



Arkansas Analytical, Inc.

Toxicity Test Results

MAGCOBAR MINE SITE
NPDES PERMIT NUMBER: AR0049794
July 2003

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**
Weston Solutions
Magcobar Mine Site
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Tuesday, August 12, 2003

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 July of 2003.

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:	7-23-03, 1500	7-24-03, 1500
Sample #2:	7-24-03, 1445	7-25-03, 1445
Sample #3:	7-28-03, 1045	7-29-03, 1045

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	Temperature (°C)
Sample #1:	7-24-03, 1559	3
Sample #2:	7-25-03, 1622	2
Sample #3:	7-29-03, 1710	Not Taken

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	100%	X	
Average of 15 or more young per surviving female	26.8	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	14.6%	X	

TEST ACCEPTANCE CRITERIA for *Pimephales promelas*

Control Criteria	Results	Pass	Fail
Greater than or equal to 80% survival	98%	X	
The percent coefficient of variation between replicates must be 40% or less for survival	4.56%	X	
Minimum of 0.25 mg average dry weight of surviving controls	0.513	X	
The percent coefficient of variation between replicates must be 40% or less for growth	16.3%	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)	28.8	%CV survival (critical dilution)	5.71%
%CV Reproduction (critical dilution)	29.0%	Mean dry weight (critical dilution) in milligrams	0.609
		%CV growth (critical dilution)	2.99%

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:


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**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:	7-23-03, 1500	7-24-03, 1500
Sample #2:	7-24-03, 1445	7-25-03, 1445
Sample #3:	7-28-03, 1045	7-29-03, 1045

Test initiated (date, time): 7-25-03, 1330 Test terminated (date, time): 8-1-03, 1200

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%	90	100	100	100	100	100	100	98	4.56	
32%	100	100	100	100	100	100	100	100		
42%	90	100	100	100	100	100	100	98		
56%	100	100	100	100	100	100	100	100		
75%	100	100	100	90	100	100	100	98		
100%	100	90	100	100	90	100	100	96	5.71	

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%	0.385	0.555	0.489	0.526	0.609	0.513	16.3
32%	0.769	0.670	0.648	0.644	0.702	0.687	
42%	0.696	0.523	0.623	0.518	0.712	0.614	
56%	0.556	0.532	0.610	0.547	0.562	0.561	
75%	0.723	0.594	0.551	0.528	0.691	0.617	
100%	0.629	0.594	0.609	0.625	0.588	0.609	2.99

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)= 5.71 %

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:	7-23-03, 1500	7-24-03, 1500
Sample #2:	7-24-03, 1445	7-25-03, 1445
Sample #3:	7-28-03, 1045	7-29-03, 1045

Test initiated (date, time): 7-25-03, 1000 Test terminated (date, time): 7-31-03, 0915

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	23	26	4	22	17	36
B	31	27	29	27	33	26
C	33	17	8	13	X0	15
D	22	24	22	27	9	18
E	22	26	24	14	18	14
F	28	27	X8	27	20	21
G	30	31	31	30	30	24
H	28	25	23	26	24	20
I	27	27	25	26	21	27
J	24	32	25	18	27	27
Mean	26.8	26.2	19.9	23.0	19.9	22.8
Mean/surviving female	26.8	26.2	21.2	23.0	22.1	22.8
CV%*	14.6					29.0

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	100	100	100	100	100
48 HOURS	100	100	100	100	100	100
Test termination	100	100	90	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)= 29.0 %



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: David Passmore			MAGCOBAR Mine Site Reporting Information Telephone: 501/467-8355 FAX: 501/467-8687 Bill to P.O.		24 hour 48 hour <u>routine</u>		1. Cool, 4 degrees Centigrade	4. Thiocyanate for dechlorination	
<i>Alan B. Brown</i> Alan B. Brown Samples: (Printed)			Sample Collection Dates: 25-Jul Times: 14:45		# of Containers Grab Comp X 3		2. Sulfuric Acid, pH <2 3. Nitric Acid, pH <2		
							5. Hydrochloric Acid for VDA 6. Sodium Hydroxide, pH >12		
Bottle Type P			Chronic Bio		X		TEST PARAMETERS Bottle type code G-glass; P-HDPE V-septum; A-amber		
Field Number FD0725COMP			Sample Identification/Description Facility Discharge		Sample Matrix X		Arkansas Analytical Lab # K307495B		
1. Relinquished by: (Signature)			Date/Time		1. Received by: (Signature)		For completion by laboratory		
<i>Alan B. Brown</i>			7/25/03 4:22		_____		Condition of samples:		
2. Relinquished by: (Signature)			Date/Time		2. Received by laboratory: (Signature)		A. Containers Correct? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		
_____			7/25/03 1622		<i>Alan B. Brown</i>		B. Preservation Correct? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		
_____			_____		_____		C. Seals intact? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		
_____			_____		_____		Remarks: <i>per on in 20c</i>		



APPENDIX B

Effluent and Dilution Water Data

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Fathead Minnow

Lab # / Sample ID		K307495		Test Start (Date/Time)		7/25/03/			
Client		Weston		Test End (Date/Time)					
		Day of Test							
		1	2	3	4	5	6	7	notes/remarks
Control		7/25	7/26	7/27	7/28	7/29	7-30	7-31	SS #61 7/25
D.O (mg/L)	INITIAL	9.0	8.3	9.4	7.9	8.2	8.5	8.5	SS #103 7/28
	FINAL	7.2	7.7	7.6	7.4	7.5	7.9	8.1	SS #64 7/31
pH(mg/L)	INITIAL	7.6	7.5	7.8	7.7	7.6	7.6	8.1	
	FINAL	7.4	7.5	7.5	7.3	7.4	7.5	7.7	
temp(C)	INITIAL	22.2	22.2	20.6	21.8	21.8	22.2	23.1	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
ALKALINITY(mg/L)		33			28			34	
HARDNESS(mg/L)		33			44			46	
CONDUCTIVITY(umhos/cm)		153			161			152	
CHLORINE(mg/L)		40.05			40.05			40.05	
CONC:		32%	32%	32%	32%	32%	32%	32%	
D.O (mg/L)	INITIAL	8.1	8.8	9.4	8.3	8.3	8.4	8.8	
	FINAL	7.3	7.8	7.6	7.3	7.5	7.9	8.3	
pH(mg/L)	INITIAL	7.6	7.1	7.5	7.5	7.4	7.6	7.9	
	FINAL	7.2	7.4	7.4	7.2	7.3	7.4	7.5	
temp(C)	INITIAL	22.3	22.2	20.9	22.4	21.7	22.6	24.2	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	29.0	
CONC:		42%	42%	42%	42%	42%	42%	42%	
D.O (mg/L)	INITIAL	8.1	8.9	9.3	8.1	8.3	8.4	8.7	
	FINAL	7.5	7.9	7.6	7.3	7.6	7.8	8.3	
pH(mg/L)	INITIAL	7.6	7.2	7.5	7.5	7.5	7.6	7.9	
	FINAL	7.2	7.3	7.4	7.2	7.3	7.4	7.5	
temp(C)	INITIAL	22.3	22.2	20.9	22.7	21.6	22.9	24.8	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	29.0	
CONC:		56%	56%	56%	56%	56%	56%	56%	
D.O (mg/L)	INITIAL	8.1	8.6	9.5	8.0	8.4	8.4	8.7	
	FINAL	7.4	8.0	7.7	7.3	7.8	7.8	8.4	
pH(mg/L)	INITIAL	7.6	7.2	7.5	7.4	7.4	7.6	7.9	
	FINAL	7.1	7.3	7.4	7.2	7.4	7.3	7.4	
temp(C)	INITIAL	22.3	22.7	20.8	22.9	21.5	23.0	25.4	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	29.0	
CONC:		75%	75%	75%	75%	75%	75%	75%	
D.O (mg/L)	INITIAL	8.0	8.5	9.6	7.9	8.4	8.4	8.7	
	FINAL	7.5	8.0	7.6	7.3	7.6	7.7	8.3	
pH(mg/L)	INITIAL	7.5	7.2	7.5	7.4	7.4	7.6	7.8	
	FINAL	7.2	7.2	7.3	7.1	7.2	7.3	7.3	
temp(C)	INITIAL	22.6	23.0	20.6	22.9	21.9	23.4	26.0	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	29.0	
CONC:		100%	100%	100%	100%	100%	100%	100%	
D.O (mg/L)	INITIAL	8.2	8.6	9.6	8.6	8.4	8.3	8.8	
	FINAL	7.5	8.1	7.6	7.3	7.8	7.6	8.3	
pH(mg/L)	INITIAL	7.5	7.2	7.5	7.3	7.4	7.5	7.8	
	FINAL	7.2	7.1	7.2	7.1	7.1	7.2	7.5	
temp(C)	INITIAL	22.7	21.5	20.4	23.5	21.7	24.0	26.5	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	29.0	
CONC:	100%	A	A	B	B	A	0	C	
ALKALINITY(mg/L)		26		10		26	15		
HARDNESS(mg/L)		1430		1070		1430	1060		
CONDUCTIVITY(umhos/cm)		2330		2340		2330	2350		
CHLORINE(mg/L)		40.05		40.05		40.05	40.05		

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Ceriodaphnia dubia

Lab # / Sample ID		K301495		Test Start (Date/Time)		7-25-03/1000		Client		Weston		Test End (Date/Time)		7-31-03/0915	
		Day of Test													
		1	2	3	4	5	6	7	8	notes/remarks					
Control		7/25	7/26	7/27	7/28	7/29	7/30			SS 61 7/25					
D.O (mg/L)	INITIAL	9.0	8.3	9.4	7.9	8.2	8.5			7/28 SS 63					
	FINAL	7.6	8.6	8.2	8.4	8.4	6.7								
pH	INITIAL	7.6	7.5	7.8	7.7	7.6	7.6								
	FINAL	7.4	7.4	7.8	7.6	7.6	7.2								
temp(C)	INITIAL	22.2	22.2	20.6	21.8	21.8	22.2								
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0								
ALKALINITY(mg/L)		33			28										
HARDNESS(mg/L)		33			44										
CONDUCTIVITY(umhos/cm)		153			161										
CHLORINE(mg/L)		40.05			40.05										
CONC:		321	321	321	321	321	321								
D.O (mg/L)	INITIAL	8.1	8.8	9.4	8.3	8.3	8.4								
	FINAL	7.6	8.4	8.1	8.7	8.5	6.9								
pH	INITIAL	7.6	7.1	7.5	7.5	7.4	7.6								
	FINAL	7.3	7.4	7.8	7.5	7.5	7.0								
temp(C)	INITIAL	22.3	22.2	20.9	22.4	21.7	22.6								
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0								
CONC:		421	421	421	421	421	421								
D.O (mg/L)	INITIAL	8.1	8.9	9.3	8.1	8.3	8.4								
	FINAL	7.5	8.3	8.2	8.7	8.7	6.9								
pH	INITIAL	7.6	7.2	7.5	7.5	7.5	7.0								
	FINAL	7.6	7.4	7.8	7.5	7.5	7.0								
temp(C)	INITIAL	22.3	22.2	20.9	22.7	21.6	22.9								
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0								
CONC:		561	561	561	561	561	561								
D.O (mg/L)	INITIAL	8.1	8.6	9.5	8.0	8.4	8.4								
	FINAL	7.6	8.4	8.1	8.6	8.6	7.0								
pH	INITIAL	7.6	7.2	7.5	7.4	7.4	7.6								
	FINAL	7.4	7.5	7.7	7.4	7.5	7.0								
temp(C)	INITIAL	22.4	22.7	20.6	22.9	21.5	23.0								
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0								
CONC:		751	751	751	751	751	751								
D.O (mg/L)	INITIAL	8.0	8.5	9.6	7.9	8.4	8.4								
	FINAL	7.7	8.4	8.3	8.7	8.7	6.9								
pH	INITIAL	7.5	7.2	7.5	7.4	7.4	7.6								
	FINAL	7.3	7.5	7.7	7.3	7.4	7.4								
temp(C)	INITIAL	22.6	22.7	20.4	22.9	21.5	23.4								
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0								
CONC:		1001	1001	1001	1001	1001	1001								
D.O (mg/L)	INITIAL	8.2	8.6	9.6	8.6	8.4	8.3								
	FINAL	7.8	8.4	8.4	8.6	8.7	7.1								
pH	INITIAL	7.5	7.2	7.5	7.3	7.4	7.5								
	FINAL	7.3	7.4	7.6	7.3	7.4	6.8								
temp(C)	INITIAL	22.7	21.5	20.3	23.5	21.7	24.0								
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0								
CONC: 100%		A	A	B	B	A	C								
ALKALINITY(mg/L)		26		10		26	15								
HARDNESS(mg/L)		1430		1070		1430	1060								
CONDUCTIVITY(umhos/cm)		2330		2340		2330	2350								
CHLORINE(mg/L)		40.05		40.05		40.05	40.05								



APPENDIX C

Fathead Minnow Raw Data and Statistics

Pimephales promelas

FATHEAD MINNOW

TEST 1000.0

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB #/S: K307495	TEST DATES (BEGIN/END): 7-29-03/8-1-03
CLIENT: Weston	WEIGHING DATE/TIME:
ANALYST/S: AF, MJC, AD	DRYING TEMPERATURE (DEGREES C): 60°C
SAMPLE ID:	DRYING TIME (HOURS): 24 hrs

	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	A56	0.98151	0.97766	0.00385	10	0.385	AVG DRY	
	B57	0.98711	0.98156	0.00555	10	0.555	WEIGHT (mg)	
	C58	0.99331	0.98842	0.00489	10	0.489	0.513	
	D59	0.99121	0.98595	0.00526	10	0.526	CV	
	E60	0.99185	0.98576	0.00609	10	0.609	11.3%	
CONC:	A61	0.98989	0.98220	0.00769	10	0.769	AVG DRY	
	B62	0.98065	0.97395	0.00670	10	0.670	WEIGHT(MG)	
	C63	0.98873	0.98235	0.00648	10	0.648	0.687	
	D64	0.98969	0.98325	0.00644	10	0.644	CV	
	E65	0.98776	0.98074	0.00702	10	0.702		
CONC:	A66	0.99096	0.98400	0.00696	10	0.696	AVG DRY	
	B67	0.99181	0.98403	0.00523	10	0.523	WEIGHT(MG)	
	C68	0.99261	0.98638	0.00623	10	0.623	0.614	
	D69	0.99881	0.99363	0.00518	10	0.518	CV	
	E70	0.00285	0.99573	0.00712	10	0.712		
CONC:	A71	0.99508	0.98952	0.00556	10	0.556	AVG DRY	
	B72	0.98888	0.98356	0.00532	10	0.532	WEIGHT(MG)	
	C73	0.99321	0.98711	0.00610	10	0.610	0.588	
	D74	0.99313	0.98766	0.00547	10	0.547	CV	
	E75	0.99318	0.98756	0.00562	10	0.562		
CONC:	A76	0.98989	0.98266	0.00723	10	0.723	AVG DRY	
	B77	0.98764	0.98170	0.00594	10	0.594	WEIGHT(MG)	
	C78	0.98838	0.98287	0.00551	10	0.551	0.617	
	D79	0.98954	0.98426	0.00528	10	0.528	CV	
	E80	0.98898	0.98207	0.00691	10	0.691		
CONC:	A81	0.99068	0.98439	0.00629	10	0.629	AVG DRY	
	B82	0.98722	0.98128	0.00594	10	0.594	WEIGHT(MG)	
	C83	0.99144	0.98535	0.00609	10	0.609	0.609	
	D84	0.99249	0.98624	0.00625	10	0.625	CV	
	E85	0.99207	0.98619	0.00588	10	0.588	2.99%	

CV = (STANDARD DEVIATION/MEAN)*100

AA# K307495 FATHEAD MINNOW SURVIVAL, 7-25-03
File: k307495s Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.096

W = 0.752

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# K307495 FATHEAD MINNOW SURVIVAL, 7-25-03
File: k307495s 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# K307495 FATHEAD MINNOW SURVIVAL, 7-25-03

FILE: k307495s

TRANSFORM: ARC SINE(SQUARE ROOT(Y))

NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.9000	1.2490
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	0.9000	1.2490
3	42 % EFFLUENT	2	1.0000	1.4120
3	42 % EFFLUENT	3	1.0000	1.4120
3	42 % EFFLUENT	4	1.0000	1.4120
3	42 % EFFLUENT	5	1.0000	1.4120
4	56 % EFFLUENT	1	1.0000	1.4120
4	56 % EFFLUENT	2	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	0.9000	1.2490
5	75 % EFFLUENT	5	1.0000	1.4120
6	100 % EFFLUENT	1	1.0000	1.4120
6	100 % EFFLUENT	2	0.9000	1.2490
6	100 % EFFLUENT	3	1.0000	1.4120
6	100 % EFFLUENT	4	1.0000	1.4120
6	100 % EFFLUENT	5	0.9000	1.2490

AA# K307495 FATHEAD MINNOW SURVIVAL, 7-25-03

File: k307495s

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	1.379				
2	32 % EFFLUENT	1.412	30.00	16.00	5.00	
3	42 % EFFLUENT	1.379	27.50	16.00	5.00	
4	56 % EFFLUENT	1.412	30.00	16.00	5.00	
5	75 % EFFLUENT	1.379	27.50	16.00	5.00	
6	100 % EFFLUENT	1.347	25.00	16.00	5.00	

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

AA # K307495, FATHEAD MINNOW GROWTH, 7-25-03
File: k307495g Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

D = 0.107

W = 0.964

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 # K307495, FATHEAD MINNOW GROWTH, 7-25-03
File: k307495g Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

Calculated B1 statistic = 11.50

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 # K307495, FATHEAD MINNOW GROWTH, 7-25-03
FILE: k307495g
TRANSFORM: NO TRANSFORMATION

NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.3850	0.3850
1	CONTROL	2	0.5550	0.5550
1	CONTROL	3	0.4890	0.4890
1	CONTROL	4	0.5260	0.5260
1	CONTROL	5	0.6090	0.6090
2	32 % EFFLUENT	1	0.7690	0.7690
2	32 % EFFLUENT	2	0.6700	0.6700
2	32 % EFFLUENT	3	0.6480	0.6480
2	32 % EFFLUENT	4	0.6440	0.6440
2	32 % EFFLUENT	5	0.7020	0.7020
3	42 % EFFLUENT	1	0.6960	0.6960
3	42 % EFFLUENT	2	0.5230	0.5230
3	42 % EFFLUENT	3	0.6230	0.6230
3	42 % EFFLUENT	4	0.5180	0.5180
3	42 % EFFLUENT	5	0.7120	0.7120
4	56 % EFFLUENT	1	0.5560	0.5560
4	56 % EFFLUENT	2	0.5320	0.5320
4	56 % EFFLUENT	3	0.6100	0.6100
4	56 % EFFLUENT	4	0.5470	0.5470
4	56 % EFFLUENT	5	0.5620	0.5620
5	75 % EFFLUENT	1	0.7230	0.7230
5	75 % EFFLUENT	2	0.5940	0.5940
5	75 % EFFLUENT	3	0.5510	0.5510
5	75 % EFFLUENT	4	0.5280	0.5280
5	75 % EFFLUENT	5	0.6910	0.6910
6	100 % EFFLUENT	1	0.6290	0.6290
6	100 % EFFLUENT	2	0.5940	0.5940
6	100 % EFFLUENT	3	0.6090	0.6090
6	100 % EFFLUENT	4	0.6250	0.6250
6	100 % EFFLUENT	5	0.5880	0.5880

AA # K307495, FATHEAD MINNOW GROWTH, 7-25-03
File: k307495g Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.086	0.017	3.857
Within (Error)	24	0.107	0.004	
Total	29	0.193		

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

AA # K307495, FATHEAD MINNOW GROWTH, 7-25-03
 File: k307495g 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	0.513	0.513		
2	32 % EFFLUENT	0.687	0.687	-4.117	
3	42 % EFFLUENT	0.614	0.614	-2.407	
4	56 % EFFLUENT	0.561	0.561	-1.151	
5	75 % EFFLUENT	0.617	0.617	-2.478	
6	100 % EFFLUENT	0.609	0.609	-2.279	

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

AA # K307495, FATHEAD MINNOW GROWTH, 7-25-03
 File: k307495g 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	0.100	19.4	-0.174
3	42 % EFFLUENT	5	0.100	19.4	-0.102
4	56 % EFFLUENT	5	0.100	19.4	-0.049
5	75 % EFFLUENT	5	0.100	19.4	-0.105
6	100 % EFFLUENT	5	0.100	19.4	-0.096



APPENDIX D

Ceriodaphnia dubia Raw Data and Statistics

Ceriodaphnia dubia

SURVIVAL AND REPRODUCTION TEST

Discharger: Weston

Lab Number/s

Location: K307495

Analyst: MG, AF, TC

Test Start-Date/Time: 7-25-03/1000

Test Stop-Date/Time: 7-31-03/0915

Date Sample Collected: See CDC

Conc 1	Replicate													Total	No. of Young/Adults	Analyst	
	A	B	C	D	E	F	G	H	I	J	Young	Adult					
Day 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	TC
Day 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	TC
Day 3	0	0	0	0	5	0	0	5	4	0	20	10	2.0	AF			
Day 4	5	6	6	4	6	5	0	9	10	6	57	10	5.7	MG			
Day 5	6	11	12	7	0	8	10	12	13	7	86	10	8.6	MG			
Day 6	12	14	15	11	11	15	14	2	0	11	105	10	10.5	AF			
Day 7																	
Day 8																	
Total	23	31	33	22	22	28	30	28	27	24	268	26.8	26.8	26.8	26.8	26.8	
%	Control																

Conc 4	Replicate													Total	No. of Young/Adults	Analyst	
	A	B	C	D	E	F	G	H	I	J	Young	Adult					
Day 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	TC
Day 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	TC
Day 3	0	6	0	0	0	0	5	4	5	0	20	10	2.0	AF			
Day 4	8	0	4	3	6	4	1	10	10	4	50	10	5.0	MG			
Day 5	13	9	8	10	7	10	11	9	11	5	93	10	9.3	MG			
Day 6	1	12	1	14	1	13	13	3	0	9	67	10	6.7	AF			
Day 7																	
Day 8																	
Total	22	27	13	27	14	27	30	26	26	18	230	23.0	23.0	23.0	23.0	23.0	
%	56																

Conc 5	Replicate													Total	No. of Young/Adults	Analyst	
	A	B	C	D	E	F	G	H	I	J	Young	Adult					
Day 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	TC
Day 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	TC
Day 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	TC
Day 4	5	0	0	0	5	4	5	0	8	11	0	38	9	4.2	MG		
Day 5	6	12	0	0	4	0	8	10	10	6	64	9	7.1	MG			
Day 6	6	15	0	9	7	14	1	1	13	6	66	9	7.3	AF			
Day 7																	
Day 8																	
Total	17	33	0	9	18	20	30	24	21	21	199	19.9	19.9	19.9	19.9	19.9	
%	75																

Conc 6	Replicate													Total	No. of Young/Adults	Analyst	
	A	B	C	D	E	F	G	H	I	J	Young	Adult					
Day 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	TC
Day 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	TC
Day 3	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	TC
Day 4	3	4	4	4	4	4	0	9	7	6	45	10	4.5	MG			
Day 5	13	9	7	6	1	7	7	7	7	10	74	10	7.4	MG			
Day 6	20	11	4	8	6	10	11	0	10	11	91	10	9.1	AF			
Day 7																	
Day 8																	
Total	36	26	15	18	14	21	24	20	27	27	228	22.8	22.8	22.8	22.8	22.8	
%	100																

X=DEAD; Y=MALE

29.01

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
32% effluent	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	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
42	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	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
56% effluent	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	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
75% effluent	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	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
100% effluent	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

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

AA # K307495, CERIODAPHNIA DUBIA REPRODUCTION, 7-25-03
File: C:\TOXSTAT\WESTON\K307495C. 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 # K307495, CERIODAPHNIA DUBIA REPRODUCTION, 7-25-03
File: C:\TOXSTAT\WESTON\K307495C. Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 12.80

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 # K307495, CERIODAPHNIA DUBIA REPRODUCTION, 7-25-03
 FILE: C:\TOXSTAT\WESTON\K307495C.
 TRANSFORM: NO TRANSFORMATION

NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	23.0000	23.0000
1	CONTROL	2	31.0000	31.0000
1	CONTROL	3	33.0000	33.0000
1	CONTROL	4	22.0000	22.0000
1	CONTROL	5	22.0000	22.0000
1	CONTROL	6	28.0000	28.0000
1	CONTROL	7	30.0000	30.0000
1	CONTROL	8	28.0000	28.0000
1	CONTROL	9	27.0000	27.0000
1	CONTROL	10	24.0000	24.0000
2	32 % EFFLUENT	1	26.0000	26.0000
2	32 % EFFLUENT	2	27.0000	27.0000
2	32 % EFFLUENT	3	17.0000	17.0000
2	32 % EFFLUENT	4	24.0000	24.0000
2	32 % EFFLUENT	5	26.0000	26.0000
2	32 % EFFLUENT	6	27.0000	27.0000
2	32 % EFFLUENT	7	31.0000	31.0000
2	32 % EFFLUENT	8	25.0000	25.0000
2	32 % EFFLUENT	9	27.0000	27.0000
2	32 % EFFLUENT	10	32.0000	32.0000
3	42 % EFFLUENT	1	4.0000	4.0000
3	42 % EFFLUENT	2	29.0000	29.0000
3	42 % EFFLUENT	3	8.0000	8.0000
3	42 % EFFLUENT	4	22.0000	22.0000
3	42 % EFFLUENT	5	24.0000	24.0000
3	42 % EFFLUENT	6	8.0000	8.0000
3	42 % EFFLUENT	7	31.0000	31.0000
3	42 % EFFLUENT	8	23.0000	23.0000
3	42 % EFFLUENT	9	25.0000	25.0000
3	42 % EFFLUENT	10	25.0000	25.0000
4	56 % EFFLUENT	1	22.0000	22.0000
4	56 % EFFLUENT	2	27.0000	27.0000
4	56 % EFFLUENT	3	13.0000	13.0000
4	56 % EFFLUENT	4	27.0000	27.0000
4	56 % EFFLUENT	5	14.0000	14.0000
4	56 % EFFLUENT	6	27.0000	27.0000
4	56 % EFFLUENT	7	30.0000	30.0000
4	56 % EFFLUENT	8	26.0000	26.0000
4	56 % EFFLUENT	9	26.0000	26.0000
4	56 % EFFLUENT	10	18.0000	18.0000
5	75 % EFFLUENT	1	17.0000	17.0000
5	75 % EFFLUENT	2	33.0000	33.0000
5	75 % EFFLUENT	3	0.0000	0.0000
5	75 % EFFLUENT	4	9.0000	9.0000
5	75 % EFFLUENT	5	18.0000	18.0000
5	75 % EFFLUENT	6	20.0000	20.0000
5	75 % EFFLUENT	7	30.0000	30.0000
5	75 % EFFLUENT	8	24.0000	24.0000
5	75 % EFFLUENT	9	21.0000	21.0000
5	75 % EFFLUENT	10	27.0000	27.0000

6	100	%	EFFLUENT	1	36.0000	36.0000
6	100	%	EFFLUENT	2	26.0000	26.0000
6	100	%	EFFLUENT	3	15.0000	15.0000
6	100	%	EFFLUENT	4	18.0000	18.0000
6	100	%	EFFLUENT	5	14.0000	14.0000
6	100	%	EFFLUENT	6	21.0000	21.0000
6	100	%	EFFLUENT	7	24.0000	24.0000
6	100	%	EFFLUENT	8	20.0000	20.0000
6	100	%	EFFLUENT	9	27.0000	27.0000
6	100	%	EFFLUENT	10	27.0000	27.0000

AA # K307495, CERIODAPHNIA DUBIA REPRODUCTION, 7-25-03

File: C:\TOXSTAT\WESTON\K307495C.

Transform: NO TRANSFORMATION

STEEL'S MANY-ONE RANK TEST

Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	26.800				
2	32 % EFFLUENT	26.200	101.50	75.00	10.00	
3	42 % EFFLUENT	19.900	85.50	75.00	10.00	
4	56 % EFFLUENT	23.000	85.00	75.00	10.00	
5	75 % EFFLUENT	19.900	80.00	75.00	10.00	
6	100 % EFFLUENT	22.800	81.50	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 7-24-03 Arkansas Analytical

SPECIES Pimephales promelas

QUANTITY SHIPPED 900+

AGE/LIFE STAGE 24 hrs 7/24 1500cs

BROODSTOCK SOURCE Anderson Farms, AL

CULTURE WATER groundwater

ALKALINITY (Mg/l as CaCO₃) = 180

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

FEEDING ATTEMIN

COMMENTS _____

PACKAGED BY UM

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:



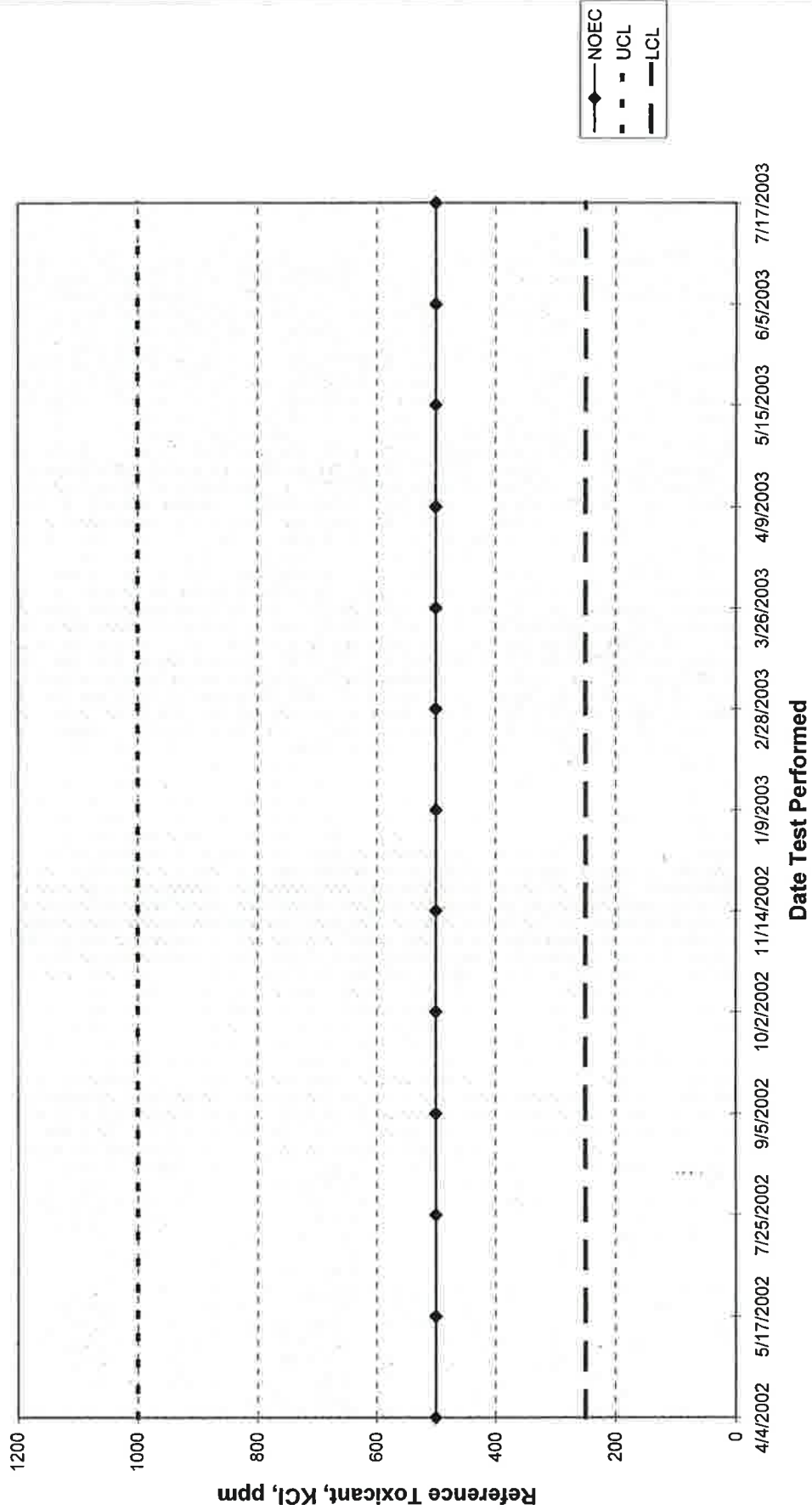
Facility Supervisor



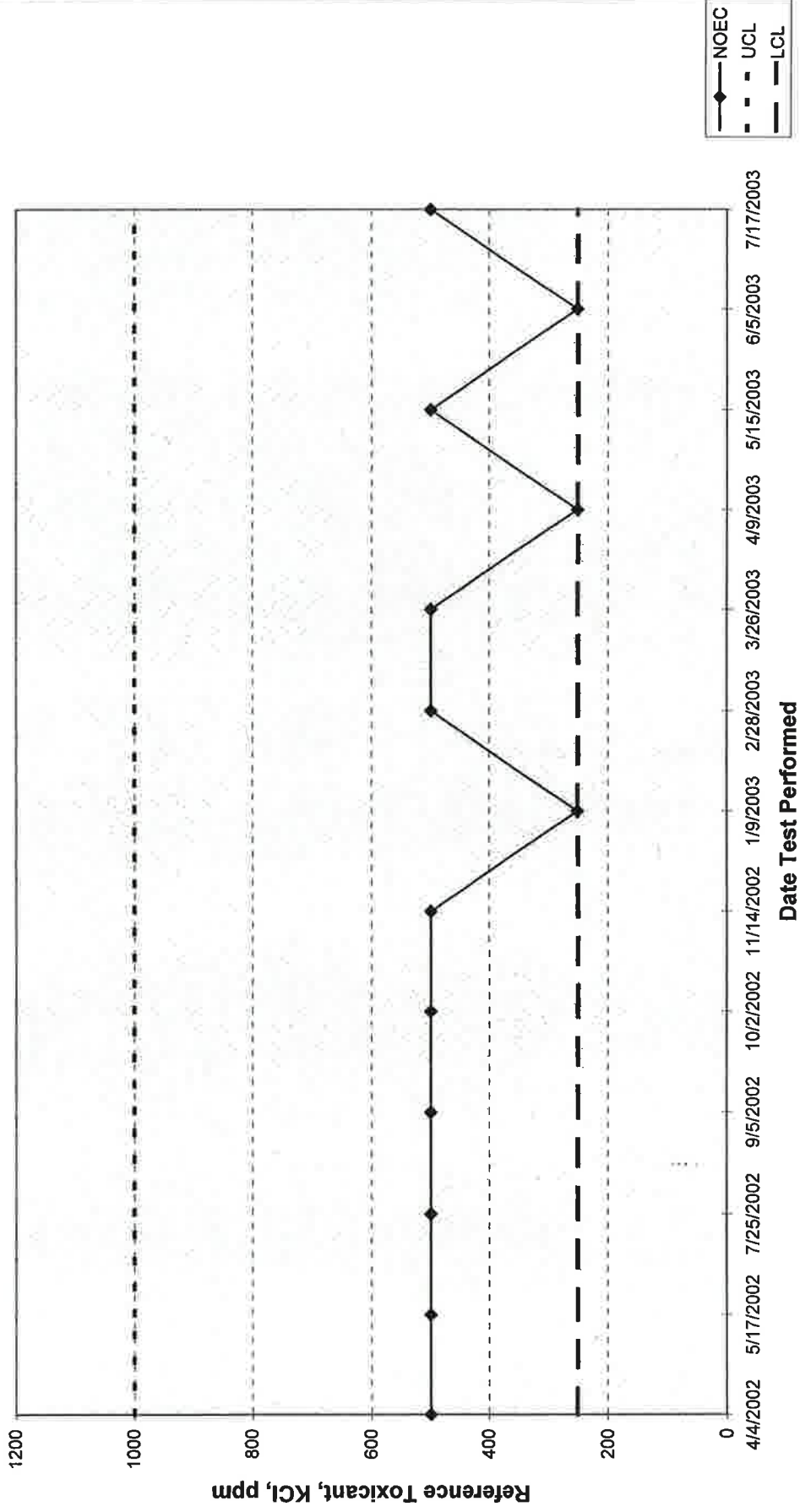
APPENDIX F

Quality Assurance Charts

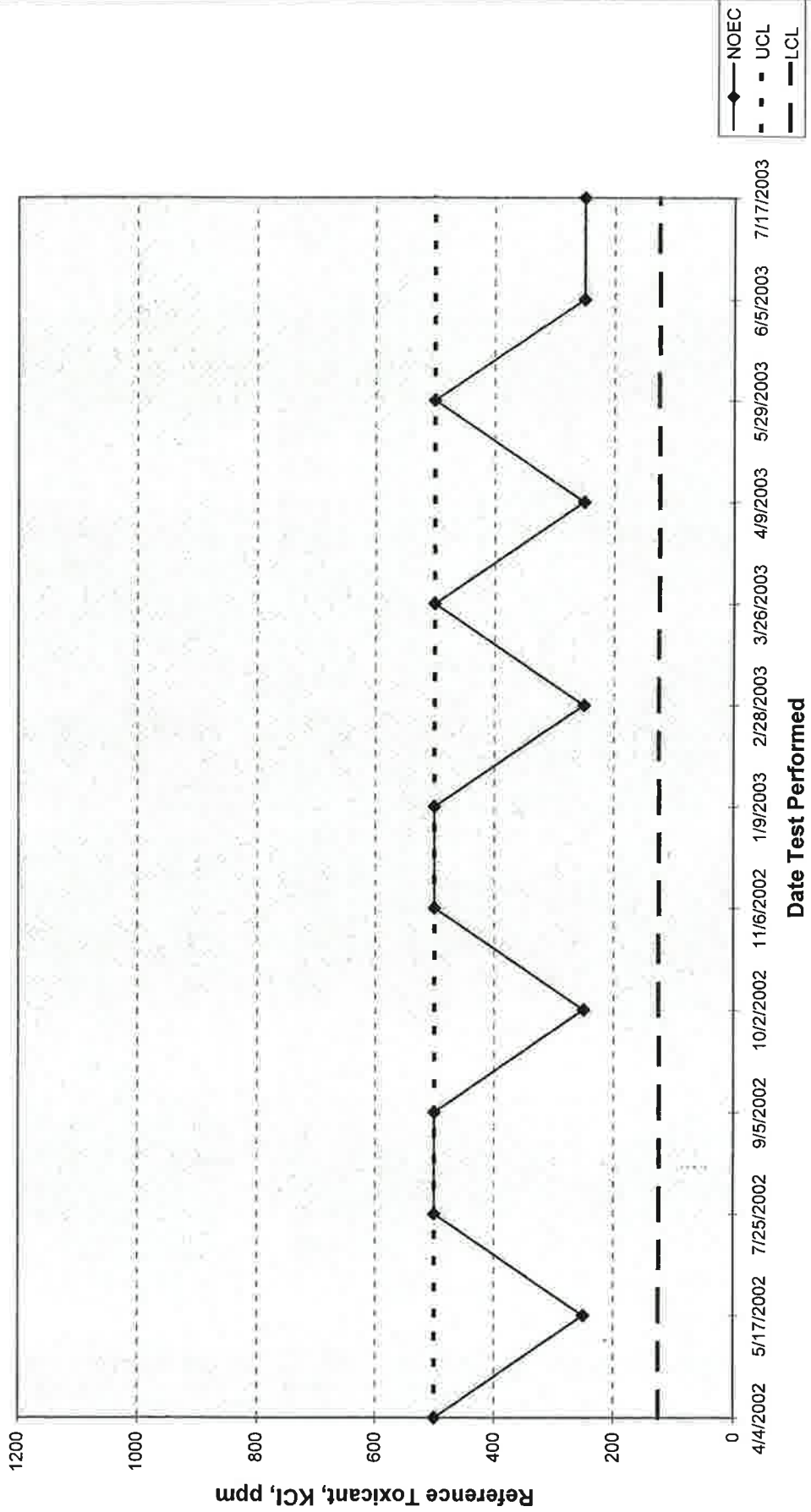
ARKANSAS ANALYTICAL, INC.
FATHEAD MINNOW SURVIVAL
QUALITY ASSURANCE



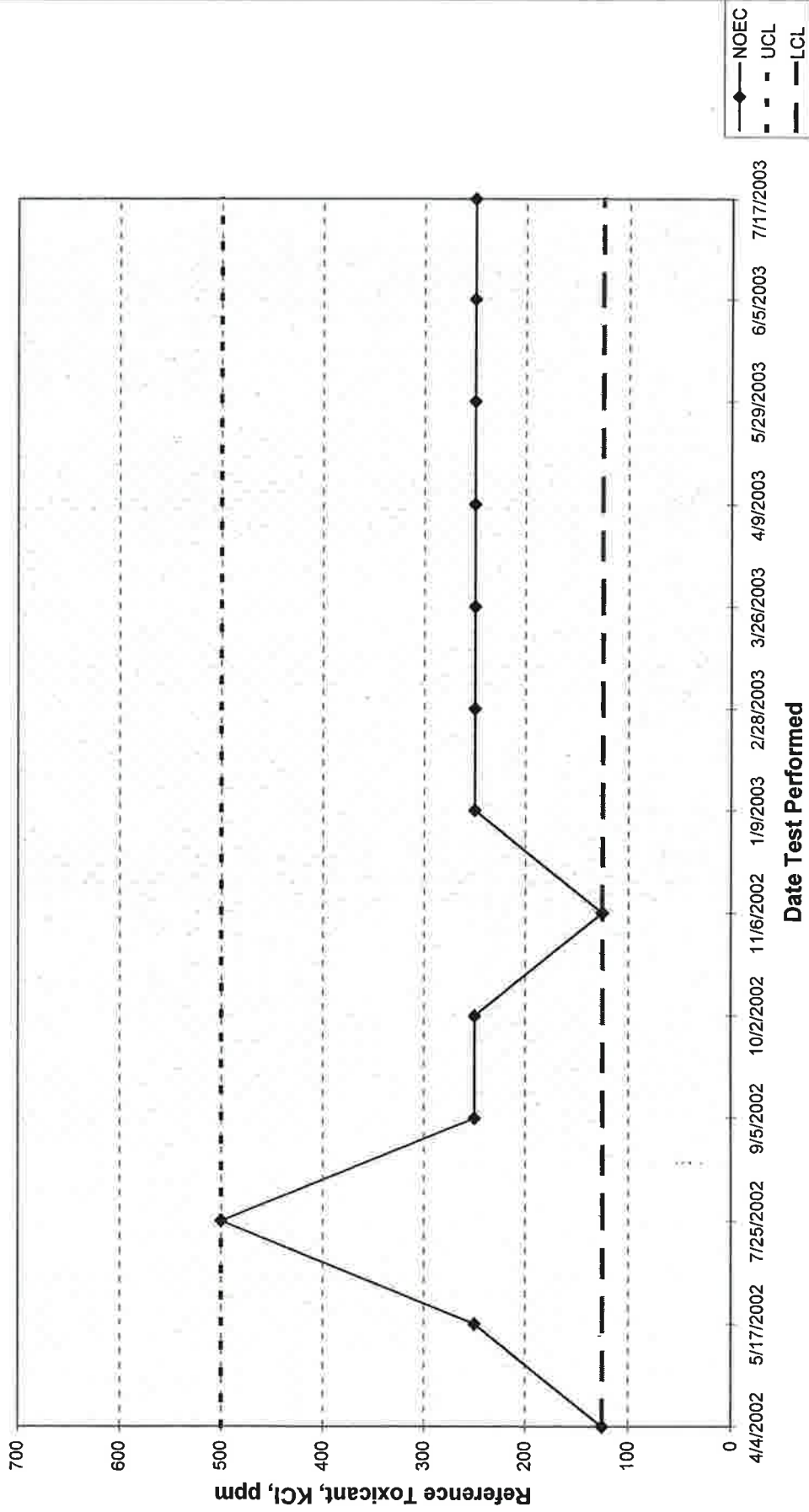
ARKANSAS ANALYTICAL, INC.
FATHEAD MINNOW GROWTH
QUALITY ASSURANCE



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
May 14, 2003 to October 30, 2003

Laboratory ID # 60-1754

Certificate # 03-031-1

The following parameters are certified:

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

J.A. Sembranski
Quality Assurance Officer

May 15, 2003 Date

ARKANSAS ANALYTICAL, INCORPORATED

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

Laboratory Control Number: K307495 Date: 8-12-03

Client: Weston Solutions Sample ID: Facility Discharge

	Pass	Fail	
Fathead Minnow Survival Test	<u>✓</u>	<u> </u>	
Fathead Minnow Growth Test	<u>✓</u>	<u> </u>	
<i>Ceriodaphnia dubia</i> Survival Test	<u>✓</u>	<u> </u>	
<i>Ceriodaphnia dubia</i> Reproduction Test	<u>✓</u>	<u> </u>	Analyst Initials <u>MS</u>