



Arkansas Analytical, Inc.

Toxicity Test Results

MAGCOBAR MINE SITE
NPDES PERMIT NUMBER: AR0049794
June 2004

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

Ceriodaphnia dubia, Survival and Reproduction Test
Test 1002.0

Prepared for: **Mr. Alan B. Brown**
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Magcobar Mine Site
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Malvern, AR 72104

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Wednesday, June 30, 2004

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 Quachita River in Segment 2F of the Ouachita River Basin.

The permit requires chronic biomonitoring testing once per month for both *Ceriodaphnia dubia* and *Pimephales promelas*. The test results in this report represent the testing for June of 2004.

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:	6-16-04, 1030	6-17-04, 1030
Sample #2:	6-17-04, 1100	6-18-04, 1100
Sample #3:	6-21-04, 0930	6-22-04, 0930

The sample was a composite 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	Storage Temperature (°C)
Sample #1:	6-17-04, 1624	4
Sample #2:	6-18-04, 1305	4
Sample #3:	6-22-04, 1150	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. There were no deviations from the reference method. The test chambers were 500 ml plastic cups, and each chamber contained ten organisms in a test solution volume of 250 mls. 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 < 48 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	90%	X	
Average of 15 or more young per surviving female	19.0	X	
At least 60% of surviving females should have produced 3 broods	70%	X	
The percent coefficient of variation between replicates must be 40% or less for the young of surviving females	23.2%	X	

TEST ACCEPTANCE CRITERIA for *Pimephales promelas*

Control Criteria	Results	Pass	Fail
Greater than or equal to 80% survival	100%	X	
The percent coefficient of variation between replicates must be 40% or less for survival	0%	X	
Minimum of 0.25 mg average dry weight of surviving controls	0.351	X	
The percent coefficient of variation between replicates must be 40% or less for growth	9.60%	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)	18.9	%CV survival (critical dilution)	0%
%CV Reproduction (critical dilution)	24.4%	Mean dry weight (critical dilution) in milligrams	0.568
		%CV growth (critical dilution)	16.5%

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, 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:


Melissa Green


Tracy Bounds

**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:	6-16-04, 1030	6-17-04, 1030
Sample #2:	6-17-04, 1100	6-18-04, 1100
Sample #3:	6-21-04, 0930	6-22-04, 0930

Test initiated (date, time): 6-18-04, 1700 Test terminated (date, time): 6-25-04, 1620

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%	100	100	100	100	100		100	100	100	0.00
32%	100	100	100	100	100		100	100	100	
42%	100	100	100	90	100		100	100	98	
56%	100	100	100	100	100		100	100	100	
75%	100	100	100	100	100		100	100	100	
100%	100	100	100	100	100		100	100	100	0.00

DATA TABLE FOR GROWTH OF FATHEAD MINNOWS

Effluent Conc %	Average Dry Weight in milligrams in replicate chambers						Mean Dry Weight	CV%
	A	B	C	D	E			
0%	0.337	0.303	0.353	0.374	0.390		0.351	9.60
32%	0.433	0.504	0.503	0.568	0.541		0.510	
42%	0.739	0.510	0.529	0.492	0.522		0.558	
56%	0.452	0.523	0.521	0.458	0.517		0.494	
75%	0.589	0.558	0.428	0.458	0.561		0.519	
100%	0.411	0.642	0.624	0.554	0.609		0.568	16.5

Coefficient of Variation = standard deviation / mean * 100

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

Pimephales promelas

1. Dunnett's procedure or Steel's Many-One Rank Test as appropriate:

Is the mean survival at 7 days significantly different ($p=0.05$) than the control survival for:

a) LOW FLOW OR CRITICAL DILUTION, (100%) YES _____ NO X_____

2. Dunnett's Procedure

Is the mean dry weight (growth) at 7 days significantly different ($p=0.05$) than the control's dry weight (growth) for:

a) LOW FLOW OR CRITICAL DILUTION, (100%) YES _____ NO X_____

3. If NO was answered to 1.a) enter [0] otherwise enter [1] (parameter TLP6C): _____ 0 _____

4. If NO was answered to 2.a) enter [0] otherwise enter [1] (parameter TGP6C): _____ 0 _____

5. Enter percentage corresponding to each parameter below:

a) NOEC survival (parameter TOP6C)= _____ 100 _____ % effluent

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

c) Coefficient of variation (parameter TQP6C)= _____ 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:	6-16-04, 1030	6-17-04, 1030
Sample #2:	6-17-04, 1100	6-18-04, 1100
Sample #3:	6-21-04, 0930	6-22-04, 0930

Test initiated (date, time): 6-18-04, 1630 Test terminated (date, time): 6-25-04, 0925

Dilution water used: Soft Synthetic

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

Replicate	0%	32%	42%	52%	75%	100%
A	20	17	26	25	21	14
B	17	6	24	22	16	17
C	25	23	41	15	10	19
D	16	22	18	17	26	26
E	18	37	23	24	16	12
F	18	31	17	28	23	22
G	25	7	34	23	X6	18
H	X8	20	26	22	17	26
I	21	17	22	23	14	18
J	11	18	27	29	13	17
Mean	17.9	19.8	25.8	22.8	16.2	18.9
Mean/surviving female	19.0	19.8	25.8	22.8	17.3	18.9
CV%*	23.2					24.4

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	90	100	100	100	90	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



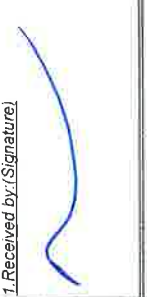

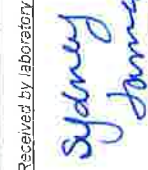
c) Coefficient of variation (parameter TQP3B)= 24.4 %



APPENDIX A

Chain of Custody Forms

CHAIN OF CUSTODY RECORD

CLIENT INFORMATION		Project Description		Turnaround Time (CIRCLE ONE)		Preservation Codes:		
Weston Solutions, Inc. P.O. Box 699 2000 Darby Lane Malvern, AR 72104 Attn: Alan Brown		MAGCOBAR Mine Site Reporting Information Telephone: 501/467-8355 FAX: 501/467-8687 Bill to P.O.		24 hour 48 hour <u>24 HOURS</u>		1. Cool, 4 degrees Centigrade 2. Sulfuric Acid, pH <2 3. Nitric Acid, pH <2 4. Thiourea for dechlorination 5. Hydrochloric Acid for VOA 6. Sodium Hydroxide, pH >12		
Samplers: (Signature/s)		Samplers: (Printed)		Preservative Codes:		Bottle Type		
		Darrel Scott		P Chronic Bio		C=glass, P=HDPE V=septum, A=amber		
Field Number	Sample Collection Date/s	Time/s	Grab	Comp	# of Containers	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION	Arkansas Analytical Lab #
FD0617COMP	6/17/2004	10:30	X	X	5		Facility Discharge	K406 439A
1. Relinquished by: (Signature)		Date/Time		1. Received by: (Signature)		REMARKS		
		6-17-04 15:24				Condition of samples: A. Containers Correct? <input checked="" type="checkbox"/> yes <input type="checkbox"/> no B. Preservation Correct? <input checked="" type="checkbox"/> yes <input type="checkbox"/> no C. Seals Intact? <input checked="" type="checkbox"/> yes <input type="checkbox"/> no		
2. Relinquished by: (Signature)		Date/Time		2. Received by laboratory: (Signature)				
		6-17-04, 1524						



APPENDIX B

Effluent and Dilution Water Data

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Fathead Minnow

Lab # / Sample ID		K406439		Test Start (Date/Time)		6-18-04 / 1700			
Client		Weston		Test End (Date/Time)		6-25-04 / 1620			
		Day of Test							notes/remarks
		1	2	3	4	5	6	7	
Control		6/18	6/19	6/20	6/21	6/22	6/23	6/24	6/18 SS 105
D.O (mg/L)	INITIAL	7.9	8.1	7.8	7.6	7.7	7.8	7.6	6/20 SS 106
	FINAL	6.9	7.2	7.3	7.4	7.6	7.3	6.3	
pH(mg/L)	INITIAL	6.9	7.2	7.4	7.3	7.2	7.3	7.3	
	FINAL	7.2	8.0	7.8	7.6	7.4	7.3	7.2	
temp(C)	INITIAL	22.2	21.2	21.0	21.7	22.0	22.1	22.2	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
ALKALINITY(mg/L)		30	→	25				→	
HARDNESS(mg/L)		42	→	38				→	
CONDUCTIVITY(umhos/cm)		170	→	149				→	
CHLORINE(mg/L)		40.05	→	40.05				→	
CONC:		32%	32%	32%	32%	32%	32%	32%	
D.O (mg/L)	INITIAL	7.7	7.8	8.1	7.76	7.7	7.8	7.6	
	FINAL	7.2	7.2	7.3	7.4	7.5	7.3	6.5	
pH(mg/L)	INITIAL	7.0	7.4	7.5	7.4	7.2	7.3	7.2	
	FINAL	7.1	7.7	7.8	7.6	7.4	7.3	7.1	
temp(C)	INITIAL	22.3	21.4	21.0	21.7	21.9	22.1	22.3	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
CONC:		42%	42%	42%	42%	42%	42%	42%	
D.O (mg/L)	INITIAL	7.8	7.8	8.1	7.7	7.6	7.9	7.7	
	FINAL	6.9	7.1	7.3	7.5	7.5	7.2	6.2	
pH(mg/L)	INITIAL	7.0	7.5	7.5	7.4	7.3	7.3	7.3	
	FINAL	7.1	7.7	7.7	7.7	7.4	7.4	7.1	
temp(C)	INITIAL	22.3	21.7	21.0	21.7	21.9	22.2	22.5	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
CONC:		56%	56%	56%	56%	56%	56%	56%	
D.O (mg/L)	INITIAL	7.8	7.9	8.2	7.7	7.7	7.9	7.7	
	FINAL	7.1	7.2	7.4	7.5	7.6	7.2	6.2	
pH(mg/L)	INITIAL	7.0	7.5	7.5	7.5	7.3	7.4	7.3	
	FINAL	7.1	7.7	7.7	7.7	7.5	7.4	7.0	
temp(C)	INITIAL	22.4	21.9	21.1	21.7	21.8	22.3	22.6	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
CONC:		75%	75%	75%	75%	75%	75%	75%	
D.O (mg/L)	INITIAL	8.0	8.2	8.2	7.8	7.6	7.9	7.8	
	FINAL	7.0	7.1	7.4	7.5	7.6	7.1	6.2	
pH(mg/L)	INITIAL	7.0	7.5	7.6	7.5	7.4	7.5	7.4	
	FINAL	7.1	7.6	7.8	7.8	7.5	7.6	7.0	
temp(C)	INITIAL	22.7	22.0	21.1	21.7	21.8	22.4	22.8	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
CONC:		100%	100%	100%	100%	100%	100%	100%	
D.O (mg/L)	INITIAL	8.9	8.3	8.1	7.8	7.6	8.0	7.8	
	FINAL	7.1	6.9	7.5	7.6	7.6	7.0	6.3	
pH(mg/L)	INITIAL	6.9	7.5	7.6	7.5	7.5	7.5	7.4	
	FINAL	7.1	7.6	7.8	7.7	7.5	7.5	6.9	
temp(C)	INITIAL	23.1	22.1	21.1	21.7	21.7	22.6	22.9	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
CONC:		100%	A	A	A	B	B	C	C
ALKALINITY(mg/L)		18	→	→	19	→	15	→	
HARDNESS(mg/L)		1420	→	→	1380	→	1500	→	
CONDUCTIVITY(umhos/cm)		2350	→	→	2350	→	2340	→	
CHLORINE(mg/L)		40.05	→	→	40.05	→	40.05	→	

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Ceriodaphnia dubia

Lab # / Sample ID		k406439		Test Start (Date/Time)		6-18-04/1625		Test End (Date/Time)		6-25-04/0925			
Client		Weston		Day of Test									
		1	2	3	4	5	6	7	8	notes/remarks			
Control		6/18	6/19	6/20	6/21	6/22	6/23	6/24		SS 105			
D.O (mg/L)	INITIAL	7.9	8.1	7.8	7.6	7.7	7.8	7.6		6/20 SS 105			
	FINAL	7.7	8.1	7.6	7.4	6.7	7.0	6.8					
pH	INITIAL	6.9	7.2	7.4	7.3	7.2	7.3	7.3					
	FINAL	6.9	7.0	7.1	7.0	7.1	7.2	7.0					
temp(C)	INITIAL	22.2	21.2	21.0	21.7	22.0	22.1	22.2					
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0					
ALKALINITY(mg/L)		30	→	25				→					
HARDNESS(mg/L)		42	→	38				→					
CONDUCTIVITY(umhos/cm)		170	→	149				→					
CHLORINE(mg/L)		<0.05	→	<0.05				→					
CONC:		32%	32%	32%	32%	32%	32%	32%					
D.O (mg/L)	INITIAL	7.7	7.8	8.1	7.6	7.7	7.8	7.6					
	FINAL	7.7	7.8	7.6	7.4	6.6	7.1	6.8					
pH	INITIAL	7.0	7.4	7.5	7.4	7.2	7.3	7.2					
	FINAL	6.8	6.9	7.1	7.0	7.1	7.2	7.0					
temp(C)	INITIAL	22.3	21.4	21.0	21.7	21.9	22.1	22.3					
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0					
CONC:		42%	42%	42%	42%	42%	42%	42%					
D.O (mg/L)	INITIAL	7.8	7.8	8.1	7.7	7.6	7.9	7.7					
	FINAL	7.6	7.6	7.6	7.5	6.6	7.1	6.8					
pH	INITIAL	7.0	7.5	7.5	7.4	7.3	7.3	7.3					
	FINAL	6.9	7.0	7.0	6.9	6.8	7.2	7.1					
temp(C)	INITIAL	22.3	21.7	21.0	21.7	21.9	22.2	22.5					
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0					
CONC:		56%	56%	56%	56%	56%	56%	56%					
D.O (mg/L)	INITIAL	7.8	7.9	8.2	7.7	7.7	7.9	7.7					
	FINAL	7.7	7.7	7.5	7.5	6.6	7.2	6.8					
pH	INITIAL	7.0	7.5	7.5	7.5	7.3	7.4	7.3					
	FINAL	6.9	7.1	7.0	6.9	6.8	7.1	7.1					
temp(C)	INITIAL	22.4	21.9	21.1	21.7	21.8	22.3	22.6					
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0					
CONC:		75%	75%	75%	75%	75%	75%	75%					
D.O (mg/L)	INITIAL	8.0	8.2	8.2	7.8	7.6	7.9	7.8					
	FINAL	7.5	7.7	7.5	7.4	6.7	7.2	6.8					
pH	INITIAL	7.0	7.5	7.6	7.5	7.4	7.5	7.4					
	FINAL	7.0	7.1	7.0	7.0	6.7	7.0	7.0					
temp(C)	INITIAL	22.7	22.0	21.1	21.7	21.8	22.4	22.8					
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0					
CONC:		100%	100%	100%	100%	100%	100%	100%					
D.O (mg/L)	INITIAL	8.9	8.3	8.1	7.8	7.6	8.0	7.8					
	FINAL	7.6	7.7	7.5	7.5	6.7	7.2	6.8					
pH	INITIAL	6.9	7.5	7.6	7.5	7.5	7.5	7.4					
	FINAL	7.0	7.2	7.0	7.0	6.6	7.0	7.0					
temp(C)	INITIAL	23.1	22.1	21.1	21.7	21.7	22.6	22.9					
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0					
CONC: 100%		A	A	A	B	B	C	C					
ALKALINITY (mg/L)		18		→	19	→	15	→					
HARDNESS(mg/L)		1420		→	1380	→	1500	→					
CONDUCTIVITY(umhos/cm)		2350		→	2350	→	2340	→					
CHLORINE(mg/L)		<0.05		→	<0.05	→	<0.05	→					



APPENDIX C

Fathead Minnow Raw Data and Statistics

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB #/S: <u>K106439</u>		TEST DATES (BEGIN/END): <u>6-18-04/6-25-04</u>
CLIENT: <u>Weston</u>		WEIGHING DATE/TIME: <u>6-28-04/1530</u>
ANALYST/S: <u>mg, AF</u>		DRYING TEMPERATURE (DEGREES C): <u>60°C</u>
SAMPLE ID:		DRYING TIME (HOURS): <u>24 hrs.</u>

	REP #	FINAL DRY WEIGHT TIN+LARVAE (g)	INITIAL WEIGHT TIN (g)	TOTAL DRY WEIGHT OF LARVAE (g)	NUMBER OF LARVAE	DRY WEIGHT OF LARVA (mg)		REMARKS
CONTROL	A 1	0.96383	0.96046	0.00337	10	0.337	AVG DRY	
	B 2	0.96780	0.96477	0.00303	10	0.303	WEIGHT (mg)	
	C 3	0.95913	0.95560	0.00353	10	0.353	0.351	
	D 4	0.95723	0.95349	0.00374	10	0.374	CV	
	E 5	0.96369	0.95979	0.00390	10	0.390	9.60%	
CONC: 32%	A 6	0.96524	0.96091	0.00433	10	0.433	AVG DRY	
	B 7	0.97243	0.96739	0.00504	10	0.504	WEIGHT (MG)	
	C 8	0.96857	0.96354	0.00503	10	0.503	0.510	
	D 9	0.97089	0.96521	0.00568	10	0.568	CV	
	E 10	0.96856	0.96315	0.00541	10	0.541		
CONC: 42%	A 11	0.96412	0.95673	0.00739	10	0.739	AVG DRY	
	B 12	0.95240	0.94730	0.00510	10	0.510	WEIGHT (MG)	
	C 13	0.96421	0.95892	0.00529	10	0.529	0.558	
	D 14	0.95581	0.95089	0.00492	10	0.492	CV	
	E 15	0.95593	0.95071	0.00522	10	0.522		
CONC: 56%	A 16	0.95466	0.945014	0.00452	10	0.452	AVG DRY	
	B 17	0.95964	0.95441	0.00523	10	0.523	WEIGHT (MG)	
	C 18	0.96402	0.95881	0.00521	10	0.521	0.494	
	D 19	0.95517	0.95059	0.00458	10	0.458	CV	
	E 20	0.95281	0.94764	0.00517	10	0.517		
CONC: 75%	A 21	0.95416	0.94827	0.00589	10	0.589	AVG DRY	
	B 22	0.96347	0.95789	0.00558	10	0.558	WEIGHT (MG)	
	C 23	0.95420	0.94992	0.00428	10	0.428	0.519	
	D 24	0.95345	0.94887	0.00458	10	0.458	CV	
	E 25	0.95724	0.95183	0.00561	10	0.561		
CONC: 100%	A 26	0.96454	0.96043	0.00411	10	0.411	AVG DRY	
	B 27	0.97149	0.964507	0.00642	10	0.642	WEIGHT (MG)	
	C 28	0.97377	0.96753	0.00624	10	0.624	0.568	
	D 29	0.95976	0.95422	0.00554	10	0.554	CV	
	E 30	0.96479	0.95870	0.00609	10	0.609	16.5%	

CV = (STANDARD DEVIATION/MEAN)*100

AA# K406439 FATHEAD MINNOW SURVIVAL, 6-18-04
File: k406439s Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.021

W = 0.416

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# K406439 FATHEAD MINNOW SURVIVAL, 6-18-04
File: k406439s 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# K406439 FATHEAD MINNOW SURVIVAL, 6-18-04
FILE: k406439s
TRANSFORM: ARC SINE(SQUARE ROOT(Y))

NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	1.0000	1.4120
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	1.0000	1.4120
3	42 % EFFLUENT	3	1.0000	1.4120
3	42 % EFFLUENT	4	0.9000	1.2490
3	42 % EFFLUENT	5	1.0000	1.4120
4	56 % EFFLUENT	1	1.0000	1.4120
4	56 % EFFLUENT	2	1.0000	1.4120
4	56 % EFFLUENT	3	1.0000	1.4120
4	56 % EFFLUENT	4	1.0000	1.4120
4	56 % EFFLUENT	5	1.0000	1.4120
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	1.0000	1.4120
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	1.0000	1.4120
6	100 % EFFLUENT	5	1.0000	1.4120

AA# K406439 FATHEAD MINNOW SURVIVAL, 6-18-04
 File: k406439s 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	1.412				
2	32 % EFFLUENT	1.412	27.50	16.00	5.00	
3	42 % EFFLUENT	1.379	25.00	16.00	5.00	
4	56 % EFFLUENT	1.412	27.50	16.00	5.00	
5	75 % EFFLUENT	1.412	27.50	16.00	5.00	
6	100 % EFFLUENT	1.412	27.50	16.00	5.00	

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

AA # K406439, FATHEAD MINNOW GROWTH, 6-18-04
File: k406439g Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

D = 0.117

W = 0.969

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 # K406439, FATHEAD MINNOW GROWTH, 6-18-04
File: k406439g Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 7.42

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 # K406439, FATHEAD MINNOW GROWTH, 6-18-04

FILE: k406439g

TRANSFORM: NO TRANSFORMATION

NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.3370	0.3370
1	CONTROL	2	0.3030	0.3030
1	CONTROL	3	0.3530	0.3530
1	CONTROL	4	0.3740	0.3740
1	CONTROL	5	0.3900	0.3900
2	32 % EFFLUENT	1	0.4330	0.4330
2	32 % EFFLUENT	2	0.5040	0.5040
2	32 % EFFLUENT	3	0.5030	0.5030
2	32 % EFFLUENT	4	0.5680	0.5680
2	32 % EFFLUENT	5	0.5410	0.5410
3	42 % EFFLUENT	1	0.7390	0.7390
3	42 % EFFLUENT	2	0.5100	0.5100
3	42 % EFFLUENT	3	0.5290	0.5290
3	42 % EFFLUENT	4	0.4920	0.4920
3	42 % EFFLUENT	5	0.5220	0.5220
4	56 % EFFLUENT	1	0.4520	0.4520
4	56 % EFFLUENT	2	0.5230	0.5230
4	56 % EFFLUENT	3	0.5210	0.5210
4	56 % EFFLUENT	4	0.4580	0.4580
4	56 % EFFLUENT	5	0.5170	0.5170
5	75 % EFFLUENT	1	0.5890	0.5890
5	75 % EFFLUENT	2	0.5580	0.5580
5	75 % EFFLUENT	3	0.4280	0.4280
5	75 % EFFLUENT	4	0.4580	0.4580
5	75 % EFFLUENT	5	0.5610	0.5610
6	100 % EFFLUENT	1	0.4110	0.4110
6	100 % EFFLUENT	2	0.6420	0.6420
6	100 % EFFLUENT	3	0.6240	0.6240
6	100 % EFFLUENT	4	0.5540	0.5540
6	100 % EFFLUENT	5	0.6090	0.6090

AA # K406439, FATHEAD MINNOW GROWTH, 6-18-04
File: k406439g Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.153	0.031	6.280
Within (Error)	24	0.117	0.005	
Total	29	0.270		

Critical F value = 2.62 (0.05,5,24)
Since $F > \text{Critical } F$ REJECT H_0 : All equal

AA # K406439, FATHEAD MINNOW GROWTH, 6-18-04
 File: k406439g 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	0.351	0.351		
2	32 % EFFLUENT	0.510	0.510	-3.588	
3	42 % EFFLUENT	0.558	0.558	-4.689	
4	56 % EFFLUENT	0.494	0.494	-3.235	
5	75 % EFFLUENT	0.519	0.519	-3.792	
6	100 % EFFLUENT	0.568	0.568	-4.906	

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

AA # K406439, FATHEAD MINNOW GROWTH, 6-18-04
 File: k406439g 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	0.104	29.6	-0.158
3	42 % EFFLUENT	5	0.104	29.6	-0.207
4	56 % EFFLUENT	5	0.104	29.6	-0.143
5	75 % EFFLUENT	5	0.104	29.6	-0.167
6	100 % EFFLUENT	5	0.104	29.6	-0.217

APPENDIX D

Ceriodaphnia dubia Raw Data and Statistics

Ceriodaphnia dubia

SURVIVAL AND REPRODUCTION TEST

Discharger: Weston
 Location: W406439
 Date Sample Collected: See Log

Analyst: mg, hb
 Test Start-Date/Time: 6-18-04/1030
 Test Stop-Date/Time: 6-25-04/1025

Conc 1	Day	Replicate										No. of		Analyst	
		A	B	C	D	E	F	G	H	I	J	Young	Adult		
%	1	0	0	0	0	0	0	0	0	0	0	0	10	0	hb
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	hb
	3	0	0	0	0	0	0	0	0	0	0	0	10	0	mg
	4	4	3	4	4	0	4	5	2	4	1	31	10	3.1	mg
	5	4	5	8	0	8	5	0	2	10	0	42	10	4.2	mg
	6	0	9	0	5	0	8	12	X	4	0	38	9	3.8	mg
	7	12	0	13	7	10	1	8	-	7	10	68	9	7.6	mg
	8														
	Total	20	17	25	10	18	25	X	8	21	11	179	X=19.0	CV=23.2%	

Conc 4	Day	Replicate										No. of		Analyst	
		A	B	C	D	E	F	G	H	I	J	Young	Adult		
%	1	0	0	0	0	0	0	0	0	0	0	0	10	0	hb
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	hb
	3	3	0	0	0	0	4	0	0	0	0	7	10	0.7	mg
	4	0	0	0	0	3	0	3	3	5	1	15	10	1.5	mg
	5	8	8	7	6	9	9	6	0	12	7	74	10	7.4	mg
	6	12	9	8	6	2	13	0	13	10	14	87	10	8.7	mg
	7	2	5	0	5	10	2	11	0	8	2	45	10	4.5	mg
	8														
	Total	25	22	15	17	24	28	23	22	23	22	228			

Conc 2	Day	Replicate										No. of		Analyst	
		A	B	C	D	E	F	G	H	I	J	Young	Adult		
%	1	0	0	0	0	0	0	0	0	0	0	0	10	0	hb
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	hb
	3	0	0	4	4	6	2	0	0	3	0	19	10	1.9	mg
	4	4	0	0	0	7	0	3	0	7	2	21	10	2.1	mg
	5	5	0	7	8	10	2	0	7	6	4	49	10	4.9	mg
	6	1	1	12	10	10	13	5	10	7	0	69	10	6.9	mg
	7	7	5	0	0	11	7	2	0	1	7	40	10	4.0	mg
	8														
	Total	17	6	23	22	37	31	7	20	17	18	198			

Conc 5	Day	Replicate										No. of		Analyst	
		A	B	C	D	E	F	G	H	I	J	Young	Adult		
%	1	0	0	0	0	0	0	0	0	0	0	0	10	0	hb
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	hb
	3	3	0	0	0	0	0	3	0	0	0	6	10	0.6	mg
	4	0	0	0	4	0	4	0	0	0	2	10	10	1.0	mg
	5	6	9	3	11	4	9	3	6	3	2	56	10	5.6	mg
	6	12	0	2	1	4	10	X	0	11	9	60	9	6.0	mg
	7	0	7	5	10	8	0	-	0	0	0	30	9	3.3	mg
	8														
	Total	21	16	10	26	16	23	X	6	17	14	162			

Conc 3	Day	Replicate										No. of		Analyst	
		A	B	C	D	E	F	G	H	I	J	Young	Adult		
%	1	0	0	0	0	0	0	0	0	0	0	0	10	0	hb
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	hb
	3	0	4	3	0	0	0	3	0	0	0	13	10	1.3	mg
	4	4	0	9	4	2	4	0	0	7	7	37	10	3.7	mg
	5	8	6	0	7	8	0	9	10	0	0	48	10	4.8	mg
	6	5	14	16	0	13	6	15	12	8	11	100	10	10.0	mg
	7	9	0	13	7	0	7	7	1	7	9	60	10	6.0	mg
	8														
	Total	26	24	41	18	23	17	34	20	22	21	258			

Conc 6	Day	Replicate										No. of		Analyst	
		A	B	C	D	E	F	G	H	I	J	Young	Adult		
%	1	0	0	0	0	0	0	0	0	0	0	0	10	0	hb
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	hb
	3	0	0	0	0	0	0	0	0	0	0	0	10	0	mg
	4	0	3	0	5	0	1	3	7	0	2	20	10	2.0	mg
	5	3	0	7	0	4	7	3	9	0	4	37	10	3.7	mg
	6	7	8	6	11	0	14	5	14	0	9	74	10	7.4	mg
	7	4	6	6	10	8	0	9	0	11	4	58	10	5.8	mg
	8														
	Total	14	17	19	20	12	22	18	26	18	17	189	X=18.9	CV=24.4%	

X=DEAD; Y=MALE

FISHER'S EXACT TEST

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

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

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	DEAD	ALIVE	TOTAL ANIMALS
CONTROL	1	9	10
42% effluent	0	10	10
TOTAL	1	19	20

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

FISHER'S EXACT TEST

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

TOTAL 1 19 20

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

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	9	1	10
75% effluent	9	1	10
TOTAL	18	2	20

CRITICAL FISHER'S VALUE (10,10,9) (p=0.05) IS 4. b VALUE IS 9.
Since b is greater than 4 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	1	9	10
100% effluent	0	10	10
TOTAL	1	19	20

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

SUMMARY OF FISHER'S EXACT TESTS

GROUP	IDENTIFICATION	NUMBER EXPOSED	NUMBER DEAD	SIG (P=.05)
	CONTROL	10	1	

1	32% effluent	10	0
2	42% effluent	10	0
3	56% effluent	10	0
4	75% effluent	10	1
5	100% effluent	10	0

AA# K406439, CERIODAPHNIA REPRODUCTION, 6-18-04
File: k406439c 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# K406439, CERIODAPHNIA REPRODUCTION, 6-18-04
File: k406439c Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 7.88

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# K406439, CERIODAPHNIA REPRODUCTION, 6-18-04
 FILE: k406439c
 TRANSFORM: NO TRANSFORMATION

NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	20.0000	20.0000
1	CONTROL	2	17.0000	17.0000
1	CONTROL	3	25.0000	25.0000
1	CONTROL	4	16.0000	16.0000
1	CONTROL	5	18.0000	18.0000
1	CONTROL	6	18.0000	18.0000
1	CONTROL	7	25.0000	25.0000
1	CONTROL	8	8.0000	8.0000
1	CONTROL	9	21.0000	21.0000
1	CONTROL	10	11.0000	11.0000
2	32 % EFFLUENT	1	17.0000	17.0000
2	32 % EFFLUENT	2	6.0000	6.0000
2	32 % EFFLUENT	3	23.0000	23.0000
2	32 % EFFLUENT	4	22.0000	22.0000
2	32 % EFFLUENT	5	37.0000	37.0000
2	32 % EFFLUENT	6	31.0000	31.0000
2	32 % EFFLUENT	7	7.0000	7.0000
2	32 % EFFLUENT	8	20.0000	20.0000
2	32 % EFFLUENT	9	17.0000	17.0000
2	32 % EFFLUENT	10	18.0000	18.0000
3	42 % EFFLUENT	1	26.0000	26.0000
3	42 % EFFLUENT	2	24.0000	24.0000
3	42 % EFFLUENT	3	41.0000	41.0000
3	42 % EFFLUENT	4	18.0000	18.0000
3	42 % EFFLUENT	5	23.0000	23.0000
3	42 % EFFLUENT	6	17.0000	17.0000
3	42 % EFFLUENT	7	34.0000	34.0000
3	42 % EFFLUENT	8	26.0000	26.0000
3	42 % EFFLUENT	9	22.0000	22.0000
3	42 % EFFLUENT	10	27.0000	27.0000
4	56 % EFFLUENT	1	25.0000	25.0000
4	56 % EFFLUENT	2	22.0000	22.0000
4	56 % EFFLUENT	3	15.0000	15.0000
4	56 % EFFLUENT	4	17.0000	17.0000
4	56 % EFFLUENT	5	24.0000	24.0000
4	56 % EFFLUENT	6	28.0000	28.0000
4	56 % EFFLUENT	7	23.0000	23.0000
4	56 % EFFLUENT	8	22.0000	22.0000
4	56 % EFFLUENT	9	23.0000	23.0000
4	56 % EFFLUENT	10	29.0000	29.0000
5	75 % EFFLUENT	1	21.0000	21.0000
5	75 % EFFLUENT	2	16.0000	16.0000
5	75 % EFFLUENT	3	10.0000	10.0000
5	75 % EFFLUENT	4	26.0000	26.0000
5	75 % EFFLUENT	5	16.0000	16.0000
5	75 % EFFLUENT	6	23.0000	23.0000
5	75 % EFFLUENT	7	6.0000	6.0000
5	75 % EFFLUENT	8	17.0000	17.0000
5	75 % EFFLUENT	9	14.0000	14.0000

5	75	%	EFFLUENT	10	13.0000	13.0000
6	100	%	EFFLUENT	1	14.0000	14.0000
6	100	%	EFFLUENT	2	17.0000	17.0000
6	100	%	EFFLUENT	3	19.0000	19.0000
6	100	%	EFFLUENT	4	26.0000	26.0000
6	100	%	EFFLUENT	5	12.0000	12.0000
6	100	%	EFFLUENT	6	22.0000	22.0000
6	100	%	EFFLUENT	7	18.0000	18.0000
6	100	%	EFFLUENT	8	26.0000	26.0000
6	100	%	EFFLUENT	9	18.0000	18.0000
6	100	%	EFFLUENT	10	17.0000	17.0000

AA# K406439, CERIODAPHNIA REPRODUCTION, 6-18-04
 File: k406439c Transform: NO TRANSFORMATION

STEEL'S MANY-ONE RANK TEST

Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	17.900				
2	32 % EFFLUENT	19.800	109.50	75.00	10.00	
3	42 % EFFLUENT	25.800	137.50	75.00	10.00	
4	56 % EFFLUENT	22.800	129.50	75.00	10.00	
5	75 % EFFLUENT	16.200	94.00	75.00	10.00	
6	100 % EFFLUENT	18.900	110.00	75.00	10.00	

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



APPENDIX E

Organism History

AQUATOX, INC.

100 Springwood Drive #15
Hot Springs, Arkansas 71913
(501) 767-9120

TEST ORGANISM HISTORY

DATE SHIPPED 6-17-04 Arkansas Analytical

SPECIES Pimephales promelas

QUANTITY SHIPPED 300+

AGE/LIFE STAGE 424 hrs 6/17 SEQUEST

BROODSTOCK SOURCE Anderson Farms, AZ

CULTURE WATER groundwater

ALKALINITY (Mg/l as CaCO₃) =180

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

FEEDING ARTIFICIAL

COMMENTS _____

PACKAGED BY MLL

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: 1/17/01

SPECIES: Ceriodaphnia dubia

AGE: Variable

LIFE STAGE: Adult

HATCH DATE: Variable

BEGAN FEEDING: Immediately

FOOD: YTC, Selenastrum

Water Chemistry Record:

	Mean	Range
TEMPERATURE:	<u>24 °C</u>	<u>21-24°C</u>
SALINITY/CONDUCTIVITY:	<u>--</u>	<u>--</u>
TOTAL HARDNESS (as CaCO ₃):	<u>112 mg/l</u>	<u>90-124 mg/l</u>
TOTAL ALKALINITY (as CaCO ₃):	<u>85 mg/l</u>	<u>50-85 mg/l</u>
pH:	<u>8.09</u>	<u>7.68-8.14</u>

Comments:



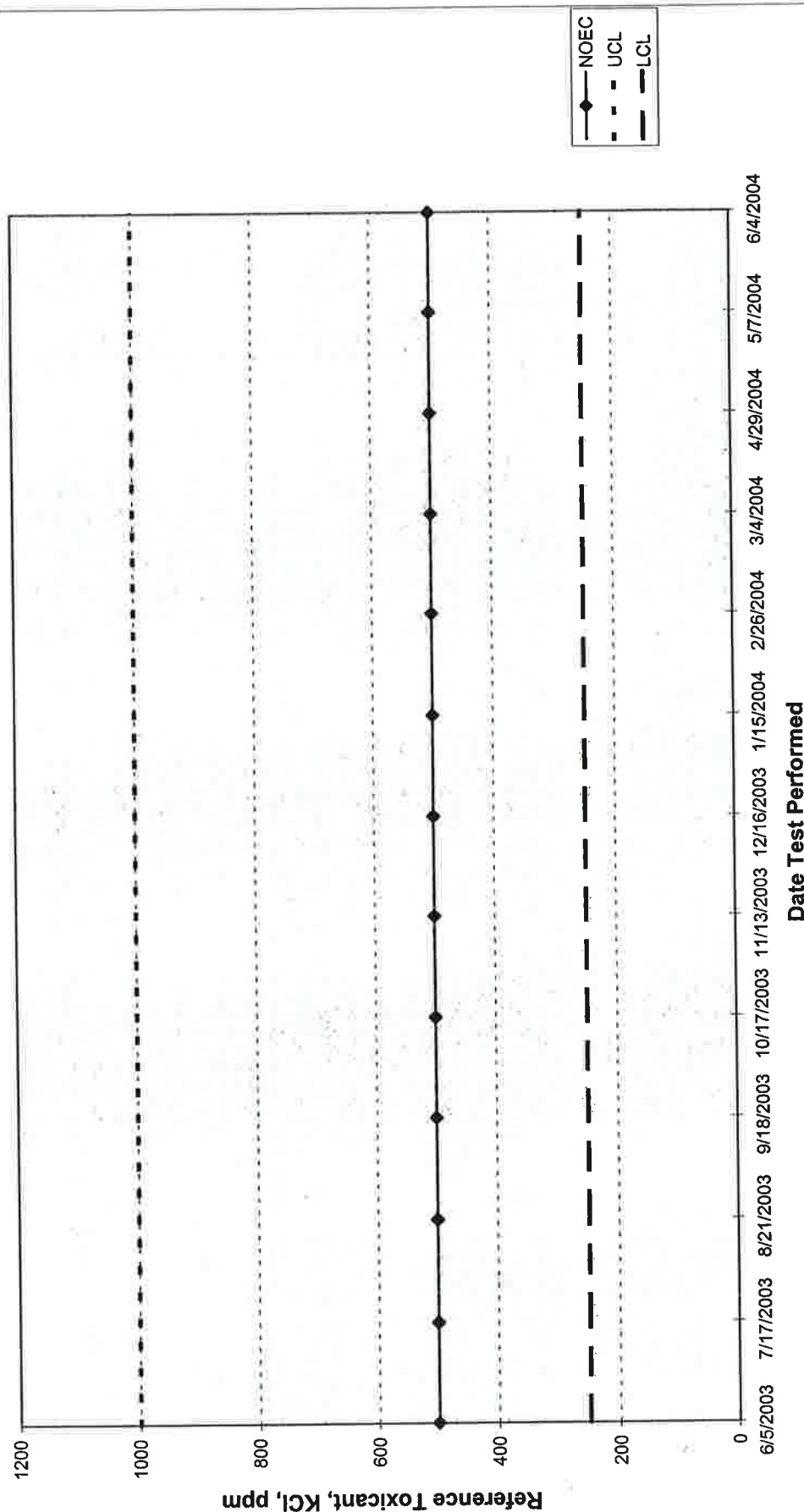
Facility Supervisor



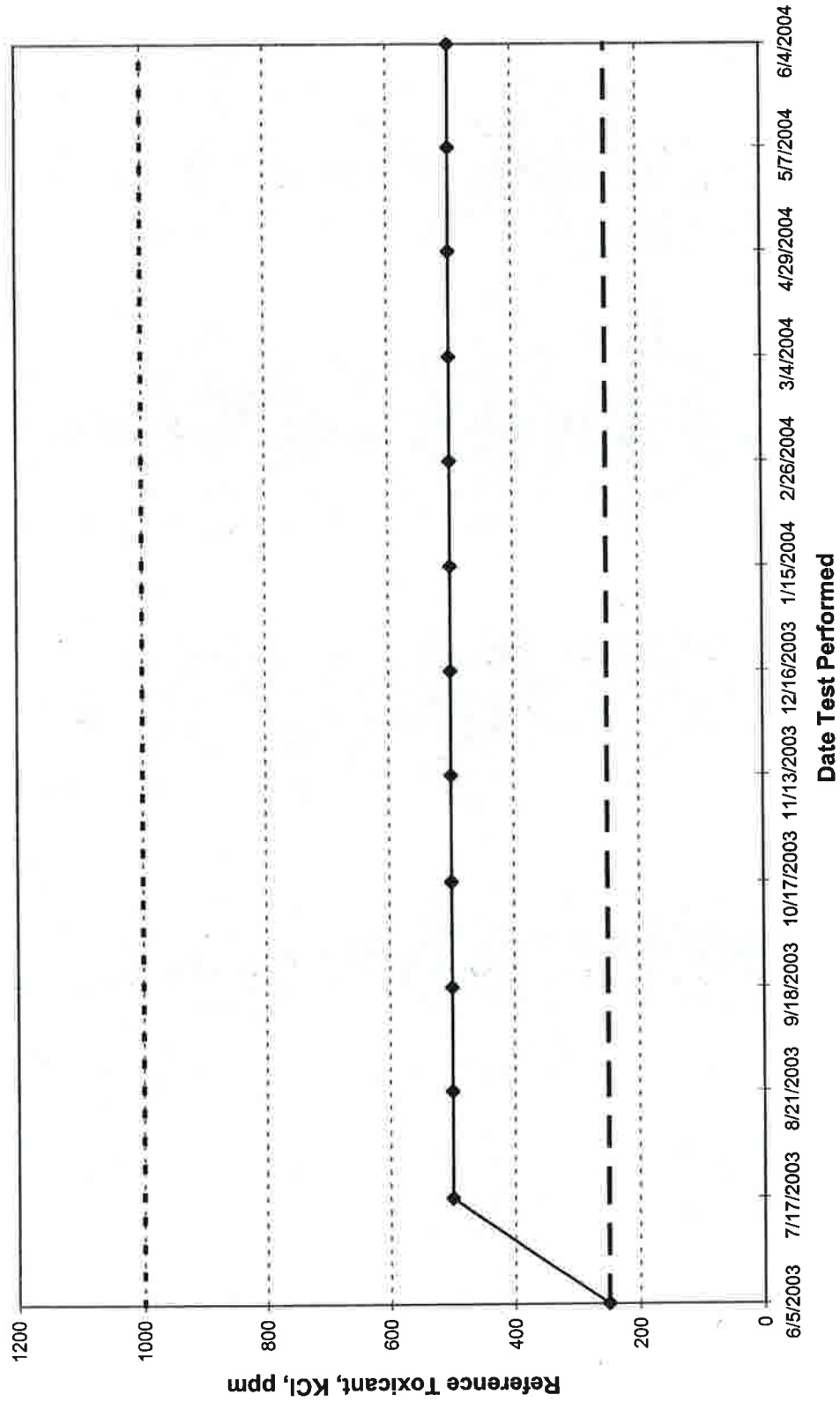
APPENDIX F

Quality Assurance Charts

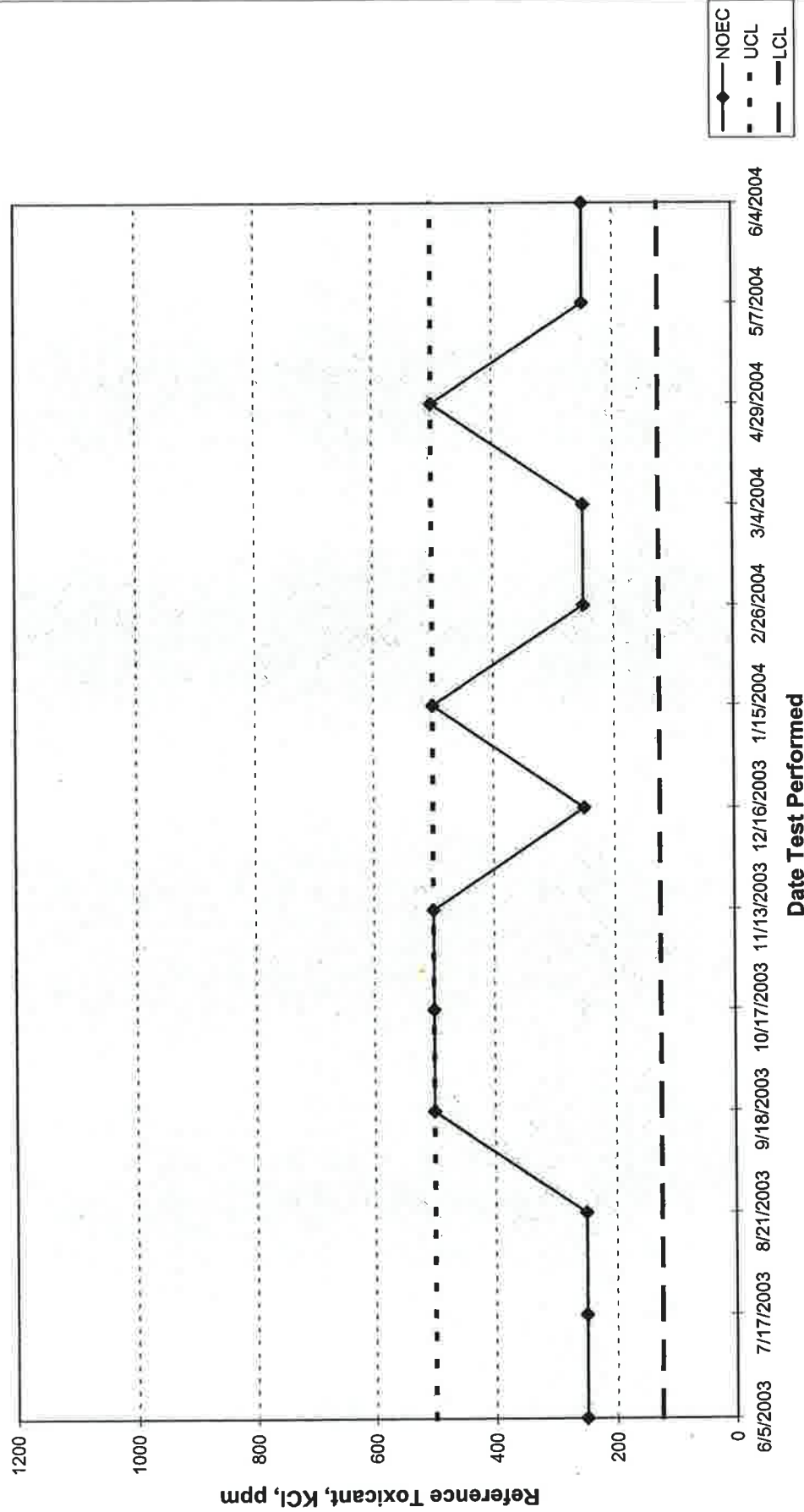
ARKANSAS ANALYTICAL, INC.
FATHEAD MINNOW SURVIVAL
QUALITY ASSURANCE



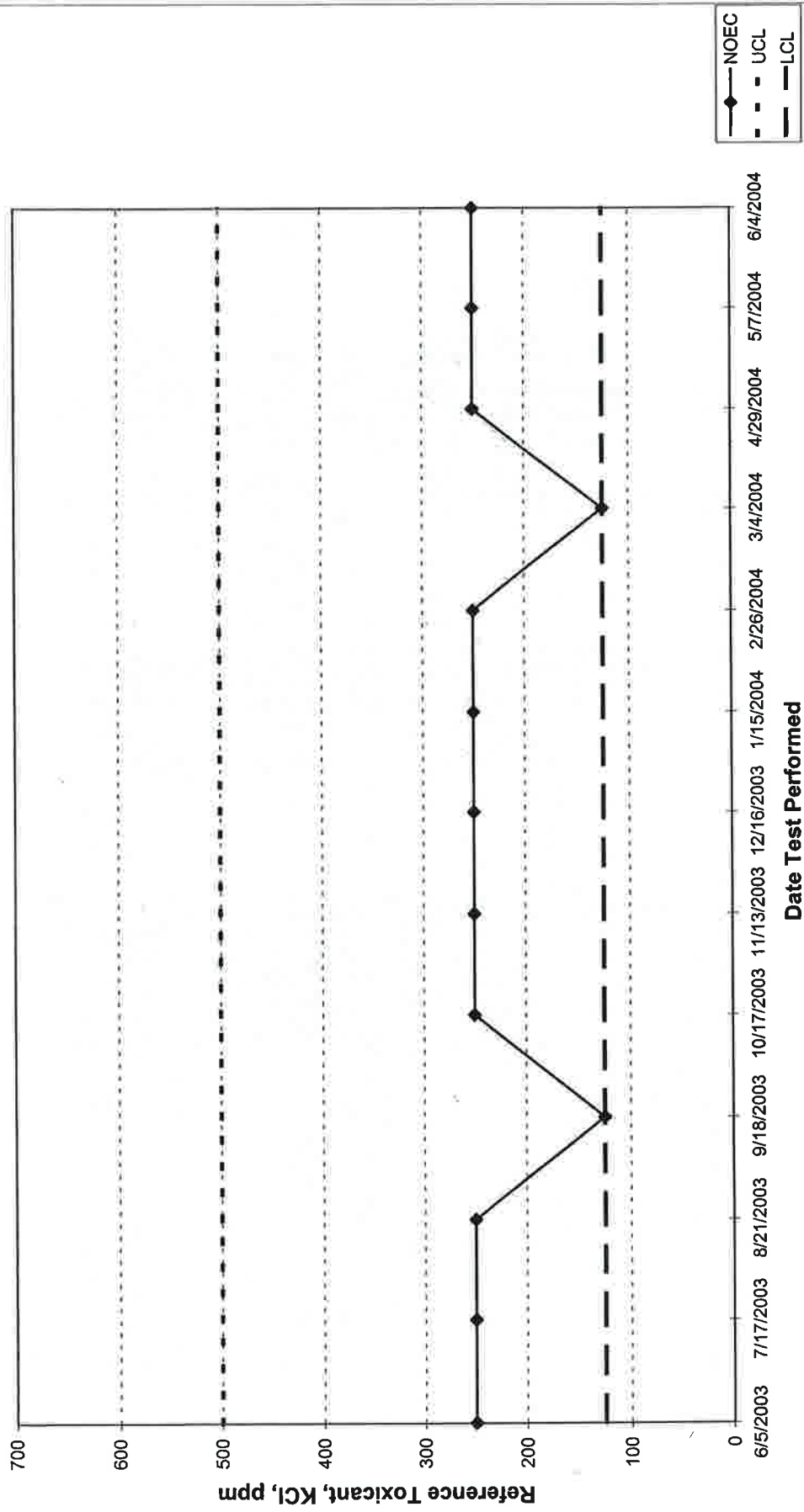
ARKANSAS ANALYTICAL, INC.
FATHEAD MINNOW GROWTH
QUALITY ASSURANCE



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



Be it known that **Arkansas Analytical, Inc**
Little Rock, Arkansas
has earned certification by this Department for the period of
October 30, 2003 to October 30, 2004

Laboratory ID # 60-1754

Certificate # 03-079-0

The following parameters are certified:

Alkalinity
Ammonia
BOD
Bromide
CBOD
Chloride
Chlorine
COD
Conductivity
Cyanide
Fluoride
Hardness
Nitrate
Nitrite

Oil & Grease
Orthophosphate
Perchlorate
pH
Phenol
Sulfate
Sulfide
Surfactants
TDS
TKN
TOC
Total Phosphorus
Total Solids
TSS

Turbidity
Aluminum
Antimony
Arsenic
Barium
Beryllium
Boron
Cadmium
Calcium
Chromium
Cobalt
Copper
Hex. Chromium
Iron

Lead
Magnesium
Manganese
Mercury
Molybdenum
Nickel
Potassium
Selenium
Silver
Sodium
Strontium
Thallium
Tin
Titanium
Vanadium
Zinc
Herbicides
Pesticides & PCBs
Semi-volatiles
TPHC
Volatile Organics
Fecal Coliform
Acute Toxicity
Chronic Toxicity

October 24, 2003

Date

J. Sembrski

Quality Assurance Officer

ARKANSAS ANALYTICAL, INCORPORATED

11701 I-30, BUILDING 1, SUITE 115
LITTLE ROCK, AR 72209

Laboratory Control Number: K406439 Date: 6-30-04

Client: Weston Sample ID: MAGCOBAR Mine Site

Pass Fail

Fathead Minnow Survival Test ✓

Fathead Minnow Growth Test ✓

Ceriodaphnia dubia Survival Test ✓

Ceriodaphnia dubia Reproduction Test ✓ Analyst Initials MA