Arkansas Analytical, Inc.

Toxicity Test Results

MAGCOBAR MINE SITE
NPDES PERMIT NUMBER: AR0049794
May 2005

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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Lab Number K505063

Tuesday, May 31, 2005

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 May of 2005.

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:	5-3-05, 0930	5-4-05, 0930
Sample #2:	5-4-05, 1000	5-5-05, 1000
Sample #3:	5-9-05, 1000	5-10-05, 1000

The samples were composites 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:	5-4-05, 1340	4
Sample #2:	5-5-05, 1103	4
Sample #3:	5-10-05, 1340	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	90%	X	
Average of 15 or more young per surviving female	21.3	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	38.4%	X	

TEST ACCEPTANCE CRITERIA for *Pimephales promelas*

Control Criteria	Results	Pass	Fail
Greater than or equal to 80% survival	96%	X	
The percent coefficient of variation between replicates must be 40% or less for survival	5.71%	X	
Minimum of 0.25 mg average dry weight of surviving controls	0.386	X	
The percent coefficient of variation between replicates must be 40% or less for growth	4.88%	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:	250 ppm KCl	NOEC Survival:	500 ppm KCl
LOEC Survival:	500 ppm KCl	LOEC Survival:	1000 ppm KCl
NOEC Reproduction:	125 ppm KCl	NOEC Growth:	500 ppm KCl
LOEC Reproduction:	250 ppm KCl	LOEC Growth:	1000 ppm KCl

Quality Assurance charts are provided in Appendix F.

Arkansas Analytical Inc.

Summary of Results
Magcobar Mine Site

Pimephales promelas		*Pimephales promelas (UV Treated)*	
NOEC / LOEC survival	100% / NA	NOEC / LOEC survival	100% / NA
NOEC / LOEC growth	100% / NA	NOEC / LOEC growth	100% / NA
%CV survival (critical dilution)	5.71%	%CV survival (critical dilution)	11.9%
Mean dry weight (critical dilution) in milligrams	0.544	Mean dry weight (critical dilution) in milligrams	0.577
%CV growth (critical dilution)	19.7%	%CV growth (critical dilution)	19.2%
Ceriodaphnia dubia		*Ceriodaphnia dubia (UV Treated)*	
NOEC / LOEC survival	100% / NA	NOEC / LOEC survival	100% / NA
NOEC / LOEC reproduction	100% /NA	NOEC / LOEC reproduction	100% / NA
Mean number of neonates (critical dilution)	17.4	Mean number of neonates (critical dilution)	16.8
%CV Reproduction (critical dilution)	16.5%	%CV Reproduction (critical dilution)	24.7%

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

Biomonitoring Analysts:

Melissa Green

Andrea Fox

Andrea Fox

Jessica Gallagher

Jessica Gallagher

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:	5-3-05, 0930	5-4-05, 0930
Sample #2:	5-4-05, 1000	5-5-05, 1000
Sample #3:	5-9-05, 1000	5-10-05, 1000

Test initiated (date, time): 5-5-05, 1100 Test terminated (date, time): 5-12-05, 1030

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

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%	0.410	0.380	0.397	0.360	0.383		0.386	4.88
32%	0.538	0.452	0.515	0.477	0.635		0.523	
42%	0.553	0.353	0.369	0.542	0.522		0.468	
56%	0.643	0.480	0.496	0.466	0.557		0.528	
75%	0.812	0.485	0.499	0.393	0.524		0.543	
100%	0.533	0.507	0.405	0.573	0.700		0.544	19.7

Coefficient of Variation = standard deviation / mean * 100

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

Test initiated (date, time): 5-5-05, 1130 Test terminated (date, time): 5-12-05, 1100

Dilution water used: Soft Synthetic

DATA TABLE FOR FATHEAD MINNOW SURVIVAL (UV Treated)

	Percent Survival in Replicate Chambers						Mean Percent Survival			
Effluent Conc %	A	B	C	D	E		24 hours	48 hours	7 days	CV %
0%	100	90	90	100	100		100	98	96	5.71
32%	100	100	90	90	100		100	100	96	
42%	100	100	100	90	100		100	100	98	
56%	100	100	100	100	90		100	100	98	
75%	100	100	100	100	100		100	100	100	
100%	100	100	100	80	80		100	100	92	11.9

DATA TABLE FOR GROWTH OF FATHEAD MINNOWS (UV Treated)

Effluent Conc %	A	B	C	D	E		Mean Dry Weight	CV%
0%	0.410	0.380	0.397	0.360	0.383		0.386	4.88
32%	0.546	0.518	0.429	0.494	0.575		0.512	
42%	0.538	0.516	0.544	0.551	0.601		0.550	
56%	0.546	0.589	0.540	0.499	0.469		0.529	
75%	0.529	0.505	0.588	0.516	0.655		0.559	
100%	0.705	0.643	0.512	0.438	0.489		0.557	20.1

Coefficient of Variation = standard deviation / mean * 100

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 Coefficient of Variation, parameter TQP6C: _____**5.71**_____%

6. Enter percent effluent corresponding to each NOEC below and circle the lowest number:

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

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

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:	5-3-05, 0930	5-4-05, 0930
Sample #2:	5-4-05, 1000	5-5-05, 1000
Sample #3:	5-9-05, 1000	5-10-05, 1000

Test initiated (date, time): 5-5-05, 1300 Test terminated (date, time): 5-11-05, 0900

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	27	2	22	18	0	17
B	27	14	23	18	22	16
C	28	27	22	25	23	21
D	23	27	23	28	25	20
E	x0	0	28	21	19	17
F	27	18	18	23	22	21
G	16	20	22	16	24	18
H	7	21	0	22	0	X11
I	27	24	24	20	20	14
J	10	24	3	15	22	13
Mean	19.2	17.7	18.5	20.6	17.7	16.8
Mean/surviving female	21.3	17.7	18.5	20.6	17.7	17.4
CV%*	38.4					16.5

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**

SUMMARY REPORT FORMS FOR CHRONIC BIOMONITORING
Ceriodaphnia dubia SURVIVAL AND REPRODUCTION
UV Treated sample

Test initiated (date, time): 5-5-05, 1330 Test terminated (date, time): 5-11-05, 0930

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	28	26	15	X0	X21	19
B	28	11	X0	20	14	15
C	22	24	29	26	18	22
D	29	2	7	24	16	19
E	23	23	26	26	17	10
F	6	26	11	21	19	16
G	35	2	21	26	22	X0
H	X0	25	X0	23	X9	16
I	26	22	22	2	16	22
J	22	1	18	27	21	12
Mean	21.9	16.2	14.9	19.5	17.3	15.1
Mean/surviving female	24.3	16.2	18.6	21.7	17.9	16.8
CV%*	32.9					24.7

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)= _____**38.4**_____%

APPENDIX A

Chain of Custody Forms

CHAIN OF CUSTODY RECORD

CLIENT INFORMATION	Project Description	Turnaround Time
EEMA O&M	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: Darrel Scott	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) Kenneth Carter

Samplers:(Printed) Kenneth Carter

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	Arkansas Analytical Lab #
								P		
FD54COMP	5/4/2005	9:30		X	5		Facilty Discharge	X		K505063A
UV54PATH	5/4/2005	9:30			4		Facility Discharge			

1.Relinquished by:(Signature)	Date/Time	1.Received by:(Signature)
Bill Horton	5-4-05 13:40	
2.Relinquished by:(Signature)	Date/Time	2.Received by laboratory :(Signature)
	5-4-05, 1340	Sydney James

For completion by laboratory

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

REMARKS

Temp. on Receipt - 1°C

CHAIN OF CUSTODY RECORD

CLIENT INFORMATION	Project Description	Turnaround Time
EEMA O&M	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: Darrel Scott	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) Kenneth Carter

Samplers:(Printed) Kenneth Carter

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 #
FD55COMP	5/5/2005	10:00		X	3		Facilty Discharge	X		K5050638
UV55PATH	5/5/2005	10:00			2					

1 Relinquished by:(Signature)	Date/Time	1.Received by:(Signature)
Kenneth Carter	5-5-05 1103	
2.Relinquished by:(Signature)	Date/Time	2.Received by laboratory :(Signature)
	5-5-05 1103	Sydney James

For completion by laboratory

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

REMARKS

Temp. on Receipt - 1°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
EEMA O&M	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: Darrel Scott	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): Darrel 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 #
FD510COMP	5/10/2005	10:00		X	3		Facilty Discharge	X			15505030
UV510PATH	5/10/2005	10:00	X		2						

1.Relinquished by:(Signature)	Date/Time	1.Received by:(Signature)
Brad Foster	5-10-05 13:40	
2.Relinquished by:(Signature)	Date/Time	2.Received by laboratory :(Signature)
	5/10/05 1340	

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: KS6C163 — Test Start (Date/Time): 5-5-05 / ~~1330~~ 1100

Client: Western — Test End (Date/Time): 5-12-05 / 1030

		Day of Test 1	2	3	4	5	6	7	notes/remarks
Control		5|5	5|6	5|7	5|8	5|9	5|10	5|11	SS 74
D.O (mg/L)	INITIAL	7.3	7.8	7.9	7.7	7.6	7.7	7.6	
	FINAL	7.4	7.3	7.2	7.1	7.2	7.1	7.2	
pH(mg/L)	INITIAL	7.3	7.2	7.3	7.2	7.4	7.3	7.2	
	FINAL	7.0	7.1	7.2	7.2	7.2	7.2	7.2	
temp(C)	INITIAL	24.0	23.0	22.2	22.7	23.4	23.1	24.0	
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
ALKALINITY(mg/L)		35	—					→	
HARDNESS(mg/L)		46	—					→	
CONDUCTIVITY(umhos/cm)		175	—					→	
CHLORINE(mg/L)		<0.05	—					→	
CONC:		32%	32%	32%	32%	32%	32%	32%	
D.O (mg/L)	INITIAL	7.3	7.7	7.8	7.7	7.6	7.7	7.6	
	FINAL	7.3	7.3	7.1	7.1	7.2	6.9	7.7	
pH(mg/L)	INITIAL	7.1	7.0	7.5	7.5	7.3	7.4	7.3	
	FINAL	6.8	6.9	7.0	7.0	7.2	6.9	7.4	
temp(C)	INITIAL	24.0	23.0	22.2	22.7	23.4	23.1	24.0	
	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	7.3	8.2	7.9	8.0	7.8	7.7	7.6	
	FINAL	7.3	7.2	7.0	7.1	7.2	6.8	7.3	
pH(mg/L)	INITIAL	7.1	7.0	7.5	7.6	7.2	7.4	7.3	
	FINAL	6.9	6.8	6.9	6.9	7.5	6.9	7.3	
temp(C)	INITIAL	24.0	23.0	22.2	22.7	23.4	23.1	24.0	
	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	7.3	8.2	7.9	7.8	7.8	7.8	7.5	
	FINAL	7.4	7.1	6.9	7.0	7.2	6.8	7.3	
pH(mg/L)	INITIAL	7.6	7.5	7.6	7.7	7.6	7.5	7.4	
	FINAL	7.0	7.0	7.4	6.9	7.4	6.8	7.3	
temp(C)	INITIAL	24.0	23.0	22.2	22.7	23.4	23.1	24.0	
	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	7.3	8.2	8.1	8.0	7.9	7.9	7.5	
	FINAL	7.4	7.2	6.8	7.0	7.2	6.8	7.4	
pH(mg/L)	INITIAL	7.6	7.8	7.8	7.8	7.8	7.7	7.5	
	FINAL	6.9	7.0	7.4	6.8	7.9	6.8	7.3	
temp(C)	INITIAL	24.0	23.0	22.2	22.7	23.4	23.1	24.0	
	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	7.3	8.5	8.2	8.0	7.9	8.1	7.7	
	FINAL	7.4	7.3	6.7	7.0	7.3	6.8	7.3	
pH(mg/L)	INITIAL	7.6	7.8	7.7	7.9	8.0	7.9	7.7	
	FINAL	7.0	7.1	7.3	6.8	7.9	6.7	7.2	
temp(C)	INITIAL	24.0	23.0	22.2	22.7	23.4	23.1	24.0	
	FINAL	25.0	25.0	25.0	25.0	25.1	25.0	25.0	
CONC:	***100%***	A	A	A	B	B	C	C	
ALKALINITY((mg/L)		15	—	→	13	→	17	→	
HARDNESS(mg/L)		1170	—	→	1200	→	1190	→	
CONDUCTIVITY(umhos/cm)		2390	—	→	2400	→	2380	→	
CHLORINE(mg/L)		<0.05	—	→	<0.05	→	<0.05	→	

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING — Ceriodaphnia dubia

Lab # / Sample ID: KS05C163 — Test Start (Date/Time): 5 5 05/1300

Client: Weston — Test End (Date/Time): 5 11-05/0900

		Day of Test 1	2	3	4	5	6	7	8	notes/remarks
Control		5/5	5/6	5/7	5/8	5/9	5/10			SS 74
D.O (mg/L)	INITIAL	7.3	7.8	7.9	7.7	7.6	7.7			
	FINAL	7.7	7.5	7.6	7.1	7.4	7.3			
pH	INITIAL	7.3	7.2	7.3	7.2	7.4	7.3			
	FINAL	6.9	6.8	6.9	7.0	7.5	7.1			
temp(C)	INITIAL	24.0	23.0	22.2	22.7	23.4	23.1			
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0			
ALKALINITY(mg/L)		35	—	—	—	—	→			
HARDNESS(mg/L)		46	—	—	—	—	→			
CONDUCTIVITY(umhos/cm)		175	—	—	—	—	→			
CHLORINE(mg/L)		<0.05	—	—	—	—	→			
CONC:		32%	32%	32%	32%	32%	32%	~~32%~~		
D.O (mg/L)	INITIAL	7.3	7.7	7.8	7.7	7.6	7.7			
	FINAL	7.5	7.4	7.4	7.0	7.3	7.0			
pH	INITIAL	7.1	7.0	7.5	7.5	7.3	7.4			
	FINAL	7.1	7.3	7.0	7.0	7.3	7.1			
temp(C)	INITIAL	24.0	23.0	22.2	22.7	23.4	23.1			
	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	7.3	8.2	7.9	8.0	7.8	7.7			
	FINAL	7.5	7.4	7.4	7.0	7.2	7.2			
pH	INITIAL	7.1	7.0	7.5	7.6	7.2	7.4			
	FINAL	7.1	7.3	7.0	7.0	7.3	7.0			
temp(C)	INITIAL	24.0	23.0	22.2	22.7	23.4	23.1			
	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	7.3	8.2	7.9	7.8	7.8	7.8			
	FINAL	7.5	7.4	7.3	7.0	7.2	6.7			
pH	INITIAL	7.6	7.5	7.6	7.7	7.6	7.5			
	FINAL	7.1	7.3	7.0	7.0	7.2	7.0			
temp(C)	INITIAL	24.0	23.0	22.2	22.7	23.4	23.1			
	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	7.3	8.2	8.1	8.0	7.9	7.9			
	FINAL	7.5	7.3	7.3	7.1	7.2	6.8			
pH	INITIAL	7.6	7.8	7.8	7.8	7.8	7.7			
	FINAL	7.1	7.1	7.0	7.0	7.2	7.0			
temp(C)	INITIAL	24.0	23.0	22.2	22.7	23.4	23.1			
	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	7.3	8.3	8.2	8.0	7.9	8.0			
	FINAL	7.6	7.3	7.3	7.1	7.2	7.0			
pH	INITIAL	7.6	7.8	7.7	7.9	8.0	7.9			
	FINAL	7.1	7.1	7.0	6.9	7.1	7.0			
temp(C)	INITIAL	24.0	23.0	22.2	22.7	23.4	23.1			
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0			
CONC:	**100%**	A	A	A	B	B	C			
ALKALINITY((mg/L)		15	—	→	13	→	17			
HARDNESS(mg/L)		1170	—	→	1200	→	1190			
CONDUCTIVITY(umhos/cm)		2390	—	→	2400	→	2380			
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 K505063 TEST START DATE 5-5 TIME 1100

CLIENT Weston TEST END DATE 5-12 TIME 1030

AGE AND SOURCE OF MINNOWS <24 hrs, Aquatox

		DAY (NUMBER SURVIVING)								SURVIVAL		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: Control	A	10	10	10	10	10	10	10	10	100	96	5.71%
	B		9	9	9	9	9	9	9	90		
	C		10	10	10	10	9/10	9	9	90		
	D		10	10	10	10	10	10	10	100		
	E		10	10	10	10	10	10	10	100		
CONC: 32%	A	10	10	10	10	10	10	10	10	100	96	
	B		10	10	10	10	9	9	9	90		
	C		10	10	10	10	10	10	10	100		
	D		10	10	10	10	10	10	9	90		
	E		10	10	10	10	10	10	10	100		
CONC: 42%	A	10	10	10	10	10	10	10	10	100	96	
	B		10	10	10	10	10	10	10	100		
	C		10	10	10	10	9	9	8	80		
	D		10	10	10	10	10	10	10	100		
	E		10	10	10	10	10	10	10	100		
CONC: 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		
CONC: 75%	A	10	10	10	10	10	10	10	10	100	90	
	B		10	10	10	10	10	10	9/10	90		
	C		10	10	10	10	9	9	9	90		
	D		9	9	9	9	9	9	8	80		
	E		10	10	10	10	10	10	9	90		
CONC: 100%	A	10	10	10	10	10	10	10	10	100	96	5.71%
	B		10	10	10	10	9	9	9	90		
	C		10	10	10	10	10	9	9	90		
	D		10	10	10	10	10	10	10	100		
	E		10	10	10	10	10	10	10	100		
ANALYST:		KG	KG	MF	MF	KG	KG	KG	KG			
DATE:		5-5	5-6	5-7	5-8	5-9	5-10	5-11	5-12			
TIME:		1100	1400	1000	1000	1130	1400	0930				

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB #/ SAMPLE ID KSC-1063 TEST START DATE 5-5 TIME 1136

CLIENT Weston-UV TEST END DATE 5-12 TIME 1100

AGE AND SOURCE OF MINNOWS <24hrs, Aquatox

		DAY (NUMBER SURVIVING)								SURVIVAL		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: Control	A	10	10	10	10	10	10	10	10	100	96	5.71%
	B	|	10	~~9~~	~~9~~	~~9~~ 9	9	9	9	90		
	C	|	10	10	10	10	10	9	9	90		
	D	|	10	10	10	10	10	10	10	100		
	E	⊥	10	10	10	10	10	10	10	100		
CONC: 32%	A	10	10	10	10	10	10	10	10	100	96	
	B	|	10	10	10	10	10	10	10	100		
	C	|	10	10	9	9	9	9	9	90		
	D	|	10	10	10	10	10	9	9	90		
	E	⊥	10	10	10	10	10	10	10	100		
CONC: 42%	A	10	10	10	10	10	10	10	10	100	98	
	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	9	90		
	E	⊥	10	10	10	10	10	10	10	100		
CONC: 56%	A	10	10	10	10	10	10	10	10	100	98	
	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	9	90		
CONC: 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		
CONC: 100%	A	10	10	10	10	10	10	10	10	100	92	11.9%
	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	8	80		
	E	⊥	10	10	9	9	9	9	8	80		
ANALYST:		JG	JG	AF	AF	JG	JG	JG	JG			
DATE:		5-5	5-6	5-7	5-8	5-9	5-10	5-11	5-12			
TIME:		1130	1115	1530	1230	1100	1430	1000	1100			

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:	K505063	TEST DATES (BEGIN / END):	5/5-12/05
CLIENT:	Weston	WEIGHING DATE / TIME:	5/13/05, 0900
ANALYSTS:	jg	DRYING TEMP (DEGREES C):	60
SAMPLE ID:		DRYING TIME (HOURS):	24

	REP #	FINAL DRY WEIGHT TIN+LARVAE (g)	INITIAL WEIGHT TIN (g)	TOTAL DRY WEIGHT OF LARVAE (g)	NUMBER OF LARVAE	DRY WEIGHT OF LARVAE (mg)	
CONTROL	A	0.97638	0.97228	0.00410	10	0.410	AVG DRY
	B	0.97891	0.97511	0.00380	10	0.380	WEIGHT (mg)
	C	0.97695	0.97298	0.00397	10	0.397	0.386
	D	0.97646	0.97286	0.00360	10	0.360	CV
	E	0.97370	0.96987	0.00383	10	0.383	4.88
CONC:	A	0.97712	0.97174	0.00538	10	0.538	AVG DRY
	B	0.96103	0.95651	0.00452	10	0.452	WEIGHT (mg)
32%	C	0.96465	0.95950	0.00515	10	0.515	0.523
	D	0.96288	0.95811	0.00477	10	0.477	CV
	E	0.96738	0.96103	0.00635	10	0.635	
CONC:	A	0.96490	0.95937	0.00553	10	0.553	AVG DRY
	B	0.96596	0.96243	0.00353	10	0.353	WEIGHT (mg)
42%	C	0.96277	0.95908	0.00369	10	0.369	0.468
	D	0.96400	0.95858	0.00542	10	0.542	CV
	E	0.96467	0.95945	0.00522	10	0.522	
CONC:	A	0.96830	0.96187	0.00643	10	0.643	AVG DRY
	B	0.96661	0.96181	0.00480	10	0.480	WEIGHT (mg)
56%	C	0.96629	0.96133	0.00496	10	0.496	0.528
	D	0.96881	0.96415	0.00466	10	0.466	CV
	E	0.96815	0.96258	0.00557	10	0.557	
CONC:	A	0.97135	0.96323	0.00812	10	0.812	AVG DRY
	B	0.96971	0.96486	0.00485	10	0.485	WEIGHT (mg)
75%	C	0.97582	0.97083	0.00499	10	0.499	0.543
	D	0.96853	0.96460	0.00393	10	0.393	CV
	E	0.97060	0.96536	0.00524	10	0.524	
CONC:	A	0.96789	0.96256	0.00533	10	0.533	AVG DRY
	B	0.97056	0.96549	0.00507	10	0.507	WEIGHT (mg)
100%	C	0.96828	0.96423	0.00405	10	0.405	0.544
	D	0.97219	0.96646	0.00573	10	0.573	CV
	E	0.97922	0.97222	0.00700	10	0.700	19.7

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

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

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s:	K5C5C163				TEST DATES (BEGIN / END):	5-5-05 – 5-12-05	
CLIENT:	Weston				WEIGHING DATE / TIME:	5-13-05, 0900	
ANALYSTS:	KC				DRYING TEMP (DEGREES C):	60	
SAMPLE ID:					DRYING TIME (HOURS):	24	

	REP #	FINAL DRY WEIGHT TIN+LARVAE (g)	INITIAL WEIGHT TIN (g)	TOTAL DRY WEIGHT OF LARVAE (g)	NUMBER OF LARVAE	DRY WEIGHT OF LARVAE (mg)	
CONTROL	A 1	0.97638	0.97228				AVG DRY
	B 2	0.97891	0.97511				WEIGHT (mg)
	C 3	0.97695	0.97298				
	D 4	0.97646	0.97286				CV
	E 5	0.97370	0.96987				
CONC:	A 6	~~0.96288~~ 0.97112	0.97174				AVG DRY
	B 7	0.96103	0.95651				WEIGHT (mg)
32%	C 8	0.96465	0.95950				
	D 9	0.96288	0.95811				CV
	E 10	0.96738	0.96103				
CONC:	A 11	0.96490	0.95937				AVG DRY
	B 12	0.96596	0.96243				WEIGHT (mg)
42%	C 13	0.96277	0.95908				
	D 14	0.96400	0.95858				CV
	E 15	0.96467	0.95945				
CONC:	A 16	0.96830	0.96187				AVG DRY
	B 17	0.96661	0.96181				WEIGHT (mg)
56%	C 18	0.96629	0.96133				
	D 19	0.96881	0.96415				CV
	E 20	0.96815	0.96258				
CONC:	A 21	0.97135	0.96323				AVG DRY
	B 22	0.96971	0.96486				WEIGHT (mg)
75%	C 23	0.97582	0.97083				
	D 24	0.96853	0.96460				CV
	E 25	0.97060	0.96536				
CONC:	A 26	0.96789	0.96256				AVG DRY
	B 27	0.97056	0.96549				WEIGHT (mg)
100%	C 28	0.96828	0.96423				
	D 29	0.97219	0.96646				CV
	E 30	0.97922	0.97222				

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

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

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s:	K505063	**TEST DATES (BEGIN / END):**	5/5-12/05
CLIENT:	Weston - UV Treated	**WEIGHING DATE / TIME:**	5/13/05, 0930
ANALYSTS:	jg	**DRYING TEMP (DEGREES C):**	60
SAMPLE ID:		**DRYING TIME (HOURS):**	24

	REP #	FINAL DRY WEIGHT TIN+LARVAE (g)	INITIAL WEIGHT TIN (g)	TOTAL DRY WEIGHT OF LARVAE (g)	NUMBER OF LARVAE	DRY WEIGHT OF LARVAE (mg)	
CONTROL	A	0.97638	0.97228	0.00410	10	0.410	AVG DRY
	B	0.97891	0.97511	0.00380	10	0.380	WEIGHT (mg)
	C	0.97695	0.97298	0.00397	10	0.397	0.386
	D	0.97646	0.97286	0.00360	10	0.360	CV
	E	0.97370	0.96987	0.00383	10	0.383	4.88
CONC:	A	0.97716	0.97170	0.00546	10	0.546	AVG DRY
	B	0.97816	0.97298	0.00518	10	0.518	WEIGHT (mg)
32%	C	0.97691	0.97262	0.00429	10	0.429	0.512
	D	0.97604	0.97110	0.00494	10	0.494	CV
	E	0.97990	0.97415	0.00575	10	0.575	
CONC:	A	0.97987	0.97449	0.00538	10	0.538	AVG DRY
	B	0.97901	0.97385	0.00516	10	0.516	WEIGHT (mg)
42%	C	0.97629	0.97085	0.00544	10	0.544	0.550
	D	0.97652	0.97101	0.00551	10	0.551	CV
	E	0.97654	0.97053	0.00601	10	0.601	
CONC:	A	0.97621	0.97075	0.00546	10	0.546	AVG DRY
	B	0.97843	0.97254	0.00589	10	0.589	WEIGHT (mg)
56%	C	0.97944	0.97404	0.00540	10	0.540	0.529
	D	0.97744	0.97245	0.00499	10	0.499	CV
	E	0.97581	0.97112	0.00469	10	0.469	
CONC:	A	0.97995	0.97466	0.00529	10	0.529	AVG DRY
	B	0.97850	0.97345	0.00505	10	0.505	WEIGHT (mg)
75%	C	0.97687	0.97099	0.00588	10	0.588	0.559
	D	0.97426	0.96910	0.00516	10	0.516	CV
	E	0.97981	0.97326	0.00655	10	0.655	
CONC:	A	0.97645	0.96940	0.00705	10	0.705	AVG DRY
	B	0.98288	0.97645	0.00643	10	0.643	WEIGHT (mg)
100%	C	0.98243	0.97631	0.00612	10	0.612	0.577
	D	0.98024	0.97586	0.00438	10	0.438	CV
	E	0.98009	0.97520	0.00489	10	0.489	19.2

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

Pimephales promelas **FATHEAD MINNOW** TEST 1000.0

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s: KSW0603
CLIENT: Weston UV
ANALYSTS: KG
SAMPLE ID:

TEST DATES (BEGIN / END): 5/5/05 - 5/12/05
WEIGHING DATE / TIME: 5-13-05, 0930
DRYING TEMP (DEGREES C): 60
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	0.97638	0.97228				AVG DRY WEIGHT (mg)
	B 2	0.97891	0.97511				
	C 3	0.97695	0.97298				
	D 4	0.97846	0.97286				CV
	E 5	0.97370	0.96987				
CONC: 32%	A 31	0.97716	0.97170				AVG DRY WEIGHT (mg)
	B 32	0.97816	0.97298				
	C 33	0.97691	0.97262				
	D 31	0.97604	0.97110				CV
	E 35	0.97990	0.97415				
CONC: 42%	A 36	0.97187	0.97449				AVG DRY WEIGHT (mg)
	B 37	0.97901	0.97385				
	C 38	0.97629	0.97085				
	D 39	0.97652	0.97101				CV
	E 40	0.97654	0.97053				
CONC: 56%	A 41	0.97621	0.97075				AVG DRY WEIGHT (mg)
	B 42	0.97843	0.97254				
	C 43	0.97944	0.97404				
	D 44	0.97744	0.97245				CV
	E 45	0.97581	0.97112				
CONC: 75%	A 46	0.97995	0.97466				AVG DRY WEIGHT (mg)
	B 47	0.97850	0.97345				
	C 48	0.97687	0.97099				
	D 49	0.97426	0.96910				CV
	E 50	0.97981	0.97326				
CONC: 100%	A 51	0.97645	0.96940				AVG DRY WEIGHT (mg)
	B 52	0.98288	0.97645				
	C 53	0.98243	0.97631				
	D 54	0.98024	0.97586				CV
	E 55	0.98009	0.97520				

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

AA# K505063, FATHEAD MINNOW SURVIVAL, 5-5-05
File: k505063s Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.217

W = 0.868

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# K505063, FATHEAD MINNOW SURVIVAL, 5-5-05
File: k505063s 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# K505063, FATHEAD MINNOW SURVIVAL, 5-5-05
FILE: k505063s
TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	1.0000	1.4120
1	CONTROL	2	0.9000	1.2490
1	CONTROL	3	0.9000	1.2490
1	CONTROL	4	1.0000	1.4120
1	CONTROL	5	1.0000	1.4120
2	32 % EFFLUENT	1	1.0000	1.4120
2	32 % EFFLUENT	2	0.9000	1.2490
2	32 % EFFLUENT	3	1.0000	1.4120
2	32 % EFFLUENT	4	0.9000	1.2490
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	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	0.9000	1.2490
5	75 % EFFLUENT	3	0.9000	1.2490
5	75 % EFFLUENT	4	0.8000	1.1071
5	75 % EFFLUENT	5	0.9000	1.2490
6	100 % EFFLUENT	1	1.0000	1.4120
6	100 % EFFLUENT	2	0.9000	1.2490
6	100 % EFFLUENT	3	0.9000	1.2490
6	100 % EFFLUENT	4	1.0000	1.4120
6	100 % EFFLUENT	5	1.0000	1.4120

AA# K505063, FATHEAD MINNOW SURVIVAL, 5-5-05
File: k505063s Transform: ARC SINE(SQUARE ROOT(Y))

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

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	1.347				
2	32 % EFFLUENT	1.347	27.50	16.00	5.00	
3	42 % EFLLUENT	1.351	29.00	16.00	5.00	
4	56 % EFFLUENT	1.412	32.50	16.00	5.00	
5	75 % EFFLUENT	1.253	21.50	16.00	5.00	
6	100 % EFFLUENT	1.347	27.50	16.00	5.00	

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

AA# K505063, UV Treated FATHEAD MINNOW SURVIVAL, 5-5-05
File: C:\TOXSTAT\WESTON\K505063S. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.218

W = 0.885

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# K505063, UV Treated FATHEAD MINNOW SURVIVAL, 5-5-05
File: C:\TOXSTAT\WESTON\K505063S. 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# K505063, UV Treated FATHEAD MINNOW SURVIVAL, 5-5-05
FILE: C:\TOXSTAT\WESTON\K505063S.
TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	1.0000	1.4120
1	CONTROL	2	0.9000	1.2490
1	CONTROL	3	0.9000	1.2490
1	CONTROL	4	1.0000	1.4120
1	CONTROL	5	1.0000	1.4120
2	32 % EFFLUENT	1	1.0000	1.4120
2	32 % EFFLUENT	2	1.0000	1.4120
2	32 % EFFLUENT	3	0.9000	1.2490
2	32 % EFFLUENT	4	0.9000	1.2490
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	1.0000	1.4120
3	42 % EFLLUENT	4	0.9000	1.2490
3	42 % EFLLUENT	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	0.9000	1.2490
5	75 % EFFLUENT	1	1.0000	1.4120
5	75 % EFFLUENT	2	1.0000	1.4120
5	75 % EFFLUENT	3	1.0000	1.4120
5	75 % EFFLUENT	4	1.0000	1.4120
5	75 % EFFLUENT	5	1.0000	1.4120
6	100 % EFFLUENT	1	1.0000	1.4120
6	100 % EFFLUENT	2	1.0000	1.4120
6	100 % EFFLUENT	3	1.0000	1.4120
6	100 % EFFLUENT	4	0.8000	1.1071
6	100 % EFFLUENT	5	0.8000	1.1071

AA# K505063, UV Treated FATHEAD MINNOW SURVIVAL, 5-5-05
File: C:\TOXSTAT\WESTON\K505063S. Transform: ARC SINE(SQUARE ROOT(Y))

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

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	1.347				
2	32 % EFFLUENT	1.347	27.50	16.00	5.00	
3	42 % EFLLUENT	1.379	30.00	16.00	5.00	
4	56 % EFFLUENT	1.379	30.00	16.00	5.00	
5	75 % EFFLUENT	1.412	32.50	16.00	5.00	
6	100 % EFFLUENT	1.290	25.50	16.00	5.00	

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

AA # K505063, FATHEAD MINNOW GROWTH, 5-5-05
File: k505063g Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

D = 0.228

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 # K505063, FATHEAD MINNOW GROWTH, 5-5-05
File: k505063g Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 12.13

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 # K505063, FATHEAD MINNOW GROWTH, 5-5-05
FILE: k505063g
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.4100	0.4100
1	CONTROL	2	0.3800	0.3800
1	CONTROL	3	0.3970	0.3970
1	CONTROL	4	0.3600	0.3600
1	CONTROL	5	0.3830	0.3830
2	32 % EFFLUENT	1	0.5380	0.5380
2	32 % EFFLUENT	2	0.4520	0.4520
2	32 % EFFLUENT	3	0.5150	0.5150
2	32 % EFFLUENT	4	0.4770	0.4770
2	32 % EFFLUENT	5	0.6350	0.6350
3	42 % EFFLUENT	1	0.5530	0.5530
3	42 % EFFLUENT	2	0.3530	0.3530
3	42 % EFFLUENT	3	0.3690	0.3690
3	42 % EFFLUENT	4	0.5420	0.5420
3	42 % EFFLUENT	5	0.5220	0.5220
4	56 % EFFLUENT	1	0.6430	0.6430
4	56 % EFFLUENT	2	0.4800	0.4800
4	56 % EFFLUENT	3	0.4960	0.4960
4	56 % EFFLUENT	4	0.4660	0.4660
4	56 % EFFLUENT	5	0.5570	0.5570
5	75 % EFFLUENT	1	0.8120	0.8120
5	75 % EFFLUENT	2	0.4850	0.4850
5	75 % EFFLUENT	3	0.4990	0.4990
5	75 % EFFLUENT	4	0.3930	0.3930
5	75 % EFFLUENT	5	0.5240	0.5240
6	100 % EFFLUENT	1	0.5330	0.5330
6	100 % EFFLUENT	2	0.5070	0.5070
6	100 % EFFLUENT	3	0.4050	0.4050
6	100 % EFFLUENT	4	0.5730	0.5730
6	100 % EFFLUENT	5	0.7000	0.7000

AA # K505063, FATHEAD MINNOW GROWTH, 5-5-05
File: k505063g Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.095	0.019	2.011
Within (Error)	24	0.228	0.009	
Total	29	0.323		

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

AA # K505063, FATHEAD MINNOW GROWTH, 5-5-05
File: k505063g 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	0.386	0.386		
2	32 % EFFLUENT	0.523	0.523	-2.230	
3	42 % EFFLUENT	0.468	0.468	-1.328	
4	56 % EFFLUENT	0.528	0.528	-2.311	
5	75 % EFFLUENT	0.543	0.543	-2.542	
6	100 % EFFLUENT	0.544	0.544	-2.558	

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

AA # K505063, FATHEAD MINNOW GROWTH, 5-5-05
File: k505063g 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	0.145	37.7	-0.137
3	42 % EFFLUENT	5	0.145	37.7	-0.082
4	56 % EFFLUENT	5	0.145	37.7	-0.142
5	75 % EFFLUENT	5	0.145	37.7	-0.157
6	100 % EFFLUENT	5	0.145	37.7	-0.158

AA # K505063, UV Treated FATHEAD MINNOW GROWTH, 5-5-05
File: C:\TOXSTAT\WESTON\K505063G. Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

D = 0.091

W = 0.992

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 # K505063, UV Treated FATHEAD MINNOW GROWTH, 5-5-05
File: C:\TOXSTAT\WESTON\K505063G. Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 11.99

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 # K505063, UV Treated FATHEAD MINNOW GROWTH, 5-5-05
FILE: C:\TOXSTAT\WESTON\K505063G.
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.4100	0.4100
1	CONTROL	2	0.3800	0.3800
1	CONTROL	3	0.3970	0.3970
1	CONTROL	4	0.3600	0.3600
1	CONTROL	5	0.3830	0.3830
2	32 % EFFLUENT	1	0.5460	0.5460
2	32 % EFFLUENT	2	0.5180	0.5180
2	32 % EFFLUENT	3	0.4290	0.4290
2	32 % EFFLUENT	4	0.4940	0.4940
2	32 % EFFLUENT	5	0.5750	0.5750
3	42 % EFFLUENT	1	0.5380	0.5380
3	42 % EFFLUENT	2	0.5160	0.5160
3	42 % EFFLUENT	3	0.5440	0.5440
3	42 % EFFLUENT	4	0.5510	0.5510
3	42 % EFFLUENT	5	0.6010	0.6010
4	56 % EFFLUENT	1	0.5460	0.5460
4	56 % EFFLUENT	2	0.5890	0.5890
4	56 % EFFLUENT	3	0.5400	0.5400
4	56 % EFFLUENT	4	0.4990	0.4990
4	56 % EFFLUENT	5	0.4690	0.4690
5	75 % EFFLUENT	1	0.5290	0.5290
5	75 % EFFLUENT	2	0.5050	0.5050
5	75 % EFFLUENT	3	0.5880	0.5880
5	75 % EFFLUENT	4	0.5160	0.5160
5	75 % EFFLUENT	5	0.6550	0.6550
6	100 % EFFLUENT	1	0.7050	0.7050
6	100 % EFFLUENT	2	0.6430	0.6430
6	100 % EFFLUENT	3	0.6120	0.6120
6	100 % EFFLUENT	4	0.4380	0.4380
6	100 % EFFLUENT	5	0.4890	0.4890

AA # K505063, UV Treated FATHEAD MINNOW GROWTH, 5-5-05
File: C:\TOXSTAT\WESTON\K505063G. Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.119	0.024	6.268
Within (Error)	24	0.091	0.004	
Total	29	0.210		

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

AA # K505063, UV Treated FATHEAD MINNOW GROWTH, 5-5-05
File: C:\TOXSTAT\WESTON\K505063G. 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	0.386	0.386		
2	32 % EFFLUENT	0.512	0.512	-3.246	
3	42 % EFFLUENT	0.550	0.550	-4.211	
4	56 % EFFLUENT	0.529	0.529	-3.662	
5	75 % EFFLUENT	0.559	0.559	-4.432	
6	100 % EFFLUENT	0.577	0.577	-4.915	

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

AA # K505063, UV Treated FATHEAD MINNOW GROWTH, 5-5-05
File: C:\TOXSTAT\WESTON\K505063G. 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	0.092	23.8	-0.126
3	42 % EFFLUENT	5	0.092	23.8	-0.164
4	56 % EFFLUENT	5	0.092	23.8	-0.143
5	75 % EFFLUENT	5	0.092	23.8	-0.173
6	100 % EFFLUENT	5	0.092	23.8	-0.191

APPENDIX D

Ceriodaphnia dubia Raw Data and Statistics

Ceriodaphnia dubia — **SURVIVAL AND REPRODUCTION TEST**

Discharger: Weston | Lab Number/s: K505-0603 | Analyst: YG, AF

Location: | Test Start-Date/Time: 5-5-05/1300

Date Sample Collected: See COC | Test Stop-Date/Time: 5-11-05/0900

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	AF
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	AF
	3	6	4	4	3	0	4	6	0	6	0	33	10	3.3	YG
	4	8	0	8	6	0	10	5	0	0	3	40	10	4.0	YG
	5	0	8	0	14	X0	0	0	7	7	7	43	9	4.3	YG
	6	13	15	16	0	0	13	5	0	14	0	76	9	8.4	YG
	7														
	8														
	Total	27	27	28	23	X0	27	16	7	27	10	192	$\bar{x}$= 21.3	CV=38.4%	

60% 3rd brood

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	AF
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	AF
	3	0	0	0	6	0	5	4	2	5	4	26	10	2.6	YG
	4	0	4	5	8	0	1	6	3	0	1	28	10	2.8	YG
	5	0	8	10	13	0	4	10	6	8	10	65	10	6.5	YG
	6	2	2	12	0	0	8	0	10	11	13	58	10	5.8	YG
	7														
	8														
	Total	2	14	27	27	0	18	20	21	24	24	177			

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	AF
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	AF
	3	5	5	4	0	4	5	5	0	5	0	33	10	3.3	YG
	4	0	1	0	5	7	0	7	0	2	0	22	10	2.2	YG
	5	6	11	9	10	5	7	10	0	8	0	66	10	6.6	YG
	6	11	6	9	8	12	6	0	0	9	3	64	10	6.4	YG
	7														
	8														
	Total	22	23	22	23	28	18	22	0	24	3	185			

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	AF
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	AF
	3	0	5	5	5	1	3	5	0	3	0	27	10	2.7	YG
	4	7	8	6	8	9	11	0	6	3	6	64	10	6.4	YG
	5	9	0	1	6	11	9	6	9	7	9	67	10	6.7	YG
	6	2	5	13	9	0	0	5	7	7	0	48	10	4.8	YG
	7														
	8														
	Total	18	18	25	28	21	23	16	22	20	15	206			

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	AF
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	AF
	3	0	5	4	4	4	5	3	0	0	4	29	10	2.9	YG
	4	0	8	1	0	8	8	9	0	6	7	47	10	4.7	YG
	5	0	0	8	8	7	8	12	0	7	11	61	10	6.1	YG
	6	0	9	10	13	0	1	0	0	7	0	40	10	4.0	YG
	7														
	8														
	Total	0	22	23	25	19	22	24	0	20	22	177			

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	AF
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	AF
	3	0	0	3	5	4	0	3	2	0	2	19	10	1.9	YG
	4	9	5	8	0	6	3	7	7	3	5	53	10	5.3	YG
	5	8	0	10	8	7	8	8	X2	6	0	57	9	5.7	YG
	6	0	11	0	7	0	10	0	–	5	6	39	9	4.3	YG
	7														
	8														
	Total	17	16	21	20	17	21	18	X1	14	13	168	$\bar{x}$= 17.4		

CV=16.5%

X=DEAD; Y=MALE

Ceriodaphnia dubia — **SURVIVAL AND REPRODUCTION TEST**

Discharger: Weston - UV treat | Lab Number/s: KS050603 | Analyst: JG, AF

Location: | Test Start-Date/Time: 5-5-05/1330

Date Sample Collected: See COC | Test Stop-Date/Time: 5-11-05/0930

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	AF
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	AF
	3	0	5	3	4	4	0	0	0	0	0	16	10	1.6	JG
	4	5	10	1	9	9	0	6	0	5	3	48	10	4.8	JG
	5	12	13	6	15	9	2	12	X0	10	9	86	9	9.8	JG
	6	11	0	12	1	1	4	17	—	11	10	67	9	7.4	JG
	7														
	8														
	Total	28	28	22	29	23	6	35	X0	26	22	289	X̄= 24.3	CV= 32.9%	

80% 3rd brood

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	AF
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	AF
	3	0	0	4	0	0	4	0	4	1	1	14	10	1.4	JG
	4	6	0	8	0	5	8	0	7	8	0	42	10	4.2	JG
	5	12	1	12	2	9	14	0	14	13	0	77	10	7.7	JG
	6	8	10	0	0	9	0	2	0	0	0	29	10	2.9	JG
	7														
	8														
	Total	26	11	24	2	23	26	2	25	22	1	162			

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	X0	0	0	0	0	0	0	0	0	0	9	0	AF
	2	0	—	0	0	0	0	0	X0	0	0	0	8	0	AF
	3	0	—	4	0	3	0	1	—	0	0	8	8	1.0	JG
	4	10	—	8	2	9	1	1	—	6	9	46	8	5.8	JG
	5	0	—	17	0	14	10	8	—	8	9	66	8	8.2	JG
	6	5	—	0	5	0	0	11	—	8	0	29	8	3.6	JG
	7														
	8														
	Total	15	X0	29	7	26	11	21	X0	22	18	149			

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	AF
	2	X0	0	0	0	0	0	0	0	0	0	0	9	0	AF
	3	—	1	0	3	4	0	0	4	0	4	16	9	1.8	JG
	4	—	3	9	9	0	9	5	7	1	9	52	9	5.8	JG
	5	—	7	12	12	10	12	10	11	1	13	88	9	9.8	JG
	6	—	9	5	0	12	0	11	1	0	1	39	9	4.3	JG
	7														
	8														
	Total	X0	20	26	24	26	21	26	23	2	27	195			

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	AF
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	AF
	3	3	0	3	0	0	4	0	0	0	0	10	10	1.0	JG
	4	7	6	5	5	2	8	6	7	4	1	51	10	5.1	JG
	5	11	8	10	8	9	6	6	X2	7	10	77	9	7.7	JG
	6	X0	0	0	3	6	1	10	—	5	10	35	8	3.9	JG
	7														
	8														
	Total	X1	14	18	16	17	19	22	X9	16	21	173			

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	AF
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	AF
	3	4	0	2	3	0	3	0	0	1	4	17	10	1.7	JG
	4	8	5	7	9	0	5	0	5	6	4	49	10	4.9	JG
	5	0	10	13	7	5	8	0	9	5	4	61	10	6.1	JG
	6	7	0	0	0	5	0	X0	2	10	0	24	9	2.4	JG
	7														
	8														
	Total	19	15	22	19	10	16	X0	16	22	12	151	X̄=	16.8	

X=DEAD; Y=MALE

CV=24.7%

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF DEAD	NUMBER OF 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	NUMBER OF 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	NUMBER OF 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

	NUMBER OF		
IDENTIFICATION	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

	NUMBER OF		
IDENTIFICATION	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# K505063, CERIODAPHNIA REPRODUCTION, 5-5-05
File: k505063c 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# K505063, CERIODAPHNIA REPRODUCTION, 5-5-05
File: k505063c Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 15.94

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

Data FAIL B1 homogeneity test at 0.01 level. Try another transformation.

TITLE: AA# K505063, CERIODAPHNIA REPRODUCTION, 5-5-05
FILE: k505063c
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	27.0000	27.0000
1	CONTROL	2	27.0000	27.0000
1	CONTROL	3	28.0000	28.0000
1	CONTROL	4	23.0000	23.0000
1	CONTROL	5	0.0000	0.0000
1	CONTROL	6	27.0000	27.0000
1	CONTROL	7	16.0000	16.0000
1	CONTROL	8	7.0000	7.0000
1	CONTROL	9	27.0000	27.0000
1	CONTROL	10	10.0000	10.0000
2	32 % EFFLUENT	1	2.0000	2.0000
2	32 % EFFLUENT	2	14.0000	14.0000
2	32 % EFFLUENT	3	27.0000	27.0000
2	32 % EFFLUENT	4	27.0000	27.0000
2	32 % EFFLUENT	5	0.0000	0.0000
2	32 % EFFLUENT	6	18.0000	18.0000
2	32 % EFFLUENT	7	20.0000	20.0000
2	32 % EFFLUENT	8	21.0000	21.0000
2	32 % EFFLUENT	9	24.0000	24.0000
2	32 % EFFLUENT	10	24.0000	24.0000
3	42 % EFFLUENT	1	22.0000	22.0000
3	42 % EFFLUENT	2	23.0000	23.0000
3	42 % EFFLUENT	3	22.0000	22.0000
3	42 % EFFLUENT	4	23.0000	23.0000
3	42 % EFFLUENT	5	28.0000	28.0000
3	42 % EFFLUENT	6	18.0000	18.0000
3	42 % EFFLUENT	7	22.0000	22.0000
3	42 % EFFLUENT	8	24.0000	24.0000
3	42 % EFFLUENT	9	0.0000	0.0000
3	42 % EFFLUENT	10	3.0000	3.0000
4	56 % EFFLUENT	1	18.0000	18.0000
4	56 % EFFLUENT	2	18.0000	18.0000
4	56 % EFFLUENT	3	25.0000	25.0000
4	56 % EFFLUENT	4	28.0000	28.0000
4	56 % EFFLUENT	5	21.0000	21.0000
4	56 % EFFLUENT	6	23.0000	23.0000
4	56 % EFFLUENT	7	16.0000	16.0000
4	56 % EFFLUENT	8	22.0000	22.0000
4	56 % EFFLUENT	9	20.0000	20.0000
4	56 % EFFLUENT	10	15.0000	15.0000
5	75 % EFFLUENT	1	0.0000	0.0000
5	75 % EFFLUENT	2	22.0000	22.0000
5	75 % EFFLUENT	3	23.0000	23.0000
5	75 % EFFLUENT	4	25.0000	25.0000
5	75 % EFFLUENT	5	19.0000	19.0000
5	75 % EFFLUENT	6	22.0000	22.0000
5	75 % EFFLUENT	7	24.0000	24.0000
5	75 % EFFLUENT	8	0.0000	0.0000
5	75 % EFFLUENT	9	20.0000	20.0000

5	75	%	EFFLUENT	10	22.0000	22.0000
6	100	%	EFFLUENT	1	17.0000	17.0000
6	100	%	EFFLUENT	2	16.0000	16.0000
6	100	%	EFFLUENT	3	21.0000	21.0000
6	100	%	EFFLUENT	4	20.0000	20.0000
6	100	%	EFFLUENT	5	17.0000	17.0000
6	100	%	EFFLUENT	6	21.0000	21.0000
6	100	%	EFFLUENT	7	18.0000	18.0000
6	100	%	EFFLUENT	8	11.0000	11.0000
6	100	%	EFFLUENT	9	14.0000	14.0000
6	100	%	EFFLUENT	10	13.0000	13.0000

AA# K505063, CERIODAPHNIA REPRODUCTION, 5-5-05
File: k505063c Transform: NO TRANSFORMATION

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

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	19.200				
2	32 % EFFLUENT	17.700	95.50	75.00	10.00	
3	42 % EFFLUENT	18.500	96.00	75.00	10.00	
4	56 % EFFLUENT	20.600	100.50	75.00	10.00	
5	75 % EFFLUENT	17.700	90.50	75.00	10.00	
6	100 % EFFLUENT	16.800	91.50	75.00	10.00	

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

FISHER'S EXACT TEST UV treated

IDENTIFICATION	NUMBER OF DEAD	NUMBER OF 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 ALIVE	NUMBER OF DEAD	TOTAL ANIMALS
CONTROL	9	1	10
42% effluent	8	2	10
TOTAL	17	3	20

CRITICAL FISHER'S VALUE (10,10,9) (p=0.05) IS 4. b VALUE IS 8.
Since b is greater than 4 there is no significant difference between CONTROL and TREATMENT at the 0.05 level.

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	NUMBER OF DEAD	TOTAL ANIMALS
CONTROL	9	1	10
56% 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.

FISHER'S EXACT TEST

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

CRITICAL FISHER'S VALUE (10,10,9) (p=0.05) IS 4. b VALUE IS 8.
Since b is greater than 4 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	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

	NUMBER	NUMBER	SIG

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

'A# K505063, UV Treated C DUBIA REPRODUCTION, 5-5-05
'ile: k505063c Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

******** Shapiro - Wilk's Test is aborted ********

'his test can not be performed because total number of replicates
is greater than 50.

'otal number of replicates = 60

AA# K505063, UV Treated C DUBIA REPRODUCTION, 5-5-05
File: k505063c Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 10.16

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# K505063, UV Treated C DUBIA REPRODUCTION, 5-5-05
FILE: k505063c
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	28.0000	28.0000
1	CONTROL	2	28.0000	28.0000
1	CONTROL	3	22.0000	22.0000
1	CONTROL	4	29.0000	29.0000
1	CONTROL	5	23.0000	23.0000
1	CONTROL	6	6.0000	6.0000
1	CONTROL	7	35.0000	35.0000
1	CONTROL	8	0.0000	0.0000
1	CONTROL	9	26.0000	26.0000
1	CONTROL	10	22.0000	22.0000
2	32 % EFFLUENT	1	26.0000	26.0000
2	32 % EFFLUENT	2	11.0000	11.0000
2	32 % EFFLUENT	3	24.0000	24.0000
2	32 % EFFLUENT	4	2.0000	2.0000
2	32 % EFFLUENT	5	23.0000	23.0000
2	32 % EFFLUENT	6	26.0000	26.0000
2	32 % EFFLUENT	7	25.0000	25.0000
2	32 % EFFLUENT	8	22.0000	22.0000
2	32 % EFFLUENT	9	1.0000	1.0000
2	32 % EFFLUENT	10	24.0000	24.0000
3	42 % EFFLUENT	1	15.0000	15.0000
3	42 % EFFLUENT	2	0.0000	0.0000
3	42 % EFFLUENT	3	29.0000	29.0000
3	42 % EFFLUENT	4	7.0000	7.0000
3	42 % EFFLUENT	5	26.0000	26.0000
3	42 % EFFLUENT	6	11.0000	11.0000
3	42 % EFFLUENT	7	21.0000	21.0000
3	42 % EFFLUENT	8	0.0000	0.0000
3	42 % EFFLUENT	9	22.0000	22.0000
3	42 % EFFLUENT	10	18.0000	18.0000
4	56 % EFFLUENT	1	0.0000	0.0000
4	56 % EFFLUENT	2	20.0000	20.0000
4	56 % EFFLUENT	3	26.0000	26.0000
4	56 % EFFLUENT	4	24.0000	24.0000
4	56 % EFFLUENT	5	26.0000	26.0000
4	56 % EFFLUENT	6	21.0000	21.0000
4	56 % EFFLUENT	7	26.0000	26.0000
4	56 % EFFLUENT	8	23.0000	23.0000
4	56 % EFFLUENT	9	2.0000	2.0000
4	56 % EFFLUENT	10	27.0000	27.0000
5	75 % EFFLUENT	1	21.0000	21.0000
5	75 % EFFLUENT	2	14.0000	14.0000
5	75 % EFFLUENT	3	18.0000	18.0000
5	75 % EFFLUENT	4	16.0000	16.0000
5	75 % EFFLUENT	5	17.0000	17.0000
5	75 % EFFLUENT	6	19.0000	19.0000
5	75 % EFFLUENT	7	22.0000	22.0000
5	75 % EFFLUENT	8	9.0000	9.0000
5	75 % EFFLUENT	9	16.0000	16.0000

5	75	%	EFFLUENT	10	21.0000	21.0000
6	100	%	EFFLUENT	1	19.0000	19.0000
6	100	%	EFFLUENT	2	15.0000	15.0000
6	100	%	EFFLUENT	3	22.0000	22.0000
6	100	%	EFFLUENT	4	19.0000	19.0000
6	100	%	EFFLUENT	5	10.0000	10.0000
6	100	%	EFFLUENT	6	16.0000	16.0000
6	100	%	EFFLUENT	7	0.0000	0.0000
6	100	%	EFFLUENT	8	16.0000	16.0000
6	100	%	EFFLUENT	9	22.0000	22.0000
6	100	%	EFFLUENT	10	12.0000	12.0000

AA# K505063, UV Treated C DUBIA REPRODUCTION, 5-5-05
File: k505063c Transform: NO TRANSFORMATION

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

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	21.900				
2	32 % EFFLUENT	18.400	92.50	75.00	10.00	
3	42 % EFFLUENT	14.900	83.00	75.00	10.00	
4	56 % EFFLUENT	19.500	92.50	75.00	10.00	
5	75 % EFFLUENT	17.300	76.00	75.00	10.00	
6	100 % EFFLUENT	15.100	75.50	75.00	10.00	

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

APPENDIX E

Organism History

AQUATOX, INC.

100 Springwood Drive #15
Hot Springs, Arkansas 71913
(501) 767-9120

TEST ORGANISM HISTORY

DATE SHIPPED 5-5-05 ARKANSAS Analytical

SPECIES Pimephales promelas

QUANTITY SHIPPED 550+

AGE/LIFE STAGE 24 hrs 5/5 15 days

BROODSTOCK SOURCE Aquatox Hatchery

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

Aquatic Research Organisms

DATA SHEET

I. Organism History

Species: Ceriodaphnia dubia

Source: Lab reared X 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 X 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: _____

1 - 800 - 927 - 1650

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

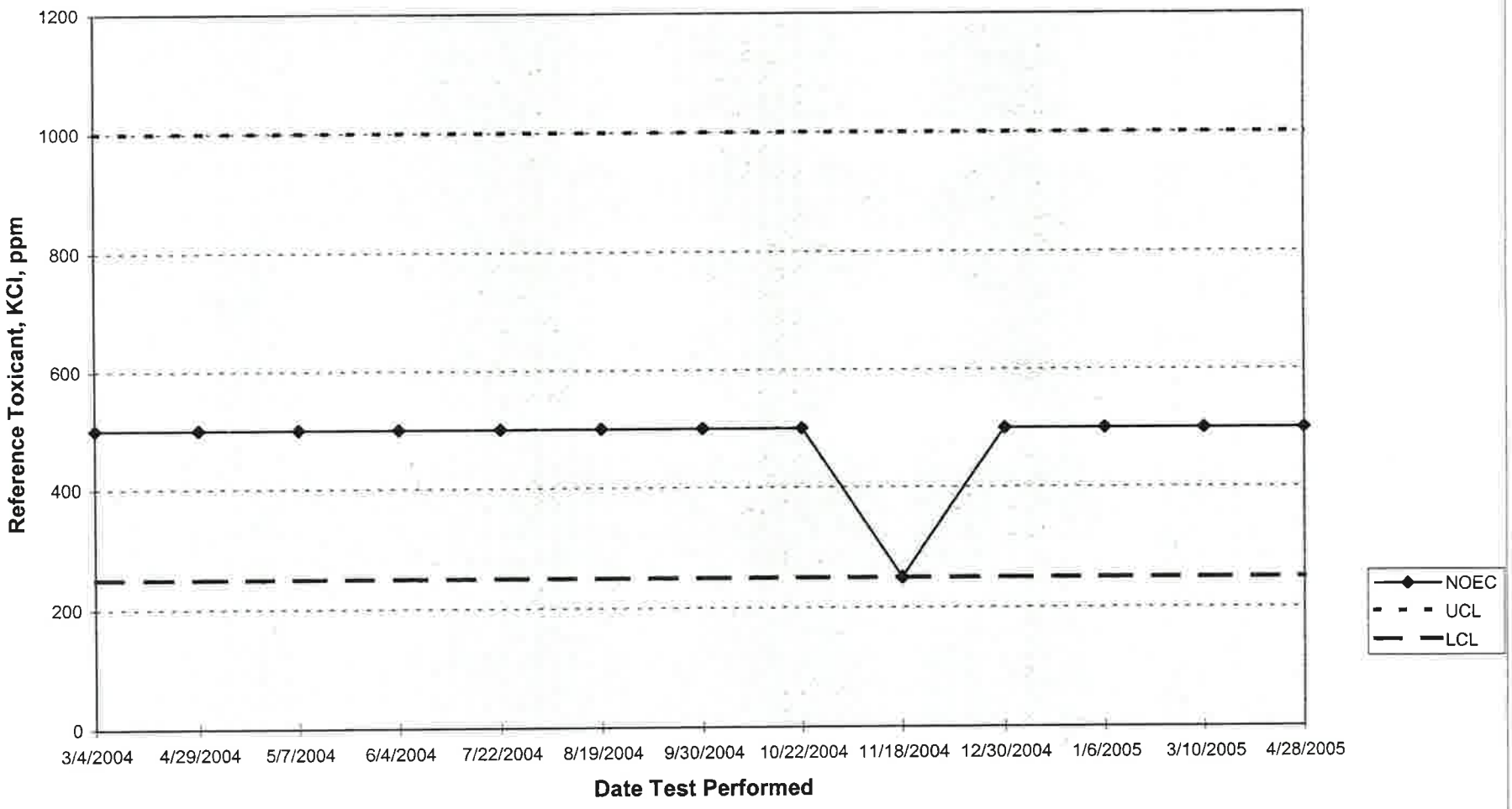
APPENDIX F

Quality Assurance Charts

ARKANSAS ANALYTICAL, INC.

FATHEAD MINNOW SURVIVAL

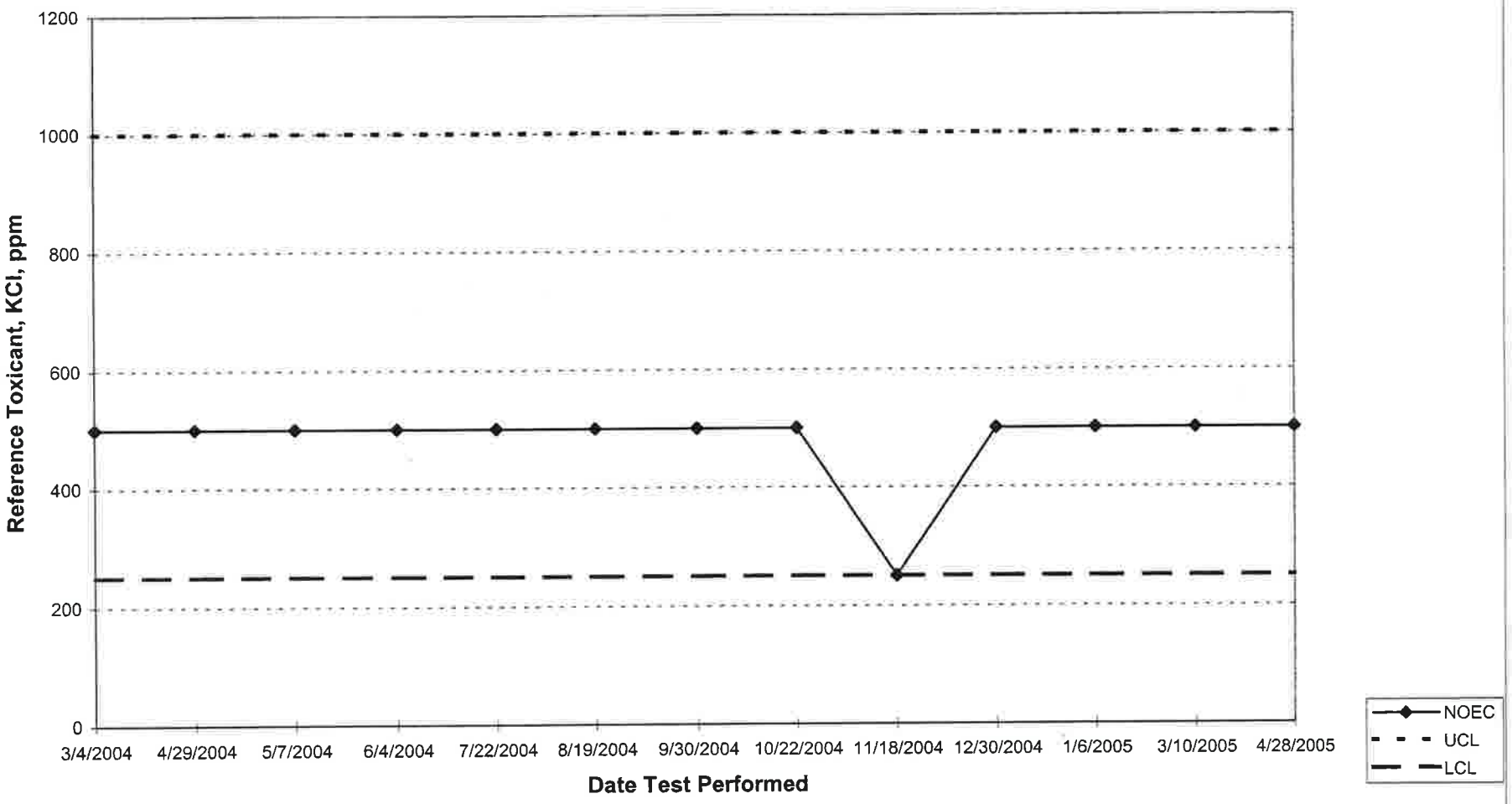
QUALITY ASSURANCE



ARKANSAS ANALYTICAL, INC.

FATHEAD MINNOW GROWTH

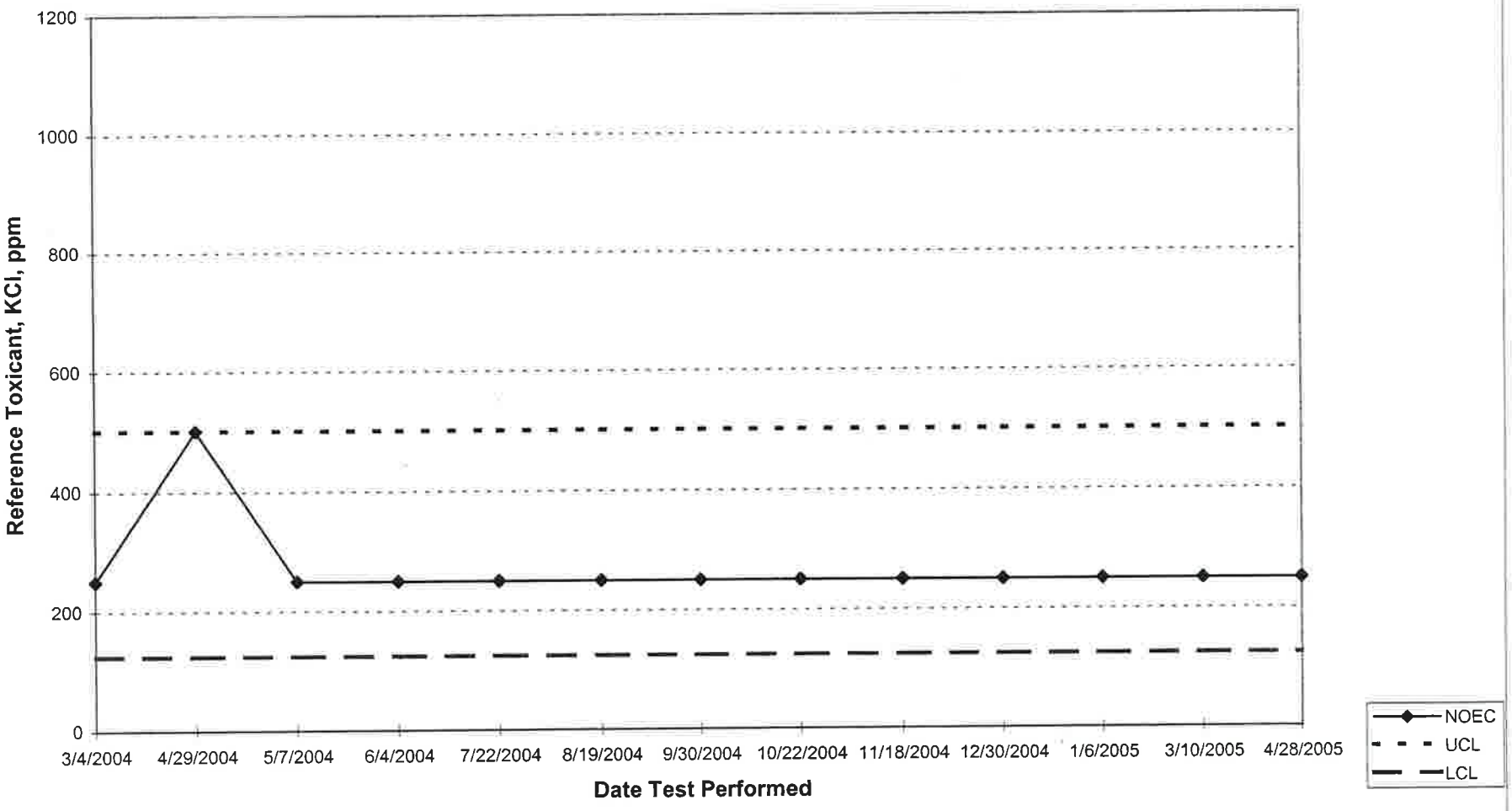
QUALITY ASSURANCE



ARKANSAS ANALYTICAL, INC.

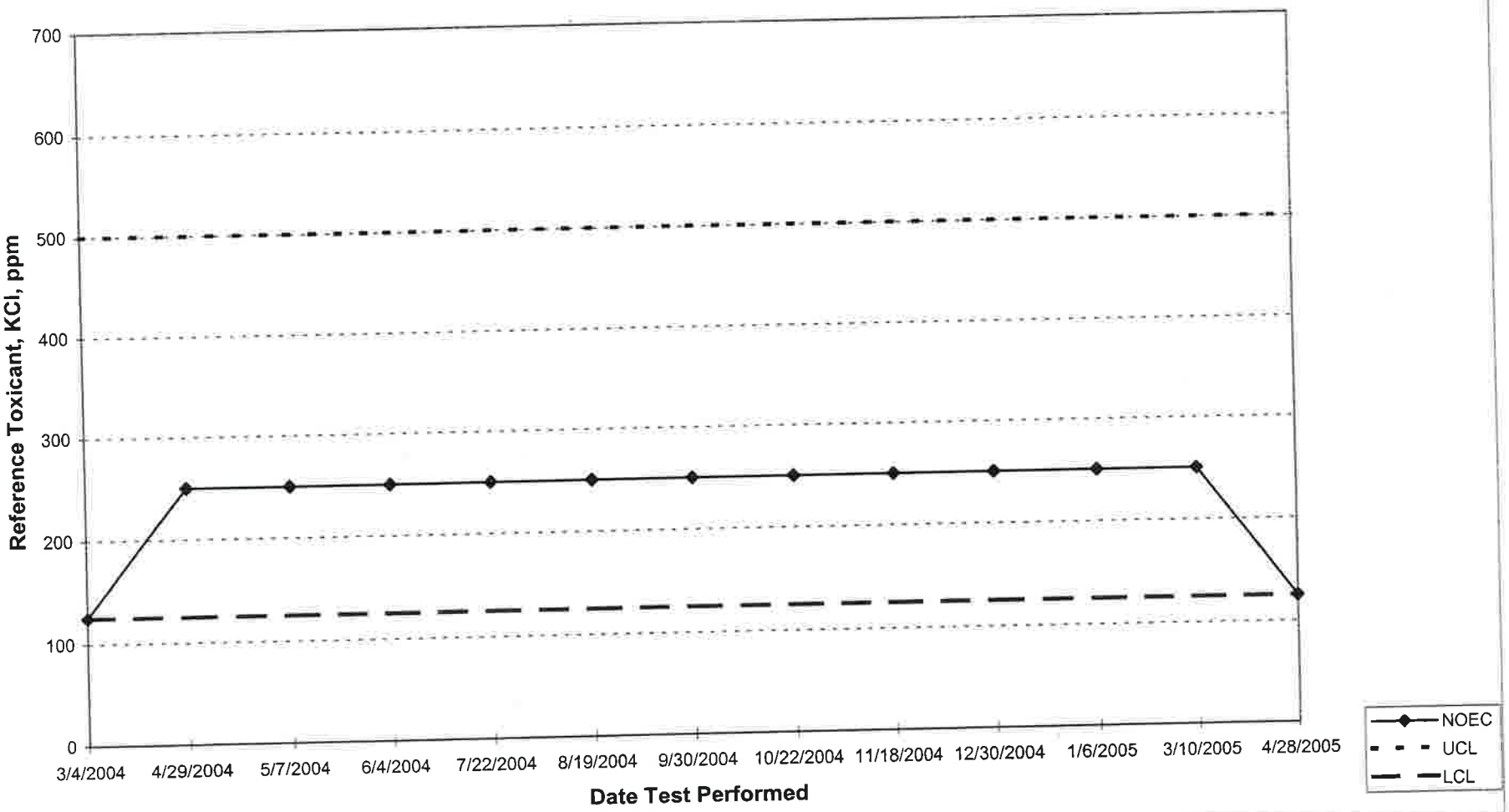
CERIODAPHNIA DUBIA SURVIVAL

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: **04-075-0**

Issued Date: **30 October 2004**

Expired Date: **30 October 2005**

J A Semlinski

ADEQ Quality Assurance Officer

Date October 27, 2004