## *Summary - Laboratory Water Results for Saltwater Copper WER Studies in Texas Waterbodies*
## 8/2/2006

| Waterbody | Species | Toxicant | Salinity (ppt) | Test Duration (hours) | LC50 Value (ug/L) (dissolved) | Geometric Mean (ug/L) | see Comment (#) |
|---|---|---|---|---|---|---|---|
| Brownsville Ship Channel | *Americamysis bahia* | copper nitrate | 15 | 48 | 108.95 | 284.11 | 1, 2 |
| Brownsville Ship Channel | *Americamysis bahia* | copper nitrate | 15 | 48 | 282.45 | | 1, 2 |
| Cow Bayou Tidal (Firestone) | *Americamysis bahia* | copper nitrate | 15 | 48 | 499.15 | | 1, 2 |
| Cow Bayou Tidal (Firestone) | *Americamysis bahia* | copper nitrate | 15 | 48 | 360.59 | | 1, 2 |
| Moses Bayou | *Americamysis bahia* | copper nitrate | 15 | 48 | 258.41 | | 1, 2 |
| Moses Bayou | *Americamysis bahia* | copper nitrate | 15 | 48 | 236.9 | | 1, 2 |
| Moses Bayou | *Americamysis bahia* | copper nitrate | 15 | 48 | 359.48 | | 1, 2 |
| Moses Bayou | *Americamysis bahia* | copper nitrate | 15 | 48 | 259.23 | | 1, 2 |
| Victoria Barge Canal | *Americamysis bahia* | copper nitrate | 25 | 48 | 261.96 | | 1, 2 |
| Victoria Barge Canal | *Americamysis bahia* | copper nitrate | 25 | 48 | 414.01 | | 1, 2 |
| Cow Bayou Tidal (Honeywell) | *Americamysis bahia* | copper sulfate | 25 | 48 | 316.26 | 258.04 | 1, 2 |
| Cow Bayou Tidal (Honeywell) | *Americamysis bahia* | copper sulfate | 25 | 48 | 201.92 | | 1, 2 |
| Cow Bayou Tidal (Honeywell) | *Americamysis bahia* | copper sulfate | 25 | 48 | 271.85 | | 1, 2 |
| Cow Bayou Tidal (Honeywell) | *Americamysis bahia* | copper sulfate | 25 | 48 | 255.4 | | 1, 2 |
| Kinney Bayou | *Americamysis bahia* | copper chloride | 20 | 48 | 243.22 | 312.54 | 1, 2 |
| Kinney Bayou | *Americamysis bahia* | copper chloride | 20 | 48 | 283.96 | | 1, 2 |
| Kinney Bayou | *Americamysis bahia* | copper chloride | 20 | 48 | 347.6 | | 1, 2 |
| Kinney Bayou | *Americamysis bahia* | copper chloride | 20 | 48 | 397.5 | | 1, 2 |
| Brownsville Ship Channel | *Menidia beryllina* | copper nitrate | 15 | 48 | >827 | 814.78 | 3 |
| Brownsville Ship Channel | *Menidia beryllina* | copper nitrate | 15 | 48 | 1150.14 | | 3 |
| Cow Bayou Tidal (Firestone) | *Menidia beryllina* | copper nitrate | 15 | 48 | 927.71 | | 3 |
| Cow Bayou Tidal (Firestone) | *Menidia beryllina* | copper nitrate | 15 | 48 | 1332.33 | | 3 |
| Moses Bayou | *Menidia beryllina* | copper nitrate | 15 | 48 | >495 | | 3 |
| Victoria Barge Canal | *Menidia beryllina* | copper nitrate | 25 | 48 | 502.77 | | 3 |
| Cow Bayou Tidal (Honeywell) | *Menidia beryllina* | copper sulfate | 25 | 48 | 145.59 | 145.59 | 3 |
| Brownsville Ship Channel | *Menidia beryllina* | copper nitrate | 15 | 96 | 266.25 | 292.29 | 3 |
| Brownsville Ship Channel | *Menidia beryllina* | copper nitrate | 15 | 96 | 357.71 | | 3 |
| Cow Bayou Tidal (Firestone) | *Menidia beryllina* | copper nitrate | 15 | 96 | 131.79 | | 3 |
| Cow Bayou Tidal (Firestone) | *Menidia beryllina* | copper nitrate | 15 | 96 | 681.39 | | 3 |
| Moses Bayou | *Menidia beryllina* | copper nitrate | 15 | 96 | 200.51 | | 3 |
| Victoria Barge Canal | *Menidia beryllina* | copper nitrate | 25 | 96 | 363.64 | | 3 |

**Comments**

#1 - SMAV for ***A. bahia*** in draft 2003 Copper Criteria Document is based on **96-h LC50** values with tests using **copper nitrate** and is = 164.5 ug/L.
#2 - Texas-based SMAV for ***A. bahia*** derived from 72 **48h-LC50** values from reference toxicant test results (PBS&J) using **copper nitrate** = 378.33 ug/L.
#3 - SMAV for ***M. beryllina*** in draft 2003 Copper Criteria Document is based on **96-h LC50** values with tests using **copper sulfate** and is = 111.1 ug/L.

## Additional Summary Information

**Copper nitrate tests**

*A. bahia* is more sensitive (has a lower LC50 value) at 48 hours than *M. beryllina* in all 4 WER studies conducted using copper nitrate.
The geometric mean of ten 48-hour LC50s for *A. bahia* is 284.11 ug/L (range =108.95 ug/L to 499.19 ug/L).
Previously, TCEQ and EPA WQS staff had worked together to derive a 48-hour SMAV for *A. bahia* of 378.33 ug/L (see comment #2 above).
The geometric mean of 284.11 ug/L for *A. bahia* is lower than this value.
The geometric mean of six 48-hour LC50s for *M. beryllina* is 814.78 ug/L (range =495 ug/L to 1332.33 ug/L).
The geometric mean of six 96-hour LC50s for M. beryllina is 292.29 ug/L (range = 131.79 ug/L to 681.39 ug/L).

**Copper sulfate tests**

*M. beryllina* is more sensitive (has a lower LC50 value) at 48 hours than *A. bahia* in the only studies conducted using copper sulfate.
The geometric mean at 48 hours for *M. beryllina* = 145.59 ug/L.
The SMAV for *M. beryllina* in the draft 2003 Copper Criteria Document (96-hour test using copper sulfate) = 111.1 ug/L.
The geometric mean of four 48-hour LC50s for *A. bahia* = 258.04 ug/L.

**Copper chloride tests**

There are only four 48-hour LC50s for *A. bahia*, with a geometric mean of 312.54 ug/L.

**Possible Options:**

EPA WQS staff's preferred option:

In utilizing the streamlined WER method for saltwater copper WER studies in Texas, one option is to conduct the studies using only copper nitrate and using only two 48-hour tests with *A. bahia*. Then, the WER would be the site water LC50 divided by the greater of the laboratory water LC50 or the SMAV. However, rather than using the 48-hour SMAV of 378.33 ug/L (as previously determined) for *A. bahia*, EPA WQS staff recommend using 284.11 ug/L as determined in the table above from the ten 48-hour LC50s values for *A. bahia* in tests with copper nitrate.

Option 2:

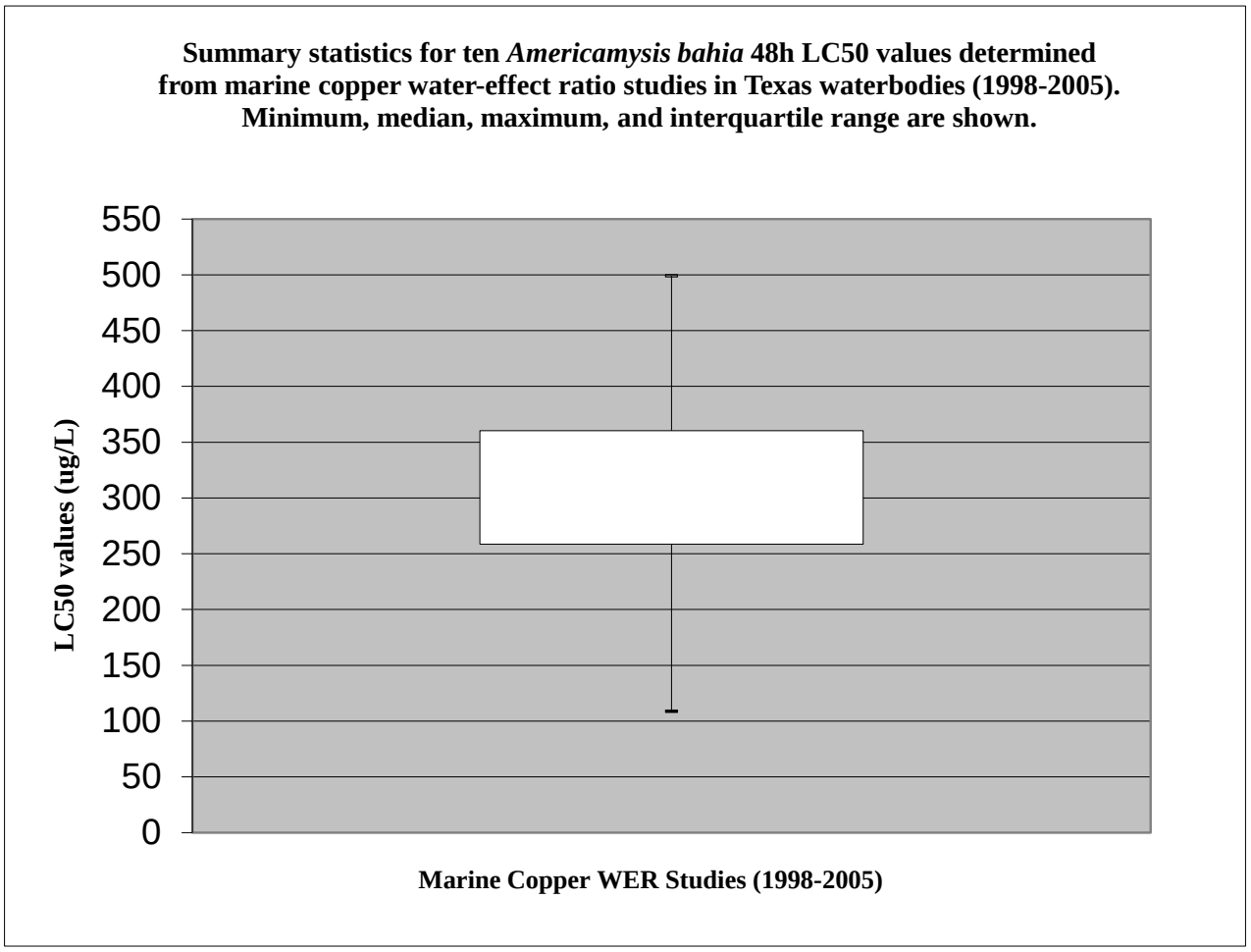
Another option would be to conduct the studies using only copper nitrate, with the first round of testing being a 48-hour test with *A. bahia* and a 96-hour test with *M. beryllina*. After determining which species is most senstive at 48-hours, the second test would be conducted with whichever species is most sensitive during the first round. If it's *A. bahia*, then the WER would be the site water LC50 divided by the greater of the laboratory water LC50 or the SMAV (284.11 ug/L, as discussed above). If it's *M. beryllina*, then the second round of testing would be conducted for 96 hours and the WER would be the site water LC50 divided by the greater of the laboratory water LC50 or the geomean 96-h LC50 of 292.29 ug/L determined above. [There is such a wide spread of data leading to the geomean 48-h LC50 of 814.78 ug/L, that the confidence in this value may be less.]

Option 3:

Another option would be to utlized the 1994 Interim WER guidance for determining saltwater copper WERs, rather than the streamlined method.

**Box and Whisker Plot and Identification of Ouliers**
**48h LC50 values for *Americamysis bahia*.**

| Statistic | Group A |
|---|---|
| q1 | 258.615 |
| min | 108.95 |
| median | 272.205 |
| max | 499.15 |
| q3 | 360.3125 |




**Outlier Identification**
Q3 - Q1 = 101.69
101.69 x 1.5 = 152.55

Q3 + 1.5(Q3-Q1) = 512.85
Q1 - 1.5(Q3-Q1) = 106.06

All ten LC50 values fall within the range above; so, there are no outliers.

**Dixon's Test for Outliers - 48h LC50 values for *Americamysis bahia* .**

| LC50 Value | Q exp | Q crit |
|---|---|---|
| 108.95 | 0.327909 | 0.466 |
| 236.9 | 0.055126 | |
| 258.41 | 0.002101 | |
| 259.23 | 0.006996 | |
| 261.96 | 0.052512 | |
| 282.45 | 0.197412 | |
| 359.48 | 0.002845 | |
| 360.59 | 0.136904 | |
| 414.01 | 0.218196 | |
| 499.15 | | |

**Q exp is not greater than Q crit, so cannot reject any of the values as outliers.**

Source: http://www.chem.uoa.gr/Applets/AppletQtest/Appl_Qtest2.html

| | |
|---|---|
| **Location:** | Unnamed Canal to Cow Bayou Tidal |
| **Discharger:** | Honeywell, Inc. |
| **Critical Dilution:** | 48% effluent; 52% upstream water |
| **Water Type:** | saltwater |
| **Primary Test Species:** | *Mysidopsis bahia* (4x) |
| **Secondary Test Species:** | *Menidia beryllina* (1x) |
| **Toxicant:** | copper sulfate (d) |
| **Test Duration:** | 48h for both species |
| **Test Salinity:** | 25 ppt +/- 2 |
| **Total # Organisms per Treatment:** | 40 |

**Test Date:** December 14-16, 2001

**Species:** *M. bahia*

**WER** 2.24

**Lab Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| 0 | 0 | 316.26 |
| 185 | 2 | |
| 210 | 3 | |
| 288 | 8 | |
| 371 | 35 | |
| 511 | 39 | |

**SIM Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| 0 | 0 | >708 |
| 204 | 0 | |
| 250 | 0 | |
| 339 | 0 | |
| 495 | 6 | |
| 708 | 19 | |

**Test Date:** April 11-13, 2002

**Species:** *M. bahia*

**WER** 2.32

**Lab Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| 0 | 0 | 201.92 |
| 126 | 6 | |
| 172.5 | 13 | |
| 218 | 20 | |
| 274.5 | 36 | |
| 349 | 40 | |

**SIM Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 | |
|---|---|---|---|
| 0 | 0 | >468 | Trim S-K |
| 182.5 | 0 | 496.8 | computational interpolation |
| 238.5 | 0 | | |
| 366 | 8 | | |
| 398.5 | 6 | | |
| 468 | 17 | | |

**Test Date:** August 29-31, 2002

**Species:** *M. bahia*

**WER**
2.17

**Lab Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| 0 | 0 | 271.85 |
| 134.5 | 0 | |
| 173.5 | 3 | |
| 204 | 8 | |
| 245 | 17 | |
| 400 | 34 | |

**SIM Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| 0 | 0 | 591.15 |
| 257 | 1 | |
| 356 | 5 | |
| 517.5 | 19 | |
| 712 | 27 | |
| 996 | 32 | |
| 1515 | 38 | |

**Test Date:** November 22-24, 2002

**Species:** *M. bahia*

**WER**
2.75

**Lab Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| 0 | 0 | 255.4 |
| 143 | 0 | |
| 170 | 1 | |
| 207 | 9 | |
| 269.5 | 25 | |
| 382.5 | 35 | |

**SIM Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| 0 | 0 | 701.34 |
| 265.5 | 0 | |
| 367 | 1 | |
| 530 | 4 | |
| 743 | 26 | |
| 942 | 35 | |
| 1584 | 38 | |

**FWER**
2.36

**Test Date:** November 22-24, 2002

**Species:** *M. beryllina*

**WER**
1.86

**Lab Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| 0 | 0 | 145.59 |
| 45 | 0 | |
| 59 | 0 | |
| 69 | 7 | |
| 136 | 10 | |
| 205 | 36 | |

**SIM Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| 0 | 0 | 271.22 |
| 69 | 1 | |
| 92.5 | 1 | |
| 133 | 3 | |
| 217 | 8 | |
| 339 | 32 | |

**FWER**
1.86

| | |
|---|---|
| **Location:** | Cow Bayou Tidal |
| **Discharger:** | Firestone Polymers, LLC |
| **Critical Dilution:** | 100% effluent |
| **Water Type:** | saltwater |
| **Primary Test Species:** | *Mysidopsis bahia* (2x) |
| **Secondary Test Species:** | *Menidia beryllina* (2x) |
| **Toxicant:** | copper nitrate (t and d) |
| **Test Duration:** | 48h for *M. bahia*; 96h for *M. beryllina* |
| **Test Salinity:** | 15 ppt |
| **Total # Organisms per Treatment:** | 50 |

**Test Date:** October 2004

**Species:** *M. bahia*

**WER** 1.7104

**Lab Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | 499.19 |
| 148 | 2 | |
| 224 | 5 | |
| 338 | 13 | |
| 506 | 25 | |
| 752 | 36 | |
| 1095 | 47 | |

**SIM Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | 853.83 |
| 227 | 0 | |
| 313 | 2 | |
| 468 | 3 | |
| 659 | 16 | |
| 958 | 29 | |

**Test Date:** January 2005

**Species:** *M. bahia*

**WER** 2.8121

**Lab Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | 360.59 |
| 130 | 2 | |
| 168 | 5 | |
| 257 | 13 | |
| 349 | 29 | |

| | | | | |
|---|---|---|---|---|
| | | 522 | 39 | Firestone, Page 9 |
| | | 742 | 38 | |
| | | 1037 | 45 | |
| | **SIM Water** | | | |
| | | **Measured Concentration (d) (ug/L)** | **Number of Mortalities** | **LC50** |
| | | <5 | 0 | >1014 |
| | | 82 | 0 | |
| | | 147 | 0 | |
| | | 264 | 2 | |
| | | 522 | 3 | **fWER** |
| | | 1014 | 8 | 2.1931 |

| | | | | | |
|---|---|---|---|---|---|
| **Test Date:** October 2004 | | | | | |
| | **Species:** *M. bahia* | | | | **WER** |
| | | **Lab Water** | | | 2.2435 |
| | | **Measured Concentration (t) (ug/L)** | **Number of Mortalities** | **LC50** | |
| | | <5 | 0 | 571.9 | |
| | | 179 | 2 | | |
| | | 267 | 5 | | |
| | | 387 | 13 | | |
| | | 580 | 25 | | |
| | | 856 | 36 | | |
| | | 1215 | 47 | | |
| | | **SIM Water** | | | |
| | | **Measured Concentration (t) (ug/L)** | **Number of Mortalities** | **LC50** | |
| | | <5 | 0 | 1283.07 | |
| | | 339 | 0 | | |
| | | 481 | 2 | | |
| | | 703 | 3 | | |
| | | 982 | 16 | | |
| | | 1445 | 29 | | |
| **Test Date:** January 2005 | | | | | |
| | **Species:** *M. bahia* | | | | **WER** |
| | | **Lab Water** | | | 3.0794 |
| | | **Measured Concentration (t) (ug/L)** | **Number of Mortalities** | **LC50** | |
| | | <5 | 0 | 420.53 | |
| | | 150 | 2 | | |
| | | 213 | 5 | | |
| | | 297 | 13 | | |
| | | 399 | 29 | | |

| | | | |
|---|---|---|---|
| | 611 | 39 | Firestone, Page 10 |
| | 868 | 38 | |
| | 1210 | 45 | |

**SIM Water**

| Measured Concentration (t) (ug/L) | Number of Mortalities | LC50 | |
|---|---|---|---|
| 6 | 0 | >1295 | |
| 94 | 0 | | |
| 174 | 0 | | |
| 329 | 2 | | |
| 660 | 3 | | **fWER** |
| 1295 | 8 | | 2.6284 |

**Test Date:** October 2004

**Species:** *M. beryllina*

**WER** 1.4361

**Lab Water**

| Measured Concentration (d-48h) (ug/l | Number of Mortalities (48h) | LC50 |
|---|---|---|
| <5 | 1 | 927.71 |
| 57 | 6 | |
| 91 | 7 | |
| 160 | 5 | |
| 243 | 8 | |
| 359 | 12 | |
| 512 | 15 | |
| 753 | 27 | |
| 1040 | 23 | |
| 1510 | 33 | |

**SIM Water**

| Measured Concentration (d-48h) (ug/l | Number of Mortalities (48h) | LC50 |
|---|---|---|
| <5 | 2 | 1332.33 |
| 231 | 2 | |
| 350 | 11 | |
| 506 | 18 | |
| 735 | 21 | |
| 1040 | 21 | |
| 1400 | 27 | |

**Test Date:** January 2005

**Species:** *M. beryllina*

**WER** n/a

**Lab Water**

| Measured Concentration (d-48h) (ug/l | Number of Mortalities (48h) | LC50 |
|---|---|---|

| | | |
|---|---|---|
| <5 | 0 | >1310 |
| 59 | 2 | |
| 79 | 2 | |
| 145 | 1 | |
| 212 | 2 | |
| 330 | 1 | |
| 478 | 1 | |
| 714 | 3 | |
| 927 | 15 | |
| 1310 | 14 | |

**SIM Water**

| Measured Concentration (d-48h) (ug/l | Number of Mortalities (48h) | LC50 |
|---|---|---|
| 7 | 0 | >1160 |
| 122 | 0 | |
| 133 | 1 | |
| 208 | 0 | |
| 253 | 1 | |
| 322 | 5 | |
| 445 | 3 | |
| 725 | 13 | |
| 792 | 9 | |
| 1160 | 7 | |

**fWER**
1.4361

**Test Date:** October 2004

**Species:** *M. beryllina*

**WER**
1.7733

**Lab Water**

| Measured Concentration (t-48h) (ug/L | Number of Mortalities (48h) | LC50 |
|---|---|---|
| <5 | 1 | 1088.02 |
| 86 | 6 | |
| 128 | 7 | |
| 204 | 5 | |
| 289 | 8 | |
| 416 | 12 | |
| 610 | 15 | |
| 854 | 27 | |
| 1270 | 23 | |
| 1750 | 33 | |

**SIM Water**

| Measured Concentration (t-48h) (ug/L | Number of Mortalities (48h) | LC50 |
|---|---|---|
| 6 | 2 | 1929.38 |
| 339 | 2 | |

| | |
|---|---|
| 483 | 11 |
| 690 | 18 |
| 995 | 21 |
| 1460 | 21 |
| 2040 | 27 |

**Test Date:** January 2005

**Species:** *M. beryllina*

**WER**
>1.3315

**Lab Water**

| Measured Concentration (t-48h) (ug/L | Number of Mortalities (48h) | LC50 |
|---|---|---|
| <5 | 0 | >1780 |
| 114 | 2 | |
| 144 | 2 | |
| 228 | 1 | |
| 314 | 2 | |
| 429 | 1 | |
| 607 | 1 | |
| 905 | 3 | |
| 1220 | 15 | |
| 1780 | 14 | |

**SIM Water**

| Measured Concentration (t-48h) (ug/L | Number of Mortalities (48h) | LC50 |
|---|---|---|
| 11 | 0 | >2370 |
| 162 | 0 | |
| 186 | 1 | |
| 264 | 0 | |
| 352 | 1 | |
| 508 | 5 | |
| 744 | 3 | |
| 1150 | 13 | |
| 1650 | 9 | |
| 2370 | 7 | |

**fWER**
1.5366

**Test Date:** October 2004

**Species:** *M. beryllina*

**WER**
3.9626

**Lab Water**

| Measured Concentration (d-96h) (ug/l | Number of Mortalities (96h) | LC50 |
|---|---|---|
| <5 | 1 | 131.79 |
| 63 | 22 | |
| 164 | 26 | |
| 251 | 31 | |
| 360 | 32 | |

| | | | |
|---|---|---|---|
| 519 | 36 | Firestone, Page 13 | |
| 769 | 41 | | |
| 1078 | 43 | | |
| 1560 | 45 | | |

**Species:** *M. beryllina*

**SIM Water**

| Measured Concentration (d-96h) (ug/l | Number of Mortalities (96h) | LC50 |
|---|---|---|
| <5 | 3 | 522.23 |
| 258 | 3 | |
| 368 | 14 | |
| 528 | 32 | |
| 749 | 41 | |
| 1050 | 42 | |
| 1438 | 49 | |

**Test Date:** January 2005

**Species:** *M. beryllina*

**Lab Water**

**WER**
0.9060

| Measured Concentration (d-96h) (ug/l | Number of Mortalities (96h) | LC50 |
|---|---|---|
| <5 | 0 | 681.39 |
| 75 | 14 | |
| 99 | 14 | |
| 164 | 12 | |
| 241 | 12 | |
| 350 | 15 | |
| 494 | 20 | |
| 709 | 23 | |
| 975 | 31 | |
| 1360 | 38 | |

**Species:** *M. beryllina*

**SIM Water**

| Measured Concentration (d-96h) (ug/l | Number of Mortalities (96h) | LC50 |
|---|---|---|
| 10 | 0 | 617.37 |
| 125 | 1 | |
| 153 | 1 | |
| 221 | 0 | |
| 284 | 2 | |
| 377 | 8 | |
| 531 | 17 | |
| 748 | 35 | |
| 937 | 42 | |
| 1365 | 36 | |

**fWER**
1.8948

**Test Date:** October 2004

**Species:** *M. beryllina*

**Lab Water**

**WER**
4.3672

| Measured Concentration (t-96h) (ug/L | Number of Mortalities (96h) | LC50 |
|---|---|---|
| <5 | 1 | 173.13 |
| 91 | 22 | |
| 210 | 26 | |
| 300 | 31 | |
| 415 | 32 | |
| 593 | 36 | |
| 867 | 41 | |
| 1270 | 43 | |
| 1753 | 45 | |

**Species:** *M. beryllina*

**SIM Water**

| Measured Concentration (t-96h) (ug/L | Number of Mortalities (96h) | LC50 |
|---|---|---|
| 8 | 3 | 756.09 |
| 384 | 3 | |
| 532 | 14 | |
| 736 | 32 | |
| 1085 | 41 | |
| 1563 | 42 | |
| 2248 | 49 | |

**Test Date:** January 2005

**Species:** *M. beryllina*

**Lab Water**

**WER**
0.9882

| Measured Concentration (t-96h) (ug/L | Number of Mortalities (96h) | LC50 |
|---|---|---|
| <5 | 0 | 892.49 |
| 119 | 14 | |
| 149 | 14 | |
| 229 | 12 | |
| 323 | 12 | |
| 446 | 15 | |
| 638 | 20 | |
| 931 | 23 | |
| 1288 | 31 | |
| 1818 | 38 | |

**Species:** *M. beryllina*

**SIM Water**

| Measured Concentration (t-96h) (ug/L | Number of Mortalities (96h) | LC50 | fWER |
|---|---|---|---|
| 12 | 0 | 881.92 | |
| 155 | 1 | | |
| 192 | 1 | | |
| 271 | 0 | | |
| 378 | 2 | | |
| 529 | 8 | | |
| 735 | 17 | | |
| 1084 | 35 | | |
| 1543 | 42 | | |
| 2298 | 36 | | 2.0774 |

| | |
|---|---|
| **Location:** | Victoria Barge Canal |
| **Discharger:** | Air Liquide America, Inc. |
| **Critical Dilution:** | 12% effluent; 52% upstream water |
| **Water Type:** | saltwater |
| **Primary Test Species:** | *Mysidopsis bahia* (2x) |
| **Secondary Test Species:** | *Menidia beryllina* (1x) |
| **Toxicant:** | copper nitrate (t and d) |
| **Test Duration:** | 48h for *M. bahia* ; 96h for *M. beryllina* |
| **Test Salinity:** | 25 ppt |
| **Total # Organisms per Treatment:** | 50 |

**Test Date:** August 12-13, 2004

**Species:** *M. bahia*

**WER**
1.9509

**Lab Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <25 | 0 | 261.96 |
| 155 | 6 | |
| 240 | 19 | |
| 318 | 36 | |
| 408 | 41 | |
| 538 | 49 | |
| 710 | 50 | |
| 1010 | 50 | |
| 1305 | 50 | |

**SIM Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <25 | 0 | 511.06 |
| 209 | 1 | |
| 328 | 20 | |
| 420 | 18 | |
| 572 | 35 | |

| | | | | |
|---|---|---|---|---|
| | 894 | 36 | | |
| | 1152 | 38 | | |
| | 1515 | 45 | | |

**Test Date:** September 27-28, 2004

**Species:** *M. bahia*

**WER**
3.3453

**Lab Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| 4 | 0 | 414.01 |
| 89 | 2 | |
| 114 | 0 | |
| 174 | 1 | |
| 256 | 2 | |
| 327 | 21 | |
| 402 | 33 | |
| 568 | 35 | |
| 777 | 42 | |
| 1055 | 49 | |

**SIM Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| 4 | 0 | >1385 |
| 117 | 0 | |
| 150 | 0 | |
| 231 | 0 | |
| 328 | 0 | |
| 452 | 1 | |
| 635 | 1 | |
| 817 | 4 | |
| 1043 | 13 | |
| 1385 | 22 | |

**fWER**
2.5546

**Test Date:** August 12-13, 2004

**Species:** *M. bahia*

**WER**
2.4725

**Lab Water**

| Measured Concentration (t) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <25 | 0 | 252.49 |

| | | | |
|---|---|---|---|
| | 143 | 6 | |
| | 224 | 19 | |
| | 304 | 36 | |
| | 456 | 41 | |
| | 648 | 49 | |
| | 955 | 50 | |
| | 1355 | 50 | |
| | 1950 | 50 | |

**SIM Water**

| Measured Concentration (t) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <25 | 0 | 624.27 |
| 173 | 0 | |
| 244 | 1 | |
| 355 | 20 | |
| 486 | 18 | |
| 646 | 35 | |
| 1038 | 36 | |
| 1510 | 38 | |
| 2215 | 45 | |
| 3120 | 50 | |

**Test Date:** September 27-28, 2004

**Species:** *M. bahia*

**WER**
5.5805

**Lab Water**

| Measured Concentration (t) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| 4 | 0 | 483.83 |
| 80 | 2 | |
| 107 | 0 | |
| 167 | 1 | |
| 267 | 2 | |
| 350 | 21 | |
| 515 | 33 | |
| 707 | 35 | |
| 1080 | 42 | |
| 1405 | 49 | |

**SIM Water**

| Measured Concentration (t) (ug/L) | Number of Mortalities | LC50 | fWER |
|---|---|---|---|
| 4 | 0 | >2700 | 3.7145 |
| 166 | 0 | | |
| 225 | 0 | | |
| 327 | 0 | | |
| 456 | 0 | | |
| 591 | 1 | | |
| 878 | 1 | | |
| 1214 | 4 | | |
| 1765 | 13 | | |
| 2700 | 22 | | |

**Test Date:** August 12-13, 2004

**Species:** *M. beryllina*

**Lab Water**

| Measured Concentration (d-48h) (ug/l | Number of Mortalities (48h) | LC50 | WER |
|---|---|---|---|
| 12 | 5 | 502.77 | 0.8499 |
| 67 | 7 | | |
| 77 | 7 | | |
| 119 | 8 | | |
| 159 | 12 | | |
| 329 | 10 | | |
| 356 | 3 | | |
| 469 | 12 | | |
| 642 | 50 | | |
| 899 | 50 | | |

**Species:** *M. beryllina*

**SIM Water**

| Measured Concentration (d-48h) (ug/l | Number of Mortalities (48h) | LC50 |
|---|---|---|
| <5 | 0 | 427.28 |
| 80 | 0 | |
| 92 | 0 | |
| 163 | 0 | |
| 241 | 1 | |
| 335 | 7 | |

| | | | |
|---|---|---|---|
| | 436 | 25 | **fWER** |
| | 636 | 50 | 0.8499 |

**Test Date:** August 12-13, 2004

**Species:** *M. beryllina*

**Lab Water**

| Measured Concentration (t-48h) (ug/L | Number of Mortalities (48h) | LC50 | WER |
|---|---|---|---|
| <5 | 5 | 467.75 | 1.2121 |
| 53 | 7 | | |
| 76 | 7 | | |
| 112 | 8 | | |
| 213 | 12 | | |
| 235 | 10 | | |
| 296 | 3 | | |
| 434 | 12 | | |
| 605 | 50 | | |
| 847 | 50 | | |

**Species:** *M. beryllina*

**SIM Water**

| Measured Concentration (t-48h) (ug/L | Number of Mortalities (48h) | LC50 | |
|---|---|---|---|
| 11 | 0 | 566.94 | |
| 102 | 0 | | |
| 140 | 0 | | |
| 221 | 0 | | |
| 313 | 1 | | |
| 429 | 7 | | |
| 583 | 25 | | **fWER** |
| 866 | 50 | | 1.2121 |

**Test Date:** August 12-13, 2004

**Species:** *M. beryllina*

**Lab Water**

| Measured Concentration (d-96h) (ug/L | Number of Mortalities (96h) | LC50 | WER |
|---|---|---|---|
| <10 | 6 | 363.64 | 1.2078 |
| 60 | 8 | | |
| 75 | 10 | | |

| | |
|---|---|
| 112 | 11 |
| 143 | 16 |
| 271 | 4 |
| 308 | 14 |
| 441 | 44 |

**Species:** *M. beryllina*

**SIM Water**

| Measured Concentration (d-96h) (ug/l | Number of Mortalities (96h) | LC50 | fWER |
|---|---|---|---|
| <5 | 0 | 439.2 | 1.2078 |
| 81 | 0 | | |
| 95 | 1 | | |
| 160 | 1 | | |
| 224 | 4 | | |
| 320 | 7 | | |
| 463 | 28 | | |

**Test Date:** August 12-13, 2004

**Species:** *M. beryllina*

**Lab Water**

| Measured Concentration (t-96h) (ug/L | Number of Mortalities (96h) | LC50 | WER |
|---|---|---|---|
| <5 | 6 | 341.63 | 1.748 |
| 47 | 8 | | |
| 67 | 10 | | |
| 104 | 11 | | |
| 171 | 16 | | |
| 242 | 4 | | |
| 264 | 14 | | |
| 459 | 44 | | |

**Species:** *M. beryllina*

**SIM Water**

| Measured Concentration (t-96h) (ug/L | Number of Mortalities (96h) | LC50 |
|---|---|---|
| <10 | 0 | 597.16 |
| 102 | 0 | |
| 140 | 1 | |
| 236 | 1 | |

| | | |
|---|---|---|
| 315 | 4 | |
| 450 | 7 | **fWER** |
| 626 | 28 | 1.748 |

| | |
|---|---|
| **Location:** | Moses Bayou |
| **Discharger:** | ISP Technologies, Inc. |
| **Critical Dilution:** | 50% effluent; 50% upstream water |
| **Water Type:** | saltwater |
| **Primary Test Species:** | *Mysidopsis bahia* (4x) |
| **Secondary Test Species:** | *Menidia beryllina* (1x) |
| **Toxicant:** | copper nitrate (t and d) |
| **Test Duration:** | 48h for *M. bahia* ; 96h for *M. beryllina* |
| **Test Salinity:** | 15 ppt |
| **Total # Organisms per Treatment:** | 50 |

**Test Date:** December 2002

**Species:** *M. bahia*

**WER**
1.9209

**Lab Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <10 | 0 | 258.41 |
| 76.5 | 0 | |
| 130.5 | 3 | |
| 188.5 | 4 | |
| 263 | 31 | |
| 362 | 42 | |
| 515.5 | 47 | |

**SIM Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <10 | 0 | 496.39 |
| 186.5 | 0 | |
| 269 | 0 | |
| 373.5 | 13 | |
| 521.5 | 27 | |
| 691.5 | 40 | |

| | | | | | |
|---|---|---|---|---|---|
| | | | 867.5 | 44 | |

**Test Date:** February 2003

**Species:** *M. bahia*

**WER**
2.714

**Lab Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 1 | 236.9 |
| 120.5 | 1 | |
| 161.5 | 14 | |
| 230 | 27 | |
| 317 | 34 | |
| 456.5 | 47 | |
| 648.5 | 50 | |

**SIM Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | 642.95 |
| 254.5 | 0 | |
| 330.5 | 2 | |
| 479.5 | 8 | |
| 643 | 27 | |
| 881.5 | 38 | |

**Test Date:** April 2003

**Species:** *M. bahia*

**WER**
1.3126

**Lab Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | 359.48 |
| 58.5 | 6 | |
| 112 | 5 | |
| 163 | 9 | |
| 254.5 | 6 | |
| 381 | 25 | |
| 560.5 | 47 | |

| | | | | | |
|---|---|---|---|---|---|
| | | | 809 | 50 | |
| | | **SIM Water** | | | |
| | | | **Measured Concentration (d) (ug/L)** | **Number of Mortalities** | **LC50** |
| | | | <5 | 0 | 471.87 |
| | | | 113.5 | 0 | |
| | | | 158.5 | 0 | |
| | | | 223 | 1 | |
| | | | 324 | 12 | |
| | | | 489.5 | 27 | |
| | | | 655 | 33 | |
| | | | 854 | 48 | |
| **Test Date:** July 2003 | | | | | |
| | **Species:** *M. bahia* | | | | **WER** |
| | | **Lab Water** | | | 1.8379 |
| | | | **Measured Concentration (d) (ug/L)** | **Number of Mortalities** | **LC50** |
| | | | <5 | 0 | 259.23 |
| | | | 44.5 | 0 | |
| | | | 84 | 1 | |
| | | | 140.5 | 1 | |
| | | | 220 | 19 | |
| | | | 344 | 37 | |
| | | | 483 | 44 | |
| | | **SIM Water** | | | |
| | | | **Measured Concentration (d) (ug/L)** | **Number of Mortalities** | **LC50** |
| | | | <5 | 0 | 476.44 |
| | | | 223.5 | 0 | |
| | | | 327.5 | 9 | |
| | | | 473.5 | 26 | |
| | | | 635 | 36 | **fWER** |
| | | | 800.5 | 38 | 1.8832 |

**Test Date:** December 2002

**Species:** *M. bahia*

**WER**
2.695

**Lab Water**

| Measured Concentration (t) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <10 | 0 | 284.39 |
| 81 | 0 | |
| 136.5 | 3 | |
| 200 | 4 | |
| 284.5 | 31 | |
| 427.5 | 42 | |
| 640 | 47 | |

**SIM Water**

| Measured Concentration (t) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <10 | 0 | 766.43 |
| 256 | 0 | |
| 378 | 0 | |
| 538.5 | 13 | |
| 792 | 27 | |
| 1175 | 40 | |
| 1650 | 44 | |

**Test Date:** February 2003

**Species:** *M. bahia*

**WER**
3.9711

**Lab Water**

| Measured Concentration (t) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 1 | 266.85 |
| 131 | 1 | |
| 182.5 | 14 | |
| 258 | 27 | |
| 358.5 | 34 | |
| 525 | 47 | |
| 742.5 | 50 | |

**SIM Water**

| Measured Concentration (t) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | 1059.7 |
| 358 | 0 | |
| 517.5 | 2 | |
| 734.5 | 8 | |
| 1072 | 27 | |
| 1525 | 38 | |

**Test Date:** April 2003

**Species:** *M. bahia*

**WER**
2.1191

**Lab Water**

| Measured Concentration (t) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | 386.86 |
| 78 | 6 | |
| 127 | 5 | |
| 183.5 | 9 | |
| 277 | 6 | |
| 406 | 25 | |
| 603 | 47 | |
| 885 | 50 | |

**SIM Water**

| Measured Concentration (t) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | 819.81 |
| 185.5 | 0 | |
| 264.5 | 0 | |
| 390.5 | 1 | |
| 547 | 12 | |
| 862.5 | 27 | |
| 1142.5 | 33 | |
| 1675 | 48 | |

**Test Date:** July 2003

**Species:** *M. bahia*

**WER**
2.4163

**Lab Water**

| Measured Concentration (t) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | 318.22 |
| 82 | 0 | |
| 126 | 1 | |
| 186.5 | 1 | |
| 271 | 19 | |
| 407.5 | 37 | |
| 596 | 44 | |

**SIM Water**

| Measured Concentration (t) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | 768.91 |
| 367.5 | 0 | |
| 507 | 9 | |
| 748.5 | 26 | |
| 1078 | 36 | |
| 1595 | 38 | |

**fWER**
2.7208

**Test Date:** December 2002

**Species:** *M. beryllina*

**WER**
>1.2283

**Lab Water**

| Measured Concentration (d-48h) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <10 | 0 | >495 |
| 66 | 3 | |
| 89 | 3 | |
| 144 | 5 | |
| 231 | 5 | |
| 329 | 10 | |
| 495 | 15 | |

**SIM Water**

| Measured Concentration (d-48h) (ug/L) | Number of Mortalities | LC50 | |
|---|---|---|---|
| <10 | 0 | >608 | |
| 112 | 0 | | |
| 159 | 0 | | |
| 236 | 1 | | |
| 323 | 3 | | |
| 443 | 11 | | **fWER** |
| 608 | 9 | | >1.2283 |

**Test Date:** December 2002

**Species:** *M. beryllina*

**WER**
>1.5579

**Lab Water**

| Measured Concentration (t-48h) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <10 | 0 | >579 |
| 63 | 3 | |
| 96 | 3 | |
| 161 | 5 | |
| 256 | 5 | |
| 376 | 10 | |
| 579 | 15 | |

**SIM Water**

| Measured Concentration (t-48h) (ug/L) | Number of Mortalities | LC50 | |
|---|---|---|---|
| <10 | 0 | >902 | |
| 143 | 0 | | |
| 214 | 0 | | |
| 310 | 1 | | |
| 434 | 3 | | |
| 623 | 11 | | **fWER** |
| 902 | 9 | | >1.5579 |

**Test Date:** December 2002

**Species:** *M. beryllina*

**WER**
2.031

**Lab Water**

| Measured Concentration (d-96h) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <10 | 1 | 200.51 |
| 67.25 | 9 | |
| 105.25 | 8 | |
| 163.5 | 15 | |
| 239.5 | 33 | |
| 339 | 45 | |
| 487.25 | 46 | |

**SIM Water**

| Measured Concentration (d-96h) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <10 | 0 | 407.23 |
| 112.25 | 0 | |
| 160.25 | 1 | |
| 247.5 | 8 | |
| 353.25 | 19 | |
| 496 | 32 | |
| 682.75 | 44 | |

**fWER**
2.031

**Test Date:** December 2002

**Species:** *M. beryllina*

**WER**
2.7063

**Lab Water**

| Measured Concentration (t-96h) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <10 | 1 | 223.15 |
| 70 | 9 | |
| 115.75 | 8 | |
| 177.25 | 15 | |
| 269 | 33 | |
| 400.5 | 45 | |
| 597.25 | 46 | |

| SIM Water | Measured Concentration (t-96h) (ug/L) | Number of Mortalities | LC50 | |
|---|---|---|---|---|
| | <10 | 0 | 603.91 | |
| | 165.75 | 0 | | |
| | 242 | 1 | | |
| | 356.75 | 8 | | |
| | 506.75 | 19 | | |
| | 746.5 | 32 | | fWER |
| | 1084.75 | 44 | | 2.7063 |

| | |
|---|---|
| **Location:** | Kinney Bayou |
| **Discharger:** | City of Ingleside WWTP |
| **Critical Dilution:** | 60% effluent; 40% upstream water |
| **Water Type:** | saltwater |
| **Primary Test Species:** | *Mysidopsis bahia* (4x) |
| **Secondary Test Species:** | n/a |
| **Toxicant:** | copper chloride (t and d) |
| **Test Duration:** | 48h for *M. bahia* |
| **Test Salinity:** | 20 ppt |
| **Total # Organisms per Treatment:** | 50 |

**Test Date:** August 1998

**Species:** *M. bahia*

**WER**
2.1174

**Lab Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <1 | 0 | 243.22 |
| 55 | 0 | |
| 100 | 0 | |
| 160 | 0 | |
| 215 | 18 | |
| 300 | 37 | |

**SIM Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <1 | 1 | >515 |
| 115 | 2 | |
| 135 | 1 | |
| 190 | 0 | |
| 275 | 7 | |
| 415 | 3 | |

| | | | |
|---|---|---|---|
| 515 | 6 | | |

**Test Date:** November 1998

**Species:** *M. bahia*

**WER**
2.4869

**Lab Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 1 | 283.96 |
| 165 | 3 | |
| 195 | 17 | |
| 240 | 24 | |
| 440 | 35 | |
| 525 | 47 | |

**SIM Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | 706.17 |
| 210 | 1 | |
| 320 | 0 | |
| 410 | 0 | |
| 555 | 17 | |
| 750 | 27 | |
| 910 | 27 | |

**Test Date:** February 1999

**Species:** *M. bahia*

**WER**
1.761

**Lab Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | 397.5 |
| 110 | 1 | |
| 185 | 0 | |
| 265 | 11 | |
| 470 | 30 | |
| 595 | 41 | |

**SIM Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | >700 |
| 200 | 1 | |
| 255 | 0 | |
| 405 | 10 | |
| 505 | 17 | |
| 620 | 20 | |
| 700 | 22 | |

**Test Date:** June 1999

**Species:** *M. bahia*

**WER**
2.5029

**Lab Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | 347.6 |
| 95 | 3 | |
| 150 | 1 | |
| 260 | 6 | |
| 405 | 35 | |
| 500 | 35 | |

**SIM Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | >870 |
| 275 | 2 | |
| 400 | 3 | |
| 505 | 10 | |
| 625 | 24 | |
| 810 | 18 | |
| 870 | 23 | |

fWER
2.1949

**Test Date:** August 1998

**Species:** *M. bahia*

**WER**
1.8438

**Lab Water**

| Measured Concentration (t) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <1 | 0 | 290.16 |
| 75 | 0 | |
| 125 | 0 | |
| 175 | 0 | |
| 245 | 18 | |
| 385 | 37 | |

**SIM Water**

| Measured Concentration (t) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <1 | 1 | >535 |
| 135 | 2 | |
| 155 | 1 | |
| 215 | 0 | |
| 330 | 7 | |
| 455 | 3 | |
| 535 | 6 | |

**Test Date:** November 1998

**Species:** *M. bahia*

**WER**
2.3421

**Lab Water**

| Measured Concentration (t) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 1 | 321.39 |
| 170 | 3 | |
| 210 | 17 | |
| 280 | 24 | |
| 525 | 35 | |
| 615 | 47 | |

**SIM Water**

| Measured Concentration (t) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | 752.74 |
| 220 | 1 | |

| | | | | | |
|---|---|---|---|---|---|
| | | | 340 | 0 | |
| | | | 410 | 0 | |
| | | | 590 | 17 | |
| | | | 800 | 27 | |
| | | | 1020 | 27 | |
| **Test Date:** February 1999 | | | | | |
| | **Species:** *M. bahia* | | | | **WER** |
| | | **Lab Water** | | | 1.8234 |
| | | | **Measured Concentration (t) (ug/L)** | **Number of Mortalities** | **LC50** |
| | | | <5 | 0 | 419.55 |
| | | | 115 | 1 | |
| | | | 195 | 0 | |
| | | | 290 | 11 | |
| | | | 485 | 30 | |
| | | | 620 | 41 | |
| | | **SIM Water** | | | |
| | | | **Measured Concentration (t) (ug/L)** | **Number of Mortalities** | **LC50** |
| | | | <5 | 0 | >765 |
| | | | 205 | 1 | |
| | | | 280 | 0 | |
| | | | 435 | 10 | |
| | | | 555 | 17 | |
| | | | 710 | 20 | |
| | | | 765 | 22 | |
| **Test Date:** June 1999 | | | | | |
| | **Species:** *M. bahia* | | | | **WER** |
| | | **Lab Water** | | | 2.6217 |
| | | | **Measured Concentration (t) (ug/L)** | **Number of Mortalities** | **LC50** |
| | | | <5 | 0 | 383.34 |
| | | | 110 | 3 | |
| | | | 165 | 1 | |

| | | | | |
|---|---|---|---|---|
| | 295 | 6 | | |
| | 440 | 35 | | |
| | 570 | 35 | | |
| **SIM Water** | | | | |
| | **Measured Concentration (t) (ug/L)** | **Number of Mortalities** | **LC50** | |
| | <5 | 0 | >1005 | |
| | 290 | 2 | | |
| | 440 | 3 | | |
| | 555 | 10 | | |
| | 690 | 24 | | |
| | 860 | 18 | | fWER |
| | 1005 | 23 | | 2.1316 |

| | |
|---|---|
| **Location:** | Brownsville Ship Channel |
| **Discharger:** | Laguna Madre Water District- Port Isabel WWTP |
| **Critical Dilution:** | 100% effluent |
| **Water Type:** | saltwater |
| **Primary Test Species:** | *Mysidopsis bahia* (2x) |
| **Secondary Test Species:** | *Menidia beryllina* (2x) |
| **Toxicant:** | copper nitrate (t and d) |
| **Test Duration:** | 48h for *M. bahia* ; 96h for *M. beryllina* |
| **Test Salinity:** | 15 ppt |
| **Total # Organisms per Treatment:** | 50 |

**Test Date:** February 2005 using the SMAV

**Species:** *M. bahia*

**WER**
2.9298

**Lab Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 1 | 108.95 |
| <5 | 0 | |
| <5 | 0 | |
| <5 | 4 | |
| 36 | 7 | |
| 114 | 21 | |
| 223 | 40 | |
| 371 | 49 | |
| 557 | 48 | |
| 776 | 50 | |

**SIM Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | 481.95 |

| | |
|---|---|
| 109 | 0 |
| 162 | 5 |
| 260 | 8 |
| 346 | 14 |
| 431 | 18 |
| 536 | 27 |
| 613 | 29 |
| 743 | 40 |
| 970 | 46 |

**Test Date:** April 2005

**Species:** *M. bahia*

**WER**
2.1673

**Lab Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | 282.45 |
| <5 | 1 | |
| 10 | 0 | |
| 33 | 0 | |
| 69 | 3 | |
| 138 | 5 | |
| 232 | 26 | |
| 371 | 28 | |
| 531 | 39 | |
| 795 | 47 | |

**SIM Water**

| Measured Concentration (d) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | 612.14 |
| 124 | 0 | |
| 180 | 0 | |
| 268 | 0 | |
| 346 | 2 | |
| 429 | 1 | |
| 506 | 10 | |
| 573 | 24 | |

| | | | | |
|---|---|---|---|---|
| | | 719 | 32 | **fWER** |
| | | 951 | 33 | 2.5199 |

**Test Date:** February 2005

**Species:** *M. bahia*

**WER**
4.7743

**Lab Water**

| Measured Concentration (t) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 1 | 188.84 |
| <5 | 0 | |
| <5 | 0 | |
| 62 | 4 | |
| 113 | 7 | |
| 203 | 21 | |
| 312 | 42 | |
| 479 | 49 | |
| 690 | 48 | |
| 1090 | 50 | |

**SIM Water**

| Measured Concentration (t) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | 901.57 |
| 118 | 0 | |
| 173 | 5 | |
| 307 | 8 | |
| 432 | 14 | |
| 725 | 18 | |
| 977 | 27 | |
| 1445 | 29 | |
| 2020 | 40 | |
| 3140 | 46 | |

**Test Date:** April 2005

**Species:** *M. bahia*

**WER**
4.4775

**Lab Water**

| Measured Concentration (t) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | 357.29 |
| 30 | 1 | |
| 44 | 0 | |
| 79 | 0 | |
| 125 | 3 | |
| 196 | 5 | |
| 297 | 26 | |
| 428 | 28 | |
| 613 | 39 | |
| 919 | 47 | |

**SIM Water**

| Measured Concentration (t) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | 1599.75 |
| 158 | 0 | |
| 210 | 0 | |
| 307 | 0 | |
| 487 | 2 | |
| 706 | 1 | |
| 1013 | 10 | |
| 1480 | 24 | |
| 2080 | 32 | |
| 3145 | 33 | |

**fWER**
4.6235

**Test Date:** February 2005

**Species:** *M. beryllina*

**WER**
1.1526

**Lab Water**

| Measured Concentration (d-48h) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | >827 |
| <5 | 1 | |
| <5 | 2 | |
| <5 | 7 | |
| 48 | 10 | |

| | | | | | |
|---|---|---|---|---|---|
| | | | 100 | 7 | |
| | | | 230 | 6 | |
| | | | 411 | 8 | |
| | | | 607 | 9 | |
| | | | 827 | 10 | |
| | | **SIM Water** | | | |
| | | | **Measured Concentration (d-48h) (ug/L)** | **Number of Mortalities** | **LC50** |
| | | | <5 | 0 | >953 |
| | | | 124 | 0 | |
| | | | 163 | 0 | |
| | | | 232 | 0 | |
| | | | 327 | 1 | |
| | | | 393 | 6 | |
| | | | 524 | 1 | |
| | | | 661 | 7 | |
| | | | 759 | 13 | |
| | | | 953 | 22 | |
| **Test Date:** April 2005 | | | | | |
| | **Species:** *M. beryllina* | | | | **WER** |
| | | **Lab Water** | | | 0.7703 |
| | | | **Measured Concentration (d-48h) (ug/L)** | **Number of Mortalities** | **LC50** |
| | | | <5 | 0 | 1150.14 |
| | | | 58 | 26 | |
| | | | 105 | 19 | |
| | | | 211 | 17 | |
| | | | 301 | 8 | |
| | | | 432 | 17 | |
| | | | 615 | 26 | |
| | | | 815 | 24 | |
| | | | 1100 | 23 | |
| | | | 1550 | 26 | |
| | | **SIM Water** | | | |

| Measured Concentration (d-48h) (ug/L) | Number of Mortalities | LC50 | |
|---|---|---|---|
| <5 | 0 | >886 | |
| 168 | 0 | | |
| 210 | 0 | | |
| 313 | 0 | | |
| 418 | 2 | | |
| 478 | 3 | | |
| 563 | 3 | | |
| 685 | 7 | | |
| 750 | 16 | | **fWER** |
| 886 | 24 | | 0.9423 |

**Test Date:** February 2005

**Species:** *M. beryllina*

**WER**
2.1176

**Lab Water**

| Measured Concentration (t-48h) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | >1020 |
| <5 | 1 | |
| <5 | 2 | |
| 39 | 7 | |
| 75 | 10 | |
| 166 | 7 | |
| 309 | 6 | |
| 468 | 8 | |
| 715 | 9 | |
| 1020 | 10 | |

**SIM Water**

| Measured Concentration (t-48h) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | >2160 |
| 140 | 0 | |
| 181 | 0 | |
| 272 | 0 | |
| 365 | 1 | |

| | | | | | |
|---|---|---|---|---|---|
| | | | 530 | 6 | |
| | | | 799 | 1 | |
| | | | 1110 | 7 | |
| | | | 1540 | 13 | |
| | | | 2160 | 22 | |
| **Test Date:** April 2005 | | | | | |
| | **Species:** *M. beryllina* | | | | **WER** |
| | | **Lab Water** | | | 1.9622 |
| | | | **Measured Concentration (t-48h) (ug/L)** | **Number of Mortalities** | **LC50** |
| | | | <5 | 0 | 1508.51 |
| | | | 90 | 26 | |
| | | | 128 | 19 | |
| | | | 205 | 17 | |
| | | | 317 | 8 | |
| | | | 487 | 17 | |
| | | | 714 | 26 | |
| | | | 1070 | 24 | |
| | | | 1460 | 23 | |
| | | | 2110 | 26 | |
| | | **SIM Water** | | | |
| | | | **Measured Concentration (t-48h) (ug/L)** | **Number of Mortalities** | **LC50** |
| | | | <5 | 0 | >2960 |
| | | | 203 | 0 | |
| | | | 240 | 0 | |
| | | | 386 | 0 | |
| | | | 563 | 2 | |
| | | | 731 | 3 | |
| | | | 1010 | 3 | |
| | | | 1420 | 7 | |
| | | | 2120 | 16 | **fWER** |
| | | | 2960 | 24 | 2.0384 |

**Test Date:** February 2005

**Species:** *M. beryllina*

**WER**
2.9673

**Lab Water**

| Measured Concentration (d-96h) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | 266.25 |
| <5 | 1 | |
| <5 | 4 | |
| <5 | 14 | |
| 45 | 15 | |
| 112 | 16 | |
| 219 | 19 | |
| 388 | 33 | |
| 583 | 37 | |
| 845 | 32 | |

**SIM Water**

| Measured Concentration (d-96h) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | 790.05 |
| 134 | 1 | |
| 167 | 1 | |
| 239 | 0 | |
| 337 | 1 | |
| 419 | 6 | |
| 520 | 2 | |
| 652 | 11 | |
| 792 | 28 | |
| 1082 | 41 | |

**Test Date:** April 2005

**Species:** *M. beryllina*

**WER**
2.4827

**Lab Water**

| Measured Concentration (d-96h) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | 357.71 |
| 69 | 30 | |

| | | | | |
|---|---|---|---|---|
| | 111 | 25 | | |
| | 216 | 21 | | |
| | 320 | 12 | | |
| | 447 | 31 | | |
| | 587 | 38 | | |
| | 792 | 36 | | |
| | 1073 | 35 | | |
| | 1535 | 38 | | |
| **SIM Water** | | | | |
| | **Measured Concentration (d-96h) (ug/L)** | **Number of Mortalities** | **LC50** | |
| | <5 | 0 | 888.07 | |
| | 134 | 0 | | |
| | 213 | 0 | | |
| | 308 | 0 | | |
| | 405 | 3 | | |
| | 499 | 3 | | |
| | 571 | 7 | | |
| | 672 | 13 | | |
| | 836 | 23 | | **fWER** |
| | 1072 | 32 | | 2.7142 |

**Test Date:** February 2005

**Species:** *M. beryllina*

**WER**
4.2624

| | | | |
|---|---|---|---|
| **Lab Water** | | | |
| | **Measured Concentration (t-96h) (ug/L)** | **Number of Mortalities** | **LC50** |
| | <5 | 0 | 360.06 |
| | <5 | 1 | |
| | 6 | 4 | |
| | 43 | 14 | |
| | 96 | 15 | |
| | 183 | 16 | |
| | 311 | 19 | |
| | 475 | 33 | |
| | 732 | 37 | |

| | | | |
|---|---|---|---|
| 1068 | 32 | | |

**SIM Water**

| Measured Concentration (t-96h) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | 1534.73 |
| 142 | 1 | |
| 179 | 1 | |
| 272 | 0 | |
| 388 | 1 | |
| 562 | 6 | |
| 787 | 2 | |
| 1115 | 11 | |
| 1623 | 28 | |
| 2295 | 41 | |

**Test Date:** April 2005

**Species:** *M. beryllina*

**WER**
5.8116

**Lab Water**

| Measured Concentration (t-96h) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | 372.66 |
| 107 | 30 | |
| 145 | 25 | |
| 226 | 21 | |
| 324 | 12 | |
| 493 | 31 | |
| 726 | 38 | |
| 1046 | 36 | |
| 1503 | 35 | |
| 2128 | 38 | |

**SIM Water**

| Measured Concentration (t-96h) (ug/L) | Number of Mortalities | LC50 |
|---|---|---|
| <5 | 0 | 2165.76 |

| | | |
|---|---|---|
| 158 | 0 | |
| 244 | 0 | |
| 345 | 0 | |
| 503 | 3 | |
| 656 | 3 | |
| 902 | 7 | |
| 1300 | 13 | |
| 2023 | 23 | **fWER** |
| 2828 | 32 | 4.9771 |