16.00	5.00	
4	56 % EFFLUENT	1.299	24.50	16.00	5.00	
5	75 % EFFLUENT	1.372	27.50	16.00	5.00	
6	100 % EFFLUENT	1.372	27.50	16.00	5.00	

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

AA# K902010, FATHEAD MINNOW GROWTH CHRONIC, 2-19-09
 File: J:\TOXSTAT\MONTE\FHGWGROWTH. Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

D = 0.180
 W = 0.960

Critical W (P = 0.05) (n = 30) = 0.927
 Critical W (P = 0.01) (n = 30) = 0.900

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

AA# K902010, FATHEAD MINNOW GROWTH CHRONIC, 2-19-09
 File: J:\TOXSTAT\MONTE\FHGWGROWTH. Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
 Calculated B1 statistic = 5.26

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# K902010, FATHEAD MINNOW GROWTH CHRONIC, 2-19-09
 FILE: J:\TOXSTAT\MONTE\FHGWGROWTH.
 TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.3300	0.3300
1	CONTROL	2	0.3900	0.3900
1	CONTROL	3	0.3960	0.3960
1	CONTROL	4	0.3650	0.3650
1	CONTROL	5	0.5150	0.5150
2	32 % EFFLUENT	1	0.6790	0.6790
2	32 % EFFLUENT	2	0.6370	0.6370
2	32 % EFFLUENT	3	0.6040	0.6040
2	32 % EFFLUENT	4	0.5910	0.5910
2	32 % EFFLUENT	5	0.7390	0.7390
3	42 % EFFLUENT	1	0.7690	0.7690
3	42 % EFFLUENT	2	0.6990	0.6990
3	42 % EFFLUENT	3	0.7280	0.7280
3	42 % EFFLUENT	4	0.6150	0.6150
3	42 % EFFLUENT	5	0.8690	0.8690
4	56 % EFFLUENT	1	0.8590	0.8590

4	56 %	EFFLUENT	2	0.7780	0.7780
4	56 %	EFFLUENT	3	0.7760	0.7760
4	56 %	EFFLUENT	4	0.8580	0.8580
4	56 %	EFFLUENT	5	0.7950	0.7950
5	75 %	EFFLUENT	1	0.9050	0.9050
5	75 %	EFFLUENT	2	1.0540	1.0540
5	75 %	EFFLUENT	3	0.8670	0.8670
5	75 %	EFFLUENT	4	0.8480	0.8480
5	75 %	EFFLUENT	5	1.0350	1.0350
6	100 %	EFFLUENT	1	1.1740	1.1740
6	100 %	EFFLUENT	2	1.0270	1.0270
6	100 %	EFFLUENT	3	0.9890	0.9890
6	100 %	EFFLUENT	4	1.0900	1.0900
6	100 %	EFFLUENT	5	1.3140	1.3140

AA# K902010, FATHEAD MINNOW GROWTH CHRONIC, 2-19-09
 File: J:\TOXSTAT\MONTE\FHGROWTH. Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	1.529	0.306	40.738
Within (Error)	24	0.180	0.008	
Total	29	1.709		

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

AA# K902010, FATHEAD MINNOW GROWTH CHRONIC, 2-19-09
 File: J:\TOXSTAT\MONTE\FHGROWTH. Transform: NO TRANSFORMATION

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

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	0.399	0.399		
2	32 % EFFLUENT	0.650	0.650	-4.577	
3	42 % EFFLUENT	0.736	0.736	-6.146	
4	56 % EFFLUENT	0.813	0.813	-7.555	
5	75 % EFFLUENT	0.942	0.942	-9.902	
6	100 % EFFLUENT	1.119	1.119	-13.132	

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

AA# K902010, FATHEAD MINNOW GROWTH CHRONIC, 2-19-09
 File: J:\TOXSTAT\MONTE\FHGROWTH. Transform: NO TRANSFORMATION

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

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	5			
2	32 % EFFLUENT	5	0.129	32.4	-0.251
3	42 % EFFLUENT	5	0.129	32.4	-0.337
4	56 % EFFLUENT	5	0.129	32.4	-0.414
5	75 % EFFLUENT	5	0.129	32.4	-0.543
6	100 % EFFLUENT	5	0.129	32.4	-0.720

APPENDIX D

Ceriodaphnia dubia Raw Data and Statistics

Ceriodaphnia dubia

SURVIVAL AND REPRODUCTION TEST

Discharger: Western
 Location: K90200
 Date Sample Collected:

Analyst: Ken P.
 Test Start - Date/Time: 2/19/09, 1620
 Test Stop - Date/Time: 2/26/09, 0850

Conc 1	%	Day	Replicate										No. of Young	No. of Adult	Young/Adult	Analyst
			A	B	C	D	E	F	G	H	I	J				
Control	1	0	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	0	10	0	HP
	3	4	3	6	5	4	1	3	0	2	0	28	10	2.8	KP	
	4	4	0	0	0	1	1	2	2	0	10	10	1.0	KP		
	5	3	3	0	5	4	0	3	3	7	1	29	10	2.9	KP	
	6	6	2	0	3	5	3	1	4	2	5	31	8	3.9	HP	
	7	5	7	5	3	7	9	1	8	11	48	8	6.0	KP		
	8															
Total		22	8	13	18	16	12	7	9	2	17	153				

Conc 4	%	Day	Replicate										No. of Young	No. of Adult	Young/Adult	Analyst
			A	B	C	D	E	F	G	H	I	J				
25	1	0	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	0	10	0	
	3	2	5	3	2	2	0	1	3	1	0	19	10	1.9		
	4	1	0	0	6	7	3	0	0	0	0	23	10	2.3		
	5	7	10	3	6	6	5	0	9	8	0	49	8	6.1		
	6	1	0	9	8	4	5	4	10	7	47	8	5.9			
	7	1	1	3	7	7	6	3	5	5	4	50	8	6.3		
	8															
Total		25	15	19	30	25	18	9	24	32	11	188				

Conc 2	%	Day	Replicate										No. of Young	No. of Adult	Young/Adult	Analyst
			A	B	C	D	E	F	G	H	I	J				
32	1	0	0	0	0	0	0	0	0	0	0	0	9	0		
	2	0	0	0	0	0	0	0	0	0	0	0	8	0		
	3	3	1	2	4	1	5	3	5	1	1	24	8	3.0		
	4	1	1	4	0	1	4	0	0	3	3	13	8	1.6		
	5	2	1	8	7	1	8	9	1	3	9	47	8	5.9		
	6	2	1	4	10	1	10	1	5	7	9	48	7	6.9		
	7	7	1	1	7	1	5	3	3	5	42	7	6.0			
	8															
Total		15	0	18	28	10	31	22	14	19	27	107				

Conc 5	%	Day	Replicate										No. of Young	No. of Adult	Young/Adult	Analyst
			A	B	C	D	E	F	G	H	I	J				
50	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	1	2	3	2	4	1	0	1	18	10	1.8			
	4	2	0	2	3	1	4	0	1	0	2	15	9	1.7		
	5	2	0	7	1	1	5	0	0	2	13	8	2.1			
	6	1	3	5	1	5	2	3	1	2	6	22	8	3.4		
	7	4	2	6	1	5	7	6	1	3	9	37	8	4.6		
	8															
Total		12	6	22	6	14	22	10	2	3	15	114				

Conc 3	%	Day	Replicate										No. of Young	No. of Adult	Young/Adult	Analyst
			A	B	C	D	E	F	G	H	I	J				
42	1	0	0	0	0	0	0	0	0	0	0	0	9	0		
	2	0	0	0	0	0	0	0	0	0	0	0	9	0		
	3	2	2	1	4	2	3	7	3	2	26	9	2.9			
	4	3	4	1	2	0	2	2	3	0	18	9	2.0			
	5	4	3	1	3	1	9	8	6	7	37	9	4.1			
	6	1	3	1	0	5	0	7	4	0	28	9	3.1			
	7	0	7	1	5	6	5	7	6	6	49	9	5.4			
	8															
Total		10	19	10	11	18	8	28	27	27	10	158				

Conc 6	%	Day	Replicate										No. of Young	No. of Adult	Young/Adult	Analyst
			A	B	C	D	E	F	G	H	I	J				
100	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	4	2	3	2	3	3	3	1	2	24	10	2.4		
	4	0	0	2	0	0	0	5	0	0	0	7	10	0.7		
	5	2	1	3	0	5	3	7	0	4	10	19	9	2.1		
	6	3	2	5	6	0	4	5	5	6	1	36	9	4.0		
	7	4	5	6	4	5	4	4	7	6	1	45	9	5.0		
	8															
Total		10	12	18	13	12	14	18	15	17	2	131				

X= DEAD; Y= MALE

$\bar{X} = 143$
 $CV = 26.6$

AA # K902010, C. DUBIA CHRONIC, REPRODUCCION, 2-19-09
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 # K902010, C. DUBIA CHRONIC, REPRODUCCION, 2-19-09
File: J:/toxstat/monte\C.DUB Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 9.89

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	8	2	10
32%	7	3	10
TOTAL	15	5	20

CRITICAL FISHER'S VALUE (10,10,8) (p=0.05) IS 3. b VALUE IS 7.
 Since b is greater than 3 there is no significant difference
 between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	DEAD	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		
	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	8	2	10
56%	8	2	10

TOTAL 16 4 20

CRITICAL FISHER'S VALUE (10,10,8) (p=0.05) IS 3. b VALUE IS 8.

Since b is greater than 3 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	8	2	10
75%	8	2	10
TOTAL	16	4	20

CRITICAL FISHER'S VALUE (10,10,8) (p=0.05) IS 3. b VALUE IS 8.

Since b is greater than 3 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

NUMBER OF

IDENTIFICATION	DEAD	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	3
2	42%	10	1
3	56%	10	2
4	75%	10	2
5	100%	10	1

TITLE: AA # K902010, C. DUBIA CHRONIC, REPRODUCCION, 2-19-09
FILE: J:/toxstat/monte\C.DUB
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	22.0000	22.0000
1	CONTROL	2	8.0000	8.0000
1	CONTROL	3	13.0000	13.0000
1	CONTROL	4	18.0000	18.0000
1	CONTROL	5	16.0000	16.0000
1	CONTROL	6	12.0000	12.0000
1	CONTROL	7	17.0000	17.0000
1	CONTROL	8	9.0000	9.0000
1	CONTROL	9	21.0000	21.0000
1	CONTROL	10	17.0000	17.0000
2	32 % EFFLUENT	1	15.0000	15.0000
2	32 % EFFLUENT	2	0.0000	0.0000
2	32 % EFFLUENT	3	18.0000	18.0000
2	32 % EFFLUENT	4	28.0000	28.0000
2	32 % EFFLUENT	5	0.0000	0.0000
2	32 % EFFLUENT	6	31.0000	31.0000
2	32 % EFFLUENT	7	22.0000	22.0000
2	32 % EFFLUENT	8	14.0000	14.0000
2	32 % EFFLUENT	9	19.0000	19.0000
2	32 % EFFLUENT	10	27.0000	27.0000
3	42 % EFFLUENT	1	10.0000	10.0000
3	42 % EFFLUENT	2	19.0000	19.0000
3	42 % EFFLUENT	3	0.0000	0.0000
3	42 % EFFLUENT	4	11.0000	11.0000
3	42 % EFFLUENT	5	18.0000	18.0000
3	42 % EFFLUENT	6	8.0000	8.0000
3	42 % EFFLUENT	7	28.0000	28.0000
3	42 % EFFLUENT	8	27.0000	27.0000
3	42 % EFFLUENT	9	27.0000	27.0000
3	42 % EFFLUENT	10	10.0000	10.0000
4	56 % EFFLUENT	1	5.0000	5.0000
4	56 % EFFLUENT	2	15.0000	15.0000
4	56 % EFFLUENT	3	19.0000	19.0000
4	56 % EFFLUENT	4	30.0000	30.0000
4	56 % EFFLUENT	5	25.0000	25.0000
4	56 % EFFLUENT	6	18.0000	18.0000
4	56 % EFFLUENT	7	9.0000	9.0000
4	56 % EFFLUENT	8	24.0000	24.0000
4	56 % EFFLUENT	9	32.0000	32.0000
4	56 % EFFLUENT	10	11.0000	11.0000

5	75 % EFFLUENT	1	12.0000	12.0000
5	75 % EFFLUENT	2	6.0000	6.0000
5	75 % EFFLUENT	3	22.0000	22.0000
5	75 % EFFLUENT	4	6.0000	6.0000
5	75 % EFFLUENT	5	14.0000	14.0000
5	75 % EFFLUENT	6	22.0000	22.0000
5	75 % EFFLUENT	7	10.0000	10.0000
5	75 % EFFLUENT	8	2.0000	2.0000
5	75 % EFFLUENT	9	5.0000	5.0000
5	75 % EFFLUENT	10	15.0000	15.0000
6	100 % EFFLUENT	1	10.0000	10.0000
6	100 % EFFLUENT	2	12.0000	12.0000
6	100 % EFFLUENT	3	18.0000	18.0000
6	100 % EFFLUENT	4	13.0000	13.0000
6	100 % EFFLUENT	5	12.0000	12.0000
6	100 % EFFLUENT	6	14.0000	14.0000
6	100 % EFFLUENT	7	18.0000	18.0000
6	100 % EFFLUENT	8	15.0000	15.0000
6	100 % EFFLUENT	9	17.0000	17.0000
6	100 % EFFLUENT	10	2.0000	2.0000

AA # K902010, C. DUBIA CHRONIC, REPRODUCCION, 2-19-09
 File: J:/toxstat/monte\C.DUB Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	369.600	73.920	1.168
Within (Error)	54	3417.000	63.278	
Total	59	3786.600		

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

AA # K902010, C. DUBIA CHRONIC, REPRODUCCION, 2-19-09
 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	17.400	17.400	-0.590	
3	42 % EFFLUENT	15.800	15.800	-0.141	
4	56 % EFFLUENT	18.800	18.800	-0.984	
5	75 % EFFLUENT	11.400	11.400	1.096	
6	100 % EFFLUENT	13.100	13.100	0.618	

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

AA # K902010, C. DUBIA CHRONIC, REPRODUCTION, 2-19-09

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	8.218	53.7	-2.100
3	42 % EFFLUENT	10	8.218	53.7	-0.500
4	56 % EFFLUENT	10	8.218	53.7	-3.500
5	75 % EFFLUENT	10	8.218	53.7	3.900
6	100 % EFFLUENT	10	8.218	53.7	2.200

AA # K902010, C. DUBIA CHRONIC, REPRODUCTION, 2-19-09

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	17.400	118.00	75.00	10.00	
3	42 % EFFLUENT	15.800	107.00	75.00	10.00	
4	56 % EFFLUENT	18.800	118.00	75.00	10.00	
5	75 % EFFLUENT	11.400	86.50	75.00	10.00	
6	100 % EFFLUENT	13.100	94.50	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 2-18-09 Ark Analytical

SPECIES Pimephales promelas

QUANTITY SHIPPED 300⁺ + 300⁺

AGE/LIFE STAGE 44 hrs 2/15 1500⁺ + 4 Days old

BROODSTOCK SOURCE Anderson Farms, AR

CULTURE WATER groundwater

ALKALINITY (Mg/l as CaCO₃) = 180

HARDNESS (Mg/l as CaCO₃)/Salinity (ppt) = 160

FEEDING Artemia

COMMENTS _____

PACKAGED BY MM

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: 7/13/06

SPECIES: Ceriodaphnia dubia

AGE: Variable

LIFE STAGE: Adult

HATCH DATE: Variable

BEGAN FEEDING: Immediately

FOOD: YTC, Selenastrum sp.

Water Chemistry Record:	Current	Range
TEMPERATURE:	<u>24°C</u>	<u>22-25°C</u>
SALINITY/CONDUCTIVITY:	<u>--</u>	<u>--</u>
TOTAL HARDNESS (as CaCO ₃):	<u>126 mg/l</u>	<u>60-138 mg/l</u>
TOTAL ALKALINITY (as CaCO ₃):	<u>60 mg/l</u>	<u>50-110 mg/l</u>
pH:	<u>8.00</u>	<u>6.98-8.32</u>

Comments:

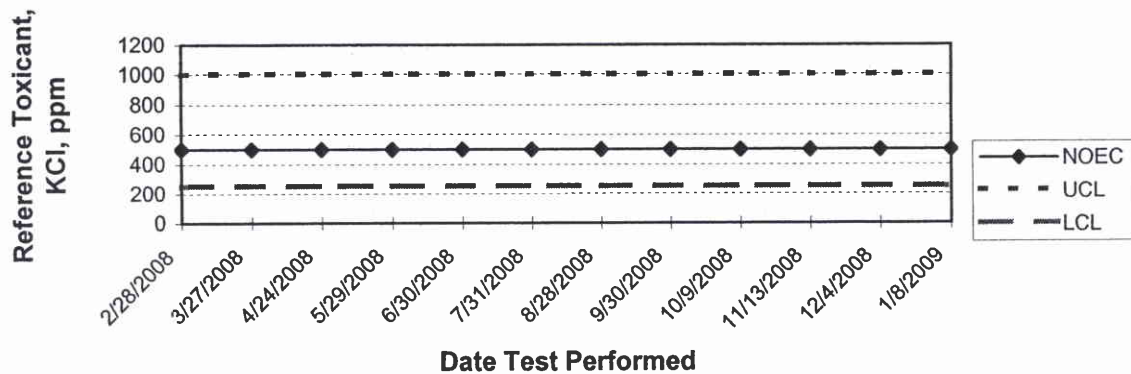


Facility Supervisor

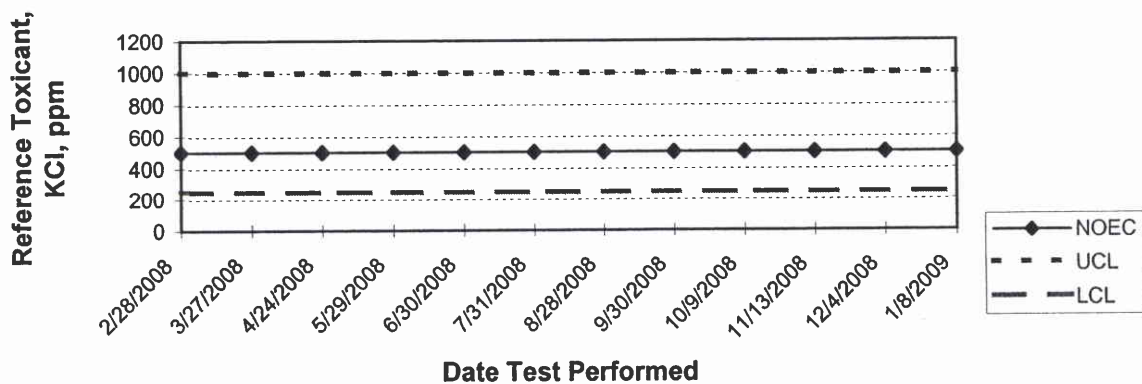
APPENDIX F

Quality Assurance Charts

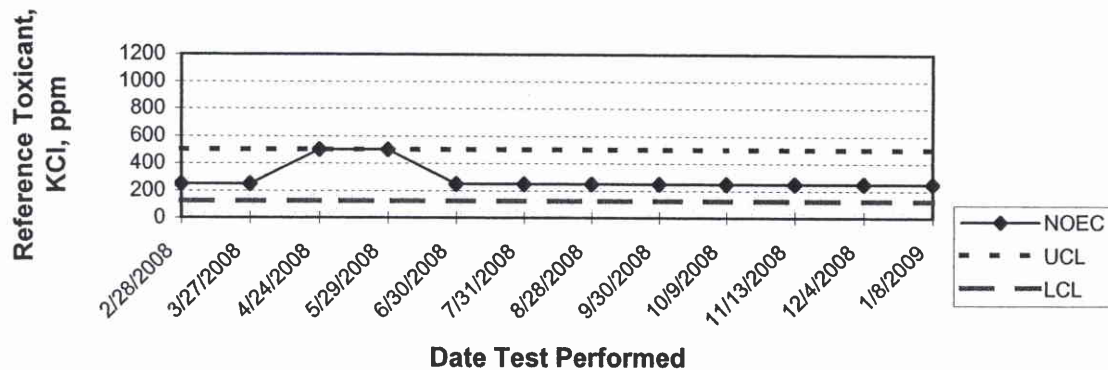
ARKANSAS ANALYTICAL, INC.
FATHEAD MINNOW SURVIVAL
QUALITY ASSURANCE



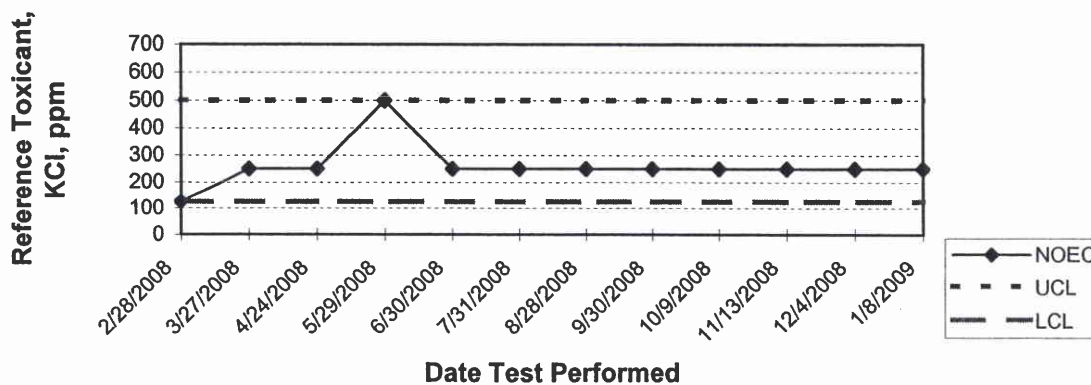
ARKANSAS ANALYTICAL, INC.
FATHEAD MINNOW GROWTH
QUALITY ASSURANCE



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

Jessica Maubach

ADEQ Director