



Arkansas Analytical, Inc.

Toxicity Test Results

MAGCOBAR MINE SITE
NPDES PERMIT NUMBER: AR0049794
February, 2006

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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Monday, March 20, 2006



Introduction

This report contains test results for toxicity testing for the Magcobar Mine Site. The NPDES permit number is AR0049794. The facility is located one mile northeast of Magnet Cove in Sections 10, 11, 14, & 15, Township 3 South, Range 17 West in Hot Springs County, Arkansas. The facility discharges into Chamberlain Creek, thence to Cove Creek, thence to Ouachita River in Segment 2F of the Ouachita River Basin.

The permit requires chronic biomonitoring testing bi-monthly for both *Ceriodaphnia dubia* and *Pimephales promelas*. The test results in this report represent the testing for February of 2006.

Plant Operations

To be provided by permittee.

Source of Effluent and Dilution Water

Effluent samples were collected as follows:

Sample Collection:	Date, Time Started	Date, Time Ended
Sample #1:	2-6-06, 0900	2-7-06, 0900
Sample #2:	2-7-06, 0900	2-8-06, 0900
Sample #3:	2-13-06, 0900	2-14-06, 0900

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:	2-7-06, 1242	4
Sample #2:	2-8-06, 1208	4
Sample #3:	2-14-06, 1132	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 eight organisms in a test solution volume of 250 mls. The alternate method suggested in the method (11.3.4.5) for combating pathogen interference, was also run parallel to the original fathead minnow test. The test chambers were 30 ml plastic cups with 20 ml of test solution. Each chamber contained 2 organisms. The total number of fish remained the same (40 per test solution). The fish were then combined to perform growth analysis. The test temperature was 25 degrees Centigrade. Raw data and statistics are provided in Appendix C.

EPA Method 1002.0, Cladoceran, *Ceriodaphnia dubia*, Survival and Reproduction Test, was also used. Neonates are exposed in a static renewal system until at least 60% of the control organisms have produced a third brood. Results are based on the survival and reproduction of the organisms. One neonate was placed in each of ten replicate chambers using a randomizing template. Test chambers were 30 ml plastic cups filled with 15 ml of test solution. The test temperature was 25 degrees Centigrade. Raw data and statistics are provided in Appendix D.

Test Organisms

The organisms used in Test 1000.0 were < 24 hour old Fathead Minnows, *Pimephales promelas*, which were purchased from Aquatox; a copy of the organism history is provided in Appendix E.

The organisms used in Test 1002.0 were < 24 hour old *Ceriodaphnia dubia* neonates, (all born within the same eight hours), obtained from an in-house culture. An organism history is provided in Appendix E.

Quality Assurance

Test Acceptability

TEST ACCEPTANCE CRITERIA for *Ceriodaphnia dubia*

Control Criteria	Results	Pass	Fail
Greater than or equal to 80% survival	90%	X	
Average of 15 or more young per surviving female	22.4	X	
At least 60% of surviving females should have produced 3 broods	90%	X	
The percent coefficient of variation between replicates must be 40% or less for the young of surviving females	7.75%	X	

TEST ACCEPTANCE CRITERIA for *Pimephales promelas*

Control Criteria	Results	Pass	Fail
Greater than or equal to 80% survival	95%	X	
The percent coefficient of variation between replicates must be 40% or less for survival	11.8%	X	
Minimum of 0.25 mg average dry weight of surviving controls	0.687	X	
The percent coefficient of variation between replicates must be 40% or less for growth	12.1%	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)	18.3	%CV survival (critical dilution)	20.2%
%CV Reproduction (critical dilution)	17.9%	Mean dry weight (critical dilution) in milligrams	0.509
		%CV growth (critical dilution)	24.8%

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:


Melissa Green


Andrea Fox


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Wendy Best



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

PERMITTEE: Magcobar Mine Site

NPDES #: AR0049794

Sample Collection:	Date, Time Started	Date, Time Ended
Sample #1:	2-6-06, 0900	2-7-06, 0900
Sample #2:	2-7-06, 0900	2-8-06, 0900
Sample #3:	2-13-06, 0900	2-14-06, 0900

Test initiated (date, time): 2-9-06, 1600 Test terminated (date, time): 2-16-06, 0930

Dilution water used: Soft Synthetic

DATA TABLE FOR FATHEAD MINNOW SURVIVAL

Effluent Conc %	Percent Survival in Replicate Chambers					Mean Percent Survival			
	A	B	C	D	E	24 hours	48 hours	7 days	CV %
0%	100	100	100	75	100	100	100	95	11.8
32%	62.5	100	100	87.5	100	100	100	90	
42%	100	87.5	75	100	100	97.5	97.5	92.5	
56%	87.5	75	75	100	87.5	100	92.5	85	
75%	100	100	87.5	100	100	100	100	97.5	
100%	100	75	62.5	100	100	100	95	87.5	20.2

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%	0.787	0.655	0.643	0.590	0.760	0.687	12.1
32%	0.529	0.704	0.577	0.493	0.821	0.625	
42%	0.817	0.615	0.569	0.522	0.540	0.613	
56%	0.464	0.516	0.456	0.623	0.593	0.530	
75%	0.631	0.669	0.520	0.604	0.604	0.606	
100%	0.689	0.555	0.343	0.481	0.479	0.509	24.8

Coefficient of Variation = standard deviation / mean * 100



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

PERMITTEE: Magcobar Mine Site

NPDES #: AR0049794

Sample Collection:	Date, Time Started	Date, Time Ended
Sample #1:	2-6-06, 0900	2-7-06, 0900
Sample #2:	2-7-06, 0900	2-8-06, 0900
Sample #3:	2-13-06, 0900	2-14-06, 0900

Test initiated (date, time): 2-9-06, 1630 Test terminated (date, time): 2-16-06, 0910

Dilution water used: Soft Synthetic

**DATA TABLE FOR FATHEAD MINNOW SURVIVAL
ALTERNATE METHOD (SUMMARY)**

Effluent Conc %	Percent Survival in Replicate Chambers						Mean Percent Survival			
	A	B	C	D	E		24 hours	48 hours	7 days	CV %
0%	100	87.5	87.5	100	75		100	100	90	11.6
32%	75	100	75	87.5	100		97.5	97.5	87.5	
42%	87.5	75	100	87.5	100		97.5	97.5	90	
56%	87.5	75	87.5	87.5	87.5		100	97.5	85	
75%	75	87.5	87.5	100	87.5		100	100	87.5	
100%	50	87.5	87.5	87.5	87.5		100	100	80	21.0

**DATA TABLE FOR GROWTH OF FATHEAD MINNOWS
ALTERNATE METHOD**

Effluent Conc %	Average Dry Weight in milligrams in replicate chambers						Mean Dry Weight	CV%
	A	B	C	D	E			
0%	0.427	0.444	0.421	0.248	0.511		0.410	23.8
32%	0.319	0.419	0.438	0.339	0.565		0.416	
42%	0.619	0.525	0.611	0.424	0.595		0.555	
56%	0.501	0.394	0.392	0.419	0.560		0.453	
75%	0.290	0.381	0.405	0.459	0.291		0.365	
100%	0.629	0.339	0.424	0.377	0.278		0.409	32.7

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)= 20.2 %



SUMMARY REPORTING FORMS FOR CHRONIC BIOMONITORING
Ceriodaphnia dubia SURVIVAL AND REPRODUCTION

Permittee: Magcobar Mine Site

NPDES #: AR0049794

Sample Collection:	Date, Time Started	Date, Time Ended
Sample #1:	2-6-06, 0900	2-7-06, 0900
Sample #2:	2-7-06, 0900	2-8-06, 0900
Sample #3:	2-13-06, 0900	2-14-06, 0900

Test initiated (date, time): 2-9-06, 0930 Test terminated (date, time): 2-15-06, 0820

Dilution water used: Soft Synthetic

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

Replicate	0%	32%	42%	56%	75%	100%
A	22	20	17	18	20	24
B	22	20	21	20	18	16
C	20	19	22	17	19	X0
D	24	19	4	30	21	17
E	20	18	21	4	16	20
F	24	24	16	19	16	16
G	X0	19	20	18	21	15
H	22	16	17	21	17	22
I	25	20	19	18	19	15
J	23	12	22	15	17	20
Mean	20.2	18.7	17.9	18.0	18.4	16.5
Mean/surviving female	22.4	18.7	17.9	18.0	18.4	18.3
CV%*	7.75					17.9

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	100	90

1. Fisher's Exact Test:

Is the mean survival at test termination significantly different (p=0.05) than the control survival for:

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

2. Dunnett's Procedure or Steel's Many One Rank Test:

Is the mean number of young produced per female significantly different (p=0.05) than the controls number of young per female for:

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

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

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

5. Enter percentage corresponding to each parameter below:

a) NOEC survival (parameter TOP3B)= 100 % effluent





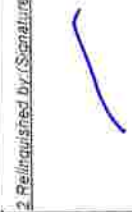
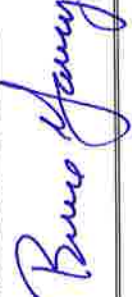
b) NOEC reproduction (parameter TPP3B)= 100 % effluent

c) Coefficient of variation (parameter TQP3B)= 17.9 %



APPENDIX A

Chain of Custody Forms

CHAIN OF CUSTODY RECORD

CLIENT INFORMATION		Project Description		Turnaround Time		Preservation Codes:			
EEMA O&M		MAGCOBAR Mine Site		(CIRCLE ONE)		1. Cool, 4 degrees Centigrade 2. Sulfuric Acid, pH <2 3. Nitric Acid, pH <2 4. Thiou sulfate for dechlorination 5. Hydrochloric Acid for YDA 6. Sodium Hydroxide, pH >12			
P.O. Box 699		Reporting Information		24 hour					
2000 Darby Lane		Telephone: 501/467-8355		48 hour					
Malvern, AR 72104		FAX: 501/467-8687		<input checked="" type="checkbox"/> routine Preservative Code:					
Attn: Darrel Scott		Bill to/P.O		Bottle Type		Bottle type code C=glass; P=HDPE V=septum; A=amber			
				Samplers: (Printed)				Chronic Bio	
				Sample Collection		# of Containers		SAMPLE IDENTIFICATION/DESCRIPTION	
Field Number	Date/s	Time/s	Grab	Comp	Matrix				
FD27COMP	2/1/2006	9:00	X	X	10	Facility Discharge			
1. Relinquished by: (Signature) 		Date/Time	1. Received by: (Signature) 		For completion by laboratory				
		2/1/06			Condition of samples				
		1242			A. Containers Correct? <input checked="" type="checkbox"/>				
2. Relinquished by: (Signature) 		Date/Time	2. Received by: (Signature) 		B. Preservation Correct? <input checked="" type="checkbox"/>				
		2/1/06			C. Seals Intact? <input checked="" type="checkbox"/>				
		1242			REMARKS Temp. on Receipt - 2°C				

CHAIN OF CUSTODY RECORD

CLIENT INFORMATION				Project Description		Turnaround Time (CIRCLE ONE)		Preservation Codes:											
EEMA O&M				MAGCOBAR Mine Site		(CIRCLE ONE)		1. Cool, 4 degrees Centigrade											
P.O. Box 699				Reporting Information		24 hour		2. Sulfuric Acid, pH <2											
2000 Darby Lane				Telephone: 501/467-8355		48 hour		3. Nitric Acid, pH <2											
Malvern, AR 72104				FAX: 501/467-8687		routine		4. Thiosulfate for dechlorination											
Attn: Randall Lambert				Bill to/P.O.		Preservative Code:		5. Hydrochloric Acid for VOA											
Bottle Type				P		Bottle type code		6. Sodium Hydroxide, pH >12											
G=glass; P=HDPE				V=septum; A=amber															
<p>Samplers: (Signature/s)</p> <p><i>Randall Lambert</i></p>				<p>Samplers: (Printed)</p> <p>RANDALL Lambert</p>				<p>TEST PARAMETERS</p>											
<p>Field Number</p> <p>FD28COMP</p>				<p>Date/s</p> <p>2/8/2006 9/00</p>		<p>Sample Collection Time/s</p>		<p>Grab</p> <p>X</p>		<p>Comp</p>		<p># of Containers</p> <p>4</p>		<p>SAMPLE IDENTIFICATION/ DESCRIPTION</p> <p>Facility Discharge</p>		<p>Chronic Bio</p> <p>X</p>		<p>Arkansas Analytical Lab #</p> <p>K602179B</p>	
1. Relinquished by: (Signature)				Date/Time				1. Received by: (Signature)				For completion by laboratory				REMARKS			
<i>Randall Lambert</i>				11:20 2-8-06								Condition of samples: yes <input checked="" type="checkbox"/> no <input type="checkbox"/>				Temp. on Receipt - 10C			
2. Relinquished by: (Signature)				Date/Time				2. Received by laboratory: (Signature)				A. Containers Correct? <input checked="" type="checkbox"/>				B. Preservation Correct? <input checked="" type="checkbox"/>			
				2-8-06, 1208				<i>Sydney James</i>				C. Seals Intact? <input checked="" type="checkbox"/>							

CHAIN OF CUSTODY RECORD

CLIENT INFORMATION		Project Description		Turnaround Time (CIRCLE ONE)		Preservation Codes:	
EEMA O&M		MAGCOBAR Mine Site		24 hour		1. Cool, 4 degrees Centigrade	
P.O. Box 699		Reporting Information		48 hour		2. Sulfuric Acid, pH <2	
2000 Darby Lane		Telephone: 501/467-8355		routine		3. Nitric Acid, pH <2	
Malvern, AR 72104		FAX: 501/467-8687		Preservative Code:		4. Thiosulfate for dechlorination	
Attn: Randall Lambert		Bill to P.O.		Bottle Type		5. Hydrochloric Acid for F04	
Randall Lambert		Randall Lambert		P		6. Sodium Hydroxide, pH >12	
Samplers: (Signature/s)		Samplers: (Printed)		Chronic Bio		Bottle type code	
Field Number		Sample Collection Date/s		Time/s		C=glass, P=HDPE	
FD214COMP		2/14/2006		9:00		V=septum; A=amber	
Grab		Comp		# of Containers		TEST PARAMETERS	
		X		5			
Sample		Matrix		IDENTIFICATION/ DESCRIPTION		Arkansas Analytical Lab #	
				Facility Discharge		K602179C	
Date/Time		1 Received by: (Signature)		For completion by laboratory		REMARKS	
2-14-06		2-14-06		Condition of samples		Temp on Receipt - 10C	
Randall Lambert		Bottles		yes <input type="checkbox"/>			
2. Relinquished by: (Signature)		2. Received by laboratory: (Signature)		no <input type="checkbox"/>			
Randall Lambert		Jessie Redman		A. Containers Correct? <input type="checkbox"/>			
		1132		B. Preservation Correct? <input type="checkbox"/>			
				C. Seals intact? <input type="checkbox"/>			

APPENDIX B

Effluent and Dilution Water Data

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Fathead Minnow

Lab # / Sample ID		K602179							Test Start (Date/Time)	2-9-06 / 1600
Client		EEMA							Test End (Date/Time)	2-14-06 / 0930
		Day of Test								
		1	2	3	4	5	6	7	notes/remarks	
Control		2/9	2/10	2/11	2/12	2/13	2/14	2/15	SS 142	
D.O (mg/L)	INITIAL	7.5	7.4	7.8	7.7	7.6	7.5	7.6		
	FINAL	6.5	7.9	6.7	7.2	7.9	7.8	7.9		
pH(mg/L)	INITIAL	7.3	7.3	6.9	7.3	7.2	7.3	7.4		
	FINAL	7.1	7.9	7.6	7.5	7.9	7.7	7.6		
temp(C)	INITIAL	22.4	23.0	22.8	20.0	22.1	22.8	22.3		
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0		
ALKALINITY(mg/L)		30							→	
HARDNESS(mg/L)		38							→	
CONDUCTIVITY(umhos/cm)		153							→	
CHLORINE(mg/L)		0.05							→	
CONC:	32%	32%	32%	32%	32%	32%	32%	32%		
D.O (mg/L)	INITIAL	8.0	7.9	8.4	8.3	8.0	8.0	7.9		
	FINAL	6.6	7.7	7.1	7.2	7.7	7.6	7.7		
pH(mg/L)	INITIAL	7.5	7.4	6.8	7.3	7.4	7.5	7.6		
	FINAL	7.2	7.4	7.3	7.1	7.4	7.4	7.3		
temp(C)	INITIAL	22.5	23.1	22.7	20.0	22.2	23.0	22.2		
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0		
CONC:	42%	42%	42%	42%	42%	42%	42%	42%		
D.O (mg/L)	INITIAL	8.1	8.0	8.5	8.4	8.2	8.1	8.0		
	FINAL	6.8	7.5	7.0	7.3	7.5	7.5	7.4		
pH(mg/L)	INITIAL	7.6	7.5	7.1	7.4	7.3	7.6	7.5		
	FINAL	7.2	7.3	7.4	7.4	7.3	7.2	7.3		
temp(C)	INITIAL	22.7	23.0	22.7	19.7	22.3	23.0	22.3		
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0		
CONC:	56%	56%	56%	56%	56%	56%	56%	56%		
D.O (mg/L)	INITIAL	8.2	8.1	8.9	8.5	8.4	8.2	8.1		
	FINAL	7.0	7.1	7.2	7.1	7.1	7.2	7.0		
pH(mg/L)	INITIAL	7.7	7.6	7.3	7.4	7.3	7.7	7.4		
	FINAL	7.2	7.3	7.4	7.3	7.3	7.4	7.2		
temp(C)	INITIAL	22.9	23.1	22.8	20.1	22.2	23.1	22.4		
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0		
CONC:	75%	75%	75%	75%	75%	75%	75%	75%		
D.O (mg/L)	INITIAL	8.4	8.3	9.4	8.8	8.7	8.4	8.3		
	FINAL	7.0	7.4	8.8	8.2	7.4	7.6	7.8		
pH(mg/L)	INITIAL	7.7	7.7	7.5	7.5	7.4	7.7	7.6		
	FINAL	7.3	7.3	7.5	7.6	7.3	7.5	7.6		
temp(C)	INITIAL	22.9	23.2	22.9	19.9	22.1	23.0	22.4		
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0		
CONC:	100%	100%	100%	100%	100%	100%	100%	100%		
D.O (mg/L)	INITIAL	8.7	8.6	10.2	8.7	8.6	8.7	8.8		
	FINAL	7.0	7.2	8.7	8.6	7.2	7.2	7.2		
pH(mg/L)	INITIAL	7.8	7.8	7.4	7.1	7.0	7.8	7.7		
	FINAL	7.3	7.3	7.2	7.3	7.3	7.3	7.3		
temp(C)	INITIAL	22.9	23.3	22.7	19.9	22.2	22.9	22.5		
	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)		23			22		21		→	
HARDNESS(mg/L)		1530			1590		1530		→	
CONDUCTIVITY(umhos/cm)		2430			2450		2420		→	
CHLORINE(mg/L)		0.05			0.05		0.05		→	

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Ceriodaphnia dubia

Lab # / Sample ID		K602179		Test Start (Date/Time)		2-9-06 / 0930		Test End (Date/Time)		2-15-06 / 10820		Day of Test	notes/remarks								
Client		EEMA		Day of Test		1		2		3				4		5		6		7	
Control		2/9	2/10	2/11	2/12	2/13	2/14	2/15					SSM2								
D.O (mg/L)	INITIAL	7.5	7.4	7.8	7.7	7.6	7.5	7.6													
	FINAL	7.2	7.7	7.6	7.5	7.4	7.2	-													
pH	INITIAL	7.3	7.3	6.9	7.3	7.2	7.3	7.4													
	FINAL	7.4	7.6	7.5	7.4	7.4	7.5	-													
temp(C)	INITIAL	22.4	23.0	22.8	20.0	22.1	22.8	22.3													
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	-													
ALKALINITY(mg/L)		30																			
HARDNESS(mg/L)		38																			
CONDUCTIVITY(umhos/cm)		153																			
CHLORINE(mg/L)		0.05																			
CONC: 32.1.		32.9%	32.9%	32.9%	32%	32.1.	32.1.	32.1.													
D.O (mg/L)	INITIAL	8.0	7.9	8.4	8.3	8.0	8.0	7.9													
	FINAL	7.3	7.7	7.8	7.6	7.7	7.2	-													
pH	INITIAL	7.5	7.4	6.8	7.3	7.4	7.5	7.6													
	FINAL	7.4	7.4	7.3	7.4	7.3	7.4	-													
temp(C)	INITIAL	22.5	23.1	22.7	20.0	22.2	23.0	22.2													
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	-													
CONC: 42.1.		42.9%	42.9%	42.9%	42%	42.1.	42.1.	42.1.													
D.O (mg/L)	INITIAL	8.1	8.0	8.5	8.4	8.2	8.1	8.0													
	FINAL	7.2	7.6	7.4	7.3	7.4	7.5	-													
pH	INITIAL	7.6	7.5	7.1	7.4	7.3	7.6	7.6													
	FINAL	7.5	7.5	7.6	7.5	7.6	7.6	-													
temp(C)	INITIAL	22.7	23.0	22.7	19.7	22.3	23.0	22.3													
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	-													
CONC: 56.1.		56.9%	56.9%	56.9%	56%	56.1.	56.1.	56.1.													
D.O (mg/L)	INITIAL	8.2	8.1	8.9	8.5	8.4	8.2	8.1													
	FINAL	7.3	7.6	7.6	7.7	7.7	7.5	-													
pH	INITIAL	7.7	7.6	7.3	7.4	7.3	7.7	7.4													
	FINAL	7.6	7.5	7.6	7.6	7.6	7.5	-													
temp(C)	INITIAL	22.9	23.1	22.8	20.1	22.2	23.1	22.4													
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	-													
CONC: 75.1.		75.9%	75.9%	75.9%	75%	75.1.	75.1.	75.1.													
D.O (mg/L)	INITIAL	8.4	8.3	9.4	8.8	8.7	8.4	8.3													
	FINAL	7.3	7.6	7.5	7.5	7.6	7.5	-													
pH	INITIAL	7.7	7.7	7.5	7.5	7.4	7.7	7.6													
	FINAL	7.6	7.5	7.4	7.4	7.4	7.6	-													
temp(C)	INITIAL	22.9	23.2	22.9	19.9	22.1	23.0	22.4													
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	-													
CONC: 100.1.		100.9%	100.9%	100.9%	100%	100.1.	100.1.	100.1.													
D.O (mg/L)	INITIAL	8.7	8.6	10.2	8.7	8.6	8.7	8.8													
	FINAL	7.4	7.7	7.8	7.6	7.8	7.7	-													
pH	INITIAL	7.8	7.8	7.6	7.1	7.0	7.8	7.7													
	FINAL	7.7	7.6	7.7	7.6	7.8	7.7	-													
temp(C)	INITIAL	22.9	23.3	22.7	19.9	22.2	22.9	22.5													
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	-													
CONC:	100%	A	A	A	B	B	C	C													
ALKALINITY(mg/L)		23			> 22		> 21														
HARDNESS(mg/L)		1530			> 1590		> 1530														
CONDUCTIVITY(umhos/cm)		2430			> 2450		> 2420														
CHLORINE(mg/L)		0.05			> 0.05		> 0.05														

APPENDIX C

Fathead minnow raw data and statistics

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB #/ SAMPLE ID K602179 TEST START DATE 2-9-06 TIME 1600

CLIENT EEMA TEST END DATE 2-16-06 TIME 0930

AGE AND SOURCE OF MINNOWS

CONC:	REP #	DAY (NUMBER SURVIVING)								SURVIVAL			
		start	1	2	3	4	5	6	7	%	MEAN %	CV	
Control	A	8	8	8	8	8	8	8	8	8	100	95%	11.8%
	B	8	8	8	8	8	8	8	8	8	100		
	C	8	8	8	8	8	8	8	8	8	100		
	D	8	8	8	8	6	6	6	6	6	75		
	E	8	8	8	8	8	8	8	8	8	100		
32%	A	8	8	8	8	5	5	5	5	5	62.5	90%	
	B	8	8	8	8	8	8	8	8	8	100		
	C	8	8	8	8	8	8	8	8	8	100		
	D	8	8	8	8	7	7	7	7	7	87.5		
	E	8	8	8	8	8	8	8	8	8	100		
42%	A	8	8	8	8	8	8	8	8	8	100	92.5%	
	B	8	7	7	7	7	7	7	7	7	87.5		
	C	8	8	8	8	6	6	6	6	6	75		
	D	8	8	8	8	8	8	8	8	8	100		
	E	8	8	8	8	8	8	8	8	8	100		
56%	A	8	8	7	7	7	7	7	7	7	87.5	85%	
	B	8	8	7	7	6	6	6	6	6	75		
	C	8	8	7	7	7	6	6	6	6	75		
	D	8	8	8	8	8	8	8	8	8	100		
	E	8	8	8	8	8	8	7	7	7	87.5		
75%	A	8	8	8	8	8	8	8	8	8	100	97.5%	
	B	8	8	8	8	8	8	8	8	8	100		
	C	8	8	8	8	7	7	7	7	7	87.5		
	D	8	8	8	8	8	8	8	8	8	100		
	E	8	8	8	8	8	8	8	8	8	100		
100%	A	8	8	8	8	8	8	8	8	8	100	87.5%	20.2%
	B	8	8	6	6	6	6	6	6	6	75		
	C	8	8	8	8	6	5	5	5	5	62.5		
	D	8	8	8	8	8	8	8	8	8	100		
	E	8	8	8	8	8	8	8	8	8	100		
ANALYST:		WB	WB	JM	HH	WB	WB	WB	AF				
DATE:		2-9	2-10	2-11	2-12	2-13	2-14	2-15	2-16				
TIME:		1600	1110	1035	1045	1335	1500	1345	0930				

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

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s:		K602179			TEST DATES (BEGIN / END):		2/9-16/06	
CLIENT:		EEMA			WEIGHING DATE / TIME:		2/20/06, 0930	
ANALYSTS:		wb			DRYING TEMP (DEGREES C):		60	
SAMPLE ID:		SEE COC			DRYING TIME (HOURS):		24	
	REP #	FINAL DRY WEIGHT TIN+LARVAE (g)	INITIAL WEIGHT TIN (g)	TOTAL DRY WEIGHT OF LARVAE (g)	NUMBER OF LARVAE	DRY WEIGHT OF LARVAE (mg)		
CONTROL	A	1.26068	1.25598	0.00470	8	0.587	AVG DRY	
	B	1.25803	1.25279	0.00524	8	0.655	WEIGHT (mg)	
	C	1.25930	1.25416	0.00514	8	0.643		0.647
	D	1.25968	1.25496	0.00472	8	0.590	CV	
	E	1.26443	1.25835	0.00608	8	0.760		10.8
CONC:	A	1.26218	1.25795	0.00423	8	0.529	AVG DRY	
	B	1.25638	1.25075	0.00563	8	0.704	WEIGHT (mg)	
	C	1.25493	1.25031	0.00462	8	0.577		0.625
	D	1.25143	1.24749	0.00394	8	0.493	CV	
	E	1.25607	1.24950	0.00657	8	0.821		
CONC:	A	1.25892	1.25238	0.00654	8	0.817	AVG DRY	
	B	1.25274	1.24782	0.00492	8	0.615	WEIGHT (mg)	
	C	1.25131	1.24676	0.00455	8	0.569		0.613
	D	1.25589	1.25171	0.00418	8	0.522	CV	
	E	1.25637	1.25205	0.00432	8	0.540		
CONC:	A	1.25638	1.25267	0.00371	8	0.464	AVG DRY	
	B	1.25217	1.24804	0.00413	8	0.516	WEIGHT (mg)	
	C	1.25143	1.24778	0.00365	8	0.456		0.530
	D	1.25719	1.25221	0.00498	8	0.623	CV	
	E	1.25014	1.24540	0.00474	8	0.593		
CONC:	A	1.25808	1.25303	0.00505	8	0.631	AVG DRY	
	B	1.25723	1.25188	0.00535	8	0.669	WEIGHT (mg)	
	C	1.25961	1.25545	0.00416	8	0.520		0.606
	D	1.25537	1.25054	0.00483	8	0.604	CV	
	E	1.25322	1.24839	0.00483	8	0.604		
CONC:	A	1.25043	1.24492	0.00551	8	0.689	AVG DRY	
	B	1.24798	1.24354	0.00444	8	0.555	WEIGHT (mg)	
	C	1.25649	1.25375	0.00274	8	0.343		0.509
	D	1.25483	1.25098	0.00385	8	0.481	CV	
	E	1.25396	1.25013	0.00383	8	0.479		24.8

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s: K1007179						TEST DATES (BEGIN / END): 2/9-10/06
CLIENT: FEEMA						WEIGHING DATE / TIME: 2/20/06; 0930
ANALYSTS: WB						DRYING TEMP (DEGREES C): 60°C
SAMPLE ID: See conc						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	1.26068	1.25598			AVG DRY
	B	1.25803	1.25279			WEIGHT (mg)
	C	1.25930	1.25410			
	D	1.25968	1.25490			CV
	E	1.26443	1.25835			
321.	A	1.26218	1.25795			AVG DRY
	B	1.25638	1.25075			WEIGHT (mg)
	C	1.25493	1.25031			
	D	1.25143	1.24749			CV
	E	1.25607	1.24950			
421.	A	1.25892	1.25238			AVG DRY
	B	1.25274	1.24782			WEIGHT (mg)
	C	1.25131	1.24670			
	D	1.25589	1.25171			CV
	E	1.25637	1.25205			
561.	A	1.25638	1.25267			AVG DRY
	B	1.25217	1.24804			WEIGHT (mg)
	C	1.25143	1.24778			
	D	1.25719	1.25221			CV
	E	1.25014	1.24540			
751.	A	1.25808	1.25303			AVG DRY
	B	1.25723	1.25188			WEIGHT (mg)
	C	1.25961	1.25545			
	D	1.25537	1.25054			CV
	E	1.25322	1.24839			
1001.	A	1.25043	1.24492			AVG DRY
	B	1.24798	1.24354			WEIGHT (mg)
	C	1.25649	1.25375			
	D	1.25483	1.25098			CV
	E	1.25396	1.25013			

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

AA # K602179, FATHEAD MINNOW SURVIVAL, CHRONIC 2-9-06
File: K602179s Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.694

W = 0.895

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 # K602179, FATHEAD MINNOW SURVIVAL, CHRONIC 2-9-06
File: K602179s Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 4.06

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 # K602179, FATHEAD MINNOW SURVIVAL, CHRONIC 2-9-06
 FILE: K602179s
 TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	1.0000	1.3931
1	CONTROL	2	1.0000	1.3931
1	CONTROL	3	1.0000	1.3931
1	CONTROL	4	0.7500	1.0472
1	CONTROL	5	1.0000	1.3931
2	32 % EFFLUENT	1	0.6250	0.9117
2	32 % EFFLUENT	2	1.0000	1.3931
2	32 % EFFLUENT	3	1.0000	1.3931
2	32 % EFFLUENT	4	0.8750	1.2094
2	32 % EFFLUENT	5	1.0000	1.3931
3	42 % EFFLUENT	1	1.0000	1.3931
3	42 % EFFLUENT	2	0.8750	1.2094
3	42 % EFFLUENT	3	0.7500	1.0472
3	42 % EFFLUENT	4	1.0000	1.3931
3	42 % EFFLUENT	5	1.0000	1.3931
4	56 % EFFLUENT	1	0.8750	1.2094
4	56 % EFFLUENT	2	0.7500	1.0472
4	56 % EFFLUENT	3	0.7500	1.0472
4	56 % EFFLUENT	4	1.0000	1.3931
4	56 % EFFLUENT	5	0.8750	1.2094
5	75 % EFFLUENT	1	1.0000	1.3931
5	75 % EFFLUENT	2	1.0000	1.3931
5	75 % EFFLUENT	3	0.8750	1.2094
5	75 % EFFLUENT	4	1.0000	1.3931
5	75 % EFFLUENT	5	1.0000	1.3931
6	100 % EFFLUENT	1	1.0000	1.3931
6	100 % EFFLUENT	2	0.7500	1.0472
6	100 % EFFLUENT	3	0.6250	0.9117
6	100 % EFFLUENT	4	1.0000	1.3931
6	100 % EFFLUENT	5	1.0000	1.3931

AA # K602179, FATHEAD MINNOW SURVIVAL, CHRONIC 2-9-06
 File: K602179s 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	1.324				
2	32 % EFFLUENT	1.260	25.00	16.00	5.00	
3	42 % EFFLUENT	1.287	25.50	16.00	5.00	
4	56 % EFFLUENT	1.181	21.00	16.00	5.00	
5	75 % EFFLUENT	1.356	28.00	16.00	5.00	
6	100 % EFFLUENT	1.228	24.50	16.00	5.00	

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

AA # K602179, FATHEAD MINNOW GROWTH, CHRONIC, 2-9-06

File: K602179G Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

D = 0.249

W = 0.949

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 # K602179, FATHEAD MINNOW GROWTH, CHRONIC, 2-9-06
File: K602179G Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 4.62

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 # K602179, FATHEAD MINNOW GROWTH, CHRONIC, 2-9-06
 FILE: K602179G
 TRANSFORM: NO TRANSFORMATION

NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.5870	0.5870
1	CONTROL	2	0.6550	0.6550
1	CONTROL	3	0.6430	0.6430
1	CONTROL	4	0.5900	0.5900
1	CONTROL	5	0.7600	0.7600
2	32 % EFFLUENT	1	0.5290	0.5290
2	32 % EFFLUENT	2	0.7040	0.7040
2	32 % EFFLUENT	3	0.5770	0.5770
2	32 % EFFLUENT	4	0.4930	0.4930
2	32 % EFFLUENT	5	0.8210	0.8210
3	42 % EFFLUENT	1	0.8170	0.8170
3	42 % EFFLUENT	2	0.6150	0.6150
3	42 % EFFLUENT	3	0.5690	0.5690
3	42 % EFFLUENT	4	0.5220	0.5220
3	42 % EFFLUENT	5	0.5400	0.5400
4	56 % EFFLUENT	1	0.4640	0.4640
4	56 % EFFLUENT	2	0.5160	0.5160
4	56 % EFFLUENT	3	0.4560	0.4560
4	56 % EFFLUENT	4	0.6230	0.6230
4	56 % EFFLUENT	5	0.5930	0.5930
5	75 % EFFLUENT	1	0.6310	0.6310
5	75 % EFFLUENT	2	0.6690	0.6690
5	75 % EFFLUENT	3	0.5200	0.5200
5	75 % EFFLUENT	4	0.6040	0.6040
5	75 % EFFLUENT	5	0.6040	0.6040
6	100 % EFFLUENT	1	0.6890	0.6890
6	100 % EFFLUENT	2	0.5550	0.5550
6	100 % EFFLUENT	3	0.3430	0.3430
6	100 % EFFLUENT	4	0.4810	0.4810
6	100 % EFFLUENT	5	0.4790	0.4790

AA # K602179, FATHEAD MINNOW GROWTH, CHRONIC, 2-9-06
File: K602179G Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.076	0.015	1.470
Within (Error)	24	0.249	0.010	
Total	29	0.325		

Critical F value = 2.62 (0.05,5,24)

Since $F < \text{Critical } F$ FAIL TO REJECT H_0 : All equal

AA # K602179, FATHEAD MINNOW GROWTH, CHRONIC, 2-9-06
 File: K602179G 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	0.647	0.647		
2	32 % EFFLUENT	0.625	0.625	0.345	
3	42 % EFFLUENT	0.613	0.613	0.534	
4	56 % EFFLUENT	0.530	0.530	1.810	
5	75 % EFFLUENT	0.606	0.606	0.643	
6	100 % EFFLUENT	0.509	0.509	2.137	

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

AA # K602179, FATHEAD MINNOW GROWTH, CHRONIC, 2-9-06
 File: K602179G 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	0.152	23.5	0.022
3	42 % EFFLUENT	5	0.152	23.5	0.034
4	56 % EFFLUENT	5	0.152	23.5	0.117
5	75 % EFFLUENT	5	0.152	23.5	0.041
6	100 % EFFLUENT	5	0.152	23.5	0.138

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB #/ SAMPLE ID _____ TEST START DATE 2-9-06 TIME 1630
 CLIENT EEMA TEST END DATE 2-10 TIME 0910

Control

AGE AND SOURCE OF MINNOWS

CONC:	REP #	DAY (NUMBER SURVIVING)								SURVIVAL		
		start	1	2	3	4	5	6	7	%	MEAN %	CV
A	A	2	2	2	2	2	2	2	2	100	100	
	B	2	2	2	2	2	2	2	2	100		
	C	2	2	2	2	2	2	2	2	100		
	D	2	2	2	2	2	2	2	2	100		
	E											
B	A	2	2	2	2	2	2	2	2	100	87.5	
	B	2	2	2	1	1	1	1	1	50		
	C	2	2	2	2	2	2	2	2	100		
	D	2	2	2	2	2	2	2	2	100		
	E											
C	A	2	2	2	2	2	2	2	2	100	87.5	
	B	2	2	2	2	2	2	2	2	100		
	C	2	2	2	2	2	2	1	1	50		
	D	2	2	2	2	2	2	2	2	100		
	E											
D	A	2	2	2	2	2	2	2	2	100	100	
	B	2	2	2	2	2	2	2	2	100		
	C	2	2	2	2	2	2	2	2	100		
	D	2	2	2	2	2	2	2	2	100		
	E											
E	A	2	2	2	1	1	1	1	1	50	75	
	B	2	2	2	2	2	2	2	2	100		
	C	2	2	2	2	2	1	1	1	50		
	D	2	2	2	2	2	2	2	2	100		
	E											
CONC:	A											
	B											
	C											
	D											
	E											
ANALYST:		WB	WB	AF	mg	WB	WB	WB	WB			
DATE:		2-9	2-10	2-11	2-12	2-13	2-14	2-15	2-16			
TIME:		1630	1300	1000	1030	1400	1615	1100	0910			

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB #/ SAMPLE ID TEST START DATE 2-9-06 TIME 11:30
 CLIENT EEMA TEST END DATE 2-10 TIME 0925
32% effluent AGE AND SOURCE OF MINNOWS

CONC:	REP #	DAY (NUMBER SURVIVING)								SURVIVAL		
		start	1	2	3	4	5	6	7	%	MEAN %	CV
A	A	2	2	2	2	2	2	2	2	100	75	
	B	2	2	2	2	2	2	2	2	100		
	C	2	2	2	2	2	2	2	2	100		
	D	2	2	2	0	0	0	0	0	0		
	E											
B	A	2	2	2	2	2	2	2	2	100	100	
	B	2	2	2	2	2	2	2	2	100		
	C	2	2	2	2	2	2	2	2	100		
	D	2	2	2	2	2	2	2	2	100		
	E											
C	A	2	1	1	1	1	1	1	1	50	75	
	B	2	2	2	2	2	2	2	2	100		
	C	2	2	2	2	2	2	1	1	50		
	D	2	2	2	2	2	2	2	2	100		
	E											
D	A	2	2	2	2	2	2	2	2	100	87.5	
	B	2	2	2	2	2	2	2	2	100		
	C	2	2	2	2	2	1	1	1	50		
	D	2	2	2	2	2	2	2	2	100		
	E											
E	A	2	2	2	2	2	2	2	2	100	100	
	B	2	2	2	2	2	2	2	2	100		
	C	2	2	2	2	2	2	2	2	100		
	D	2	2	2	2	2	2	2	2	100		
	E											
CONC:	A											
	B											
	C											
	D											
	E											
ANALYST:		WB	WB	AF	mg	WB	WB	WB	WB			
DATE:		2-9	2-10	2-11	2-12	2-13	2-14	2-15	2-16			
TIME:		11:30	1300	1015	1030	1400	1515	1100	0925			

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB #/ SAMPLE ID TEST START DATE 2-9-06 TIME 1630
 CLIENT EEIMA TEST END DATE 2-10 TIME 0935
 421. effluent AGE AND SOURCE OF MINNOWS

CONC:	REP #	DAY (NUMBER SURVIVING)								SURVIVAL		
		start	1	2	3	4	5	6	7	%	MEAN %	CV
A	A	2	2	2	2	2	2	2	1	50	875	
	B	2	2	2	2	2	2	2	2	100		
	C	2	2	2	2	2	2	2	2	100		
	D	2	2	2	2	2	2	2	2	100		
	E											
B	A	2	2	2	1	1	1	1	1	50	75	
	B	2	2	2	1	1	1	1	1	50		
	C	2	2	2	2	2	2	2	2	100		
	D	2	2	2	2	2	2	2	2	100		
	E											
C	A	2	2	2	2	2	2	2	2	100	100	
	B	2	2	2	2	2	2	2	2	100		
	C	2	2	2	2	2	2	2	2	100		
	D	2	2	2	2	2	2	2	2	100		
	E											
D	A	2	2	2	2	2	2	2	2	100	875	
	B	2	2	2	2	2	2	2	2	100		
	C	2	2	2	2	2	2	2	2	100		
	D	2	1	1	1	1	1	1	1	50		
	E											
E	A	2	2	2	2	2	2	2	2	100	100	
	B	2	2	2	2	2	2	2	2	100		
	C	2	2	2	2	2	2	2	2	100		
	D	2	2	2	2	2	2	2	2	100		
	E											
CONC:	A											
	B											
	C											
	D											
	E											
ANALYST:		WB	WB	AF	mg	WB	WB	WB	WB			
DATE:		2-9	2-10	2-11	2-12	2-13	2-14	2-15	2-16			
TIME:		1630	1300	1015	1030	1400	1525	1100	0935			

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB #/ SAMPLE ID _____ TEST START DATE 2-9-06 TIME 1630
 CLIENT EEEMA TEST END DATE 2-16 TIME 0945
50% effluent AGE AND SOURCE OF MINNOWS _____

CONC:	REP #	start	DAY (NUMBER SURVIVING)							SURVIVAL			
			1	2	3	4	5	6	7	%	MEAN %	CV	
A	A	2	2	2	2	2	2	2	2	2	100	87.5	
	B	2	2	2	1	1	1	1	1	50			
	C	2	2	2	2	2	2	2	2	100			
	D	2	2	2	2	2	2	2	2	100			
	E												
B	A	2	2	2	2	2	2	2	2	100	75		
	B	2	2	2	2	2	2	2	2	100			
	C	2	2	1	1	1	1	0	0	0			
	D	2	2	2	2	2	2	2	2	100			
	E												
C	A	2	2	2	2	2	1	1	1	50	87.5		
	B	2	2	2	2	2	2	2	2	100			
	C	2	2	2	2	2	2	2	2	100			
	D	2	2	2	2	2	2	2	2	100			
	E												
D	A	2	2	2	2	2	2	2	2	100	87.5		
	B	2	2	2	2	2	2	2	2	100			
	C	2	2	2	2	2	2	2	2	100			
	D	2	2	2	1	1	1	1	1	50			
	E												
E	A	2	2	2	2	2	2	2	2	100	87.5		
	B	2	2	2	1	1	1	1	1	50			
	C	2	2	2	2	2	2	2	2	100			
	D	2	2	2	2	2	2	2	2	100			
	E												
CONC:	A												
	B												
	C												
	D												
	E												
ANALYST:		WB	WB	AF	mg	WB	WB	WB	WB				
DATE:		2-9	2-10	2-11	2-12	2-13	2-14	2-15	2-16				
TIME:		1630	1300	1015	1030	1400	1530	1130	0945				

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID _____ TEST START DATE 2-9-06 TIME 1630
 CLIENT EEMA TEST END DATE 2-16 TIME 0950
75% effluent AGE AND SOURCE OF MINNOWS _____

CONC:	REP #	DAY (NUMBER SURVIVING)								SURVIVAL		
		start	1	2	3	4	5	6	7	%	MEAN %	CV
A	A	2	2	2	2	2	2	2	2	100	75	
	B	2	2	2	2	2	2	2	2	100		
	C	2	2	2	2	1	1	1	1	50		
	D	2	2	2	2	1	1	1	1	50		
	E											
B	A	2	2	2	2	2	2	2	2	100	87.5	
	B	2	2	2	2	2	1	1	1	50		
	C	2	2	2	2	2	2	2	2	100		
	D	2	2	2	2	2	2	2	2	100		
	E											
C	A	2	2	2	2	2	2	2	2	100	87.5	
	B	2	2	2	2	1	1	1	1	50		
	C	2	2	2	2	2	2	2	2	100		
	D	2	2	2	2	2	2	2	2	100		
	E											
D	A	2	2	2	2	2	2	2	2	100	100	
	B	2	2	2	2	2	2	2	2	100		
	C	2	2	2	2	2	2	2	2	100		
	D	2	2	2	2	2	2	2	2	100		
	E											
E	A	2	2	2	2	2	2	2	2	100	87.5	
	B	2	2	2	2	1	1	1	1	50		
	C	2	2	2	2	2	2	2	2	100		
	D	2	2	2	2	2	2	2	2	100		
	E											
CONC:	A											
	B											
	C											
	D											
	E											
ANALYST:		WB	WB	AF	mg	WB	HH	WB	WB			
DATE:		2-9	2-10	2-11	2-12	2-13	2-14	2-15	2-16			
TIME:		1630	1300	1020	1030	1400	1530	1130	0950			

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB #/ SAMPLE ID _____ TEST START DATE 2-9-06 TIME 1630
 CLIENT EEMA TEST END DATE 2-10 TIME 0955
100% effluent AGE AND SOURCE OF MINNOWS _____

CONC:	REP #	DAY (NUMBER SURVIVING)								SURVIVAL		
		start	1	2	3	4	5	6	7	%	MEAN %	CV
A	A	2	2	2	2	2	2	2	2	100	50	
	B	2	2	2	2	2	0	0	0	0		
	C	2	2	2	2	2	1	1	1	50		
	D	2	2	2	2	2	1	1	1	50		
	E											
B	A	2	2	2	2	2	2	2	2	20	87.5	
	B	2	2	2	2	2	1	1	1	10		
	C	2	2	2	2	2	2	2	2	20		
	D	2	2	2	2	2	2	2	2	20		
	E											
C	A	2	2	2	2	1	1	1	1	50	87.5	
	B	2	2	2	2	2	2	2	2	100		
	C	2	2	2	2	2	2	2	2	100		
	D	2	2	2	2	2	2	2	2	100		
	E											
D	A	2	2	2	2	2	2	2	2	100	87.5	
	B	2	2	2	2	2	2	1	1	50		
	C	2	2	2	2	2	2	2	2	100		
	D	2	2	2	2	2	2	2	2	100		
	E											
E	A	2	2	2	2	2	2	2	2	100	87.5	
	B	2	2	2	2	1	1	1	1	50		
	C	2	2	2	2	2	2	2	2	100		
	D	2	2	2	2	2	2	2	2	100		
	E											
CONC:	A											
	B											
	C											
	D											
	E											
ANALYST:		WB	WB	HF	mq	WB	HF	WB	WB			
DATE:		2-9	2-10	2-11	2-12	2-13	2-14	2-15	2-16			
TIME:		1630	1300	1020	1030	1400	1530	1145	0955			

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

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s:		K602179				TEST DATES (BEGIN / END):		2/9-16/06	
CLIENT:		EEMA- Alternate Method				WEIGHING DATE / TIME:		2/20/06, 0950	
ANALYSTS:		wb				DRYING TEMP (DEGREES C):		60	
SAMPLE ID:		SEE COC				DRYING TIME (HOURS):		24	
	REP #	FINAL DRY WEIGHT TIN+LARVAE (g)	INITIAL WEIGHT TIN (g)	TOTAL DRY WEIGHT OF LARVAE (g)	NUMBER OF LARVAE	DRY WEIGHT OF LARVAE (mg)			
CONTROL	A	1.24914	1.24572	0.00342	8	0.427	AVG DRY		
	B	1.24779	1.24424	0.00355	8	0.444	WEIGHT (mg)		
	C	1.25096	1.24759	0.00337	8	0.421	0.410		
	D	1.25126	1.24928	0.00198	8	0.248	CV		
	E	1.25281	1.24872	0.00409	8	0.511	23.8		
CONC:	A	1.25563	1.25308	0.00255	8	0.319	AVG DRY		
	B	1.25619	1.25284	0.00335	8	0.419	WEIGHT (mg)		
	C	1.25855	1.25505	0.00350	8	0.438	0.416		
	D	1.26275	1.26004	0.00271	8	0.339	CV		
	E	1.25469	1.25017	0.00452	8	0.565			
CONC:	A	1.26025	1.25530	0.00495	8	0.619	AVG DRY		
	B	1.25850	1.25430	0.00420	8	0.525	WEIGHT (mg)		
	C	1.26247	1.25758	0.00489	8	0.611	0.555		
	D	1.24940	1.24601	0.00339	8	0.424	CV		
	E	1.26527	1.26051	0.00476	8	0.595			
CONC:	A	1.26202	1.25801	0.00401	8	0.501	AVG DRY		
	B	1.25953	1.25638	0.00315	8	0.394	WEIGHT (mg)		
	C	1.25422	1.25108	0.00314	8	0.392	0.453		
	D	1.25704	1.25369	0.00335	8	0.419	CV		
	E	1.25711	1.25263	0.00448	8	0.560			
CONC:	A	1.25440	1.25208	0.00232	8	0.290	AVG DRY		
	B	1.26370	1.26065	0.00305	8	0.381	WEIGHT (mg)		
	C	1.25908	1.25584	0.00324	8	0.405	0.365		
	D	1.26018	1.25651	0.00367	8	0.459	CV		
	E	1.24215	1.23982	0.00233	8	0.291			
CONC:	A	1.25725	1.25222	0.00503	8	0.629	AVG DRY		
	B	1.24981	1.24710	0.00271	8	0.339	WEIGHT (mg)		
	C	1.24244	1.23905	0.00339	8	0.424	0.409		
	D	1.25927	1.25625	0.00302	8	0.377	CV		
	E	1.24269	1.24047	0.00222	8	0.278	32.7		

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s:		K1002179		TEST DATES (BEGIN / END):		2/9-10/06	
CLIENT:		EEMA - Alternate method		WEIGHING DATE / TIME:		2-20-06; 0930	
ANALYSTS:		WB		DRYING TEMP (DEGREES C):		60°C	
SAMPLE ID:				DRYING TIME (HOURS):		24hrs.	
	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 31	1.24914	1.24572				AVG DRY WEIGHT (mg)
	B 32	1.24779	1.24424				
	C 33	1.250910	1.24769				CV
	D 34	1.25126	1.24928				
	E 35	1.25281	1.24872				
32%	A 36	1.25563	1.25308				AVG DRY WEIGHT (mg)
	B 37	1.25619	1.25284				
	C 38	1.25855	1.25505				CV
	D 39	1.26275	1.26004				
	E 40	1.25469	1.25017				
42%	A 41	1.26025	1.25530				AVG DRY WEIGHT (mg)
	B 42	1.25850	1.25430				
	C 43	1.26247	1.25758				CV
	D 44	1.24940	1.24601				
	E 45	1.26527	1.26051				
56%	A 46	1.26202	1.25801				AVG DRY WEIGHT (mg)
	B 47	1.25953	1.25638				
	C 48	1.25422	1.25108				CV
	D 49	1.25704	1.25369				
	E 50	1.25711	1.25263				
75%	A 51	1.25444	1.25208				AVG DRY WEIGHT (mg)
	B 52	1.26370	1.26065				
	C 53	1.25908	1.25584				CV
	D 54	1.26018	1.25651				
	E 55	1.24215	1.23982				
100%	A 56	1.25725	1.25222				AVG DRY WEIGHT (mg)
	B 57	1.24981	1.24710				
	C 58	1.24244	1.23905				CV
	D 59	1.25927	1.25625				
	E 60	1.24269	1.24047				

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

AA # K602179 FATHEAD SURVIVAL, ALTERNATE CHRONIC 2-9-06

File: C:\TOXSTAT\EEMA\K602179S. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.515

W = 0.934

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 # K602179 FATHEAD SURVIVAL, ALTERNATE CHRONIC 2-9-06

File: C:\TOXSTAT\EEMA\K602179S. Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance

Calculated B1 statistic = 3.39

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 # K602179 FATHEAD SURVIVAL, ALTERNATE CHRONIC 2-9-06
 FILE: C:\TOXSTAT\EEMA\K602179S.
 TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	1.0000	1.3931
1	CONTROL	2	0.8750	1.2094
1	CONTROL	3	0.8750	1.2094
1	CONTROL	4	1.0000	1.3931
1	CONTROL	5	0.7500	1.0472
2	32 % EFFLUENT	1	0.7500	1.0472
2	32 % EFFLUENT	2	1.0000	1.3931
2	32 % EFFLUENT	3	0.7500	1.0472
2	32 % EFFLUENT	4	0.8750	1.2094
2	32 % EFFLUENT	5	1.0000	1.3931
3	42 % EFFLUENT	1	0.8750	1.2094
3	42 % EFFLUENT	2	0.7500	1.0472
3	42 % EFFLUENT	3	1.0000	1.3931
3	42 % EFFLUENT	4	0.8750	1.2094
3	42 % EFFLUENT	5	1.0000	1.3931
4	56 % EFFLUENT	1	0.8750	1.2094
4	56 % EFFLUENT	2	0.7500	1.0472
4	56 % EFFLUENT	3	0.8750	1.2094
4	56 % EFFLUENT	4	0.8750	1.2094
4	56 % EFFLUENT	5	0.8750	1.2094
5	75 % EFFLUENT	1	0.7500	1.0472
5	75 % EFFLUENT	2	0.8750	1.2094
5	75 % EFFLUENT	3	0.8750	1.2094
5	75 % EFFLUENT	4	1.0000	1.3931
5	75 % EFFLUENT	5	0.8750	1.2094
6	100 % EFFLUENT	1	0.5000	0.7854
6	100 % EFFLUENT	2	0.8750	1.2094
6	100 % EFFLUENT	3	0.8750	1.2094
6	100 % EFFLUENT	4	0.8750	1.2094
6	100 % EFFLUENT	5	0.8750	1.2094

AA # K602179 FATHEAD SURVIVAL, ALTERNATE CHRONIC 2-9-06

File: C:\TOXSTAT\EEMA\K602179S. Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.058	0.012	0.541
Within (Error)	24	0.515	0.021	
Total	29	0.573		

Critical F value = 2.62 (0.05,5,24)

Since $F < \text{Critical } F$ FAIL TO REJECT H_0 : All equal

AA # K602179 FATHEAD SURVIVAL, ALTERNATE CHRONIC 2-9-06

File: C:\TOXSTAT\EEMA\K602179S.

Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST - TABLE 1 OF 2

Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	1.250	0.900		
2	32 % EFFLUENT	1.218	0.875	0.350	
3	42 % EFFLUENT	1.250	0.900	0.000	
4	56 % EFFLUENT	1.177	0.850	0.793	
5	75 % EFFLUENT	1.214	0.875	0.396	
6	100 % EFFLUENT	1.125	0.800	1.358	

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

AA # K602179 FATHEAD SURVIVAL, ALTERNATE CHRONIC 2-9-06

File: C:\TOXSTAT\EEMA\K602179S.

Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST - TABLE 2 OF 2

Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	5			
2	32 % EFFLUENT	5	0.164	18.3	0.025
3	42 % EFFLUENT	5	0.164	18.3	0.000
4	56 % EFFLUENT	5	0.164	18.3	0.050
5	75 % EFFLUENT	5	0.164	18.3	0.025
6	100 % EFFLUENT	5	0.164	18.3	0.100

AA # K602179 FATHEAD GROWTH, ALTERNATE CHRONIC, 2-9-06

File: C:\TOXSTAT\EEMA\K602179G. Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

D = 0.219

W = 0.980

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 # K602179 FATHEAD GROWTH, ALTERNATE CHRONIC, 2-9-06

File: C:\TOXSTAT\EEMA\K602179G. Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

Calculated B1 statistic = 2.02

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 # K602179 FATHEAD GROWTH, ALTERNATE CHRONIC, 2-9-06
 FILE: C:\TOXSTAT\EEMA\K602179G.
 TRANSFORM: NO TRANSFORMATION

NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.4270	0.4270
1	CONTROL	2	0.4440	0.4440
1	CONTROL	3	0.4210	0.4210
1	CONTROL	4	0.2480	0.2480
1	CONTROL	5	0.5110	0.5110
2	32 % EFFLUENT	1	0.3190	0.3190
2	32 % EFFLUENT	2	0.4190	0.4190
2	32 % EFFLUENT	3	0.4380	0.4380
2	32 % EFFLUENT	4	0.3390	0.3390
2	32 % EFFLUENT	5	0.5650	0.5650
3	42 % EFFLUENT	1	0.6190	0.6190
3	42 % EFFLUENT	2	0.5250	0.5250
3	42 % EFFLUENT	3	0.6110	0.6110
3	42 % EFFLUENT	4	0.4240	0.4240
3	42 % EFFLUENT	5	0.5950	0.5950
4	56 % EFFLUENT	1	0.5010	0.5010
4	56 % EFFLUENT	2	0.3940	0.3940
4	56 % EFFLUENT	3	0.3920	0.3920
4	56 % EFFLUENT	4	0.4190	0.4190
4	56 % EFFLUENT	5	0.5600	0.5600
5	75 % EFFLUENT	1	0.2900	0.2900
5	75 % EFFLUENT	2	0.3810	0.3810
5	75 % EFFLUENT	3	0.4050	0.4050
5	75 % EFFLUENT	4	0.4590	0.4590
5	75 % EFFLUENT	5	0.2910	0.2910
6	100 % EFFLUENT	1	0.6290	0.6290
6	100 % EFFLUENT	2	0.3390	0.3390
6	100 % EFFLUENT	3	0.4240	0.4240
6	100 % EFFLUENT	4	0.3770	0.3770
6	100 % EFFLUENT	5	0.2780	0.2780

AA # K602179 FATHEAD GROWTH, ALTERNATE CHRONIC, 2-9-06

File: C:\TOXSTAT\EEMA\K602179G.

Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.106	0.021	2.327
Within (Error)	24	0.219	0.009	
Total	29	0.324		

Critical F value = 2.62 (0.05,5,24)

Since $F < \text{Critical } F$ FAIL TO REJECT H_0 : All equal

AA # K602179 FATHEAD GROWTH, ALTERNATE CHRONIC, 2-9-06

File: C:\TOXSTAT\EEMA\K602179G.

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	0.410	0.410		
2	32 % EFFLUENT	0.416	0.416	-0.096	
3	42 % EFFLUENT	0.555	0.555	-2.396	
4	56 % EFFLUENT	0.453	0.453	-0.712	
5	75 % EFFLUENT	0.365	0.365	0.746	
6	100 % EFFLUENT	0.409	0.409	0.013	

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

AA # K602179 FATHEAD GROWTH, ALTERNATE CHRONIC, 2-9-06

File: C:\TOXSTAT\EEMA\K602179G.

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	0.142	34.7	-0.006
3	42 % EFFLUENT	5	0.142	34.7	-0.145
4	56 % EFFLUENT	5	0.142	34.7	-0.043
5	75 % EFFLUENT	5	0.142	34.7	0.045
6	100 % EFFLUENT	5	0.142	34.7	0.001

APPENDIX D

Ceriodaphnia dubia Raw Data and Statistics

SURVIVAL AND REPRODUCTION TEST

Ceriodaphnia dubia

Analyst: WB, HH

Discharger: EE MA

Location: 29-06/0930

Date Sample Collected: 2-15-06 / 0820

Lab Number/s: KU02179

Conc 4	Replicate													No. of Young Adults	Young/Adult	Analyst
	Day	A	B	C	D	E	F	G	H	I	J					
%	1	0	0	0	0	0	0	0	0	0	0	0	0	10	0	WB
	2	0	0	0	0	0	0	0	0	0	0	0	0	10	0	HH
	3	4	3	4	2	4	2	0	3	3	0	2	5	10	2.5	WB
	4	5	0	8	6	7	X	0	7	4	4	5	4	10	4.8	WB
	5	0	13	6	13	0	0	11	0	9	0	7	0	10	6.1	WB
	6	7	0	0	7	0	10	13	0	9	0	10	13	10	4.0	WB
	7															
	8															
Total	18	20	17	30	4	19	18	21	18	15	18	15	18	180		

Conc 5	Replicate													No. of Young Adults	Young/Adult	Analyst
	Day	A	B	C	D	E	F	G	H	I	J					
%	1	0	0	0	0	0	0	0	0	0	0	0	0	10	0	WB
	2	0	0	0	0	0	0	0	0	0	0	0	0	10	0	HH
	3	3	4	3	2	3	0	4	2	4	3	0	2	10	2.8	WB
	4	4	0	4	4	5	7	4	3	0	3	0	3	10	3.0	WB
	5	7	0	8	7	8	11	10	5	4	7	7	5	10	7.5	WB
	6	0	8	4	8	0	10	0	0	6	7	5	5	10	5.5	WB
	7															
	8															
Total	20	20	18	19	21	16	16	21	17	19	17	19	17	194		

Conc 6	Replicate													No. of Young Adults	Young/Adult	Analyst
	Day	A	B	C	D	E	F	G	H	I	J					
%	1	0	0	0	0	0	0	0	0	0	0	0	0	10	0	WB
	2	0	0	0	0	0	0	0	0	0	0	0	0	10	0	HH
	3	1	0	0	4	3	5	3	5	0	2	5	0	10	2.5	WB
	4	6	1	0	3	5	0	5	0	2	2	2	2	10	2.2	WB
	5	7	5	X	0	11	3	0	10	6	4	4	0	9	4.0	WB
	6	10	10	-	10	0	10	5	9	4	14	7	2	9	8.0	WB
	7															
	8															
Total	24	16	X	6	17	20	16	15	22	15	20	16	20	165		

Conc 1	Replicate													No. of Young Adults	Young/Adult	Analyst
	Day	A	B	C	D	E	F	G	H	I	J					
%	1	0	0	0	0	0	0	0	0	0	0	0	0	10	0	WB
	2	0	0	0	0	0	0	0	0	0	0	0	0	10	0	HH
	3	3	4	3	2	4	0	4	3	3	0	3	3	10	3.0	WB
	4	5	0	8	6	7	X	0	7	4	4	5	4	9	4.9	WB
	5	0	13	6	13	0	0	11	0	8	0	7	0	9	9.9	WB
	6	13	0	10	0	0	0	0	0	11	3	4	9	9	3.8	WB
	7															
	8															
Total	22	22	20	24	20	24	X	22	25	23	23	20	22	202		

Conc 2	Replicate													No. of Young Adults	Young/Adult	Analyst
	Day	A	B	C	D	E	F	G	H	I	J					
%	1	0	0	0	0	0	0	0	0	0	0	0	0	10	0	WB
	2	0	0	0	0	0	0	0	0	0	0	0	0	10	0	HH
	3	0	1	1	2	0	2	1	0	2	2	1	1	10	1.1	WB
	4	0	4	6	4	7	0	7	7	8	10	5	5	10	5.5	WB
	5	9	8	12	11	10	11	9	0	0	0	8	1	10	8.1	WB
	6	11	7	0	0	0	12	0	0	10	0	4	0	10	4.0	WB
	7															
	8															
Total	20	20	19	19	18	24	19	16	20	12	12	18	17	187		

Conc 3	Replicate													No. of Young Adults	Young/Adult	Analyst
	Day	A	B	C	D	E	F	G	H	I	J					
%	1	0	0	0	0	0	0	0	0	0	0	0	0	10	0	WB
	2	0	0	0	0	0	0	0	0	0	0	0	0	10	0	HH
	3	3	4	3	4	0	0	1	0	0	0	1	0	10	1.9	WB
	4	4	0	0	0	6	4	4	7	9	4	4	4	10	4.4	WB
	5	8	8	0	11	9	14	7	0	0	0	6	5	10	6.5	WB
	6	0	9	11	0	0	1	0	5	12	13	5	1	10	5.1	WB
	7															
	8															
Total	17	21	22	4	21	16	20	17	19	22	17	19	22	179		

X=DEAD; Y=MALE X̄=18.3 CV=17.9%

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		
	DEAD	ALIVE	TOTAL ANIMALS
CONTROL	1	9	10
75% 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
100% 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.

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	0
5	100% effluent	10	1

AA # K602179, CERIODAPHNIA DUBIA REPRODUCTION, 2-9-06
File: k602179c 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 # K602179, CERIODAPHNIA DUBIA REPRODUCTION, 2-9-06
File: k602179c Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 11.64

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 # K602179, CERIODAPHNIA DUBIA REPRODUCTION, 2-9-06
 FILE: k602179c
 TRANSFORM: NO TRANSFORMATION

NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	22.0000	22.0000
1	CONTROL	2	22.0000	22.0000
1	CONTROL	3	20.0000	20.0000
1	CONTROL	4	24.0000	24.0000
1	CONTROL	5	20.0000	20.0000
1	CONTROL	6	24.0000	24.0000
1	CONTROL	7	0.0000	0.0000
1	CONTROL	8	22.0000	22.0000
1	CONTROL	9	25.0000	25.0000
1	CONTROL	10	23.0000	23.0000
2	32 % EFFLUENT	1	20.0000	20.0000
2	32 % EFFLUENT	2	20.0000	20.0000
2	32 % EFFLUENT	3	19.0000	19.0000
2	32 % EFFLUENT	4	19.0000	19.0000
2	32 % EFFLUENT	5	18.0000	18.0000
2	32 % EFFLUENT	6	24.0000	24.0000
2	32 % EFFLUENT	7	19.0000	19.0000
2	32 % EFFLUENT	8	16.0000	16.0000
2	32 % EFFLUENT	9	20.0000	20.0000
2	32 % EFFLUENT	10	12.0000	12.0000
3	42 % EFFLUENT	1	17.0000	17.0000
3	42 % EFFLUENT	2	21.0000	21.0000
3	42 % EFFLUENT	3	22.0000	22.0000
3	42 % EFFLUENT	4	4.0000	4.0000
3	42 % EFFLUENT	5	21.0000	21.0000
3	42 % EFFLUENT	6	16.0000	16.0000
3	42 % EFFLUENT	7	20.0000	20.0000
3	42 % EFFLUENT	8	17.0000	17.0000
3	42 % EFFLUENT	9	19.0000	19.0000
3	42 % EFFLUENT	10	22.0000	22.0000
4	56 % EFFLUENT	1	18.0000	18.0000
4	56 % EFFLUENT	2	20.0000	20.0000
4	56 % EFFLUENT	3	17.0000	17.0000
4	56 % EFFLUENT	4	30.0000	30.0000
4	56 % EFFLUENT	5	4.0000	4.0000
4	56 % EFFLUENT	6	19.0000	19.0000
4	56 % EFFLUENT	7	18.0000	18.0000
4	56 % EFFLUENT	8	21.0000	21.0000
4	56 % EFFLUENT	9	18.0000	18.0000
4	56 % EFFLUENT	10	15.0000	15.0000
5	75 % EFFLUENT	1	20.0000	20.0000
5	75 % EFFLUENT	2	18.0000	18.0000
5	75 % EFFLUENT	3	19.0000	19.0000
5	75 % EFFLUENT	4	21.0000	21.0000
5	75 % EFFLUENT	5	16.0000	16.0000
5	75 % EFFLUENT	6	26.0000	26.0000
5	75 % EFFLUENT	7	21.0000	21.0000
5	75 % EFFLUENT	8	17.0000	17.0000
5	75 % EFFLUENT	9	19.0000	19.0000

5	75	%	EFFLUENT	10	17.0000	17.0000
6	100	%	EFFLUENT	1	24.0000	24.0000
6	100	%	EFFLUENT	2	16.0000	16.0000
6	100	%	EFFLUENT	3	0.0000	0.0000
6	100	%	EFFLUENT	4	17.0000	17.0000
6	100	%	EFFLUENT	5	20.0000	20.0000
6	100	%	EFFLUENT	6	16.0000	16.0000
6	100	%	EFFLUENT	7	15.0000	15.0000
6	100	%	EFFLUENT	8	22.0000	22.0000
6	100	%	EFFLUENT	9	15.0000	15.0000
6	100	%	EFFLUENT	10	20.0000	20.0000

AA # K602179, CERIODAPHNIA DUBIA REPRODUCTION, 2-9-06
File: k602179c Transform: NO TRANSFORMATION

STEEL'S MANY-ONE RANK TEST

Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	20.200				
2	32 % EFFLUENT	18.700	75.00	75.00	10.00	*
3	42 % EFFLUENT	17.900	77.00	75.00	10.00	
4	56 % EFFLUENT	18.000	77.00	75.00	10.00	
5	75 % EFFLUENT	19.400	79.00	75.00	10.00	
6	100 % EFFLUENT	16.500	77.00	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 2-9-06 Arkansas Analytical

SPECIES Protophysalis promelas

QUANTITY SHIPPED 480⁺ = 300⁺ 3-10

AGE/LIFE STAGE 1500ct
424hrs 2/9 * 5 Days old 2/9

BROODSTOCK SOURCE Anderson Farms, AR

CULTURE WATER groundwater

ALKALINITY (Mg/l as CaCO₃) = 180

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

FEEDING Automatic

COMMENTS _____

PACKAGED BY UW



Aquatic Research Organisms

DATA SHEET

I. Organism History

Species: Ceriodaphnia dubia

Source: Lab reared Hatchery reared Field collected

Hatch date 01/05 Receipt date

Lot number 02 07 05 CD Strain ARO

Brood Origination EPA OH

II. Water Quality

Temperature 24 °C Salinity — ppt DO SAT

pH 7.4 Hardness ~ 75 ppm

III. Culture Conditions

System: Fw static renewal

Diet: Flake Food Phytoplankton Trout Chow

Brine Shrimp Rotifers Other YCT

Prophylactic Treatments:

Comments: All gravid as of 2:00pm
EST

IV. Shipping Information

Client: Arkansas Analytical # of Organisms: 1 culture

Carrier: Fed Ex Date Shipped: 2/7/05

Biologist: [Signature]

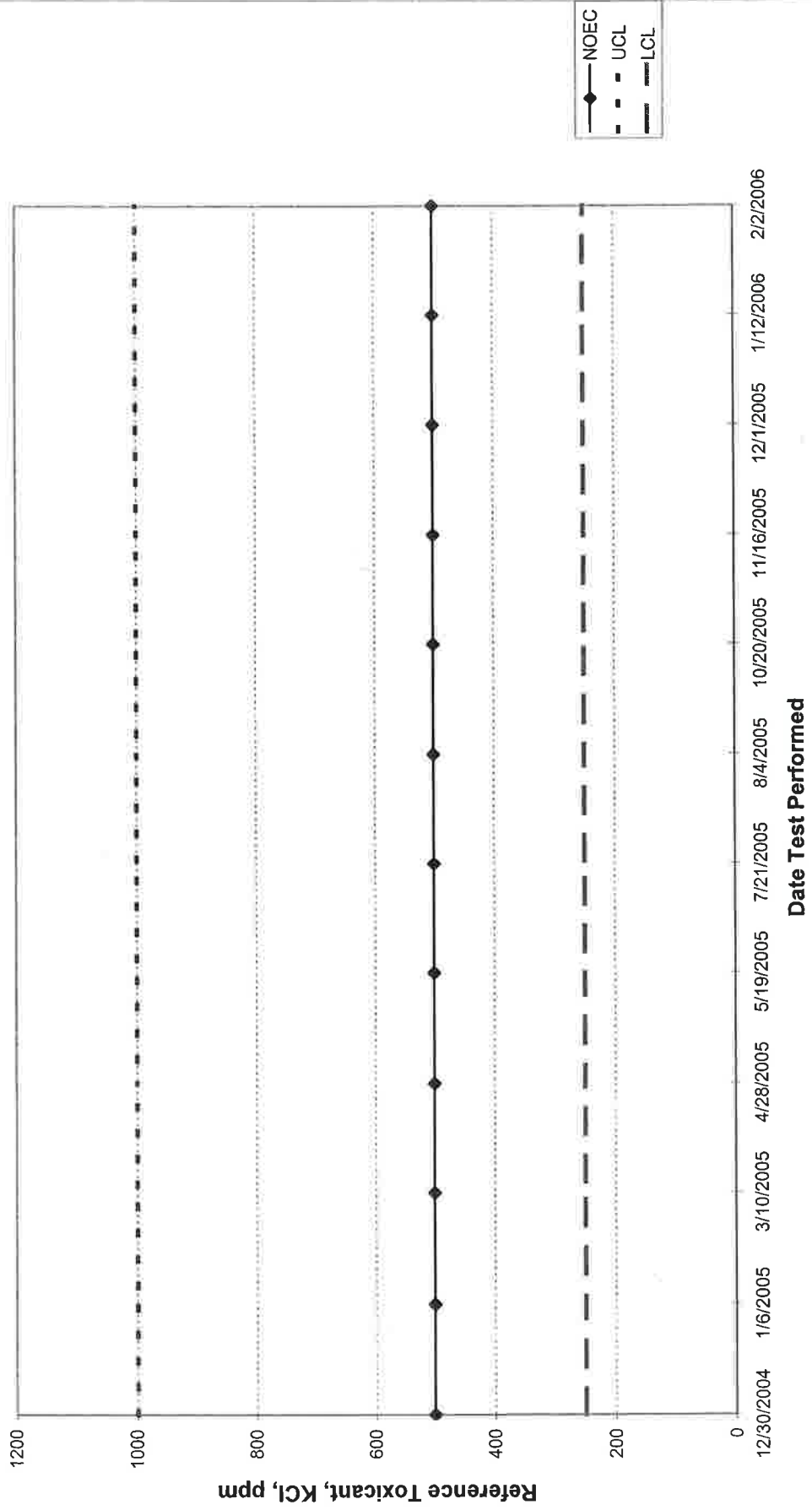
1 - 800 - 927 - 1650

PO Box 1271 • One Lafayette Road • Hampton, NH 03842 • (603) 926-1650

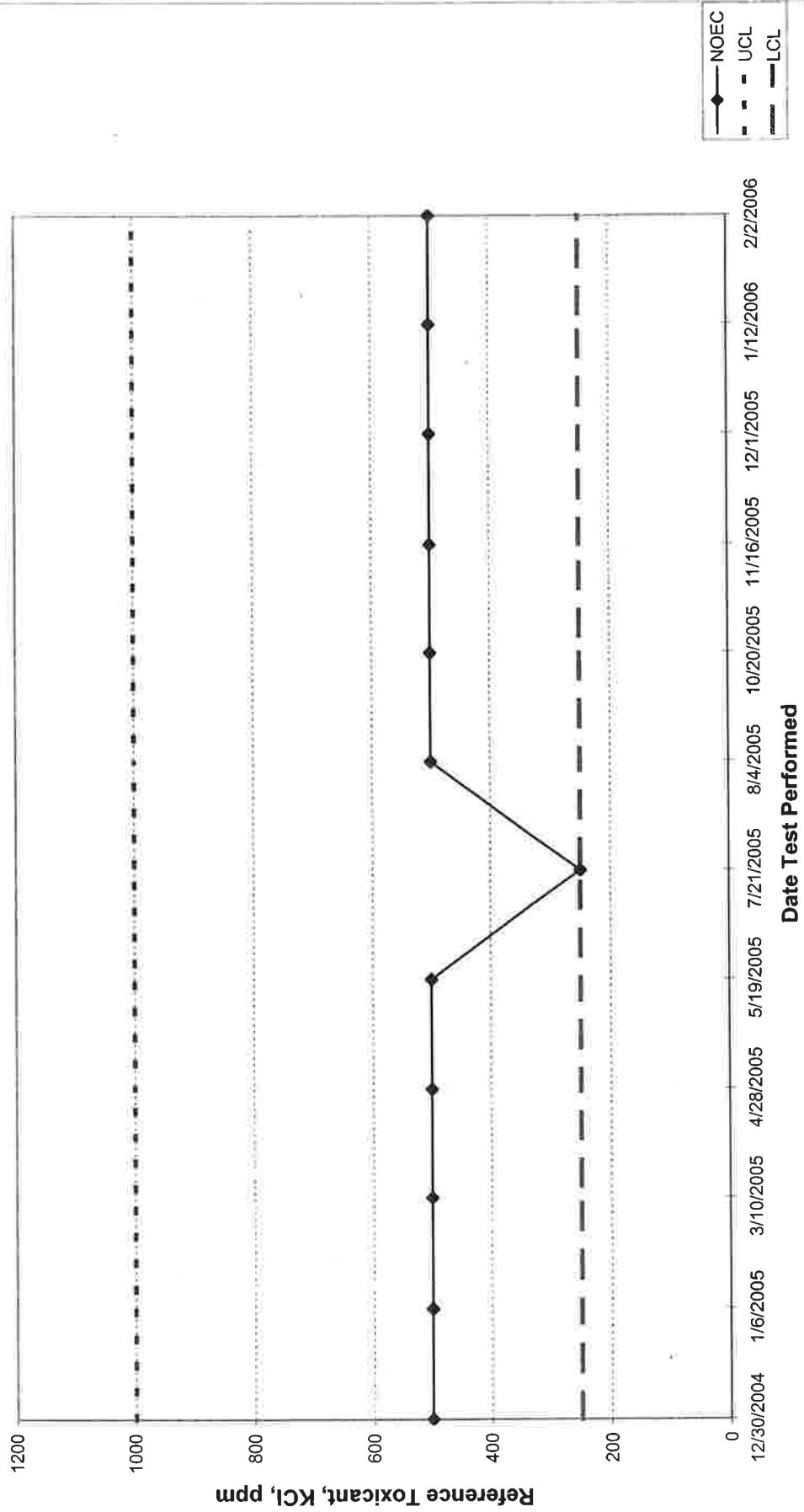
APPENDIX F

Quality Assurance Charts

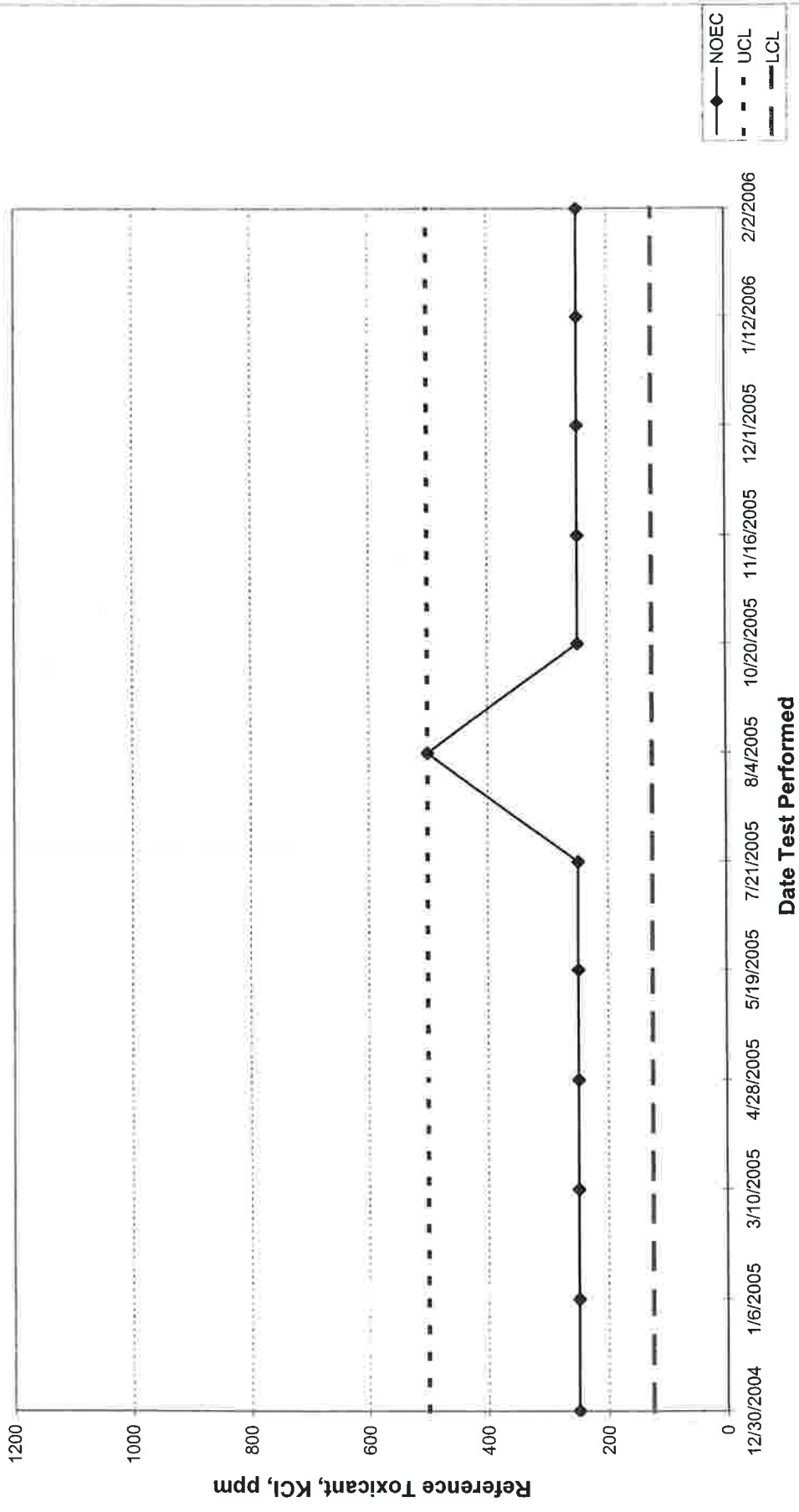
ARKANSAS ANALYTICAL, INC.
FATHEAD MINNOW SURVIVAL
QUALITY ASSURANCE



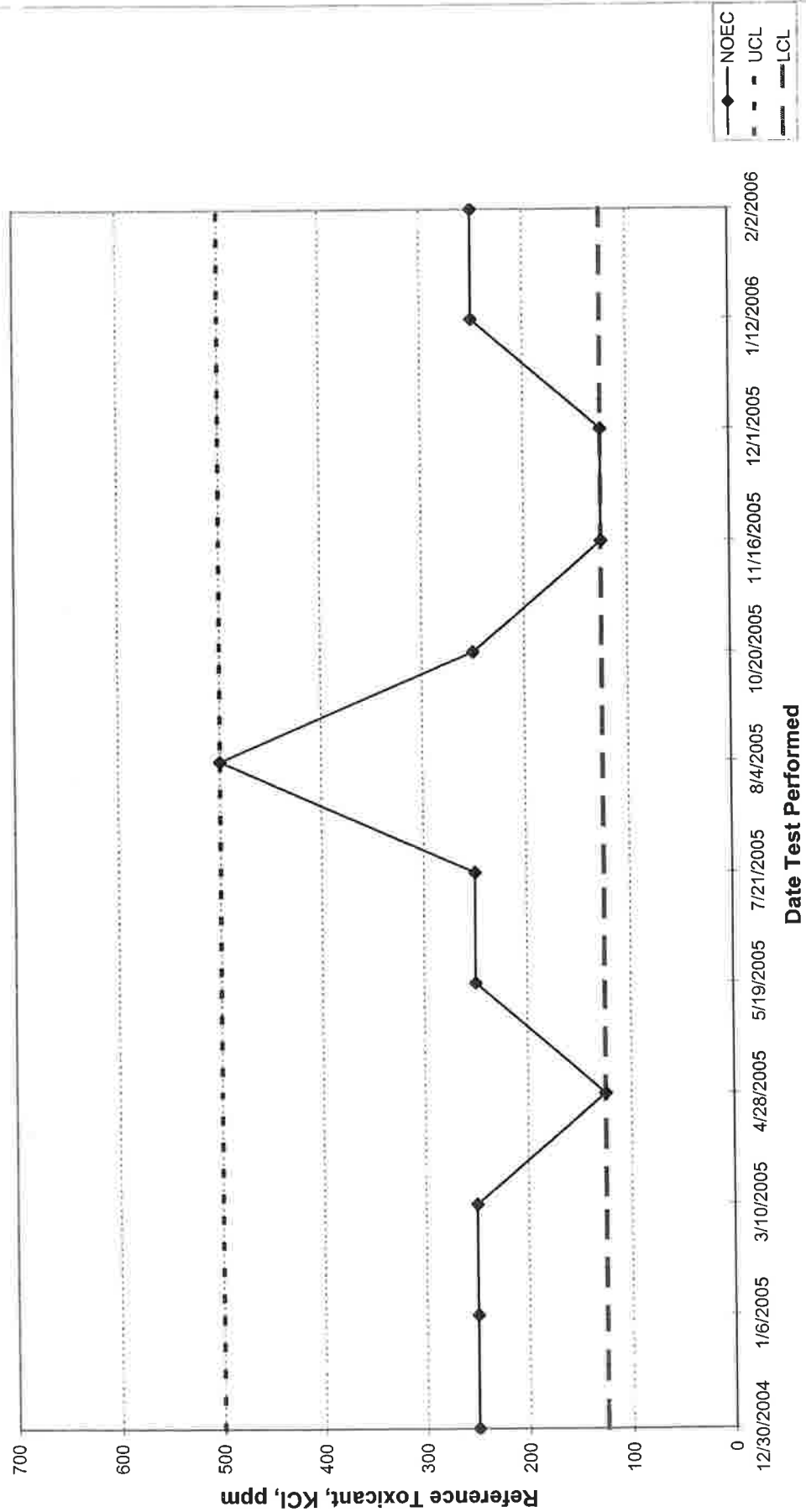
ARKANSAS ANALYTICAL, INC.
FATHEAD MINNOW GROWTH
QUALITY ASSURANCE



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: **05-070-0**

Issued Date: **30 October 2005**

Expired Date: **30 October 2006**

J.A. Sembruski
 ADEQ Quality Assurance Officer

Date *October 28, 2005*