Arkansas Analytical, Inc.

Toxicity Test Results

MAGCOBAR MINE SITE
NPDES PERMIT NUMBER: AR0049794
April 2008
AFIN# 00-00348

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**
EEMA O&M Services Group
P.O. Box 232
Kulpsville, PA 19443

Prepared by: Arkansas Analytical, Inc.
11701 I-30, Bldg 1, Suite 115
Little Rock, Arkansas 72209
Lab Number K804008

Tuesday, April 29, 2008

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 April of 2008.

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:	4-16-08, 0815	4-17-08, 0815
Sample #2:	4-17-08, 0900	4-18-08, 0900
Sample #3:	4-21-08, 0815	4-22-08, 0815

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	Temperature Upon Receipt (°C)
Sample #1:	4-17-08, 1400	1
Sample #2:	4-18-08, 1439	3
Sample #3:	4-22-08, 1517	3

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. The alternate method suggested in the method (11.3.4.5) for combating pathogen interference, was run in place of the original fathead minnow test. The test chambers were 30 ml plastic cups with 20 ml of test solution. Each chamber contained 2 organisms. The total number of fish was 40 per test solution. The fish were then combined to perform growth analysis. The test temperature was 25 degrees Centigrade. Raw data and statistics are provided in Appendix C.

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

Test Organisms

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

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

Quality Assurance

Test Acceptability

TEST ACCEPTANCE CRITERIA for *Ceriodaphnia dubia*

Control Criteria	Results	Pass	Fail
Greater than or equal to 80% survival	100%	X	
Average of 15 or more young per surviving female	19.8	X	
At least 60% of surviving females should have produced 3 broods	100%	X	
The percent coefficient of variation between replicates must be 40% or less for the young of surviving females	28.6%	X	

TEST ACCEPTANCE CRITERIA for *Pimephales promelas*

Control Criteria	Results	Pass	Fail
Greater than or equal to 80% survival	95.0%	X	
The percent coefficient of variation between replicates must be 40% or less for survival	7.21%	X	
Minimum of 0.25 mg average dry weight of surviving controls	0.303	X	
The percent coefficient of variation between replicates must be 40% or less for growth	17.0%	X	

Reference Toxicant

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

REFERENCE TOXICANT

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:	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)	18.4	%CV survival (critical dilution)	5.73%
%CV Reproduction (critical dilution)	25.1%	Mean dry weight (critical dilution) in milligrams	0.982
		%CV growth (critical dilution)	8.76%

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 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.

Biomonitoring Analysts:

Ken Pigue

Chris Turney

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:	4-16-08, 0815	4-17-08, 0815
Sample #2:	4-17-08, 0900	4-18-08, 0900
Sample #3:	4-21-08, 0815	4-22-08, 0815

Test initiated (date, time): 4-17-08, 1340 Test terminated (date, time): 4-24-08, 0830

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	87.5	100	87.5	100		100	100	95	7.21
32%	100	100	100	100	100		100	100	100	
42%	100	100	100	87.5	100		100	100	97.5	
56%	100	100	100	100	100		100	100	100	
75%	100	87.5	87.5	100	100		100	100	95	
100%	87.5	100	100	100	100		100	100	97.5	5.73

DATA TABLE FOR GROWTH OF FATHEAD MINNOWS

SUMMARY

Effluent Conc %	A	B	C	D	E		Mean Dry Weight	CV%
0%	0.350	0.241	0.340	0.253	0.330		0.303	17.0
32%	0.571	0.596	0.736	0.589	0.638		0.626	
42%	0.734	0.666	0.675	0.565	0.776		0.683	
56%	0.871	0.787	0.820	0.783	0.939		0.840	
75%	0.946	0.855	0.739	0.864	0.967		0.874	
100%	0.926	1.096	1.029	0.876	0.982		0.982	8.76

Coefficient of Variation = standard deviation / mean * 100

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)= _____**7.21**_____%

   d) PMSD survival = _____**6.8**___%

   e) PMSD growth = _____**36.7**____%

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:	4-16-08, 0815	4-17-08, 0815
Sample #2:	4-17-08, 0900	4-18-08, 0900
Sample #3:	4-21-08, 0815	4-22-08, 0815

Test initiated (date, time): 4-17-08, 1215 Test terminated (date, time): 4-23-08, 0820

Dilution water used: Soft Synthetic

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

Replicate	0%	32%	42%	56%	75%	100%
A	22	15	18	21	15	13
B	20	23	27	24	11	13
C	15	22	18	18	10	14
D	18	x1	19	16	17	21
E	7	19	25	25	20	16
F	26	19	16	24	18	16
G	19	21	17	22	20	24
H	22	22	19	16	24	23
I	26	24	11	19	20	25
J	23	16	24	25	22	19
Mean	19.8	18.1	19.4	21.0	17.7	18.4
Mean/surviving female	19.8	20.1	19.4	21.0	17.7	18.4
CV%*	28.6					25.1

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	90	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)= _____**28.6**_____**%**

   d) PMSD reproduction = _____**26.6**____%

APPENDIX A

Chain of Custody Forms

Arkansas Analytical Inc.
11701 Interstate 30, Bldg. 1, Ste. 115
Little Rock, AR 72209
PHONE: 501-455-3233
FAX: 501-455-6118

CHAIN OF CUSTODY RECORD

CLIENT INFORMATION		Project Description	Turnaround Time
EEMA O & M Services Group	EEMA O & M Services Group	Magcobar Mine Site	24 Hour
Magcobar Mine Site	P.O. Box 699	**Reporting Information**	48 Hour
2000 Darby Lane	Malvern, AR 72104	Telephone: 501-467-8355	72 Hour
Malvern, AR 72104		FAX: 501-467-8687	Routine (5 Day)
Attn: Bill Mc Alister		Bill to/P.O. #:	Preservative Code:
			Bottle Type:

Preservation Codes:

1. Cool, 4 Degrees Centigrade
2. Sulfuric Acid (H_2SO_4), pH < 2
3. Nitric Acid (HNO_3), pH < 2
4. Thiosulfate for Dechlorination
5. Hydrochloric Acid(HCl)
6. Sodium Hydroxide (NaOH), pH > 12

Sampler(s) Signature: Bill Mc Alister

Sampler(s) Printed: Bill Mc Alister

Field Number	SAMPLE COLLECTION Date/s	Time/s	Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION	Chronic Biomonitoring	TEST PARAMETERS									Bottle Type Code	Arkansas Analytical Work Order Number:
								1										G = Glass; P = Plastic	
								P										V = Septum; A = Amber	
FD-2	4/17/2008	8:15AM		X	4	W	Facility Discharge FD-2	X										A	1-804008

1. Relinquished by: (Signature)	Date/Time	2. Received by: (Signature)
Bill Mc Alister	4-17-08 14:00	
3. Relinquished by: (Signature)	**Date/Time**	**4. Received by lab: (Signature)**
		Sydney James

SAMPLE CONDITION UPON RECEIPT IN LAB

1. CUSTODY SEALS:	✓ Yes	___ No
2. CONTAINERS CORRECT:	___ Yes	___ No
3. COC/LABELS AGREE:	___ Yes	___ No
4. PRESERVATION CONFIRMED:	___ Yes	___ No
5. RECEIVED ON ICE:	___ Yes	___ No
6. TEMPERATURE ON RECEIPT:	1°C	

FOR COMPLETION BY LAB ONLY

REMARKS / SAMPLE COMMENTS

Arkansas Analytical Inc.
11701 Interstate 30, Bldg. 1, Ste. 115
Little Rock, AR 72209
PHONE: 501-455-3233
FAX: 501-455-6118

CHAIN OF CUSTODY RECORD

CLIENT INFORMATION		Project Description	Turnaround Time
EEMA O & M Services Group	EEMA O & M Services Group	Magcobar Mine Site	24 Hour
Magcobar Mine Site	P.O. Box 699	**Reporting Information**	48 Hour
2000 Darby Lane	Malvern, AR 72104	Telephone: 501-467-8355	72 Hour
Malvern, AR 72104		FAX: 501-467-8687	Routine (5 Day)
Attn: Bill Mc Allster		Bill to/P.O. #:	Preservative Code: 1
			Bottle Type: P

Preservation Codes:

1. Cool, 4 Degrees Centigrade
2. Sulfuric Acid (H_2SO_4), pH < 2
3. Nitric Acid (HNO_3), pH < 2
4. Thiosulfate for Dechlorination
5. Hydrochloric Acid(HCl)
6. Sodium Hydroxide (NaOH), pH > 12

Bottle Type Code: G = Glass; P = Plastic; V = Septum; A = Amber

Sampler(s) Signature: Bill McAlister

Sampler(s) Printed: Bill McAlister

Field Number	SAMPLE COLLECTION Date/s	Time/s	Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION	Chronic Biomonitoring	TEST PARAMETERS	Arkansas Analytical Work Order Number:
FD-1	4/18/2008	9:00 AM		X	4	W	Facility Discharge FD-1	X		K804088

1. Relinquished by: (Signature)	Date/Time	2. Received by: (Signature)
Bill McAlister	4-18-08 1439	
3. Relinquished by: (Signature)	Date/Time	4. Received by lab: (Signature)
	4-18-08 1439	

SAMPLE CONDITION UPON RECEIPT IN LAB

1. CUSTODY SEALS:	✓ Yes	No
2. CONTAINERS CORRECT:	Yes	No
3. COC/LABELS AGREE:	Yes	No
4. PRESERVATION CONFIRMED:	Yes	No
5. RECEIVED ON ICE:	Yes	No
6. TEMPERATURE ON RECEIPT:	3°C	

FOR COMPLETION BY LAB ONLY

REMARKS / SAMPLE COMMENTS

Arkansas Analytical Inc.
11701 Interstate 30, Bldg. 1, Ste. 115
Little Rock, AR 72209
PHONE: 501-455-3233
FAX: 501-455-6118

CHAIN OF CUSTODY RECORD

CLIENT INFORMATION		Project Description	Turnaround Time
EEMA O & M Services Group	EEMA O & M Services Group	Magcobar Mine Site	24 Hour
Magcobar Mine Site	P.O. Box 699	Reporting Information	48 Hour
2000 Darby Lane	Malvern, AR 72104	Telephone: 501-467-8365	72 Hour
Malvern, AR 72104		FAX: 501-467-8687	Routine (5 Day)
Attn: Bill Mc Alister		Bill to/P.O. #:	Preservative Code
			Bottle Type

Preservation Codes:
1. Cool, 4 Degrees Centigrade
2. Sulfuric Acid (H_2SO_4), pH < 2
3. Nitric Acid (HNO_3), pH < 2
4. Thiosulfate for Dechlorination
5. Hydrochloric Acid(HCl)
6. Sodium Hydroxide (NaOH), pH > 12

Bottle Type Code: G = Glass; P = Plastic; V = Septum; A = Amber

Sampler(s) Signature: Bill McAlister

Sampler(s) Printed: Bill McAlister

Field Number	SAMPLE COLLECTION Date/s	Time/s	Grab	Comp	Number of Bottles	Sample Matrix	SAMPLE IDENTIFICATION/ DESCRIPTION	Chronic Biomonitoring	TEST PARAMETERS	Arkansas Analytical Work Order Number:
								1		K804008
								P		
FD-1	4/22/2008	8:15 AM		X	4	W	Facility Discharge FD-1	X		C

1. Relinquished by: (Signature)	Date/Time	2. Received by: (Signature)
Bill McAlister	4-22-08 15:17	
3. Relinquished by: (Signature)	Date/Time	4. Received by lab: (Signature)
		Sydney James

SAMPLE CONDITION UPON RECEIPT IN LAB

1. CUSTODY SEALS:	✓ Yes	___ No
2. CONTAINERS CORRECT:	___ Yes	___ No
3. COC/LABELS AGREE:	___ Yes	___ No
4. PRESERVATION CONFIRMED:	___ Yes	___ No
5. RECEIVED ON ICE:	___ Yes	___ No
6. TEMPERATURE ON RECEIPT:	3°C	

FOR COMPLETION BY LAB ONLY

REMARKS / SAMPLE COMMENTS

APPENDIX B

Effluent and Dilution Water Data

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING									Fathead Minnow
Lab # / Sample ID		K804008			Test Start (Date/Time)		4/17/08		
Client		Weston			Test End (Date/Time)		4/24/08		
		Day of Test							
		1	2	3	4	5	6	7	notes/remarks
Control		4/17	4/18	4/19	4/20	4/21	4/22	4/23	
D.O. (mg/L)	INITIAL	76	79	78.1	7.7	7.6	8.1	82	
	FINAL	72	7.0	7.4	74	74	76	76	
pH (s.u.)	INITIAL	73	72	7.7	7.7	74	74	74	
	FINAL	70	7.7	7.3	72	74	74	74	
temp (C)	INITIAL	23.0	23.0	23.0	23.1	22.3	21.7	21.8	
	FINAL	250	25.0	25.0	250	250	250	250	
ALKALINITY (mg/L)		30							
HARDNESS (mg/L)		52							
CONDUCTIVITY (umhos/cm)		175							
CHLORINE (mg/L)		<0.05							
CONC:		32	32	32	32	32	32	32	
D.O. (mg/L)	INITIAL	76	76	8.2	7.9	76	83	82	
	FINAL	74	7.1	7.5	72	74	75	76	
pH (s.u)	INITIAL	69	74	7.4	7.3	69	72	72	
	FINAL	67	7.4	7.2	7.1	71	72	72	
temp (C)	INITIAL	23.1	23.4	23.2	23.1	22.3	21.6	21.9	
	FINAL	250	25.0	25.0	250	250	250	250	
CONC:		42	42	42	42	42	42	42	
D.O. (mg/L)	INITIAL	79	78	7.9	8.1	7.8	85	84	
	FINAL	77	6.8	7.7	7.3	75	75	76	
pH (mg/L)	INITIAL	69	73	7.5	7.4	7.0	7.2	72	
	FINAL	67	7.3	7.3	72	72	72	72	
temp (C)	INITIAL	23.3	24.1	23.2	23.2	22.3	21.6	21.9	
	FINAL	250	25.0	25.0	250	250	250	250	
CONC:		56	56	56	56	56	56	56	
D.O. (mg/L)	INITIAL	82	81	8.0	8.4	78	85	84	
	FINAL	77	6.9	7.7	73	75	75	77	
pH (s.u.)	INITIAL	69	72	7.5	7.4	7.1	72	72	
	FINAL	64	7.3	7.3	73	71	7.2	72	
temp (C)	INITIAL	23.5	25.0	23.0	23.1	22.4	21.5	22.1	
	FINAL	250	25.0	25.0	250	250	250	250	
CONC:		75	75	75	75	75	75	75	
D.O. (mg/L)	INITIAL	85	82	8.0	8.2	79	84	85	
	FINAL	78	7.1	7.2	7.1	75	74	77	
pH (s.u.)	INITIAL	69	71	7.5	7.5	7.1	7.2	71	
	FINAL	68	7.3	7.2	7.2	7.1	7.2	73	
temp (C)	INITIAL	23.6	25.2	23.2	23.1	22.3	21.5	22.2	
	FINAL	250	25.0	25.0	250	250	250	250	
CONC:		100	100	100	100	100	100	100	
D.O. (mg/L)	INITIAL	85	84	8.1	8.4	8.1	85	85	
	FINAL	79	7.2	7.6	72	76	75	77	
pH (s.u.)	INITIAL	69	70	7.4	7.4	72	72	71	
	FINAL	68	7.2	7.2	7.2	7.0	72	73	
temp (C)	INITIAL	23.8	25.0	23.1	23.3	22.4	21.4	22.3	
	FINAL	250	25.0	25.0	250	250	250	250	
CONC:	**100%**	A	A	BA	B	B	C	C	
ALKALINITY (mg/L)		8			16		20		
HARDNESS (mg/L)		>600			>600		>600		
CONDUCTIVITY (umhos/cm)		20800			20500		20700		
CHLORINE (mg/L)		<0.05			<0.05		<0.05		

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING										Cerodaphnia Dubia
Lab # / Sample ID		K804008			Test Start (Date/Time)		4/17/08			
Client		Weston			Test End (Date/Time)		4/23/08			
		Day of-Test								
		1	2	3	4	5	6	7	notes/remarks	
Control		4/17	4/18	4/19	4/20	4/21	4/22	4/23		
D.O. (mg/L)	INITIAL	76	79	8.1	7.6	7.6	81	82		
	FINAL	74	7.6	79	7.7	74	77			
pH (s.u.)	INITIAL	73	72	7.7	7.7	74	74	74		
	FINAL	73	7.5	7.4	7.8	77	72			
temp (C)	INITIAL	23.0	23.0	23.0	23.1	22.3	21.7	21.8		
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0			
ALKALINITY (mg/L)		30								
HARDNESS (mg/L)		52								
CONDUCTIVITY (umhos/cm)		175								
CHLORINE (mg/L)		<0.05								
CONC:		32	32	32	32	32	32	32		
D.O. (mg/L)	INITIAL	76	76	8.0	7.9	7.6	83	82		
	FINAL	75	7.6 7.6	7.7	7.7	75	77			
pH (s.u)	INITIAL	6.9	7.4	7.4	7.3	6.9	7.6	7.2		
	FINAL	7.0	7.1	7.4	7.4	7.4	7.3			
temp (C)	INITIAL	23.1	23.4	23.2	23.1	22.3	21.6	21.9		
	FINAL	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	79	78	7.9	8.1	7.8	85	84		
	FINAL	77	7.7	7.6	7.4	7.5	7.7			
pH (mg/L)	INITIAL	6.9	7.3	7.5	7.4	7.0	7.2	7.2		
	FINAL	7.0	7.2	7.4	7.3	7.4	7.3			
temp (C)	INITIAL	23.3	24.1	23.2	23.2	22.3	21.6	21.9		
	FINAL	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	82	8.1	8.0	8.4	7.8	8.5	8.4		
	FINAL	7.8	7.8	7.8	7.4	7.6	7.8			
pH (s.u.)	INITIAL	6.9	7.2	7.5	7.4	7.1	7.2	7.2		
	FINAL	7.0	7.1	7.4	7.4	7.4	7.3			
temp (C)	INITIAL	23.5	25.0	23.0	23.1	22.4	21.5	22.1		
	FINAL	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	8.5	8.2	8.0	8.2	7.9	8.4	8.5		
	FINAL	7.8	7.9	7.6	7.7	7.6	7.9			
pH (s.u.)	INITIAL	6.9	7.1	7.6	7.5	7.1	7.2	7.1		
	FINAL	6.9	7.1	7.4	7.3	7.4	7.3			
temp (C)	INITIAL	23.6	25.2	23.2	23.1	22.3	21.5	22.2		
	FINAL	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	8.5	8.4	8.1	8.4	8.1	8.5	8.5		
	FINAL	7.4	7.9	7.6	7.7	7.5	7.9			
pH (s.u.)	INITIAL	6.9	7.0	7.4	7.4	7.3	7.2	7.1		
	FINAL	6.9	7.1	7.3	7.3	7.3	7.2			
temp (C)	INITIAL	23.8	25.0	23.1	23.3	22.4	21.4	22.3		
	FINAL	25.0	25.0	25.0	25.0	25.0	25.0			
CONC:	**100%**	A	A	A	B	B	C	C		
ALKALINITY (mg/L)		8			16		20			
HARDNESS (mg/L)		>600			>600		>600			
CONDUCTIVITY (umhos/cm)		20800			20500		20700			
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 K804008 TEST START DATE 4/17 TIME 1340

CLIENT Weston TEST END DATE 4/24 TIME 0830

AGE AND SOURCE OF MINNOWS

		D A Y (NUMBER SURVIVING)								SURVIVAL		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: Control	A	8	8	8	8	8	8	8	8	100	95.0	7.21
	B	8	8	8	8	8	8	8	7	87.5		
	C	8	8	8	8	8	7	8	8	100		
	D	8	8	8	8	8	7	7	7	87.5		
	E	8	8	8	8	8	8	8	8	100		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 32	A	8	8	8	8	8	8	8	8	100	100	
	B	8	8	8	8	8	8	8	8	100		
	C	8	8	8	8	8	8	8	8	100		
	D	8	8	8	8	8	8	8	8	100		
	E	8	8	8	8	8	8	8	8	100		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 42	A	8	8	8	8	8	8	8	8	100	97.5	
	B	8	8	8	8	8	8	8	8	100		
	C	8	8	8	8	8	8	8	8	100		
	D	8	8	8	8	8	8	8	7	87.5		
	E	8	8	8	8	8	8	8	8	100		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 56	A	8	8	8	8	8	8	8	8	100	100	
	B	8	8	8	8	8	8	8	8	100		
	C	8	8	8	8	8	8	8	8	100		
	D	8	8	8	8	8	8	8	8	100		
	E	8	8	8	8	8	8	8	8	100		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 75	A	8	8	8	8	8	8	8	8	100	95	
	B	8	8	8	7	7	7	7	7	87.5		
	C	8	8	8	7	7	7	7	7	87.5		
	D	8	8	8	8	8	8	8	8	100		
	E	8	8	8	8	8	8	8	8	100		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: 100	A	8	8	8	7	7	7	7	7	87.5	97.5	7.21 5.73
	B	8	8	8	8	8	8	8	8	100		
	C	8	8	8	8	8	8	8	8	100		
	D	8	8	8	8	8	8	8	8	100		
	E	8	8	8	8	8	8	8	8	100		
ANALYST												
DATE:												
TIME:												

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID: K804008 TEST START DATE 4/17 TIME 1340

CLIENT: Weston TEST END DATE 4/24 TIME 0830

AGE AND SOURCE OF MINNOWS: Control

DAY (NUMBER SURVIVING)

	REP #	start	1	2	3	4	5	6	7	SURVIVAL %	MEAN %	CV
CONC: A	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D	2										
	E											
CONC: B	A	2	2	2	2	2	2	2	2			
	B								2			
	C								2			
	D											
	E											
CONC: C	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D	2										
	E											
CONC: D	A	2	2	2	2	2	2	2	2			
	B						2	2	2			
	C											
	D						2	2	2			
	E											
CONC: E	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D	2										
	E											
CONC:	A											
	B											
	C											
	D											
	E											
ANALYST		KP	KP	d	d	KP	KP	KP	KP			
DATE:		4/17	4/18	4-19	4-20	4/21	4/22	4/23	4/24			
TIME:		1340	1110	1005	1330	1110	1315	1015	0830			

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID	TEST START	DATE	TIME
CLIENT Weston	TEST END	DATE	TIME
	AGE AND SOURCE OF MINNOWS		
321.	D A Y (NUMBER SURVIVING)		SURVIVAL

CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
A	A	2	2	2	2	2	2	2	2			
	B	|	|	|	|	|	|	|	|			
	C	|	|	|	|	|	|	|	|			
	D	|	|	|	|	|	|	|	|			
	E											

CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
B	A	2	2	2	2	2	2	2	2			
	B	|	|	|	|	|	|	|	|			
	C	|	|	|	|	|	|	|	|			
	D	|	|	|	|	|	|	|	|			
	E											

CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
C	A	2	2	2	2	2	2	2	2			
	B	|	|	|	|	|	|	|	|			
	C	|	|	|	|	|	|	|	|			
	D	|	|	|	|	|	|	|	|			
	E											

CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
D	A	2	2	2	2	2	2	2	2			
	B	|	|	|	|	|	|	|	|			
	C	|	|	|	|	|	|	|	|			
	D	|	|	|	|	|	|	|	|			
	E											

CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
E	A	2	2	2	2	2	2	2	2			
	B	|	|	|	|	|	|	|	|			
	C	|	|	|	|	|	|	|	|			
	D	|	|	|	|	|	|	|	|			
	E											

CONC:	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
	A											
	B											
	C											
	D											
	E											
ANALYST				ct	ct							
DATE:	-	-		4/19	4-20							
TIME:	-	-		1005	1330							

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID			TEST START DATE			TIME							
CLIENT Weston			TEST END DATE			TIME							
421			AGE AND SOURCE OF MINNOWS										
			D A Y (NUMBER SURVIVING)								SURVIVAL		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: A	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D											
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: B	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D											
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: C	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D											
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: D	A	2	2	2	2	2	2	2	2			
	B								2			
	C								1			
	D								2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: E	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D											
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A											
	B											
	C											
	D											
	E											
ANALYST				CH	CH							
DATE:				4-19	4-20							
TIME:				1005	1330							

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID				TEST START DATE			TIME						
CLIENT Weston				TEST END DATE			TIME						
Stl.				AGE AND SOURCE OF MINNOWS									
				D A Y (NUMBER SURVIVING)							SURVIVAL		
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	2	2	2	2	2	2	2	2			
	B											
	C											
A	D											
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	2	2	2	2	2	2	2	2			
	B											
	C											
B	D											
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	2	2	2	2	2	2	2	2			
	B											
	C											
C	D											
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	2	2	2	2	2	2	2	2			
	B											
	C											
D	D											
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	2	2	2	2	2	2	1	2			
	B											
	C											
E	D											
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A											
	B											
	C											
	D											
	E											
ANALYST				CH	CH							
DATE:				4-19	4-20							
TIME:				1005	1330							

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID			TEST START DATE			TIME							
CLIENT Weston			TEST END DATE			TIME							
75%			AGE AND SOURCE OF MINNOWS										
			D A Y (NUMBER SURVIVING)							SURVIVAL			
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: A	A	2	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1	1			
	C	1	1	1	1	1	1	1	1			
	D	1	1	1	1	1	1	1	1			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: B	A	2	2	2	1	1	1	1	1			
	B	1	1	1	2	2	2	2	2			
	C	1	1	1	2	2	2	2	2			
	D	1	1	1	2	2	2	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: C	A	2	2	2	2	2	2	2	2			
	B	1	1	1	2	2	2	2	2			
	C	1	1	1	2	2	2	2	2			
	D	1	1	1	1	1	1	1	1			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: D	A	2	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1	2			
	C	1	1	1	1	1	1	1	2			
	D	1	1	1	1	1	1	1	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: E	A	2	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1	1			
	C	1	1	1	1	1	1	1	1			
	D	1	1	1	1	1	1	1	1			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A	2										
	B	1										
	C	1										
	D	1										
	E											
ANALYST				CA	CA							
DATE:				4-19	4-20							
TIME:				1005	1330							

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

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID			TEST START	DATE		TIME								
CLIENT Weston			TEST END	DATE		TIME								
100%			AGE AND SOURCE OF MINNOWS											
			D A Y (NUMBER SURVIVING)								SURVIVAL			
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: A	A	2	2	2	2	2	2	2	2			
	B				1	1	1	1	1			
	C				2	2	2	2	2			
	D				2	2	2	2	2			
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: B	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D											
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: C	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D											
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: D	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D											
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC: E	A	2	2	2	2	2	2	2	2			
	B											
	C											
	D											
	E											
	REP #	start	1	2	3	4	5	6	7	%	MEAN %	CV
CONC:	A											
	B											
	C											
	D											
	E											
ANALYST				CT	CD							
DATE:				4-14	4-20							
TIME:				1007	1220							

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:	K804009
CLIENT:	EEMA
ANALYSTS:	KP
SAMPLE ID:	SEE COC

TEST DATES (BEGIN / END):	4/17-24/08
WEIGHING DATE / TIME:	4/29/2008
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	1.02005	1.01725	0.00280	8	0.350	AVG DRY
	B	1.01905	1.01712	0.00193	8	0.241	WEIGHT (mg)
	C	1.01226	1.00954	0.00272	8	0.340	0.303
	D	1.00408	1.00206	0.00202	8	0.253	CV
	E	1.00800	1.00536	0.00264	8	0.330	17.06
CONC:	A	1.02276	1.01819	0.00457	8	0.571	AVG DRY
	B	1.00023	0.99546	0.00477	8	0.596	WEIGHT (mg)
32%	C	0.99889	0.99300	0.00589	8	0.736	0.626
	D	1.01808	1.01337	0.00471	8	0.589	CV
	E	1.01252	1.00742	0.00510	8	0.638	
CONC:	A	1.04739	1.04152	0.00587	8	0.734	AVG DRY
	B	1.02534	1.02001	0.00533	8	0.666	WEIGHT (mg)
42%	C	1.01750	1.01210	0.00540	8	0.675	0.683
	D	0.99171	0.98719	0.00452	8	0.565	CV
	E	1.00238	0.99617	0.00621	8	0.776	
CONC:	A	1.00799	1.00102	0.00697	8	0.871	AVG DRY
	B	1.00818	1.00188	0.00630	8	0.787	WEIGHT (mg)
56%	C	1.00731	1.00075	0.00656	8	0.820	0.840
	D	1.03424	1.02798	0.00626	8	0.783	CV
	E	0.99542	0.98791	0.00751	8	0.939	
CONC:	A	1.00331	0.99574	0.00757	8	0.946	AVG DRY
	B	0.98110	0.97426	0.00684	8	0.855	WEIGHT (mg)
75%	C	1.01155	1.00564	0.00591	8	0.739	0.874
	D	0.99526	0.98835	0.00691	8	0.864	CV
	E	1.00284	0.99510	0.00774	8	0.967	
CONC:	A	0.98454	0.97713	0.00741	8	0.926	AVG DRY
	B	0.97503	0.96626	0.00877	8	1.096	WEIGHT (mg)
100%	C	0.98665	0.97842	0.00823	8	1.029	0.982
	D	0.98753	0.98052	0.00701	8	0.876	CV
	E	1.04990	1.04204	0.00786	8	0.982	8.75

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

Pimephales promelas **FATHEAD MINNOW** TEST 1000.0

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s: K804008
CLIENT: Weston
ANALYSTS: KP
SAMPLE ID:

TEST DATES (BEGIN / END): 4/17-24/08
WEIGHING DATE / TIME: 4/29/08 1540
DRYING TEMP (DEGREES C): 60
DRYING TIME (HOURS): 24

	REP#	FINAL DRY WEIGHT TIN+LARVAE (g)	INTIAL WEIGHT TIN (g)	TOTAL DRY WEIGHT OF LARVAE (g)	NUMBER OF LARVAE	DRY WEIGHT OF LARVAE (mg)	
CONTROL	A 1	1.02005	1.01725				AVG DRY WEIGHT (mg)
	B 2	1.01905	1.01712				
Control	C 3	1.01726	1.00954				
	D 4	1.00408	1.00206				CV
	E 5	1.00800	1.00536				
CONC:	A 6	1.02276	1.01819				AVG DRY WEIGHT (mg)
	B 7	1.00023	0.99546				
32	C 8	0.99889	0.99360				
	D 9	1.01808	1.00742	1.01337			CV
	E 10	1.01252	1.00742				
CONC:	A 11	1.04739	1.04152				AVG DRY WEIGHT (mg)
	B 12	1.02534	1.02001				
42	C 13	1.01750	1.01210				
	D 14	0.99171	0.98719				CV
	E 15	1.00238	0.99617				
CONC:	A 16	1.00799	1.00102				AVG DRY WEIGHT (mg)
	B 17	1.00818	1.00188				
56	C 18	1.00731	1.00075				
	D 19	1.03424	1.02798				CV
	E 20	0.99542	0.98741				
CONC:	A 21	1.00331	0.99574				AVG DRY WEIGHT (mg)
	B 22	0.98110	0.97426				
75	C 23	1.01155	1.00564				
	D 24	0.99526	0.98835				CV
	E 25	1.00284	0.99510				
CONC:	A 26	0.98454	0.97713				AVG DRY WEIGHT (mg)
	B 27	0.97503	0.96626				
100	C 28	0.98665	0.97842				
	D 29	0.98753	0.98052				CV
	E 30	1.04990	1.04204				

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

AA # K804008, FATHEAD MINNOW SURVIVAL, CHRONIC, 4-17-08
File: J:\TOXSTAT\MONTE\K703010F. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.135

W = 0.814

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 # K804008, FATHEAD MINNOW SURVIVAL, CHRONIC, 4-17-08
File: J:\TOXSTAT\MONTE\K703010F. 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 # K804008, FATHEAD MINNOW SURVIVAL, CHRONIC, 4-17-08
FILE: J:\TOXSTAT\MONTE\K703010F.
TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	1.0000	1.3931
1	CONTROL	2	0.8750	1.2094
1	CONTROL	3	1.0000	1.3931
1	CONTROL	4	0.8750	1.2094
1	CONTROL	5	1.0000	1.3931
2	32 % EFFLUENT	1	1.0000	1.3931
2	32 % EFFLUENT	2	1.0000	1.3931
2	32 % EFFLUENT	3	1.0000	1.3931
2	32 % EFFLUENT	4	1.0000	1.3931
2	32 % EFFLUENT	5	1.0000	1.3931

3	42 % EFFLUENT	1	1.0000	1.3931
3	42 % EFFLUENT	2	1.0000	1.3931
3	42 % EFFLUENT	3	1.0000	1.3931
3	42 % EFFLUENT	4	0.8750	1.2094
3	42 % EFFLUENT	5	1.0000	1.3931
4	56 % EFFLUENT	1	1.0000	1.3931
4	56 % EFFLUENT	2	1.0000	1.3931
4	56 % EFFLUENT	3	1.0000	1.3931
4	56 % EFFLUENT	4	1.0000	1.3931
4	56 % EFFLUENT	5	1.0000	1.3931
5	75 % EFFLUENT	1	1.0000	1.3931
5	75 % EFFLUENT	2	0.8750	1.2094
5	75 % EFFLUENT	3	0.8750	1.2094
5	75 % EFFLUENT	4	1.0000	1.3931
5	75 % EFFLUENT	5	1.0000	1.3931
6	100 % EFFLUENT	1	0.8750	1.2094
6	100 % EFFLUENT	2	1.0000	1.3931
6	100 % EFFLUENT	3	1.0000	1.3931
6	100 % EFFLUENT	4	1.0000	1.3931
6	100 % EFFLUENT	5	1.0000	1.3931

AA # K804008, FATHEAD MINNOW SURVIVAL, CHRONIC, 4-17-08
File: J:\TOXSTAT\MONTE\K703010F. Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.027	0.005	0.960
Within (Error)	24	0.135	0.006	
Total	29	0.162		

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

AA # K804008, FATHEAD MINNOW SURVIVAL, CHRONIC, 4-17-08
File: J:\TOXSTAT\MONTE\K703010F. Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	CONTROL	1.320	0.950		
2	32 % EFFLUENT	1.393	1.000	-1.549	
3	42 % EFFLUENT	1.356	0.975	-0.775	
4	56 % EFFLUENT	1.393	1.000	-1.549	
5	75 % EFFLUENT	1.320	0.950	0.000	
6	100 % EFFLUENT	1.356	0.975	-0.775	

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

AA # K804008, FATHEAD MINNOW SURVIVAL, CHRONIC, 4-17-08
File: J:\TOXSTAT\MONTE\K703010F. Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETT'S TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	CONTROL	5			
2	32 % EFFLUENT	5	0.064	6.8	-0.050
3	42 % EFFLUENT	5	0.064	6.8	-0.025
4	56 % EFFLUENT	5	0.064	6.8	-0.050
5	75 % EFFLUENT	5	0.064	6.8	0.000
6	100 % EFFLUENT	5	0.064	6.8	-0.025

AA # K804008, FATHEAD MINNOW SURVIVAL, CHRONIC, 4-17-08
File: J:\TOXSTAT\MONTE\K703010F. 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	1.320				
2	32 % EFFLUENT	1.393	32.50	16.00	5.00	
3	42 % EFFLUENT	1.356	30.00	16.00	5.00	
4	56 % EFFLUENT	1.393	32.50	16.00	5.00	
5	75 % EFFLUENT	1.320	27.50	16.00	5.00	
6	100 % EFFLUENT	1.356	30.00	16.00	5.00	

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

AA # K804008, FATHEAD MINNOW GROWTH, CHRONIC, 4-17-08
File: J:/toxstat/monte\K703010G. Transform: NO TRANSFORMATION

Shapiro - Wilk's test for normality

D = 0.133

W = 0.965

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 # K804008, FATHEAD MINNOW GROWTH, CHRONIC, 4-17-08
File: J:/toxstat/monte\K703010G. Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 1.49

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 # K804008, FATHEAD MINNOW GROWTH, CHRONIC, 4-17-08
FILE: J:/toxstat/monte\K703010G.
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	0.3500	0.3500
1	CONTROL	2	0.2410	0.2410
1	CONTROL	3	0.3400	0.3400
1	CONTROL	4	0.2530	0.2530
1	CONTROL	5	0.3300	0.3300
2	32 % EFFLUENT	1	0.5710	0.5710
2	32 % EFFLUENT	2	0.5960	0.5960
2	32 % EFFLUENT	3	0.7360	0.7360
2	32 % EFFLUENT	4	0.5890	0.5890
2	32 % EFFLUENT	5	0.6380	0.6380
3	42 % EFFLUENT	1	0.7340	0.7340
3	42 % EFFLUENT	2	0.6660	0.6660
3	42 % EFFLUENT	3	0.6750	0.6750
3	42 % EFFLUENT	4	0.5650	0.5650
3	42 % EFFLUENT	5	0.7760	0.7760
4	56 % EFFLUENT	1	0.8710	0.8710

4	56 % EFFLUENT	2	0.7870	0.7870
4	56 % EFFLUENT	3	0.8200	0.8200
4	56 % EFFLUENT	4	0.7830	0.7830
4	56 % EFFLUENT	5	0.9390	0.9390
5	75 % EFFLUENT	1	0.9460	0.9460
5	75 % EFFLUENT	2	0.8550	0.8550
5	75 % EFFLUENT	3	0.7390	0.7390
5	75 % EFFLUENT	4	0.8640	0.8640
5	75 % EFFLUENT	5	0.9670	0.9670
6	100 % EFFLUENT	1	0.9260	0.9260
6	100 % EFFLUENT	2	1.0960	1.0960
6	100 % EFFLUENT	3	1.0290	1.0290
6	100 % EFFLUENT	4	0.8760	0.8760
6	100 % EFFLUENT	5	0.9820	0.9820

AA # K804008, FATHEAD MINNOW GROWTH, CHRONIC, 4-17-08
File: J:/toxstat/monte\K703010G. Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	1.455	0.291	52.488
Within (Error)	24	0.133	0.006	
Total	29	1.588		

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

AA # K804008, FATHEAD MINNOW GROWTH, CHRONIC, 4-17-08
File: J:/toxstat/monte\K703010G. 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	0.303	0.303		
2	32 % EFFLUENT	0.626	0.626	-6.864	
3	42 % EFFLUENT	0.683	0.683	-8.079	
4	56 % EFFLUENT	0.840	0.840	-11.409	
5	75 % EFFLUENT	0.874	0.874	-12.135	
6	100 % EFFLUENT	0.982	0.982	-14.420	

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

AA # K804008, FATHEAD MINNOW GROWTH, CHRONIC, 4-17-08
File: J:/toxstat/monte\K703010G. 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	0.111	36.7	-0.323
3	42 % EFFLUENT	5	0.111	36.7	-0.380
4	56 % EFFLUENT	5	0.111	36.7	-0.537
5	75 % EFFLUENT	5	0.111	36.7	-0.571
6	100 % EFFLUENT	5	0.111	36.7	-0.679

APPENDIX D

Ceriodaphnia dubia Raw Data and Statistics

Cerodaphnia dubia

SURVIVAL AND REPRODUCTION TEST

Discharger: Lweston
Location:
Date Sample Collected: See COC

Lab Number/s: 1804008

Analyst: KP
Test Start - Date/ Time: 4/17/08 12:15
Test Stop - Date/Time: 4/23/08 08:20

Conc 1 (Control)

%	Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adult	Young/ Adult	Analyst
	1	0	0	0	0	0	0	0	0	0	0	0	10	0	KP
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	ct
	3	6	0	3	2	1	5	4	4	2	4	31	10	3.1	KP
	4	7	6	1	4	4	1	6	7	6	8	47	10	4.7	KP
	5	7	7	5	6	4	8	9	8	10	7	71	10	7.1	KP
	6	2	7	6	6	1	12	0	3	8	4	49	10	4.9	KP
	7														
	8													$\bar{x}$=19.8	
	Total	22	20	15	18	7	26	19	22	26	23	198		CV= 23.6	

Conc 2 (35)

%	Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adult	Young/ Adult	Analyst
	1	0	0	0	0	0	0	0	0	0	0	0	10	0	
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	ct
	3	2	3	1	X	2	2	2	5	4	2	21	9	2.3	
	4	5	8	6	-	3	4	3	7	8	3	47	9	5.2	
	5	6	8	9	-	9	6	8	7	7	4	64	9	7.1	
	6	4	4	6	-	5	7	8	3	5	7	49	9	5.4	
	7														
	8														
	Total	15	23	22	X	19	19	21	22	24	16	181			

Conc 3 (42)

%	Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adult	Young/ Adult	Analyst
	1	0	0	0	0	0	0	0	0	0	0	0	10	0	
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	ct
	3	3	4	2	3	6	2	2	7	1	3	33	10	3.3	
	4	7	8	0	0	3	7	4	0	2	6	37	10	3.7	
	5	4	5	8	9	7	3	9	6	8		66	10	6.6	
	6	4	8	11	8	7	0	8	3	2	7	58	10	5.8	
	7														
	8														
	Total	18	27	18	19	25	16	17	19	11	24	194			

X= DEAD; Y= MALE

Conc 4 (56)

%	Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adult	Young/ Adult	Analyst
	1	0	0	0	0	0	0	0	0	0	0	0	10	0	
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	ct
	3	3	5	3	2	4	4	5	3	1	4	34	10	3.4	
	4	4	7	6	6	4	6	5	3	4	8	58	10	5.8	
	5	7	7	6	8	10	7	6	5	9	7	72	10	7.2	
	6	2	5	3	8	7	5	6	5	5	6	46	10	4.6	
	7														
	8														
	Total	21	24	18	18	25	24	22	16	19	25	210			

Conc 5 (75)

%	Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adult	Young/ Adult	Analyst
	1	0	0	0	0	0	0	0	0	0	0	0	10	0	
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	ct
	3	2	3	1	5	2	2	4	5	5	5	34	10	3.4	
	4	5	1	2	3	6	4	2	1	3	8	42	10	4.2	
	5	5	5	3	4	6	6	7	8	6	7	53	10	5.3	
	6	3	0	4	5	6	7	7	10	4	2	48	10	4.8	
	7														
	8														
	Total	15	11	10	17	20	18	20	24	20	22	177			

Conc 6 (100)

%	Day	A	B	C	D	E	F	G	H	I	J	No. of Young	No. of Adult	Young/ Adult	Analyst
	1	0	0	0	0	0	0	0	0	0	0	0	10	0	
	2	0	0	0	0	0	0	0	0	0	0	0	10	0	ct
	3	2	1	4	3	2	2	4	5	3	3	28	10	2.8	
	4	6	2	5	7	3	3	1	8	4	2	47	10	4.7	
	5	5	4	0	6	4	3	5	6	4	3	44	10	4.4	
	6	0	6	5	5	7	8	8	9	7	10	65	10	6.5	
	7														
	8														
	Total	13	13	14	21	16	16	24	23	25	18	184			

$\bar{x}$= 18.4
CV= 25.1

2007

AA # K804008, CERIODAPHNIA DUBIA REPRODUCTION, 4-17-08
File: J:/toxstat/monte\K703010C. 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 # K804008, CERIODAPHNIA DUBIA REPRODUCTION, 4-17-08
File: J:/toxstat/monte\K703010C. Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance
Calculated B1 statistic = 4.01

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 # K804008, CERIODAPHNIA DUBIA REPRODUCTION, 4-17-08
FILE: J:/toxstat/monte\K703010C.
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	CONTROL	1	22.0000	22.0000
1	CONTROL	2	20.0000	20.0000
1	CONTROL	3	15.0000	15.0000
1	CONTROL	4	18.0000	18.0000
1	CONTROL	5	7.0000	7.0000
1	CONTROL	6	26.0000	26.0000
1	CONTROL	7	19.0000	19.0000
1	CONTROL	8	22.0000	22.0000
1	CONTROL	9	26.0000	26.0000
1	CONTROL	10	23.0000	23.0000
2	32 % EFFLUENT	1	15.0000	15.0000
2	32 % EFFLUENT	2	23.0000	23.0000
2	32 % EFFLUENT	3	22.0000	22.0000
2	32 % EFFLUENT	4	1.0000	1.0000
2	32 % EFFLUENT	5	19.0000	19.0000
2	32 % EFFLUENT	6	19.0000	19.0000

2	32 % EFFLUENT	7	21.0000	21.0000
2	32 % EFFLUENT	8	22.0000	22.0000
2	32 % EFFLUENT	9	24.0000	24.0000
2	32 % EFFLUENT	10	16.0000	16.0000
3	42 % EFFLUENT	1	18.0000	18.0000
3	42 % EFFLUENT	2	27.0000	27.0000
3	42 % EFFLUENT	3	18.0000	18.0000
3	42 % EFFLUENT	4	19.0000	19.0000
3	42 % EFFLUENT	5	25.0000	25.0000
3	42 % EFFLUENT	6	16.0000	16.0000
3	42 % EFFLUENT	7	17.0000	17.0000
3	42 % EFFLUENT	8	19.0000	19.0000
3	42 % EFFLUENT	9	11.0000	11.0000
3	42 % EFFLUENT	10	24.0000	24.0000
4	56 % EFFLUENT	1	21.0000	21.0000
4	56 % EFFLUENT	2	24.0000	24.0000
4	56 % EFFLUENT	3	18.0000	18.0000
4	56 % EFFLUENT	4	16.0000	16.0000
4	56 % EFFLUENT	5	25.0000	25.0000
4	56 % EFFLUENT	6	24.0000	24.0000
4	56 % EFFLUENT	7	22.0000	22.0000
4	56 % EFFLUENT	8	16.0000	16.0000
4	56 % EFFLUENT	9	19.0000	19.0000
4	56 % EFFLUENT	10	25.0000	25.0000
5	75 % EFFLUENT	1	15.0000	15.0000
5	75 % EFFLUENT	2	11.0000	11.0000
5	75 % EFFLUENT	3	10.0000	10.0000
5	75 % EFFLUENT	4	17.0000	17.0000
5	75 % EFFLUENT	5	20.0000	20.0000
5	75 % EFFLUENT	6	18.0000	18.0000
5	75 % EFFLUENT	7	20.0000	20.0000
5	75 % EFFLUENT	8	24.0000	24.0000
5	75 % EFFLUENT	9	20.0000	20.0000
5	75 % EFFLUENT	10	22.0000	22.0000
6	100 % EFFLUENT	1	13.0000	13.0000
6	100 % EFFLUENT	2	13.0000	13.0000
6	100 % EFFLUENT	3	14.0000	14.0000
6	100 % EFFLUENT	4	21.0000	21.0000
6	100 % EFFLUENT	5	16.0000	16.0000
6	100 % EFFLUENT	6	16.0000	16.0000
6	100 % EFFLUENT	7	24.0000	24.0000
6	100 % EFFLUENT	8	23.0000	23.0000
6	100 % EFFLUENT	9	25.0000	25.0000
6	100 % EFFLUENT	10	19.0000	19.0000

AA # K804008, CERIODAPHNIA DUBIA REPRODUCTION, 4-17-08
File: J:/toxstat/monte\K703010C. Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	74.483	14.897	0.580
Within (Error)	54	1388.100	25.706	
Total	59	1462.583		

Critical F value = 2.45 (0.05,5,40)
Since F < Critical F FAIL TO REJECT Ho: All equal

AA # K804008, CERIODAPHNIA DUBIA REPRODUCTION, 4-17-08
File: J:/toxstat/monte\K703010C. 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	19.800	19.800		
2	32 % EFFLUENT	18.200	18.200	0.706	
3	42 % EFFLUENT	19.400	19.400	0.176	
4	56 % EFFLUENT	21.000	21.000	-0.529	
5	75 % EFFLUENT	17.700	17.700	0.926	
6	100 % EFFLUENT	18.400	18.400	0.617	

Dunnett table value = 2.31 (1 Tailed Value, P=0.05, df=40,5)

AA # K804008, CERIODAPHNIA DUBIA REPRODUCTION, 4-17-08
File: J:/toxstat/monte\K703010C. 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	10			
2	32 % EFFLUENT	10	5.238	26.5	1.600
3	42 % EFFLUENT	10	5.238	26.5	0.400
4	56 % EFFLUENT	10	5.238	26.5	-1.200
5	75 % EFFLUENT	10	5.238	26.5	2.100
6	100 % EFFLUENT	10	5.238	26.5	1.400

AA # K804008, CERIODAPHNIA DUBIA REPRODUCTION, 4-17-08
File: J:/toxstat/monte\K703010C. Transform: NO TRANSFORMATION

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

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	19.800				
2	32 % EFFLUENT	18.200	98.00	75.00	10.00	
3	42 % EFFLUENT	19.400	98.00	75.00	10.00	
4	56 % EFFLUENT	21.000	108.00	75.00	10.00	
5	75 % EFFLUENT	17.700	90.50	75.00	10.00	
6	100 % EFFLUENT	18.400	94.00	75.00	10.00	

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

FISHER'S EXACT TEST

IDENTIFICATION	NUMBER OF ALIVE	NUMBER OF DEAD	TOTAL ANIMALS
CONTROL	10	0	10
32%	9	1	10
TOTAL	19	1	20

CRITICAL FISHER'S VALUE (10,10,10) (p=0.05) IS 6. b VALUE IS 9.
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	NUMBER OF DEAD	TOTAL ANIMALS
CONTROL	10	0	10
42%	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	NUMBER OF DEAD	TOTAL ANIMALS
CONTROL	10	0	10

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

TITLE: AA # K804008, CERIODAPHNIA DUBIA REPRODUCTION, 4-17-08
FILE: J:/toxstat/monte\K703010C.
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

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

4	56	%	EFFLUENT	6	24.0000	24.0000
4	56	%	EFFLUENT	7	22.0000	22.0000
4	56	%	EFFLUENT	8	16.0000	16.0000
4	56	%	EFFLUENT	9	19.0000	19.0000
4	56	%	EFFLUENT	10	25.0000	25.0000
5	75	%	EFFLUENT	1	15.0000	15.0000
5	75	%	EFFLUENT	2	11.0000	11.0000
5	75	%	EFFLUENT	3	10.0000	10.0000
5	75	%	EFFLUENT	4	17.0000	17.0000
5	75	%	EFFLUENT	5	20.0000	20.0000
5	75	%	EFFLUENT	6	18.0000	18.0000
5	75	%	EFFLUENT	7	20.0000	20.0000
5	75	%	EFFLUENT	8	24.0000	24.0000
5	75	%	EFFLUENT	9	20.0000	20.0000
5	75	%	EFFLUENT	10	22.0000	22.0000
6	100	%	EFFLUENT	1	13.0000	13.0000
6	100	%	EFFLUENT	2	13.0000	13.0000
6	100	%	EFFLUENT	3	14.0000	14.0000
6	100	%	EFFLUENT	4	21.0000	21.0000
6	100	%	EFFLUENT	5	16.0000	16.0000
6	100	%	EFFLUENT	6	16.0000	16.0000
6	100	%	EFFLUENT	7	24.0000	24.0000
6	100	%	EFFLUENT	8	23.0000	23.0000
6	100	%	EFFLUENT	9	25.0000	25.0000
6	100	%	EFFLUENT	10	19.0000	19.0000

APPENDIX E

Organism History

AQUATOX, INC.
416 Twin Points Road
Hot Springs, Arkansas 71913
(501) 520-0560

TEST ORGANISM HISTORY

DATE SHIPPED 4-17-08 Arkansas Analytical

SPECIES Pimephales promelas

QUANTITY SHIPPED 300+

AGE/LIFE STAGE 48hrs 4/17 1500+

BROODSTOCK SOURCE Aquatox Hot Springs, AR

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: 4/11/06

SPECIES: Ceriodaphnia dubia

AGE: Variable

LIFE STAGE: Adult

HATCH DATE: Variable

BEGAN FEEDING: Immediately

FOOD: YTC, Selenastrum

Water Chemistry Record:	Current	Range
TEMPERATURE:	23°C	22-25°C
SALINITY/CONDUCTIVITY:	--	--
TOTAL HARDNESS (as $CaCO_3$):	124 mg/l	60-138 mg/l
TOTAL ALKALINITY (as $CaCO_3$):	100 mg/l	50-110 mg/l
pH:	7.95	7.10-8.32

Comments:

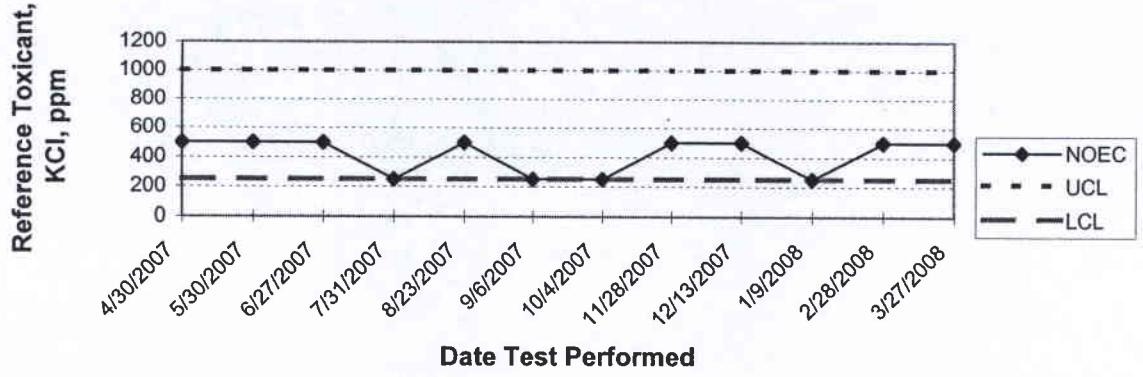
Facility Supervisor

APPENDIX F

Quality Assurance Charts

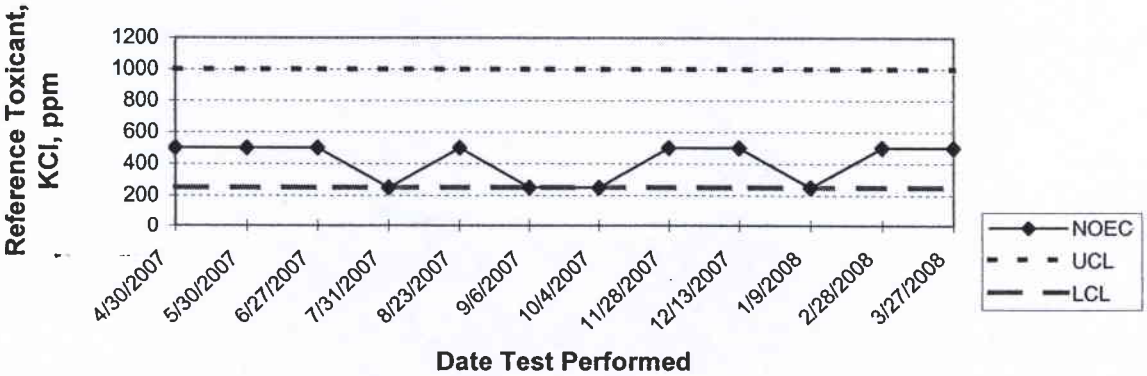
ARKANSAS ANALYTICAL, INC.

FATHEAD MINNOW SURVIVAL
QUALITY ASSURANCE



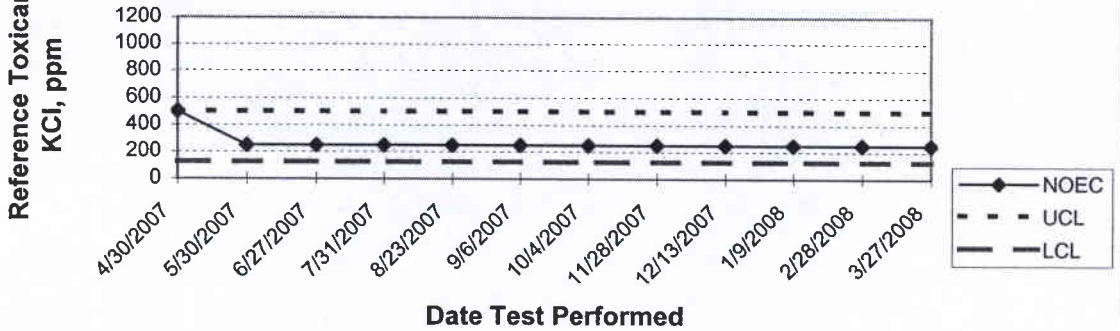
ARKANSAS ANALYTICAL, INC.

FATHEAD MINNOW GROWTH
QUALITY ASSURANCE



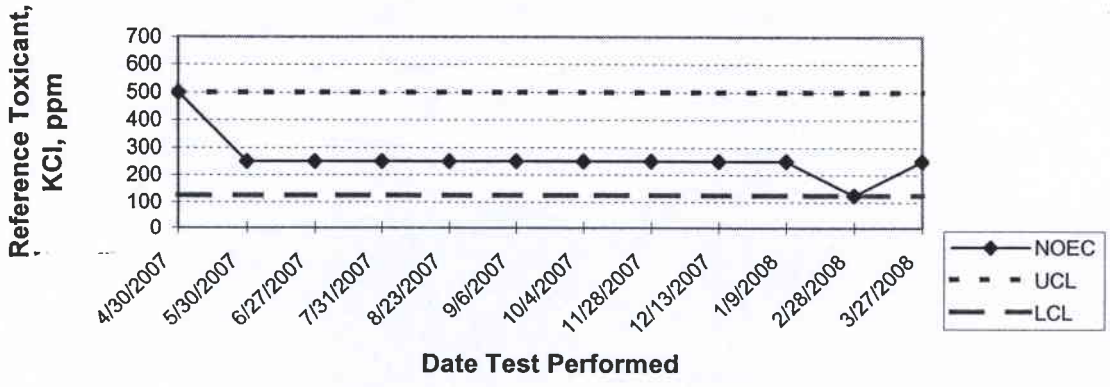
ARKANSAS ANALYTICAL, INC.

CERIODAPHNIA DUBIA SURVIVAL
QUALITY ASSURANCE



ARKANSAS ANALYTICAL, INC.

CERIODAPHNIA DUBIA REPRODUCTION
QUALITY ASSURANCE



APPENDIX G

Lab Certification

State of Arkansas
Department of Environmental Quality
Laboratory Certification Program

Arkansas Analytical, Inc.

Little Rock, AR

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

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

Laboratory ID: **60-1754**

Certificate Number: **07-084-0**

Issued Date: **30 October 2007**

Expired Date: **30 October 2008**

Teresa Marks

ADEQ Director