



Arkansas Analytical, Inc.

Toxicity Test Results

MAGCOBAR MINE SITE
NPDES PERMIT NUMBER: AR0049794
December 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. David Friedman**
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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 December 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:	12-15-04, 1000	12-16-04, 1000
Sample #2:	12-16-04, 1000	12-17-04, 1000
Sample #3:	12-20-04, 1000	12-21-04, 1000

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:	12-16-04, 1622	4
Sample #2:	12-17-04, 1328	4
Sample #3:	12-21-04, 1545	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 < 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	22.8	X	
At least 60% of surviving females should have produced 3 broods	60%	X	
The percent coefficient of variation between replicates must be 40% or less for the young of surviving females	16.2%	X	

TEST ACCEPTANCE CRITERIA for *Pimephales promelas*

Control Criteria	Results	Pass	Fail
Greater than or equal to 80% survival	96%	X	
The percent coefficient of variation between replicates must be 40% or less for survival	5.71%	X	
Minimum of 0.25 mg average dry weight of surviving controls	0.494	X	
The percent coefficient of variation between replicates must be 40% or less for growth	12.9%	X	

Reference Toxicant

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

REFERENCE TOXICANT

<i>Ceriodaphnia dubia</i>		<i>Pimephales promelas</i>	
NOEC Survival:	250 ppm KCl	NOEC Survival:	250 ppm KCl
LOEC Survival:	500 ppm KCl	LOEC Survival:	500 ppm KCl
NOEC Reproduction:	250 ppm KCl	NOEC Growth:	250 ppm KCl
LOEC Reproduction:	500 ppm KCl	LOEC Growth:	500 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)	24.5	%CV survival (critical dilution)	4.56%
%CV Reproduction (critical dilution)	32.6%	Mean dry weight (critical dilution) in milligrams	0.542
		%CV growth (critical dilution)	12.8%

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:	12-15-04, 1000	12-16-04, 1000
Sample #2:	12-16-04, 1000	12-17-04, 1000
Sample #3:	12-20-04, 1000	12-21-04, 1000

Test initiated (date, time): 12-16-04, 1700 Test terminated (date, time): 12-23-04, 1050

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	90	90	100	100	100	100	96	5.71
32%	100	100	100	100	90	100	100	98	
42%	100	100	100	80	100	100	100	96	
56%	100	100	100	100	100	100	100	100	
75%	100	100	100	100	100	100	100	100	
100%	100	100	100	90	100	100	100	98	4.56

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%	0.590	0.420	0.460	0.514	0.487	0.494	12.9
32%	0.576	0.637	0.620	0.635	0.628	0.619	
42%	0.594	0.633	0.604	0.507	0.692	0.606	
56%	0.553	0.464	0.586	0.578	0.658	0.568	
75%	0.648	0.550	0.664	0.515	0.637	0.603	
100%	0.506	0.587	0.622	0.445	0.551	0.542	12.8

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: Magcohar Mine Site

NPDES #: AR0049794

Sample Collection:	Date, Time Started	Date, Time Ended
Sample #1:	12-15-04, 1000	12-16-04, 1000
Sample #2:	12-16-04, 1000	12-17-04, 1000
Sample #3:	12-20-04, 1000	12-21-04, 1000

Test initiated (date, time): 12-16-04, 1630 Test terminated (date, time): 12-22-04, 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	18	0	22	27	24	17
B	25	25	28	25	19	22
C	24	23	15	22	15	40
D	X21	19	23	31	18	29
E	16	24	30	0	27	12
F	23	19	21	26	25	22
G	25	22	20	27	X16	21
H	26	28	0	25	23	33
I	X8	23	27	22	31	26
J	25	26	8	X0	18	23
Mean	21.1	20.9	19.4	20.5	21.6	24.5
Mean/surviving female	22.8	20.9	19.4	22.8	22.2	24.5
CV%*	16.2					32.6

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	90	100	100
Test termination	80	100	100	90	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)= 32.6 %

APPENDIX A

Chain of Custody Forms

APPENDIX B

Effluent and Dilution Water Data

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Fathead Minnow

Lab # / Sample ID		K412477							Test Start (Date/Time)	12-16-04/1700
Client		Weston							Test End (Date/Time)	12-23-04/1050
		Day of Test								
		1	2	3	4	5	6	7	notes/remarks	
Control		12/16	12/17	12/18	12/19	12/20	12/21	12/22	SS 116	
D.O (mg/L)	INITIAL	8.4	7.7	7.8	7.6	8.0	7.6	7.6		
	FINAL	6.5	6.6	6.8	5.6	5.6	6.5	7.0		
pH(mg/L)	INITIAL	7.3	7.3	7.4	7.0	7.4	7.3	7.2		
	FINAL	7.2	7.0	6.9	7.3	7.3	7.3	7.2		
temp(C)	INITIAL	20.1	20.7	21.5	19.6	21.3	20.9	22.2		
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0		
ALKALINITY(mg/L)		30								
HARDNESS(mg/L)		42								
CONDUCTIVITY(umhos/cm)		161								
CHLORINE(mg/L)		10.05								
CONC:		321.	321.	321.	321.	321.	321.	321.		
D.O (mg/L)	INITIAL	8.2	8.0	8.1	7.8	8.0	7.9	7.9		
	FINAL	6.8	6.7	6.9	5.8	5.7	5.8	6.8		
pH(mg/L)	INITIAL	6.8	6.8	6.9	6.7	7.0	6.9	6.7		
	FINAL	6.8	6.6	6.8	7.0	6.9	6.8	6.8		
temp(C)	INITIAL	20.1	21.4	21.2	19.6	21.4	21.1	22.1		
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0		
CONC:		421.	421.	421.	421.	421.	421.	421.		
D.O (mg/L)	INITIAL	8.2	8.2	8.0	8.2	8.1	8.6	8.2		
	FINAL	6.9	6.7	7.0	5.9	5.8	5.8	7.4		
pH(mg/L)	INITIAL	6.8	6.7	6.9	6.7	7.0	6.8	6.6		
	FINAL	6.8	6.6	6.7	6.9	6.9	6.8	6.9		
temp(C)	INITIAL	20.1	21.4	21.3	19.7	21.4	21.1	22.1		
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0		
CONC:		561.	561.	561.	561.	561.	561.	561.		
D.O (mg/L)	INITIAL	8.4	8.3	8.2	8.6	8.3	8.8	8.7		
	FINAL	7.2	7.0	7.1	6.3	6.1	6.2	6.8		
pH(mg/L)	INITIAL	6.8	6.7	6.9	6.7	6.9	6.8	6.7		
	FINAL	6.8	6.9	7.2	6.9	6.8	6.8	6.9		
temp(C)	INITIAL	20.1	21.4	21.4	19.8	21.8	21.2	22.1		
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0		
CONC:		751.	751.	751.	751.	751.	751.	751.		
D.O (mg/L)	INITIAL	8.4	8.4	8.4	8.7	8.3	8.8	8.8		
	FINAL	6.9	7.0	6.7	6.3	6.1	6.5	6.8		
pH(mg/L)	INITIAL	6.8	6.7	6.9	6.8	6.9	6.8	6.7		
	FINAL	6.7	6.9	6.9	6.9	6.8	6.8	6.7		
temp(C)	INITIAL	20.1	21.4	21.4	19.8	22.2	21.8	22.1		
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0		
CONC:		1001.	1001.	1001.	1001.	1001.	1001.	1001.		
D.O (mg/L)	INITIAL	9.0	8.7	8.8	8.9	8.1	8.9	9.7		
	FINAL	7.1	7.0	6.7	6.3	6.4	6.9	7.1		
pH(mg/L)	INITIAL	6.9	6.7	6.7	6.9	7.0	6.8	6.7		
	FINAL	6.7	6.6	6.9	6.8	6.7	6.7	6.9		
temp(C)	INITIAL	20.1	21.3	21.4	19.9	22.2	21.8	22.3		
	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)		12			22		30			
HARDNESS(mg/L)		1388			1192		1320			
CONDUCTIVITY(umhos/cm)		2311			2210		1990			
CHLORINE(mg/L)		10.10			10.10		10.10			

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Ceriodaphnia dubia

Lab # / Sample ID		K412477		Test Start (Date/Time)		12-16 / 1630				
Client		Weston		Test End (Date/Time)		12-22 / 0925				
		Day of Test								
		1	2	3	4	5	6	7	8	notes/remarks
Control		12/16	12/17	12/18	12/19	12/20	12/21			35 116
D.O (mg/L)	INITIAL	8.4	7.7	7.8	7.6	8.0	7.6			
	FINAL	7.1	7.0	7.1	7.6	7.8	7.3			
pH	INITIAL	7.3	7.3	7.4	7.0	7.4	7.3			
	FINAL	7.2	7.4	7.2	7.1	7.3	7.0			
temp(C)	INITIAL	20.1	20.7	21.5	19.6	21.3	20.9			
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0			
ALKALINITY(mg/L)		30								
HARDNESS(mg/L)		42								
CONDUCTIVITY(umhos/cm)		161								
CHLORINE(mg/L)		2005								
CONC:		321	321	321	321	321	321			
D.O (mg/L)	INITIAL	8.2	8.0	8.1	7.8	8.0	7.9			
	FINAL	7.3	7.0	6.9	7.7	7.8	7.4			
pH	INITIAL	6.8	6.8	6.9	6.7	7.0	6.9			
	FINAL	6.7	6.6	6.7	6.7	7.2	7.0			
temp(C)	INITIAL	20.1	21.4	21.2	19.4	21.4	21.1			
	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	8.2	8.2	8.0	8.2	8.1	8.6			
	FINAL	7.4	7.0	7.3	7.8	7.8	7.7			
pH	INITIAL	6.8	6.7	6.9	6.7	7.0	6.8			
	FINAL	6.7	6.5	6.8	6.7	7.2	7.0			
temp(C)	INITIAL	20.1	21.4	21.3	19.7	21.4	21.1			
	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	8.4	8.3	8.2	8.6	8.3	8.8			
	FINAL	7.5	7.3	7.3	7.8	7.8	7.7			
pH	INITIAL	6.8	6.7	6.9	6.7	6.9	6.8			
	FINAL	6.7	6.8	6.8	6.7	7.2	7.0			
temp(C)	INITIAL	20.1	21.4	21.4	19.8	21.8	21.2			
	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	8.4	8.4	8.4	8.7	8.3	8.8			
	FINAL	7.4	7.4	7.5	7.8	7.7	7.7			
pH	INITIAL	6.8	6.7	6.7	6.9	6.9	6.8			
	FINAL	6.7	6.6	6.4	6.7	7.2	6.9			
temp(C)	INITIAL	20.1	21.4	21.4	19.8	22.2	21.8			
	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	9.0	8.7	8.8	8.9	8.1	8.9			
	FINAL	7.9	7.7	7.9	7.9	7.7	7.6			
pH	INITIAL	6.9	6.7	6.7	6.9	7.0	6.8			
	FINAL	6.7	6.5	6.6	6.7	7.1	6.9			
temp(C)	INITIAL	20.1	21.3	21.4	19.9	22.2	21.8			
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0			
CONC: 100%		A	A	A	B	B	C			
ALKALINITY(mg/L)		12			22		30			
HARDNESS(mg/L)		1388			1192		1320			
CONDUCTIVITY(umhos/cm)		2311			2210		1990			
CHLORINE(mg/L)		20.10			20.10		20.10			

APPENDIX C

Fathead Minnow Raw Data and Statistics

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # SAMPLE ID W412477 TEST START DATE 12-16 TIME 1700
 CLIENT Western TEST END DATE 12-23 TIME 1050
 AGE AND SOURCE OF MINNOWS 274 hrs; Aquatex

CONC:	REP #	DAY (NUMBER SURVIVING)								SURVIVAL		
		start	1	2	3	4	5	6	7	%	MEAN %	CV
<i>Control</i>	A	10	10	10	10	10	10	10	10	100	96%	5.71%
	B	10	10	10	10	10	9	9	9	90		
	C	10	10	10	9	9	9	9	9	90		
	D	10	10	10	10	10	10	10	10	100		
	E	10	10	10	10	10	10	10	10	100		
321	A	10	10	10	10	10	10	10	10	100	98%	
	B	10	10	10	10	10	10	10	10	100		
	C	10	10	10	10	10	10	10	10	100		
	D	10	10	10	10	10	10	10	10	100		
	E	10	10	10	10	9	9	9	9	90		
421	A	10	10	10	10	10	10	10	10	100	96%	
	B	10	10	10	10	10	10	10	10	100		
	C	10	10	10	10	10	10	10	10	100		
	D	10	10	10	9	9	9	9	8	80		
	E	10	10	10	10	10	10	10	10	100		
561	A	10	10	10	10	10	10	10	10	100	100%	
	B	10	10	10	10	10	10	10	10	100		
	C	10	10	10	10	10	10	10	10	100		
	D	10	10	10	10	10	10	10	10	100		
	E	10	10	10	10	10	10	10	10	100		
751	A	10	10	10	10	10	10	10	10	100	100%	
	B	10	10	10	10	10	10	10	10	100		
	C	10	10	10	10	10	10	10	10	100		
	D	10	10	10	10	10	10	10	10	100		
	E	10	10	10	10	10	10	10	10	100		
1001	A	10	10	10	10	10	10	10	10	100	98%	4.56%
	B	10	10	10	10	10	10	10	10	100		
	C	10	10	10	10	10	10	10	10	100		
	D	10	10	10	10	9	9	9	9	90		
	E	10	10	10	10	10	10	10	10	100		
ANALYST:		MA	JD	WH	JD	JD	JD	JD	#B, TT			
DATE:		12-16	12-17	12-18	12-19	12-20	12-21	12-22	12-23			
TIME:		1700	1445	1045	1330	1445	1630	1200	1050			

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

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s:		K412477		TEST DATES (BEGIN / END):		12/16-23/04	
CLIENT:		Weston		WEIGHING DATE / TIME:		12/28/04, 1135	
ANALYSTS:		jd, tt		DRYING TEMP (DEGREES C):		60	
SAMPLE ID:				DRYING TIME (HOURS):		24	
	REP #	FINAL DRY WEIGHT TIN+LARVAE (g)	INITIAL WEIGHT TIN (g)	TOTAL DRY WEIGHT OF LARVAE (g)	NUMBER OF LARVAE	DRY WEIGHT OF LARVAE (mg)	
CONTROL	A	0.97012	0.96422	0.00590	10	0.590	AVG DRY
	B	0.97112	0.96692	0.00420	10	0.420	WEIGHT (mg)
	C	0.97316	0.96856	0.00460	10	0.460	0.494
	D	0.96807	0.96293	0.00514	10	0.514	CV
	E	0.97006	0.96519	0.00487	10	0.487	12.9
CONC: 32%	A	0.96992	0.96416	0.00576	10	0.576	AVG DRY
	B	0.97688	0.97051	0.00637	10	0.637	WEIGHT (mg)
	C	0.97674	0.97054	0.00620	10	0.620	0.619
	D	0.97533	0.96898	0.00635	10	0.635	CV
	E	0.97005	0.96377	0.00628	10	0.628	
CONC: 42%	A	0.96944	0.96350	0.00594	10	0.594	AVG DRY
	B	0.96977	0.96344	0.00633	10	0.633	WEIGHT (mg)
	C	0.96863	0.96259	0.00604	10	0.604	0.606
	D	0.96853	0.96346	0.00507	10	0.507	CV
	E	0.96859	0.96167	0.00692	10	0.692	
CONC: 56%	A	0.96803	0.96250	0.00553	10	0.553	AVG DRY
	B	0.96910	0.96446	0.00464	10	0.464	WEIGHT (mg)
	C	0.97334	0.96748	0.00586	10	0.586	0.568
	D	0.96953	0.96375	0.00578	10	0.578	CV
	E	0.97073	0.96415	0.00658	10	0.658	
CONC: 75%	A	0.97208	0.96560	0.00648	10	0.648	AVG DRY
	B	0.97347	0.96797	0.00550	10	0.550	WEIGHT (mg)
	C	0.97336	0.96672	0.00664	10	0.664	0.603
	D	0.97137	0.96622	0.00515	10	0.515	CV
	E	0.97206	0.96569	0.00637	10	0.637	
CONC: 100%	A	0.96859	0.96353	0.00506	10	0.506	AVG DRY
	B	0.97567	0.96980	0.00587	10	0.587	WEIGHT (mg)
	C	0.97634	0.97012	0.00622	10	0.622	0.542
	D	0.97272	0.96827	0.00445	10	0.445	CV
	E	0.97344	0.96793	0.00551	10	0.551	12.8

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB #/ #s:		K412477		TEST DATES (BEGIN / END): 12/10-23/04		
CLIENT:		Weston		WEIGHING DATE / TIME: 12/28/04, 11:35		
ANALYSTS:		JD, TT		DRYING TEMP (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 LARVAE (mg)
CONTROL	A 301	0.97012	0.96422			AVG DRY WEIGHT (mg)
	B 302	0.97112	0.96692			
	C 303	0.97316	0.96856			
	D 304	0.96807	0.96293			CV
	E 305	0.97006	0.96519			
321	A 306	0.96992	0.96416			AVG DRY WEIGHT (mg)
	B 307	0.97688	0.97051			
	C 308	0.97674	0.97054			
	D 309	0.97533	0.96898			CV
	E 310	0.97005	0.96377			
421	A 311	0.96944	0.96350			AVG DRY WEIGHT (mg)
	B 312	0.96977	0.96344			
	C 313	0.96863	0.96259			
	D 314	0.96853	0.96346			CV
	E 315	0.96859	0.96117			
561	A 316	0.96803	0.96250			AVG DRY WEIGHT (mg)
	B 317	0.96910	0.96446			
	C 318	0.97334	0.96748			
	D 319	0.96953	0.96375			CV
	E 320	0.97073	0.96415			
751	A 321	0.97208	0.96560			AVG DRY WEIGHT (mg)
	B 322	0.97347	0.96797			
	C 323	0.97334	0.96672			
	D 324	0.97137	0.96622			CV
	E 325	0.97206	0.96569			
1001	A 326	0.96859	0.96353			AVG DRY WEIGHT (mg)
	B 327	0.97567	0.96980			
	C 328	0.97634	0.97012			
	D 329	0.97272	0.96827			CV
	E 330	0.97344	0.96793			

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

AA# K412477 FATHEAD MINNOW SURVIVAL, 12-16-04
File: k412477s Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.149

W = 0.761

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# K412477 FATHEAD MINNOW SURVIVAL, 12-16-04
File: k412477s 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# K412477 FATHEAD MINNOW SURVIVAL, 12-16-04

FILE: k412477s

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	0.9000	1.2490
1	CONTROL	3	0.9000	1.2490
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	0.9000	1.2490
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	0.8000	1.1071
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	0.9000	1.2490
6	100 % EFFLUENT	5	1.0000	1.4120

AA# K412477 FATHEAD MINNOW SURVIVAL, 12-16-04

File: k412477s 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	1.347				
2	32 % EFFLUENT	1.379	30.00	16.00	5.00	
3	42 % EFFLUENT	1.351	29.00	16.00	5.00	
4	56 % EFFLUENT	1.412	32.50	16.00	5.00	
5	75 % EFFLUENT	1.412	32.50	16.00	5.00	
6	100 % EFFLUENT	1.379	30.00	16.00	5.00	

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

AA # K412477, FATHEAD MINNOW GROWTH, 12-16-04
File: k412477g Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

D = 0.093

W = 0.955

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 # K412477, FATHEAD MINNOW GROWTH, 12-16-04
File: k412477g Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 3.85

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 # K412477, FATHEAD MINNOW GROWTH, 12-16-04
FILE: k412477g
TRANSFORM: NO TRANSFORMATION

NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.5900	0.5900
1	CONTROL	2	0.4200	0.4200
1	CONTROL	3	0.4600	0.4600
1	CONTROL	4	0.5140	0.5140
1	CONTROL	5	0.4870	0.4870
2	32 % EFFLUENT	1	0.5760	0.5760
2	32 % EFFLUENT	2	0.6370	0.6370
2	32 % EFFLUENT	3	0.6200	0.6200
2	32 % EFFLUENT	4	0.6350	0.6350
2	32 % EFFLUENT	5	0.6280	0.6280
3	42 % EFFLUENT	1	0.5940	0.5940
3	42 % EFFLUENT	2	0.6330	0.6330
3	42 % EFFLUENT	3	0.6040	0.6040
3	42 % EFFLUENT	4	0.5070	0.5070
3	42 % EFFLUENT	5	0.6920	0.6920
4	56 % EFFLUENT	1	0.5530	0.5530
4	56 % EFFLUENT	2	0.4640	0.4640
4	56 % EFFLUENT	3	0.5860	0.5860
4	56 % EFFLUENT	4	0.5780	0.5780
4	56 % EFFLUENT	5	0.6580	0.6580
5	75 % EFFLUENT	1	0.6480	0.6480
5	75 % EFFLUENT	2	0.5500	0.5500
5	75 % EFFLUENT	3	0.6640	0.6640
5	75 % EFFLUENT	4	0.5150	0.5150
5	75 % EFFLUENT	5	0.6370	0.6370
6	100 % EFFLUENT	1	0.5060	0.5060
6	100 % EFFLUENT	2	0.5870	0.5870
6	100 % EFFLUENT	3	0.6220	0.6220
6	100 % EFFLUENT	4	0.4450	0.4450
6	100 % EFFLUENT	5	0.5510	0.5510

AA # K412477, FATHEAD MINNOW GROWTH, 12-16-04
File: k412477g Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.056	0.011	2.910
Within (Error)	24	0.093	0.004	
Total	29	0.150		

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

AA # K412477, FATHEAD MINNOW GROWTH, 12-16-04
 File: k412477g 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	0.494	0.494		
2	32 % EFFLUENT	0.619	0.619	-3.173	
3	42 % EFFLUENT	0.606	0.606	-2.838	
4	56 % EFFLUENT	0.568	0.568	-1.868	
5	75 % EFFLUENT	0.603	0.603	-2.757	
6	100 % EFFLUENT	0.542	0.542	-1.218	

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

AA # K412477, FATHEAD MINNOW GROWTH, 12-16-04
 File: k412477g 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	0.093	18.8	-0.125
3	42 % EFFLUENT	5	0.093	18.8	-0.112
4	56 % EFFLUENT	5	0.093	18.8	-0.074
5	75 % EFFLUENT	5	0.093	18.8	-0.109
6	100 % EFFLUENT	5	0.093	18.8	-0.048

APPENDIX D

Ceriodaphnia dubia Raw Data and Statistics

Ceriodaphnia dubia

SURVIVAL AND REPRODUCTION TEST

Discharger:		Lab Number/s		Analyst:										
Weston		K412477		WH 30 mg										
Location:		Date Sample Collected:		Test Start-Date/Time:										
See CDC		See CDC		12-16-04 1630										
Date Sample Collected:		Test Stop-Date/Time:		Conc 4										
See CDC		12-22-04 0925		WH 30 mg										
Conc 1	Day	Replicate								No. of Young/Adults	Analyst			
		A	B	C	D	E	F	G	H			I	J	
%	1	0	0	0	0	0	0	0	0	0	0	0	0	WH
	2	0	0	0	0	0	0	0	0	0	0	0	0	JD
	3	4	3	2	1	0	0	2	3	5	3	23	23	JD
	4	8	8	7	2	8	8	3	7	6	7	67	67	JD
	5	6	14	12	11	8	10	11	13	12	9	97	97	mg
	6	0	0	1	0	1	0	1	0	3	2	4	3	mg
	7													
	8													
Total		18	35	24	11	23	25	26	28	25	21	211	208	CV=16.2%
Conc 2	Day	Replicate								No. of Young/Adults	Analyst			
		A	B	C	D	E	F	G	H			I	J	
%	1	0	0	0	0	0	0	0	0	0	0	0	0	WH
	2	0	0	0	0	0	0	0	0	0	0	0	0	JD
	3	0	4	3	0	5	2	0	2	3	3	22	22	JD
	4	0	7	7	0	0	0	9	7	1	6	49	49	JD
	5	0	8	10	10	8	9	9	10	3	7	74	74	mg
	6	0	6	3	3	1	2	4	9	6	10	64	64	mg
	7													
	8													
Total		0	25	23	19	24	19	22	28	23	26	208	208	
Conc 3	Day	Replicate								No. of Young/Adults	Analyst			
		A	B	C	D	E	F	G	H			I	J	
%	1	0	0	0	0	0	0	0	0	0	0	0	0	WH
	2	0	0	0	0	0	0	0	0	0	0	0	0	JD
	3	3	4	0	3	0	2	3	0	6	1	28	28	JD
	4	7	8	4	9	1	6	7	0	0	3	45	45	JD
	5	12	12	5	6	7	7	8	0	2	1	60	60	mg
	6	0	4	6	5	10	6	3	0	13	3	55	55	mg
	7													
	8													
Total		32	28	15	33	30	21	20	27	20	18	194	194	
Conc 4	Day	Replicate								No. of Young/Adults	Analyst			
		A	B	C	D	E	F	G	H			I	J	
%	1	0	0	0	0	0	0	0	0	0	0	0	0	WH
	2	0	0	0	0	0	0	0	0	0	0	0	0	JD
	3	4	4	0	4	0	4	3	2	3	-	24	24	JD
	4	11	6	0	12	0	10	8	9	10	-	66	66	JD
	5	12	10	5	10	0	11	10	12	8	-	78	78	mg
	6	0	5	17	5	0	1	6	2	1	-	37	37	mg
	7													
	8													
Total		27	25	22	31	0	26	27	25	22	20	205	205	
Conc 5	Day	Replicate								No. of Young/Adults	Analyst			
		A	B	C	D	E	F	G	H			I	J	
%	1	0	0	0	0	0	0	0	0	0	0	0	0	WH
	2	0	0	0	0	0	0	0	0	0	0	0	0	JD
	3	2	0	0	3	2	4	4	2	2	2	23	23	JD
	4	0	9	5	1	8	8	1	7	5	4	50	50	JD
	5	9	10	9	4	13	12	11	9	12	7	96	96	mg
	6	13	0	1	10	4	1	-	3	12	3	47	47	mg
	7													
	8													
Total		21	19	15	18	27	25	16	23	31	19	216	216	
Conc 6	Day	Replicate								No. of Young/Adults	Analyst			
		A	B	C	D	E	F	G	H			I	J	
%	1	0	0	0	0	0	0	0	0	0	0	0	0	WH
	2	0	0	0	0	0	0	0	0	0	0	0	0	JD
	3	0	2	0	5	0	2	4	3	5	3	27	27	JD
	4	4	8	15	6	5	0	8	2	8	7	63	63	JD
	5	1	9	10	11	3	7	9	12	11	9	82	82	mg
	6	12	3	10	12	2	11	1	4	4	4	73	73	mg
	7													
	8													
Total		17	22	40	29	12	22	21	33	26	23	245	245	CV=32.6%

X=DEAD; Y=MALE

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	DEAD	ALIVE	TOTAL ANIMALS
CONTROL	2	8	10
32% effluent	0	10	10
TOTAL	2	18	20

CRITICAL FISHER'S VALUE (10,10,2) ($p=0.05$) IS LESS THAN 0. b VALUE IS 0.
NO SIGNIFICANT DIFFERENCE

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	DEAD	ALIVE	TOTAL ANIMALS
CONTROL	2	8	10
42% effluent	0	10	10
TOTAL	2	18	20

CRITICAL FISHER'S VALUE (10,10,2) ($p=0.05$) IS LESS THAN 0. b VALUE IS 0.
NO SIGNIFICANT DIFFERENCE

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	DEAD	ALIVE	TOTAL ANIMALS
CONTROL	2	8	10
56% effluent	1	9	10

TOTAL 3 17 20

CRITICAL FISHER'S VALUE (10,10,2) (p=0.05) IS LESS THAN 0. b VALUE IS 1.
NO SIGNIFICANT DIFFERENCE

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	DEAD	ALIVE	TOTAL ANIMALS
CONTROL	2	8	10
75% effluent	1	9	10
TOTAL	3	17	20

CRITICAL FISHER'S VALUE (10,10,2) (p=0.05) IS LESS THAN 0. b VALUE IS 1.
NO SIGNIFICANT DIFFERENCE

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF		
	DEAD	ALIVE	TOTAL ANIMALS
CONTROL	2	8	10
100% effluent	0	10	10
TOTAL	2	18	20

CRITICAL FISHER'S VALUE (10,10,2) (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)
1	CONTROL	10	2	
	32% effluent	10	0	

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

AA# K412477, CERIODAPHNIA REPRODUCTION, 12-16-04
File: k412477c 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# K412477, CERIODAPHNIA REPRODUCTION, 12-16-04
File: k412477c Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 6.89

Table Chi-square value = 15.09 (alpha = 0.01, df = 5)
Table Chi-square value = 11.07 (alpha = 0.05, df = 5)

Data PASS B1 homogeneity test at 0.01 level. Continue analysis.

TITLE: AA# K412477, CERIODAPHNIA REPRODUCTION, 12-16-04
 FILE: k412477c
 TRANSFORM: NO TRANSFORMATION

NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	18.0000	18.0000
1	CONTROL	2	25.0000	25.0000
1	CONTROL	3	24.0000	24.0000
1	CONTROL	4	21.0000	21.0000
1	CONTROL	5	16.0000	16.0000
1	CONTROL	6	23.0000	23.0000
1	CONTROL	7	25.0000	25.0000
1	CONTROL	8	26.0000	26.0000
1	CONTROL	9	8.0000	8.0000
1	CONTROL	10	25.0000	25.0000
2	32 % EFFLUENT	1	0.0000	0.0000
2	32 % EFFLUENT	2	25.0000	25.0000
2	32 % EFFLUENT	3	23.0000	23.0000
2	32 % EFFLUENT	4	19.0000	19.0000
2	32 % EFFLUENT	5	24.0000	24.0000
2	32 % EFFLUENT	6	19.0000	19.0000
2	32 % EFFLUENT	7	22.0000	22.0000
2	32 % EFFLUENT	8	28.0000	28.0000
2	32 % EFFLUENT	9	23.0000	23.0000
2	32 % EFFLUENT	10	26.0000	26.0000
3	42 % EFFLUENT	1	22.0000	22.0000
3	42 % EFFLUENT	2	28.0000	28.0000
3	42 % EFFLUENT	3	15.0000	15.0000
3	42 % EFFLUENT	4	23.0000	23.0000
3	42 % EFFLUENT	5	30.0000	30.0000
3	42 % EFFLUENT	6	21.0000	21.0000
3	42 % EFFLUENT	7	20.0000	20.0000
3	42 % EFFLUENT	8	0.0000	0.0000
3	42 % EFFLUENT	9	27.0000	27.0000
3	42 % EFFLUENT	10	8.0000	8.0000
4	56 % EFFLUENT	1	27.0000	27.0000
4	56 % EFFLUENT	2	25.0000	25.0000
4	56 % EFFLUENT	3	22.0000	22.0000
4	56 % EFFLUENT	4	31.0000	31.0000
4	56 % EFFLUENT	5	0.0000	0.0000
4	56 % EFFLUENT	6	26.0000	26.0000
4	56 % EFFLUENT	7	27.0000	27.0000
4	56 % EFFLUENT	8	25.0000	25.0000
4	56 % EFFLUENT	9	22.0000	22.0000
4	56 % EFFLUENT	10	0.0000	0.0000
5	75 % EFFLUENT	1	24.0000	24.0000
5	75 % EFFLUENT	2	19.0000	19.0000
5	75 % EFFLUENT	3	15.0000	15.0000
5	75 % EFFLUENT	4	18.0000	18.0000
5	75 % EFFLUENT	5	27.0000	27.0000
5	75 % EFFLUENT	6	25.0000	25.0000
5	75 % EFFLUENT	7	16.0000	16.0000
5	75 % EFFLUENT	8	23.0000	23.0000
5	75 % EFFLUENT	9	31.0000	31.0000

5	75	%	EFFLUENT	10	18.0000	18.0000
6	100	%	EFFLUENT	1	17.0000	17.0000
6	100	%	EFFLUENT	2	22.0000	22.0000
6	100	%	EFFLUENT	3	40.0000	40.0000
6	100	%	EFFLUENT	4	29.0000	29.0000
6	100	%	EFFLUENT	5	12.0000	12.0000
6	100	%	EFFLUENT	6	22.0000	22.0000
6	100	%	EFFLUENT	7	21.0000	21.0000
6	100	%	EFFLUENT	8	33.0000	33.0000
6	100	%	EFFLUENT	9	26.0000	26.0000
6	100	%	EFFLUENT	10	23.0000	23.0000

AA# K412477, CERIODAPHNIA REPRODUCTION, 12-16-04
File: k412477c Transform: NO TRANSFORMATION

STEEL'S MANY-ONE RANK TEST

Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	21.100				
2	32 % EFFLUENT	20.900	106.50	75.00	10.00	
3	42 % EFFLUENT	19.400	101.50	75.00	10.00	
4	56 % EFFLUENT	20.500	117.50	75.00	10.00	
5	75 % EFFLUENT	21.600	103.00	75.00	10.00	
6	100 % EFFLUENT	24.500	113.50	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 12-16-04 Arkansas Analytical

SPECIES Pimephales promelas

QUANTITY SHIPPED 800+

AGE/LIFE STAGE 42 hrs 12/16 1500ST

BROODSTOCK SOURCE Anderson Farms, Ar

CULTURE WATER groundwater

ALKALINITY (Mg/l as CaCO₃) = 180

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

FEEDING AT Farm

COMMENTS _____

PACKAGED BY lll

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:

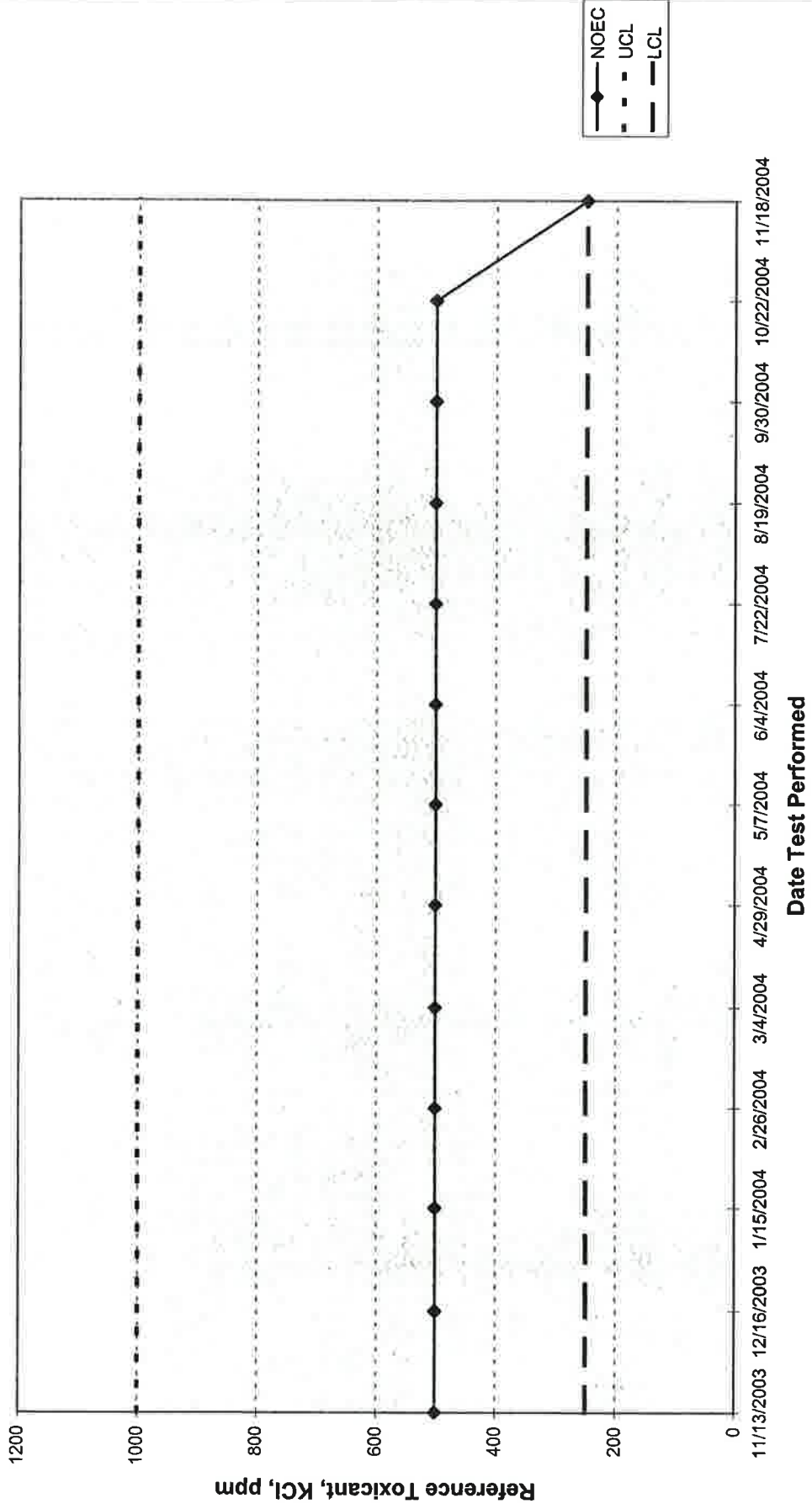


Facility Supervisor

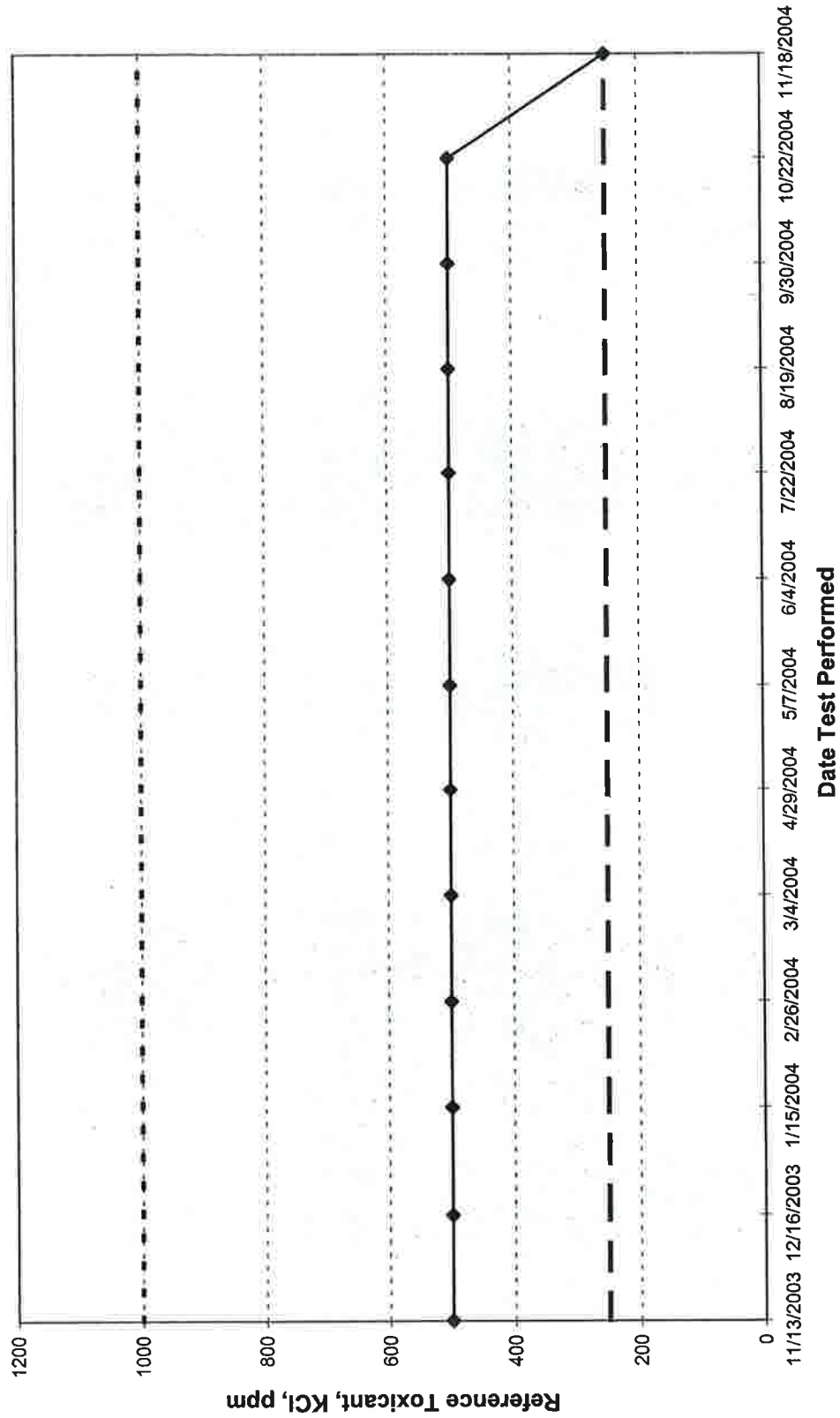
APPENDIX F

Quality Assurance Charts

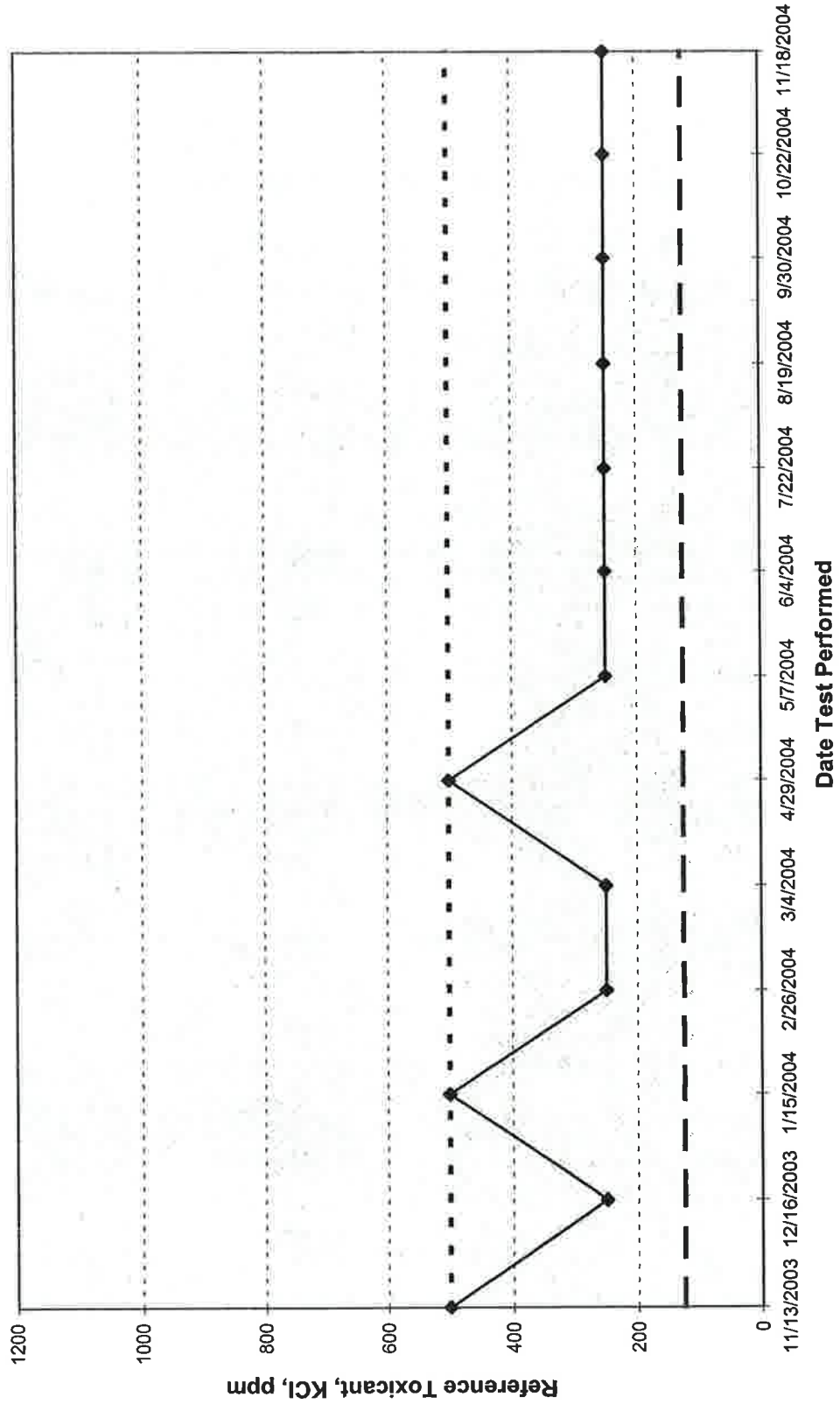
ARKANSAS ANALYTICAL, INC.
FATHEAD MINNOW SURVIVAL
QUALITY ASSURANCE



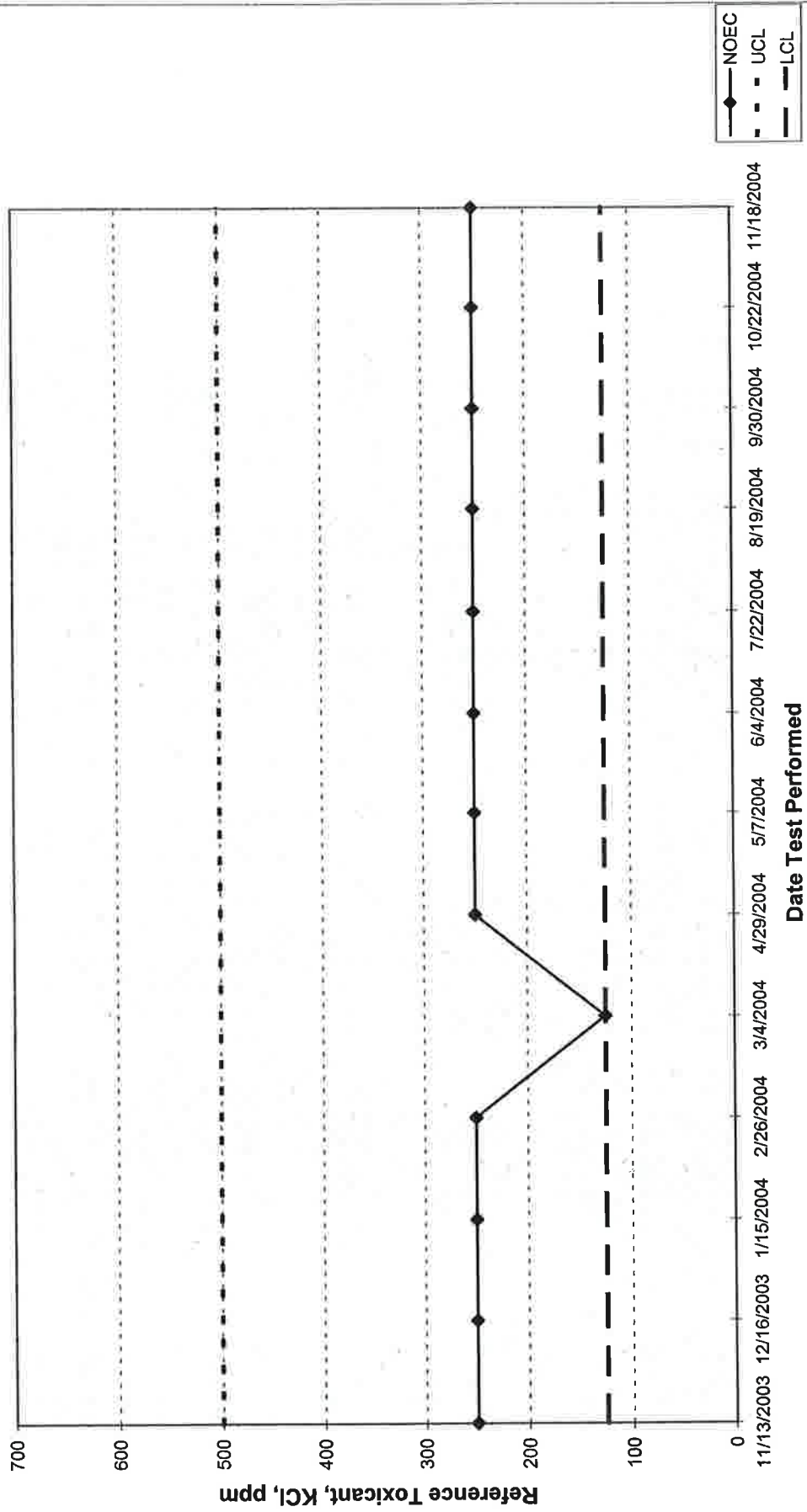
ARKANSAS ANALYTICAL, INC.
FATHEAD MINNOW GROWTH
QUALITY ASSURANCE



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
Arkansas Analytical, Inc.
 Little Rock, AR

has earned certification by law in accordance with Code Annotated §8-2-201 et seq., the State Environmental Laboratory Certification Program Act for the following parameters:

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

Laboratory ID: 60-1754

Certificate Number: 04-075-0

Issued Date: 30 October 2004

Expired Date: 30 October 2005

J.A. Semlowski
 ADEQ Quality Assurance Officer

Date *October 27, 2004*

