Arkansas Analytical, Inc.

Toxicity Test Results

MAGCOBAR MINE SITE
NPDES PERMIT NUMBER: AR0049794
February, 2011
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 K1102004

Tuesday, March 01, 2011

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 2011.

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:	2-14-11, 0820	2-15-11, 0820
Sample #2:	2-15-11, 0910	2-16-11, 0910
Sample #3:	2-17-11, 0930	2-18-11, 0930

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:	2-15-11, 1226	4
Sample #2:	2-16-11, 1152	2
Sample #3:	2-18-11, 1130	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	100%	X	
Average of 15 or more young per surviving female	16.2	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	10.8%	X	

TEST ACCEPTANCE CRITERIA for *Pimephales promelas*

Control Criteria	Results	Pass	Fail
Greater than or equal to 80% survival	90%	X	
The percent coefficient of variation between replicates must be 40% or less for survival	18.1%	X	
Minimum of 0.25 mg average dry weight of surviving controls	0.341	X	
The percent coefficient of variation between replicates must be 40% or less for growth	13.9%	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 1/26/11-2/2/11		*Pimephales promelas* 1/26/11-2/2/11	
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)	17.7	%CV survival (critical dilution)	23.9 %
%CV Reproduction (critical dilution)	27.2%	Mean dry weight (critical dilution) in milligrams	0.462
		%CV growth (critical dilution)	15.0%
PMSD Reproduction	30.0	PMSD Growth	30.2

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 or sublethal effects at the critical dilution, and, as such, **passed** both the portions of the test.

Biomonitoring Analysts:

Ken Pigue

Chris Turney

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:	2-14-11, 0820	2-15-11, 0820
Sample #2:	2-15-11, 0910	2-16-11, 0910
Sample #3:	2-17-11, 0930	2-18-11, 0930

Test initiated (date, time): 2-16-11, 1645 Test terminated (date, time): 2-23-11, 1405

Dilution water used: Soft Synthetic

DATA TABLE FOR FATHEAD MINNOW SURVIVAL

Percent Survival in Replicate Chambers **Mean Percent Survival**

DATA TABLE FOR GROWTH OF FATHEAD MINNOWS

Effluent Conc %	A	B	C	D	E		24 hours	48 hours	7 days	CV %
0%	62.5	87.5	100	100	100		100	100	90	18.1
32%	50	87.5	50	75	100		100	100	72.5	
42%	100	62.5	87.5	100	87.5		100	100	87.5	
56%	100	75	87.5	87.5	87.5		100	100	87.5	
75%	100	87.5	50	100	75		100	100	82.5	
100%	75	100	75	87.5	50		100	100	77.5	23.9

SUMMARY

Effluent Conc %	A	B	C	D	E		Mean Dry Weight	CV%
0%	0.293	0.301	0.330	0.395	0.386		0.341	13.9
32%	0.310	0.356	0.250	0.375	0.405		0.339	
42%	0.556	0.390	0.506	0.524	0.480		0.491	
56%	0.566	0.317	0.580	0.446	0.470		0.476	
75%	0.554	0.429	0.334	0.526	0.468		0.462	
100%	0.444	0.540	0.452	0.512	0.361		0.462	15.0

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)= _____**15.0**_____%

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:	2-14-11, 0820	2-15-11, 0820
Sample #2:	2-15-11, 0910	2-16-11, 0910
Sample #3:	2-17-11, 0930	2-18-11, 0930

Test initiated (date, time): 2-16-11, 1630 Test terminated (date, time): 2-23-11, 1015

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	17	21	22	21	16	21
B	18	16	16	18	17	26
C	18	17	15	7	15	18
D	16	x5	7	16	13	21
E	14	16	21	18	17	15
F	17	15	15	11	8	8
G	13	15	11	24	13	16
H	16	13	5	x2	9	20
I	18	10	10	12	15	15
J	15	15	13	14	21	17
Mean	16.2	14.3	13.5	14.3	14.4	17.7
Mean/surviving female	16.2	15.3	13.5	15.7	14.4	17.7
CV%*	10.8					27.2

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	100	100	100
48 HOURS	100	100	100	100	100	100
Test termination	100	90	100	90	100	100

1. Fisher's Exact Test:
   Is the mean survival at test termination significantly different (p=0.05) than the control survival for:

   a) LOW FLOW OR CRITICAL DILUTION, (100%): YES_____ NO___**X**___

2. Dunnett's Procedure or Steel's Many One Rank Test:
   Is the mean number of young produced per female significantly different (p=0.05) than the controls number of young per female for:

   a) LOW FLOW OR CRITICAL DILUTION, (100%): YES_____ NO___**X**____

3. If NO was answered to 1.a) enter [0] otherwise enter [1] (parameter TLP3B):_____**0**_____

4. If NO was answered to 2.a) enter [0] otherwise enter [1] (parameter TGP3B):_____**0**_____

5. Enter percentage corresponding to each parameter below:

   a) NOEC survival (parameter TOP3B)= _____**100**____ % effluent

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

   c) Coefficient of variation (parameter TQP3B)= _____**27.2**_____%

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 R

CLIENT INFORMATION		Project Description	Turnaround Time	Preservation Cod
EEMA O & M Services Group	EEMA O & M Services Group	Magcobar Mine Site	24 Hour	1. Cool, 4 Degrees Centigrade
Magcobar Mine Site	P.O. Box 732	Biomonitoring Sample	48 Hour	2. Sulfuric Acid (H_2SO_4), pH < 2
P.O. Box 699	Kulpsville, PA 19443	Reporting Information	72 Hour	3. Nitric Acid (HNO_3), pH < 2
Malvern, AR 72104		Telephone: 501-467-8355	Routine (5 Day)	TEST PARAMETERS
Attn: Bill McAlister	Attn: Amber Rich	Fax: 501-467-8687	Preservative Code:	1
		Email: dave.friedman@eema-inc.com; bmcalister@eema-inc.com; bhorton@eema-inc.com	Bottle Type:	P

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						
FD-1 Comp.	2/15/2010	8:20 AM		X	4	W	Facility Discharge	X						

1. Relinquished by: (Signature)	Date/Time	2. Received by: (Signature)	SAMPLE CONDITION UPON RECEIPT IN LAB	REMARKS / SA
Bill McAlister	2-15-11		1. CUSTODY SEALS: ✓ Yes ___ No	
			2. CONTAINERS CORRECT: ___ Yes ___ No	
			3. COC/LABELS AGREE: ___ Yes ___ No	
3. Relinquished by: (Signature)	Date/Time	4. Received by lab: (Signature)	4. PRESERVATION CONFIRMED: ___ Yes ___ No	
	12:26	Amanda for bish	5. RECEIVED ON ICE: ___ Yes ___ No	
			6. TEMPERATURE ON RECEIPT: 4°C	
			FOR COMPLETION BY LAB ONLY	

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 R

CLIENT INFORMATION		Project Description	Turnaround Time	Preservation Code
EEMA O & M Services Group	EEMA O & M Services Group	Magcobar Mine Site	24 Hour	1. Cool, 4 Degrees Centigrade
Magcobar Mine Site	P.O. Box 732	Biomonitoring Sample	48 Hour	2. Sulfuric Acid (H_2SO_4), pH < 2
P.O. Box 699	Kulpsville, PA 19443	Reporting Information	72 Hour	3. Nitric Acid (HNO_3), pH < 2
Malvern, AR 72104		Telephone: 501-467-8355	Routine (5 Day)	4. Thic
Attn: Bill McAlister	Attn: Amber Rich	Fax: 501-467-8687	Preservative Code:	1
		Email: dave.friedman@eema-inc.com; bmcalister@eema-inc.com; bhorton@eema-inc.com	Bottle Type:	P

Sampler(s) Signature: Larry Curtis

Sampler(s) Printed: LARRY Curtis

Field Number	SAMPLE COLLECTION Date/s	Time/s	Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION	Chronic Biomonitoring	TEST PARAMETERS
FD-1 Comp.	2/16/2011	9:10 AM		X	3	W	Facility Discharge	X	

1. Relinquished by: (Signature)	Date/Time	2. Received by: (Signature)	SAMPLE CONDITION UPON RECEIPT IN LAB	REMARKS / SA
Larry Curtis			1. CUSTODY SEALS: Y Yes ___No	
3. Relinquished by: (Signature)	Date/Time	4. Received by lab: (Signature)	2. CONTAINERS CORRECT: ___Yes ___No	
	2-16-11 1152	Amanda Forbush	3. COC/LABELS AGREE: ___Yes ___No	
			4. PRESERVATION CONFIRMED: ___Yes ___No	
			5. RECEIVED ON ICE: ___Yes ___No	
			6. TEMPERATURE ON RECEIPT: 2°C	
			FOR COMPLETION BY LAB ONLY	

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 R

CLIENT INFORMATION		Project Description	Turnaround Time	Preservation Code
EEMA O & M Services Group	EEMA O & M Services Group	Magcobar Mine Site	24 Hour	1. Cool, 4 Degrees Centigrade / 4. Thio
Magcobar Mine Site	P.O. Box 732	Biomonitoring Sample	48 Hour	2. Sulfuric Acid (H_2SO_4), pH < 2 / 5. Hyd
P.O. Box 699	Kulpsville, PA 19443	Reporting Information	72 Hour	3. Nitric Acid (HNO_3), pH < 2 / 6. Sodiu
Malvern, AR 72104		Telephone: 501-467-8355	Routine (5 Day)	TEST PARAMETERS
Attn: Bill McAlister	Attn: Amber Rich	Fax: 501-467-8687	Preservative Code:	1
		Email: dave.friedman@eema-inc.com; bmcalister@eema-inc.com; bhorton@eema-inc.com	Bottle Type:	P

Sampler(s) Signature: Bill Horton

Sampler(s) Printed: Bill Horton

Field Number	SAMPLE COLLECTION Date/s	Time/s	Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION	Chronic Biomonitoring
FD-1 Comp.	2/18/2011	9:30 AM		X	3	W	Facility Discharge	X

1. Relinquished by: (Signature)	Date/Time	2. Received by: (Signature)	SAMPLE CONDITION UPON RECEIPT IN LAB	REMARKS / SA
Bill Horton	2/18/11, 1130		1. CUSTODY SEALS: ✓ Yes ___ No	
			2. CONTAINERS CORRECT: ___ Yes ___ No	
			3. COC/LABELS AGREE: ___ Yes ___ No	
3. Relinquished by: (Signature)	Date/Time	4. Received by lab: (Signature)	4. PRESERVATION CONFIRMED: ___ Yes ___ No	
		Sydney James	5. RECEIVED ON ICE: ___ Yes ___ No	
			6. TEMPERATURE ON RECEIPT: 4°C	
			FOR COMPLETION BY LAB ONLY	

APPENDIX B

Effluent and Dilution Water Data

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING — Fathead Minnow

Lab # / Sample ID: K1102004 — Test Start (Date/Time): 2/16/11

Client: Weston — Test End (Date/Time): ~~2/17~~ 2/23/11

		Day of Test 1	2	3	4	5	6	7	notes/remarks
Control	MHS551	2/16	2/17	2/18	2/19	2/20	2/21	2/22	
D.O. (mg/L)	INITIAL	86	80	85	7.8	7.9	78	79	
	FINAL	~~78~~	78	8.2	7.2	7.4	7.8	~~7.9~~	
pH (s.u.)	INITIAL	77	80	79	7.6	7.6	7.9	7.8	
	FINAL	7.8	7.7	7.7 (7.5)	7.6	7.7	7.7	7.5	
temp (C)	INITIAL	21.5	23.3	23.6	22.1	23.1	22.8	21.2	
	FINAL	250	250	250	25.0	250	250	250	
ALKALINITY (mg/L)		32			34				
HARDNESS (mg/L)		42			42				
CONDUCTIVITY (umhos/cm)		167			170				
CHLORINE (mg/L)		<0.05			<0.05				
CONC:									
D.O. (mg/L)	INITIAL	88	81	85	7.6	8.1	79	83	
	FINAL	78	77	8.1	6.4	7.2	7.8	7.8	
pH (s.u)	INITIAL	75	76	77	7.3	7.5	76	74	
	FINAL	75	74	7.5	7.3	7.3	7.4	7.2	
temp (C)	INITIAL	22.2	23.4	23.0	22.3	24.2	22.9	21.2	
	FINAL	250	250	25.0	25.0	250	250	250	
CONC:									
D.O. (mg/L)	INITIAL	87	83	85	8.2	8.3	81	85	
	FINAL	79	76	8.1	6.5	7.1	7.8	7.7	
pH (mg/L)	INITIAL	74	76	77	7.4	7.6	7.6	7.4	
	FINAL	75	7.3	7.6	7.3	7.3	7.4	7.3	
temp (C)	INITIAL	22.3	23.6	23.3	22.8	24.9	22.9	21.3	
	FINAL	250	250	25.0	25.0	250	250	250	
CONC:									
D.O. (mg/L)	INITIAL	87	84	87	8.4	8.5	84	87	
	FINAL	79	75	8.0	6.1	7.0	7.7	7.7	
pH (s.u.)	INITIAL	74	76	76	7.4	7.5	7.5	7.4	
	FINAL	74	7.4	7.5	7.3	7.4	7.4	7.4	
temp (C)	INITIAL	22.1	23.4	23.6	23.1	25.8	23.4	21.1	
	FINAL	25.6	250	25.0	25.0	250	250	250	
CONC:									
D.O. (mg/L)	INITIAL	87	85	86	8.6	8.6	86	87	
	FINAL	79	75	8.0	6.2	6.9	7.8	7.4	
pH (s.u.)	INITIAL	74	75	75	7.4	7.5	7.5	7.4	
	FINAL	74	74	7.5	7.2	7.3	7.4	7.4	
temp (C)	INITIAL	22.2	23.2	23.8	23.6	26.3	23.5	21.1	
	FINAL	250	250	25.0	25.0	250	250	250	
CONC:									
D.O. (mg/L)	INITIAL	88	88	87	8.8	9.5	88	88	
	FINAL	80	7.3	8.0	7.5	7.4/6.8	7.8	7.6	
pH (s.u.)	INITIAL	73	73	75	7.4	7.4	7.5	7.4	
	FINAL	7.4	7.4	7.4	7.4	7.3	7.3	7.3	
temp (C)	INITIAL	22.5	22.6	24.0	23.3	26.5	23.9	21.6	
	FINAL	250	250	25.0	25.0	250	250	250	
CONC:	**100%**	A	A	A	B	B	C	C	
ALKALINITY (mg/L)		20			18		22		
HARDNESS (mg/L)		>600			>600		>600		
CONDUCTIVITY (umhos/cm)		230			240		240		
CHLORINE (mg/L)		0.11			<0.05		<0.05		

Revision 1
11/30/10

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING — Cerodaphnia Dubia

Lab # / Sample ID: 14162004 — Test Start (Date/Time): 2/16/11

Client: Weston — Test End (Date/Time): 2/23/11

		Day of Test 1	2	3	4	5	6	7	notes/remarks
Control	MHS551	2/16	2/17	2/18	2/19	2/20	2/21	2/22	
D.O. (mg/L)	INITIAL	86	80	85	78	79	78	79	
	FINAL	80	79	78	77	76	76	78	
pH (s.u.)	INITIAL	77	80	79	76	76	79	78	
	FINAL	80	78	78	79	77	78	77	
temp (C)	INITIAL	215	233	230	221	231	228	212	
	FINAL	250	250	250	250	250	250	250	
ALKALINITY (mg/L)		32		↓	34			↓	
HARDNESS (mg/L)		42		↓	42			↓	
CONDUCTIVITY (umhos/cm)		167		↓	170			↓	
CHLORINE (mg/L)		<0.05		↓	<0.05			↓	
CONC:									
D.O. (mg/L)	INITIAL	88	81	85	76	81	79	83	
	FINAL	80	79	78	76	76	75	81	
pH (s.u)	INITIAL	75	76	77	73	75	76	74	
	FINAL	77	77	76	76	74	75	74	
temp (C)	INITIAL	222	234	230	223	242	229	212	
	FINAL	250	250	250	250	250	250	250	
CONC:									
D.O. (mg/L)	INITIAL	87	83	85	82	83	81	85	
	FINAL	80	78	77	76	77	76	81	
pH (mg/L)	INITIAL	74	76	77	74	76	76	74	
	FINAL	77	76	76	77	74	75	74	
temp (C)	INITIAL	223	236	233	228	249	229	213	
	FINAL	250	250	250	250	250	250	250	
CONC:									
D.O. (mg/L)	INITIAL	87	84	87	84	85	84	87	
	FINAL	79	78	78	78	75	76	82	
pH (s.u.)	INITIAL	74	76	76	74	75	75	74	
	FINAL	76	76	76	74	74	75	74	
temp (C)	INITIAL	221	234	236	231	258	234	211	
	FINAL	250	250	250	250	250	250	250	
CONC:									
D.O. (mg/L)	INITIAL	87	85	86	86	86	86	87	
	FINAL	79	78	77	79	77	76	81	
pH (s.u.)	INITIAL	74	75	75	74	75	75	74	
	FINAL	76	76	76	77	74	75	73	
temp (C)	INITIAL	222	232	238	236	263	235	211	
	FINAL	250	250	250	256	250	250	250	
CONC:									
D.O. (mg/L)	INITIAL	88	88	87	88	95	85	88	
	FINAL	79	78	78	80	77	75	82	
pH (s.u.)	INITIAL	73	73	75	74	74	75	74	
	FINAL	75	75	76	76	74	75	73	
temp (C)	INITIAL	225	226	240	233	265	239	216	
	FINAL	250	250	250	250	250	250	250	
CONC:	**100%**	A	A	A	B	B	C	C	
ALKALINITY (mg/L)		20		↓	18	↓	22	↓	
HARDNESS (mg/L)		>600		↓	>600	↓	>600	↓	
CONDUCTIVITY (umhos/cm)		2130		↓	2140	↓	2140	↓	
CHLORINE (mg/L)		0.11		↓	<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 K/102004 TEST START DATE 2/16/11 TIME 1645

CLIENT Weston Summary TEST END DATE 2/23/11 TIME 1405

AGE AND SOURCE OF MINNOWS

		DAY (NUMBER SURVIVING)								SURVIVAL		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	8	8	8	7	7	6	5	5	62.5	90	18.1
	B	8	8	8	8	8	8	7	7	87.5		
	C	8	8	8	8	8	8	8	8	100		
	D	8	8	8	8	8	8	8	8	100		
	E	8	8	8	8	8	8	8	8	100		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	8	8	8	8	6	5	4	4	50	73.5	
	B	8	8	8	8	7	7	7	7	87.5		
	C	8	8	8	8	5	5	4	4	50		
	D	8	8	8	6	6	6	6	6	75		
	E	8	8	8	8	8	8	8	8	100		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	8	8	8	8	8	8	8	8	100	87.5	
	B	8	8	8	8	8	6	5	5	62.5		
	C	8	8	8	8	7	7	7	7	87.5		
	D	8	8	8	8	8	8	8	8	100		
	E	8	8	8	7	7	7	7	7	87.5		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	8	8	8	8	8	8	8	8	100	87.5	
	B	8	8	8	8	6	6	6	6	75		
	C	8	8	8	8	7	7	7	7	87.5		
	D	8	8	8	7	7	7	7	7	87.5		
	E	8	8	8	7	7	7	7	7	87.5		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	8	8	8	8	8	8	8	8	100	82.5	
	B	8	8	8	8	7	7	7	7	87.5		
	C	8	8	8	4	4	4	4	4	50		
	D	8	8	8	8	8	8	8	8	100		
	E	8	8	8	6	6	6	6	6	75		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	8	8	8	6	6	6	6	6	75	78	23.9
	B	8	8	8	8	8	8	8	8	100		
	C	8	8	8	6	6	6	6	6	75		
	D	8	8	8	8	8	8	7	7	87.5	77.5	
	E	8	8	8	6	4	4	4	4	50		
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 2/16/11 TIME 1645

CLIENT Weston A — TEST END DATE 2/23/11 TIME 1405

AGE AND SOURCE OF MINNOWS

D A Y (NUMBER SURVIVING) — SURVIVAL

	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 0	A	2	2	2	2	2	1	1	1			
	B				2	2	2	1	1			
	C				1	1	1	1	1			
	D	+	+	+	2	2	2	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 32	A	2	2	2	2	1	0	0	0			
	B				2	2	2	2	2			
	C				2	2	2	2	2			
	D	+	+	+	2	1	1	0	0			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 42	A	2	2	2	2	2	2	2	2			
	B				2	2	2	2	2			
	C				2	2	2	2	2			
	D	+	+	+	2	2	2	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 56	A	2	2	2	2	2	2	2	2			
	B				2	2	2	2	2			
	C				2	2	2	2	2			
	D	+	+	+	2	2	2	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 75	A	2	2	2	2	2	2	2	2			
	B				2	2	2	2	2			
	C				2	2	2	2	2			
	D	+	+	+	2	2	2	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 100	A	2	2	2	2	2	2	2	2			
	B				2	2	2	2	2			
	C				0	0	0	0	0			
	D	+	+	+	2	2	2	2	2			
	E											
ANALYST		KP/KB	KP	KP	CA	CA	KP	KP	KP			
DATE:		2/16/11	2/17/11	2/18/11	2/19/11	2/20/11	2/21/11	2/22/11	2/23/11			
TIME:		1645	1630	1500	1100	1200	1600	1500	1405			

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 2/16/11 TIME 1645

CLIENT Weston B — TEST END DATE — TIME

AGE AND SOURCE OF MINNOWS

		D A Y (NUMBER SURVIVING)								SURVIVAL		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 0	A	2	2	2	2	2	2	2	2			
	B					2	2	1	2			
	C					2	2	2	2			
	D	+	+	+	+	2	2	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 32	A	2	2	2	2	2	2	2	2			
	B					2	2	2	2			
	C					1	1	1	1			
	D	+	+	+	+	2	2	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 42	A	2	2	2		2	2	1	1			
	B					2	0	0	0			
	C					2	2	2	2			
	D	+	+	+	+	2	2	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 56	A	2	2	2	2	2	2	2	2			
	B					2	2	2	2			
	C					0	0	0	0			
	D	+	+	+	+	2	2	2	2			
	E					*						
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 75	A	2	2	2	2	2	2	2	2			
	B					2	2	2	2			
	C					1	1	1	1			
	D	+	+	+	+	2	2	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 100	A	2	2	2	2	2	2	2	2			
	B					2	2	2	2			
	C					2	2	2	2			
	D	+	+	+	+	2	2	2	2			
	E											
ANALYST		KP/KR			CK	CK	KP					
DATE:		2/16/11			2/19/11	2/20/11	2/21/11					
TIME:		1645			11:00	1200						

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 2/16/11 TIME 1645

CLIENT Weston — TEST END DATE — TIME

AGE AND SOURCE OF MINNOWS

D A Y (NUMBER SURVIVING) — SURVIVAL

	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 0	A	2	2	2	2	2	2	2	2			
	B					2	2	2	2			
	C					2	2	2	2			
	D	+	+	+	+	2	2	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 32	A	2	2	2	2	1	1	1	1			
	B					0	0	0	0			
	C					2	2	1	1			
	D	+	+	+	+	2	2	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 42	A	2	2	2	2	2	2	2	2			
	B					2	2	2	2			
	C					2	2	2	2			
	D	+	+	+	+	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					1	1	1	1			
	C					2	2	2	2			
	D	+	+	+	+	2	2	2	2			
	E											
	REP #	start	1	2	2 (3)	2 (3)	5	6	7	%	MEAN %	CV
CONC: 75	A	2	2	2	1 2	0 2	2	2	2			
	B				2	0	0	0	0			
	C				2	2	2	2	2			
	D	+	+	+	2	0	0	0	0			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 100	A	2	2	2	2	2	2	2	2			
	B				2	2	2	2	2			
	C				0	0	0	0	0			
	D	+	+	+	2	2	2	2	2			
	E											
ANALYST		KP/KR			CA	CA	KP	KP				
DATE:		2/16/11			2-19-11	2-20	2/21/11	2/22/11				
TIME:		1645			11:30	12:30						

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 2/16/11 TIME 1645

CLIENT Weston D — TEST END DATE — TIME

AGE AND SOURCE OF MINNOWS

D A Y (NUMBER SURVIVING) — SURVIVAL

	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 0	A	2	2	2	2	2	2	2	2			
	B							2	2			
	C							2	2			
	D							2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 32	A	2	2	2	2	2	2	2	2			
	B				0	0	0	0	0			
	C				2	2	2	2	2			
	D				2	2	2	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 42	A	2	2	2	2	2	2	2	2			
	B							2	2			
	C							2	2			
	D							2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 56	A	2	2	2	2	2	2	2	2			
	B				2			2	2			
	C				2			2	2			
	D				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				2			2	2			
	C				2			2	2			
	D				2			2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 100	A	2	2	2	2	2	2	2	2			
	B				2			2	2			
	C				2			2	2			
	D				2			2	1			
	E											
ANALYST		KP/KR			KP	KP	KP	KP				
DATE:		2/16/11			2/9-11	2-20-11		2/21/11				
TIME:		1645			11:30	12:30						

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 2/16/11 TIME 1645

CLIENT Weston — TEST END DATE TIME

AGE AND SOURCE OF MINNOWS

D A Y (NUMBER SURVIVING) — SURVIVAL

	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 0	A	2	2	2	2	2	2	2	2			
	B					2	2	2	2			
	C					2	2	2	2			
	D					2	2	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 32	A	2	2	2	2	2	2	2	2			
	B						2	2	2			
	C						2	2	2			
	D						2	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 42	A	2	2	2	2	2	2	2	2			
	B				2	2	2	2	2			
	C				1	1	1	1	1			
	D				2	2	2	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 56	A	2	2	2	2	2	2	2	2			
	B				2	2	2	2	2			
	C				2	2	2	2	2			
	D				1	1	1	1	1			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 75	A	2	2	2	1	1	1	1	1			
	B				2	2	2	2	2			
	C				2	2	2	2	2			
	D				1	1	1	1	1			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 100	A	2	2	2	2	0	0	0	0			
	B				0	0	0	0	0			
	C				2	2	2	2	2			
	D				2	2	2	2	2			
	E											
ANALYST		KP/KP			CT	CT	KP					
DATE:		2/16/11			2-19-11	2-20-11	2/21/11					
TIME:		1645				1300						

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:	K1102004				TEST DATES (BEGIN / END):		2/16-23/11	
CLIENT:	EEMA- Alternate Method				WEIGHING DATE / TIME:		2/28/1, 1100	
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	1.01027	1.00793	0.00234	8	0.293	AVG DRY	
	B	1.02897	1.02656	0.00241	8	0.301	WEIGHT (mg)	
	C	1.01078	1.00814	0.00264	8	0.330		0.341
	D	1.02982	1.02666	0.00316	8	0.395	CV	
	E	1.01324	1.01015	0.00309	8	0.386		13.9
CONC:	A	1.03751	1.03503	0.00248	8	0.310	AVG DRY	
	B	1.01288	1.01003	0.00285	8	0.356	WEIGHT (mg)	
32%	C	1.01101	1.00901	0.00200	8	0.250		0.339
	D	1.02862	1.02562	0.00300	8	0.375	CV	
	E	1.02217	1.01893	0.00324	8	0.405		
CONC:	A	1.02890	1.02445	0.00445	8	0.556	AVG DRY	
	B	1.03627	1.03315	0.00312	8	0.390	WEIGHT (mg)	
42%	C	1.03319	1.02914	0.00405	8	0.506		0.491
	D	1.03131	1.02712	0.00419	8	0.524	CV	
	E	1.05408	1.05024	0.00384	8	0.480		
CONC:	A	1.06170	1.05717	0.00453	8	0.566	AVG DRY	
	B	1.04503	1.04249	0.00254	8	0.317	WEIGHT (mg)	
56%	C	1.03627	1.03163	0.00464	8	0.580		0.476
	D	1.01342	1.00985	0.00357	8	0.446	CV	
	E	1.02393	1.02017	0.00376	8	0.470		
CONC:	A	1.04748	1.04305	0.00443	8	0.554	AVG DRY	
	B	1.05266	1.04923	0.00343	8	0.429	WEIGHT (mg)	
75%	C	1.03270	1.03003	0.00267	8	0.334		0.462
	D	1.02981	1.02560	0.00421	8	0.526	CV	
	E	1.02889	1.02515	0.00374	8	0.468		
CONC:	A	1.02486	1.02131	0.00355	8	0.444	AVG DRY	
	B	1.02439	1.02007	0.00432	8	0.540	WEIGHT (mg)	
100%	C	1.01745	1.01383	0.00362	8	0.452		0.462
	D	1.02556	1.02146	0.00410	8	0.512	CV	
	E	1.02888	1.02599	0.00289	8	0.361		15.0

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

Pimephales promelas **FATHEAD MINNOW** TEST 1000.0

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s: K1102004						TEST DATES (BEGIN / END):	
CLIENT: Weston						WEIGHING DATE / TIME: 2/28/11, 1100	
ANALYSTS:						DRYING TEMP (DEGREES C): 60	
SAMPLE ID:						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 1	1.01027	1.00793				AVG DRY WEIGHT (mg)
	B 2	1.02897	1.02656				
	C 3	1.01078	1.00814				
	D 4	1.02982	1.02666				CV
	E 5	1.01324	1.01095				
CONC:	A 6	1.03751	1.03503				AVG DRY WEIGHT (mg)
	B 7	1.01288	1.01003				
	C 8	1.01101	1.00901				
	D 9	1.02862	1.02562				CV
	E 10	1.02717	1.01893				
CONC:	A 11	1.02880	1.02445				AVG DRY WEIGHT (mg)
	B 12	1.03627	1.03315				
1.03319	C 13	~~1.03484~~	1.02914				
	D 14	1.03131	1.02712				CV
	E 15	1.05408	1.05024				
CONC:	A 16	1.06170	1.05717				AVG DRY WEIGHT (mg)
	B 17	1.04503	1.04249				
	C 18	1.03627	1.03163				
	D 19	1.01342	1.00985				CV
	E 20	1.07393	1.07017				
CONC:	A 21	~~1.04305~~	1.04305				AVG DRY WEIGHT (mg)
1.04748	B 22	~~1.04923~~	1.04923				
1.05266	C 23	~~1.03603~~	1.03603				
1.03270	D 24	~~1.02560~~	1.02560				CV
1.02981	E 25	~~1.02515~~	1.02515				
1.02889							
CONC:	A 26	~~1.02134~~	1.02131				AVG DRY WEIGHT (mg)
1.02486	B 27	~~1.02007~~	1.02007				
1.02459	C 28	~~1.01383~~	1.01383				
1.01745	D 29	~~1.02146~~	1.02146				CV
1.02556	E 30	~~1.02599~~	1.02599				
1.02888							

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

AA# K1102004, FATHEAD MINNOW SURVIVAL, CHRONIC, 2-16-11
File: Z:\TOXSTAT\MONTE\FHSURV. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 1.141

W = 0.948

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# K1102004, FATHEAD MINNOW SURVIVAL, CHRONIC, 2-16-11
File: Z:\TOXSTAT\MONTE\FHSURV. Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 2.35

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# K1102004, FATHEAD MINNOW SURVIVAL, CHRONIC, 2-16-11
FILE: Z:\TOXSTAT\MONTE\FHSURV.
TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.6250	0.9117
1	CONTROL	2	0.8750	1.2094
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	0.5000	0.7854
2	32 % EFFLUENT	2	0.8750	1.2094
2	32 % EFFLUENT	3	0.5000	0.7854
2	32 % EFFLUENT	4	0.7500	1.0472
2	32 % EFFLUENT	5	1.0000	1.3931
3	42 % EFFLUENT	1	1.0000	1.3931
3	42 % EFFLUENT	2	0.6250	0.9117
3	42 % EFFLUENT	3	0.8750	1.2094
3	42 % EFFLUENT	4	1.0000	1.3931
3	42 % EFFLUENT	5	0.8750	1.2094
4	56 % EFFLUENT	1	1.0000	1.3931

4	56 % EFFLUENT	2	0.7500	1.0472
4	56 % EFFLUENT	3	0.8750	1.2094
4	56 % EFFLUENT	4	0.8750	1.2094
4	56 % EFFLUENT	5	0.8750	1.2094
5	75 % EFFLUENT	1	1.0000	1.3931
5	75 % EFFLUENT	2	0.8750	1.2094
5	75 % EFFLUENT	3	0.5000	0.7854
5	75 % EFFLUENT	4	1.0000	1.3931
5	75 % EFFLUENT	5	0.7500	1.0472
6	100 % EFFLUENT	1	0.7500	1.0472
6	100 % EFFLUENT	2	1.0000	1.3931
6	100 % EFFLUENT	3	0.7500	1.0472
6	100 % EFFLUENT	4	0.8750	1.2094
6	100 % EFFLUENT	5	0.5000	0.7854

AA# K1102004, FATHEAD MINNOW SURVIVAL, CHRONIC, 2-16-11
File: Z:\TOXSTAT\MONTE\FHSURV. Transform: ARC SINE(SQUARE ROOT(Y))

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

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	1.260				
2	32 % EFFLUENT	1.044	21.00	16.00	5.00	
3	42 % EFFLUENT	1.223	25.50	16.00	5.00	
4	56 % EFFLUENT	1.214	24.00	16.00	5.00	
5	75 % EFFLUENT	1.166	24.50	16.00	5.00	
6	100 % EFFLUENT	1.096	22.00	16.00	5.00	

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

AA# K1102004, FATHEAD MINNOW GROWTH CHRONIC, 2-16-11
File: Z:\TOXSTAT\MONTE\FHGR. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.140

W = 0.953

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# K1102004, FATHEAD MINNOW GROWTH CHRONIC, 2-16-11
File: Z:\TOXSTAT\MONTE\FHGR. Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 2.74

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# K1102004, FATHEAD MINNOW GROWTH CHRONIC, 2-16-11
FILE: Z:\TOXSTAT\MONTE\FHGR.
TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.2930	0.5720
1	CONTROL	2	0.3010	0.5807
1	CONTROL	3	0.3300	0.6119
1	CONTROL	4	0.3950	0.6796
1	CONTROL	5	0.3860	0.6704
2	32 % EFFLUENT	1	0.3100	0.5905
2	32 % EFFLUENT	2	0.3560	0.6393
2	32 % EFFLUENT	3	0.2500	0.5236
2	32 % EFFLUENT	4	0.3750	0.6591
2	32 % EFFLUENT	5	0.4050	0.6898
3	42 % EFFLUENT	1	0.5560	0.8415
3	42 % EFFLUENT	2	0.3900	0.6745
3	42 % EFFLUENT	3	0.5060	0.7914
3	42 % EFFLUENT	4	0.5240	0.8094
3	42 % EFFLUENT	5	0.4800	0.7654
4	56 % EFFLUENT	1	0.5660	0.8516

4	56 % EFFLUENT	2	0.3170	0.5980
4	56 % EFFLUENT	3	0.5800	0.8657
4	56 % EFFLUENT	4	0.4460	0.7313
4	56 % EFFLUENT	5	0.4700	0.7554
5	75 % EFFLUENT	1	0.5540	0.8395
5	75 % EFFLUENT	2	0.4290	0.7142
5	75 % EFFLUENT	3	0.3340	0.6162
5	75 % EFFLUENT	4	0.5260	0.8114
5	75 % EFFLUENT	5	0.4680	0.7534
6	100 % EFFLUENT	1	0.4440	0.7293
6	100 % EFFLUENT	2	0.5400	0.8254
6	100 % EFFLUENT	3	0.4520	0.7373
6	100 % EFFLUENT	4	0.5120	0.7974
6	100 % EFFLUENT	5	0.3610	0.6445

AA# K1102004, FATHEAD MINNOW GROWTH CHRONIC, 2-16-11
File: Z:\TOXSTAT\MONTE\FHGR. Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.126	0.025	4.322
Within (Error)	24	0.140	0.006	
Total	29	0.266		

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

AA# K1102004, FATHEAD MINNOW GROWTH CHRONIC, 2-16-11
File: Z:\TOXSTAT\MONTE\FHGR. Transform: ARC SINE(SQUARE ROOT(Y))

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

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	0.623	0.341		
2	32 % EFFLUENT	0.620	0.339	0.051	
3	42 % EFFLUENT	0.776	0.491	-3.176	
4	56 % EFFLUENT	0.760	0.476	-2.845	
5	75 % EFFLUENT	0.747	0.462	-2.566	
6	100 % EFFLUENT	0.747	0.462	-2.563	

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

AA# K1102004, FATHEAD MINNOW GROWTH CHRONIC, 2-16-11
File: Z:\TOXSTAT\MONTE\FHGR. Transform: ARC SINE(SQUARE ROOT(Y))

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

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	5			
2	32 % EFFLUENT	5	0.103	30.2	0.002
3	42 % EFFLUENT	5	0.103	30.2	-0.150
4	56 % EFFLUENT	5	0.103	30.2	-0.135
5	75 % EFFLUENT	5	0.103	30.2	-0.121
6	100 % EFFLUENT	5	0.103	30.2	-0.121

APPENDIX D

Ceriodaphnia dubia Raw Data and Statistics

Cerodaphnia dubia

SURVIVAL AND REPRODUCTION TEST

Discharger: Weston

Location:

Date Sample Collected:

Lab Number/s: K11020D4

Analyst: KP

Test Start - Date/ Time: 2/16/11; 1630

Test Stop - Date/Time: 2/23/11; 1015

Conc 1 (%: 0)

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	KP
3	01	0	0	0	0	0	10	0	0	0	2	10	0.2	SB
4	01	3D	2D	1D	2D	01	0	0	03	0	13	10	1.3	SB
5	3	2	5	4	2	3	1	2	3	3	28	10	2.8	KP
6	6	6	2	5	4	3	1	4	3	1	40	10	4.0	KP
7	6	7	9	6	6	5	10	10	9	11	79	10	7.9	KP
8														
Total	17	18	18	16	14	17	13	16	18	15	162		X=16.2	

CV=10.18

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	0	0	0	0	0	0	0	01	0	0	1	10	0.1	SB
4	03	02	1D	3D	4D	01	01	0	0	02	17	10	1.7	
5	8	4	2	0	2	3	7	1	0	5	32	10	3.2	
6	8	8	6	2X	4	5	0	7	1	1	47	9	4.7	
7	2	2	8	6	6	6	3	4	9	7	51	9	5.6	
8														
Total	21	16	17	X5	16	15	15	13	10	15	143			

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	0	0	0	0	0	0	0	0	01	0	1	10	0.1	SB
4	04	04	0	1D	2D	0	0	0	0	03	14	10	1.4	
5	7	1	4	3	6	5	6	3	1	4	40	10	4.0	
6	7	6	7	1	8	7	4	2	6	0	43	10	4.3	
7	4	5	9	2	5	3	1	0	2	6	37	10	3.7	
8														
Total	22	16	15	7	21	15	11	5	10	13	135			

X= DEAD; Y= MALE

Conc 4 (%: 56)

Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adult	Young/ Adult	Analyst
1	0	0	0	0	0	0	0	0	0	0	0	10	0	
2	0	0	0	0	0	0	0	0	0	0	0	10	0	
3	0	0	0	0	0	0	0	0	0	0	0	10	0	
4	03	03	01	0	03	0	03	02	0	0	12	10	1.2	
5	8	0	0	2	5	4	3	0X			22	8	2.8	
6	2	5	7	7	3	2	3	—			29	8	3.6	
7	8	10	4	7	7	5	8	—			49	8	6.1	
8														
Total	21	18	7	16	18	11	24	X2			112		X=14	

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	0	0	0	0	0	0	0	0	0	0	0	10	0	
4	01	05	01	01	01	02	4D	0			14	10	1.4	
5	2	2	4	3	2	2	2	0			17	10	1.7	
6	4	4	3	4	4	0	2	5			26	10	2.6	
7	8	6	7	5	10	4	5	4			49	10	4.9	
8														
Total	16	17	15	13	17	8	13	9			106			

Conc 6 (%: 100)

Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adult	Young/ Adult	Analyst
1	0	0	0	0	0	0	0	0			0	10	0	
2	0	0	0	0	0	0	0	0			0	10	0	
3	01	0	0	0	0	0	0	0			1	10	0.1	
4	0	03	3D	2D	5D	0	0	03			13	10	1.3	
5	6	2	7	4	5	1	6	2			33	10	3.3	
6	2	9	8	4	0	0	4	5			32	10	3.2	
7	7	6	8	11	5	7	6	8			60	10	6.0	
8														
Total	21	26	18	21	15	8	16	20			129			

Revision 1
11/30/10

AA # K1102004 C. DUBIA CHRONIC, REPRODUCION, 2-16-11
File: Z:/toxstat/monte\CD. Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

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

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

Total number of replicates = 60

AA # K1102004 C. DUBIA CHRONIC, REPRODUCION, 2-16-11
File: Z:/toxstat/monte\CD. Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 13.29

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	NUMBER OF DEAD	TOTAL ANIMALS
CONTROL	10	0	10
32%	9	1	10
TOTAL	19	1	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 9.
Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	NUMBER OF DEAD	TOTAL ANIMALS
CONTROL	10	0	10
42%	10	0	10
TOTAL	20	0	20

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

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	NUMBER OF DEAD	TOTAL ANIMALS
CONTROL	10	0	10
56%	9	1	10

TOTAL	19	1	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 9.
Since b is greater than 6 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

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

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

FISHER'S EXACT TEST

	NUMBER OF		
IDENTIFICATION	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
100%	10	0	10
TOTAL	20	0	20

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

SUMMARY OF FISHER'S EXACT TESTS

	NUMBER	NUMBER	SIG

GROUP	IDENTIFICATION	EXPOSED	DEAD	(P=.05)
	CONTROL	10	0	
1	32%	10	1	
2	42%	10	0	
3	56%	10	1	
4	75%	10	0	
5	100%	10	0	

TITLE: AA # K1102004 C. DUBIA CHRONIC, REPRODUCION, 2-16-11
FILE: Z:/toxstat/monte\CD.
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	17.0000	17.0000
1	CONTROL	2	18.0000	18.0000
1	CONTROL	3	18.0000	18.0000
1	CONTROL	4	16.0000	16.0000
1	CONTROL	5	14.0000	14.0000
1	CONTROL	6	17.0000	17.0000
1	CONTROL	7	13.0000	13.0000
1	CONTROL	8	16.0000	16.0000
1	CONTROL	9	18.0000	18.0000
1	CONTROL	10	15.0000	15.0000
2	32 % EFFLUENT	1	21.0000	21.0000
2	32 % EFFLUENT	2	16.0000	16.0000
2	32 % EFFLUENT	3	17.0000	17.0000
2	32 % EFFLUENT	4	5.0000	5.0000
2	32 % EFFLUENT	5	16.0000	16.0000
2	32 % EFFLUENT	6	15.0000	15.0000
2	32 % EFFLUENT	7	15.0000	15.0000
2	32 % EFFLUENT	8	13.0000	13.0000
2	32 % EFFLUENT	9	10.0000	10.0000
2	32 % EFFLUENT	10	15.0000	15.0000
3	42 % EFFLUENT	1	22.0000	22.0000
3	42 % EFFLUENT	2	16.0000	16.0000
3	42 % EFFLUENT	3	15.0000	15.0000
3	42 % EFFLUENT	4	7.0000	7.0000
3	42 % EFFLUENT	5	21.0000	21.0000
3	42 % EFFLUENT	6	15.0000	15.0000
3	42 % EFFLUENT	7	11.0000	11.0000
3	42 % EFFLUENT	8	5.0000	5.0000
3	42 % EFFLUENT	9	10.0000	10.0000
3	42 % EFFLUENT	10	13.0000	13.0000
4	56 % EFFLUENT	1	21.0000	21.0000
4	56 % EFFLUENT	2	18.0000	18.0000
4	56 % EFFLUENT	3	7.0000	7.0000
4	56 % EFFLUENT	4	16.0000	16.0000
4	56 % EFFLUENT	5	18.0000	18.0000
4	56 % EFFLUENT	6	11.0000	11.0000
4	56 % EFFLUENT	7	24.0000	24.0000
4	56 % EFFLUENT	8	2.0000	2.0000

4	56 % EFFLUENT	9	12.0000	12.0000
4	56 % EFFLUENT	10	14.0000	14.0000
5	75 % EFFLUENT	1	16.0000	16.0000
5	75 % EFFLUENT	2	17.0000	17.0000
5	75 % EFFLUENT	3	15.0000	15.0000
5	75 % EFFLUENT	4	13.0000	13.0000
5	75 % EFFLUENT	5	17.0000	17.0000
5	75 % EFFLUENT	6	8.0000	8.0000
5	75 % EFFLUENT	7	13.0000	13.0000
5	75 % EFFLUENT	8	9.0000	9.0000
5	75 % EFFLUENT	9	15.0000	15.0000
5	75 % EFFLUENT	10	21.0000	21.0000
6	100 % EFFLUENT	1	21.0000	21.0000
6	100 % EFFLUENT	2	26.0000	26.0000
6	100 % EFFLUENT	3	18.0000	18.0000
6	100 % EFFLUENT	4	21.0000	21.0000
6	100 % EFFLUENT	5	15.0000	15.0000
6	100 % EFFLUENT	6	8.0000	8.0000
6	100 % EFFLUENT	7	16.0000	16.0000
6	100 % EFFLUENT	8	20.0000	20.0000
6	100 % EFFLUENT	9	15.0000	15.0000
6	100 % EFFLUENT	10	17.0000	17.0000

AA # K1102004 C. DUBIA CHRONIC, REPRODUCION, 2-16-11
File: Z:/toxstat/monte\CD. Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	122.933	24.587	1.108
Within (Error)	54	1198.800	22.200	
Total	59	1321.733		

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

AA # K1102004 C. DUBIA CHRONIC, REPRODUCION, 2-16-11
File: Z:/toxstat/monte\CD. Transform: NO TRANSFORMATION

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

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	16.200	16.200		
2	32 % EFFLUENT	14.300	14.300	0.902	
3	42 % EFFLUENT	13.500	13.500	1.281	
4	56 % EFFLUENT	14.300	14.300	0.902	
5	75 % EFFLUENT	14.400	14.400	0.854	
6	100 % EFFLUENT	17.700	17.700	-0.712	

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

AA # K1102004 C. DUBIA CHRONIC, REPRODUCION, 2-16-11
File: Z:/toxstat/monte\CD. Transform: NO TRANSFORMATION

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

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	10			
2	32 % EFFLUENT	10	4.867	30.0	1.900
3	42 % EFFLUENT	10	4.867	30.0	2.700
4	56 % EFFLUENT	10	4.867	30.0	1.900
5	75 % EFFLUENT	10	4.867	30.0	1.800
6	100 % EFFLUENT	10	4.867	30.0	-1.500

AA # K1102004 C. DUBIA CHRONIC, REPRODUCION, 2-16-11
File: Z:/toxstat/monte\CD. Transform: NO TRANSFORMATION

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

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	16.200				
2	32 % EFFLUENT	14.300	87.00	75.00	10.00	
3	42 % EFFLUENT	13.500	84.50	75.00	10.00	
4	56 % EFFLUENT	14.300	97.50	75.00	10.00	
5	75 % EFFLUENT	14.400	87.00	75.00	10.00	
6	100 % EFFLUENT	17.700	118.50	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 2-16-11 **CLIENT** Arkansas Analytical

Purchase Order #: _____

SPECIES:	(Pimephales promelas)	Mysidopsis bahia	Cyprinodon variegates
Quantity Shipped:	720+ - 600+ 1500 ST		
Age:	24hrs 2/16 & 3 Days old 2/16		
Brood Stock Source:	Anderson Hays, AR		
Culture Water:	~~Groundwater~~	Artificial Salts	Artificial Salts
Hardness (Mg/l CaCO3)	160	**Salinity (ppt)**	
Dissolved Oxygen (Mg/1):	8.1		

Feeding: Artemia

Comments: 25.2°C

pH 7.6

DO ran

Shipped Via: Federal Express UPS Overnight (Suttle)

Packaged By: CC

Bill Hall Printers 3171

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

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

ORGANISM HISTORY

DATE: 6/22/09

SPECIES: *Ceriodaphnia dubia*

AGE: Variable

LIFE STAGE: Adult

HATCH DATE: Variable

BEGAN FEEDING: Immediately

FOOD: YTC, *Selenastrum* sp.

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

Comments:

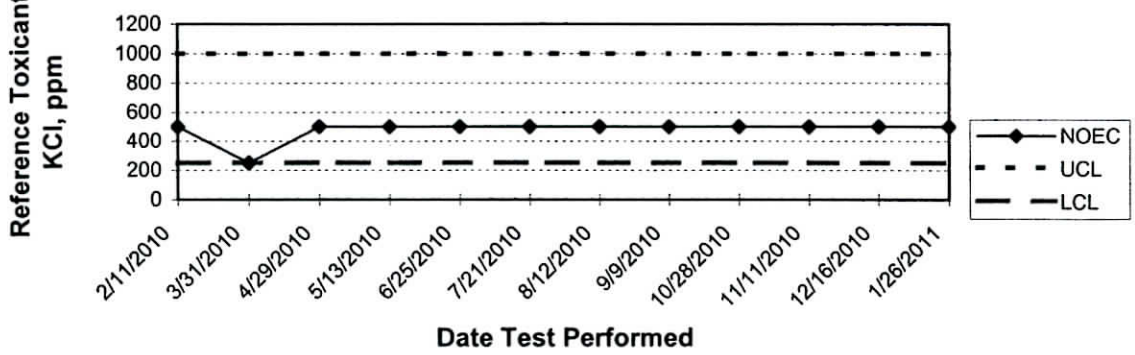
Facility Supervisor

APPENDIX F

Quality Assurance Charts

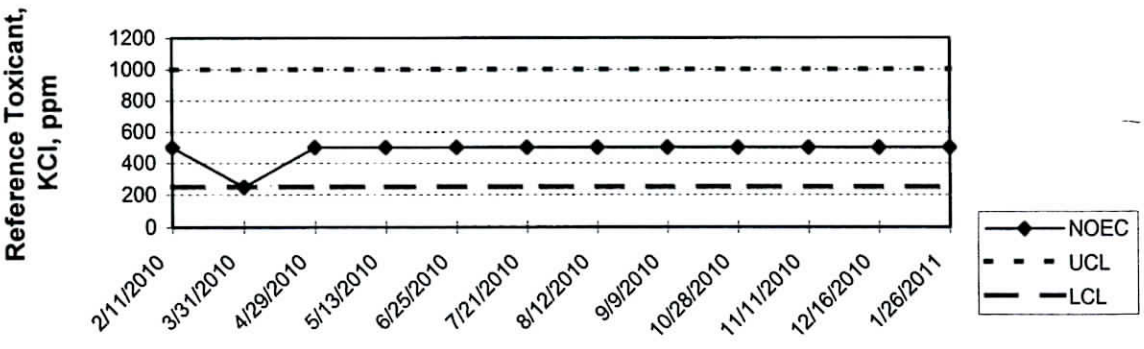
ARKANSAS ANALYTICAL, INC.

FATHEAD MINNOW SURVIVAL
QUALITY ASSURANCE



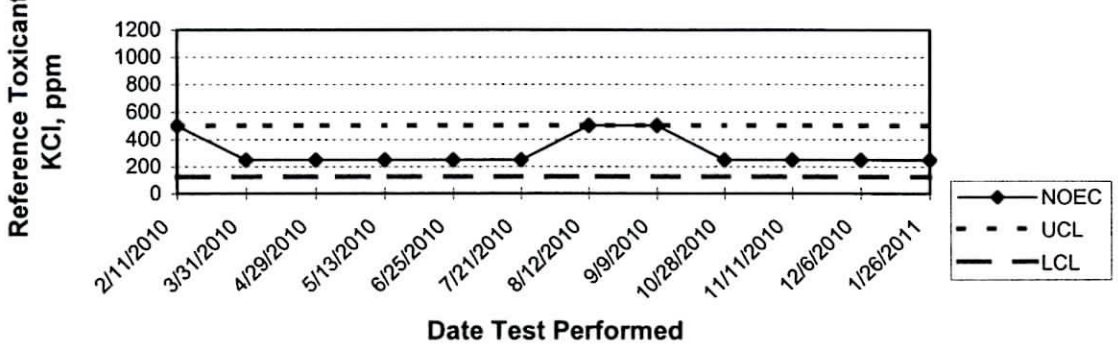
ARKANSAS ANALYTICAL, INC.

FATHEAD MINNOW GROWTH
QUALITY ASSURANCE



ARKANSAS ANALYTICAL, INC.

CERIODAPHNIA DUBIA SURVIVAL
QUALITY ASSURANCE



ARKANSAS ANALYTICAL, INC.

CERIODAPHNIA DUBIA REPRODUCTION
QUALITY ASSURANCE