Arkansas Analytical, Inc.

Toxicity Test Results

MAGCOBAR MINE SITE
NPDES PERMIT NUMBER: AR0049794
February 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

Prepared by: Arkansas Analytical, Inc.
11701 I-30, Bldg 1, Suite 115
Little Rock, Arkansas 72209
Lab Number K402501

Tuesday, March 16, 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 February 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:	2-18-04, 0930	2-19-04, 0930
Sample #2:	2-19-04, 0930	2-20-04, 0930
Sample #3:	2-23-04, 0900	2-24-04, 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:	2-19-04, 1515	4
Sample #2:	2-20-04, 1500	4
Sample #3:	2-24-04, 1515	4

Chain of custody documentation is located in Appendix A.

The permit designates the receiving water to be used as dilution water for the toxicity tests. Synthetic dilution water was substituted either because zero flow conditions existed or due to an earlier characterization of the receiving water as being toxic.

Each sample was analyzed for pH, hardness, total alkalinity, and conductivity. Results are provided in Appendix B.

Dilution Series

Five dilutions in addition to a control (0% effluent) were used in the toxicity tests. The dilutions, which were made with synthetic water, were 32%, 42%, 56%, 75%, and 100%. The low-flow effluent concentration (**critical dilution**) was defined as **100% effluent**.

Test Methods

EPA Method 1000.0, Fathead Minnow, *Pimephales promelas,* Larval Survival and Growth Test, was used in this bioassay. Larvae are exposed in a static renewal system for seven days and the results are based on the survival and growth (increase in weight) of the larvae. There were no deviations from the reference method. The test chambers were 500 ml plastic cups, and each chamber contained ten organisms in a test solution volume of 250 mls. The test temperature was 25 degrees Centigrade. Raw data and statistics are provided in Appendix C.

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

Test Organisms

The organisms used in Test 1000.0 were < 48 hour old Fathead Minnows, *Pimephales promelas*, which were purchased from Aquatox; a copy of the organism history is provided in Appendix E.

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

Quality Assurance

Test Acceptability

TEST ACCEPTANCE CRITERIA for *Ceriodaphnia dubia*

Control Criteria	Results	Pass	Fail
Greater than or equal to 80% survival	100%	X	
Average of 15 or more young per surviving female	27.4	X	
At least 60% of surviving females should have produced 3 broods	80%	X	
The percent coefficient of variation between replicates must be 40% or less for the young of surviving females	17.8%	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	0.339	X	
The percent coefficient of variation between replicates must be 40% or less for growth	11.5%	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

Ceriodaphnia dubia		*Pimephales promelas*	
NOEC Survival:	500 ppm KCl	NOEC Survival:	500 ppm KCl
LOEC Survival:	1000 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

Ceriodaphnia dubia		*Pimephales promelas*	
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)	23.7	%CV survival (critical dilution)	0%
%CV Reproduction (critical dilution)	25.0%	Mean dry weight (critical dilution) in milligrams	0.570
		%CV growth (critical dilution)	8.99%

Conclusion

Chronic static renewal larval survival and growth test using fathead minnow, *Pimephales promelas*, (Method 1000.0).

The permit issued to the Magcobar Mine Site, AR0049794, specifies that the **critical dilution is 100% effluent**. The effluent samples did not exhibit lethal effects or sublethal effects at the critical dilution, and, as such, **passed** both portions of the test.

Chronic static renewal survival and reproduction test using *Ceriodaphnia dubia,* (Method 1002.0).

The permit issued to the Magcobar, AR0049794, specifies that the **critical dilution is 100% effluent**. The effluent samples did not exhibit lethal effects or sublethal effects at the critical dilution, and, as such, **passed** both portions of the test.

Biomonitoring Analysts:

Melissa Green

Melissa Green

Andrea Fox

Andrea Fox

Arkansas Analytical Inc.

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:	2-18-04, 0930	2-19-04, 0930
Sample #2:	2-19-04, 0930	2-20-04, 0930
Sample #3:	2-23-04, 0900	2-24-04, 0900

Test initiated (date, time): 2-20-04, 1400 Test terminated (date, time): 2-27-04, 1000

Dilution water used: Soft Synthetic

DATA TABLE FOR FATHEAD MINNOW SURVIVAL

	Percent Survival in Replicate Chambers						Mean Percent Survival			
Effluent Conc %	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	80	100	90		100	100	94	
56%	100	100	100	100	100		100	100	100	
75%	100	100	100	100	100		100	100	100	
100%	100	100	100	100	100		100	100	100	0.00

DATA TABLE FOR GROWTH OF FATHEAD MINNOWS

Average Dry Weight in milligrams in replicate chambers

Effluent Conc %	A	B	C	D	E		Mean Dry Weight	CV%
0%	0.361	0.278	0.354	0.326	0.377		0.339	11.5
32%	0.404	0.429	0.395	0.500	0.486		0.443	
42%	0.647	0.558	0.503	0.442	0.511		0.532	
56%	0.413	0.500	0.423	0.514	0.402		0.450	
75%	0.542	0.360	0.650	0.624	0.529		0.541	
100%	0.515	0.590	0.559	0.648	0.540		0.570	8.99

Coefficient of Variation = standard deviation / mean * 100

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

Pimephales promelas

1. Dunnett's procedure or Steel's Many-One Rank Test as appropriate:
   Is the mean survival at 7 days significantly different (p=0.05) than the control survival for:

   a) LOW FLOW OR CRITICAL DILUTION, (100%) YES _____ NO___**X**___

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

   a) LOW FLOW OR CRITICAL DILUTION, (100%) YES_____ NO___**X**____

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

4. If NO was answered to 2.a) enter [0] otherwise enter [1] (parameter TGP6C): _____**0**_____
5. Enter percentage corresponding to each parameter below:

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

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

   c) Coefficient of variation (parameter TQP6C)= _____**0**_____%

Arkansas Analytical Inc.

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:	2-18-04, 0930	2-19-04, 0930
Sample #2:	2-19-04, 0930	2-20-04, 0930
Sample #3:	2-23-04, 0900	2-24-04, 0900

Test initiated (date, time): 2-20-04, 0930 Test terminated (date, time): 2-26-04, 0840

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	21	27	24	18	15	17
B	24	30	26	29	28	13
C	29	30	26	27	32	27
D	30	31	22	13	28	20
E	18	15	27	12	14	19
F	30	28	35	10	30	29
G	29	34	24	34	28	28
H	31	32	26	34	36	28
I	34	32	29	32	29	30
J	28	29	21	31	33	26
Mean	27.4	28.8	26.0	24.0	27.3	23.7
Mean/surviving female	27.4	28.8	26.0	24.0	27.3	23.7
CV%*	17.8					25.0

X= Dead Adult; M= Male (Not considered in statistics)
*Coefficient of Variation = standard deviation/ mean * 100; CV% calculation based on young per surviving female

SUMMARY REPORTING FORMS FOR CHRONIC BIOMONITORING *Ceriodaphnia dubia* SURVIVAL AND REPRODUCTION

Permittee: Magcobar Mine Site **NPDES #: AR0049794**

PERCENT SURVIVAL

PERCENT EFFLUENT	0%	32%	42%	56%	75%	100%
Time of Reading: 24 HOURS	100	100	100	100	100	100
48 HOURS	100	100	100	100	100	100
Test termination	100	100	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)= _____**25.0**_____%

APPENDIX A

Chain of Custody Forms

CHAIN OF CUSTODY RECORD

CLIENT INFORMATION	Project Description	Turnaround Time
Weston Solutions, Inc.	MAGCOBAR Mine Site	(CIRCLE ONE)
P.O. Box 699	Reporting Information	24 hour
2000 Darby Lane	Telephone: 501/467-8355	48 hour
Malvern, AR 72104	FAX: 501/467-8687	routine
Attn: Alan Brown	Bill to/P.O	Preservative Code:
		Bottle Type

Preservation Codes:

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): Darrel Scott

Samplers:(Printed): Darrel Scott

Field Number	Sample Collection Date/s	Time/s	Grab	Comp	# of Containers	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION	TEST PARAMETERS: Chronic Bio	Bottle type code G=glass;P=HDPE V=septum;A=amber: P	Arkansas Analytical Lab #
FD0219COMP	2/19/2004	9:30		X	5		Facilty Discharge	X		KL02501A

1.Relinquished by:(Signature)	Date/Time	1.Received by:(Signature)
Darrel Scott	2-19-04 1515	
2.Relinquished by:(Signature)	Date/Time	2.Received by laboratory :(Signature)
	2-19-04 1515	

For completion by laboratory

Condition of samples:	yes	no
A. Containers Correct:?	✓	
B. Preservation Correct:?	✓	
C. Seals Intact:?	✓	

REMARKS

CHAIN OF CUSTODY RECORD

CLIENT INFORMATION	Project Description	Turnaround Time
Weston Solutions, Inc.	MAGCOBAR Mine Site	(CIRCLE ONE)
P.O. Box 699	Reporting Information	24 hour
2000 Darby Lane	Telephone: 501/467-8355	48 hour
Malvern, AR 72104	FAX: 501/467-8687	routine
Attn: Alan Brown	Bill to/P.O	Preservative Code:
		Bottle Type

Preservation Codes:

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): Daniel Scott

Samplers:(Printed): Darrel Scott

Field Number	Sample Collection Date/s	Sample Collection Time/s	Grab	Comp	# of Containers	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION	TEST PARAMETERS: Chronic Bio	Bottle type code G=glass;P=HDPE V=septum;A=amber	Arkansas Analytical Lab #
								P		
FD0220COMP	2/20/2004	9:30		X	3		Facilty Discharge	X		02501B

1 Relinquished by:(Signature)	Date/Time	1.Received by:(Signature)
Daniel Scott	2-20-04 1500	
2.Relinquished by:(Signature)	Date/Time	2.Received by laboratory :(Signature)
	2/20/04 1500	

For completion by laboratory

Condition of samples:	yes	no
A. Containers Correct:?	✓	
B. Preservation Correct:?	—	
C. Seals Intact:?	—	

REMARKS

2°C

ARKANSAS ANALYTICAL, INC. ** 11701 I-30, Bldg 1, Suite 115**Little Rock, Arkansas 72209**phone(501)455-3233**Fax(501)455-6118

CHAIN OF CUSTODY RECORD

CLIENT INFORMATION	Project Description	Turnaround Time
Weston Solutions, Inc.	MAGCOBAR Mine Site	(CIRCLE ONE)
P.O. Box 699	Reporting Information	24 hour
2000 Darby Lane	Telephone: 501/467-8355	48 hour
Malvern, AR 72104	FAX: 501/467-8687	routine
Attn: Alan Brown	Bill to/P.O	Preservative Code:
		Bottle Type: P

Preservation Codes:

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): Daniel Scott

Samplers:(Printed): Darrel Scott

Field Number	Sample Collection Date/s	Sample Collection Time/s	Grab	Comp	# of Containers	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION	Chronic Bio	TEST PARAMETERS	Bottle type code G=glass;P=HDPE V=septum;A=amber	Arkansas Analytical Lab #
FD0224Comp	2/24/2004	9:00		X	3		Facilty Discharge	X			K40250 C

1 Relinquished by:(Signature)	Date/Time	1.Received by:(Signature)
Daniel Scott	2-24-04 1515	
2.Relinquished by:(Signature)	Date/Time	2.Received by laboratory :(Signature)
	2/24/04 1515	

For completion by laboratory

Condition of samples:	yes	no
A. Containers Correct:?	✓	
B. Preservation Correct:?	✓	
C. Seals Intact:?	✓	

REMARKS

ARKANSAS ANALYTICAL, INC. ** 11701 I-30, Bldg 1, Suite 115**Little Rock, Arkansas 72209**phone(501)455-3233**Fax(501)455-6118

APPENDIX B

Effluent and Dilution Water Data

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING — Fathead Minnow

Lab # / Sample ID: K402501 — Test Start (Date/Time): 2-20-04 / 1400

Client: Weston — Test End (Date/Time): 2-27-04 / 1000

		Day of Test 1	2	3	4	5	6	7	notes/remarks
Control		2/20	2/21	2/22	2/23	2/24	2/25	2/26	MHS 353
D.O (mg/L)	INITIAL	8.4	8.2	8.0	8.2	8.3	8.4	8.3	
	FINAL	7.9	8.0	7.6	7.5	7.6	7.7	7.6	
pH(mg/L)	INITIAL	7.9	7.6	7.8	8.1	8.1	7.6	7.9	
	FINAL	7.8	7.7	7.7	7.9	7.9	7.8	7.8	
temp(C)	INITIAL	22.0	21.3	21.4	22.7	22.9	22.1	22.8	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
ALKALINITY(mg/L)		66	—	—	—	—	—	→	
HARDNESS(mg/L)		78	—	—	—	—	—	→	
CONDUCTIVITY(umhos/cm)		304	—	—	—	—	—	→	
CHLORINE(mg/L)		<0.05	—	—	—	—	—	→	
CONC:		32%	32%	32%	32%	32%	4/25	32%	
D.O (mg/L)	INITIAL	8.5	8.2	8.1	8.2	8.2	8.5	8.4	
	FINAL	7.9	7.9	7.5	7.6	7.7	7.7	7.6	
pH(mg/L)	INITIAL	7.6	7.6	7.8	7.7	7.8	7.3	7.5	
	FINAL	7.8	7.6	7.5	7.5	7.5	7.6	7.7	
temp(C)	INITIAL	22.2	21.3	21.4	22.9	22.8	22.3	22.9	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
CONC:		42%	42%	42%	42%	42%	42%	42%	
D.O (mg/L)	INITIAL	8.3	8.0	8.1	8.4	8.2	8.6	8.5	
	FINAL	7.8	7.9	7.4	7.5	7.5	7.7	7.6	
pH(mg/L)	INITIAL	7.6	7.5	7.6	7.7	7.7	7.3	7.5	
	FINAL	7.7	7.6	7.5	7.5	7.5	7.5	7.5	
temp(C)	INITIAL	22.3	21.4	21.4	22.7	22.7	22.3	22.9	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
CONC:		56%	56%	56%	56%	56%	56%	56%	
D.O (mg/L)	INITIAL	8.3	8.0	8.0	8.4	8.3	8.9	8.7	
	FINAL	7.7	7.8	7.3	7.4	7.7	7.6	7.5	
pH(mg/L)	INITIAL	7.6	7.5	7.6	7.7	7.7	7.3	7.6	
	FINAL	7.7	7.6	7.4	7.5	7.5	7.5	7.5	
temp(C)	INITIAL	22.3	21.4	21.4	22.7	22.7	22.2	22.9	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
CONC:		75%	75%	75%	75%	75%	75%	75%	
D.O (mg/L)	INITIAL	8.3	7.9	7.9	8.4	8.3	8.9	8.8	
	FINAL	7.7	7.8	7.3	7.3	7.6	7.6	7.6	
pH(mg/L)	INITIAL	7.6	7.5	7.5	7.6	7.7	7.3	7.6	
	FINAL	7.7	7.5	7.4	7.4	7.4	7.4	7.5	
temp(C)	INITIAL	22.3	21.4	21.4	22.7	22.7	22.1	22.8	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
CONC:		100%	100%	100%	100%	100%	100%	100%	
D.O (mg/L)	INITIAL	8.6	7.8	7.9	8.6	8.4	8.9	8.8	
	FINAL	7.6	7.8	7.2	7.3	7.6	7.6	7.5	
pH(mg/L)	INITIAL	7.6	7.5	7.4	7.6	7.6	7.3	7.6	
	FINAL	7.7	7.5	7.3	7.4	7.4	7.4	7.4	
temp(C)	INITIAL	22.3	21.5	21.4	22.7	22.8	22.3	22.9	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
CONC:	**100%**	A	A	A	B	B	C	C	
ALKALINITY((mg/L)		15	—	—	12	→	13	→	
HARDNESS(mg/L)		1320	—	→	1370	→	1470	→	
CONDUCTIVITY(umhos/cm)		2360	—	→	2460	→	2410	→	
CHLORINE(mg/L)		<0.05	—	→	<0.05	→	<0.05	→	

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING — Ceriodaphnia dubia

Lab # / Sample ID: 4402501 — Test Start (Date/Time): 2-20-04/0930

Client: Weston — Test End (Date/Time): 2-26-04/0840

		Day of Test 1	2	3	4	5	6	7	8	notes/remarks
Control		2/20	2/21	2/22	2/23	2/24	2/25			MHS 353
D.O (mg/L)	INITIAL	8.4	8.2	8.0	8.2	8.3	8.4			
	FINAL	8.3	8.0	7.9	8.1	8.2	8.1			
pH	INITIAL	7.9	7.6	7.8	8.1	8.1	7.6			
	FINAL	7.6	7.5	7.6	7.8	7.3	7.2			
temp(C)	INITIAL	22.0	21.3	21.4	22.7	22.9	22.1			
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0			
ALKALINITY(mg/L)		46	—	—	—	—	→			
HARDNESS(mg/L)		78	—	—	—	—	→			
CONDUCTIVITY(umhos/cm)		304	—	—	—	—	→			
CHLORINE(mg/L)		<0.05	—	—	—	—	→			
CONC:		32%	32%	32%	32%	32%	32%			
D.O (mg/L)	INITIAL	8.5	8.2	8.1	8.2	8.2	8.5			
	FINAL	8.3	7.9	8.0	8.0	8.3	8.2			
pH	INITIAL	7.6	7.6	7.8	7.7	7.7	7.3			
	FINAL	7.6	7.5	7.5	7.5	7.0	7.1			
temp(C)	INITIAL	22.2	21.3	21.4	22.9	22.7	22.3			
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0			
CONC:		42%	42%	42%	42%	42%	42%			
D.O (mg/L)	INITIAL	8.3	8.0	8.1	8.4	8.2	8.6			
	FINAL	8.2	7.9	7.9	8.1	8.3	8.1			
pH	INITIAL	7.6	7.5	7.6	7.7	7.7	7.3			
	FINAL	7.5	7.4	7.5	7.5	7.0	7.2			
temp(C)	INITIAL	22.3	21.4	21.4	22.7	22.7	22.3			
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0			
CONC:		56%	56%	56%	56%	56%	56%			
D.O (mg/L)	INITIAL	8.3	8.0	8.0	8.4	8.3	8.9			
	FINAL	8.2	7.8	7.9	8.2	8.3	8.1			
pH	INITIAL	7.6	7.5	7.6	7.7	7.7	7.3			
	FINAL	7.5	7.4	7.5	7.5	7.0	7.2			
temp(C)	INITIAL	22.3	21.4	21.4	22.7	22.7	22.2			
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0			
CONC:		75%	75%	75%	75%	75%	75%			
D.O (mg/L)	INITIAL	8.3	7.9	7.9	8.4	8.3	8.9			
	FINAL	8.3	7.7	7.8	8.2	8.3	8.2			
pH	INITIAL	7.6	7.5	7.5	7.6	7.7	7.3			
	FINAL	7.4	7.3	7.4	7.5	7.0	7.1			
temp(C)	INITIAL	22.3	21.4	21.4	22.7	22.7	22.1			
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0			
CONC:		100%	100%	100%	100%	100%	100%			
D.O (mg/L)	INITIAL	8.6	7.8	7.9	8.6	8.4	8.9			
	FINAL	8.3	7.7	7.8	8.2	8.4	8.1			
pH	INITIAL	7.6	7.5	7.4	7.6	7.6	7.3			
	FINAL	7.4	7.3	7.3	7.4	7.0	7.2			
temp(C)	INITIAL	22.3	21.5	21.4	22.7	22.8	22.3			
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0			
CONC:		A	A	A	B	B	C			
ALKALINITY((mg/L)		15	—	→	12	→	13			
HARDNESS(mg/L)		1320	—	→	1370	→	1470			
CONDUCTIVITY(umhos/cm)		2360	—	→	2460	→	2410			
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 K402E01 TEST START DATE 2-20 TIME 1400

CLIENT Wiston TEST END DATE 2-27 TIME 1000

AGE AND SOURCE OF MINNOWS. <48hrs; Aquatox

		DAY (NUMBER SURVIVING)								SURVIVAL		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	10	10	10	10	10	10	10	10	100		
	B		10	10	10	10	10	10	10	100		
Control	C		10	10	10	10	10	10	10	100	100	0%
	D		10	10	10	10	10	10	10	100		
	E		10	10	10	10	10	10	10	100		
CONC:	A	10	10	10	10	10	10	10	10	100		
	B		10	10	10	10	10	10	10	100		
32%	C		10	10	10	10	10	10	10	100	100	
	D		10	10	10	10	10	10	10	100		
	E		10	10	10	10	10	10	10	100		
CONC:	A	10	10	10	10	10	10	10	10	100		
	B		10	10	10	10	10	10	10	100		
42%	C		10	10	10	8	8	8	8	80	94	
	D		10	10	10	10	10	10	10	100		
	E		10	10	10	10	10	10	9	90		
CONC:	A	10	10	10	10	10	10	10	10	100		
	B		10	10	10	10	10	10	10	100		
56%	C		10	10	10	10	10	10	10	100	100	
	D		10	10	10	10	10	10	10	100		
	E		10	10	10	10	10	10	10	100		
CONC:	A	10	10	10	10	10	10	10	10	100		
	B		10	10	10	10	10	10	10	100		
75%	C		10	10	10	10	10	10	10	100	100	
	D		10	10	10	10	10	10	10	100		
	E		10	10	10	10	10	10	10	100		
CONC:	A	10	10	10	10	10	10	10	10	100		
	B		10	10	10	10	10	10	10	100		
100%	C		10	10	10	10	10	10	10	100	100	0%
	D		10	10	10	10	10	10	10	100		
	E		10	10	10	10	10	10	10	100		
ANALYST:		AF	mg	mg	AF	AF	mg	AF	mg			
DATE:		2-20	2-21	2-22	2-23	2-24	2-25	2-26	2-27			
TIME:		1400	0840	1040	1415	1600	1405	1400	1000			

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

Pimephales promelas **FATHEAD MINNOW** **TEST 1000.0**

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB #/#S: K402501	TEST DATES (BEGIN/END): 2-20-04 / 2-27-04
CLIENT: Weston	WEIGHING DATE/TIME:
ANALYST/S: mg, AF	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	A61	0.97542	0.97181	0.00361	10	0.361	AVG DRY	
	B62	0.97570	0.97292	0.00278	10	0.278	WEIGHT (mg)	
	C63	0.97829	0.97475	0.00354	10	0.354	0.339	
	D64	0.97516	0.97190	0.00326	10	0.326	CV	
	E65	0.97814	0.97437	0.00377	10	0.377	11.5%	
CONC:	A66	0.98094	0.97690	0.00404	10	0.404	AVG DRY	
	B67	0.98280	0.97851	0.00429	10	0.429	WEIGHT(MG)	
32%	C68	0.98180	0.97785	0.00395	10	0.395	0.443	
	D69	0.98240	0.97740	0.00500	10	0.500	CV	
	E70	0.97838	0.97352	0.00486	10	0.486		
CONC:	A71	0.98048	0.97401	0.00647	10	0.647	AVG DRY	
	B72	0.98161	0.97603	0.00558	10	0.558	WEIGHT(MG)	
42%	C73	0.98287	0.97784	0.00503	10	0.503	0.532	
	D74	0.98156	0.97714	0.00442	10	0.442	CV	
	E75	0.98030	0.97519	0.00511	10	0.511		
CONC:	A76	0.98005	0.97592	0.00413	10	0.413	AVG DRY	
	B77	0.98186	0.97686	0.00500	10	0.500	WEIGHT(MG)	
56%	C78	0.98330	0.97907	0.00423	10	0.423	0.450	
	D79	0.98253	0.97739	0.00514	10	0.514	CV	
	E80	0.97919	0.97517	0.00402	10	0.402		
CONC:	A81	0.98004	0.97462	0.00542	10	0.542	AVG DRY	
	B82	0.98411	0.98051	0.00360	10	0.360	WEIGHT(MG)	
75%	C83	0.98436	0.97786	0.00650	10	0.650	0.541	
	D84	0.98041	0.97417	0.00624	10	0.624	CV	
	E85	0.98177	0.97648	0.00529	10	0.529		
CONC:	A86	0.98329	0.97814	0.00515	10	0.515	AVG DRY	
	B87	0.97649	0.97059	0.00590	10	0.590	WEIGHT(MG)	
100%	C88	0.97757	0.97198	0.00559	10	0.559	0.570	
	D89	0.97963	0.97315	0.00648	10	0.648	CV	
	E90	0.98235	0.97695	0.00540	10	0.540	8.99%	

*CV = (STANDARD DEVIATION/MEAN)*100*

AA# K402501 FATHEAD MINNOW SURVIVAL, 2-20-04
File: k402501s Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.076

W = 0.533

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# K402501 FATHEAD MINNOW SURVIVAL, 2-20-04
File: k402501s 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# K402501 FATHEAD MINNOW SURVIVAL, 2-20-04
FILE: k402501s
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 % EFLLUENT	1	1.0000	1.4120
3	42 % EFLLUENT	2	1.0000	1.4120
3	42 % EFLLUENT	3	0.8000	1.1071
3	42 % EFLLUENT	4	1.0000	1.4120
3	42 % EFLLUENT	5	0.9000	1.2490
4	56 % EFFLUENT	1	1.0000	1.4120
4	56 % EFFLUENT	2	1.0000	1.4120
4	56 % EFFLUENT	3	1.0000	1.4120
4	56 % EFFLUENT	4	1.0000	1.4120
4	56 % EFFLUENT	5	1.0000	1.4120
5	75 % EFFLUENT	1	1.0000	1.4120
5	75 % EFFLUENT	2	1.0000	1.4120
5	75 % EFFLUENT	3	1.0000	1.4120
5	75 % EFFLUENT	4	1.0000	1.4120
5	75 % EFFLUENT	5	1.0000	1.4120
6	100 % EFFLUENT	1	1.0000	1.4120
6	100 % EFFLUENT	2	1.0000	1.4120
6	100 % EFFLUENT	3	1.0000	1.4120
6	100 % EFFLUENT	4	1.0000	1.4120
6	100 % EFFLUENT	5	1.0000	1.4120

AA# K402501 FATHEAD MINNOW SURVIVAL, 2-20-04
File: k402501s 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 % EFLLUENT	1.318	22.50	16.00	5.00	
4	56 % EFFLUENT	1.412	27.50	16.00	5.00	
5	75 % EFFLUENT	1.412	27.50	16.00	5.00	
6	100 % EFFLUENT	1.412	27.50	16.00	5.00	

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

AA # K402501, FATHEAD MINNOW GROWTH, 2-20-04
File: k402501g Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

D = 0.112

W = 0.964

Critical W (P = 0.05) (n = 30) = 0.927
Critical W (P = 0.01) (n = 30) = 0.900

Data PASS normality test at P=0.01 level. Continue analysis.

AA # K402501, FATHEAD MINNOW GROWTH, 2-20-04
File: k402501g Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 6.15

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 # K402501, FATHEAD MINNOW GROWTH, 2-20-04
FILE: k402501g
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.3610	0.3610
1	CONTROL	2	0.2780	0.2780
1	CONTROL	3	0.3540	0.3540
1	CONTROL	4	0.3260	0.3260
1	CONTROL	5	0.3770	0.3770
2	32 % EFFLUENT	1	0.4040	0.4040
2	32 % EFFLUENT	2	0.4290	0.4290
2	32 % EFFLUENT	3	0.3950	0.3950
2	32 % EFFLUENT	4	0.5000	0.5000
2	32 % EFFLUENT	5	0.4860	0.4860
3	42 % EFFLUENT	1	0.6470	0.6470
3	42 % EFFLUENT	2	0.5580	0.5580
3	42 % EFFLUENT	3	0.5030	0.5030
3	42 % EFFLUENT	4	0.4420	0.4420
3	42 % EFFLUENT	5	0.5110	0.5110
4	56 % EFFLUENT	1	0.4130	0.4130
4	56 % EFFLUENT	2	0.5000	0.5000
4	56 % EFFLUENT	3	0.4230	0.4230
4	56 % EFFLUENT	4	0.5140	0.5140
4	56 % EFFLUENT	5	0.4020	0.4020
5	75 % EFFLUENT	1	0.5420	0.5420
5	75 % EFFLUENT	2	0.3600	0.3600
5	75 % EFFLUENT	3	0.6500	0.6500
5	75 % EFFLUENT	4	0.6240	0.6240
5	75 % EFFLUENT	5	0.5290	0.5290
6	100 % EFFLUENT	1	0.5150	0.5150
6	100 % EFFLUENT	2	0.5900	0.5900
6	100 % EFFLUENT	3	0.5590	0.5590
6	100 % EFFLUENT	4	0.6480	0.6480
6	100 % EFFLUENT	5	0.5400	0.5400

AA # K402501, FATHEAD MINNOW GROWTH, 2-20-04
File: k402501g Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.183	0.037	7.889
Within (Error)	24	0.112	0.005	
Total	29	0.295		

Critical F value = 2.62 (0.05,5,24)
Since F > Critical F REJECT Ho: All equal

AA # K402501, FATHEAD MINNOW GROWTH, 2-20-04
File: k402501g 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	0.339	0.339		
2	32 % EFFLUENT	0.443	0.443	-2.402	
3	42 % EFFLUENT	0.532	0.532	-4.474	
4	56 % EFFLUENT	0.450	0.450	-2.578	
5	75 % EFFLUENT	0.541	0.541	-4.678	
6	100 % EFFLUENT	0.570	0.570	-5.360	

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

AA # K402501, FATHEAD MINNOW GROWTH, 2-20-04
File: k402501g 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	0.102	30.0	-0.104
3	42 % EFFLUENT	5	0.102	30.0	-0.193
4	56 % EFFLUENT	5	0.102	30.0	-0.111
5	75 % EFFLUENT	5	0.102	30.0	-0.202
6	100 % EFFLUENT	5	0.102	30.0	-0.231

APPENDIX D

Ceriodaphnia dubia Raw Data and Statistics

Ceriodaphnia dubia **SURVIVAL AND REPRODUCTION TEST**

Discharger: Weston
Location:
Date Sample Collected: See COC

Lab Number/s
KM02501

Analyst: AF mg
Test Start-Date/Time: 2-20-04 / 0930
Test Stop-Date/Time: 2-26-04 / 0840

Conc 1 (Control)

Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adults	Young/ Adult	Analyst
1	0	0	0	0	0	0	0	0	0	0	0	10	0	mg
2	0	0	0	0	0	0	0	0	0	0	0	10	0	mg
3	0	0	0	0	0	5	4	4	0	4	17	10	1.7	AF
4	7	6	5	5	7	0	0	1	5	10	46	10	4.6	AF
5	14	9	12	9	11	11	11	9	13	0	99	10	9.9	AF
6	0	9	12	16	0	14	14	17	16	14	112	10	11.2	AF
7														
8												80%	3rd	brood
Total	21	24	29	30	18	30	29	31	34	28	274	X̄=	27.4	CV=17.8%

Conc 2 (32%)

Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adults	Young/ Adult	Analyst
1	0	0	0	0	0	0	0	0	0	0	0	10	0	mg
2	0	0	0	0	0	0	0	0	0	0	0	10	0	mg
3	0	0	0	2	0	0	4	0	0	4	10	10	1.0	AF
4	6	5	6	0	5	4	0	7	7	11	51	10	5.1	AF
5	12	13	12	13	7	10	11	11	13	0	102	10	10.2	AF
6	9	12	12	16	3	14	19	14	12	14	125	10	12.5	AF
7														
8														
Total	27	30	30	31	15	28	34	32	32	29	288			

Conc 3 (42%)

Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adults	Young/ Adult	Analyst
1	0	0	0	0	0	0	0	0	0	0	0	10	0	mg
2	0	0	0	0	0	0	0	0	0	0	0	10	0	mg
3	0	0	0	0	0	6	0	4	0	4	14	10	1.4	AF
4	6	5	5	5	6	1	1	0	5	6	40	10	4.0	AF
5	12	10	12	9	10	12	9	11	11	1	97	10	9.7	AF
6	6	11	9	8	11	16	14	11	13	10	109	10	10.9	AF
7														
8														
Total	24	26	26	22	27	35	24	26	29	21	260			

Conc 4 (56%)

Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adults	Young/ Adult	Analyst
1	0	0	0	0	0	0	0	0	0	0	0	10	0	mg
2	0	0	0	0	0	0	0	0	0	0	0	10	0	mg
3	0	4	0	0	0	0	4	6	5	5	24	10	2.4	AF
4	6	1	6	4	4	5	1	0	0	10	37	10	3.7	AF
5	9	12	11	5	8	5	13	11	13	0	87	10	8.7	AF
6	3	12	10	4	0	0	16	17	14	16	92	10	9.2	AF
7														
8														
Total	18	29	27	13	12	10	34	34	32	31	240			

Conc 5 (75%)

Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adults	Young/ Adult	Analyst
1	0	0	0	0	0	0	0	0	0	0	0	10	0	mg
2	0	0	0	0	0	0	0	0	0	0	0	10	0	mg
3	0	2	0	7	0	5	4	8	0	5	31	10	3.1	AF
4	5	4	6	0	5	2	0	0	7	0	29	10	2.9	AF
5	9	10	12	11	9	10	9	13	9	13	105	10	10.5	AF
6	1	12	14	10	0	13	15	15	13	15	108	10	10.8	AF
7														
8														
Total	15	28	32	28	14	30	28	36	29	33	273			

Conc 6 (100%)

Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adults	Young/ Adult	Analyst
1	0	0	0	0	0	0	0	0	0	0	0	10	0	mg
2	0	0	0	0	0	0	0	0	0	0	0	10	0	mg
3	0	0	0	3	0	0	4	0	6	3	16	10	1.6	AF
4	4	6	6	0	4	7	1	6	0	10	44	10	4.4	AF
5	7	7	10	6	8	9	11	9	10	0	77	10	7.7	AF
6	6	0	11	11	7	13	12	13	14	13	100	10	10.0	AF
7														
8														
Total	17	13	27	20	19	29	28	28	30	26	237	X̄=	23.7	CV=25.0%

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# K402501, CERIODAPHNIA REPRODUCTION, 2-20-04
File: k402501c 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# K402501, CERIODAPHNIA REPRODUCTION, 2-20-04
File: k402501c Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 8.96

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# K402501, CERIODAPHNIA REPRODUCTION, 2-20-04
FILE: k402501c
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	21.0000	21.0000
1	CONTROL	2	24.0000	24.0000
1	CONTROL	3	29.0000	29.0000
1	CONTROL	4	30.0000	30.0000
1	CONTROL	5	18.0000	18.0000
1	CONTROL	6	30.0000	30.0000
1	CONTROL	7	29.0000	29.0000
1	CONTROL	8	31.0000	31.0000
1	CONTROL	9	34.0000	34.0000
1	CONTROL	10	28.0000	28.0000
2	32 % EFFLUENT	1	27.0000	27.0000
2	32 % EFFLUENT	2	30.0000	30.0000
2	32 % EFFLUENT	3	30.0000	30.0000
2	32 % EFFLUENT	4	31.0000	31.0000
2	32 % EFFLUENT	5	15.0000	15.0000
2	32 % EFFLUENT	6	28.0000	28.0000
2	32 % EFFLUENT	7	34.0000	34.0000
2	32 % EFFLUENT	8	32.0000	32.0000
2	32 % EFFLUENT	9	32.0000	32.0000
2	32 % EFFLUENT	10	29.0000	29.0000
3	42 % EFFLUENT	1	24.0000	24.0000
3	42 % EFFLUENT	2	26.0000	26.0000
3	42 % EFFLUENT	3	26.0000	26.0000
3	42 % EFFLUENT	4	22.0000	22.0000
3	42 % EFFLUENT	5	27.0000	27.0000
3	42 % EFFLUENT	6	35.0000	35.0000
3	42 % EFFLUENT	7	24.0000	24.0000
3	42 % EFFLUENT	8	26.0000	26.0000
3	42 % EFFLUENT	9	29.0000	29.0000
3	42 % EFFLUENT	10	21.0000	21.0000
4	56 % EFFLUENT	1	18.0000	18.0000
4	56 % EFFLUENT	2	29.0000	29.0000
4	56 % EFFLUENT	3	27.0000	27.0000
4	56 % EFFLUENT	4	13.0000	13.0000
4	56 % EFFLUENT	5	12.0000	12.0000
4	56 % EFFLUENT	6	10.0000	10.0000
4	56 % EFFLUENT	7	34.0000	34.0000
4	56 % EFFLUENT	8	34.0000	34.0000
4	56 % EFFLUENT	9	32.0000	32.0000
4	56 % EFFLUENT	10	31.0000	31.0000
5	75 % EFFLUENT	1	15.0000	15.0000
5	75 % EFFLUENT	2	28.0000	28.0000
5	75 % EFFLUENT	3	32.0000	32.0000
5	75 % EFFLUENT	4	28.0000	28.0000
5	75 % EFFLUENT	5	14.0000	14.0000
5	75 % EFFLUENT	6	30.0000	30.0000
5	75 % EFFLUENT	7	28.0000	28.0000
5	75 % EFFLUENT	8	36.0000	36.0000
5	75 % EFFLUENT	9	29.0000	29.0000
5	75 % EFFLUENT	10	33.0000	33.0000

6	100	%	EFFLUENT	1	17.0000	17.0000
6	100	%	EFFLUENT	2	13.0000	13.0000
6	100	%	EFFLUENT	3	27.0000	27.0000
6	100	%	EFFLUENT	4	20.0000	20.0000
6	100	%	EFFLUENT	5	19.0000	19.0000
6	100	%	EFFLUENT	6	29.0000	29.0000
6	100	%	EFFLUENT	7	28.0000	28.0000
6	100	%	EFFLUENT	8	28.0000	28.0000
6	100	%	EFFLUENT	9	30.0000	30.0000
6	100	%	EFFLUENT	10	26.0000	26.0000

AA# K402501, CERIODAPHNIA REPRODUCTION, 2-20-04
File: k402501c Transform: NO TRANSFORMATION

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

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	27.400				
2	32 % EFFLUENT	28.800	116.50	75.00	10.00	
3	42 % EFFLUENT	26.000	90.50	75.00	10.00	
4	56 % EFFLUENT	24.000	100.00	75.00	10.00	
5	75 % EFFLUENT	27.300	105.50	75.00	10.00	
6	100 % EFFLUENT	23.700	82.00	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 2-19-04 ARKANSAS Analytical

SPECIES Pimephales promelas

QUANTITY SHIPPED 1,100+

AGE/LIFE STAGE 24hrs 2/19 1500ct

BROODSTOCK SOURCE Anderson Farms, AL

CULTURE WATER Groundwater

ALKALINITY (Mg/l as $CaCO_3$) =180

HARDNESS (Mg/l as $CaCO_3$)/Salinity (ppt) =160

FEEDING Artemia

COMMENTS

PACKAGED BY

BILL HALL PRINTERS 3171

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:	24 °C	21-24°C
SALINITY/CONDUCTIVITY:	--	--
TOTAL HARDNESS (as $CaCO_3$):	112 mg/l	90-124 mg/l
TOTAL ALKALINITY (as $CaCO_3$):	85 mg/l	50-85 mg/l
pH:	8.09	7.68-8.14

Comments:

Facility Supervisor

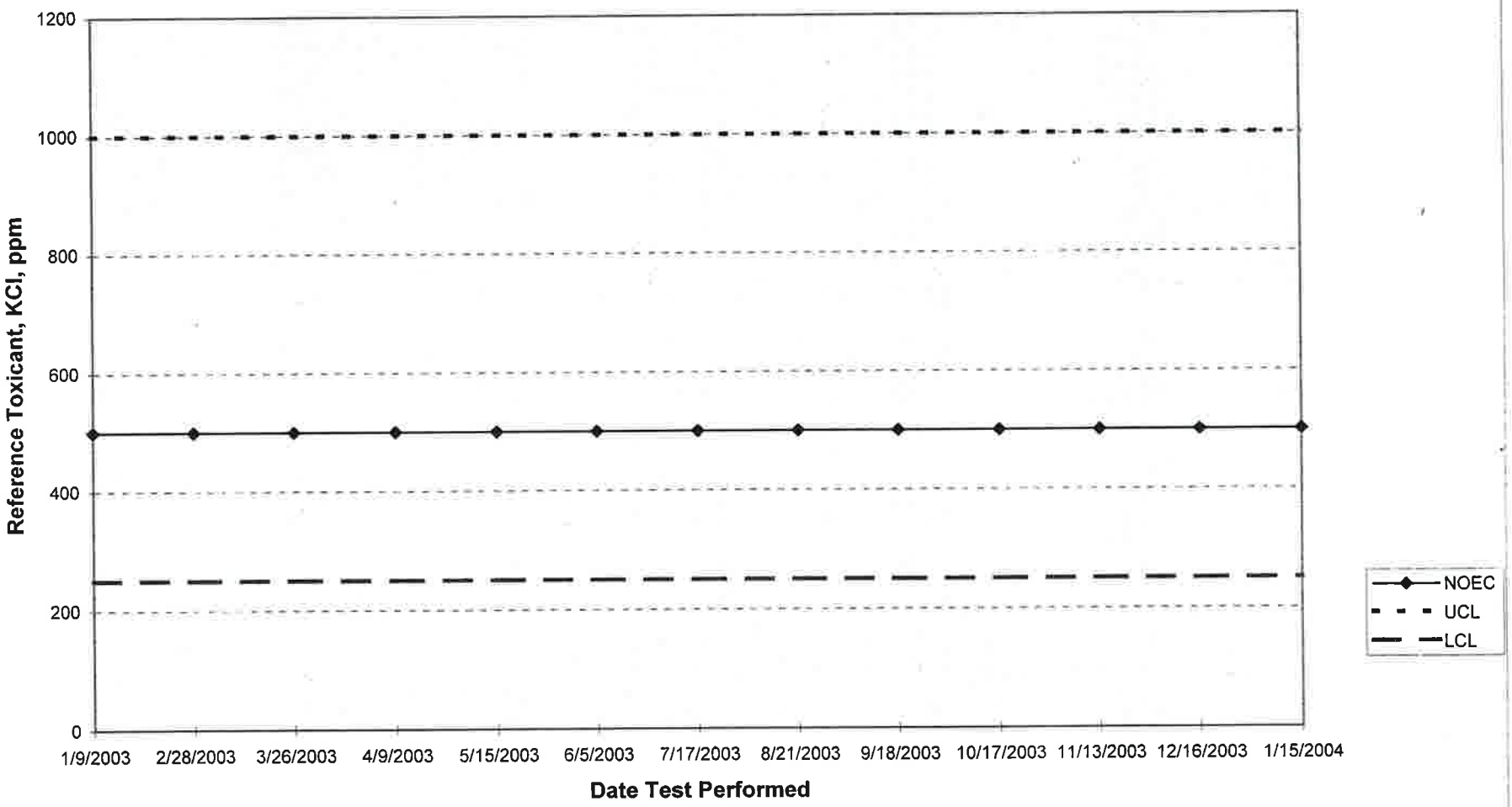
APPENDIX F

Quality Assurance Charts

ARKANSAS ANALYTICAL, INC.

FATHEAD MINNOW SURVIVAL

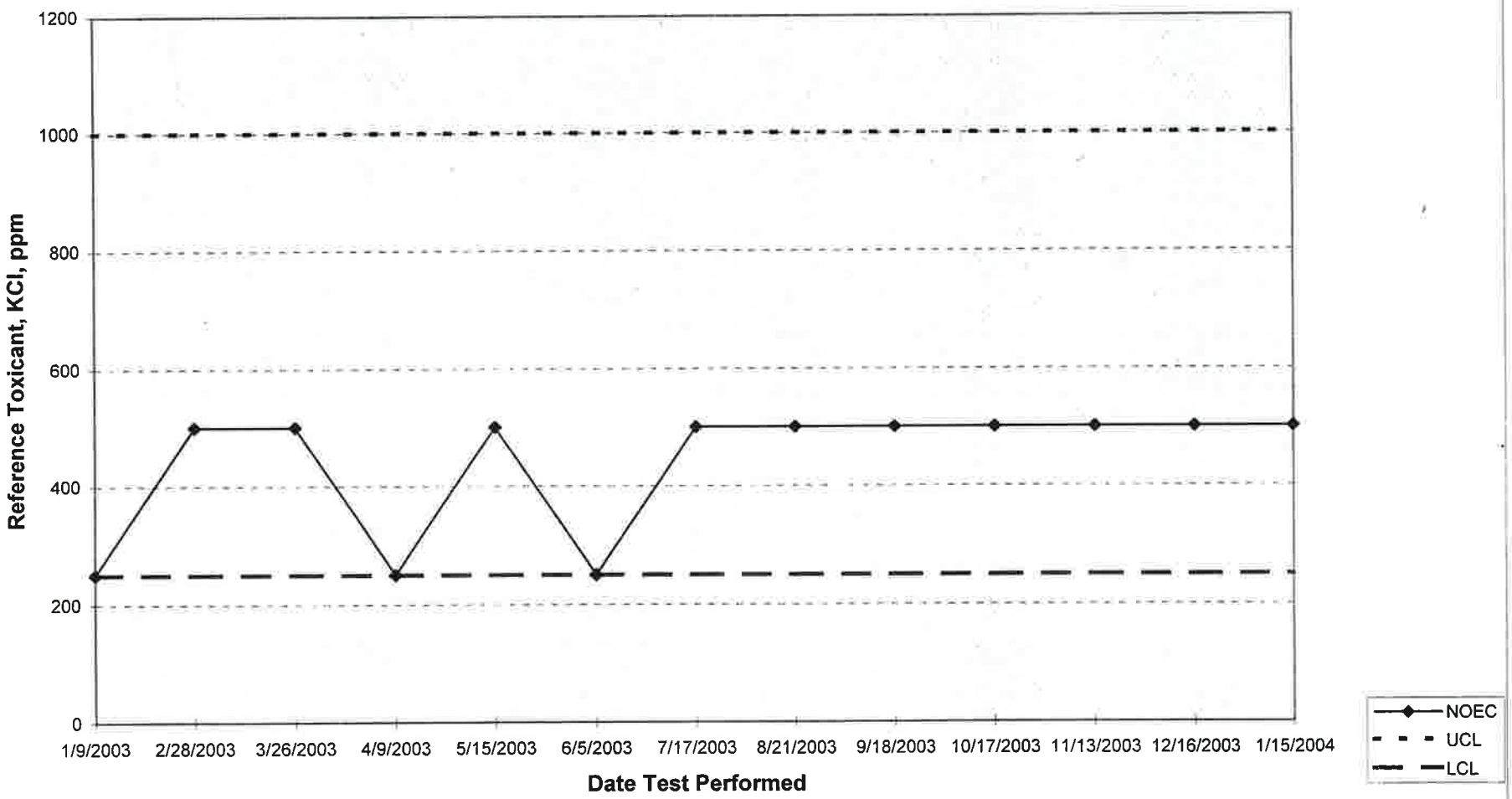
QUALITY ASSURANCE



ARKANSAS ANALYTICAL, INC.

FATHEAD MINNOW GROWTH

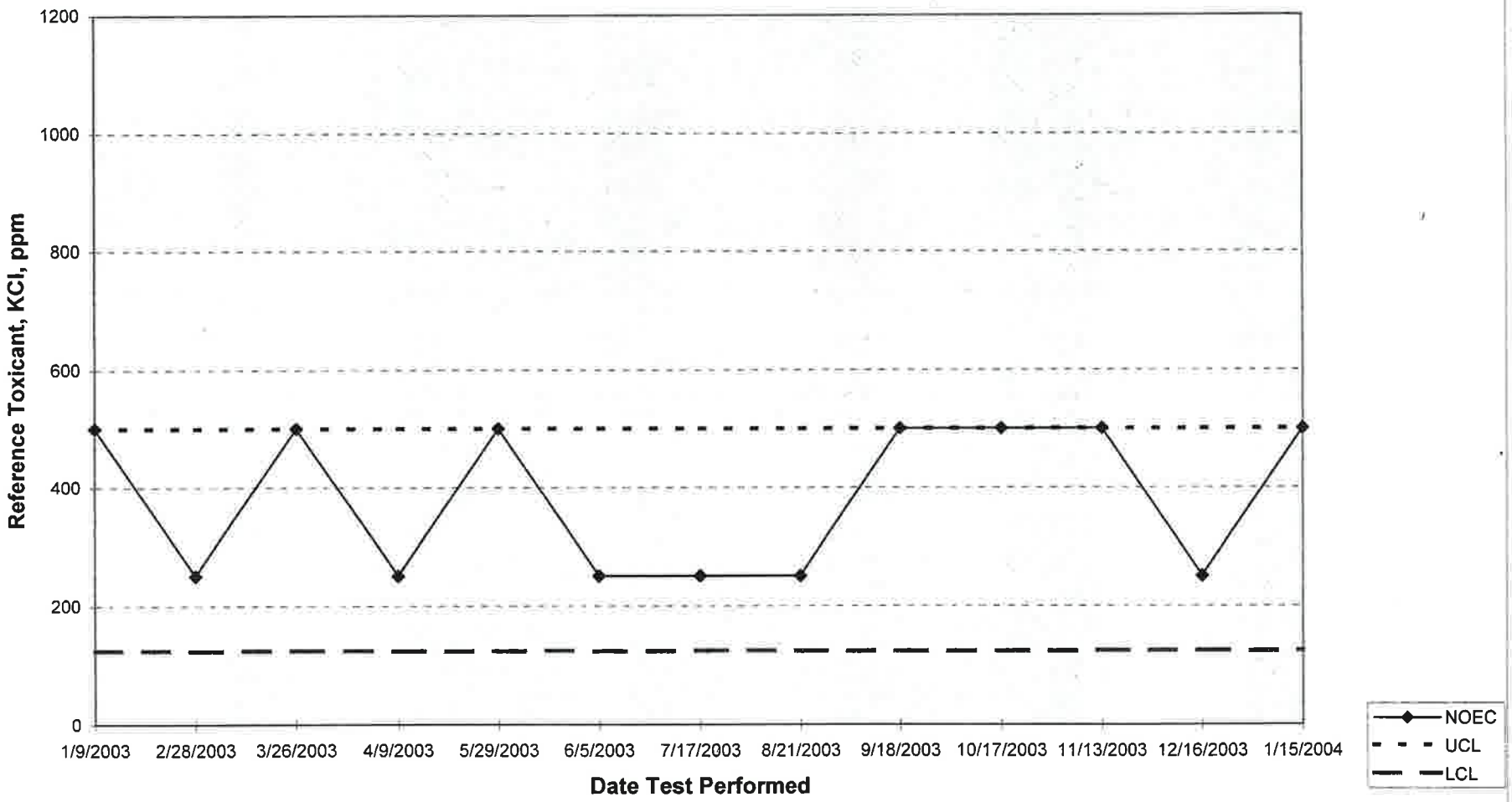
QUALITY ASSURANCE



ARKANSAS ANALYTICAL, INC.

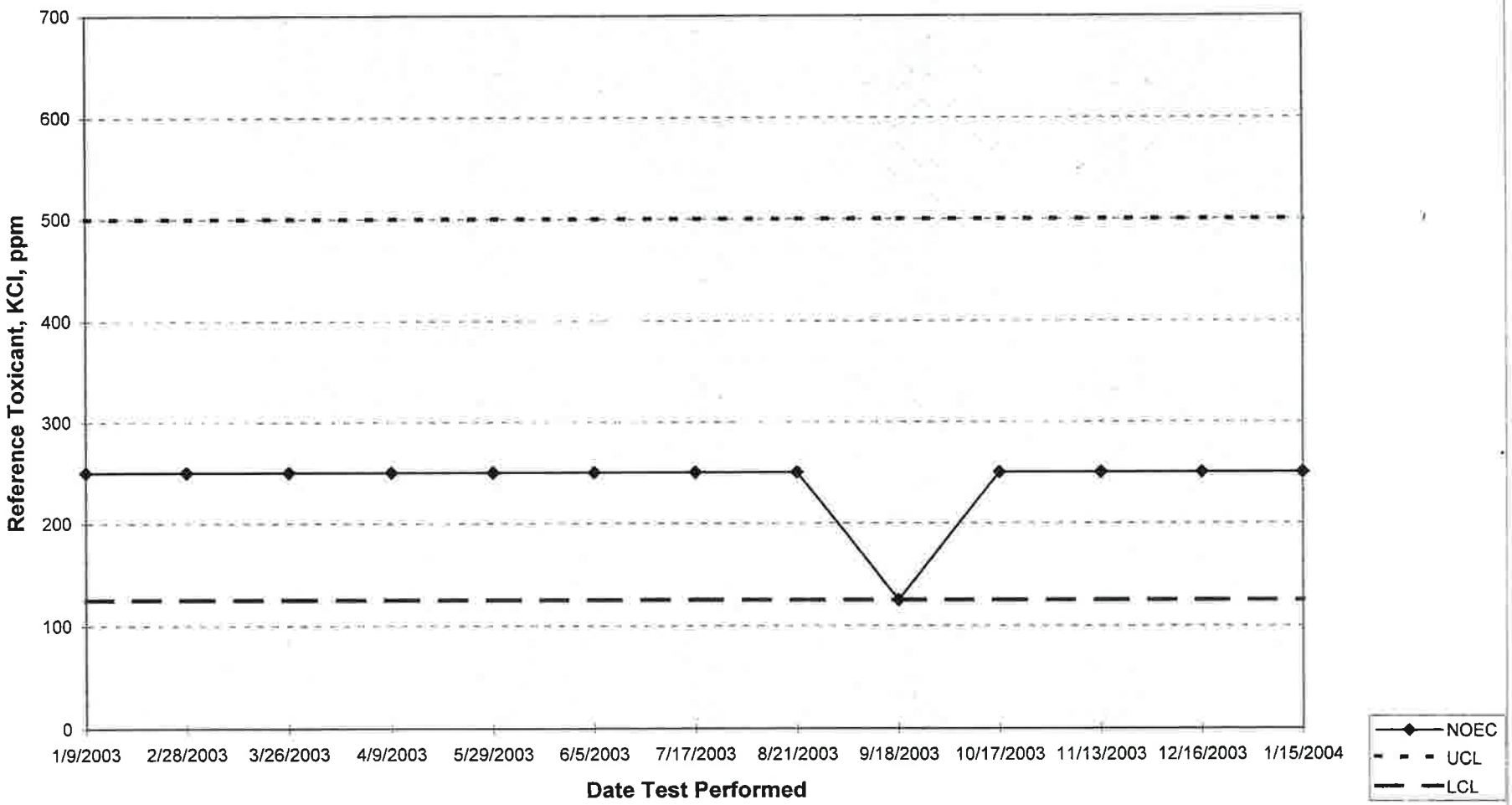
CERIODAPHNIA DUBIA SURVIVAL

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		

October 24, 2003
Date

J. H. Sembleski
Quality Assurance Officer

LITHO IN U.S.A.