

# Arkansas Analytical, Inc.

## Toxicity Test Results

**MAGCOBAR MINE SITE**  
**NPDES PERMIT NUMBER: AR0049794**  
**August, 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 August 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:         | 8-10-09, 1015      | 8-11-09, 1015    |
| Sample #2:         | 8-11-09, 0825      | 8-12-09, 0825    |
| Sample #3:         | 8-13-09, 0920      | 8-14-09, 0920    |

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:                    | 8-11-09, 1333                 | 4                             |
| Sample #2:                    | 8-12-09, 1349                 | 6                             |
| Sample #3:                    | 8-14-09, 1450                 | 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  | 90%     | X    |      |
| Average of 15 or more young per surviving female   | 15.6    | X    |      |
| At least 60% of surviving females should have produced 3 broods  | 66.7%   | X    |      |
| The percent coefficient of variation between replicates must be 40% or less for the young of surviving females | 27.3%   | X    |      |

#### TEST ACCEPTANCE CRITERIA for *Pimephales promelas*

| Control Criteria   | Results | Pass | Fail |
|--|---------|------|------|
| Greater than or equal to 80% survival  | 95%     | 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                              | 0.451   | X    |      |
| The percent coefficient of variation between replicates must be 40% or less for growth   | 10.7%   | 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> 8/20-27/09 |             | <i>Pimephales promelas</i> 8/20-27/09 |              |
|--------------------------------------|-------------|---------------------------------------|--------------|
| NOEC Survival:                       | 250 ppm KCl | NOEC Survival:                        | 500 ppm KCl  |
| LOEC Survival:                       | 500 ppm KCl | LOEC Survival:                        | 1000 ppm KCl |
| NOEC Reproduction:                   | 250 ppm KCl | NOEC Growth:                          | 500 ppm KCl  |
| LOEC Reproduction:                   | 500 ppm KCl | LOEC Growth:                          | 1000 ppm KCl |

Quality Assurance charts are provided in Appendix F.

## Summary of Results Magcobar Mine Site

| <i>Ceriodaphnia dubia</i>                   |           | <i>Pimephales promelas</i>                        |           |
|---|-----------|---|-----------|
| NOEC / LOEC Survival                        | 100% / NA | NOEC / LOEC survival                              | 100% / NA |
| NOEC / LOEC Reproduction                    | 100% / NA | NOEC / LOEC growth                                | 100% / NA |
| Mean number of neonates (critical dilution) | 13.4      | %CV survival (critical dilution)                  | 7.21%     |
| %CV Reproduction (critical dilution)        | 28.2%     | Mean dry weight (critical dilution) in milligrams | .510      |
|   |           | %CV growth (critical dilution)                    | 29.9%     |
| PMSD Reproduction                           | 36.9      | PMSD Growth                                       | 28.3      |

### 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

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:         | 8-10-09, 1015      | 8-11-09, 1015    |
| Sample #2:         | 8-11-09, 0825      | 8-12-09, 0825    |
| Sample #3:         | 8-13-09, 0920      | 8-14-09, 0920    |

Test initiated (date, time): 8-12-09, 1530      Test terminated (date, time): 8-19-09, 1445

Dilution water used:      Soft Synthetic

**DATA TABLE FOR FATHEAD MINNOW SURVIVAL**

**Percent Survival in Replicate Chambers**

**Mean Percent Survival**

**DATA TABLE FOR GROWTH OF FATHEAD MINNOWS**

| Effluent Conc % | A   | B    | C    | D    | E   |  | 24 hours | 48 hours | 7 days | CV % |
|-----------------|-----|------|------|------|-----|--|----------|----------|--------|------|
| 0%              | 100 | 87.5 | 87.5 | 100  | 100 |  | 100      | 100      | 95     | 7.21 |
| 32%             | 100 | 100  | 87.5 | 100  | 100 |  | 100      | 100      | 97.5   |      |
| 42%             | 100 | 100  | 100  | 87.5 | 100 |  | 100      | 100      | 97.5   |      |
| 56%             | 100 | 100  | 100  | 87.5 | 100 |  | 100      | 100      | 97.5   |      |
| 75%             | 100 | 87.5 | 100  | 100  | 100 |  | 100      | 100      | 97.5   |      |
| 100%            | 100 | 87.5 | 87.5 | 100  | 100 |  | 100      | 100      | 95     | 7.21 |

**SUMMARY**

| Effluent Conc % | A     | B     | C     | D     | E     |  | Mean Dry Weight | CV%  |
|-----------------|-------|-------|-------|-------|-------|--|-----------------|------|
| 0%              | 0.396 | 0.473 | 0.407 | 0.465 | 0.512 |  | 0.451           | 10.7 |
| 32%             | 0.319 | 0.373 | 0.409 | 0.393 | 0.425 |  | 0.384           |      |
| 42%             | 0.475 | 0.361 | 0.480 | 0.382 | 0.519 |  | 0.443           |      |
| 56%             | 0.500 | 0.511 | 0.494 | 0.441 | 0.463 |  | 0.482           |      |
| 75%             | 0.534 | 0.370 | 0.514 | 0.439 | 0.666 |  | 0.505           |      |
| 100%            | 0.374 | 0.351 | 0.493 | 0.664 | 0.669 |  | 0.510           | 29.9 |

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)= \_\_\_\_\_ 29.9 \_\_\_\_\_ %

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:         | 8-10-09, 1015      | 8-11-09, 1015    |
| Sample #2:         | 8-11-09, 0825      | 8-12-09, 0825    |
| Sample #3:         | 8-13-09, 0920      | 8-14-09, 0920    |

Test initiated (date, time): 8-12-09, 1420      Test terminated (date, time): 8-19-09, 0955

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                     | 17   | 5    | 8    | 10   | 13   | 8    |
| B                     | 8    | 8    | 17   | 15   | 10   | 19   |
| C                     | 15   | 15   | 14   | 15   | x4   | 8    |
| D                     | 13   | 11   | 15   | 7    | 16   | 13   |
| E                     | 17   | 13   | 9    | 12   | 9    | 15   |
| F                     | 15   | 19   | 10   | 18   | 10   | x2   |
| G                     | 17   | 12   | 4    | 12   | 17   | 14   |
| H                     | 14   | 15   | 16   | x2   | 12   | x9   |
| I                     | 24   | 13   | 14   | 16   | 20   | 14   |
| J                     | x3   | 11   | 20   | 24   | 19   | 16   |
| Mean                  | 14.3 | 12.2 | 12.7 | 13.1 | 13.0 | 11.8 |
| Mean/surviving female | 15.6 | 12.2 | 12.7 | 14.3 | 14.0 | 13.4 |
| CV%*                  | 27.3 |      |      |      |      | 28.2 |

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:<br>24 HOURS | 100 | 100 | 100 | 100 | 100 | 100  |
| 48 HOURS                     | 100 | 100 | 100 | 100 | 100 | 100  |
| Test termination             | 90  | 100 | 100 | 90  | 90  | 80   |

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)= \_\_\_\_\_   28.2   %

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 1988007

Test Start (Date/Time) 8/12/09

Client Weston

Test End (Date/Time) 8/19/09

Day of Test

|                         |             | 1           | 2           | 3           | 4           | 5           | 6           | 7           | notes/remarks |
|-------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|---------------|
| <b>Control</b>          | <u>SS</u>   | <u>8/12</u> | <u>8/13</u> | <u>8/14</u> | <u>8/15</u> | <u>8/16</u> | <u>8/17</u> | <u>8/18</u> |               |
| D.O. (mg/L)             | INITIAL     | <u>80</u>   | <u>78</u>   | <u>79</u>   | <u>84</u>   | <u>85</u>   | <u>84</u>   | <u>80</u>   |               |
|                         | FINAL       | <u>78</u>   | <u>76</u>   | <u>79</u>   | <u>75</u>   | <u>77</u>   | <u>76</u>   | <u>74</u>   |               |
| pH (s.u.)               | INITIAL     | <u>79</u>   | <u>75</u>   | <u>74</u>   | <u>79</u>   | <u>78</u>   | <u>78</u>   | <u>73</u>   |               |
|                         | FINAL       | <u>77</u>   | <u>78</u>   | <u>78</u>   | <u>76</u>   | <u>75</u>   | <u>74</u>   | <u>74</u>   |               |
| temp (C)                | INITIAL     | <u>228</u>  | <u>228</u>  | <u>226</u>  | <u>217</u>  | <u>226</u>  | <u>225</u>  | <u>223</u>  |               |
|                         | FINAL       | <u>250</u>  | <u>250</u>  | <u>231</u>  | <u>237</u>  | <u>250</u>  | <u>250</u>  | <u>250</u>  |               |
| ALKALINITY (mg/L)       |             | <u>38</u>   | <u>—</u>    | <u>28</u>   | <u>—</u>    | <u>—</u>    | <u>—</u>    | <u>—</u>    |               |
| HARDNESS (mg/L)         |             | <u>42</u>   | <u>—</u>    | <u>56</u>   | <u>—</u>    | <u>—</u>    | <u>—</u>    | <u>—</u>    |               |
| CONDUCTIVITY (umhos/cm) |             | <u>149</u>  | <u>—</u>    | <u>158</u>  | <u>—</u>    | <u>—</u>    | <u>—</u>    | <u>—</u>    |               |
| CHLORINE (mg/L)         |             | <u>0.05</u> | <u>—</u>    | <u>0.05</u> | <u>—</u>    | <u>—</u>    | <u>—</u>    | <u>—</u>    |               |
| <b>CONC:</b>            | <u>32</u>   |             |             |             |             |             |             |             |               |
| D.O. (mg/L)             | INITIAL     | <u>80</u>   | <u>79</u>   | <u>81</u>   | <u>84</u>   | <u>83</u>   | <u>84</u>   | <u>83</u>   |               |
|                         | FINAL       | <u>78</u>   | <u>76</u>   | <u>73</u>   | <u>74</u>   | <u>76</u>   | <u>76</u>   | <u>73</u>   |               |
| pH (s.u.)               | INITIAL     | <u>79</u>   | <u>73</u>   | <u>71</u>   | <u>76</u>   | <u>76</u>   | <u>78</u>   | <u>70</u>   |               |
|                         | FINAL       | <u>74</u>   | <u>74</u>   | <u>74</u>   | <u>73</u>   | <u>73</u>   | <u>70</u>   | <u>73</u>   |               |
| temp (C)                | INITIAL     | <u>229</u>  | <u>230</u>  | <u>232</u>  | <u>219</u>  | <u>233</u>  | <u>227</u>  | <u>223</u>  |               |
|                         | FINAL       | <u>250</u>  | <u>250</u>  | <u>232</u>  | <u>238</u>  | <u>250</u>  | <u>250</u>  | <u>250</u>  |               |
| <b>CONC:</b>            | <u>42</u>   |             |             |             |             |             |             |             |               |
| D.O. (mg/L)             | INITIAL     | <u>81</u>   | <u>80</u>   | <u>81</u>   | <u>85</u>   | <u>83</u>   | <u>85</u>   | <u>83</u>   |               |
|                         | FINAL       | <u>78</u>   | <u>75</u>   | <u>73</u>   | <u>77</u>   | <u>77</u>   | <u>75</u>   | <u>73</u>   |               |
| pH (mg/L)               | INITIAL     | <u>78</u>   | <u>73</u>   | <u>71</u>   | <u>77</u>   | <u>76</u>   | <u>79</u>   | <u>70</u>   |               |
|                         | FINAL       | <u>74</u>   | <u>74</u>   | <u>74</u>   | <u>73</u>   | <u>72</u>   | <u>70</u>   | <u>73</u>   |               |
| temp (C)                | INITIAL     | <u>231</u>  | <u>230</u>  | <u>236</u>  | <u>215</u>  | <u>239</u>  | <u>227</u>  | <u>223</u>  |               |
|                         | FINAL       | <u>250</u>  | <u>250</u>  | <u>232</u>  | <u>237</u>  | <u>250</u>  | <u>250</u>  | <u>250</u>  |               |
| <b>CONC:</b>            | <u>56</u>   |             |             |             |             |             |             |             |               |
| D.O. (mg/L)             | INITIAL     | <u>82</u>   | <u>81</u>   | <u>82</u>   | <u>87</u>   | <u>84</u>   | <u>86</u>   | <u>84</u>   |               |
|                         | FINAL       | <u>76</u>   | <u>74</u>   | <u>72</u>   | <u>73</u>   | <u>77</u>   | <u>76</u>   | <u>72</u>   |               |
| pH (s.u.)               | INITIAL     | <u>78</u>   | <u>77</u>   | <u>71</u>   | <u>76</u>   | <u>75</u>   | <u>74</u>   | <u>76</u>   |               |
|                         | FINAL       | <u>74</u>   | <u>73</u>   | <u>73</u>   | <u>73</u>   | <u>72</u>   | <u>6.7</u>  | <u>70</u>   |               |
| temp (C)                | INITIAL     | <u>234</u>  | <u>230</u>  | <u>241</u>  | <u>214</u>  | <u>239</u>  | <u>227</u>  | <u>223</u>  |               |
|                         | FINAL       | <u>250</u>  | <u>250</u>  | <u>232</u>  | <u>238</u>  | <u>250</u>  | <u>250</u>  | <u>250</u>  |               |
| <b>CONC:</b>            | <u>75</u>   |             |             |             |             |             |             |             |               |
| D.O. (mg/L)             | INITIAL     | <u>82</u>   | <u>82</u>   | <u>84</u>   | <u>88</u>   | <u>84</u>   | <u>86</u>   | <u>84</u>   |               |
|                         | FINAL       | <u>75</u>   | <u>74</u>   | <u>73</u>   | <u>75</u>   | <u>76</u>   | <u>75</u>   | <u>71</u>   |               |
| pH (s.u.)               | INITIAL     | <u>77</u>   | <u>72</u>   | <u>71</u>   | <u>74</u>   | <u>75</u>   | <u>74</u>   | <u>70</u>   |               |
|                         | FINAL       | <u>73</u>   | <u>73</u>   | <u>73</u>   | <u>72</u>   | <u>71</u>   | <u>6.7</u>  | <u>6.8</u>  |               |
| temp (C)                | INITIAL     | <u>235</u>  | <u>231</u>  | <u>246</u>  | <u>209</u>  | <u>242</u>  | <u>228</u>  | <u>223</u>  |               |
|                         | FINAL       | <u>250</u>  | <u>250</u>  | <u>233</u>  | <u>238</u>  | <u>250</u>  | <u>250</u>  | <u>250</u>  |               |
| <b>CONC:</b>            | <u>100</u>  |             |             |             |             |             |             |             |               |
| D.O. (mg/L)             | INITIAL     | <u>83</u>   | <u>82</u>   | <u>85</u>   | <u>88</u>   | <u>84</u>   | <u>86</u>   | <u>86</u>   |               |
|                         | FINAL       | <u>73</u>   | <u>74</u>   | <u>75</u>   | <u>78</u>   | <u>75</u>   | <u>74</u>   | <u>6.8</u>  |               |
| pH (s.u.)               | INITIAL     | <u>76</u>   | <u>71</u>   | <u>70</u>   | <u>74</u>   | <u>75</u>   | <u>73</u>   | <u>6.9</u>  |               |
|                         | FINAL       | <u>73</u>   | <u>72</u>   | <u>72</u>   | <u>72</u>   | <u>72</u>   | <u>6.7</u>  | <u>6.7</u>  |               |
| temp (C)                | INITIAL     | <u>238</u>  | <u>231</u>  | <u>247</u>  | <u>202</u>  | <u>247</u>  | <u>228</u>  | <u>224</u>  |               |
|                         | FINAL       | <u>250</u>  | <u>250</u>  | <u>232</u>  | <u>238</u>  | <u>250</u>  | <u>250</u>  | <u>250</u>  |               |
| <b>CONC:</b>            | <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>4</u>    | <u>—</u>    | <u>—</u>    | <u>4</u>    | <u>—</u>    | <u>6</u>    | <u>—</u>    |               |
| HARDNESS (mg/L)         |             | <u>2600</u> | <u>—</u>    | <u>—</u>    | <u>2600</u> | <u>—</u>    | <u>2600</u> | <u>—</u>    |               |
| CONDUCTIVITY (umhos/cm) |             | <u>1962</u> | <u>—</u>    | <u>—</u>    | <u>1934</u> | <u>—</u>    | <u>1953</u> | <u>—</u>    |               |
| CHLORINE (mg/L)         |             | <u>0.05</u> | <u>—</u>    | <u>—</u>    | <u>0.05</u> | <u>—</u>    | <u>0.05</u> | <u>—</u>    |               |

CHEMICAL DATA SHEET FOR CHRONIC TOXICITY TESTING

Cerodaphnia Dubia

Lab # / Sample ID K908007

Test Start (Date/Time) 8/12/09

Client Weston

Test End (Date/Time) 8/19/09

|                         |         | Day of Test |      |      |                  |      |      |      | notes/remarks |
|-------------------------|---------|-------------|------|------|------------------|------|------|------|---------------|
|                         |         | 1           | 2    | 3    | 4                | 5    | 6    | 7    |               |
| <b>Control</b>          | SS      | 8/12        | 8/13 | 8/14 | 8/15             | 8/16 | 8/17 | 8/18 |               |
| D.O. (mg/L)             | INITIAL | 86          | 88   | 79   | <del>78</del> 84 | 85   | 84   | 80   |               |
|                         | FINAL   | 76          | 75   | 74   | 76               | 74   | 73   | 72   |               |
| pH (s.u.)               | INITIAL | 79          | 75   | 74   | 79               | 78   | 78   | 73   |               |
|                         | FINAL   | 75          | 74   | 74   | 76               | 79   | 79   | 77   |               |
| temp (C)                | INITIAL | 228         | 228  | 226  | 217              | 216  | 225  | 225  |               |
|                         | FINAL   | 250         | 250  | 250  | 250              | 250  | 250  | 250  |               |
| ALKALINITY (mg/L)       |         | 38          | —    | 28   | —                | —    | —    | —    |               |
| HARDNESS (mg/L)         |         | 42          | —    | 56   | —                | —    | —    | —    |               |
| CONDUCTIVITY (umhos/cm) |         | 149         | —    | 158  | —                | —    | —    | —    |               |
| CHLORINE (mg/L)         |         | 0.05        | —    | 0.05 | —                | —    | —    | —    |               |
| <b>CONC:</b>            | 32      |             |      |      |                  |      |      |      |               |
| D.O. (mg/L)             | INITIAL | 80          | 79   | 81   | 84               | 83   | 84   | 83   |               |
|                         | FINAL   | 76          | 74   | 74   | 75               | 74   | 74   | 72   |               |
| pH (s.u.)               | INITIAL | 79          | 73   | 71   | 74               | 74   | 74   | 70   |               |
|                         | FINAL   | 72          | 74   | 72   | 74               | 76   | 76   | 74   |               |
| temp (C)                | INITIAL | 229         | 230  | 232  | 219              | 233  | 227  | 223  |               |
|                         | FINAL   | 250         | 250  | 250  | 250              | 250  | 250  | 250  |               |
| <b>CONC:</b>            | 42      |             |      |      |                  |      |      |      |               |
| D.O. (mg/L)             | INITIAL | 81          | 80   | 81   | 85               | 83   | 85   | 83   |               |
|                         | FINAL   | 75          | 74   | 73   | 75               | 75   | 73   | 72   |               |
| pH (mg/L)               | INITIAL | 78          | 73   | 71   | 77               | 74   | 84   | 70   |               |
|                         | FINAL   | 72          | 72   | 72   | 73               | 76   | 76   | 74   |               |
| temp (C)                | INITIAL | 231         | 230  | 236  | 215              | 236  | 227  | 223  |               |
|                         | FINAL   | 250         | 250  | 250  | 250              | 250  | 250  | 250  |               |
| <b>CONC:</b>            | 56      |             |      |      |                  |      |      |      |               |
| D.O. (mg/L)             | INITIAL | 82          | 81   | 82   | 87               | 84   | 86   | 84   |               |
|                         | FINAL   | 75          | 74   | 73   | 75               | 76   | 73   | 75   |               |
| pH (s.u.)               | INITIAL | 78          | 72   | 71   | 74               | 75   | 74   | 70   |               |
|                         | FINAL   | 72          | 71   | 72   | 73               | 76   | 75   | 74   |               |
| temp (C)                | INITIAL | 234         | 230  | 241  | 214              | 239  | 227  | 223  |               |
|                         | FINAL   | 250         | 250  | 250  | 250              | 250  | 250  | 250  |               |
| <b>CONC:</b>            | 75      |             |      |      |                  |      |      |      |               |
| D.O. (mg/L)             | INITIAL | 82          | 82   | 84   | 88               | 84   | 86   | 84   |               |
|                         | FINAL   | 75          | 74   | 74   | 76               | 76   | 72   | 73   |               |
| pH (s.u.)               | INITIAL | 77          | 72   | 71   | 74               | 75   | 74   | 70   |               |
|                         | FINAL   | 72          | 71   | 72   | 73               | 75   | 75   | 73   |               |
| temp (C)                | INITIAL | 235         | 231  | 246  | 209              | 242  | 228  | 223  |               |
|                         | FINAL   | 250         | 250  | 250  | 250              | 250  | 250  | 250  |               |
| <b>CONC:</b>            | 100     |             |      |      |                  |      |      |      |               |
| D.O. (mg/L)             | INITIAL | 83          | 82   | 85   | 88               | 94   | 86   | 80   |               |
|                         | FINAL   | 76          | 75   | 73   | 76               | 76   | 72   | 73   |               |
| pH (s.u.)               | INITIAL | 76          | 71   | 70   | 74               | 75   | 73   | 69   |               |
|                         | FINAL   | 70          | 76   | 71   | 73               | 75   | 74   | 72   |               |
| temp (C)                | INITIAL | 238         | 231  | 241  | 202              | 247  | 228  | 224  |               |
|                         | FINAL   | 250         | 250  | 250  | 250              | 250  | 250  | 250  |               |
| <b>CONC:</b>            | 100%    | A           | A    | A    | B                | B    | C    | C    |               |
| ALKALINITY (mg/L)       |         | 4           | —    | —    | 4                | —    | 6    | —    |               |
| HARDNESS (mg/L)         |         | 2600        | —    | —    | 2600             | —    | 2600 | —    |               |
| CONDUCTIVITY (umhos/cm) |         | 1962        | —    | —    | 1934             | —    | 1953 | —    |               |
| 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 1908007 TEST START DATE 8/12/09 TIME 15:30  
 CLIENT Weston TEST END DATE 8/19/09 TIME 1445  
 AGE AND SOURCE OF MINNOWS

Summary Page

DAY (NUMBER SURVIVING)

SURVIVAL

| CONC:   | REP # | start | 1 | 2 | 3 | 4 | 5 | 6 | 7 %  | MEAN % | CV   |
|---------|-------|-------|---|---|---|---|---|---|------|--------|------|
| 0%      | A     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 100  | 95     | 7.21 |
|         | B     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 87.5 |        |      |
|         | C     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 87.5 |        |      |
|         | D     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 100  |        |      |
|         | E     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 100  |        |      |
| 32      | A     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 100  | 97.5   |      |
|         | B     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 100  |        |      |
|         | C     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 87.5 |        |      |
|         | D     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 100  |        |      |
|         | E     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 100  |        |      |
| 12      | A     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 100  | 97.5   |      |
|         | B     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 100  |        |      |
|         | C     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 100  |        |      |
|         | D     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 87.5 |        |      |
|         | E     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 100  |        |      |
| 50      | A     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 100  | 97.5   |      |
|         | B     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 100  |        |      |
|         | C     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 100  |        |      |
|         | D     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 87.5 |        |      |
|         | E     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 100  |        |      |
| 75      | A     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 100  | 97.5   |      |
|         | B     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 87.5 |        |      |
|         | C     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 100  |        |      |
|         | D     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 100  |        |      |
|         | E     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 100  |        |      |
| 100     | A     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 100  | 95     | 7.21 |
|         | B     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 87.5 |        |      |
|         | C     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 87.5 |        |      |
|         | D     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 100  |        |      |
|         | E     | 8     | 8 | 8 | 8 | 8 | 8 | 8 | 100  |        |      |
| ANALYST |       |       |   |   |   |   |   |   |      |        |      |
| DATE:   |       |       |   |   |   |   |   |   |      |        |      |
| TIME:   |       |       |   |   |   |   |   |   |      |        |      |

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

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SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

| LAB # / SAMPLE ID         |       | TEST START DATE        |         | TIME |      |      |         |         |          |        |    |
|---------------------------|-------|------------------------|---------|------|------|------|---------|---------|----------|--------|----|
| 1908007                   |       | 8/12/09                |         | 1530 |      |      |         |         |          |        |    |
| CLIENT                    |       | TEST END DATE          |         | TIME |      |      |         |         |          |        |    |
| Weston                    |       | 8/19/09                |         | 1445 |      |      |         |         |          |        |    |
| AGE AND SOURCE OF MINNOWS |       | DAY (NUMBER SURVIVING) |         |      |      |      |         |         | SURVIVAL |        |    |
| REP #                     | start | 1                      | 2       | 3    | 4    | 5    | 6       | 7       | %        | MEAN % | CV |
| CONC: 0                   | A     | 2                      | 3       | 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       |          |        |    |
| CONC: 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       |          |        |    |
| CONC: 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       |          |        |    |
| CONC: 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       |          |        |    |
| CONC: 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       |          |        |    |
| CONC: 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                   | KP    | KP                     | KP      | KP   | KP   | KP   | KP      | KP      |          |        |    |
| DATE:                     | 8/12  | 8/13/09                | 8/14/09 | 8/15 | 8/16 | 8/17 | 8/18/09 | 8/19/09 |          |        |    |
| TIME:                     | 1530  | 1515                   | 1400    | 1110 | 1030 | 1120 | 1330    | 1445    |          |        |    |

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 <i>Weston</i> |       | TEST END                  | DATE | TIME |   |   |          |     |        |    |
| <i>B</i>             |       | AGE AND SOURCE OF MINNOWS |      |      |   |   |          |     |        |    |
|                      |       | DAY (NUMBER SURVIVING)    |      |      |   |   | SURVIVAL |     |        |    |
| REP #                | start | 1                         | 2    | 3    | 4 | 5 | 6        | 7 % | MEAN % | CV |
| CONC: <i>01</i>      | A     | 2                         | 2    | 2    | 2 | 2 | 2        | 2   |        |    |
|                      | B     |                           |      |      |   |   |          |     |        |    |
|                      | C     |                           |      |      |   |   |          |     |        |    |
|                      | D     |                           |      |      |   |   |          |     |        |    |
|                      | E     |                           |      |      |   |   |          |     |        |    |
| CONC: <i>32</i>      | A     | 2                         | 2    | 2    | 2 | 2 | 2        | 2   |        |    |
|                      | B     |                           |      |      |   |   |          |     |        |    |
|                      | C     |                           |      |      |   |   |          |     |        |    |
|                      | D     |                           |      |      |   |   |          |     |        |    |
|                      | E     |                           |      |      |   |   |          |     |        |    |
| CONC: <i>47</i>      | A     | 2                         | 2    | 2    | 2 | 2 | 2        | 2   |        |    |
|                      | B     |                           |      |      |   |   |          |     |        |    |
|                      | C     |                           |      |      |   |   |          |     |        |    |
|                      | D     |                           |      |      |   |   |          |     |        |    |
|                      | E     |                           |      |      |   |   |          |     |        |    |
| CONC: <i>56</i>      | A     | 2                         | 2    | 2    | 2 | 2 | 2        | 2   |        |    |
|                      | B     |                           |      |      |   |   |          |     |        |    |
|                      | C     |                           |      |      |   |   |          |     |        |    |
|                      | D     |                           |      |      |   |   |          |     |        |    |
|                      | E     |                           |      |      |   |   |          |     |        |    |
| CONC: <i>75</i>      | A     | 2                         | 2    | 2    | 2 | 2 | 2        | 2   |        |    |
|                      | B     |                           |      |      |   |   |          |     |        |    |
|                      | C     |                           |      |      |   |   |          |     |        |    |
|                      | D     |                           |      |      |   |   |          |     |        |    |
|                      | E     |                           |      |      |   |   |          |     |        |    |
| CONC: <i>106</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

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SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

| LAB # / SAMPLE ID         |       | TEST START | DATE | TIME |   |   |   |   |     |        |    |
|---------------------------|-------|------------|------|------|---|---|---|---|-----|--------|----|
| CLIENT <i>Winston</i>     |       | TEST END   | DATE | TIME |   |   |   |   |     |        |    |
| AGE AND SOURCE OF MINNOWS |       |            |      |      |   |   |   |   |     |        |    |
| DAY (NUMBER SURVIVING)    |       |            |      |      |   |   |   |   |     |        |    |
|                           |       | start      | 1    | 2    | 3 | 4 | 5 | 6 | 7 % | MEAN % | CV |
| CONC: 0                   | REP # | start      | 1    | 2    | 3 | 4 | 5 | 6 | 7 % |        |    |
|                           | A     | 2          | 2    | 2    | 2 | 2 | 2 | 2 | 2   |        |    |
|                           | B     | 2          | 2    | 2    | 2 | 2 | 2 | 2 | 2   |        |    |
|                           | C     | 2          | 2    | 2    | 2 | 2 | 2 | 2 | 2   |        |    |
|                           | D     | 2          | 2    | 2    | 2 | 2 | 2 | 2 | 2   |        |    |
| E                         | 2     | 2          | 2    | 2    | 2 | 2 | 2 | 2 |     |        |    |
| CONC: 3L                  | REP # | start      | 1    | 2    | 3 | 4 | 5 | 6 | 7 % |        |    |
|                           | A     | 2          | 2    | 2    | 2 | 2 | 2 | 2 | 2   |        |    |
|                           | B     | 2          | 2    | 2    | 2 | 2 | 2 | 2 | 2   |        |    |
|                           | C     | 2          | 2    | 2    | 2 | 2 | 2 | 2 | 2   |        |    |
|                           | D     | 2          | 2    | 2    | 2 | 2 | 2 | 2 | 2   |        |    |
| E                         | 2     | 2          | 2    | 2    | 2 | 2 | 2 | 2 |     |        |    |
| CONC: 42                  | REP # | start      | 1    | 2    | 3 | 4 | 5 | 6 | 7 % |        |    |
|                           | A     | 2          | 2    | 2    | 2 | 2 | 2 | 2 | 2   |        |    |
|                           | B     | 2          | 2    | 2    | 2 | 2 | 2 | 2 | 2   |        |    |
|                           | C     | 2          | 2    | 2    | 2 | 2 | 2 | 2 | 2   |        |    |
|                           | D     | 2          | 2    | 2    | 2 | 2 | 2 | 2 | 2   |        |    |
| E                         | 2     | 2          | 2    | 2    | 2 | 2 | 2 | 2 |     |        |    |
| CONC: 56                  | REP # | start      | 1    | 2    | 3 | 4 | 5 | 6 | 7 % |        |    |
|                           | A     | 2          | 2    | 2    | 2 | 2 | 2 | 2 | 2   |        |    |
|                           | B     | 2          | 2    | 2    | 2 | 2 | 2 | 2 | 2   |        |    |
|                           | C     | 2          | 2    | 2    | 2 | 2 | 2 | 2 | 2   |        |    |
|                           | D     | 2          | 2    | 2    | 2 | 2 | 2 | 2 | 2   |        |    |
| E                         | 2     | 2          | 2    | 2    | 2 | 2 | 2 | 2 |     |        |    |
| CONC: 75                  | REP # | start      | 1    | 2    | 3 | 4 | 5 | 6 | 7 % |        |    |
|                           | A     | 2          | 2    | 2    | 2 | 2 | 2 | 2 | 2   |        |    |
|                           | B     | 2          | 2    | 2    | 2 | 2 | 2 | 2 | 2   |        |    |
|                           | C     | 2          | 2    | 2    | 2 | 2 | 2 | 2 | 2   |        |    |
|                           | D     | 2          | 2    | 2    | 2 | 2 | 2 | 2 | 2   |        |    |
| E                         | 2     | 2          | 2    | 2    | 2 | 2 | 2 | 2 |     |        |    |
| CONC: 100                 | REP # | start      | 1    | 2    | 3 | 4 | 5 | 6 | 7 % |        |    |
|                           | A     | 2          | 2    | 2    | 2 | 2 | 2 | 2 | 2   |        |    |
|                           | B     | 2          | 2    | 2    | 2 | 2 | 2 | 2 | 2   |        |    |
|                           | C     | 2          | 2    | 2    | 2 | 2 | 2 | 2 | 2   |        |    |
|                           | D     | 2          | 2    | 2    | 2 | 2 | 2 | 2 | 2   |        |    |
| E                         | 2     | 2          | 2    | 2    | 2 | 2 | 2 | 2 |     |        |    |
| ANALYST                   |       |            |      |      |   |   |   |   |     |        |    |
| DATE:                     |       |            |      |      |   |   |   |   |     |        |    |
| TIME:                     |       |            |      |      |   |   |   |   |     |        |    |

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

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SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

| LAB # / SAMPLE ID         |       | TEST START | DATE | TIME |   |   |   |     |        |    |
|---------------------------|-------|------------|------|------|---|---|---|-----|--------|----|
| CLIENT <u>Weston</u>      |       | TEST END   | DATE | TIME |   |   |   |     |        |    |
| AGE AND SOURCE OF MINNOWS |       |            |      |      |   |   |   |     |        |    |
| DAY (NUMBER SURVIVING)    |       |            |      |      |   |   |   |     |        |    |
| REP #                     | start | 1          | 2    | 3    | 4 | 5 | 6 | 7 % | MEAN % | CV |
| CONC: 0                   | 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   |        |    |
| CONC: 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   |        |    |
| CONC: 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   |        |    |
| CONC: 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   |        |    |
| CONC: 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   |        |    |
| CONC: 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

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SURVIVAL DATA FOR FATHEAD MINNOW LARVAL SURVIVAL AND GROWTH TEST

| LAB # / SAMPLE ID    |       | TEST START                | DATE | TIME |   |   |   |   |          |        |    |  |  |
|----------------------|-------|---------------------------|------|------|---|---|---|---|----------|--------|----|--|--|
| CLIENT <i>Weston</i> |       | TEST END                  | DATE | TIME |   |   |   |   |          |        |    |  |  |
|                      |       | AGE AND SOURCE OF MINNOWS |      |      |   |   |   |   |          |        |    |  |  |
|                      |       | DAY (NUMBER SURVIVING)    |      |      |   |   |   |   | SURVIVAL |        |    |  |  |
| CONC:                | REP # | start                     | 1    | 2    | 3 | 4 | 5 | 6 | 7 %      | MEAN % | CV |  |  |
| 0                    | A     | 2                         | 2    | 2    | 3 | 3 | 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    | 3 | 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 |          |        |    |  |  |
| 50                   | 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

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WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

| LAB # / #s: |       | K908007                         |                        | TEST DATES (BEGIN / END):      |                  | 8/12-19/09                |             |
|-------------|-------|---------------------------------|------------------------|--------------------------------|------------------|---------------------------|-------------|
| CLIENT:     |       | EEMA                            |                        | WEIGHING DATE / TIME:          |                  | 8/25/09, 1600             |             |
| 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     | 1.00160                         | 0.99843                | 0.00317                        | 8                | 0.396                     | AVG DRY     |
|             | B     | 1.00387                         | 1.00009                | 0.00378                        | 8                | 0.473                     | WEIGHT (mg) |
|             | C     | 1.00602                         | 1.00276                | 0.00326                        | 8                | 0.407                     | 0.451       |
|             | D     | 0.98930                         | 0.98558                | 0.00372                        | 8                | 0.465                     | CV          |
|             | E     | 1.00114                         | 0.99704                | 0.00410                        | 8                | 0.512                     | 10.7        |
| CONC:       | A     | 1.00198                         | 0.99943                | 0.00255                        | 8                | 0.319                     | AVG DRY     |
|             | B     | 1.00598                         | 1.00300                | 0.00298                        | 8                | 0.373                     | WEIGHT (mg) |
|             | C     | 0.99869                         | 0.99542                | 0.00327                        | 8                | 0.409                     | 0.384       |
|             | D     | 1.00635                         | 1.00321                | 0.00314                        | 8                | 0.393                     | CV          |
|             | E     | 1.00848                         | 1.00508                | 0.00340                        | 8                | 0.425                     |             |
| CONC:       | A     | 1.00896                         | 1.00516                | 0.00380                        | 8                | 0.475                     | AVG DRY     |
|             | B     | 0.97874                         | 0.97585                | 0.00289                        | 8                | 0.361                     | WEIGHT (mg) |
|             | C     | 1.00546                         | 1.00162                | 0.00384                        | 8                | 0.480                     | 0.444       |
|             | D     | 0.99093                         | 0.98787                | 0.00306                        | 8                | 0.382                     | CV          |
|             | E     | 1.00381                         | 0.99966                | 0.00415                        | 8                | 0.519                     |             |
| CONC:       | A     | 1.00011                         | 0.99611                | 0.00400                        | 8                | 0.500                     | AVG DRY     |
|             | B     | 0.97096                         | 0.96687                | 0.00409                        | 8                | 0.511                     | WEIGHT (mg) |
|             | C     | 0.96198                         | 0.95803                | 0.00395                        | 8                | 0.494                     | 0.482       |
|             | D     | 1.00139                         | 0.99786                | 0.00353                        | 8                | 0.441                     | CV          |
|             | E     | 1.00546                         | 1.00176                | 0.00370                        | 8                | 0.463                     |             |
| CONC:       | A     | 0.99919                         | 0.99492                | 0.00427                        | 8                | 0.534                     | AVG DRY     |
|             | B     | 1.00026                         | 0.99730                | 0.00296                        | 8                | 0.370                     | WEIGHT (mg) |
|             | C     | 0.99854                         | 0.99443                | 0.00411                        | 8                | 0.514                     | 0.504       |
|             | D     | 0.99605                         | 0.99254                | 0.00351                        | 8                | 0.439                     | CV          |
|             | E     | 1.00477                         | 0.99944                | 0.00533                        | 8                | 0.666                     |             |
| CONC:       | A     | 1.00453                         | 1.00154                | 0.00299                        | 8                | 0.374                     | AVG DRY     |
|             | B     | 0.99216                         | 0.98935                | 0.00281                        | 8                | 0.351                     | WEIGHT (mg) |
|             | C     | 0.99446                         | 0.99052                | 0.00394                        | 8                | 0.493                     | 0.510       |
|             | D     | 1.00703                         | 1.00172                | 0.00531                        | 8                | 0.664                     | CV          |
|             | E     | 1.01051                         | 1.00516                | 0.00535                        | 8                | 0.669                     | 29.9        |

CV = (STANDARD DEVIATION/MEAN)\*100

REMARKS:

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Pimephales promelas

FATHEAD MINNOW

TEST 1000.0

WEIGHT DATA FOR LARVAL SURVIVAL AND GROWTH TEST

|                            |   |
|----------------------------|---|
| LAB # / #s: <u>K968007</u> | TEST DATES (BEGIN / END): <u>8/12-19/09</u> |
| CLIENT: <u>Weston</u>      | WEIGHING DATE / TIME: <u>8/25/09, 1600</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    | 1.00160                         | 0.99843                |                                |                  |                           | AVG DRY WEIGHT (mg) |
|         | B    | 1.00387                         | 1.00009                |                                |                  |                           |                     |
|         | C    | 1.00602                         | 1.00276                |                                |                  |                           |                     |
|         | D    | 0.98930                         | 0.98558                |                                |                  |                           | CV                  |
|         | E    | 1.00114                         | 0.99704                |                                |                  |                           |                     |
| CONC:   | A    | 1.00198                         | 0.99943                |                                |                  |                           | AVG DRY WEIGHT (mg) |
|         | B    | 1.00598                         | 1.00300                |                                |                  |                           |                     |
|         | C    | 0.99869                         | 0.99542                |                                |                  |                           |                     |
|         | D    | 1.00635                         | 1.00321                |                                |                  |                           | CV                  |
|         | E    | 1.00848                         | 1.00508                |                                |                  |                           |                     |
| CONC:   | A    | 1.00896                         | 1.00516                |                                |                  |                           | AVG DRY WEIGHT (mg) |
|         | B    | 0.97874                         | 0.97585                |                                |                  |                           |                     |
|         | C    | 1.00546                         | 1.00162                |                                |                  |                           |                     |
|         | D    | 0.99093                         | 0.98787                |                                |                  |                           | CV                  |
|         | E    | 1.00381                         | 0.99966                |                                |                  |                           |                     |
| CONC:   | A    | 1.00011                         | 0.99611                |                                |                  |                           | AVG DRY WEIGHT (mg) |
|         | B    | 0.97096                         | 0.96687                |                                |                  |                           |                     |
|         | C    | 0.96198                         | 0.95803                |                                |                  |                           |                     |
|         | D    | 1.00139                         | 0.99786                |                                |                  |                           | CV                  |
|         | E    | 1.00546                         | 1.00176                |                                |                  |                           |                     |
| CONC:   | A    | 0.99919                         | 0.99492                |                                |                  |                           | AVG DRY WEIGHT (mg) |
|         | B    | 1.00026                         | 0.99730                |                                |                  |                           |                     |
|         | C    | 0.99854                         | 0.99443                |                                |                  |                           |                     |
|         | D    | 0.99605                         | 0.99254                |                                |                  |                           | CV                  |
|         | E    | 1.00477                         | 0.99944                |                                |                  |                           |                     |
| CONC:   | A    | 1.00453                         | 1.00154                |                                |                  |                           | AVG DRY WEIGHT (mg) |
|         | B    | 0.99896                         | 0.98935                |                                |                  |                           |                     |
|         | C    | 0.99446                         | 0.99052                |                                |                  |                           |                     |
|         | D    | 1.00703                         | 1.00172                |                                |                  |                           | CV                  |
|         | E    | 1.01051                         | 1.00516                |                                |                  |                           |                     |

CV = (STANDARD DEVIATION/MEAN)\*100

REMARKS:

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AA# K908007, FATHEAD MINNOW SURVIVAL, CHRONIC, 8-12-09  
File: H:/toxstat/monte\FHSURV~1. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

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D = 0.230

W = 0.701

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

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

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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# K908007, FATHEAD MINNOW SURVIVAL, CHRONIC, 8-12-09  
File: H:/toxstat/monte\FHSURV~1. Transform: ARC SINE(SQUARE ROOT(Y))

Bartlett's test for homogeneity of variance

Calculated B1 statistic = 0.42

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

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

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Data PASS B1 homogeneity test at 0.01 level. Continue analysis.

AA# K908007, FATHEAD MINNOW SURVIVAL, CHRONIC, 8-12-09  
File: H:/toxstat/monte\FHSURV~1. Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro - Wilk's test for normality

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D = 0.189

W = 0.701

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# K908007, FATHEAD MINNOW SURVIVAL, CHRONIC, 8-12-09

Bartlett's test for homogeneity of variance  
Calculated B1 statistic = 0.42

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# K908007, FATHEAD MINNOW SURVIVAL, CHRONIC, 8-12-09  
FILE: H:/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   | 0.8750 | 1.2094      |
| 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   | 0.8750 | 1.2094      |
| 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   | 0.8750 | 1.2094      |
| 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   | 1.0000 | 1.3931      |
| 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   | 0.8750 | 1.2094      |
| 6   | 100 % EFFLUENT | 3   | 0.8750 | 1.2094      |
| 6   | 100 % EFFLUENT | 4   | 1.0000 | 1.3931      |
| 6   | 100 % EFFLUENT | 5   | 1.0000 | 1.3931      |

## STEEL'S MANY-ONE RANK TEST

- Ho:Control&lt;Treatment

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| GROUP | IDENTIFICATION | TRANSFORMED<br>MEAN | RANK<br>SUM | CRIT.<br>VALUE | df   | SIG |
|-------|----------------|---------------------|-------------|----------------|------|-----|
| 1     | CONTROL        | 1.320               |             |                |      |     |
| 2     | 32 % EFFLUENT  | 1.356               | 30.00       | 16.00          | 5.00 |     |
| 3     | 42 % EFFLUENT  | 1.356               | 30.00       | 16.00          | 5.00 |     |
| 4     | 56 % EFFLUENT  | 1.356               | 30.00       | 16.00          | 5.00 |     |
| 5     | 75 % EFFLUENT  | 1.356               | 30.00       | 16.00          | 5.00 |     |
| 6     | 100 % EFFLUENT | 1.320               | 27.50       | 16.00          | 5.00 |     |

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