



Arkansas Analytical, Inc.

Toxicity Test Results

MAGCOBAR MINE SITE
NPDES PERMIT NUMBER: AR0049794
May 2004

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

Ceriodaphnia dubia, Survival and Reproduction Test
Test 1002.0

Prepared for: **Mr. Alan B. Brown**
Weston Solutions
Magcobar Mine Site
2000 Darby Lane
Malvern, AR 72104

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Tuesday, June 1, 2004

Introduction

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

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

Plant Operations

To be provided by permittee.

Source of Effluent and Dilution Water

Effluent samples were collected as follows:

Sample Collection:	Date, Time Started	Date, Time Ended
Sample #1:	5-19-04, 1030	5-20-04, 1030
Sample #2:	5-20-04, 1000	5-21-04, 1000
Sample #3:	5-24-04, 1230	5-24-04, 1230

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:	5-20-04, 1405	4
Sample #2:	5-21-04, 1227	4
Sample #3:	5-25-04, 1315	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	100%	X	
Average of 15 or more young per surviving female	16.6	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	18.7%	X	

TEST ACCEPTANCE CRITERIA for *Pimephales promelas*

Control Criteria	Results	Pass	Fail
Greater than or equal to 80% survival	100%	X	
The percent coefficient of variation between replicates must be 40% or less for survival	0%	X	
Minimum of 0.25 mg average dry weight of surviving controls	0.548	X	
The percent coefficient of variation between replicates must be 40% or less for growth	17.0%	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)	15.6	%CV survival (critical dilution)	24.6%
%CV Reproduction (critical dilution)	18.4%	Mean dry weight (critical dilution) in milligrams	0.536
		%CV growth (critical dilution)	35.2%

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


Amy Daniel

**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:	5-19-04, 1030	5-20-04, 1030
Sample #2:	5-20-04, 1000	5-21-04, 1000
Sample #3:	5-24-04, 1230	5-24-04, 1230

Test initiated (date, time): 5-21-04, 1515 Test terminated (date, time): 5-28-04, 1045

Dilution water used: Soft Synthetic

DATA TABLE FOR FATHEAD MINNOW SURVIVAL

Effluent Conc %	Percent Survival in Replicate Chambers						Mean Percent Survival			
	A	B	C	D	E		24 hours	48 hours	7 days	CV %
0%	100	100	100	100	100		100	100	100	0.00
32%	100	100	100	100	100		100	100	100	
42%	100	100	90	100	100		100	98	98	
56%	100	100	100	100	100		100	100	100	
75%	100	100	100	100	100		100	100	100	
100%	100	90	50	100	100		100	100	88	24.6

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%	0.687	0.463	0.583	0.464	0.543		0.548	17.0
32%	0.674	0.578	0.549	0.602	0.782		0.637	
42%	0.608	0.618	0.614	0.547	0.522		0.582	
56%	0.527	0.512	0.604	0.563	0.727		0.587	
75%	0.622	0.566	0.481	0.465	0.543		0.535	
100%	0.687	0.453	0.242	0.670	0.626		0.536	35.2

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)= 24.6 %

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:	5-19-04, 1030	5-20-04, 1030
Sample #2:	5-20-04, 1000	5-21-04, 1000
Sample #3:	5-24-04, 1230	5-24-04, 1230

Test initiated (date, time): 5-21-04, 1540 Test terminated (date, time): 5-27-04, 0910

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	14	13	19	13	12	18
B	17	20	16	13	11	16
C	13	16	10	15	19	17
D	16	19	16	17	16	12
E	18	21	17	20	15	19
F	13	16	17	21	9	12
G	18	16	17	12	22	17
H	15	20	18	12	22	14
I	19	16	19	17	19	19
J	23	12	8	10	15	12
Mean	16.6	16.9	15.7	15.0	16.0	15.6
Mean/surviving female	16.6	16.9	15.7	15.0	16.0	15.6
CV%*	18.7					18.4

X= Dead Adult; M= Male (Not considered in statistics)

*Coefficient of Variation = standard deviation/ mean * 100; CV% calculation based on young per surviving female

SUMMARY REPORTING FORMS FOR CHRONIC BIOMONITORING
Ceriodaphnia dubia SURVIVAL AND REPRODUCTION

Permittee: Magcohar Mine Site

NPDES #: AR0049794

PERCENT SURVIVAL

PERCENT EFFLUENT	0%	32%	42%	56%	75%	100%
Time of Reading: 24 HOURS	100	100	100	100	100	100
48 HOURS	100	100	100	100	100	100
Test termination	100	100	100	100	100	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)= 18.7 %





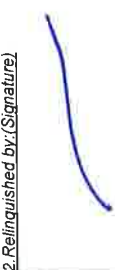

APPENDIX A

Chain of Custody Forms


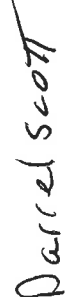


CHAIN OF CUSTODY RECORD

CLIENT INFORMATION			Project Description			Turnaround Time			Preservation Codes:					
Weston Solutions, Inc.			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						4. Thiosulfate for dechlorination					
Attn: Alan Brown			Bill to/P.O.			Preservative Code:			5. Hydrochloric Acid for VOA					
<i>Daniel Scott</i>			DARREL SCOTT			P			TEST PARAMETERS			Bottle type code G=glass, P=HDPE V=septum, A=amber		
Samplers (Signature/s)			Samplers (Printed)			Chronic Bio			K405511A					
Field Number	Sample Collection Date/s	Time/s	Grab	Comp	# of Containers	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION							
FD0520COMP	5/20/2004	10:30	X	X	5	Facility Discharge								
1. Relinquished by (Signature)			Date/Time			1. Received by (Signature)			For completion by laboratory					
<i>Daniel Scott</i>			5-20-04 1405						Condition of samples:					
2. Relinquished by (Signature)			Date/Time			2. Received by laboratory (Signature)			A. Containers Correct? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No					
			5/20/04 1405			<i>Barry</i>			B. Preservation Correct? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No					
									C. Seals Intact? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No					
REMARKS														

CHAIN OF CUSTODY RECORD

CLIENT INFORMATION			Project Description		Turnaround Time (CIRCLE ONE)		Preservation Codes:	
Weston Solutions, Inc. P.O. Box 699 2000 Darby Lane Malvern, AR 72104 Attn: Alan Brown			MAGCOBAR Mine Site Reporting Information Telephone: 501/467-8355 FAX: 501/467-8687 Bill to P.O.		24 hour 48 hour <u>routine</u>		1. Cool, 4 degrees Centigrade 2. Sulfuric Acid, pH <2 3. Nitric Acid, pH <2 4. Thiosulfate for dechlorination 5. Hydrochloric Acid for VOA 6. Sodium Hydroxide, pH >12	
Samplers: (Signature/s) 			Samplers: (Printed) Bill Horton		TEST PARAMETERS			
					Bottle type code G=glass, P=HDPE V=septum, A=samber	Arkansas Analytical Lab # <u>K4P5511B</u>		
Field Number	Sample Collection Date/s	Time/s	Grab	Comp	# of Containers	SAMPLE IDENTIFICATION/ DESCRIPTION	Matrix	Remarks
FD0521COMP	5/21/2004	10:00	X		3	Facility Discharge		Chronic Bio X
1. Received by: (Signature)						For completion by laboratory		
1. Relinquished by: (Signature) 						Condition of samples: A. Containers Correct? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No B. Preservation Correct? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No C. Seals Intact? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
2. Relinquished by: (Signature) 						2. Received by: laboratory: (Signature) 		

CHAIN OF CUSTODY RECORD

CLIENT INFORMATION				Project Description				Turnaround Time				Preservation Codes:			
Weston Solutions, Inc.				MAGCOBAR Mine Site				(CIRCLE ONE)				1. Cool, 4 degrees Centigrade 2. Sulfuric Acid, pH <2 3. Nitric Acid, pH <2 4. Thiosulfate for dechlorination 5. Hydrochloric Acid for VOA 6. Sodium Hydroxide, pH >12			
P.O. Box 699				Reporting Information				24 hour				TEST PARAMETERS C=glass, P=HDPE V=septum, A=amber			
2000 Darby Lane				Telephone: 501/467-8355				48 hour							
Malvern, AR 72104				FAX: 501/467-8687				routine				Arkansas Analytical Lab # K405571C			
Attn: Alan Brown				Bill to/P.O				Preservative Code							
								Bottle Type							
Samplers: (Signature/s)				Samplers: (Printed)				Chronic Bio							
Field Number	Sample Collection		Date/s	Time/s	Grab	Comp	# of Containers	SAMPLE IDENTIFICATION/ DESCRIPTION			Bottle Type	Preservative Code	Remarks		
	Date/s	Time/s						Sample	Matrix	IDENTIFICATION/ DESCRIPTION					
FD0525COMP	5/25/2004	12:30	X	3				Facility Discharge				X			
1. Relinquished by: (Signature) 													1. Received by: (Signature) Condition of samples: A. Containers Correct? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO B. Preservation Correct? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO Seals Intact? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		
2. Relinquished by: (Signature) Date/Time: 5-25-04 1:45													2. Received by laboratory: (Signature) Date/Time: 5-25-04 1:45 		
REMARKS Jump on Receipt - 1°C															



APPENDIX B

Effluent and Dilution Water Data

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Fathead Minnow

Lab # / Sample ID		K405511							Test Start (Date/Time)	5-21-04/1515
Client		Winston							Test End (Date/Time)	5-28-04/1045
		Day of Test								
		1	2	3	4	5	6	7	notes/remarks	
Control		5/21	5/22	5/23	5/24	5/25	5/26	5/27	SS 105	
D.O (mg/L)	INITIAL	8.0	7.9	7.9	7.0	7.9	7.3	8.3		
	FINAL	7.9	7.8	7.8	7.1	7.3	7.6	7.9		
pH(mg/L)	INITIAL	6.7	6.8	6.7	7.3	6.6	7.3	7.3		
	FINAL	7.0	6.9	6.7	7.3	6.3	7.0	7.2		
temp(C)	INITIAL	21.1	20.9	20.8	22.0	21.5	22.0	21.7		
	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)		170								
CHLORINE(mg/L)		40.05								
CONC:		321	321	321	321	321	321	321		
D.O (mg/L)	INITIAL	7.9	7.9	7.9	7.0	7.9	7.2	8.4		
	FINAL	7.9	7.8	7.8	7.1	7.2	7.6	7.9		
pH(mg/L)	INITIAL	6.9	6.8	6.7	7.3	7.3	7.2	7.3		
	FINAL	7.0	6.9	6.7	7.1	6.5	7.0	7.1		
temp(C)	INITIAL	21.2	20.9	20.9	22.0	21.5	22.0	21.7		
	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	7.8	7.9	7.8	6.9	7.8	7.2	8.5		
	FINAL	7.8	7.8	7.8	7.1	7.2	7.5	7.9		
pH(mg/L)	INITIAL	6.9	6.9	6.8	7.3	7.3	7.3	7.4		
	FINAL	7.0	7.0	6.7	7.1	6.5	7.0	7.1		
temp(C)	INITIAL	21.2	20.9	20.9	22.0	21.5	22.0	21.7		
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0		
CONC:		501	501	501	501	501	501	501		
D.O (mg/L)	INITIAL	7.8	7.9	7.8	7.1	7.8	7.2	8.4		
	FINAL	7.8	7.7	7.8	7.0	7.2	7.5	7.9		
pH(mg/L)	INITIAL	7.0	6.9	6.8	7.2	7.2	7.3	7.5		
	FINAL	7.0	7.0	7.0	7.1	6.6	6.9	7.1		
temp(C)	INITIAL	21.1	21.0	20.9	22.0	21.5	22.0	21.7		
	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	7.7	7.8	7.7	6.9	7.8	7.2	8.7		
	FINAL	7.8	7.7	7.8	7.0	7.2	7.7	7.9		
pH(mg/L)	INITIAL	7.0	7.0	6.8	7.2	7.2	7.4	7.5		
	FINAL	7.0	7.1	7.3	7.0	6.6	6.9	7.1		
temp(C)	INITIAL	21.3	21.0	21.1	22.0	21.5	22.0	21.7		
	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	7.5	7.8	7.7	6.8	7.8	7.2	8.7		
	FINAL	7.7	7.7	7.8	7.0	7.2	7.7	7.9		
pH(mg/L)	INITIAL	7.1	7.0	6.9	7.2	7.2	7.5	7.5		
	FINAL	7.0	7.1	7.3	7.0	6.6	6.9	7.1		
temp(C)	INITIAL	21.3	21.0	21.2	22.0	21.5	22.0	21.7		
	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			21		25			
HARDNESS(mg/L)		1360			1670		1580			
CONDUCTIVITY(umhos/cm)		2380			2390		2400			
CHLORINE(mg/L)		40.05			40.05		40.05			

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Ceriodaphnia dubia

Lab # / Sample ID		K405511		Test Start (Date/Time)		5-21-04/1540					
Client		WASTON		Test End (Date/Time)		5-27-04/0910					
		Day of Test									
		1	2	3	4	5	6	7	8	notes/remarks	
Control		5/21	5/22	5/23	5/24	5/25	5/26			SS 105	
D.O (mg/L)	INITIAL	8.0	7.9	7.9	7.0	7.9	7.3				
	FINAL	8.1	8.0	7.7	7.2	7.7	7.7				
pH	INITIAL	6.7	6.8	6.7	7.3	7.3	7.3				
	FINAL	7.0	7.0	6.8	6.7	7.2	7.6				
temp(C)	INITIAL	21.1	20.9	20.8	22.0	21.5	22.0				
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0				
ALKALINITY(mg/L)		30									
HARDNESS(mg/L)		42									
CONDUCTIVITY(umhos/cm)		170									
CHLORINE(mg/L)		40.05									
CONC:		321.	321.	321.	321.	321.	321.				
D.O (mg/L)	INITIAL	7.9	7.9	7.9	7.0	7.9	7.2				
	FINAL	8.1	8.0	7.7	7.2	7.8	7.7				
pH	INITIAL	6.9	6.8	6.7	7.3	7.3	7.2				
	FINAL	7.0	7.1	6.8	6.6	7.1	7.4				
temp(C)	INITIAL	21.2	20.9	20.9	22.0	21.5	22.0				
	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	7.8	7.9	7.8	6.9	7.8	7.2				
	FINAL	8.0	8.0	7.7	7.2	7.8	7.8				
pH	INITIAL	6.9	6.9	6.8	7.3	7.3	7.3				
	FINAL	7.0	7.1	6.9	6.8	7.2	7.4				
temp(C)	INITIAL	21.2	20.9	20.9	22.0	21.5	22.0				
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0				
CONC:		501.	501.	501.	501.	501.	501.				
D.O (mg/L)	INITIAL	7.8	7.9	7.8	7.1	7.8	7.2				
	FINAL	8.0	8.0	7.7	7.2	7.9	7.8				
pH	INITIAL	7.0	6.9	6.8	7.2	7.2	7.3				
	FINAL	7.0	7.1	6.9	6.9	7.3	7.4				
temp(C)	INITIAL	21.1	21.0	21.0	22.0	21.5	22.0				
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0				
CONC:		751.	751.	751.	751.	751.	751.				
D.O (mg/L)	INITIAL	7.7	7.8	7.7	6.9	7.8	7.2				
	FINAL	7.9	8.0	7.7	7.2	8.0	7.8				
pH	INITIAL	7.0	7.0	6.8	7.2	7.2	7.4				
	FINAL	7.0	7.1	7.0	6.9	7.3	7.4				
temp(C)	INITIAL	21.3	21.0	21.1	22.0	21.5	22.0				
	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	7.5	7.8	7.7	6.9	7.8	7.2				
	FINAL	7.8	7.9	7.7	7.2	8.0	7.8				
pH	INITIAL	7.1	7.0	6.9	7.2	7.2	7.5				
	FINAL	7.0	7.1	7.1	7.1	7.3	7.5				
temp(C)	INITIAL	21.3	21.0	21.2	22.0	21.5	22.0				
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0				
CONC: 100%		A	A	A	B	B	C				
ALKALINITY(mg/L)		23			> 21		> 25				
HARDNESS(mg/L)		1300			> 1070		> 1580				
CONDUCTIVITY(umhos/cm)		2380			> 2390		> 2400				
CHLORINE(mg/L)		40.05			> 40.05		> 40.05				



APPENDIX C

Fathead Minnow Raw Data and Statistics

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB #/ SAMPLE ID K405511 TEST START DATE 5-21 TIME 1515
 CLIENT Weston TEST END DATE 5-28 TIME 1045
 AGE AND SOURCE OF MINNOWS 224hrs; Aquatox

CONC:	REP #	DAY (NUMBER SURVIVING)								SURVIVAL		
		start	1	2	3	4	5	6	7	%	MEAN %	CV
Control	A	10	10	10	10	10	10	10	10	100	100	0%
	B	↓	10	10	10	10	10	10	10	100		
	C	↓	10	10	10	10	10	10	10	100		
	D	↓	10	10	10	10	10	10	10	100		
	E	↓	10	10	10	10	10	10	10	100		
32%	A	10	10	10	10	10	10	10	10	100	100	
	B	↓	10	10	10	10	10	10	10	100		
	C	↓	10	10	10	10	10	10	10	100		
	D	↓	10	10	10	10	10	10	10	100		
	E	↓	10	10	10	10	10	10	10	100		
42%	A	10	10	10	10	10	10	10	10	100	98	
	B	↓	10	10	10	10	10	10	10	100		
	C	↓	10	9	9	9	9	9	9	90		
	D	↓	10	10	10	10	10	10	10	100		
	E	↓	10	10	10	10	10	10	10	100		
56%	A	10	10	10	10	10	10	10	10	100	100	
	B	↓	10	10	10	10	10	10	10	100		
	C	↓	10	10	10	10	10	10	10	100		
	D	↓	10	10	10	10	10	10	10	100		
	E	↓	10	10	10	10	10	10	10	100		
75%	A	10	10	10	10	10	10	10	10	100	100	
	B	↓	10	10	10	10	10	10	10	100		
	C	↓	10	10	10	10	10	10	10	100		
	D	↓	10	10	10	10	10	10	10	100		
	E	↓	10	10	10	10	10	10	10	100		
100%	A	10	10	10	10	10	10	10	10	100	88	24.6%
	B	↓	10	10	10	AD	9	9	9	90		
	C	↓	10	10	10	10	10	AD	5	50		
	D	↓	10	10	10	10	10	10	10	100		
	E	↓	10	10	10	10	10	10	10	100		
ANALYST:		MA	AD	AD	AD	AD	AD	AD	AD			
DATE:		5-21	5/22	5/23	5/24	5/25	5/26	5/27	5/28			
TIME:		1515	1030	1130	1330	1000	1300	1315	1045			

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

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB #/S: 1405511	TEST DATES (BEGIN/END): 5/21-28/04
CLIENT: Weston	WEIGHING DATE/TIME: 6-1-04/0925
ANALYST/S: mg, AD	DRYING TEMPERATURE (DEGREES C): 60°C
SAMPLE ID:	DRYING TIME (HOURS): 24 hrs.

	REP #	FINAL DRY WEIGHT TIN+LARVAE (g)	INITIAL WEIGHT TIN (g)	TOTAL DRY WEIGHT OF LARVAE (g)	NUMBER OF LARVAE	DRY WEIGHT OF LARVA (mg)		REMARKS
CONTROL	A 1	0.97007	0.96320	0.00487	10	0.687	AVG DRY	
	B 2	0.96794	0.96331	0.00463	10	0.463	WEIGHT (mg)	
	C 3	0.97761	0.97178	0.00583	10	0.583	0.548	
	D 4	0.97688	0.97224	0.00464	10	0.464	CV	
	E 5	0.97340	0.96797	0.00543	10	0.543	17.0%	
32% CONC:	A 4	0.97670	0.96996	0.00674	10	0.674	AVG DRY	
	B 7	0.97500	0.96922	0.00578	10	0.578	WEIGHT(MG)	
	C 8	0.96803	0.96314	0.00549	10	0.549	0.637	
	D 9	0.96998	0.96396	0.00602	10	0.602	CV	
	E 10	0.97484	0.96702	0.00782	10	0.782		
42% CONC:	A 11	0.96855	0.96247	0.00608	10	0.608	AVG DRY	
	B 12	0.97141	0.96523	0.00618	10	0.618	WEIGHT(MG)	
	C 13	0.97082	0.96468	0.00614	10	0.614	0.582	
	D 14	0.96643	0.96096	0.00547	10	0.547	CV	
	E 15	0.96274	0.95752	0.00522	10	0.522		
50% CONC:	A 16	0.96678	0.96151	0.00527	10	0.527	AVG DRY	
	B 17	0.97083	0.96571	0.00512	10	0.512	WEIGHT(MG)	
	C 18	0.96706	0.96102	0.00604	10	0.604	0.587	
	D 19	0.97258	0.96695	0.00563	10	0.563	CV	
	E 20	0.97937	0.97210	0.00727	10	0.727		
75% CONC:	A 21	0.97754	0.97132	0.00622	10	0.622	AVG DRY	
	B 22	0.97439	0.96873	0.00566	10	0.566	WEIGHT(MG)	
	C 23	0.97849	0.97368	0.00481	10	0.481	0.535	
	D 24	0.97243	0.96778	0.00465	10	0.465	CV	
	E 25	0.98189	0.97646	0.00543	10	0.543		
100% CONC:	A 26	0.97490	0.96883	0.00687	10	0.687	AVG DRY	
	B 27	0.96435	0.95982	0.00453	10	0.453	WEIGHT(MG)	
	C 28	0.96090	0.95584	0.00506	10	0.506	0.536	
	D 29	0.95659	0.94989	0.00670	10	0.670	CV	
	E 30	0.96030	0.95404	0.00626	10	0.626	35.2%	

CV = (STANDARD DEVIATION/MEAN)*100

AA# K405511 FATHEAD MINNOW SURVIVAL, 5-21-04
File: k405511s Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

$\lambda = 0.316$

$\nu = 0.545$

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# K405511 FATHEAD MINNOW SURVIVAL, 5-21-04
File: k405511s 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# K405511 FATHEAD MINNOW SURVIVAL, 5-21-04

FILE: k405511s

TRANSFORM: ARC SINE(SQUARE ROOT(Y))

NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	1.0000	1.4120
1	CONTROL	2	1.0000	1.4120
1	CONTROL	3	1.0000	1.4120
1	CONTROL	4	1.0000	1.4120
1	CONTROL	5	1.0000	1.4120
2	32 % EFFLUENT	1	1.0000	1.4120
2	32 % EFFLUENT	2	1.0000	1.4120
2	32 % EFFLUENT	3	1.0000	1.4120
2	32 % EFFLUENT	4	1.0000	1.4120
2	32 % EFFLUENT	5	1.0000	1.4120
3	42 % EFFLUENT	1	1.0000	1.4120
3	42 % EFFLUENT	2	1.0000	1.4120
3	42 % EFFLUENT	3	0.9000	1.2490
3	42 % EFFLUENT	4	1.0000	1.4120
3	42 % EFFLUENT	5	1.0000	1.4120
4	56 % EFFLUENT	1	1.0000	1.4120
4	56 % EFFLUENT	2	1.0000	1.4120
4	56 % EFFLUENT	3	1.0000	1.4120
4	56 % EFFLUENT	4	1.0000	1.4120
4	56 % EFFLUENT	5	1.0000	1.4120
5	75 % EFFLUENT	1	1.0000	1.4120
5	75 % EFFLUENT	2	1.0000	1.4120
5	75 % EFFLUENT	3	1.0000	1.4120
5	75 % EFFLUENT	4	1.0000	1.4120
5	75 % EFFLUENT	5	1.0000	1.4120
6	100 % EFFLUENT	1	1.0000	1.4120
6	100 % EFFLUENT	2	0.9000	1.2490
6	100 % EFFLUENT	3	0.5000	0.7854
6	100 % EFFLUENT	4	1.0000	1.4120
6	100 % EFFLUENT	5	1.0000	1.4120

AA# K405511 FATHEAD MINNOW SURVIVAL, 5-21-04

File: k405511s Transform: ARC SINE(SQUARE ROOT(Y))

STEEL'S MANY-ONE RANK TEST

Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	1.412				
2	32 % EFFLUENT	1.412	27.50	16.00	5.00	
3	42 % EFFLUENT	1.379	25.00	16.00	5.00	
4	56 % EFFLUENT	1.412	27.50	16.00	5.00	
5	75 % EFFLUENT	1.412	27.50	16.00	5.00	
6	100 % EFFLUENT	1.254	22.50	16.00	5.00	

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

AA # K405511, FATHEAD MINNOW GROWTH, 5-21-04

File: C:\TOXSTAT\WESTON\K405511G.

Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

D = 0.266

l = 0.919

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 # K405511, FATHEAD MINNOW GROWTH, 5-21-04

File: C:\TOXSTAT\WESTON\K405511G.

Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

Calculated B1 statistic = 8.90

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 # K405511, FATHEAD MINNOW GROWTH, 5-21-04

FILE: C:\TOXSTAT\WESTON\K405511G.

TRANSFORM: NO TRANSFORMATION

NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.6870	0.6870
1	CONTROL	2	0.4630	0.4630
1	CONTROL	3	0.5830	0.5830
1	CONTROL	4	0.4640	0.4640
1	CONTROL	5	0.5430	0.5430
2	32 % EFFLUENT	1	0.6740	0.6740
2	32 % EFFLUENT	2	0.5780	0.5780
2	32 % EFFLUENT	3	0.5490	0.5490
2	32 % EFFLUENT	4	0.6020	0.6020
2	32 % EFFLUENT	5	0.7820	0.7820
3	42 % EFFLUENT	1	0.6080	0.6080
3	42 % EFFLUENT	2	0.6180	0.6180
3	42 % EFFLUENT	3	0.6140	0.6140
3	42 % EFFLUENT	4	0.5470	0.5470
3	42 % EFFLUENT	5	0.5220	0.5220
4	56 % EFFLUENT	1	0.5270	0.5270
4	56 % EFFLUENT	2	0.5120	0.5120
4	56 % EFFLUENT	3	0.6040	0.6040
4	56 % EFFLUENT	4	0.5630	0.5630
4	56 % EFFLUENT	5	0.7270	0.7270
5	75 % EFFLUENT	1	0.6220	0.6220
5	75 % EFFLUENT	2	0.5660	0.5660
5	75 % EFFLUENT	3	0.4810	0.4810
5	75 % EFFLUENT	4	0.4650	0.4650
5	75 % EFFLUENT	5	0.5430	0.5430
6	100 % EFFLUENT	1	0.6870	0.6870
6	100 % EFFLUENT	2	0.4530	0.4530
6	100 % EFFLUENT	3	0.2420	0.2420
6	100 % EFFLUENT	4	0.6700	0.6700
6	100 % EFFLUENT	5	0.6260	0.6260

AA # K405511, FATHEAD MINNOW GROWTH, 5-21-04

File: C:\TOXSTAT\WESTON\K405511G.

Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.039	0.008	0.701
Within (Error)	24	0.266	0.011	
Total	29	0.305		

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

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

AA # K405511, FATHEAD MINNOW GROWTH, 5-21-04

File: C:\TOXSTAT\WESTON\K405511G.

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	0.548	0.548		
2	32 % EFFLUENT	0.637	0.637	-1.337	
3	42 % EFFLUENT	0.582	0.582	-0.508	
4	56 % EFFLUENT	0.587	0.587	-0.580	
5	75 % EFFLUENT	0.535	0.535	0.189	
6	100 % EFFLUENT	0.536	0.536	0.186	

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

A # K405511, FATHEAD MINNOW GROWTH, 5-21-04

File: C:\TOXSTAT\WESTON\K405511G.

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	0.157	28.7	-0.089
3	42 % EFFLUENT	5	0.157	28.7	-0.034
4	56 % EFFLUENT	5	0.157	28.7	-0.039
5	75 % EFFLUENT	5	0.157	28.7	0.013
6	100 % EFFLUENT	5	0.157	28.7	0.012



APPENDIX D

Ceriodaphnia dubia Raw Data and Statistics

Ceriodaphnia dubia

SURVIVAL AND REPRODUCTION TEST

Discharger: Weston

Lab Number/s: 16405511

Analyst: MJA:AD

Location:

Test Start-Date/Time: 5-21-04 / 1540

Date Sample Collected: See COC

Test Stop-Date/Time: 5-27-04 / 0910

Conc 1	Replicate													No. of Young/Adult	Analyst		
	A	B	C	D	E	F	G	H	I	J	No. of Young/Adult						
Day 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	AD
Day 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	AD
Day 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	AD
Day 4	3	5	3	5	5	6	1	2	2	6	38	10	38	AD			
Day 5	9	9	6	11	9	7	7	4	9	8	79	10	79	AD			
Day 6	2	3	4	0	4	0	9	9	0	9	40	10	40	AD			
Day 7																	
Day 8																	
Total	14	17	13	16	18	13	18	15	19	23	166	10	166	CV=18.7%			

Conc 4 % 56

Day 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 AD

Day 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 AD

Day 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 AD

Day 4 5 3 5 6 5 6 4 5 6 5 50 10 50 AD

Day 5 0 0 8 11 11 11 5 5 7 0 14 10 14 AD

Day 6 8 4 2 0 4 4 3 2 4 5 36 10 36 AD

Total 13 13 15 17 20 21 12 12 17 10 150

Conc 2	Replicate													No. of Young/Adult	Analyst	
	A	B	C	D	E	F	G	H	I	J	No. of Young/Adult					
Day 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	AD
Day 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	AD
Day 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	AD
Day 4	4	4	5	4	2	4	2	5	5	5	45	10	45	AD		
Day 5	8	10	9	9	4	11	8	7	11	0	79	10	79	AD		
Day 6	1	4	2	4	11	3	2	11	0	0	44	10	44	AD		
Day 7																
Day 8																
Total	13	20	16	19	21	16	16	20	16	12	169		169			

Conc 5 % 75

Day 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 AD

Day 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 AD

Day 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 AD

Day 4 4 4 4 5 2 0 5 4 6 3 37 10 37 AD

Day 5 6 4 11 5 6 6 8 7 6 7 70 10 70 AD

Day 6 2 3 4 0 8 3 11 10 6 6 53 10 53 AD

Total 12 11 19 16 15 9 23 22 19 15 160

Conc 3	Replicate													No. of Young/Adult	Analyst	
	A	B	C	D	E	F	G	H	I	J	No. of Young/Adult					
Day 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	AD
Day 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	AD
Day 3	0	0	1	0	0	0	0	0	0	2	3	10	0.3	AD		
Day 4	9	6	3	5	4	5	3	5	6	3	49	10	49	AD		
Day 5	8	7	6	7	9	8	9	8	10	3	75	10	75	AD		
Day 6	2	3	0	4	4	4	5	5	3	0	30	10	30	AD		
Day 7																
Day 8																
Total	19	16	10	16	17	17	17	18	19	8	157		157			

Conc 6 % 100

Day 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 AD

Day 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 AD

Day 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 AD

Day 4 0 6 4 6 4 0 4 0 10 3 37 10 37 AD

Day 5 10 10 8 3 7 6 8 9 5 5 71 10 71 AD

Day 6 8 0 5 3 8 6 5 5 4 4 48 10 48 AD

Total 18 16 17 12 19 12 17 14 19 12 156 7-156 CV=18.4%

X=DEAD; Y=MALE

FISHER'S EXACT TEST

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

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
 Since b is greater than 6 there is no significant difference
 between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

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

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
 Since b is greater than 6 there is no significant difference
 between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

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

TOTAL 20 0 20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
 Since b is greater than 6 there is no significant difference
 between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

NUMBER OF

IDENTIFICATION	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
75% effluent	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
 Since b is greater than 6 there is no significant difference
 between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

NUMBER OF

IDENTIFICATION	ALIVE	DEAD	TOTAL ANIMALS
CONTROL	10	0	10
100% effluent	10	0	10
TOTAL	20	0	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 10.
 Since b is greater than 6 there is no significant difference
 between CONTROL and TREATMENT at the 0.05 level.

SUMMARY OF FISHER'S EXACT TESTS

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

AA# K405511, CERIODAPHNIA REPRODUCTION, 5-21-04
file: k405511c 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# K405511, CERIODAPHNIA REPRODUCTION, 5-21-04
File: k405511c Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
calculated B1 statistic = 2.52

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# K405511, CERIODAPHNIA REPRODUCTION, 5-21-04
 FILE: k405511c
 TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	14.0000	14.0000
1	CONTROL	2	17.0000	17.0000
1	CONTROL	3	13.0000	13.0000
1	CONTROL	4	16.0000	16.0000
1	CONTROL	5	18.0000	18.0000
1	CONTROL	6	13.0000	13.0000
1	CONTROL	7	18.0000	18.0000
1	CONTROL	8	15.0000	15.0000
1	CONTROL	9	19.0000	19.0000
1	CONTROL	10	23.0000	23.0000
2	32 % EFFLUENT	1	13.0000	13.0000
2	32 % EFFLUENT	2	20.0000	20.0000
2	32 % EFFLUENT	3	16.0000	16.0000
2	32 % EFFLUENT	4	19.0000	19.0000
2	32 % EFFLUENT	5	21.0000	21.0000
2	32 % EFFLUENT	6	16.0000	16.0000
2	32 % EFFLUENT	7	16.0000	16.0000
2	32 % EFFLUENT	8	20.0000	20.0000
2	32 % EFFLUENT	9	16.0000	16.0000
2	32 % EFFLUENT	10	12.0000	12.0000
3	42 % EFFLUENT	1	19.0000	19.0000
3	42 % EFFLUENT	2	16.0000	16.0000
3	42 % EFFLUENT	3	10.0000	10.0000
3	42 % EFFLUENT	4	16.0000	16.0000
3	42 % EFFLUENT	5	17.0000	17.0000
3	42 % EFFLUENT	6	17.0000	17.0000
3	42 % EFFLUENT	7	17.0000	17.0000
3	42 % EFFLUENT	8	18.0000	18.0000
3	42 % EFFLUENT	9	19.0000	19.0000
3	42 % EFFLUENT	10	8.0000	8.0000
4	56 % EFFLUENT	1	13.0000	13.0000
4	56 % EFFLUENT	2	13.0000	13.0000
4	56 % EFFLUENT	3	15.0000	15.0000
4	56 % EFFLUENT	4	17.0000	17.0000
4	56 % EFFLUENT	5	20.0000	20.0000
4	56 % EFFLUENT	6	21.0000	21.0000
4	56 % EFFLUENT	7	12.0000	12.0000
4	56 % EFFLUENT	8	12.0000	12.0000
4	56 % EFFLUENT	9	17.0000	17.0000
4	56 % EFFLUENT	10	10.0000	10.0000
5	75 % EFFLUENT	1	12.0000	12.0000
5	75 % EFFLUENT	2	11.0000	11.0000
5	75 % EFFLUENT	3	19.0000	19.0000
5	75 % EFFLUENT	4	16.0000	16.0000
5	75 % EFFLUENT	5	15.0000	15.0000
5	75 % EFFLUENT	6	9.0000	9.0000
5	75 % EFFLUENT	7	22.0000	22.0000
5	75 % EFFLUENT	8	22.0000	22.0000
5	75 % EFFLUENT	9	19.0000	19.0000

5	75	%	EFFLUENT	10	15.0000	15.0000
6	100	%	EFFLUENT	1	18.0000	18.0000
6	100	%	EFFLUENT	2	16.0000	16.0000
6	100	%	EFFLUENT	3	17.0000	17.0000
6	100	%	EFFLUENT	4	12.0000	12.0000
6	100	%	EFFLUENT	5	19.0000	19.0000
6	100	%	EFFLUENT	6	12.0000	12.0000
6	100	%	EFFLUENT	7	17.0000	17.0000
6	100	%	EFFLUENT	8	14.0000	14.0000
6	100	%	EFFLUENT	9	19.0000	19.0000
6	100	%	EFFLUENT	10	12.0000	12.0000

AA# K405511, CERIODAPHNIA REPRODUCTION, 5-21-04
 File: k405511c Transform: NO TRANSFORMATION

STEEL'S MANY-ONE RANK TEST - Ho:Control<Treatment

ROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	16.600				
2	32 % EFFLUENT	16.900	109.50	75.00	10.00	
3	42 % EFFLUENT	15.700	104.50	75.00	10.00	
4	56 % EFFLUENT	15.000	89.50	75.00	10.00	
5	75 % EFFLUENT	16.000	101.50	75.00	10.00	
6	100 % EFFLUENT	15.600	97.00	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 5-21-04 Arkansas Analytical

SPECIES Pimiphales pumilus

QUANTITY SHIPPED 300+

AGE/LIFE STAGE 224 hrs 5/21 150x150

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 UM

1300 Blue Spruce Drive, Suite C
Fort Collins, Colorado 80524



Toll Free: 800/331-5916
Tel: 970/484-5091 Fax:970/484-2514

ORGANISM HISTORY

DATE: 1/17/01

SPECIES: Ceriodaphnia dubia

AGE: Variable

LIFE STAGE: Adult

HATCH DATE: Variable

BEGAN FEEDING: Immediately

FOOD: YTC, Selenastrum

Water Chemistry Record:

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

Comments:

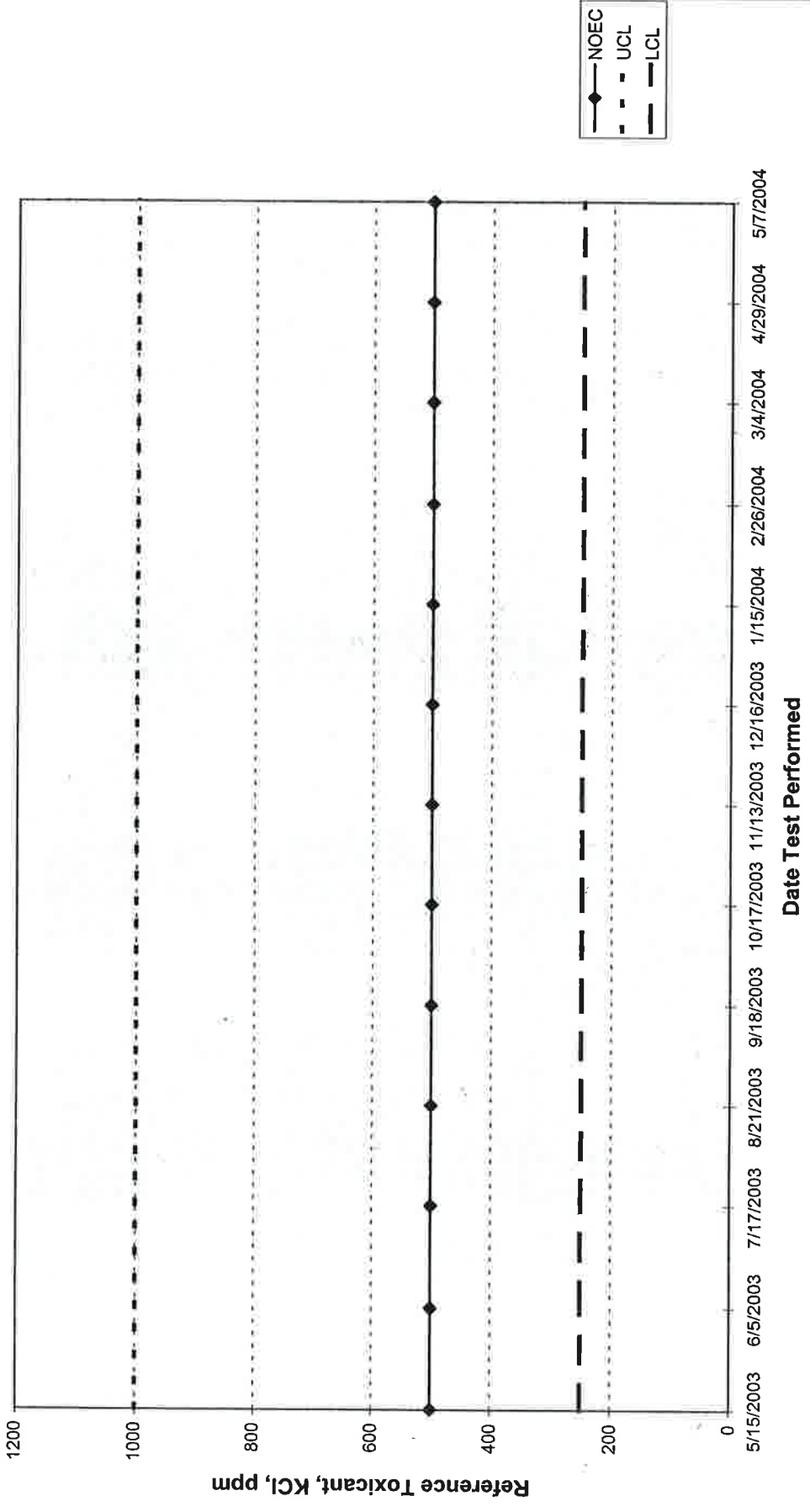


Facility Supervisor

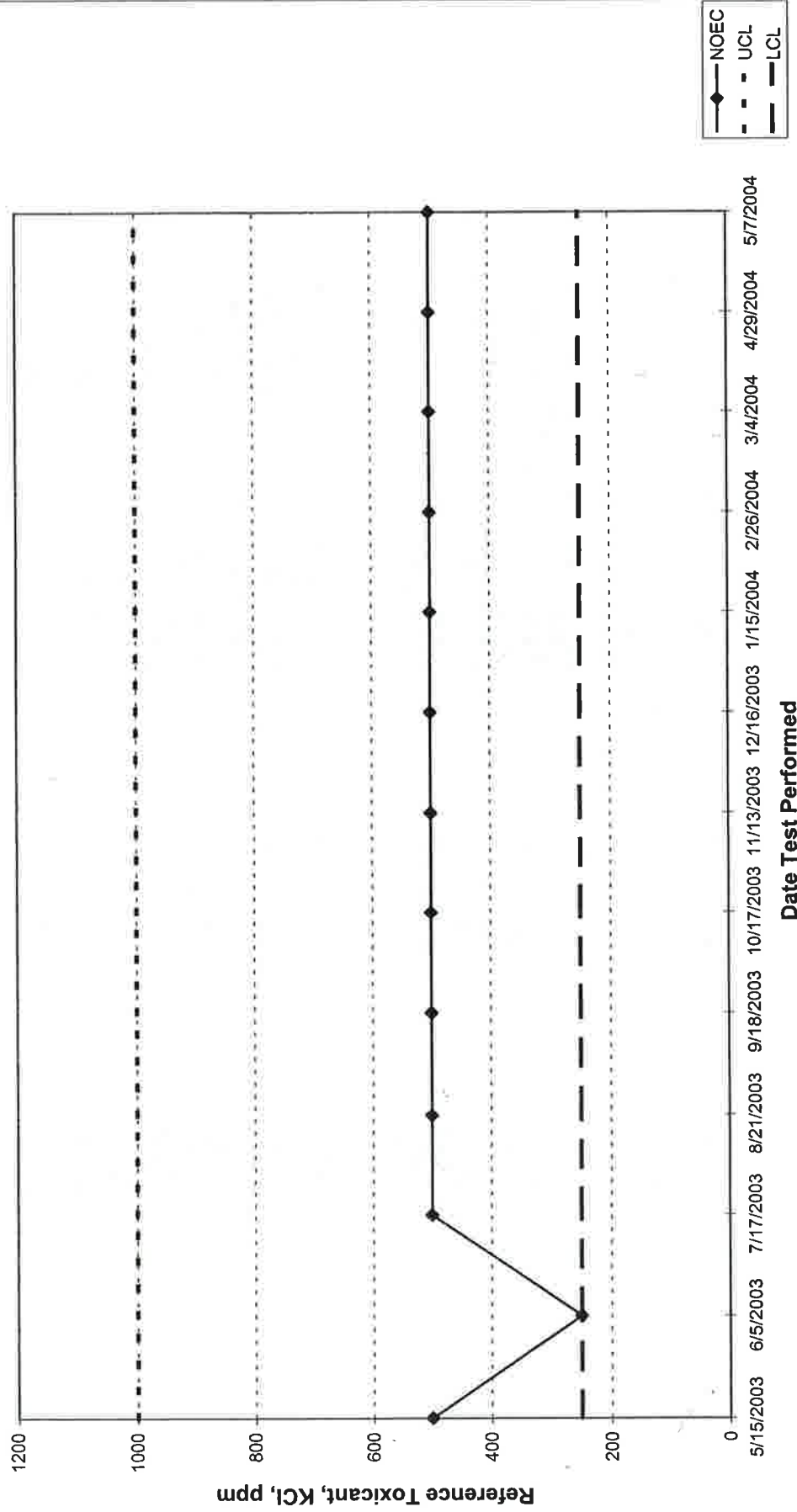
APPENDIX F

Quality Assurance Charts

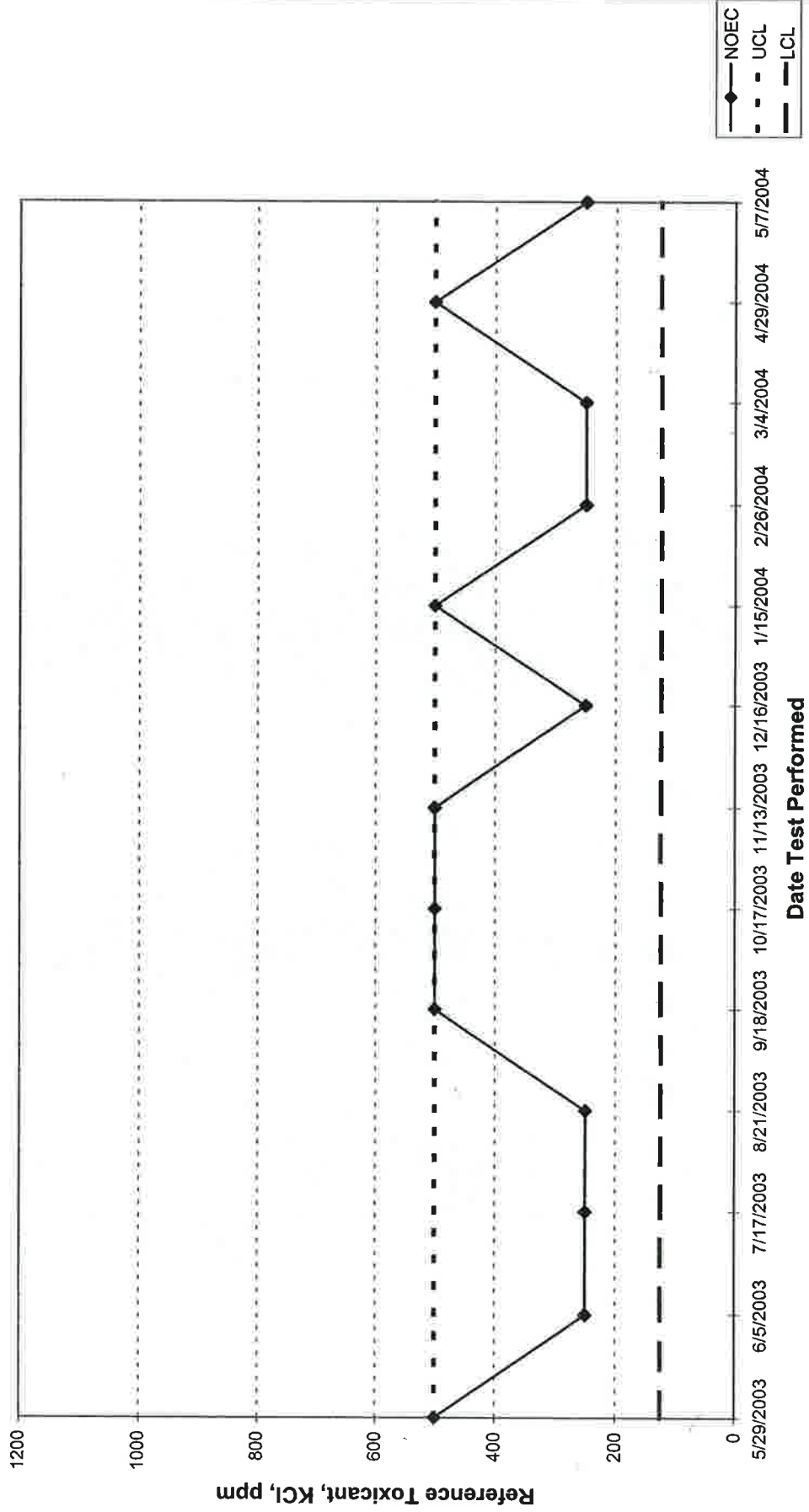
ARKANSAS ANALYTICAL, INC.
FATHEAD MINNOW SURVIVAL
QUALITY ASSURANCE



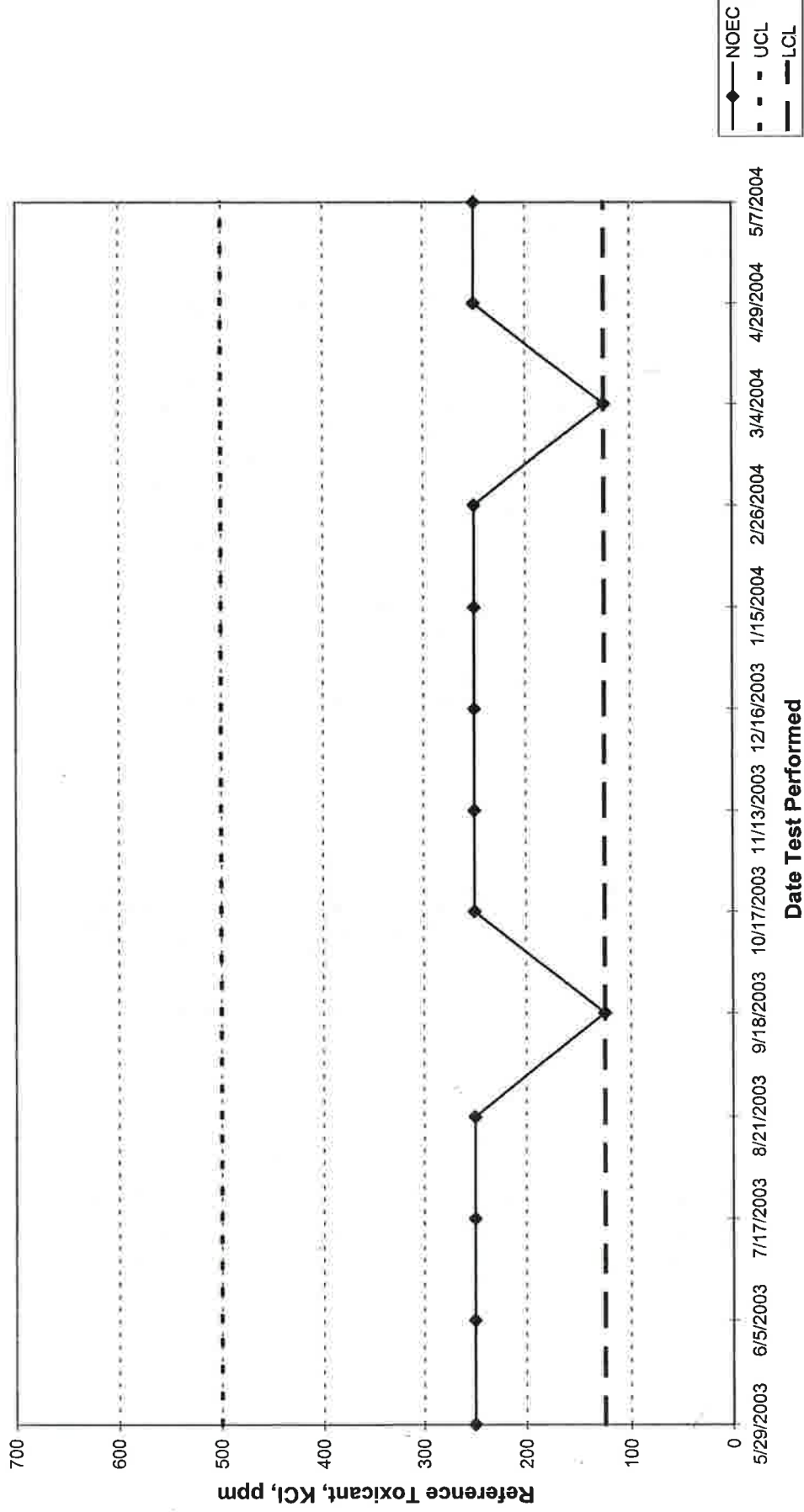
ARKANSAS ANALYTICAL, INC.
FATHEAD MINNOW GROWTH
QUALITY ASSURANCE



ARKANSAS ANALYTICAL, INC.
CERIODAPHNIA DUBIA SURVIVAL
QUALITY ASSURANCE



ARKANSAS ANALYTICAL, INC.
CERIODAPHNIA DUBIA REPRODUCTION
QUALITY ASSURANCE





APPENDIX G

Lab Certification



State of Arkansas

Department of Environmental Quality Laboratory Certification Program



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

Laboratory ID # 60-1754

Certificate # 03-079-0

The following parameters are certified:

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

J. Sembinski
Quality Assurance Officer

October 24, 2003
Date