

Arkansas Analytical, Inc.

Toxicity Test Results

MAGCOBAR MINE SITE
NPDES PERMIT NUMBER: AR0049794
April 2009
AFIN# 00-00348

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

Ceriodaphnia dubia, Survival and Reproduction Test
Test 1002.0

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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 2009.

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:	4-14-09, 0922	4-15-09, 0922
Sample #2:	4-15-09, 0804	4-16-09, 0804
Sample #3:	4-19-09, 0915	4-20-09, 0915

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:	4-15-09, 1446	4
Sample #2:	4-16-09, 1439	4
Sample #3:	4-20-09, 1454	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. 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	80%	X	
Average of 15 or more young per surviving female	16.8	X	
At least 60% of surviving females should have produced 3 broods	75%	X	
The percent coefficient of variation between replicates must be 40% or less for the young of surviving females	30.2%	X	

TEST ACCEPTANCE CRITERIA for *Pimephales promelas*

Control Criteria	Results	Pass	Fail
Greater than or equal to 80% survival	97.5%	X	
The percent coefficient of variation between replicates must be 40% or less for survival	5.73%	X	
Minimum of 0.25 mg average dry weight of surviving controls	0.300	X	
The percent coefficient of variation between replicates must be 40% or less for growth	8.25%	X	

Reference Toxicant

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

REFERENCE TOXICANT

<i>Ceriodaphnia dubia</i> 3/31/09, 4/7/09		<i>Pimephales promelas</i> 3/31/09, 4/7/09	
NOEC Survival:	125 ppm KCl	NOEC Survival:	500 ppm KCl
LOEC Survival:	250 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.

Summary of Results Magcobar Mine Site

<i>Ceriodaphnia dubia</i>		<i>Pimephales promelas</i>	
NOEC / LOEC Survival	100% / NA	NOEC / LOEC survival	100% / NA
NOEC / LOEC Reproduction	100% / NA	NOEC / LOEC growth	100% / NA
Mean number of neonates (critical dilution)	14.1	%CV survival (critical dilution)	5.73%
%CV Reproduction (critical dilution)	38.4%	Mean dry weight (critical dilution) in milligrams	0.492
		%CV growth (critical dilution)	16.4%
PMSD Reproduction	47	PMSD Growth	24.3

Conclusion

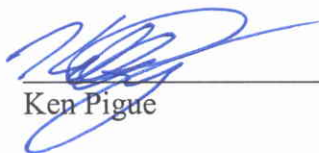
Chronic static renewal larval survival and growth test using fathead minnow, *Pimephales promelas*, (Method 1000.0).

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



Melissa Green

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:	4-14-09, 0922	4-15-09, 0922
Sample #2:	4-15-09, 0804	4-16-09, 0804
Sample #3:	4-19-09, 0915	4-20-09, 0915

Test initiated (date, time): 4-16-09, 1310 Test terminated (date, time): 4-23-09, 1110

Dilution water used: Soft Synthetic

DATA TABLE FOR FATHEAD MINNOW SURVIVAL

Effluent Conc %	Percent Survival in Replicate Chambers						Mean Percent Survival			CV %
	A	B	C	D	E		24 hours	48 hours	7 days	
0%	100	87.5	100	100	100		100	100	97.5	5.73
32%	100	100	100	100	100		100	100	100	
42%	100	100	100	100	100		100	100	100	
56%	100	87.5	100	100	100		100	100	97.5	
75%	100	100	87.5	100	100		100	100	97.5	
100%	100	100	87.5	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%	0.283	0.327	0.286	0.325	0.276		0.299	8.25
32%	0.405	0.356	0.418	0.435	0.418		0.406	
42%	0.329	0.395	0.489	0.362	0.366		0.388	
56%	0.387	0.455	0.522	0.381	0.479		0.445	
75%	0.493	0.449	0.380	0.454	0.511		0.457	
100%	0.506	0.451	0.474	0.409	0.622		0.492	16.4

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)= 16.4 %

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:	4-14-09, 0922	4-15-09, 0922
Sample #2:	4-15-09, 0804	4-16-09, 0804
Sample #3:	4-19-09, 0915	4-20-09, 0915

Test initiated (date, time): 4-16-09, 0900 Test terminated (date, time): 4-23-09, 0830

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	11	18	x0	16	11	22
B	25	6	11	17	9	12
C	20	9	20	x0	12	14
D	22	18	7	8	12	3
E	15	11	9	17	16	12
F	13	20	20	18	x0	20
G	x0	24	19	15	15	13
H	x11	11	13	6	x0	15
I	16	12	9	10	12	x4
J	12	x0	24	10	17	16
Mean	14.5	12.9	13.2	11.7	10.4	13.1
Mean/surviving female	16.8	14.3	14.7	13.0	13.0	14.1
CV%*	30.2					38.4

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

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

SUMMARY REPORTING FORMS FOR CHRONIC BIOMONITORING

Ceriodaphnia dubia SURVIVAL AND REPRODUCTION

Permittee: 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	90	90	90	100	100
Test termination	80	90	90	90	80	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

APPENDIX B

Effluent and Dilution Water Data

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Fathead Minnow

Lab # / Sample ID K904006

Test Start (Date/Time) 4/16/09

Client Weston

Test End (Date/Time) 4/21/09

		Day of Test							notes/remarks
		1	2	3	4	5	6	7	
Control	<u>SS 205</u>	<u>4/16</u>	<u>4/17</u>	<u>4/18</u>	<u>4/19</u>	<u>4/20</u>	<u>4/21</u>	<u>4/22</u>	
D.O. (mg/L)	INITIAL	<u>7.9</u>	<u>7.9</u>	<u>7.8</u>	<u>7.7</u>	<u>7.8</u>	<u>8.2</u>	<u>8.5</u>	
	FINAL	<u>7.9</u>	<u>7.5</u>	<u>7.7</u>	<u>7.6</u>	<u>7.5</u>	<u>7.4</u>	<u>7.7</u>	
pH (s.u.)	INITIAL	<u>7.7</u>	<u>7.6</u>	<u>7.7</u>	<u>7.0</u>	<u>7.9</u>	<u>8.1</u>	<u>7.7</u>	
	FINAL	<u>7.4</u>	<u>7.3</u>	<u>7.5</u>	<u>7.5</u>	<u>7.4</u>	<u>7.8</u>	<u>7.6</u>	
temp (C)	INITIAL	<u>21.8</u>	<u>22.6</u>	<u>22.0</u>	<u>22.1</u>	<u>22.5</u>	<u>21.5</u>	<u>21.8</u>	
	FINAL	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	
ALKALINITY (mg/L)		<u>28</u>						<u>1</u>	
HARDNESS (mg/L)		<u>50</u>						<u>1</u>	
CONDUCTIVITY (umhos/cm)		<u>178</u>						<u>1</u>	
CHLORINE (mg/L)		<u><0.05</u>						<u>1</u>	
CONC:	<u>32</u>								
D.O. (mg/L)	INITIAL	<u>7.7</u>	<u>8.0</u>	<u>7.9</u>	<u>7.8</u>	<u>8.0</u>	<u>8.4</u>	<u>8.5</u>	
	FINAL	<u>7.8</u>	<u>7.6</u>	<u>7.4</u>	<u>7.6</u>	<u>7.5</u>	<u>7.4</u>	<u>7.7</u>	
pH (s.u.)	INITIAL	<u>7.4</u>	<u>7.2</u>	<u>7.4</u>	<u>7.3</u>	<u>7.5</u>	<u>7.6</u>	<u>7.4</u>	
	FINAL	<u>7.1</u>	<u>7.3</u>	<u>7.5</u>	<u>7.4</u>	<u>7.2</u>	<u>7.5</u>	<u>7.2</u>	
temp (C)	INITIAL	<u>22.0</u>	<u>22.9</u>	<u>22.4</u>	<u>22.1</u>	<u>22.5</u>	<u>21.4</u>	<u>23.2</u>	
	FINAL	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	
CONC:	<u>42</u>								
D.O. (mg/L)	INITIAL	<u>7.7</u>	<u>8.2</u>	<u>8.0</u>	<u>8.0</u>	<u>8.0</u>	<u>8.3</u>	<u>8.6</u>	
	FINAL	<u>7.8</u>	<u>7.0</u>	<u>7.7</u>	<u>7.7</u>	<u>7.3</u>	<u>7.4</u>	<u>7.8</u>	
pH (mg/L)	INITIAL	<u>7.0</u>	<u>7.2</u>	<u>7.3</u>	<u>7.2</u>	<u>7.5</u>	<u>7.4</u>	<u>7.7</u>	
	FINAL	<u>7.1</u>	<u>7.2</u>	<u>7.4</u>	<u>7.4</u>	<u>7.3</u>	<u>7.4</u>	<u>7.2</u>	
temp (C)	INITIAL	<u>22.1</u>	<u>23.3</u>	<u>22.6</u>	<u>22.2</u>	<u>22.6</u>	<u>21.4</u>	<u>24.1</u>	
	FINAL	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	
CONC:	<u>56</u>								
D.O. (mg/L)	INITIAL	<u>7.7</u>	<u>8.3</u>	<u>8.0</u>	<u>8.1</u>	<u>8.0</u>	<u>8.3</u>	<u>8.5</u>	
	FINAL	<u>7.9</u>	<u>7.7</u>	<u>7.8</u>	<u>7.7</u>	<u>7.5</u>	<u>7.4</u>	<u>7.9</u>	
pH (s.u.)	INITIAL	<u>6.8</u>	<u>7.2</u>	<u>7.3</u>	<u>7.2</u>	<u>7.5</u>	<u>7.5</u>	<u>7.7</u>	
	FINAL	<u>7.2</u>	<u>7.1</u>	<u>7.4</u>	<u>7.3</u>	<u>7.0</u>	<u>7.3</u>	<u>7.2</u>	
temp (C)	INITIAL	<u>22.2</u>	<u>23.8</u>	<u>22.7</u>	<u>22.4</u>	<u>22.8</u>	<u>21.4</u>	<u>24.7</u>	
	FINAL	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	
CONC:	<u>75</u>								
D.O. (mg/L)	INITIAL	<u>8.0</u>	<u>8.4</u>	<u>8.2</u>	<u>8.3</u>	<u>8.2</u>	<u>8.4</u>	<u>8.5</u>	
	FINAL	<u>8.0</u>	<u>7.6</u>	<u>7.9</u>	<u>7.6</u>	<u>7.5</u>	<u>7.4</u>	<u>7.9</u>	
pH (s.u.)	INITIAL	<u>6.8</u>	<u>7.1</u>	<u>7.2</u>	<u>7.1</u>	<u>7.4</u>	<u>7.4</u>	<u>7.1</u>	
	FINAL	<u>7.2</u>	<u>7.1</u>	<u>7.3</u>	<u>7.3</u>	<u>6.9</u>	<u>7.3</u>	<u>7.1</u>	
temp (C)	INITIAL	<u>22.2</u>	<u>23.8</u>	<u>22.9</u>	<u>22.4</u>	<u>22.8</u>	<u>21.5</u>	<u>25.4</u>	
	FINAL	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	
CONC:	<u>100</u>								
D.O. (mg/L)	INITIAL	<u>8.1</u>	<u>8.4</u>	<u>8.2</u>	<u>8.3</u>	<u>8.2</u>	<u>8.4</u>	<u>8.4</u>	
	FINAL	<u>7.9</u>	<u>7.7</u>	<u>8.0</u>	<u>7.7</u>	<u>7.5</u>	<u>7.4</u>	<u>7.9</u>	
pH (s.u.)	INITIAL	<u>6.8</u>	<u>7.1</u>	<u>7.1</u>	<u>7.0</u>	<u>7.3</u>	<u>7.3</u>	<u>6.9</u>	
	FINAL	<u>7.1</u>	<u>7.0</u>	<u>7.2</u>	<u>7.3</u>	<u>6.9</u>	<u>7.2</u>	<u>7.1</u>	
temp (C)	INITIAL	<u>22.3</u>	<u>23.5</u>	<u>23.0</u>	<u>22.5</u>	<u>22.6</u>	<u>21.6</u>	<u>26.4</u>	
	FINAL	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	<u>25.0</u>	
CONC:	<u>100%</u>	<u>A</u>	<u>A</u>	<u>A</u>	<u>B</u>	<u>B</u>	<u>C</u>	<u>C</u>	
ALKALINITY (mg/L)		<u>12</u>		<u>1</u>	<u>10</u>	<u>1</u>	<u>10</u>	<u>1</u>	
HARDNESS (mg/L)		<u>2600</u>		<u>1</u>	<u>2600</u>	<u>1</u>	<u>2600</u>	<u>1</u>	
CONDUCTIVITY (umhos/cm)		<u>21200</u>		<u>1</u>	<u>21100</u>	<u>1</u>	<u>21160</u>	<u>1</u>	
CHLORINE (mg/L)		<u><0.05</u>		<u>1</u>	<u><0.05</u>	<u>1</u>	<u><0.05</u>	<u>1</u>	

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Cerodaphnia Dubia

Lab # / Sample ID *K904006*

Test Start (Date/Time) *4/16/09*

Client *Weston*

Test End (Date/Time) *4/17/09*

		Day of Test							notes/remarks
		1	2	3	4	5	6	7	
Control	<i>SSZ05</i>	<i>4/16</i>	<i>4/16/7</i>	<i>4/18</i>	<i>4/18</i>	<i>4/19/0</i>	<i>4/20</i>	<i>4/21</i>	
D.O. (mg/L)	INITIAL	<i>79</i>	<i>79</i>	<i>78</i>	<i>77</i>	<i>78</i>	<i>82</i>	<i>85</i>	
	FINAL	<i>78</i>	<i>77</i>	<i>77</i>	<i>74</i>	<i>76</i>	<i>76</i>		
pH (s.u.)	INITIAL	<i>77</i>	<i>76</i>	<i>77</i>	<i>7.6</i>	<i>79</i>	<i>81</i>	<i>77</i>	
	FINAL	<i>74</i>	<i>75</i>	<i>75</i>	<i>75</i>	<i>75</i>	<i>73</i>		
temp (C)	INITIAL	<i>218</i>	<i>226</i>	<i>220</i>	<i>22.1</i>	<i>225</i>	<i>215</i>	<i>218</i>	
	FINAL	<i>250</i>	<i>250</i>	<i>250</i>	<i>250</i>	<i>250</i>	<i>250</i>		
ALKALINITY (mg/L)		<i>28</i>						<i>1</i>	
HARDNESS (mg/L)		<i>50</i>						<i>1</i>	
CONDUCTIVITY (umhos/cm)		<i>178</i>						<i>1</i>	
CHLORINE (mg/L)		<i><0.05</i>						<i>1</i>	
CONC:	<i>32</i>								
D.O. (mg/L)	INITIAL	<i>77</i>	<i>80</i>	<i>79</i>	<i>78</i>	<i>80</i>	<i>84</i>	<i>85</i>	
	FINAL	<i>78</i>	<i>76</i>	<i>77</i>	<i>74</i>	<i>77</i>	<i>76</i>		
pH (s.u.)	INITIAL	<i>74</i>	<i>72</i>	<i>7.4</i>	<i>7.3</i>	<i>75</i>	<i>76</i>	<i>74</i>	
	FINAL	<i>71</i>	<i>7.2</i>	<i>7.2</i>	<i>71</i>	<i>73</i>	<i>71</i>		
temp (C)	INITIAL	<i>220</i>	<i>229</i>	<i>22.4</i>	<i>22.1</i>	<i>225</i>	<i>214</i>	<i>232</i>	
	FINAL	<i>250</i>	<i>250</i>	<i>250</i>	<i>250</i>	<i>250</i>	<i>250</i>		
CONC:	<i>42</i>								
D.O. (mg/L)	INITIAL	<i>77</i>	<i>82</i>	<i>8.0</i>	<i>8.0</i>	<i>80</i>	<i>83</i>	<i>86</i>	
	FINAL	<i>79</i>	<i>7.6</i>	<i>77</i>	<i>73</i>	<i>77</i>	<i>76</i>		
pH (mg/L)	INITIAL	<i>70</i>	<i>72</i>	<i>7.3</i>	<i>7.2</i>	<i>75</i>	<i>75</i>	<i>72</i>	
	FINAL	<i>71</i>	<i>7.3</i>	<i>7.3</i>	<i>70</i>	<i>73</i>	<i>71</i>		
temp (C)	INITIAL	<i>221</i>	<i>233</i>	<i>22.6</i>	<i>22.2</i>	<i>226</i>	<i>214</i>	<i>241</i>	
	FINAL	<i>250</i>	<i>250</i>	<i>250</i>	<i>250</i>	<i>250</i>	<i>250</i>		
CONC:	<i>56</i>								
D.O. (mg/L)	INITIAL	<i>77</i>	<i>83</i>	<i>8.0</i>	<i>8.1</i>	<i>80</i>	<i>83</i>	<i>85</i>	
	FINAL	<i>79</i>	<i>77</i>	<i>7.1</i>	<i>75</i>	<i>77</i>	<i>75</i>		
pH (s.u.)	INITIAL	<i>68</i>	<i>72</i>	<i>7.3</i>	<i>7.2</i>	<i>75</i>	<i>75</i>	<i>72</i>	
	FINAL	<i>71</i>	<i>7.2</i>	<i>7.3</i>	<i>70</i>	<i>72</i>	<i>71</i>		
temp (C)	INITIAL	<i>222</i>	<i>238</i>	<i>22.7</i>	<i>22.4</i>	<i>228</i>	<i>214</i>	<i>247</i>	
	FINAL	<i>250</i>	<i>250</i>	<i>250</i>	<i>250</i>	<i>250</i>	<i>250</i>		
CONC:	<i>75</i>								
D.O. (mg/L)	INITIAL	<i>80</i>	<i>84</i>	<i>8.2</i>	<i>8.3</i>	<i>82</i>	<i>84</i>	<i>85</i>	
	FINAL	<i>79</i>	<i>7.7</i>	<i>7.6</i>	<i>75</i>	<i>78</i>	<i>77</i>		
pH (s.u.)	INITIAL	<i>68</i>	<i>71</i>	<i>7.2</i>	<i>7.1</i>	<i>74</i>	<i>74</i>	<i>71</i>	
	FINAL	<i>71</i>	<i>7.2</i>	<i>7.3</i>	<i>69</i>	<i>73</i>	<i>71</i>		
temp (C)	INITIAL	<i>222</i>	<i>238</i>	<i>22.9</i>	<i>22.4</i>	<i>228</i>	<i>215</i>	<i>254</i>	
	FINAL	<i>250</i>	<i>250</i>	<i>250</i>	<i>250</i>	<i>250</i>	<i>250</i>		
CONC:	<i>100</i>								
D.O. (mg/L)	INITIAL	<i>81</i>	<i>84</i>	<i>8.2</i>	<i>8.3</i>	<i>82</i>	<i>84</i>	<i>84</i>	
	FINAL	<i>80</i>	<i>77</i>	<i>7.6</i>	<i>73</i>	<i>77</i>	<i>78</i>		
pH (s.u.)	INITIAL	<i>68</i>	<i>71</i>	<i>7.1</i>	<i>7.0</i>	<i>73</i>	<i>73</i>	<i>69</i>	
	FINAL	<i>70</i>	<i>7.1</i>	<i>7.3</i>	<i>69</i>	<i>72</i>	<i>70</i>		
temp (C)	INITIAL	<i>223</i>	<i>235</i>	<i>23.0</i>	<i>22.5</i>	<i>226</i>	<i>216</i>	<i>264</i>	
	FINAL	<i>250</i>	<i>250</i>	<i>250</i>	<i>250</i>	<i>250</i>	<i>250</i>		
CONC:	<i>100%</i>	<i>A</i>	<i>A</i>	<i>A</i>	<i>B</i>	<i>B</i>	<i>C</i>	<i>C</i>	
ALKALINITY (mg/L)		<i>12</i>		<i>1</i>	<i>10</i>	<i>1</i>	<i>10</i>	<i>1</i>	
HARDNESS (mg/L)		<i>2600</i>		<i>1</i>	<i>2600</i>	<i>1</i>	<i>2600</i>	<i>1</i>	
CONDUCTIVITY (umhos/cm)		<i>21200</i>		<i>1</i>	<i>21100</i>	<i>1</i>	<i>2100</i>	<i>1</i>	
CHLORINE (mg/L)		<i><0.05</i>		<i>1</i>	<i><0.05</i>	<i>1</i>	<i><0.05</i>	<i>1</i>	

APPENDIX C

Fathead minnow raw data and statistics

SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

LAB # / SAMPLE ID R904006 TEST START DATE 4/16/09 TIME 1310
 CLIENT Weston TEST END DATE 4/23/09 TIME 1110
 AGE AND SOURCE OF MINNOWS

Summary Page

		DAY (NUMBER SURVIVING)							SURVIVAL		MEAN %	CV
CONC:	REP #	start	1	2	3	4	5	6	7 %			
CONC: c	A	8	8	8	8	8	8	8	8	100	97.5	5.73
	B	8	8	8	8	8	8	8	7	87.5		
	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		
CONC: 37	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		
CONC: 42	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		
CONC: 56	A	8	8	8	8	8	8	8	8	100	97.5	
	B	8	8	8	8	8	8	8	8	87.5		
	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		
CONC: 75	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	87.5		
	D	8	8	8	8	8	8	8	8	100		
	E	8	8	8	8	8	8	8	8	100		
CONC: 100	A	8	8	8	8	8	8	8	8	100	97.5	5.73
	B	8	8	8	8	8	8	8	8	100		
	C	8	8	8	8	8	8	8	8	87.5		
	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	K904006		TEST START DATE	4/16/09	TIME	1310					
CLIENT	Weston		TEST END DATE	4/23/09	TIME	1110					
AGE AND SOURCE OF MINNOWS											
D A Y (NUMBER SURVIVING)							SURVIVAL				
CONC:	REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV
Control	A	2	2	2	2	2	2	3	2		
	B	↓	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓	↓		
	E	↓	↓	↓	↓	↓	↓	↓	↓		
CONC:	REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV
32	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
42	A	2	2	2	2	2	2	3	2		
	B	↓	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓	↓		
	E	↓	↓	↓	↓	↓	↓	↓	↓		
CONC:	REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV
56	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
75	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
100	A	2	2	2	2	2	2	2	2		
	B	↓	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓	↓		
	E	↓	↓	↓	↓	↓	↓	↓	↓		
ANALYST		KP	KP	mg	mg	KP	KP	KP	KP		
DATE:		4/16/09	4/17/09	4/18/09	4/19/09	4/20/09	4/21/09	4/22/09	4/23		
TIME:		1310	1425	0920	1300	1310	1025	1450	1110		

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		TEST END DATE		TIME							
AGE AND SOURCE OF MINNOWS											
D A Y (NUMBER SURVIVING)											
CONC:	REP #	start	1	2	3	4	5	6	7 %	MEAN %	CV
Control	A	2	3	2	2	3	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	1	1	1	1	1	1	1	1		
32	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	1	1	1	1	1	1	1	1		
42	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	1	1	1	1	1	1	1	1		
56	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	1	1	1	1	1	1	1	1		
75	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	1	1	1	1	1	1	1	1		
100	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	1	1	1	1	1	1	1	1		
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 K904006 TEST START DATE 4/17/07 TIME _____
 CLIENT Weston TEST END DATE _____ TIME _____
 AGE AND SOURCE OF MINNOWS _____
 DAY (NUMBER SURVIVING)

CONC:	REP #	start	1	2	3	4	5	6	7%	MEAN %	CV
<i>Control</i>	A	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓			
	E	↓	↓	↓	↓	↓	↓	↓			
<i>32</i>	A	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓			
	E	↓	↓	↓	↓	↓	↓	↓			
<i>42</i>	A	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓			
	E	↓	↓	↓	↓	↓	↓	↓			
<i>56</i>	A	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓			
	E	↓	↓	↓	↓	↓	↓	↓			
<i>75</i>	A	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓			
	E	↓	↓	↓	↓	↓	↓	↓			
<i>100</i>	A	2	2	2	2	2	2	2			
	B	↓	↓	↓	↓	↓	↓	↓			
	C	↓	↓	↓	↓	↓	↓	↓			
	D	↓	↓	↓	↓	↓	↓	↓			
	E	↓	↓	↓	↓	↓	↓	↓			
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 R904006 TEST START DATE 4/18/07 TIME _____
 CLIENT Weston TEST END DATE _____ TIME _____
 AGE AND SOURCE OF MINNOWS _____
 DAY (NUMBER SURVIVING)

	REP #	start	1	2	3	4	5	6	7%	MEAN %	CV
Control	CONC: A	2	2	2	2	2	2	2	2		
	B	↓	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓	↓		
	E	↓	↓	↓	↓	↓	↓	↓	↓		
32	CONC: A	2	2	2	2	2	2	2	2		
	B	↓	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓	↓		
	E	↓	↓	↓	↓	↓	↓	↓	↓		
42	CONC: A	2	2	2	2	2	2	2	2		
	B	↓	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓	↓		
	E	↓	↓	↓	↓	↓	↓	↓	↓		
56	CONC: A	2	2	2	2	2	2	2	2		
	B	↓	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓	↓		
	E	↓	↓	↓	↓	↓	↓	↓	↓		
75	CONC: A	2	2	2	2	2	2	2	2		
	B	↓	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓	↓		
	E	↓	↓	↓	↓	↓	↓	↓	↓		
100	CONC: A	2	2	2	2	2	2	2	2		
	B	↓	↓	↓	↓	↓	↓	↓	↓		
	C	↓	↓	↓	↓	↓	↓	↓	↓		
	D	↓	↓	↓	↓	↓	↓	↓	↓		
	E	↓	↓	↓	↓	↓	↓	↓	↓		
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 K904006 TEST START DATE 4/18/07 TIME _____
 CLIENT Weston TEST END DATE _____ TIME _____
 AGE AND SOURCE OF MINNOWS _____
 DAY (NUMBER SURVIVING)

CONC:	REP #	start	1	2	3	4	5	6	7%	MEAN %	CV
Control	A	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1			
	C	1	1	1	1	1	1	1			
	D	1	1	1	1	1	1	1			
	E	1	1	1	1	1	1	1			
32	A	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1			
	C	1	1	1	1	1	1	1			
	D	1	1	1	1	1	1	1			
	E	1	1	1	1	1	1	1			
42	A	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1			
	C	1	1	1	1	1	1	1			
	D	1	1	1	1	1	1	1			
	E	1	1	1	1	1	1	1			
56	A	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1			
	C	1	1	1	1	1	1	1			
	D	1	1	1	1	1	1	1			
	E	1	1	1	1	1	1	1			
75	A	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1			
	C	1	1	1	1	1	1	1			
	D	1	1	1	1	1	1	1			
	E	1	1	1	1	1	1	1			
100	A	2	2	2	2	2	2	2			
	B	1	1	1	1	1	1	1			
	C	1	1	1	1	1	1	1			
	D	1	1	1	1	1	1	1			
	E	1	1	1	1	1	1	1			
ANALYST											
DATE:											
TIME:											

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

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB # / #s:		K904006		TEST DATES (BEGIN / END):		4/16-23/09	
CLIENT:		EEMA		WEIGHING DATE / TIME:		5/6/09, 1400	
ANALYSTS:		KP		DRYING TEMP (DEGREES C):		60	
SAMPLE ID:		SEE COC		DRYING TIME (HOURS):		24	
	REP #	FINAL DRY WEIGHT TIN+LARVAE (g)	INITIAL WEIGHT TIN (g)	TOTAL DRY WEIGHT OF LARVAE (g)	NUMBER OF LARVAE	DRY WEIGHT OF LARVAE (mg)	
CONTROL	A	0.96323	0.96097	0.00226	8	0.283	AVG DRY
	B	0.98271	0.98009	0.00262	8	0.327	WEIGHT (mg)
	C	0.94185	0.93956	0.00229	8	0.286	0.300
	D	0.95708	0.95448	0.00260	8	0.325	CV
	E	0.99113	0.98892	0.00221	8	0.276	8.25
CONC: 32%	A	1.00604	1.00280	0.00324	8	0.405	AVG DRY
	B	0.96267	0.95982	0.00285	8	0.356	WEIGHT (mg)
	C	0.98318	0.97984	0.00334	8	0.418	0.406
	D	0.98051	0.97703	0.00348	8	0.435	CV
	E	0.98100	0.97766	0.00334	8	0.418	
CONC: 42%	A	0.99901	0.99638	0.00263	8	0.329	AVG DRY
	B	0.97465	0.97149	0.00316	8	0.395	WEIGHT (mg)
	C	0.99177	0.98786	0.00391	8	0.489	0.388
	D	0.98091	0.97801	0.00290	8	0.362	CV
	E	0.95666	0.95373	0.00293	8	0.366	
CONC: 56%	A	0.94661	0.94351	0.00310	8	0.387	AVG DRY
	B	0.99274	0.98910	0.00364	8	0.455	WEIGHT (mg)
	C	0.93338	0.92920	0.00418	8	0.522	0.445
	D	1.01307	1.01002	0.00305	8	0.381	CV
	E	0.96780	0.96397	0.00383	8	0.479	
CONC: 75%	A	1.01370	1.00975	0.00395	8	0.493	AVG DRY
	B	0.98448	0.98089	0.00359	8	0.449	WEIGHT (mg)
	C	0.92455	0.92151	0.00304	8	0.380	0.457
	D	0.98554	0.98191	0.00363	8	0.454	CV
	E	0.94044	0.93635	0.00409	8	0.511	
CONC: 100%	A	0.98581	0.98176	0.00405	8	0.506	AVG DRY
	B	0.99008	0.98647	0.00361	8	0.451	WEIGHT (mg)
	C	0.98442	0.98063	0.00379	8	0.474	0.492
	D	0.98668	0.98341	0.00327	8	0.409	CV
	E	0.99912	0.99414	0.00498	8	0.622	16.4

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

Pimephales promelas

FATHEAD MINNOW

TEST 1000.0

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

LAB #/ #s: <u>K904006</u>	TEST DATES (BEGIN / END): <u>4/16 - 23/09</u>
CLIENT: <u>Weston EEMA</u>	WEIGHING DATE / TIME: <u>4</u>
ANALYSTS: <u>KP</u>	DRYING TEMP (DEGREES C): <u>60</u>
SAMPLE ID:	DRYING TIME (HOURS): <u>24</u>

	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	0.96323	0.96097				AVG DRY WEIGHT (mg)
	B 2	0.98271	0.98009				
	C 3	0.94185	0.93956				
	D 4	0.95708	0.95448				
	E 5	0.91113	0.98092				
CONC: 3L	A 6	1.00604	1.00280				AVG DRY WEIGHT (mg)
	B 7	0.96767	0.95982				
	C 8	0.98318	0.97984				
	D 9	0.98051	0.97703				
	E 10	0.98100	0.97766				
CONC: 4L	A 11	0.99901	0.99638				AVG DRY WEIGHT (mg)
	B 12	0.97465	0.97149				
	C 13	0.99177	0.98786				
	D 14	0.98091	0.97801				
	E 15	0.95666	0.95373				
CONC: 5L	A 16	0.94661	0.94351				AVG DRY WEIGHT (mg)
	B 17	0.99224	0.98910				
	C 18	0.98338	0.97920				
	D 19	1.01307	1.01002				
	E 20	0.96780	0.96397				
CONC: 75	A 21	1.01366	1.00975				AVG DRY WEIGHT (mg)
	B 22	0.98448	0.98089				
	C 23	0.92455	0.92151				
	D 24	0.98554	0.98191				
	E 25	0.94044	0.93635				
CONC: 100	A 26	0.98581	0.98176				AVG DRY WEIGHT (mg)
	B 27	0.99008	0.98647				
	C 28	0.98442	0.98063				
	D 29	0.98668	0.98341				
	E 30	0.99912	0.99414				

CV = (STANDARD DEVIATION/MEAN)*100

REMARKS:

AA# K904006, FATHEAD MINNOW SURVIVAL, CHRONIC 4-16-09
File: J:\TOXSTAT\MONTE\FHSURV~1. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

D = 0.108

W = 0.596

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.

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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# K904006, FATHEAD MINNOW SURVIVAL, CHRONIC 4-16-09
FILE: J:\TOXSTAT\MONTE\FHSURV~1.
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	1.0000	1.3931
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	1.0000	1.3931
3	42 %	EFFLUENT	5	1.0000	1.3931
4	56 %	EFFLUENT	1	1.0000	1.3931
4	56 %	EFFLUENT	2	0.8750	1.2094
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	1.0000	1.3931
5	75 %	EFFLUENT	3	0.8750	1.2094
5	75 %	EFFLUENT	4	1.0000	1.3931
5	75 %	EFFLUENT	5	1.0000	1.3931
6	100 %	EFFLUENT	1	1.0000	1.3931
6	100 %	EFFLUENT	2	1.0000	1.3931
6	100 %	EFFLUENT	3	0.8750	1.2094
6	100 %	EFFLUENT	4	1.0000	1.3931
6	100 %	EFFLUENT	5	1.0000	1.3931

AA# K904006, FATHEAD MINNOW SURVIVAL, CHRONIC 4-16-09
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STEEL'S MANY-ONE RANK TEST - Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	CONTROL	1.356				
2	32 % EFFLUENT	1.393	30.00	16.00	5.00	
3	42 % EFFLUENT	1.393	30.00	16.00	5.00	
4	56 % EFFLUENT	1.356	27.50	16.00	5.00	
5	75 % EFFLUENT	1.356	27.50	16.00	5.00	
6	100 % EFFLUENT	1.356	27.50	16.00	5.00	

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