

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



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

CHAIN OF CUSTODY RECORD

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

Bill McAlister
 Sampler(s) Signature

Bill McAlister
 Sampler(s) Printed

Field Number	SAMPLE COLLECTION		Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION	Chronic Biomonitoring	TEST PARAMETERS								Arkansas Analytical Work Order Number:	
	Date/s	Time/s																
FD-1 Composite	2-19-09	8:30 AM		X		W	Facility Discharge	X										K902010
																		A

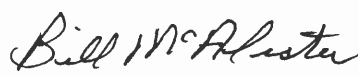

1. Relinquished by: (Signature)	Date/Time	2. Received by: (Signature)	SAMPLE CONDITION UPON RECEIPT IN LAB	REMARKS / SAMPLE COMMENTS
<i>Bill McAlister</i>	2-19-09 1457	<i>[Signature]</i>		
3. Relinquished by: (Signature)	Date/Time	4. Received by lab: (Signature)	1. CUSTODY SEALS: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
<i>[Signature]</i>		<i>Sydney James</i>	2. CONTAINERS CORRECT: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
			3. COC/LABELS AGREE: <input type="checkbox"/> Yes <input type="checkbox"/> No	
			4. PRESERVATION CONFIRMED: <input type="checkbox"/> Yes <input type="checkbox"/> No	
			5. RECEIVED ON ICE: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
			6. TEMPERATURE ON RECEIPT: -0.1°C	
			FOR COMPLETION BY LAB ONLY	





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

CHAIN OF CUSTODY RECORD

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

 Sampler(s) Signature		 Sampler(s) Printed					Chronic Biomonitoring	Bottle Type Code G = Glass; P = Plastic V = Septum; A = Amber Arkansas Analytical Work Order Number: K902010 C								
Field Number	SAMPLE COLLECTION Date/s Time/s		Grab	Comp	Number of Bottles	Sample Matrix						SAMPLE IDENTIFICATION/ DESCRIPTION				
FD2Comp	2/24/2008	9:15 AM		X	3	W						Facility Discharge FD-2				

1. Relinquished by: (Signature) 	Date/Time 2-24-09 1347	2. Received by: (Signature) 	SAMPLE CONDITION UPON RECEIPT IN LAB 1. CUSTODY SEALS: <input checked="" type="checkbox"/> Yes ___ No 2. CONTAINERS CORRECT: <input checked="" type="checkbox"/> Yes ___ No 3. COC/LABELS AGREE: <input checked="" type="checkbox"/> Yes ___ No 4. PRESERVATION CONFIRMED: <input checked="" type="checkbox"/> Yes ___ No 5. RECEIVED ON ICE: <input checked="" type="checkbox"/> Yes ___ No 6. TEMPERATURE ON RECEIPT: 3°C	REMARKS / SAMPLE COMMENTS
3. Relinquished by: (Signature)	Date/Time	4. Received by lab: (Signature) Sydney James		
FOR COMPLETION BY LAB ONLY				

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	85	85	79	83	
	FINAL	7.0	7.0	71	72	78	75	72	
pH (s.u.)	INITIAL	7.3	7.1	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>	<i>A</i>	<i>H</i>	<i>A</i>	<i>B</i>	<i>B</i>	<i>C</i>	<i>C</i>	
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
	REP #	start	1	2	3	4	5	6	7 %			
CONC: <u>2</u>	A	8	8	8	8	7	7	7	7	87.5	975	5.73
	B	↓	↓	↓	↓	↓	↓	↓	↓	100		
	C	↓	↓	↓	↓	↓	↓	↓	↓	100		
	D	↓	↓	↓	↓	↓	↓	↓	↓	100		
	E	↓	↓	↓	↓	↓	↓	↓	↓	100		
CONC: <u>32</u>	A	8	8	8	8	8	8	8	8	100	100	
	B	↓	↓	↓	↓	↓	↓	↓	↓	100		
	C	↓	↓	↓	↓	↓	↓	↓	↓	100		
	D	↓	↓	↓	↓	↓	↓	↓	↓	100		
	E	↓	↓	↓	↓	↓	↓	↓	↓	100		
CONC: <u>42</u>	A	8	8	8	8	8	8	8	8	100	975	
	B	↓	↓	↓	↓	↓	↓	↓	↓	87.5		
	C	↓	↓	↓	↓	↓	↓	↓	↓	100		
	D	↓	↓	↓	↓	↓	↓	↓	↓	100		
	E	↓	↓	↓	↓	↓	↓	↓	↓	100		
CONC: <u>56</u>	A	8	8	8	8	8	8	8	8	100	925	
	B	↓	↓	↓	↓	↓	↓	↓	↓	87.5		
	C	↓	↓	↓	↓	↓	↓	↓	↓	100		
	D	↓	↓	↓	↓	↓	↓	↓	↓	100		
	E	↓	↓	↓	↓	↓	↓	↓	↓	75		
CONC: <u>75</u>	A	8	8	8	8	8	8	8	8	100	975	
	B	↓	↓	↓	↓	↓	↓	↓	↓	100		
	C	↓	↓	↓	↓	↓	↓	↓	↓	100		
	D	↓	↓	↓	↓	↓	↓	↓	↓	100		
	E	↓	↓	↓	↓	↓	↓	↓	↓	87.5		
CONC: <u>100</u>	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	2		
	B	↓	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓	↓		
	E	↓	↓	↓	↓	↓	↓	↓	↓		
	REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV
B	CONC: A	2	2	2	2	2	2	2	2		
	B	↓	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓	↓		
	E	↓	↓	↓	↓	↓	↓	↓	↓		
	REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV
C	CONC: A	2	2	2	2	2	2	2	2		
	B	↓	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓	↓		
	E	↓	↓	↓	↓	↓	↓	↓	↓		
	REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV
D	CONC: A	2	2	2	2	2	2	2	2		
	B	↓	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓	↓		
	E	↓	↓	↓	↓	↓	↓	↓	↓		
	REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV
E	CONC: A	2	2	2	2	2	2	2	2		
	B	↓	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓	↓		
	E	↓	↓	↓	↓	↓	↓	↓	↓		
	REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV
	CONC: 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	1/2	1/2		
	B	↓	↓	↓	↓	↓	↓	2/2	2/2		
	C	↓	↓	↓	↓	↓	↓	2/2	2/2		
	D	↓	↓	↓	↓	↓	↓	2/2	2/2		
	E	↓	↓	↓	↓	↓	↓	2/2	2/2		
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	↓	↓	↓	↓	↓	↓	0/2	0/2		
	D	↓	↓	↓	↓	↓	↓	2/2	2/2		
	E	↓	↓	↓	↓	↓	↓	2/2	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		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

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: 32%	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: 42%	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: 56%	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: 75%	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: 100%	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:
