

**City of Buenaventura  
Toxicity and Chemical Evaluation  
March 04 Wet Weather Sampling Event  
Santa Clara River Estuary**

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## **INTRODUCTION**

Toxicity tests and chemical analyses were conducted on estuarine sediment and ambient water samples collected from the Santa Clara River Estuary located in the City of San Buenaventura, CA. This second sampling effort for the project was characterized as a “wet weather” event; the sand berm was breached and the estuary was open to tidal flushing. Dr. Howard Bailey, Mr. Chris Stransky, and Mr. John Rudolph of AMEC Earth & Environmental (AMEC) coordinated the sediment collection effort, toxicity testing, and chemical testing programs. Sediment toxicity testing was performed using marine species: the amphipod *Eohaustorius estuarius* and the bivalve *Mytilus galloprovincialis* (formerly *Mytilus edulis*). Estuarine ambient water toxicity was evaluated using the freshwater alga *Selenastrum capricornutum*, the water flea, *Ceriodaphnia dubia*, and the fathead minnow, *Pimephales promelas*. Ambient water toxicity to marine organisms was tested using giant kelp, *Macrocystis pyrifera*, the opossum shrimp, *Americamysis bahia* (formerly *Mysidopsis bahia*), and the pacific topsmelt, *Atherinops affinis*. Bioassays were conducted between 17 and 25 March 2004 at the AMEC Bioassay Laboratory located in San Diego, CA. A single sediment sample was retested on 8 May 2004. Chemical analyses were performed by Calscience Environmental Laboratories (CEL) located in Garden Grove, CA.

## **METHODS AND MATERIALS**

### **SAMPLE COLLECTION AND TRANSPORT**

#### **Sediment Samples**

Sediment samples were collected on 16 March 2004 from eleven locations identified as Sites A-1, A-2, A-3, B-1, B-2, B-3, B-4, C-1, C-2, C-3, and D-1. Sample collection time, water depth, sediment grab penetration depth, GPS coordinates, tidal information, and detailed physical descriptions of each sample were recorded in a field logbook (Appendix G).

All equipment used for sediment collection was cleaned thoroughly with Alconox soap and rinsed with site water. Collections were performed using a 10 cm<sup>2</sup> stainless steel Van Veen grab. Several grab samples were collected at each field location in order to obtain sufficient sediment for testing. Sample materials were placed in polypropylene

bags, labeled, and tightly sealed. All samples were packed in ice chests containing wet ice and transported to AMEC.

Upon arrival at AMEC, coolers were opened and their contents verified. Sediment grabs from each site were then placed in a clean stainless steel bucket, homogenized, and sub-sampled for chemical, grain size, and toxicity analyses. Subsamples for chemical analysis were placed in labeled, certified-clean glass jars. Toxicity testing sample materials were placed in polypropylene bags, labeled, and tightly sealed. Subsamples for grain size analysis were placed in labeled zip-lock bags. Samples for toxicity and chemical analyses were then placed in a 4°C cold room until toxicity test initiation or transport to CEL. Samples for grain size analysis were stored at room temperature.

### **Ambient Water Samples**

Ambient water samples were collected from four of the eleven sediment-sampling locations (A-2, B-1, B-3, and C-3). Sites for water collection were selected based on location within the estuary and water depth (i.e. centrally located sites with enough water to provide an adequate sample volume for testing). Sample collection time, GPS coordinates, water depth, temperature, dissolved oxygen (DO), salinity, and pH were recorded in a field logbook (Appendix G).

All equipment used for water collection was cleaned thoroughly with Alconox soap and rinsed with site water. Collections were performed using 5-L high-density-polyethylene (HDPE) containers. Several grab samples were collected at each field location in order to obtain sufficient volume for testing. Water samples from each site were then composited in clean 20-L lined buckets and tightly sealed. AMEC personnel transported all samples to the laboratory. Upon arrival in the laboratory, water quality parameters of temperature, DO, conductivity, salinity, pH, total residual chlorine, alkalinity, and hardness were measured and recorded in a logbook. Samples were then placed in a 4°C cold room until toxicity test initiation on the following day.

## **ORGANISM PROCUREMENT AND HANDLING**

### **Marine Sediment Exposures**

#### Amphipod

*Eohaustorius estuarius* were obtained from Mr. Gary Buhler of Northwest Aquatic Laboratories in Newport, OR. The organisms were transported to AMEC in coolers containing sieved site sediment and air-saturated seawater. Upon arrival at AMEC, water quality parameters of temperature, pH, DO, and salinity were measured and recorded in a logbook. Amphipod condition was also noted. The amphipods were then acclimated to test temperature and salinity, and observed each day prior to test initiation for any indications of stress (e.g. abnormal swimming or burrowing behavior) or significant mortality (>10%).

#### Bivalve

Carlsbad Aquafarms in Carlsbad, CA supplied the bay mussel *Mytilus galloprovincialis*. The mussels were transported to AMEC in ice chests via same-day courier service. In the laboratory, the organism receipt date and arrival condition were recorded in a logbook. The mussels then were acclimated to test temperature and salinity, and observed each day prior to test initiation for any indications of significant mortality (>10%).

### **Ambient Water Exposures**

#### **Freshwater Species**

#### Fathead Minnow

Fish larvae were purchased from Aquatic Biosystems of Fort Collins, CO. The organisms were placed in plastic bags containing oxygenated culture water, packed in insulated containers, and transported to AMEC via overnight delivery service. Upon arrival at AMEC, temperature, pH, DO, and conductivity were measured and recorded in a logbook. Fish larvae condition was also noted. The larvae were then acclimated to test dilution water and temperature, and observed prior to test initiation for any indications of



stress (e.g. abnormal swimming behavior) or significant mortality (>10%). Fish larvae were fed *Artemia* nauplii to satiation during holding.

#### Water Flea

Cultures of *C. dubia* are maintained for use in testing at AMEC. One week prior to test initiation, neonate (<24 hours old) water fleas were isolated from brood stock from the previous week and placed in individual holding cups containing 8:2 water and food. Neonate selection for continuing culture is based on overall health and reproductive performance of the individuals in the current culture. The number of water fleas isolated was equal to the number of neonates required to initiate testing. Cups were held in a polypropylene holder and the entire holder was placed in a temperature-controlled room maintained at 25°C. Isolated females were transferred to cups containing fresh water and food each day, and on the morning of test initiation. Neonates produced on the day of test initiation were selected for testing if produced by individuals producing at least 3 broods of 8 or more neonates over the course of the previous week.

#### Algae

A continuous culture of *S. capricornutum* is maintained for use in testing at AMEC. A new culture is started each week and allowed to grow under a cool-white fluorescent light source providing continuous illumination above the culture. The culture used to inoculate the effluent and reference toxicant test for this study was seven days old and in log-phase growth at the time of test initiation.

### **Marine Species**

#### Bivalve

The same brood stock of *M. galloprovincialis* was used to initiate both ambient water tests and sediment tests.

#### Pacific Topsmelt

Fish larvae were purchased from Aquatic Biosystems of Fort Collins, CO. The organisms were placed in plastic bags containing oxygenated culture water, packed in insulated containers, and transported to AMEC via overnight delivery service. Upon arrival at AMEC, water quality measurements of temperature, pH, DO, and salinity were

recorded in a logbook. Fish larvae condition was also noted. The larvae were then acclimated to test salinity and temperature, and observed prior to test initiation for any indications of stress (e.g. abnormal swimming behavior) or significant mortality (>10%). Fish larvae were fed *Artemia* nauplii to satiation during holding.

#### Opossum Shrimp

Shrimp larvae were purchased from Aquatic Biosystems of Fort Collins, CO. The organisms were placed in plastic bags containing oxygenated culture water, packed in insulated containers, and transported to AMEC via overnight delivery service. Upon arrival at AMEC, water quality parameters of temperature, pH, DO, and salinity were measured and recorded in a logbook. Shrimp larvae condition was also noted. The larvae were then acclimated to test salinity and temperature, and observed prior to test initiation for any indications of stress (e.g. abnormal swimming behavior) or significant mortality (>10%). Shrimp larvae were fed *Artemia* nauplii to satiation during holding.

#### Giant Kelp

Giant kelp zoospores are obtained from the reproductive blades (sporophylls) of adult plants. AMEC personnel collected kelp sporophylls from multiple plants offshore of La Jolla Cove in La Jolla, CA the day prior to test initiation. The blades were transported to AMEC in a clean cooler with blue ice. Once in the lab, sporophylls were cleaned, rinsed with 0.20- $\mu$ m filtered seawater, blotted dry, arranged individually in a single layer on paper towels, and allowed to desiccate for one hour. The blades were rinsed again and placed in a 2-L glass beaker containing 1 L of clean filtered seawater. The beaker was then placed in a temperature-controlled environmental chamber at 15°C. One hour later, the blades were removed and the resulting solution of released zoospores allowed to settle. After approximately 30 minutes, the motile zoospores were siphoned from the top layer of seawater into a flask and observed under a compound microscope at 100x to verify their viability. Spore density was determined by direct count of the spore solution with an Improved Neubauer hemacytometer, and an algal stock solution was prepared to yield an initial cell density of approximately 225,000 cells per ml in each test chamber.

## **BIOASSAY PROTOCOLS**

### **Marine Sediment Exposures**

#### Amphipod 10-Day Survival

Marine amphipod bioassays using *Eohaustorius estuarius* were conducted in accordance with “Standard Guide for Conducting 10-day Static Toxicity Tests with Marine and Estuarine Amphipods,” ASTM Designation: E 1367-92 (1993). Animals were exposed to test sediments for ten days to determine the effects of site sediment on amphipod survival. Prior to testing, sediments were sieved through a 500- $\mu$ m Nitex screen to remove native organisms and shell debris. Test chambers consisted of 1-L glass jars with a 2-cm layer of sieved sediment and 900 ml of overlying 20  $\mu$ m lab-filtered seawater at a salinity of 30 ppt. The tests were performed at a temperature of  $15 \pm 1^\circ\text{C}$  under continuous light. Aeration was provided continuously to each test chamber through a glass pipette at a rate of approximately two bubbles per second. The experimental design consisted of five laboratory replicate test chambers per site. In addition, a sixth replicate was initiated for each site as a surrogate daily water quality measurements. Twenty amphipods were carefully placed in each test chamber at test initiation. Two negative controls consisting of 1) a water-only exposure with no sediment added, and 2) sediment from the amphipod collection location were tested concurrently.

Temperature, DO, pH, and salinity were monitored daily in the surrogate test chamber for each sediment sample. Subsamples of overlying water were collected from surrogate test chambers for initial and final total ammonia analysis. Additionally, subsamples of sediment porewater were collected prior to test initiation and analyzed for total ammonia. Porewater was collected by centrifuging the whole sediment at 3500 rpm for a period of fifteen minutes.

A concurrent reference toxicant test (positive control) using cadmium (II) chloride ( $\text{CdCl}_2$ ) was conducted in conjunction with the sediment test. Reference toxicant testing is a QA/QC procedure used to evaluate the quality and sensitivity of the test organisms.

#### 48-Hour Bivalve Embryo Survival and Development

Bivalve embryo development assays were conducted in accordance with the document “Recommended Guidelines for Conducting Laboratory Bioassays on Puget Sound Sediments,” Puget Sound Estuary Program (PSEP), July (1995) and “Standard Guide for Conducting Static Acute Toxicity Tests Starting with Embryos of Four Species of Saltwater Bivalve Molluscs,” ASTM Designation: E 724-89 (1993). Embryos of the bivalve *M. galloprovincialis* were exposed to whole test sediments for 48 hours to determine the effect of site sediment exposure on survival and development. Tests were conducted in 1-L glass jars with 18 g of sediment and 900 ml of overlying 20- $\mu$ m lab-filtered seawater at a salinity of 30 ppt. The tests were performed at a temperature of  $15 \pm 1^\circ\text{C}$  under a 16:8 hour light:dark regime. Two concurrently tested negative controls consisted of 1) clean rinsed beach sand with filtered seawater, and 2) a water-only exposure with no sediment added. The experimental design consisted of five laboratory replicate test chambers per site. In addition, a sixth replicate was initiated for each site as a surrogate to perform daily water quality measurements. Fertilized eggs were added to each test chamber at a density of 20,000 eggs/ml. At test termination, overlying water was carefully poured into a clean beaker. The solution was thoroughly and gently homogenized and a 10-ml subsample was collected and preserved with 1 ml of seawater-buffered Formalin prior to scoring.

Temperature, DO, pH, and salinity were monitored daily in the surrogate test chamber for each site. Subsamples of overlying water from each site were collected for total ammonia analysis both at test initiation and termination. Additionally, subsamples of sediment porewater were collected prior to test initiation and analyzed for total ammonia. Porewater was collected by centrifuging the whole sediment at 3500 rpm for a period of fifteen minutes.

A concurrent reference toxicant test (positive control) using copper (II) chloride ( $\text{CuCl}_2$ ) was conducted in conjunction with the sediment test.

#### **Ambient Water Exposures**

All freshwater bioassay procedures used for this study follow, with some modification, “Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition (EPA/821/R-02/013),” (US EPA 2002a). Marine bioassays conducted using *Americamysis bahia*, follow “Short-Term Methods for

Estimating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms, Third Edition (EPA/821/R-02/014),” (US EPA 2002b). Finally, marine bioassays conducted using *Mytilus galloprovincialis*, *Atherinpos affinis*, and *Macrocystis pyrifera* follow “Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to West Coast Marine and Estuarine Organisms (EPA 600/R-95/136),” (US EPA 1995). The giant kelp bioassay additionally utilizes “Procedures for Conducting Toxicity Tests Developed by the Marine Bioassay Project,” (California EPA 1996).

## **Freshwater Species**

### Fathead Minnow 7-Day Survival and Growth

This test estimates chronic toxicity by evaluating survival and growth of larval fathead minnows over time. Larval fish (one day old at test initiation) were exposed to the samples for a period of seven days. A sample concentration of 100 percent was tested along with a negative control. Because samples were estuarine, an additional control of equal salinity to the sample was also tested to ensure observed mortality was not due to salinity rather than other toxic constituents.

Test solutions were prepared using graduated cylinders and pipettes. Measurements of pH, DO, temperature, and conductivity were measured and recorded for each test concentration and control. Four replicate test chambers were prepared for each test concentration and control. Replicates consisted of 400-ml plastic cups containing 250 ml of test solution. Test solutions were acclimated to 25°C in a temperature-controlled environmental chamber prior to initiation.

Ten fish larvae were arbitrarily added to each test chamber. A second technician verified counts and condition of all test organisms prior to addition of the larvae to test chambers and when test initiation was complete. A 16:8 hour light:dark illumination cycle was provided for the duration of the test. Test chambers were covered with a clear plexiglass sheet to prevent test solution contamination.

Test solutions were renewed once per day, and organisms were fed three times per day. Temperature, pH, DO, and conductivity were measured daily in both freshly prepared test solution, and test solution collected from the test chambers for each concentration and control. Survival status was recorded for each test chamber once per day. At test

termination, final observations were made and test animals were prepared for weight determination.

Fish weights were determined by placing fish from each test chamber in individual tared aluminum pans and drying them in an oven at 60°C for 24 hours. After drying, fish were weighed on a Mettler 240AE balance to the nearest 0.01 mg.

A concurrent CuCl<sub>2</sub> reference toxicant test (positive control) was also conducted as a measure of consistent organism sensitivity, as well as continuing laboratory proficiency with the method.

#### Water Flea 7-Day Survival and Reproduction

This test estimates chronic toxicity by evaluating survival and reproduction of individual water fleas over time. Water fleas (<24 hours old at test initiation) were exposed to the samples for a period of seven days. A sample concentration of 100 percent was tested along with a negative control. Because samples were estuarine, an additional control of equal salinity to the sample was also tested to ensure observed mortality was not due to salinity rather than other toxic constituents.

Test solutions were prepared using graduated cylinders and pipettes. A diet of yeast, cerophyll, trout chow (YCT) and *Selenastrum* suspension was added to each test sample and control prior to distribution to test chambers. Measurements of pH, DO, temperature, and conductivity were measured and recorded for each test concentration and control. Ten replicate test chambers were prepared for each sample and control. Replicates consisted of 30-ml soufflé cups containing 15 ml of test solution. Test solutions were acclimated to 25°C in a temperature-controlled environmental chamber prior to initiation.

Test solutions were renewed, and organisms were fed once per day. Temperature, pH, DO, and conductivity were measured daily in both freshly prepared test solution, and test solution collected from the test chambers for each concentration and control. Survival status and reproductive output were recorded for each organism once per day. At test termination, final observations were made, water quality measurements taken, and test solution and organisms discarded.

A concurrent CuCl<sub>2</sub> reference toxicant test (positive control) was also conducted.

### 96-Hour Algal Growth Inhibition

This test estimates chronic toxicity by measuring algal population response to effluent exposure in terms of changes in cell density over time. Algal cells (seven days old and in log-phase growth at test initiation) were exposed to the samples for a period of 96 hours. A sample concentration of 100 percent was tested along with a negative control. Because samples were estuarine, an additional control of equal salinity to the sample was also tested to ensure observed mortality was not due to salinity rather than other toxic constituents.

Test solutions were prepared using graduated cylinders and pipettes. Nutrients to promote algal growth were added to effluent and dilution water at a ratio of 1 ml/L. Measurements of pH, DO, temperature, and conductivity were measured and recorded for each test concentration and control. Alkalinity and hardness were measured and recorded for each control and sample prior to test initiation. Five replicate test chambers were prepared for each test concentration and control, one of which was used only as a surrogate for measuring pH and temperature during the exposure period. An additional flask containing sample not inoculated with algae was also tested as a blank to ensure that there was no growth of native algae, or other interference in measuring fluorescence at test termination. Test chambers consisted of 125-ml Erlenmeyer flasks containing 50 ml of test solution. Test solutions were acclimated to 25°C in a temperature-controlled environmental chamber prior to inoculation.

Each test chamber was aseptically inoculated with an algal stock solution prepared to yield an initial cell density of approximately 10,000 cells per ml in each test chamber. A cool-white fluorescent light source provided continuous illumination above the test chambers. Each chamber was covered with Parafilm to prevent test solution contamination.

Each test chamber was manually swirled three times per day (morning, mid-day, and evening), and rotated to a new location under the light source twice per day (morning and evening) for the duration of the test period. Temperature and pH were measured once per day in the surrogate test chamber for each concentration and control. At test termination, cell density in each test chamber was determined using a Turner Model TD-700 Fluorometer. Fluorescence was automatically converted to cell density based on an internal calibration curve that is updated monthly.

A concurrent  $\text{CuCl}_2$  reference toxicant test (positive control) was also conducted.

## **Marine Species**

### Bivalve Embryo Development

Bivalve embryos were exposed to ambient site water for a period of 48 hours to evaluate effects on embryo development. Sample concentrations 6.25, 12.5, 25, 50, and 66 – 75 percent (based on individual sample salinity) were tested along with a negative control. Due to the low salinities of the samples, hypersaline brine was added to each sample to raise the salinity to 30 ppt. The volume of hypersaline brine required to adjust the salinity determined the highest testable concentration for each sample. An additional control composed of hypersaline brine and deionized water was also tested to ensure observed toxic effect was not due to the addition of brine rather than other toxic constituents.

Test solutions were prepared using graduated cylinders and pipettes. Measurements of pH, DO, temperature, and salinity were measured and recorded for each test concentration and control. Five replicate test chambers were prepared for each test concentration and control. Replicates consisted of 30-ml shell vials containing 10 ml of test solution. Test solutions were acclimated to 15°C in temperature-controlled environmental chambers prior to initiation.

Fertilized eggs were added to each test chamber to produce a density of 20 eggs/ml. A 16:8 hour light:dark illumination cycle was provided for the duration of the test. Test chambers were covered with a clear plexiglass sheet to prevent test solution contamination.

Temperature, pH, DO, and salinity were measured daily in surrogate test chambers for each concentration and control. At test termination, larvae in each test chamber were preserved with 1-ml of seawater-buffered Formalin prior to evaluation. The total number of bivalve embryos in each test chamber was counted under a compound microscope at 400x magnification. The embryos were classified as normal or abnormal. Normally developed embryos have a distinct D-shape with complete formation of the shell.

A concurrent reference toxicant test (positive control) using  $\text{CuCl}_2$  was conducted in conjunction with the ambient water tests.



### Pacific Topsmelt and Opossum Shrimp 7-Day Survival and Growth

This test estimates chronic toxicity by evaluating survival and growth of larval pacific topsmelt or opossum shrimp over time. Organisms were exposed to the samples for a period of seven days. Sample concentrations 6.25, 12.5, 25, 50, and 100 percent were tested along with a negative control. Due to the low salinities of the samples, Forty Fathoms™ sea salt was added to each sample to raise the salinity to 30 ppt. An additional control composed of Forty Fathoms™ sea salt and deionized water was also tested to ensure observed mortality was not due to the addition of artificial salt rather than other toxic constituents.

Test solutions were prepared using graduated cylinders and pipettes. Measurements of pH, DO, temperature, and salinity were measured and recorded for each test concentration and control. Five (pacific topsmelt) or eight (opossum shrimp) replicate test chambers were prepared for each test concentration and control. Replicates for the topsmelt test consisted of 1-L plastic cups containing 500 ml of test solution. Replicates for the shrimp test consisted of 400-ml plastic cups containing 250 ml of test solution. Test solutions were acclimated to 20 and 25°C in temperature-controlled environmental chambers prior to initiation, for the topsmelt and shrimp tests respectively.

Five organisms were arbitrarily added to each test chamber. A second technician verified counts and condition of all test organisms prior to addition of the larvae to test chambers and when test initiation was complete. A 16:8 hour light:dark illumination cycle was provided for the duration of the test. Test chambers were covered with a clear plexiglass sheet to prevent test solution contamination.

Test solutions were renewed once per day, and organisms were fed two times per day. Temperature, pH, DO, and salinity were measured daily in both freshly prepared test solution, and test solution collected from the test chambers for each concentration and control. Survival status was recorded for each test chamber once per day. At test termination, final observations were made and test animals were prepared for weight determination.

Dry weights were determined by placing organisms from each test chamber in individual tared aluminum pans and drying them in an oven at 60°C for 24 hours. After drying, pans were weighed on a Mettler 240AE balance to the nearest 0.01 mg.

A concurrent  $\text{CuCl}_2$  reference toxicant test (positive control) was conducted with the pacific topsmelt test. A reference toxicant test was not run concurrent to the opossum shrimp bioassay, but was performed on 29 April 2004 with shrimp larvae from the same supplier.

#### 48-Hour Giant Kelp Germination and Growth

This test estimates chronic toxicity by evaluating germination rate and growth of individual zoospores over a 48-hour period. Sample concentrations 6.25, 12.5, 25, 50, and 58 – 68 percent (based on individual sample salinity) were tested along with a negative control. Due to the low salinities of the samples, hypersaline brine was added to each sample to raise the salinity to 32 ppt. The volume of hypersaline brine required to adjust the salinity determined the highest testable concentration for each sample. An additional control composed of hypersaline brine and deionized water was also tested to ensure observed toxic effect was not due to the addition of brine rather than other toxic constituents.

Test solutions were prepared using graduated cylinders and pipettes. Measurements of pH, DO, temperature, and salinity were measured and recorded for each test concentration and control. Five replicate test chambers were prepared for each test concentration and control. Replicates consisted of 50-ml glass petri dishes containing 30 ml of test solution. Test solutions were acclimated to 15°C in temperature-controlled environmental chambers prior to initiation.

Approximately 225,000 kelp spores were added to each test chamber. A 16:8 hour light:dark illumination cycle was provided for the duration of the test. At test termination, kelp spore germination was scored under a compound microscope at 400x magnification. Ten germinated kelp spores were then arbitrarily selected and measured to the nearest  $\mu\text{m}$ . Test solutions from each replicate were pooled by concentration, and water quality parameters of pH, DO, and salinity were measured and recorded. All test solutions were discarded.

## **STATISTICAL ANALYSES**

### **Sediment Bioassays**

*Eohaustorius* responses were analyzed using a non-parametric Analysis of Variance (ANOVA) (Kruskal-Wallis). Homogeneity of variance was checked using the F-test for equal variance and normality of data was checked using the Kolmogorov-Smirnov test. To evaluate differences between the control sediment and each sample location, one-tail Student's t-tests were performed. Proportion values were not transformed prior to analysis due to a normal distribution of the data.

*Mytilus galloprovincialis* responses were evaluated using the Kruskal-Wallis test (23 March 2004) or a one-way ANOVA (8 May 2004 B-1 retest). To evaluate differences between the control sediment and each sample location, one-way Student's t-tests were performed on untransformed proportion data. Welch's Correction was applied when a significant difference in variance was observed.

Relationships between grain size and sediment trace metals (Cu, Ni, Se, and Zn) to amphipod and bivalve responses were evaluated using Pearson correlations.

Analyses were performed using GraphPad Prism Version 4.00 statistical software.

### **Ambient Water and Reference Toxicant Bioassays**

Analysis of ambient water and reference toxicant data was conducted using ToxCalc<sup>®</sup> Comprehensive Toxicity Data Analysis and Database Software, Version 5.0. Statistical differences from the control and No Observed Effect Concentrations (NOEC) were determined for each test using Dunnett's, Wilcoxon Rank Sum, Steel's Many-One Rank, or Fisher's Exact t Multiple Comparisons Tests. Median Lethal Concentration (LC<sub>50</sub>) or Median Effect Concentration (EC<sub>50</sub>) values were determined for reference toxicant bioassays using Maximum Likelihood Probit, Trimmed Spearman-Kärber, or Linear Interpolation Analysis. The choice of statistical method used was dependent upon specific assumptions met by the data.

## **CHEMICAL ANALYSES**

Analysis of sediment total organic carbon (TOC), copper, nickel, zinc, and selenium was

performed by CEL (Appendix F).

## **RESULTS AND DISCUSSION**

Detailed data summaries are contained in Appendix A. Bioassay water quality and ammonia data are located in Appendix B. Reference toxicant data are located in Appendix C and statistical analyses and raw data are found in Appendix D. Grain size, analytical chemistry data reports, field collection data logs, and chain-of-custody information can be found in Appendices E, F, G and H, respectively.

### **SEDIMENT TOXICITY TEST RESULTS**

#### **Amphipod 10-Day Survival**

All water quality measurements recorded during the 10-day amphipod exposure with *Eohaustorius estuarius* were within the range defined as acceptable by the test protocol (Appendix B-1). Mean survival among the water only and sediment controls was 98 and 97 percent, respectively, exceeding the recommended EPA acceptability criterion of 90 percent in seawater-only controls. Mean survival among the samples ranged from 76 to 95 percent. One-way ANOVA found a significant difference among the sites ( $p = 0.001$ ). Pair-wise comparisons using one-tailed Student's t-tests indicated that Sites A-1, B-3, C-2 and C-3 exhibited a statistically significant reduction in survival when compared to the control (Appendix D-1). Although statistically significant, mean survival in these four samples was relatively high, ranging between 76 and 85 percent.

#### Correlations to Sediment Characteristics

There were no statistically significant relationships between the observed responses and percent fines, TOC or metals concentrations (Appendix D-3). Conversely, percent gravel was inversely related to survival, suggesting that a predominance of coarse grain size adversely affected survival.

#### Reference Toxicant Test

A concurrent reference toxicant test using  $\text{CdCl}_2$  was conducted in order to assess the health and sensitivity of the test organisms. Mean control survival in the reference toxicant was 85 percent (Appendix C). The  $\text{LC}_{50}$  was determined to be 5.86 mg/L  $\text{CdCl}_2$ .

(as cadmium) using the Maximum Likelihood-Probit method. This value falls within of  $\pm$  two standard deviations of laboratory control chart limits (Appendix C).

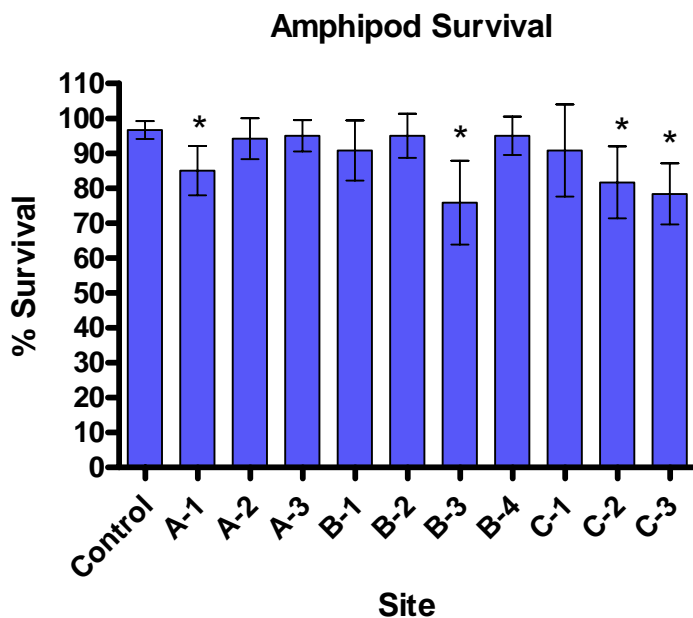


Figure 1. Summary of sediment toxicity test results for amphipod 10-day survival. Santa Clara River Estuary samples collected 17 October 2003. Mean ( $\pm 1$  SD) values are displayed. \* = Significant decrease relative to the control (one-tailed t-test,  $p < 0.05$ ,  $n=5$ ).

#### Ammonia

Total ammonia levels in interstitial porewater ranged from 0.1 to 15.4 mg/L among all test sediments. Ammonia in overlying water ranged from 0.5 to 3.1 mg/L and 0.4 to 5.7 mg/L for day zero and day ten, respectively (Appendix B-1). Levels of total ammonia were well below those (30-60 mg/L) reported to be toxic to this species (Kohn et al. 1994).

## **Bivalve Embryo Survival and Development**

All water quality measurements during the 48-hour bivalve bioassays were within acceptable ranges outlined in the test protocol (Appendix B-2). Normal development (normality) was calculated for all replicates by dividing the number of normal larvae counted in a given replicate by the total number of surviving larvae in that replicate. Normality in the water only and laboratory sediment control was 71 and 68 percent, respectively. Mean normal development in the test samples ranged from 51 to 98 percent among the samples. Student t-tests identified no statistically significant reductions in normal development of bivalve larvae when compared to the control at an alpha level of 0.05 (Appendix D-3).

Survival was derived from the total number of larvae (normal and abnormal) recovered in a 10-ml sub-sample of overlying water from each test chamber. Percent survival was then calculated based on the mean total number of embryos recovered in the test chambers divided by the mean total number of embryos recovered in the sediment control. Mean survival relative to the sediment control following exposure to the test sediment ranged from 79 to 119 percent. Student t-tests detected two sites (Sites A-1 and B-1), which showed a statistically significant reduction in survival when compared with the control.

A combined normality/survival endpoint (effective survival) was also calculated for all replicates. This measurement was derived by dividing the number of normal embryos counted by the mean total number of embryos recovered in the sediment control. This endpoint is useful in that it considers abnormal, yet surviving larvae, as unviable and therefore only takes into account normal larvae, which can be expected to develop into viable adults. The effective survival for the laboratory sediment control was 68 percent. This value is slightly below the recommended acceptability criterion of 70 percent (ASTM 1991, PSEP 1995). The effective survival ranged from 51 to 98 percent among all sediment samples. Student t-tests identified no statistically significant reductions in effective survival when compared to the control. The lowest recovery (51 percent) was associated with the sample from B-1, located near the discharge point.

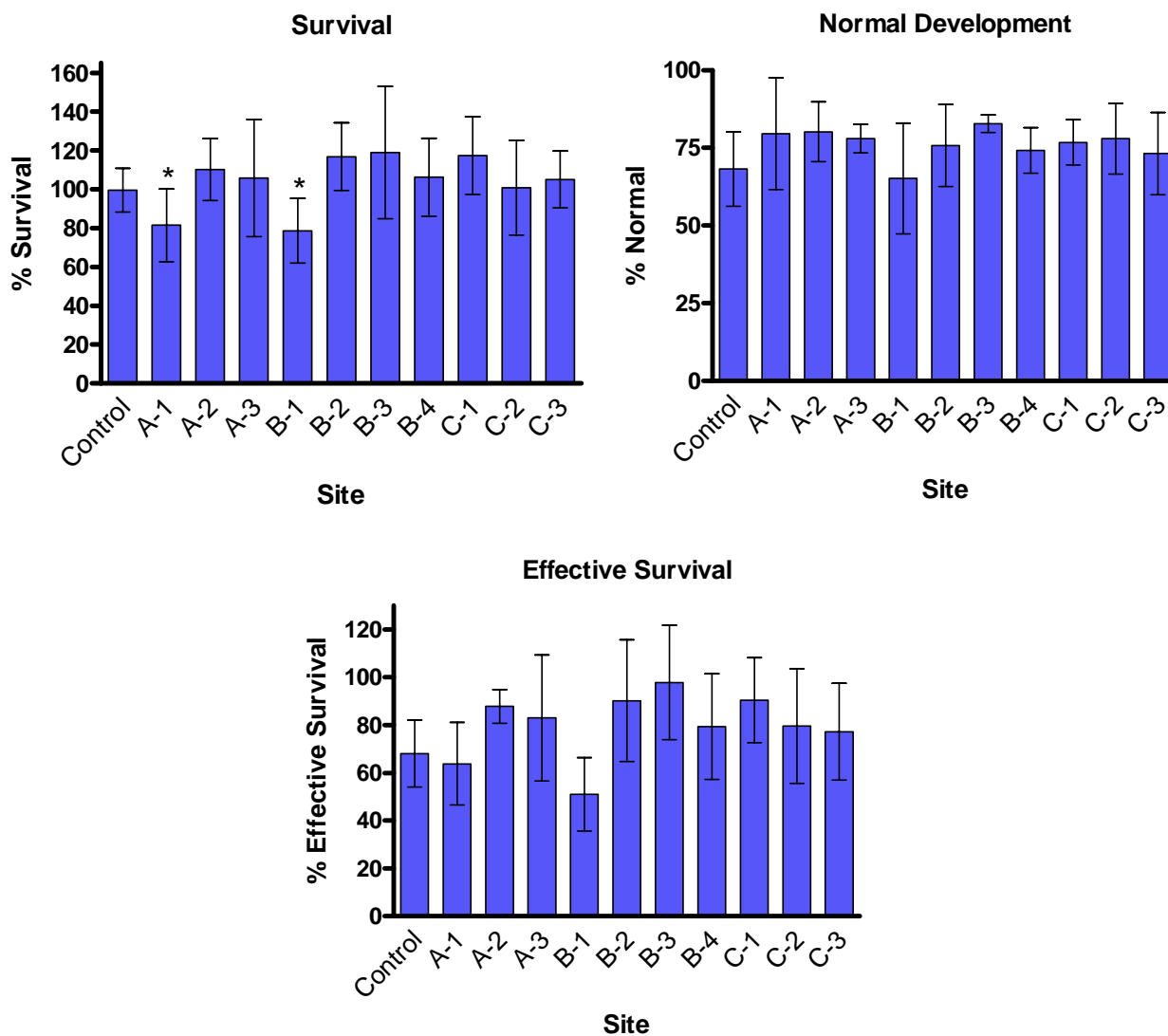


Figure 2. Summary of sediment toxicity test results for bivalve embryo development. Santa Clara River Estuary samples collected 16 March 2004. Mean ( $\pm 1$  SD) values are displayed. \* = Significant decrease relative to the control (one-tailed t-test,  $p \leq 0.05$ ,  $n=5$ ). Tests initiated 23 March 2004.

As an added QA/QC measure, sample B-1 was re-tested on 08 May 2004 due to control responses just slightly below the recommended acceptability criterion. The retest result was consistent with the first set of data. Mean effective survival in the seawater-only and sediment controls was 81 and 88 percent, respectively, exceeding the 70 percent acceptability criterion (Figure 3). Mean effective survival was 61 percent in the B-1 sample. The difference was statistically significantly reduced from the sediment control (one-tailed t-test,  $p = 0.005$ ,  $n=5$ ).

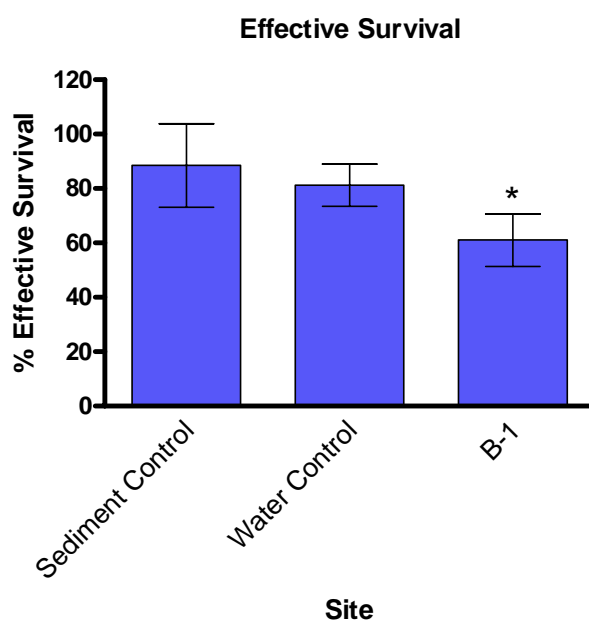


Figure 3. Summary of sediment toxicity test Site B-1 retest results for bivalve embryo development. Santa Clara River Estuary samples collected 16 March 2004. Mean ( $\pm 1$  SD) values are displayed. \* = Significant decrease relative to the control (one-tailed t-test,  $p \leq 0.05$ ,  $n=5$ ). Test initiated 08 May 2004.

It should be noted that effective survival is calculated in the ASTM and PSEP test protocols by dividing the total number of normal recovered embryos in each test chamber by time zero counts, determined through counts in surrogate test chambers terminated immediately after initiation. Time zero counts were not properly collected for this test series, therefore, total recovery of embryos in the sediment control was used for this calculation. This comparison may actually be more meaningful because unviable fertilized embryos will be lost in the sediment prior to ending the 48-hour test. This loss



of embryos in the sediment matrix usually makes the derivation of survival in test sediment from that in a water-only control conservative.

#### Correlations to Sediment Characteristics

There were no apparent relationships between the observed responses and TOC, percent fines, percent gravel or concentrations of the selected metals;  $r^2$  values associated with all of these relationships were  $< 0.10$  (Appendix D-3).

#### Reference Toxicant Test

A reference toxicant test using  $\text{CuCl}_2$  was conducted concurrently in order to assess the health and changes in response of test organisms. Mean normal development in the controls was 89 percent. The  $\text{EC}_{50}$  value was determined to be  $23.01 \mu\text{g/L}$   $\text{CuCl}_2$  (as copper) by the Trimmed Spearman-Kärber method. This value falls outside of internal control chart limits of  $\pm 2$  standard deviations ( $4$  to  $19 \mu\text{g/L}$ , Appendix C), but was deemed reportable, as there was a clear dose response to the reference toxicant. These reference toxicant results indicate that the organisms used for this study may have been slightly less sensitive than those normally tested in our laboratory.

#### Ammonia

Overlying water samples were collected at the beginning and end of the test period for ammonia measurements. Total ammonia levels in overlying water ranged from  $<0.1$  to  $1.6 \text{ mg/L}$  (Day 0) and  $0.2$  to  $1.1$  (Day 2) among all test sediments (Appendix B-2). All total ammonia levels were below a concentration ( $4.0 \text{ mg/L}$ ) reported to effect bivalve embryos (Tang, 1997).

#### **SEDIMENT TRACE METALS AND TOC**

Sediment metals concentrations and TOC are summarized for the different sites in Appendix Table F-1. Selenium concentrations were below the detection limit of  $0.5 \text{ mg/Kg}$  at all sites. Copper concentrations were relatively low at all sites, generally between  $2.69$  and  $4.1 \text{ mg/Kg}$ . Nickel concentrations ranged between  $3.8$  and  $6.4 \text{ mg/Kg}$ , with no particular trend across sites. Zinc concentrations were also relatively uniform across sites, and ranged between  $11.5$  and  $16.2 \text{ mg/Kg}$ . Sediment metal concentrations were all well below their respective ERL sediment quality guidelines (Long et al. 1995). TOC concentrations ranged between  $1400$  and  $8100 \text{ mg/Kg}$ , with no indication of any

trends across sites.

The relationship between sediment copper levels, copper effects-range low (ERL) values, and bivalve embryo development is graphically shown in Figure 4.

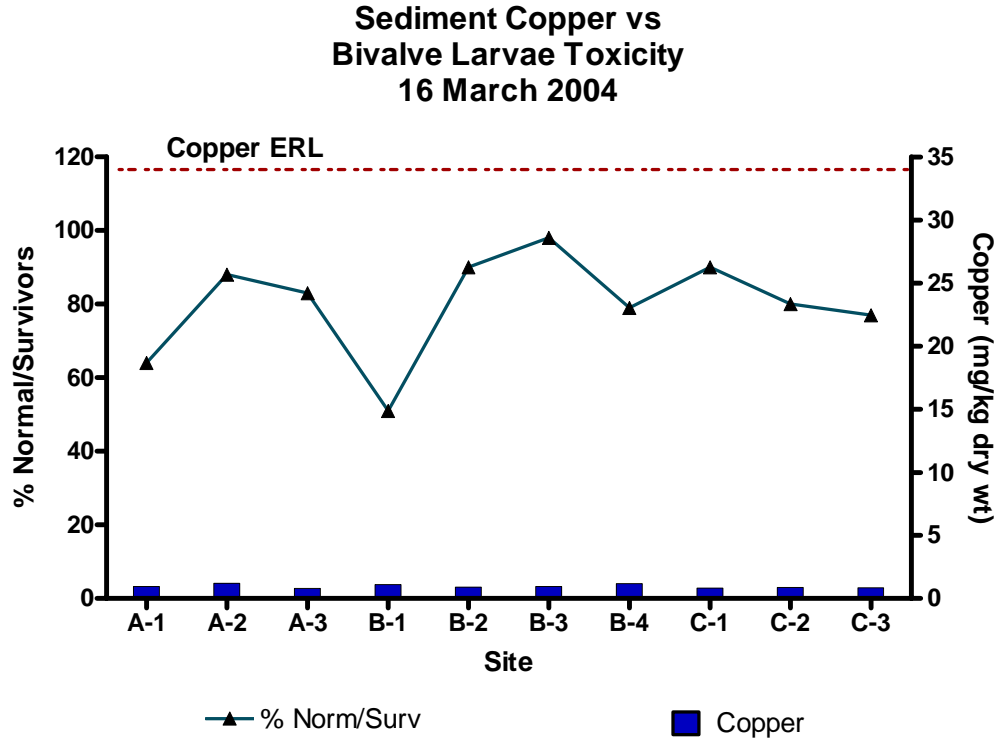


Figure 4. Relationship between sediment copper levels, copper effects-range low (ERL) values, and bivalve embryo development. Santa Clara River Estuary dry weather monitoring event, 16 March 2004.

**SEDIMENT GRAIN SIZE**

The distribution of sediment grain sizes is summarized in Appendix Table E-1. Virtually all of the sites contained relatively coarse-grained sediments, predominantly composed of sand or a mixture of gravel and sand. Percent fines ranged between 1.0 and 7.8 percent.

## **AMBIENT WATER - FRESHWATER SPECIES**

Performing toxicity tests with freshwater organisms on samples from the estuary was complicated by the fact that the salinity of the samples varied between sites and could pose variable levels of stress on the test organisms. Consequently, each sample was tested with a concurrent salinity control. To separate salinity effects from other constituents present in the sample, statistical comparisons were made between the test concentration and the appropriate salinity controls.

Reference toxicant tests for all three freshwater species met test acceptability criteria, and fell within two standard deviations of laboratory control chart means (Appendix C).

### **Fathead Minnow 7-Day Survival and Growth**

Survival of fathead minnow larvae exceeded 80 percent in samples from Sites A-2, B-1 and C-3. Conversely, only 20 percent survival was observed in sample B-3; since this site exhibited a salinity of 14.4 ppt and no larvae survived in the corresponding salinity control sample, reduced survival in this sample was attributed to elevated salinity (Appendix Table A-6). Growth results were similar to that observed for survival; no adverse effects were observed; in fact, average dry weights of larvae exposed to the samples exceeded those of their corresponding salinity controls. Overall, these results suggested that there were no adverse effects in samples beyond what could be attributed to the salinities of the samples, and that the response was limited to one sample in which the salinity reached 14.4 ppt. Conversely, the salinities of the remaining samples ranged between 1.4 and 3.1 ppt. These data are summarized in Figure 5.

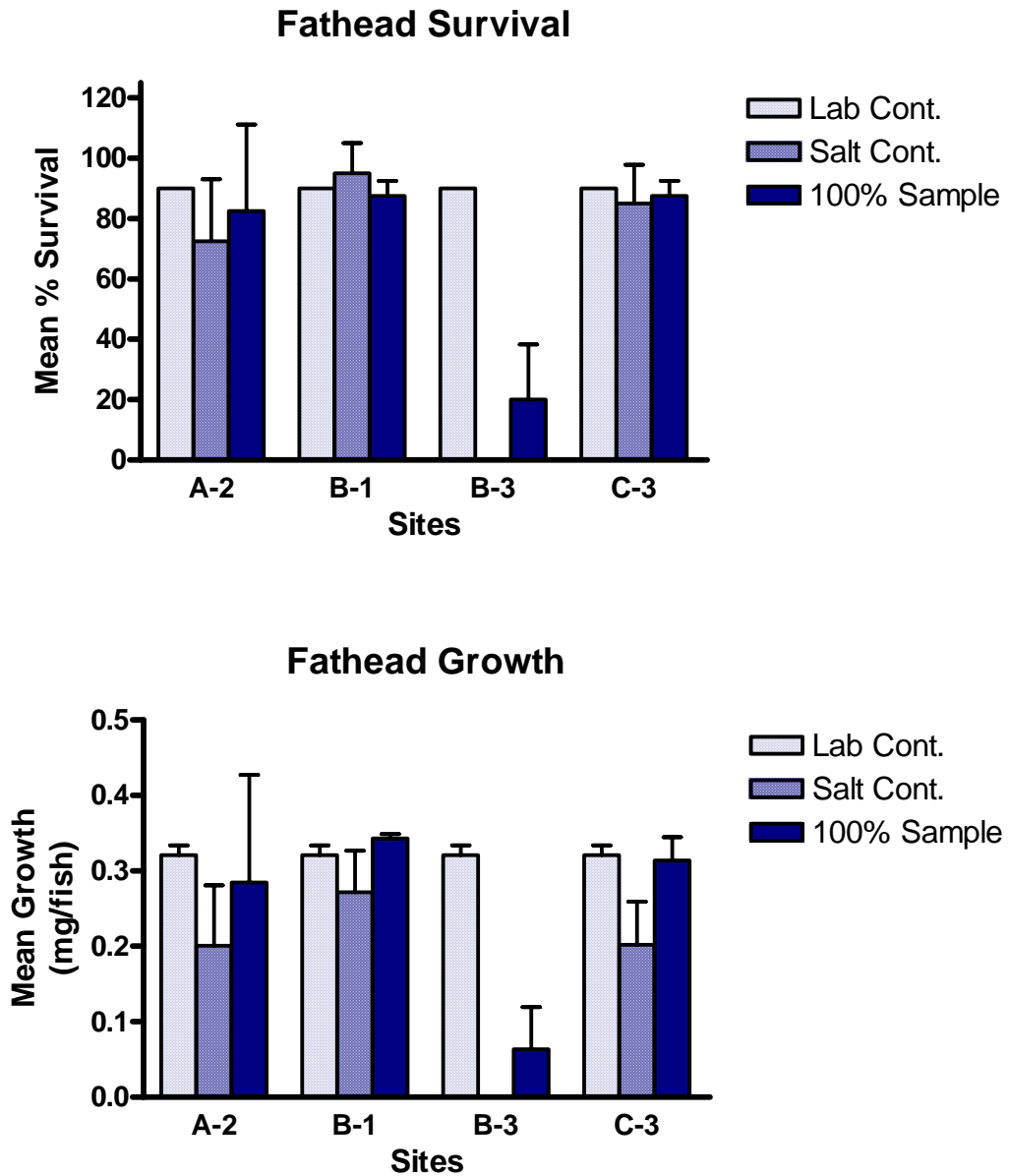


Figure 5. Summary of toxicity test results for fathead minnow 7-day survival and growth. Mean ( $\pm 1SD$ ) values in 100 percent sample are displayed. No statistically significant decreases were observed compared to concurrent salinity controls (t-test,  $p \leq 0.05$ ,  $n=4$ ).

### **Water Flea 7-Day Survival and Reproduction**

Survival of *C. dubia* exposed to samples from the estuary was also influenced primarily by salinity. Survival in the laboratory control was 80 percent, compared with a range of 0 to 100 percent across the sampling sites. Two of the sites, A-2 and B-3, exhibited survivals of 50 and 0 percent, respectively (Appendix Table A-8). However, these values were similar to their corresponding salinity controls and, therefore, these responses were attributed to salinity. Similarly, reproductive output appeared to be strongly influenced by the salinity of the samples, with no apparent evidence for any additional effects. These data are summarized in Figure 6.

### **96-Hour Algal Growth Inhibition**

The results of the *Selenastrum* (green algae) tests are more difficult to interpret. Clearly, the elevated salinity associated with the sample from site B-3 was likely responsible for the reduced cell numbers observed in this sample. However, cell numbers in the other three samples were all significantly less than their corresponding salinity controls, which may imply that other constituents present in the samples were responsible for the reduced growth. Interestingly, field blanks (site water not inoculated with *Selenastrum*, but with nutrients) incubated concurrently with the exposure flasks also exhibited elevated chlorophyll concentrations as measured by fluorescence (Appendix Table A-10). These data are summarized in Figure 7. Thus, it is possible that algae already present in the samples sequestered the added nutrients and prevented the *Selenastrum* from reaching their optimum cell density. Alternatively, organic material present in the samples may also have bound some of the micronutrients added to the flasks and reduced the amount available for growth by the introduced *Selenastrum*.

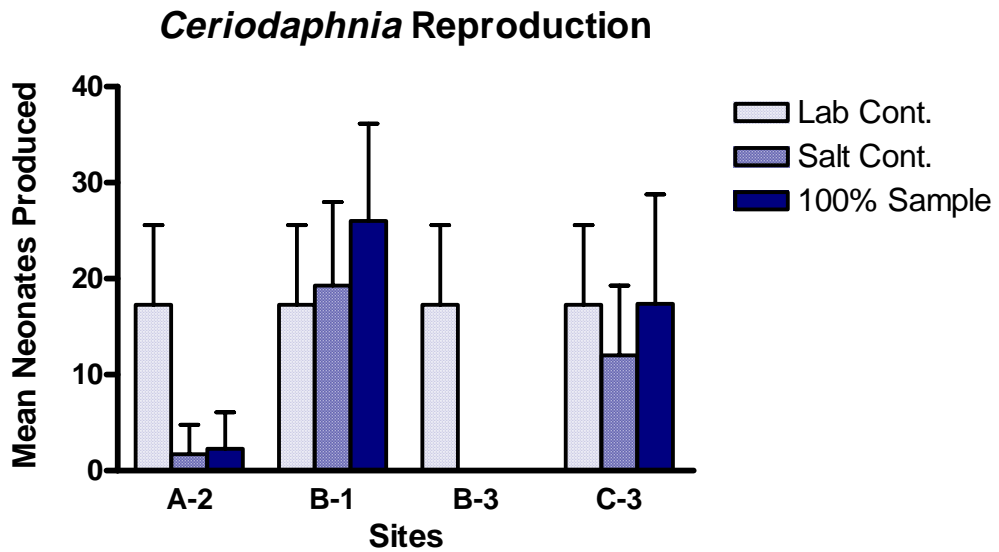
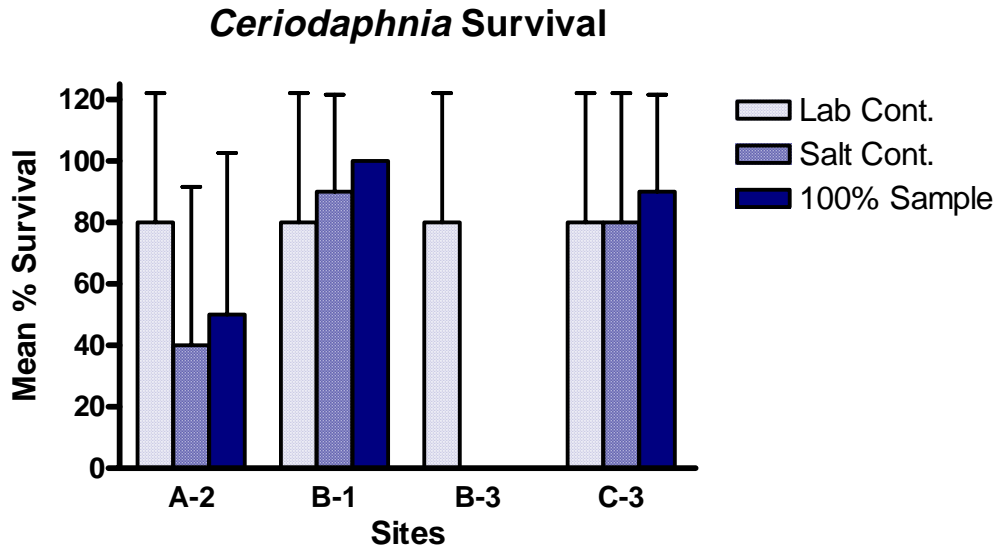


Figure 6. Summary of toxicity test results for Water Flea 7-day survival and reproduction. Mean ( $\pm 1SD$ ) values in 100 percent sample are displayed. No statistically significant decreases were observed compared to concurrent salinity controls (t-test,  $p \leq 0.05$ ,  $n=10$ ).

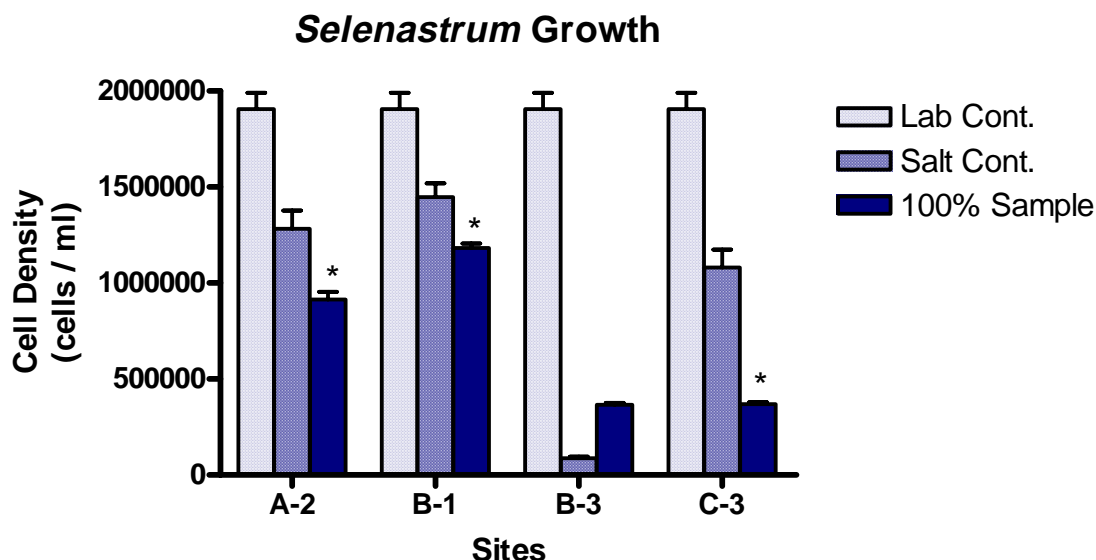


Figure 7. Summary of toxicity test results for algal growth inhibition. Mean ( $\pm 1SD$ ) values in 100 percent sample are displayed. \* = Significant decrease relative to the salinity control (t-test,  $p \leq 0.05$ ,  $n=4$ ).

**AMBIENT WATER - MARINE SPECIES**

Marine toxicity tests included bivalve larvae (*Mytilus galloprovincialis*), pacific topsmelt, opossum shrimp, and giant kelp. Due to the necessity of increasing the salinity of the samples with hypersaline brine in tests with *Mytilus* and giant kelp, modest dilutions of the samples occurred. Consequently, the highest concentrations tested with bivalve larvae were 66 (C-3 and B-1), 67 (A-2) and 75 percent (B-3). Similarly, the highest concentrations tested with giant kelp were 60 (A-3), 58 (B-1), 68 (B-3) and 59 (C-3) percent. The samples were tested up to full strength with the addition of artificial sea salts for pacific topsmelt and opossum shrimp tests.

Reference toxicant tests for all four marine species met test acceptability criteria, and fell within two standard deviations of laboratory control chart means (Appendix C).

**Bivalve Embryo Development**

No adverse effects were observed with bivalve larvae, even at the highest concentrations tested (Appendix Table A-12). These data are shown in Figure 8.

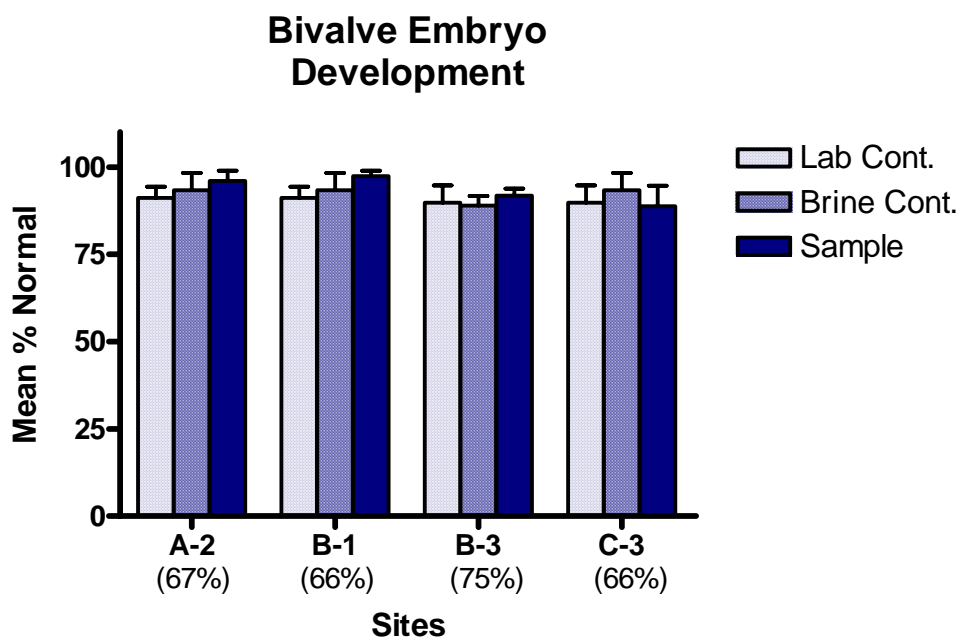


Figure 8. Summary of toxicity test results for bivalve 48-hour embryo development using *Mytilus galloprovincialis*. Mean ( $\pm 1SD$ ) values in the highest testable concentration are displayed. Highest testable concentrations are displayed in parentheses below each site. No statistically significant decreases were observed compared to concurrent brine controls (t-test,  $p \leq 0.05$ ,  $n=5$ ).

### Pacific Topsmelt 7-Day Survival and Growth

Survival of topsmelt ranged between 88 and 100 percent, depending upon the sample tested (Appendix Table A-14). Although the reduction in survival was relatively small, it was statistically significant in the sample collected at C-3. Growth was significantly reduced in the highest concentrations of all samples tested when compared with the salt control. The level of reduction ranged from approximately 18 to 37 percent of the dry weight observed in the controls. The greatest reduction was associated with the sample collected furthest upstream (C-3). These data are summarized in Figure 9.

### Opossum Shrimp 7-Day Survival and Growth

Survival of mysids averaged between 95 and 100 percent across all four samples, indicating that exposure to the samples did not increase mortality. No adverse effects were observed with the growth endpoint, as well (Appendix Table A-16). These data are summarized in Figure 10.



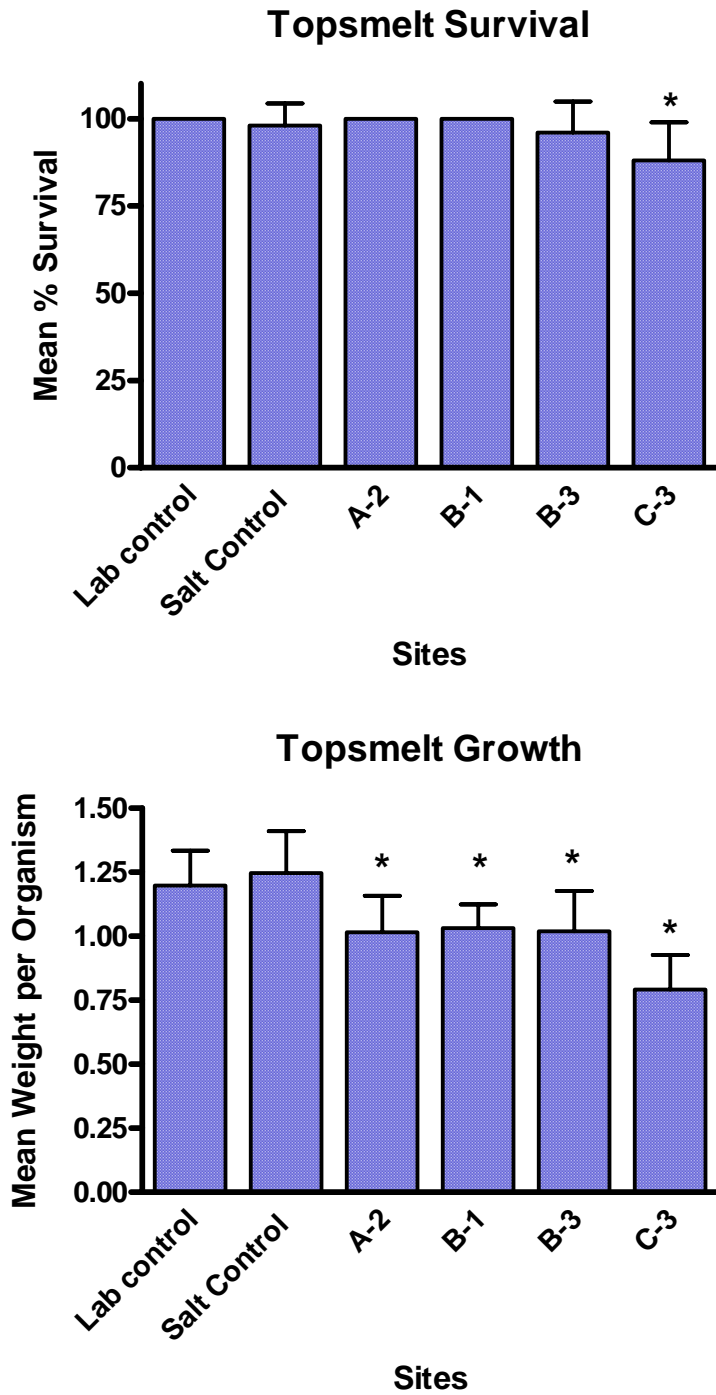


Figure 9. Summary of toxicity test results for pacific topsmelt 7-day survival and growth. Mean ( $\pm 1SD$ ) values in 100 percent sample are displayed. \* = Significant decrease relative to the salt control (t-test,  $p \leq 0.05$ ,  $n=5$ ).

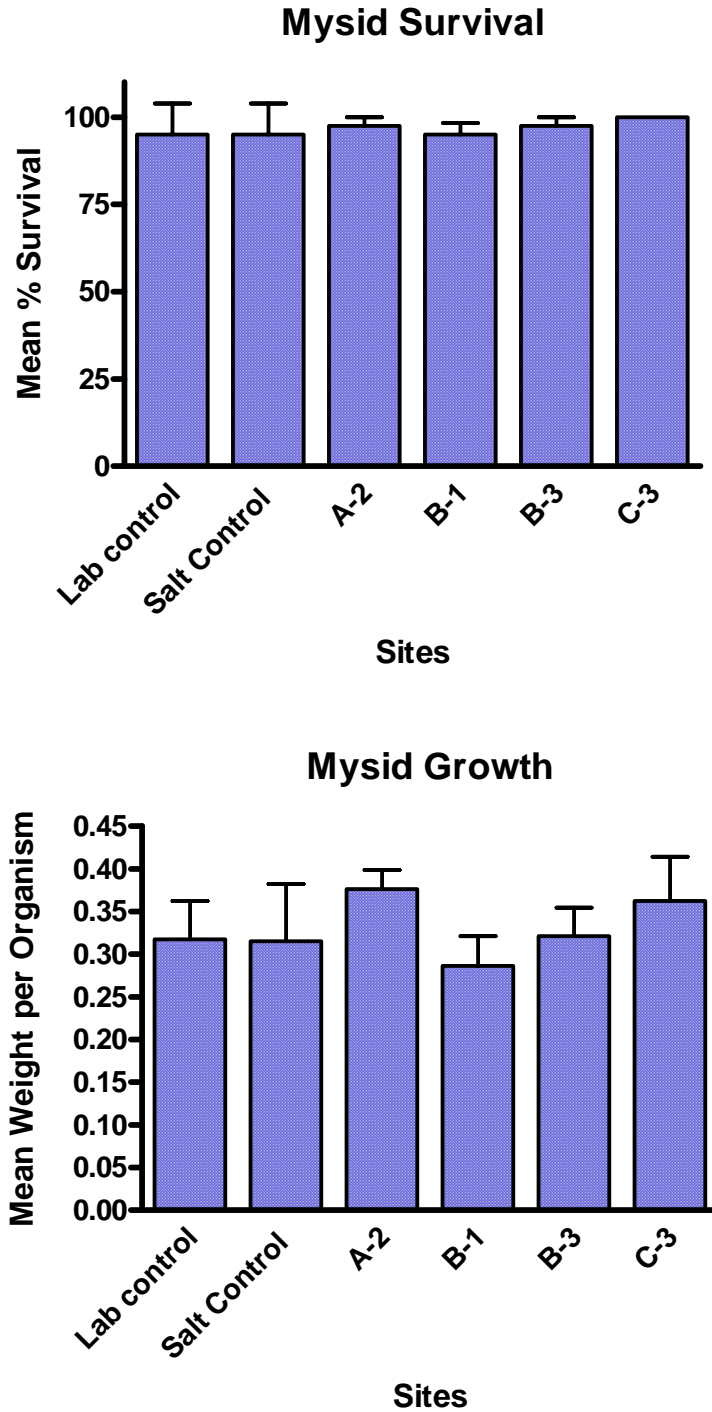


Figure 10. Summary of toxicity test results for mysid 7-day survival and growth. Mean ( $\pm 1SD$ ) values in 100 percent sample are displayed. No statistically significant decreases were observed compared to concurrent salt controls (t-test,  $p \leq 0.05$ ,  $n=8$ ).

#### **48-Hour Giant Kelp Germination and Growth**

No adverse effects on the germination of giant kelp spores were observed. By way of comparison, percent germination averaged between 78 and 90 percent in the highest concentrations of all the samples tested, compared with a range of 83 to 89 percent in the brine controls and 76 to 82 percent in the laboratory controls. Growth averaged higher in each of the test samples than in the controls (Appendix Table A-18). These data are presented in Figure 11.

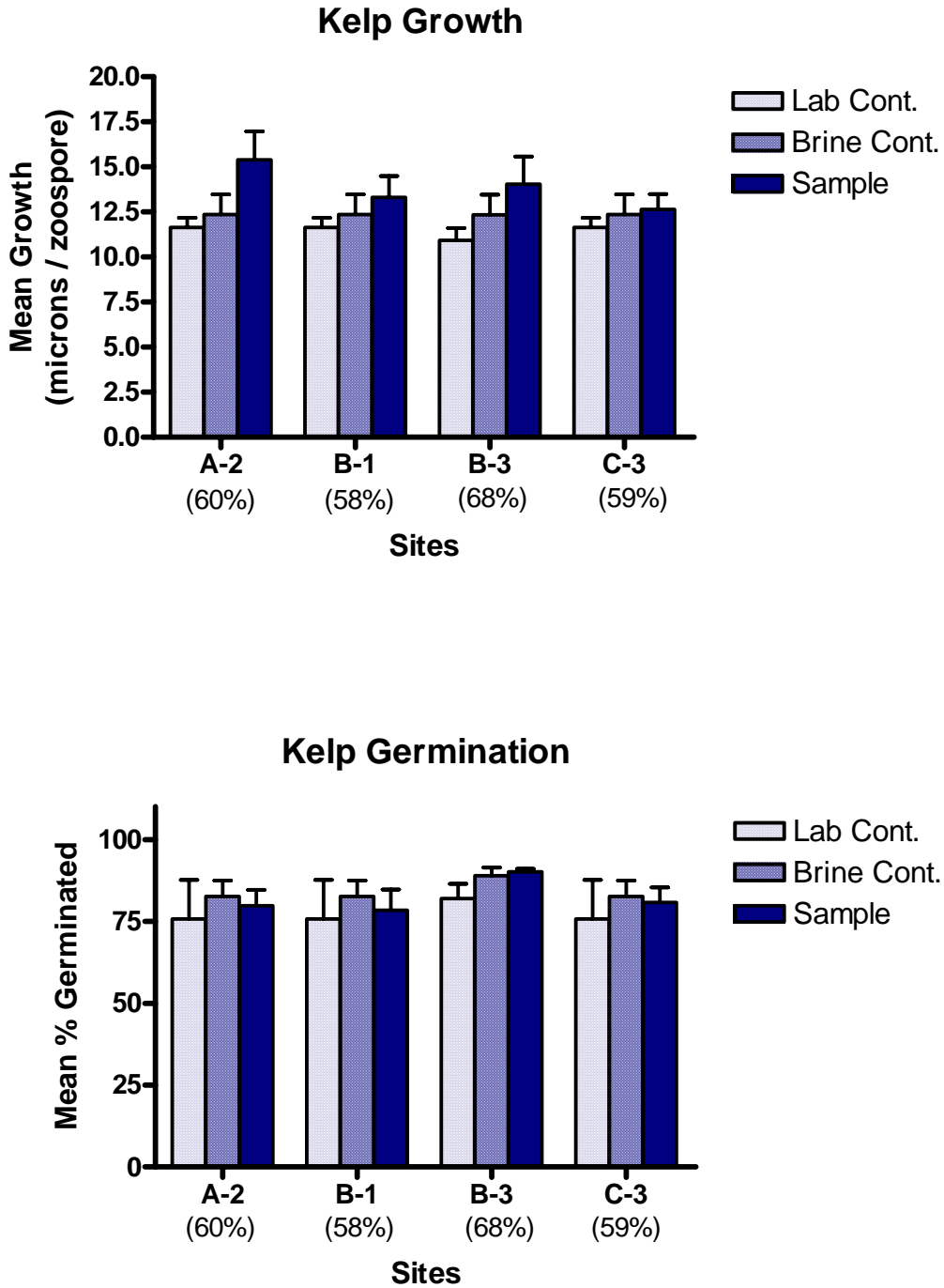


Figure 11. Summary of toxicity test results for kelp spore germination and growth. Mean ( $\pm 1SD$ ) values in the highest testable concentration are displayed. Highest testable concentrations are displayed in parentheses under each site. No statistically significant decreases were observed compared to concurrent brine controls (t-test,  $p \leq 0.05$ ,  $n=5$ ).

**AMBIENT WATER TRACE METAL RESULTS**

Copper concentrations in these samples were low, ranging between 1.9 and 4.5 µg/L. At these concentrations, copper would not be expected to result in any adverse effects based on values reported in “Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California,” (U.S. EPA 2000). Moreover, concentrations of nickel, selenium, and zinc were relatively low, and all below their respective water quality guidelines. This suggests that these contaminants were unlikely to be associated with toxicity (Tables 1 and 2).

**Table 1. Summary of Total and Dissolved Trace Metal Concentrations Measured in Santa Clara River Estuary Samples Collected 16 March 2004.**

Sample	Form	Concentration (µg/L)			
		Copper	Nickel	Selenium	Zinc
Field Blank	Total	0.19	0.26	0.13	1.89
A-2	Total	4.49	4.18	1.73	22.3
	Dissolved	3.10	3.26	2.10	17.7
B-1	Total	3.75	3.26	0.61	22.5
	Dissolved	2.93	1.31	0.57	22.0
B-3	Total	3.00	5.04	4.54	3.98
	Dissolved	2.19	4.11	3.82	3.19
B-4	Total	1.95	6.26	2.51	2.43
	Dissolved	1.83	6.12	2.58	2.39

**Table 2. EPA Water Quality Criteria for the Protection of Aquatic Life <sup>a</sup>**

Sample	Concentration (µg/L)			
	Copper	Nickel	Selenium	Zinc
EPA Marine Acute CMC	4.8	74	290	90
EPA Marine Chronic CCC	3.1	8.2	71	81
EPA Freshwater Acute CMC <sup>b</sup>	13	470	13-186 <sup>c</sup>	120
EPA Freshwater Chronic CCC <sup>b</sup>	9.0	52	5 total	120

<sup>a</sup> Values expressed as a dissolved fraction excluding the EPA freshwater CCC value for selenium

<sup>b</sup> Values are hardness dependant and based in this table on a hardness of 100mg/L CaCO<sub>3</sub>

<sup>c</sup> Freshwater CMC depends on ratio of selenite to selenate, CMC - Criterion Maximum Concentration  
CCC - Criterion Continuous Concentration

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APPENDIX A  
TOXICITY TEST SUMMARIES



## WHOLE SEDIMENT TESTING

*E. ESTUARIUS*

**Appendix Table A-1. 10-Day Amphipod Toxicity Test Summary of Means (Whole Sediment)**

City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 24 March 2004

Test Species: *Eohaustorius estuarius*

Site	Mean Percent Survival $\pm$ 1 SD
Sediment Control	97 $\pm$ 2.3
A-1	<b>85 <math>\pm</math> 7.1</b>
A-2	94 $\pm$ 5.8
A-3	95 $\pm$ 4.5
B-1	91 $\pm$ 0.09
B-2	95 $\pm$ 8.6
B-3	<b>76 <math>\pm</math> 12</b>
B-4	95 $\pm$ 5.5
C-1	91 $\pm$ 13
C-2	<b>82 <math>\pm</math> 10</b>
C-3	<b>78 <math>\pm</math> 8.8</b>

**BOLD** - Indicates a statistically significant decrease compared to the sediment control ( $p \leq 0.05$ )

**Appendix Table A-2. 10-Day Amphipod Toxicity Test Results (Whole Sediment)**

**City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event**

**Test Initiation Date: 24 March 2004**

**Test Species: *Eohaustorius estuarius***

Site	Replicate	Randon No.	No. Allve	Percent Survival	Mean Percent Survival
CONTROL - Water Only	A	19	19	95	98
	B	54	20	100	
	C	49	20	100	
	D	8	19	95	
	E	7	20	100	
	Surrogate	--	20	100	
CONTROL - Sediment	A	57	20	100	97
	B	30	19	95	
	C	12	19	95	
	D	26	20	100	
	E	25	19	95	
	Surrogate	--	19	95	
A-1	A	38	17	85	85
	B	59	15	75	
	C	22	19	95	
	D	20	17	85	
	E	42	18	90	
	Surrogate	--	16	80	
A-2	A	44	20	100	94
	B	46	19	95	
	C	16	20	100	
	D	15	17	85	
	E	45	18	90	
	Surrogate	--	19	95	
A-3	A	18	18	90	95
	B	1	19	95	
	C	29	20	100	
	D	36	19	95	
	E	39	20	100	
	Surrogate	--	18	90	
B-1	A	10	20	100	91
	B	56	19	95	
	C	58	20	100	
	D	5	17	85	
	E	60	16	80	
	Surrogate	--	17	85	

Site	Replicate	Randon No.	No. Allve	Percent Survival	Mean Percent Survival
B-2	A	21	17	85	95
	B	51	18	90	
	C	3	20	100	
	D	33	19	95	
	E	48	20	100	
	Surrogate	--	20	100	
B-3	A	31	15	75	76
	B	11	13	65	
	C	14	14	70	
	D	40	19	95	
	E	41	13	65	
	Surrogate	--	17	85	
B-4	A	43	17	85	95
	B	37	19	95	
	C	55	20	100	
	D	35	19	95	
	E	4	20	100	
	Surrogate	--	19	95	
C-1	A	17	20	100	91
	B	32	18	90	
	C	6	19	95	
	D	9	13	65	
	E	34	19	95	
	Surrogate	--	20	100	
C-2	A	28	18	90	82
	B	27	17	85	
	C	13	14	70	
	D	52	16	80	
	E	2	19	95	
	Surrogate	--	14	70	
C-3	A	50	16	80	78
	B	53	17	85	
	C	47	15	75	
	D	23	13	65	
	E	24	15	75	
	Surrogate	--	18	90	

*M. GALLOPROVINCIALIS*

**Appendix Table A-3. 48-Hour Bivalve Embryo Development Test Summary of Means (Whole Sediment)**

**City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event**

**Test Initiation Date: 23 March 2004**

**Test Species: *Mytilus galloprovincialis***

Site	Mean Percent Survival $\pm$ 1 SD		
	Survival	Normality	Effective Survival
Sediment Control	99.6 $\pm$ 11	68.4 $\pm$ 12	68.0 $\pm$ 14
A-1	81.4 $\pm$ 19	79.8 $\pm$ 18	63.8 $\pm$ 17
A-2	110 $\pm$ 16	80.3 $\pm$ 10	87.8 $\pm$ 7.0
A-3	106 $\pm$ 30	78.2 $\pm$ 5.0	83.0 $\pm$ 26
B-1	78.6 $\pm$ 17	65.1 $\pm$ 18	51.0 $\pm$ 15
B-2	117 $\pm$ 18	75.8 $\pm$ 14	90.2 $\pm$ 25
B-3	119 $\pm$ 34	82.8 $\pm$ 3.0	97.8 $\pm$ 24
B-4	106 $\pm$ 20	73.9 $\pm$ 7.0	79.4 $\pm$ 22
C-1	117 $\pm$ 20	76.9 $\pm$ 7.0	90.4 $\pm$ 18
C-2	101 $\pm$ 24	78.1 $\pm$ 11	79.6 $\pm$ 24
C-3	105 $\pm$ 15	73.2 $\pm$ 13	77.2 $\pm$ 20

**BOLD** - Indicates a statistically significant decrease compared to the sediment control ( $p \leq 0.05$ )

**Appendix Table A-3 (Cont.). 48-Hour Bivalve Embryo Development Test Summary of Means (Whole Sediment)**

**City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event**

**Test Initiation Date: 8 May 2004 - Site B-1 Retest**

**Test Species: *Mytilus galloprovincialis***

Site	Mean Percent Survival $\pm$ SD		
	Survival	Normality	Effective Survival
Sediment Control	100 $\pm$ 18	88 $\pm$ 2.6	88 $\pm$ 15
B-1	<b>76 <math>\pm</math> 10</b>	81 $\pm$ 8.9	<b>61 <math>\pm</math> 10</b>

**BOLD** - Indicates a statistically significant decrease compared to the sediment control ( $p \leq 0.05$ )

**Appendix Table A-4. 48-Hour Bivalve Embryo Development Test Results (Whole Sediment)**  
**City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event**

**Test Initiation Date: 23 March 2004**

**Test Species: *Mytilus galloprovincialis***

Site	Rep.	Random No.	Initial No.	Total No.	No. Normal	Percent Normal	Mean Percent Normal	Percent Normal Std Dev	Percent Survival	Mean Percent Survival	Percent Survival Std Dev	Percent Effective Survival <sup>a</sup>	Mean Percent Effective Survival	Percent Effective Survival Std Dev
CONTROL - Water Only	A	19	60	93	56	60			155			93		
	B	54	60	75	49	65			125			82		
	C	49	60	100	73	73	71	8	167	151	16	122	108	19
	D	8	60	89	70	79			148			117		
	E	7	60	96	75	78			160			125		
CONTROL - Sediment	A	57	60	66	33	50			110			55		
	B	30	60	50	33	66			83			55		
	C	12	60	66	51	77	68	12	110	100	11	85	68	14
	D	26	60	59	48	81			98			80		
	E	25	60	58	39	67			97			65		
A-1	A	38	60	49	45	92			82			75		
	B	59	60	60	29	48			100			48		
	C	22	60	53	46	87	80	18	88	81	19	77	64	17
	D	20	60	30	25	83			50			42		
	E	42	60	52	46	88			87			77		
A-2	A	44	60	66	52	79			110			87		
	B	46	60	56	46	82			93			77		
	C	16	60	68	52	76	80	10	113	110	16	87	88	7
	D	15	60	81	56	69			135			93		
	E	45	60	60	57	95			100			95		
A-3	A	18	60	86	70	81			143			117		
	B	1	60	43	35	81			72			58		
	C	29	60	55	43	78	78	5	92	106	30	72	83	26
	D	36	60	79	63	80			132			105		
	E	39	60	54	38	70			90			63		

a - Effective Survival is defined as the number of normal larvae divided by the total number recovered in the sediment control.



**Appendix Table A-4 (Cont.). 48-Hour Bivalve Embryo Development Test Results (Whole Sediment)**

City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 23 March 2004

Test Species: *Mytilus galloprovincialis*

Site	Rep.	Random No.	Initial No.	Total No.	No. Normal	Percent Normal	Mean Percent Normal	Percent Normal Std Dev	Percent Survival	Mean Percent Survival	Percent Survival Std Dev	Percent Effective Survival <sup>a</sup>	Mean Percent Effective Survival	Percent Effective Survival Std Dev
B-1	A	10	60	45	34	76			75			57		
	B	56	60	44	24	55			73			40		
	C	58	60	65	39	60	65	18	108	79	17	65	51	15
	D	5	60	42	38	90			70			63		
	E	60	60	40	18	45			67			30		
B-2	A	21	60	81	70	86			135			117		
	B	51	60	59	31	53			98			52		
	C	3	60	62	48	77	76	14	103	117	17	80	90	25
	D	33	60	81	64	79			135			107		
	E	48	60	68	57	84			113			95		
B-3	A	31	60	103	81	79			172			135		
	B	11	60	66	55	83			110			92		
	C	14	60	60	51	85	83	3	100	119	34	85	98	24
	D	40	60	50	43	86			83			72		
	E	41	60	78	63	81			130			105		
B-4	A	43	60	64	46	72			107			77		
	B	37	60	66	52	79			110			87		
	C	55	60	51	32	63	74	7	85	106	20	53	79	22
	D	35	60	82	67	82			137			112		
	E	4	60	55	41	75			92			68		
C-1	A	17	60	87	67	77			145			112		
	B	32	60	77	55	71			128			92		
	C	6	60	61	44	72	77	7	102	117	20	73	90	18
	D	9	60	57	43	75			95			72		
	E	34	60	70	62	89			117			103		
C-2	A	28	60	74	58	78			123			97		
	B	27	60	63	51	81			105			85		
	C	13	60	75	62	83	78	11	125	101	24	103	80	24
	D	52	60	44	26	59			73			43		
	E	2	60	47	42	89			78			70		
C-3	A	50	60	69	57	83			115			95		
	B	53	60	58	30	52			97			50		
	C	47	60	68	47	69	73	13	113	105	15	78	77	20
	D	23	60	50	39	78			83			65		
	E	24	60	70	59	84			117			98		

<sup>a</sup> - Effective Survival is defined as the number of normal larvae divided by the total number recovered in the sediment control.

**Appendix Table A-4 (Cont.). 48-Hour Bivalve Embryo Development Test Results (Whole Sediment)**  
**City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event**  
**Test Initiation Date: 8 April 2004 - Site B-1 Retest**  
**Test Species: *Mytilus galloprovincialis***

**SET A**

Site	Rep.	Random No.	Initial No.	Total No.	No. Normal	Percent Normal	Mean Percent Normal	Percent Normal Std Dev	Percent Survival	Mean Percent Survival	Percent Survival Std Dev	Percent Effective Survival <sup>a</sup>	Mean Percent Effective Survival	Percent Effective Survival Std Dev
CONTROL - Water Only	A	13	112	100	82	82			89			73		
	B	8	112	118	100	85	86	4	105	94	7	89	81	8
	C	2	112	96	83	85			88			74		
	D	5	112	109	100	92			97			89		
	E	3	112	102	91	89			91			81		
CONTROL - Sediment	A	6	112	93	80	86			83			71		
	B	1	112	109	100	92	88	2	97	100	18	89	88	15
	C	15	112	104	93	89			93			83		
	D	7	112	110	96	87			98			86		
	E	12	112	146	126	86			130			113		
B-1	A	14	112	93	84	90			83			75		
	B	10	112	99	73	74	81	9	88	76	10	65	61	10
	C	4	112	73	65	89			65			58		
	D	9	112	79	55	70			71			49		
	E	11	112	80	65	81			71			58		

<sup>a</sup> - Effective Survival is defined as the number of normal larvae divided by the total number recovered in the sediment control.

## AMBIENT WATER TESTING

FRESHWATER

*P. PROMELAS*

**Appendix Table A-5. Larval Fish 7-Day Survival and Growth Test Summary of Means**

City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 17 March 2004

Test Species: *Pimephales promelas*

Concentration (%)	Mean Percent Survival $\pm$ 1 SD			
	A-2	B-1	B-3	C-3
Lab Control	90 $\pm$ 0	90 $\pm$ 0	90 $\pm$ 0	90 $\pm$ 0
Salinity Control	73 $\pm$ 21	95 $\pm$ 10	0 $\pm$ 0	85 $\pm$ 13
100	83 $\pm$ 29	88 $\pm$ 5.0	20 $\pm$ 18	88 $\pm$ 5.0

Concentration (%)	Mean Growth (mg) $\pm$ 1 SD			
	A-2	B-1	B-3	C-3
Lab Control	0.32 $\pm$ 0.01	0.32 $\pm$ 0.01	0.32 $\pm$ 0.01	0.32 $\pm$ 0.01
Salinity Control	0.20 $\pm$ 0.08	0.27 $\pm$ 0.06	0 $\pm$ 0	0.20 $\pm$ 0.06
100	0.29 $\pm$ 0.14	0.34 $\pm$ 0.01	0.06 $\pm$ 0.06	0.31 $\pm$ 0.03

**BOLD** - Indicates a statistically significant decrease compared to the salinity control ( $p \leq 0.05$ )

**Appendix Table A-6. Larval Fish 7-Day Survival and Growth Test Results**

**City of Buenaventura**

**Santa Clara River Estuary Wet Weather Sampling Event**

**Test Initiation Date: 17 March 2004**

**Test Species: *Pimephales promelas***

Sample	Replicate	No. Alive	Percent Survival	Mean Percent Survival	Total Weight (mg)	Weight per Fish (mg)	Mean Weight per Fish (mg)
Lab Control	A	9	90	90	3.38	0.34	0.32
	B	9	90				
	C	9	90				
	D	9	90				
A-2	A	4	40	83	0.76	0.08	0.29
	B	10	100				
	C	10	100				
	D	9	90				
B-1	A	9	90	88	3.48	0.35	0.34
	B	9	90				
	C	8	80				
	D	9	90				
B-3	A	4	40	20	1.20	0.12	0.06
	B	3	30				
	C	1	10				
	D	0	0				
C-3	A	8	80	88	2.94	0.29	0.31
	B	9	90				
	C	9	90				
	D	9	90				
Salinity Control <sup>a</sup> A-2	A	6	60	73	1.50	0.15	0.20
	B	9	90				
	C	5	50				
	D	9	90				
Salinity Control <sup>a</sup> B-1	A	10	100	95	3.20	0.32	0.27
	B	10	100				
	C	10	100				
	D	8	80				
Salinity Control <sup>a</sup> B-3	A	0	0	0	-	-	-
	B	0	0				
	C	0	0				
	D	0	0				
Salinity Control <sup>a</sup> C-3	A	7	70	85	1.33	0.13	0.20
	B	8	80				
	C	9	90				
	D	10	100				

<sup>a</sup>Salinity controls initiated on 18 March 2004

*C. DUBIA*



Appendix Table A-7. Water Flea 7-Day Survival and Reproduction Test Summary of Means

City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 17 March 2004

Test Species: *Ceriodaphnia dubia*

Concentration (%)	Mean Percent Survival $\pm$ 1 SD			
	A-2	B-1	B-3	C-3
Lab Control	80 $\pm$ 42	80 $\pm$ 42	80 $\pm$ 42	80 $\pm$ 42
Salinity Control	40 $\pm$ 52	90 $\pm$ 32	0 $\pm$ 0	80 $\pm$ 42
100	50 $\pm$ 53	100 $\pm$ 0	0 $\pm$ 0	90 $\pm$ 32

Concentration (%)	Mean Number of Neonates Produced $\pm$ 1 SD			
	A-2	B-1	B-3	C-3
Lab Control	17.3 $\pm$ 8.29	17.3 $\pm$ 8.29	17.3 $\pm$ 8.29	17.3 $\pm$ 8.29
Salinity Control	1.7 $\pm$ 3.09	19.3 $\pm$ 8.69	0 $\pm$ 0	12 $\pm$ 7.29
100	2.3 $\pm$ 3.77	26 $\pm$ 10.14	0 $\pm$ 0	17.4 $\pm$ 11.39

**BOLD** - Indicates a statistically significant decrease compared to the salinity control ( $p \leq 0.05$ )

**Appendix A-8. Water Flea 7-Day Survival and Reproduction Test Results**

City of Buenaventura

Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 17 March 2004

Test Species: *Ceriodaphnia dubia*

**Survival**

Sample	Mean Percent Survival
Lab Control	80
A-2	50
B-1	100
B-3	0
C-3	90
Salinity Control A-2	40
Salinity Control B-1	90
Salinity Control B-3	0
Salinity Control C-3	80

**Reproduction (Number of Neonates Produced)**

Replicate	Lab Control	A-2	B-1	B-3	C-3	Salinity Control A-2	Salinity Control B-1	Salinity Control B-3	Salinity Control C-3
1	11	0	18	0	0	0	25	0	3
2	0	0	23	0	25	3	27	0	7
3	26	0	24	0	14	0	4	0	11
4	10	0	24	0	22	0	13	0	19
5	16	9	51	0	40	5	24	0	20
6	24	0	29	0	21	0	29	0	17
7	22	6	25	0	14	0	22	0	0
8	26	0	31	0	17	0	20	0	15
9	19	0	13	0	2	0	23	0	8
10	19	8	22	0	19	9	6	0	20
Mean	17	2	26	0	17	2	19	0	12

*S. CAPRICORNUTUM*

Appendix Table A-9. 96-Hour Algal Growth Inhibition Test Summary of Means

City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 17 March 2004

Test Species: *Selenastrum capricornutum*

Concentration (%)	Mean Cell Density ( $10^6$ cells/ml) $\pm$ 1 SD			
	A-2	B-1	B-3	C-3
Lab Control	1.91 $\pm$ 0.24	1.91 $\pm$ 0.24	1.91 $\pm$ 0.24	1.91 $\pm$ 0.24
Salinity Control	1.28 $\pm$ 0.19	1.45 $\pm$ 0.14	0.09 $\pm$ 0.02	1.08 $\pm$ 0.19
100	<b>0.91 <math>\pm</math> 0.08</b>	<b>1.18 <math>\pm</math> 0.05</b>	0.37 $\pm$ 0.02	<b>0.37 <math>\pm</math> 0.02</b>

**BOLD** - Indicates a statistically significant decrease compared to the salinity control ( $p \leq 0.05$ )

**Appendix Table A-10. 96-Hour Algal Growth Inhibition Test Results**

**City of Buenaventura**

**Santa Clara River Estuary Wet Weather Sampling Event**

**Test Initiation Date: 17 March 2004**

**Test Species: *Selenastrum capricornutum***

<b>Sample</b>	<b>Mean Cell Density (10<sup>6</sup> cell/ml)</b>
<b>Lab Control</b>	1.95
<b>A-2</b>	0.91
<b>B-1</b>	1.18
<b>B-3</b>	0.37
<b>C-3</b>	0.37
<b>Salinity Control A-2</b>	1.28
<b>Salinity Control B-1</b>	1.45
<b>Salinity Control B-3</b>	0.09
<b>Salinity Control C-3</b>	1.08
<b>Blank A-2<sup>a</sup></b>	0.73
<b>Blank B-1<sup>a</sup></b>	0.73
<b>Blank B-3<sup>a</sup></b>	0.38
<b>Blank C-3<sup>a</sup></b>	0.21

<sup>a</sup> - Blanks consist of site water with no algae inoculation.

MARINE

*M. GALLOPROVINCIALIS*

**Appendix Table A-11. 48-Hour Bivalve Embryo Development Test Summary of Means**

City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 19 March 2004

Test Species: *Mytilus galloprovincialis*

Concentration (%)	Mean Percent Normal $\pm$ 1 SD			
	A-2	B-1	B-3	C-3
Lab Control <sup>a</sup>	92 $\pm$ 4.0	92 $\pm$ 4.0	92 $\pm$ 4.0	92 $\pm$ 4.0
Brine Control	93 $\pm$ 4.9	93 $\pm$ 4.9	89 $\pm$ 2.7	93 $\pm$ 4.9
6.25	94 $\pm$ 3.4	97 $\pm$ 1.1	89 $\pm$ 5.1	88 $\pm$ 1.9
12.5	95 $\pm$ 3.4	95 $\pm$ 2.7	93 $\pm$ 1.8	91 $\pm$ 4.2
25	96 $\pm$ 4.2	93 $\pm$ 2.3	94 $\pm$ 2.7	93 $\pm$ 4.9
50	96 $\pm$ 4.0	94 $\pm$ 4.3	92 $\pm$ 5.3	94 $\pm$ 2.2
High <sup>b</sup>	96 $\pm$ 2.9 (67)	97 $\pm$ 1.5 (66)	92 $\pm$ 2.0 (75)	89 $\pm$ 5.9 (66)

**BOLD** - Indicates a statistically significant decrease compared to the brine control ( $p \leq 0.05$ )

<sup>a</sup> - lab controls pooled across sites for statistical comparisons.

<sup>b</sup> - Highest concentration noted in parenthesis



**Appendix Table A-12. Site A-2 48-Hour Bivalve Embryo Development Test Results**

**City of Buenaventura**

**Santa Clara River Estuary Wet Weather Sampling Event**

**Test Initiation Date: 19 March 2004**

**Test Species: *Mytilus galloprovincialis***

<b>Concentration</b>	<b>Replicate</b>	<b>Percent Normal</b>	<b>Mean Percent Normal</b>
<b>Lab Control</b>	A	92	91
	B	95	
	C	89	
	D	93	
	E	87	
<b>Brine Control</b>	A	86	93
	B	91	
	C	98	
	D	97	
	E	95	
<b>6.25%</b>	A	92	94
	B	96	
	C	89	
	D	96	
	E	97	
<b>12.5%</b>	A	92	95
	B	99	
	C	91	
	D	97	
	E	96	
<b>25%</b>	A	100	96
	B	99	
	C	93	
	D	96	
	E	90	
<b>50%</b>	A	90	96
	B	94	
	C	99	
	D	98	
	E	97	
<b>67%</b>	A	98	96
	B	96	
	C	97	
	D	98	
	E	91	

**Appendix Table A-12 (Cont.). Site B-1 48-Hour Bivalve Embryo Development Test Results**

**City of Buenaventura**

**Santa Clara River Estuary Wet Weather Sampling Event**

**Test Initiation Date: 19 March 2004**

**Test Species: *Mytilus galloprovincialis***

<b>Concentration</b>	<b>Replicate</b>	<b>Percent Normal</b>	<b>Mean Percent Normal</b>
<b>Lab Control</b>	A	96	95
	B	96	
	C	93	
	D	95	
	E	95	
<b>Brine Control</b>	A	86	93
	B	95	
	C	97	
	D	98	
	E	91	
<b>6.25%</b>	A	98	97
	B	97	
	C	96	
	D	95	
	E	97	
<b>12.5%</b>	A	93	95
	B	91	
	C	98	
	D	95	
	E	96	
<b>25%</b>	A	90	93
	B	94	
	C	92	
	D	92	
	E	96	
<b>50%</b>	A	98	94
	B	91	
	C	99	
	D	94	
	E	89	
<b>66%</b>	A	98	97
	B	97	
	C	99	
	D	95	
	E	98	

**Appendix Table A-12 (Cont.). Site B-3 48-Hour Bivalve Embryo Development Test Results**

**City of Buenaventura**

**Santa Clara River Estuary Wet Weather Sampling Event**

**Test Initiation Date: 19 March 2004**

**Test Species: *Mytilus galloprovincialis***

<b>Concentration</b>	<b>Replicate</b>	<b>Percent Normal</b>	<b>Mean Percent Normal</b>
<b>Lab Control</b>	A	94	90
	B	86	
	C	93	
	D	93	
	E	83	
<b>Brine Control</b>	A	85	89
	B	92	
	C	89	
	D	91	
	E	88	
<b>6.25%</b>	A	83	89
	B	97	
	C	91	
	D	88	
	E	88	
<b>12.5%</b>	A	92	93
	B	93	
	C	90	
	D	95	
	E	93	
<b>25%</b>	A	93	94
	B	97	
	C	97	
	D	91	
	E	93	
<b>50%</b>	A	97	92
	B	86	
	C	97	
	D	92	
	E	87	
<b>75%</b>	A	90	92
	B	92	
	C	90	
	D	95	
	E	92	

**Appendix Table A-12 (Cont.). Site C-3 48-Hour Bivalve Embryo Development Test Results**

**City of Buenaventura**

**Santa Clara River Estuary Wet Weather Sampling Event**

**Test Initiation Date: 19 March 2004**

**Test Species: *Mytilus galloprovincialis***

<b>Concentration</b>	<b>Replicate</b>	<b>Percent Normal</b>	<b>Mean Percent Normal</b>
<b>Lab Control</b>	A	96	93
	B	96	
	C	86	
	D	90	
	E	96	
<b>Brine Control</b>	A	95	93
	B	98	
	C	86	
	D	91	
	E	97	
<b>6.25%</b>	A	89	88
	B	90	
	C	87	
	D	87	
	E	85	
<b>12.5%</b>	A	98	91
	B	92	
	C	87	
	D	91	
	E	89	
<b>25%</b>	A	99	93
	B	92	
	C	87	
	D	89	
	E	96	
<b>50%</b>	A	90	94
	B	95	
	C	95	
	D	93	
	E	95	
<b>66%</b>	A	87	89
	B	96	
	C	90	
	D	91	
	E	80	

*A. AFFINIS*

**Appendix Table A-13. Marine Larval Fish 7-Day Survival and Growth Test Summary of Means**

City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 17 March 2004

Test Species: *Atherinops affinis*

Concentration (%)	Mean Percent Survival $\pm$ 1 SD			
	A-2	B-1	B-3	C-3
Lab Control <sup>a</sup>	100 $\pm$ 0	100 $\pm$ 0	100 $\pm$ 0	100 $\pm$ 0
Salt Control <sup>a</sup>	98 $\pm$ 6.3	98 $\pm$ 6.3	98 $\pm$ 6.3	98 $\pm$ 6.3
100	100 $\pm$ 0	100 $\pm$ 0	96 $\pm$ 8.9	<b>88 <math>\pm</math> 11.0</b>

Concentration (%)	Mean Growth (mg) $\pm$ 1 SD			
	A-2	B-1	B-3	C-3
Lab Control <sup>a</sup>	1.20 $\pm$ 0.14	1.20 $\pm$ 0.14	1.20 $\pm$ 0.14	1.20 $\pm$ 0.14
Salt Control <sup>a</sup>	1.25 $\pm$ 0.16	1.25 $\pm$ 0.16	1.25 $\pm$ 0.16	1.25 $\pm$ 0.16
100	1.02 $\pm$ 0.14	1.03 $\pm$ 0.09	1.02 $\pm$ 0.16	<b>0.79 <math>\pm</math> 0.14</b>

**BOLD** - Indicates a statistically significant decrease compared to the salt control ( $p \leq 0.05$ )

<sup>a</sup> - Lab and salt controls pooled across sites for statistical comparisons.

Appendix Table A-14. Site A-2 Marine Larval Fish 7-Day Survival and Growth Test Results

City of Buenaventura

Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 17 March 2004

Test Species: *Atherinops affinis*

Concentration	Replicate	No. Alive	Percent Survival	Mean Percent Survival	Total Weight (mg)	Weight per Fish (mg)	Mean Weight per Fish (mg)
Lab Control	A	5	100	100	5.19	1.04	1.20
	B	5	100		5.38	1.08	
	C	5	100		6.05	1.21	
	D	5	100		6.73	1.35	
	E	5	100		6.57	1.31	
Salt Control	A	5	100	100	6.62	1.32	1.30
	B	5	100		6.82	1.36	
	C	5	100		5.89	1.18	
	D	5	100		6.07	1.21	
	E	5	100		7.17	1.43	
6.25%	A	4	80	92	6.39	1.28	1.15
	B	5	100		5.44	1.09	
	C	5	100		6.28	1.26	
	D	5	100		5.34	1.07	
	E	4	80		5.28	1.06	
12.5%	A	5	100	100	6.22	1.24	1.21
	B	5	100		5.71	1.14	
	C	5	100		6.13	1.23	
	D	5	100		6.54	1.31	
	E	5	100		5.71	1.14	
25%	A	5	100	100	5.98	1.20	1.22
	B	5	100		5.13	1.03	
	C	5	100		5.96	1.19	
	D	5	100		6.52	1.30	
	E	5	100		6.89	1.38	
50%	A	4	80	96	5.12	1.02	1.08
	B	5	100		4.96	0.99	
	C	5	100		4.85	0.97	
	D	5	100		6.07	1.21	
	E	5	100		6.12	1.22	
100%	A	5	100	100	5.41	1.08	1.02
	B	5	100		4.22	0.84	
	C	5	100		5.11	1.02	
	D	5	100		4.64	0.93	
	E	5	100		6.06	1.21	

Appendix Table A-14 (Cont.). Site B-1 Marine Larval Fish 7-Day Survival and Growth Test Results

City of Buenaventura

Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 17 March 2004

Test Species: *Atherinops affinis*

Concentration	Replicate	No. Alive	Percent Survival	Mean Percent Survival	Total Weight (mg)	Weight per Fish (mg)	Mean Weight per Fish (mg)
Lab Control	A	5	100	100	5.19	1.04	1.20
	B	5	100				
	C	5	100				
	D	5	100				
	E	5	100				
Salt Control	A	5	100	100	6.62	1.32	1.30
	B	5	100				
	C	5	100				
	D	5	100				
	E	5	100				
6.25%	A	5	100	88	5.33	1.07	1.03
	B	5	100				
	C	5	100				
	D	4	80				
	E	3	60				
12.5%	A	5	100	100	5.04	1.01	1.00
	B	5	100				
	C	5	100				
	D	5	100				
	E	5	100				
25%	A	5	100	88	5.40	1.08	1.00
	B	4	80				
	C	4	80				
	D	5	100				
	E	4	80				
50%	A	5	100	92	6.29	1.26	1.11
	B	5	100				
	C	5	100				
	D	4	80				
	E	4	80				
100%	A	5	100	100	5.59	1.12	1.03
	B	5	100				
	C	5	100				
	D	5	100				
	E	5	100				



Appendix Table A-14 (Cont.). Site B-3 Marine Larval Fish 7-Day Survival and Growth Test Results

City of Buenaventura

Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 17 March 2004

Test Species: *Atherinops affinis*

Concentration	Replicate	No. Alive	Percent Survival	Mean Percent Survival	Total Weight (mg)	Weight per Fish (mg)	Mean Weight per Fish (mg)
Lab Control	A	5	100	100	5.19	1.04	1.20
	B	5	100		5.38	1.08	
	C	5	100		6.05	1.21	
	D	5	100		6.73	1.35	
	E	5	100		6.57	1.31	
Salt Control	A	4	80	96	5.60	1.12	1.20
	B	5	100		7.70	1.54	
	C	5	100		6.04	1.21	
	D	5	100		5.17	1.03	
	E	5	100		5.37	1.07	
6.25%	A	5	100	92	5.07	1.01	1.08
	B	5	100		4.89	0.98	
	C	4	80		5.92	1.18	
	D	4	80		4.82	0.96	
	E	5	100		6.23	1.25	
12.5%	A	5	100	100	5.79	1.16	1.12
	B	5	100		5.51	1.10	
	C	5	100		5.77	1.15	
	D	5	100		5.34	1.07	
	E	5	100		5.62	1.12	
25%	A	4	80	96	4.02	0.80	0.96
	B	5	100		4.66	0.93	
	C	5	100		4.63	0.93	
	D	5	100		4.83	0.97	
	E	5	100		5.84	1.17	
50%	A	4	80	96	5.09	1.02	1.01
	B	5	100		4.60	0.92	
	C	5	100		5.66	1.13	
	D	5	100		4.94	0.99	
	E	5	100		4.87	0.97	
100%	A	4	80	96	5.14	1.03	1.02
	B	5	100		4.95	0.99	
	C	5	100		5.10	1.02	
	D	5	100		4.07	0.81	
	E	5	100		6.24	1.25	

Appendix Table A-14 (Cont.). Site C-3 Marine Larval Fish 7-Day Survival and Growth Test Results

City of Buenaventura

Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 17 March 2004

Test Species: *Atherinops affinis*

Concentration	Replicate	No. Alive	Percent Survival	Mean Percent Survival	Total Weight (mg)	Weight per Fish (mg)	Mean Weight per Fish (mg)
Lab Control	A	5	100	100	5.19	1.04	1.20
	B	5	100				
	C	5	100				
	D	5	100				
	E	5	100				
Salt Control	A	4	80	96	5.60	1.12	1.20
	B	5	100				
	C	5	100				
	D	5	100				
	E	5	100				
6.25%	A	4	80	92	5.12	1.02	1.12
	B	5	100				
	C	5	100				
	D	4	80				
	E	5	100				
12.5%	A	4	80	96	3.78	0.76	1.02
	B	5	100				
	C	5	100				
	D	5	100				
	E	5	100				
25%	A	5	100	92	4.61	0.92	0.89
	B	5	100				
	C	4	80				
	D	5	100				
	E	4	80				
50%	A	5	100	92	5.14	1.03	0.94
	B	4	80				
	C	4	80				
	D	5	100				
	E	5	100				
100%	A	4	80	88	4.31	0.86	0.79
	B	5	100				
	C	5	100				
	D	4	80				
	E	4	80				

*A. BAHIA*

**Appendix Table A-15. Opossum Shrimp 7-Day Survival and Growth Test Summary of Means**

**City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event**

**Test Initiation Date: 17 March 2004**

**Test Species: *Americamysis bahia***

Concentration (%)	Mean Percent Survival $\pm$ 1 SD			
	A-2	B-1	B-3	C-3
Lab Control <sup>a</sup>	95 $\pm$ 8.9	95 $\pm$ 8.9	95 $\pm$ 8.9	95 $\pm$ 8.9
Salt Control <sup>a</sup>	95 $\pm$ 8.9	95 $\pm$ 8.9	95 $\pm$ 8.9	95 $\pm$ 8.9
100	98 $\pm$ 7.1	95 $\pm$ 9.3	98 $\pm$ 7.1	100 $\pm$ 0

Concentration (%)	Mean Growth (mg) $\pm$ 1 SD			
	A-2	B-1	B-3	C-3
Lab Control <sup>a</sup>	0.32 $\pm$ 0.05	0.32 $\pm$ 0.05	0.32 $\pm$ 0.05	0.32 $\pm$ 0.05
Salt Control <sup>a</sup>	0.32 $\pm$ 0.07	0.32 $\pm$ 0.07	0.32 $\pm$ 0.07	0.32 $\pm$ 0.07
100	0.38 $\pm$ 0.02	<b>0.29 <math>\pm</math> 0.04</b>	0.32 $\pm$ 0.03	0.36 $\pm$ 0.05

**BOLD** - Indicates a statistically significant decrease compared to the salt control ( $p \leq 0.05$ )

<sup>a</sup> - Lab and salt controls pooled across sites for statistical comparisons.

**Appendix Table A-16. Site A-2 Opossum Shrimp 7-Day Survival and Growth Test Results**

**City of Buenaventura**

**Santa Clara River Estuary Wet Weather Sampling Event**

**Test Initiation Date: 17 March 2004**

**Test Species: *Americamysis bahia***

Concentration	Replicate	No. Alive	Percent Survival	Mean Percent Survival	Total Weight (mg)	Weight per Mysid (mg)	Mean Weight per Mysid (mg)
Lab Control	A	4	80	98	1.25	0.25	0.34
	B	5	100		1.95	0.39	
	C	5	100		2.03	0.41	
	D	5	100		1.75	0.35	
	E	5	100		1.74	0.35	
	F	5	100		1.53	0.31	
	G	5	100		1.71	0.34	
	H	5	100		1.60	0.32	
Salt Control	A	4	80	98	1.35	0.27	0.36
	B	5	100		1.65	0.33	
	C	5	100		1.69	0.34	
	D	5	100		1.91	0.38	
	E	5	100		1.72	0.34	
	F	5	100		2.11	0.42	
	G	5	100		2.08	0.42	
	H	5	100		2.02	0.40	
6.25%	A	4	80	93	1.50	0.30	0.32
	B	4	80		1.54	0.31	
	C	5	100		1.65	0.33	
	D	5	100		1.67	0.33	
	E	5	100		1.50	0.30	
	F	5	100		1.72	0.34	
	G	5	100		1.70	0.34	
	H	4	80		1.44	0.29	
12.5%	A	5	100	95	1.69	0.34	0.33
	B	4	80		1.40	0.28	
	C	5	100		1.68	0.34	
	D	4	80		1.40	0.28	
	E	5	100		1.75	0.35	
	F	5	100		1.51	0.30	
	G	5	100		1.74	0.35	
	H	5	100		1.97	0.39	
25%	A	5	100	98	2.25	0.45	0.40
	B	5	100		1.80	0.36	
	C	5	100		2.31	0.46	
	D	5	100		1.81	0.36	
	E	5	100		2.14	0.43	
	F	5	100		2.08	0.42	
	G	5	100		1.73	0.35	
	H	4	80		1.86	0.37	
50%	A	5	100	100	2.13	0.43	0.38
	B	5	100		1.99	0.40	
	C	5	100		1.78	0.36	
	D	5	100		1.72	0.34	
	E	5	100		1.66	0.33	
	F	5	100		1.87	0.37	
	G	5	100		1.89	0.38	
	H	5	100		2.03	0.41	
100%	A	5	100	98	1.90	0.38	0.38
	B	5	100		1.93	0.39	
	C	5	100		1.87	0.37	
	D	5	100		1.80	0.36	
	E	5	100		1.96	0.39	
	F	5	100		1.93	0.39	
	G	5	100		2.01	0.40	
	H	4	80		1.64	0.33	

**Appendix Table A-16 (Cont.). Site B-1 Opossum Shrimp 7-Day Survival and Growth Test Results**  
**City of Buenaventura**  
**Santa Clara River Estuary Wet Weather Sampling Event**  
**Test Initiation Date: 17 March 2004**  
**Test Species: *Americamysis bahia***

Concentration	Replicate	No. Alive	Percent Survival	Mean Percent Survival	Total Weight (mg)	Weight per Mysid (mg)	Mean Weight per Mysid (mg)
Lab Control	A	4	80	98	1.25	0.25	0.34
	B	5	100		1.95	0.39	
	C	5	100		2.03	0.41	
	D	5	100		1.75	0.35	
	E	5	100		1.74	0.35	
	F	5	100		1.53	0.31	
	G	5	100		1.71	0.34	
	H	5	100		1.60	0.32	
Salt Control	A	4	80	98	1.35	0.27	0.36
	B	5	100		1.65	0.33	
	C	5	100		1.69	0.34	
	D	5	100		1.91	0.38	
	E	5	100		1.72	0.34	
	F	5	100		2.11	0.42	
	G	5	100		2.08	0.42	
	H	5	100		2.02	0.40	
6.25%	A	5	100	95	1.41	0.28	0.28
	B	5	100		1.72	0.34	
	C	4	80		0.24	0.05	
	D	5	100		1.44	0.29	
	E	5	100		1.49	0.30	
	F	4	80		1.69	0.34	
	G	5	100		1.49	0.30	
	H	5	100		1.65	0.33	
12.5%	A	4	80	95	1.32	0.26	0.35
	B	5	100		1.46	0.29	
	C	5	100		1.59	0.32	
	D	4	80		1.36	0.27	
	E	5	100		3.47	0.69	
	F	5	100		1.65	0.33	
	G	5	100		1.44	0.29	
	H	5	100		1.60	0.32	
25%	A	5	100	95	1.75	0.35	0.31
	B	5	100		1.81	0.36	
	C	5	100		1.75	0.35	
	D	5	100		1.37	0.27	
	E	4	80		1.45	0.29	
	F	4	80		1.32	0.26	
	G	5	100		1.43	0.29	
	H	5	100		1.64	0.33	
50%	A	4	80	95	1.71	0.34	0.32
	B	5	100		1.53	0.31	
	C	5	100		1.62	0.32	
	D	5	100		1.57	0.31	
	E	4	80		1.36	0.27	
	F	5	100		1.66	0.33	
	G	5	100		1.57	0.31	
	H	5	100		1.63	0.33	
100%	A	4	80	95	1.16	0.23	0.29
	B	5	100		1.56	0.31	
	C	5	100		1.40	0.28	
	D	5	100		1.41	0.28	
	E	4	80		1.25	0.25	
	F	5	100		1.44	0.29	
	G	5	100		1.57	0.31	
	H	5	100		1.72	0.34	

**Appendix Table A-16 (Cont.). Site B-3 Opossum Shrimp 7-Day Survival and Growth Test Results**  
**City of Buenaventura**  
**Santa Clara River Estuary Wet Weather Sampling Event**  
**Test Initiation Date: 17 March 2004**  
**Test Species: *Americamysis bahia***

Concentration	Replicate	No. Alive	Percent Survival	Mean Percent Survival	Total Weight (mg)	Weight per Mysid (mg)	Mean Weight per Mysid (mg)
Lab Control	A	4	80	93	1.47	0.29	0.30
	B	4	80		1.29	0.26	
	C	5	100		1.42	0.28	
	D	5	100		1.64	0.33	
	E	4	80		1.37	0.27	
	F	5	100		1.72	0.34	
	G	5	100		1.44	0.29	
	H	5	100		1.51	0.30	
Salt Control	A	4	80	93	1.21	0.24	0.27
	B	4	80		1.15	0.23	
	C	5	100		1.21	0.24	
	D	5	100		1.48	0.30	
	E	5	100		1.65	0.33	
	F	5	100		1.61	0.32	
	G	5	100		1.29	0.26	
	H	4	80		1.12	0.22	
6.25%	A	5	100	100	1.51	0.30	0.31
	B	5	100		1.44	0.29	
	C	5	100		1.54	0.31	
	D	5	100		2.19	0.44	
	E	5	100		1.62	0.32	
	F	5	100		1.47	0.29	
	G	5	100		1.37	0.27	
	H	5	100		1.43	0.29	
12.5%	A	5	100	95	1.39	0.28	0.26
	B	5	100		1.10	0.22	
	C	4	80		1.30	0.26	
	D	5	100		1.29	0.26	
	E	5	100		1.30	0.26	
	F	5	100		1.39	0.28	
	G	4	80		1.14	0.23	
	H	5	100		1.48	0.30	
25%	A	5	100	95	1.46	0.29	0.28
	B	5	100		1.49	0.30	
	C	5	100		1.34	0.27	
	D	4	80		1.36	0.27	
	E	5	100		1.48	0.30	
	F	5	100		1.48	0.30	
	G	5	100		1.30	0.26	
	H	4	80		1.38	0.28	
50%	A	5	100	98	1.50	0.30	0.33
	B	5	100		1.45	0.29	
	C	5	100		1.49	0.30	
	D	4	80		1.57	0.31	
	E	5	100		1.51	0.30	
	F	5	100		1.97	0.39	
	G	5	100		1.79	0.36	
	H	5	100		1.86	0.37	
100%	A	5	100	98	1.56	0.31	0.32
	B	5	100		1.29	0.26	
	C	5	100		1.71	0.34	
	D	5	100		1.73	0.35	
	E	5	100		1.54	0.31	
	F	4	80		1.55	0.31	
	G	5	100		1.85	0.37	
	H	5	100		1.62	0.32	

**Appendix Table A-16 (Cont.). Site C-3 Opossum Shrimp 7-Day Survival and Growth Test Results**  
**City of Buenaventura**  
**Santa Clara River Estuary Wet Weather Sampling Event**  
**Test Initiation Date: 17 March 2004**  
**Test Species: *Americamysis bahia***

Concentration	Replicate	No. Alive	Percent Survival	Mean Percent Survival	Total Weight (mg)	Weight per Mysid (mg)	Mean Weight per Mysid (mg)
Lab Control	A	4	80	93	1.47	0.29	0.30
	B	4	80		1.29	0.26	
	C	5	100		1.42	0.28	
	D	5	100		1.64	0.33	
	E	4	80		1.37	0.27	
	F	5	100		1.72	0.34	
	G	5	100		1.44	0.29	
	H	5	100		1.51	0.30	
Salt Control	A	4	80	93	1.21	0.24	0.27
	B	4	80		1.15	0.23	
	C	5	100		1.21	0.24	
	D	5	100		1.48	0.30	
	E	5	100		1.65	0.33	
	F	5	100		1.61	0.32	
	G	5	100		1.29	0.26	
	H	4	80		1.12	0.22	
6.25%	A	5	100	100	1.53	0.31	0.34
	B	5	100		1.77	0.35	
	C	5	100		1.80	0.36	
	D	5	100		1.60	0.32	
	E	5	100		1.79	0.36	
	F	5	100		1.47	0.29	
	G	5	100		1.92	0.38	
	H	5	100		1.68	0.34	
12.5%	A	5	100	95	1.70	0.34	0.31
	B	5	100		1.53	0.31	
	C	5	100		1.57	0.31	
	D	5	100		1.30	0.26	
	E	4	80		1.51	0.30	
	F	5	100		1.63	0.33	
	G	4	80		1.53	0.31	
	H	5	100		1.78	0.36	
25%	A	3	60	93	1.07	0.21	0.30
	B	5	100		1.52	0.30	
	C	5	100		1.60	0.32	
	D	5	100		1.33	0.27	
	E	4	80		1.43	0.29	
	F	5	100		1.58	0.32	
	G	5	100		1.54	0.31	
	H	5	100		1.81	0.36	
50%	A	4	80	98	1.32	0.26	0.34
	B	5	100		1.69	0.34	
	C	5	100		1.91	0.38	
	D	5	100		1.73	0.35	
	E	5	100		1.78	0.36	
	F	5	100		1.73	0.35	
	G	5	100		1.68	0.34	
	H	5	100		1.92	0.38	
100%	A	5	100	100	1.50	0.30	0.36
	B	5	100		1.69	0.34	
	C	5	100		1.67	0.33	
	D	5	100		1.70	0.34	
	E	5	100		1.70	0.34	
	F	5	100		1.87	0.37	
	G	5	100		2.23	0.45	
	H	5	100		2.15	0.43	



*M. PYRIFERA*

**Appendix Table A-17. 48-Hour Kelp Spore Germination and Growth Test Summary of Means**

**City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event**

**Test Initiation Date: 17 March 2004**

**Test Species: *Macrocystis pyrifera***

Concentration (%)	Mean Percent Germination $\pm$ 1 SD			
	A-2	B-1	B-3	C-3
Lab Control	76 $\pm$ 12	76 $\pm$ 12	82 $\pm$ 4.5	76 $\pm$ 12
Brine Control	83 $\pm$ 4.9	83 $\pm$ 4.9	89 $\pm$ 2.5	83 $\pm$ 4.9
High <sup>a</sup>	80 $\pm$ 4.9 (60)	78 $\pm$ 6.3 (58)	90 $\pm$ 0.8 (68)	<b>81 <math>\pm</math> 4.6 (59)</b>

Concentration (%)	Mean Growth ( $\mu$ m) $\pm$ 1 SD			
	A-2	B-1	B-3	C-3
Lab Control	11.7 $\pm$ 2.00	11.7 $\pm$ 2.00	10.9 $\pm$ 2.78	11.7 $\pm$ 2.00
Brine Control	12.4 $\pm$ 1.13	12.4 $\pm$ 1.13	12.3 $\pm$ 2.84	12.4 $\pm$ 1.13
High <sup>a</sup>	15.4 $\pm$ 3.09 (60)	13.3 $\pm$ 3.29 (58)	14.0 $\pm$ 3.34 (68)	12.7 $\pm$ 3.05 (59)

**BOLD** - Indicates a statistically significant decrease compared to the brine control ( $p \leq 0.05$ )

<sup>a</sup> - Highest concentration noted in parenthesis

**Appendix Table A-18. Site A-2 48-Hour Kelp Spore Germination and Growth Test Results**

**City of Buenaventura**

**Santa Clara River Estuary Wet Weather Sampling Event**

**Test Initiation Date: 17 March 2004**

**Test Species: *Macrocystis pyrifera***

Concentration	Replicate	Percent Germinated	Mean Percent Germinated	Mean Spore Length (µm)
Lab Control	A	66	76	11.65
	B	71		
	C	93		
	D	83		
	E	66		
Brine Control	A	76	83	12.35
	B	81		
	C	81		
	D	88		
	E	87		
6.25%	A	86	81	12.80
	B	79		
	C	86		
	D	76		
	E	78		
12.5%	A	83	78	13.70
	B	70		
	C	80		
	D	76		
	E	80		
25%	A	82	84	14.90
	B	89		
	C	87		
	D	84		
	E	77		
50%	A	82	82	14.95
	B	81		
	C	84		
	D	81		
	E	81		
60%	A	77	80	15.40
	B	75		
	C	84		
	D	77		
	E	86		

Appendix Table A-18 (Cont.). Site B-1 48-Hour Kelp Spore Germination and Growth Test Results

City of Buenaventura

Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 17 March 2004

Test Species: *Macrocystis pyrifera*

Concentration	Replicate	Percent Germinated	Mean Percent Germinated	Mean Spore Length (µm)
Lab Control	A	66	76	11.65
	B	71		
	C	93		
	D	83		
	E	66		
Brine Control	A	76	83	12.35
	B	81		
	C	81		
	D	88		
	E	87		
6.25%	A	68	72	9.95
	B	76		
	C	71		
	D	70		
	E	74		
12.5%	A	80	76	12.90
	B	70		
	C	74		
	D	76		
	E	82		
25%	A	67	72	11.85
	B	72		
	C	74		
	D	74		
	E	74		
50%	A	72	77	13.70
	B	74		
	C	75		
	D	84		
	E	79		
58%	A	85	78	13.30
	B	76		
	C	83		
	D	79		
	E	69		

**Appendix Table A-18 (Cont.). Site B-3 48-Hour Kelp Spore Germination and Growth Test Results**

**City of Buenaventura**

**Santa Clara River Estuary Wet Weather Sampling Event**

**Test Initiation Date: 17 March 2004**

**Test Species: *Macrocystis pyrifera***

Concentration	Replicate	Percent Germinated	Mean Percent Germinated	Mean Spore Length ( $\mu\text{m}$ )
Lab Control	A	84	82	10.92
	B	76		
	C	88		
	D	82		
	E	80		
Brine Control	A	85	89	12.34
	B	91		
	C	89		
	D	89		
	E	91		
6.25%	A	86	88	13.62
	B	85		
	C	92		
	D	88		
	E	91		
12.5%	A	80	86	13.82
	B	91		
	C	89		
	D	84		
	E	87		
25%	A	90	90	14.21
	B	88		
	C	94		
	D	85		
	E	93		
50%	A	89	90	13.60
	B	90		
	C	91		
	D	88		
	E	92		
68%	A	90	90	14.03
	B	91		
	C	90		
	D	91		
	E	89		

Appendix Table A-18 (Cont.). Site C-3 48-Hour Kelp Spore Germination and Growth Test Results

City of Buenaventura

Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 17 March 2004

Test Species: *Macrocystis pyrifera*

Concentration	Replicate	Percent Germinated	Mean Percent Germinated	Mean Spore Length (µm)
Lab Control	A	66	76	11.65
	B	71		
	C	93		
	D	83		
	E	66		
Brine Control	A	76	83	12.35
	B	81		
	C	81		
	D	88		
	E	87		
6.25%	A	85	79	12.65
	B	77		
	C	72		
	D	79		
	E	80		
12.5%	A	69	74	11.25
	B	76		
	C	81		
	D	78		
	E	67		
25%	A	74	80	12.20
	B	78		
	C	85		
	D	85		
	E	78		
50%	A	81	74	12.80
	B	77		
	C	63		
	D	77		
	E	72		
59%	A	87	81	12.65
	B	81		
	C	75		
	D	78		
	E	83		

APPENDIX B  
TOXICITY TEST WATER QUALITY DATA

## WHOLE SEDIMENT TESTING



*E. ESTUARIUS*

## Appendix Table B-1. 10-Day Amphipod Sediment Toxicity Test Water Quality Results

City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 24 March 2004

Test Species: *Eohaustorius estuarius*

Control 1						
Day	Dissolved Oxygen (mg/L)	pH (units)	Salinity (ppt)	Temperature (°C)	Total NH <sub>3</sub> (mg/L)	
					Overlying Water	Porewater
0	8.1	8.07	29	14.7	<0.1	0.6
1	8.1	8.12	29	14.9	--	--
2	8.2	8.18	29	14.9	--	--
3	8.4	8.24	29	14.9	--	--
4	8.2	8.20	29	14.8	--	--
5	8.7	7.98	29	15.2	--	--
6	8.3	7.98	29	15.0	--	--
7	8.5	8.11	29	15.0	--	--
8	8.3	8.12	29	14.9	--	--
9	8.1	8.13	29	15.0	--	--
10	8.0	8.08	29	15.0	0.2	--

**Appendix Table B-1 (cont.). 10-Day Amphipod Sediment Toxicity Test Water Quality Results**

City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 24 March 2004

Test Species: *Eohaustorius estuarius*

Control 2						
Day	Dissolved Oxygen (mg/L)	pH (units)	Salinity (ppt)	Temperature (°C)	Total NH <sub>3</sub> (mg/L)	
					Overlying Water	Porewater
0	7.9	8.02	30	14.6	0.5	3.4
1	7.9	8.02	30	15.0	--	--
2	8.1	8.13	30	14.9	--	--
3	8.2	8.25	30	14.8	--	--
4	8.2	8.19	30	14.8	--	--
5	8.6	8.01	30	15.0	--	--
6	8.1	8.00	30	15.0	--	--
7	8.2	8.10	30	15.2	--	--
8	8.2	8.09	30	14.9	--	--
9	8.1	8.10	30	14.9	--	--
10	7.8	8.14	30	15.0	1.6	--

**Appendix Table B-1 (cont.). 10-Day Amphipod Sediment Toxicity Test Water Quality Results**

City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 24 March 2004

Test Species: *Eohaustorius estuarius*

A-1						
Day	Dissolved Oxygen (mg/L)	pH (units)	Salinity (ppt)	Temperature (°C)	Total NH <sub>3</sub> (mg/L)	
					Overlying Water	Porewater
0	7.9	8.08	29	14.6	0.6	0.9
1	7.9	8.06	29	15.1	--	--
2	8.0	8.14	29	15.0	--	--
3	8.3	8.26	29	14.9	--	--
4	8.2	8.22	29	14.8	--	--
5	8.6	8.08	29	15.0	--	--
6	8.2	8.09	29	15.0	--	--
7	8.3	8.15	29	15.1	--	--
8	8.1	8.17	29	15.0	--	--
9	8.0	8.17	29	15.0	--	--
10	7.8	8.24	29	15.1	1.5	--

## Appendix Table B-1 (cont.). 10-Day Amphipod Sediment Toxicity Test Water Quality Results

City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 24 March 2004

Test Species: *Eohaustorius estuarius*

A-2						
Day	Dissolved Oxygen (mg/L)	pH (units)	Salinity (ppt)	Temperature (°C)	Total NH <sub>3</sub> (mg/L)	
					Overlying Water	Porewater
0	8.0	8.03	29	14.6	0.7	1.2
1	7.9	8.02	29	15.1	--	--
2	8.0	8.13	29	15.0	--	--
3	8.2	8.26	29	14.9	--	--
4	8.2	8.23	29	14.9	--	--
5	8.7	8.10	29	15.3	--	--
6	8.2	8.13	29	15.2	--	--
7	8.3	8.14	29	15.2	--	--
8	8.1	8.16	29	15.1	--	--
9	8.0	8.19	29	15.0	--	--
10	7.9	8.28	29	15.1	0.4	--

**Appendix Table B-1 (cont.). 10-Day Amphipod Sediment Toxicity Test Water Quality Results**

City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 24 March 2004

Test Species: *Eohaustorius estuarius*

A-3						
Day	Dissolved Oxygen (mg/L)	pH (units)	Salinity (ppt)	Temperature (°C)	Total NH <sub>3</sub> (mg/L)	
					Overlying Water	Porewater
0	8.1	8.02	30	14.6	0.4	4.0
1	7.9	8.09	30	15.0	--	--
2	8.0	8.16	30	15.0	--	--
3	8.3	8.26	30	14.9	--	--
4	8.0	8.24	30	14.9	--	--
5	8.6	8.12	30	15.3	--	--
6	8.1	8.14	30	15.3	--	--
7	8.4	8.16	30	15.3	--	--
8	8.1	8.17	30	15.1	--	--
9	8.0	8.20	30	15.0	--	--
10	7.8	8.31	30	15.1	1.5	--

## Appendix Table B-1 (cont.). 10-Day Amphipod Sediment Toxicity Test Water Quality Results

City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 24 March 2004

Test Species: *Eohaustorius estuarius*

B-1						
Day	Dissolved Oxygen (mg/L)	pH (units)	Salinity (ppt)	Temperature (°C)	Total NH <sub>3</sub> (mg/L)	
					Overlying Water	Porewater
0	8.1	7.99	29	14.5	1.3	1.3
1	8.0	8.06	28	15.2	--	--
2	8.0	8.16	28	15.0	--	--
3	8.3	8.28	28	15.0	--	--
4	8.2	8.27	28	14.9	--	--
5	8.1	8.17	28	15.3	--	--
6	8.2	8.20	28	15.2	--	--
7	8.5	8.20	28	15.2	--	--
8	8.2	8.22	28	15.1	--	--
9	8.0	8.23	28	15.1	--	--
10	7.9	8.31	28	15.1	0.2	--

**Appendix Table B-1 (cont.). 10-Day Amphipod Sediment Toxicity Test Water Quality Results**

City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 24 March 2004

Test Species: *Eohaustorius estuarius*

B-2						
Day	Dissolved Oxygen (mg/L)	pH (units)	Salinity (ppt)	Temperature (°C)	Total NH <sub>3</sub> (mg/L)	
					Overlying Water	Porewater
0	8.1	8.08	30	14.5	0.4	<0.1
1	8.1	8.09	30	15.3	--	--
2	8.0	8.16	30	15.1	--	--
3	8.3	8.24	30	15.0	--	--
4	8.3	8.23	30	15.0	--	--
5	8.1	8.04	30	15.3	--	--
6	8.2	8.13	30	15.3	--	--
7	8.3	8.12	30	15.3	--	--
8	8.2	8.12	30	15.1	--	--
9	8.0	8.16	30	15.2	--	--
10	7.8	8.27	30	15.2	0.9	--



**Appendix Table B-1 (cont.). 10-Day Amphipod Sediment Toxicity Test Water Quality Results**

City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 24 March 2004

Test Species: *Eohaustorius estuarius*

B-3						
Day	Dissolved Oxygen (mg/L)	pH (units)	Salinity (ppt)	Temperature (°C)	Total NH <sub>3</sub> (mg/L)	
					Overlying Water	Porewater
0	8.2	8.07	29	14.5	0.7	1.6
1	8.0	8.11	29	15.2	--	--
2	8.0	8.18	29	15.0	--	--
3	8.3	8.28	29	15.0	--	--
4	8.3	8.29	29	15.0	--	--
5	8.1	8.17	29	15.3	--	--
6	8.2	8.18	29	15.3	--	--
7	8.3	8.20	29	15.3	--	--
8	8.2	8.21	29	15.1	--	--
9	8.0	8.27	29	15.2	--	--
10	8.0	8.35	29	15.2	0.6	--

**Appendix Table B-1 (cont.). 10-Day Amphipod Sediment Toxicity Test Water Quality Results**

City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 24 March 2004

Test Species: *Eohaustorius estuarius*

B-4						
Day	Dissolved Oxygen (mg/L)	pH (units)	Salinity (ppt)	Temperature (°C)	Total NH <sub>3</sub> (mg/L)	
					Overlying Water	Porewater
0	8.0	7.97	29	14.5	0.1	<0.1
1	8.0	8.01	29	15.2	--	--
2	8.0	8.12	29	15.1	--	--
3	8.3	8.25	29	15.0	--	--
4	8.2	8.27	29	15.0	--	--
5	8.1	8.15	29	15.3	--	--
6	8.0	8.21	29	15.3	--	--
7	8.4	8.10	29	15.3	--	--
8	8.2	8.22	29	15.1	--	--
9	8.0	8.26	29	15.2	--	--
10	7.9	8.35	29	15.2	0.7	--

**Appendix Table B-1 (cont.). 10-Day Amphipod Sediment Toxicity Test Water Quality Results**

City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 24 March 2004

Test Species: *Eohaustorius estuarius*

C-1						
Day	Dissolved Oxygen (mg/L)	pH (units)	Salinity (ppt)	Temperature (°C)	Total NH <sub>3</sub> (mg/L)	
					Overlying Water	Forewater
0	8.1	8.05	30	14.6	0.6	0.9
1	8.1	8.06	30	15.2	--	--
2	8.0	8.11	30	15.1	--	--
3	8.4	8.23	30	15.0	--	--
4	8.2	8.24	30	15.0	--	--
5	8.1	8.08	30	15.4	--	--
6	8.1	8.12	30	15.3	--	--
7	8.4	8.04	30	15.3	--	--
8	8.2	8.10	30	15.2	--	--
9	8.0	8.16	30	15.2	--	--
10	7.8	8.27	30	15.3	0.6	--

**Appendix Table B-1 (cont.). 10-Day Amphipod Sediment Toxicity Test Water Quality Results**

City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 24 March 2004

Test Species: *Eohaustorius estuarius*

C-2						
Day	Dissolved Oxygen (mg/L)	pH (units)	Salinity (ppt)	Temperature (°C)	Total NH <sub>3</sub> (mg/L)	
					Overlying Water	Forewater
0	8.1	8.02	28	14.6	0.7	2.3
1	8.1	8.06	28	15.2	--	--
2	8.0	8.16	28	15.1	--	--
3	8.4	8.29	28	15.0	--	--
4	8.3	8.33	29	15.0	--	--
5	8.1	8.20	28	15.4	--	--
6	8.2	8.24	28	15.3	--	--
7	8.4	8.18	28	15.3	--	--
8	8.2	8.22	28	15.2	--	--
9	8.0	8.25	28	15.2	--	--
10	7.9	8.34	28	15.2	0.6	--

## Appendix Table B-1 (cont.). 10-Day Amphipod Sediment Toxicity Test Water Quality Results

City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 24 March 2004

Test Species: *Eohaustorius estuarius*

C-3						
Day	Dissolved Oxygen (mg/L)	pH (units)	Salinity (ppt)	Temperature (°C)	Total NH <sub>3</sub> (mg/L)	
					Overlying Water	Porewater
0	7.9	8.02	28	14.6	0.1	0.5
1	8.0	8.06	28	15.3	--	--
2	8.0	8.16	28	15.0	--	--
3	8.3	8.28	28	15.0	--	--
4	8.2	8.31	28	15.0	--	--
5	8.0	8.16	28	15.4	--	--
6	8.0	8.19	28	15.3	--	--
7	8.3	8.15	28	15.4	--	--
8	8.3	8.24	28	15.2	--	--
9	8.0	8.27	28	15.2	--	--
10	8.0	8.37	28	15.3	1.6	--

*M. GALLOPROVINCIALIS*

## Appendix Table B-2. 48-Hour Bivalve Embryo Development Test Water Quality Results (Whole Sediment)

City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 23 March 2004

Test Species: *Mytilus galloprovincialis*

Site	Dissolved Oxygen (mg/L)			pH (units)			Salinity (ppt)			Temperature (°C)			NH <sub>3</sub> (mg/L)	
	0	24	48	0	24	48	0	24	48	0	24	48	0	48
Control - Water Only	8.5	8.2	8.3	7.93	8.02	7.50	30	30	30	14.8	15.0	15.0	0.2	< 0.1
Control - Sediment	8.0	7.3	7.1	7.92	7.93	7.81	30	30	30	14.7	14.7	15.0	< 0.1	0.5
A-1	7.3	7.1	7.0	7.93	7.94	7.87	30	30	30	14.6	14.7	15.0	< 0.1	0.2
A-2	7.8	7.6	7.9	7.96	7.90	7.89	30	30	30	14.6	14.7	15.0	0.4	0.1
A-3	7.3	7.1	7.1	7.95	7.92	7.86	30	30	30	14.6	14.7	15.0	0.6	< 0.1
B-1	7.9	7.5	7.0	7.97	7.93	7.78	30	30	30	14.6	14.7	15.0	< 0.1	0.2
B-2	8.2	7.8	6.9	7.99	7.98	7.78	30	30	30	14.6	14.6	14.9	< 0.1	< 0.1
B-3	8.0	7.5	6.7	7.98	7.96	7.77	30	30	30	14.6	14.6	15.0	< 0.1	1.9
B-4	7.8	7.3	6.6	7.96	7.94	7.77	30	30	30	14.6	14.6	15.0	< 0.1	1.3
C-1	8.3	7.8	7.0	8.00	7.97	7.81	30	30	30	14.6	14.6	15.0	< 0.1	NC
C-2	8.3	7.7	7.1	8.00	7.97	7.81	30	30	30	14.6	14.6	15.0	< 0.1	< 0.1
C-3	8.3	7.9	7.8	7.99	7.99	7.87	30	30	30	14.7	14.6	14.9	< 0.1	0.1

NC: Not available for analysis, no sample collected.

**Appendix Table B-2 (Cont.). 48-Hour Bivalve Embryo Development Test Water Quality Results (Whole Sediment)**

City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 8 May 2004 - Site B-1 Retest

Test Species: *Mytilus galloprovincialis*

Site	Dissolved Oxygen (mg/L)			pH (units)			Salinity (ppt)			Temperature (°C)			NH <sub>3</sub> (mg/L)	
	0	24	48	0	24	48	0	24	48	0	24	48	0	48
Control - Water Only	7.4	8.9	8.1	7.44	7.71	7.72	30	30	30	15.0	14.7	14.7	NC	NC
Control - Sediment	7.5	8.7	8.2	7.44	7.71	7.70	30	30	30	15.0	14.5	14.7	NC	NC
B-1	7.4	8.6	7.7	7.44	7.74	7.72	30	30	30	15.0	14.5	14.7	NC	NC

NC: Not available for analysis, no sample collected.



## AMBIENT WATER TESTING

FRESHWATER

*P. PROMELAS*

Client: City of Buenaventura

Test Species: P. promelas

Sample ID: SCORE (A-2, B-1, B-3, C-3)

Test Date: 3/17/04

Test No: 0403-110, 111, 112, 113

Start/End Times: 1200 / 1400

Concentration		Lab Control							
Day	0	1	2	3	4	5	6	7	
Initial									
pH	8.13	8.25	8.23	8.25	8.22	8.20	7.92		
DO (mg/L)	7.5	7.6	7.5	8.3	8.2	7.5	6.5	6.8	
Cond. (µmhos-cm)	204	205	201	205	204	207	207		
Temp (°C)	25.3	24.2	26.0	25.0	24.2	25.6	24.7		
Final									
pH		8.02	7.67	8.07	8.04	7.82	7.74	7.89	
DO (mg/L)		5.65	5.3	6.3	5.6	6.3	7.58	6.2	
Temp (°C)		24.9	24.9	24.1	24.7	24.7	24.0	25.0	

Concentration		B-3 100%							
Day	0	1	2	3	4	5	6	7	
Initial									
pH	8.41	8.30	8.33	8.35	8.32	8.30	8.32		
DO (mg/L)	10.9	7.7	8.8	9.2	8.9	9.5	9.2		
Cond. (µmhos-cm)	14370	20000	26000	26106	19440	19930	19980		
Temp (°C)	24.4	25.8	24.4	25.4	24.9	24.2	24.1		
Final									
pH		8.35	8.20	8.16	8.20	8.27	8.27	8.21	
DO (mg/L)		7.1	6.1	6.2	5.7	6.3	6.7	6.2	
Temp (°C)		24.6	25.0	24.0	24.6	24.8	24.0	25.0	

Concentration		A-2 100%							
Day	0	1	2	3	4	5	6	7	
Initial									
pH	7.80	7.62	7.84	8.03	7.84	7.74	7.99		
DO (mg/L)	9.1	8.5	8.6	8.8	8.9	9.5	8.7		
Cond. (µmhos-cm)	5250	5340	5390	5330	5330	5360	5370		
Temp (°C)	24.6	24.7	24.4	25.0	24.7	24.0	23.7		
Final									
pH		8.13	8.06	8.05	8.16	7.96	8.06	7.99	
DO (mg/L)		6.8	6.2	6.7	5.9	6.2	6.4	6.1	
Temp (°C)		24.8	25.0	24.1	24.8	24.7	24.2	25.0	

Concentration		C-3 100%							
Day	0	1	2	3	4	5	6	7	
Initial 20.7 (µM)									
pH	7.99	7.79	7.73	8.10	8.20	7.94	8.07		
DO (mg/L)	10.0	8.3	9.7	9.1	9.2	9.7	9.5		
Cond. (µmhos-cm)	3100	3060	3070	3070	3140	3050	3060		
Temp (°C)	24.3	25.7	24.4	25.0	24.6	24.3	24.2		
Final									
pH		8.34	8.17	8.10	8.00	8.05	8.13	8.10	
DO (mg/L)		7.1	6.2	6.0	4.0	5.1	3.6	4.0	
Temp (°C)		24.5	25.0	24.2	24.3	24.8	24.1	24.9	

Concentration		B-1 100%							
Day	0	1	2	3	4	5	6	7	
Initial									
pH	7.70	7.41	7.70	7.89	7.72	7.71	7.98		
DO (mg/L)	8.5	8.3	9.4	8.9	8.6	9.8	9.8		
Cond. (µmhos-cm)	2510	2520	2530	2560	2520	2520	2520		
Temp (°C)	24.4	25.1	24.3	25.0	24.9	24.0	25.7		
Final									
pH		8.20	8.12	8.14	8.16	8.12	7.92	8.08	
DO (mg/L)		6.6	6.7	6.4	5.6	6.3	4.9	5.4	
Temp (°C)		24.7	25.0	24.1	24.7	24.7	24.2	25.0	

Concentration									
Day	0	1	2	3	4	5	6	7	
Initial									
pH									
DO (mg/L)									
Cond. (µmhos-cm)									
Temp (°C)									
Final									
pH									
DO (mg/L)									
Temp (°C)									

Animal Source/Date Received: ABS 3/17/04

Analysts:	Initial:	AW	SD	MC	MC	RG	AH	AW	
	Final:		SH	ME	SH	AH	AH	AW	MC

Animal Age at Initiation: 48 hours

Comments: \_\_\_\_\_

QC Check: NO 4/13/04

Final Review: [Signature] 4/21/04

Client: City of Buena Ventura  
 Sample ID: Salt Controls  
 Test No: 0463-110,111,112,113

Test Species: P. promelas  
 Test Date: 3/17/04 3/18/04  
 Start/End Times: 1415

Concentration	SC A-2 3.1 PPT							
Day	0	1	2	3	4	5	6	7
pH	7.89	7.96	8.11	7.92	7.74	8.03	7.93	
DO (mg/L)	8.4	8.9	8.9	8.9	9.4	9.1	10.1	
Cond. (µmhos-cm)	5590	5600	5640	5610	5610	5600	5540	MEC 5540
Temp (°C)	24.4	24.2	25.0	24.7	24.0	24.6	25.0	
Final								
pH		7.94	8.01	7.91	7.77	7.63	7.59	7.80
DO (mg/L)		7.1	6.9	6.0	6.8	6.2	6.0	6.7
Temp (°C)		24.2	24.0	24.9	24.8	24.0	24.9	24.7

Concentration	SC B-1 1.4 PPT							
Day	0	1	2	3	4	5	6	7
pH	8.00	8.11	8.27	8.00	7.92	7.80	8.09	
DO (mg/L)	7.9	8.6	8.8	8.7	9.5	9.4	10.2	
Cond. (µmhos-cm)	2700	2700	2760	2710	2700	2510	2690	
Temp (°C)	25.7	24.1	25.0	24.6	24.3	24.7	25.0	
Final								
pH		8.07	8.05	7.92	7.91	7.70	7.86	7.97
DO (mg/L)		7.2	6.5	5.2	6.7	6.0	5.3	6.4
Temp (°C)		24.2	24.1	25.1	25.0	24.0	25.0	24.7

Concentration	SC B-3 14.4 PPT							
Day	0	1	2	3	4	5	6	7
pH	7.76	7.75	7.8					
DO (mg/L)	7.7	7.2						
Cond. (µmhos-cm)	19,910	20000						
Temp (°C)	24.6	24.3						
Final								
pH		7.88	7.98					
DO (mg/L)		7.3	6.7 SH					
Temp (°C)		24.2	24.1					

Concentration	SC C-3 1.7 PPT							
Day	0	1	2	3	4	5	6	7
pH	8.02	8.15	8.18	8.00	7.93	8.08	8.02	
DO (mg/L)	8.1	8.2	8.8	8.4	9.6	9.3	10.6	
Cond. (µmhos-cm)	3410	3410	3440	3410	3410	3420	3410	
Temp (°C)	25.1	24.2	25.0	24.7	24.1	24.1	25.0	
Final								
pH		8.14	7.97	7.82	7.87	7.68	7.78	7.78
DO (mg/L)		7.1	6.6	5.3	6.8	6.2	5.6	6.2
Temp (°C)		24.3	24.1	25.0	25.0	24.0	25.0	24.7

	0	1	2	3	4	5	6	7
Analysts: Initial:	SD	MG	MC	RG	AH	AW	mc	
Final:		MC	SH	AH	AH	AW	MC	AW

Comments:

Animal Source/Date Received: ABS / 3-17-04 Animal Age at Initiation: 248 hrs

QC Check: mc 4/13/04

Final Review: AW 5/24/04

*C. DUBIA*

Client: City of Buena Ventura  
 Sample ID: SCRE (A-2, B-1, B-3, C-3)  
 Test No: 0403-114, 115, 116, 117

Test Species: C. dubia  
 Test Date: 3/17/04  
 Start/End Times: 1400 / 1310

Concentration		Lab Control						
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.13	8.20	8.25	8.23	8.22	8.20	7.92	
DO (mg/L)	7.5	7.4	8.3	7.5	8.2	7.5	7.8	
Cond. (µmhos-cm)	201	205	205	201	204	207	207	
Temp (°C)	25.9	24.2	25.0	26.0	24.2	25.6	24.7	
Final								
pH		7.79	8.09	7.71	8.22	8.00	7.91	8.06
DO (mg/L)		7.4	8.1	8.8	8.2	8.2	9.1	8.3
Temp (°C)		25.7	25.0	25.5	24.9	24.0	25.1	25.0

Concentration		B-3 100%						
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.42	8.30						
DO (mg/L)	10.4	7.7						
Cond. (µmhos-cm)	4300	2000						
Temp (°C)	25.1	25.8						
Final								
pH		8.37						
DO (mg/L)		7.4						
Temp (°C)		25.4						

Concentration		A-2 100%						
Day	0	1	2	3	4	5	6	7
Initial								
pH	7.88	7.62	8.03	7.84	7.84	7.74	7.99	
DO (mg/L)	8.7	8.5	8.8	8.6	8.9	9.5	8.7	
Cond. (µmhos-cm)	522	530	5330	5310	5380	5360	5370	
Temp (°C)	25.3	24.7	25.0	24.4	24.7	24.0	25.2	
Final								
pH		8.29	8.45	8.63	8.44	8.38	8.34	8.41
DO (mg/L)		7.4	8.1	8.2	8.1	8.0	7.5	8.3
Temp (°C)		25.7	25.0	25.5	24.9	24.0	25.1	25.0

Concentration		C-3 100%						
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.04	7.79	8.10	7.78	8.07	7.94	8.07	
DO (mg/L)	8.5	8.3	9.1	9.7	9.2	9.7	9.5	
Cond. (µmhos-cm)	3078	3000	3070	3070	3140	3050	300	
Temp (°C)	25.3	25.9	25.0	24.4	24.6	24.3	24.2	
Final								
pH		8.25	8.27	8.36	8.29	8.26	8.29	8.34
DO (mg/L)		7.5	8.1	8.2	8.1	8.0	9.3	8.4
Temp (°C)		25.7	25.0	25.5	24.9	24.0	25.1	25.0

Concentration		B-1 100%						
Day	0	1	2	3	4	5	6	7
Initial								
pH	7.75	7.54	7.89	7.70	7.72	7.71	7.98	
DO (mg/L)	8.5	8.3	8.9	9.4	8.6	9.8	8.6	
Cond. (µmhos-cm)	2500	2520	2560	2530	2520	2520	2520	
Temp (°C)	24.9	25.1	25.0	24.3	24.9	24.0	25.2	
Final								
pH		8.32	8.48	8.42	8.46	8.41	8.38	8.49
DO (mg/L)		7.4	8.0	8.1	7.9	7.9	9.2	8.2
Temp (°C)		25.7	25.0	25.5	24.9	24.0	25.1	25.0

Concentration								
Day	0	1	2	3	4	5	6	7
Initial								
pH								
DO (mg/L)								
Cond. (µmhos-cm)								
Temp (°C)								
Final								
pH								
DO (mg/L)								
Temp (°C)								

Animal Source/Date Received: Internal / NA  
 Animal Age at Initiation: 24 hours

Analysts:	Initial:	0	1	2	3	4	5	6	7
		AW	SD	MC	MC	RL	AW	AW	
	Final:		SD	AW	MC	RL	AW	AW	AW

Comments: Initial Readings from day 2 + 3 were switched  
 QC Check: NA 4/13/04

Final Review: AW 5/24/04

Client: City of Buena Ventura  
 Sample ID: Salt Controls  
 Test No: 0403-114, 115, 116, 117

Test Species: C. dubia  
 Test Date: 3-17-04  
 Start/End Times: 1400 / 1310

Concentration	SC A-2 3.1 ppt							
Day	0	1	2	3	4	5	6	7
Initial								
pH	7.72	7.89	7.96	8.11	7.92	7.74	8.03	
DO (mg/L)	8.2	8.4	8.9	8.9	8.9	9.4	9.1	
Cond. (µmhos-cm)	5600	5590	5600	5640	5610	5610	5600	
Temp (°C)	24.3	24.4	24.2	25.0	24.5	24.6	24.6	
Final								
pH		7.95	8.09	8.10	8.08	8.08	7.92	8.01
DO (mg/L)		8.7	8.1	8.1	8.1	8.3	8.6	8.2
Temp (°C)		25.1	25.0	25.5	24.9	24.0	25.1	25.0

Concentration	SC B-1 1.4 ppt							
Day	0	1	2	3	4	5	6	7
Initial								
pH	7.84	8.00	8.11	8.17	8.00	7.92	7.80	
DO (mg/L)	8.3	7.9	8.6	8.8	8.7	9.5	9.4	
Cond. (µmhos-cm)	2680	2700	2700	2760	2710	2700	2510	
Temp (°C)	26.7	25.7	24.1	25.0	24.6	24.3	24.2	
Final								
pH		8.03	8.10	8.09	8.11	8.06	8.00	8.35
DO (mg/L)		8.9	7.9	7.0	8.2	8.2	8.3	7.9
Temp (°C)		25.1	25.0	25.5	24.9	24.0	25.1	25.0

Concentration	SC B-3 <sup>12-1</sup> 5.4 ppt							
Day	0	1	2	3	4	5	6	7
Initial								
pH	7.65	7.71						
DO (mg/L)	8.4	8.4						
Cond. (µmhos-cm)	19930	19910						
Temp (°C)	24.1	24.6						
Final								
pH		8.00						
DO (mg/L)		8.4						
Temp (°C)		25.4			2			

Concentration	SC C-3 1.7 ppt							
Day	0	1	2	3	4	5	6	7
Initial								
pH	7.87	8.02	8.15	8.18	8.00	7.93	8.08	
DO (mg/L)	8.3	8.1	8.2	8.8	8.4	9.6	9.3	
Cond. (µmhos-cm)	3380	3410	3460	3440	3410	3410	3420	
Temp (°C)	25.0	25.1	24.2	25.0	24.7	24.1	24.1	
Final								
pH		7.99	8.05	8.07	8.07	8.25	8.02	8.10
DO (mg/L)		8.7	7.7	8.0	7.9	8.3	8.2	7.8
Temp (°C)		25.1	25.0	25.5	24.9	24.0	25.1	25.0

Analysts:	Initial:	0	1	2	3	4	5	6	7
		SD	SD	mc	me	RG	AH	AW	
	Final:		SD	AW	MR	RG	AW	AW	AW

Comments:

Animal Source/Date Received: NA - Internal Animal Age at Initiation: 224 hrs

QC Check: UC 4/13/04 Final Review: [Signature]



*S. CAPRICORNUTUM*

Freshwater Chronic Bioassay

Water Quality Measurements  
Algal Growth Inhibition

Test Species: S. capricornutum

Client: City of Buena Ventura

Test Date: 3/17/04

Sample ID: Santa Clara River Estuary  
Site A-2

Start/End Times: 1735/1630

Test No: 0403-118

Analyst: [Signature]

Concentration (%)	Initial Readings				Final Readings	
	D.O. (mg/L)	Conductivity (umhos-cm)	Alkalinity (mg/L)	Hardness (mg/L)	D.O. (mg/L)	Conductivity (umhos-cm)
Lab control #1	7.6	93.5	14	14	8.0	96.5
Salinity control A-2	7.3	5520	21	>1000	8.3	5410
A-2 100	8.4	5280	164	71000	8.5	5140

		0 Hour	24 Hour	48 Hour	72 Hour	96 Hour
pH/Temperature (°C):	control	7.60/24.2	7.62/26.1 <sup>(a)</sup>	6.96/25.9	8.66/25.3	8.41/25.6
pH/Temperature (°C):	SC A2	7.74/24.3	7.41/26.4	7.03/26.0	8.33/24.0 8.81/24.0 SA	9.08/25.6
pH/Temperature (°C):	100	7.92/24.5	8.10/26.6	8.20/26.2 <sup>(a)</sup>	8.84/24.6	9.49/25.6
pH/Temperature (°C):						
pH/Temperature (°C):						
pH/Temperature (°C):						
pH/Temperature (°C):						

Comments: (a) exceeds required temp. max of 26°C - chamber temp adjusted

QC Check: me 4/14/04

Final Review: [Signature] 5/24/04

Freshwater Chronic Bioassay

Water Quality Measurements  
Algal Growth Inhibition

Test Species: S. capricornutum

Client: City of Buena Ventura

Test Date: 3/17/04

Sample ID: SCORE Site B-1

Start/End Times: 1735/1630

Test No: D403-119

Analyst: [Signature]

Concentration (%)	Initial Readings				Final Readings	
	D.O. (mg/L)	Conductivity (umhos-cm)	Alkalinity (mg/L)	Hardness (mg/L)	D.O. (mg/L)	Conductivity (umhos-cm)
Lab control #1	7.6	93.5	14	14	8.0	96.5
Salinity control B-1	7.7	2760	15	>1000	8.7	2680
B-1 100	8.7	2570	167	>1000	9.3	2420

		0 Hour	24 Hour	48 Hour	72 Hour	96 Hour
pH/Temperature (°C):	control	7.60/24.2	7.62/26.1 <sup>(9)</sup>	6.85/25.9	8.66/25.3	8.41/25.6
pH/Temperature (°C):	SC	7.77/24.3	7.53/26.6	7.48/26.1 <sup>(3)</sup>	7.75/24.7	8.92/25.6
pH/Temperature (°C):	100	7.87/24.3	8.48/26.6	8.37/26.4	8.91/24.9	9.52/25.6
pH/Temperature (°C):						
pH/Temperature (°C):						
pH/Temperature (°C):						
pH/Temperature (°C):						

Comments: (9) exceeds required temp max of 26°C - chamber temp adjusted

QC Check: me 4/14/04

Final Review: [Signature] 5/14/04

Freshwater Chronic Bioassay

Water Quality Measurements  
Algal Growth Inhibition

Test Species: S. capricornutum

Client: City of Buenaventura

Test Date: 3/17/04

Sample ID: SCRS Site B-3

Start/End Times: 1735/1630

Test No: 0403-120

Analyst: [Signature]

Concentration (%)	Initial Readings				Final Readings	
	D.O. (mg/L)	Conductivity (umhos-cm)	Alkalinity (mg/L)	Hardness (mg/L)	D.O. (mg/L)	Conductivity (umhos-cm)
Lab control #2	7.4	93.5	14	14	8.1	93.4
salinity control B-3	7.7	19670	49	>1000	7.3	19600
B-3 100	8.6	19940	240	>1000	7.7	20200

		0 Hour	24 Hour	48 Hour	72 Hour	96 Hour
pH/Temperature (°C):	control	7.00/24.2	7.58/26.3 <sup>ⓐ</sup>	6.86/25.9	7.33/25.0	8.65/25.6
pH/Temperature (°C):	SC	8.12/24.7	7.69/26.5	7.45/26.3 <sup>ⓐ</sup>	7.71/24.3	8.15/25.6
pH/Temperature (°C):	100	8.44/24.7	8.13/26.5	8.45/26.3	8.71/24.9	8.56/25.6
pH/Temperature (°C):						
pH/Temperature (°C):						
pH/Temperature (°C):						
pH/Temperature (°C):						

Comments: ⓐ exceeds required temp max of 26°C - chamber temp adjusted

QC Check: see 4/14/04

Final Review: [Signature] 9/24/04

Freshwater Chronic Bioassay

Water Quality Measurements  
Algal Growth Inhibition

Test Species: S. capricornutum

Client: City of Buenaventura

Test Date: 3/17/04

Sample ID: SCRE Site C-3

Start/End Times: 1135/1630

Test No: 0403-101

Analyst: [Signature]

Concentration (%)	Initial Readings				Final Readings	
	D.O. (mg/L)	Conductivity (umhos-cm)	Alkalinity (mg/L)	Hardness (mg/L)	D.O. (mg/L)	Conductivity (umhos-cm)
Lab control #2	7.4	93.5	14	14	8.1	93.4
Salinity control C-3	7.7	3260	15	>1000	8.3	3320
C-3 100	9.4	3150	345	>1000	7.7	2770

		0 Hour	24 Hour	48 Hour	72 Hour	96 Hour
pH/Temperature (°C):	control	7.40/24.2	7.58/26.3 <sup>a</sup>	6.80/25.9	7.83/25.0	8.65/25.6
pH/Temperature (°C):	SC	7.79/24.9	7.56/26.4	7.51/26.2 <sup>a</sup>	7.62/24.6	8.92/25.6
pH/Temperature (°C):	100	8.08/24.7	8.25/26.4	8.16/26.3	8.41/24.6	8.48/25.6
pH/Temperature (°C):						
pH/Temperature (°C):						
pH/Temperature (°C):						
pH/Temperature (°C):						

Comments: a) exceeds temp max of 20°C - chamber temp adjusted

QC Check: see 4/14/04

Final Review: [Signature] 3/24/04

MARINE

*M. GALLOPROVINCIALIS*

AMEC Earth & Environmental  
 Bioassay Laboratory  
 5550 Morehouse Dr. Suite B  
 San Diego, CA 92121

Physical and Chemical  
 Measurements of Test Solutions  
 Salt Water Bioassays

Client: City of Buena Ventura A-2  
 Contact: NA  
 Test No.: DA03-106

Analyst: JR  
 Test Start: 3/19/04  
 Test End: 3/21/04  
 Date Collected: 3/19/04

Sample ID or Conc. %	DO (mg/L)			pH (pH units)			Salinity (ppt)			Temp °C		
	0	24	48	0	24	48	0	24	48	0	24	48
LC	8.2	9.1	8.2	8.06	8.14	8.02	30	29.5	29.8	14.8	15.0	14.9
BC	7.6	9.0	8.3	8.06	8.07	8.04	30	30.1	30.2	14.8	14.8	14.7
6.25	8.2	9.0	8.0	8.04	8.05	8.07	30	29.9	30.1	14.8	14.7	14.7
12.5	8.2	9.1	8.1	8.02	8.05	8.07	30	30.2	30.2	14.8	14.7	14.9
25	8.1	9.1	8.0	7.97	8.06	8.10	30	30.1	30.1	14.8	14.6	15.0
50	8.1	9.1	7.9	7.92	8.11	8.12	30	30.0	30.1	14.8	14.6	14.9
67	8.1	9.1	8.0	7.88	8.14	8.19	30	30.1	30.1	14.8	14.6	14.9

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

QA Check: MC 4/21/04



## Brine Dilution Worksheet

Client: City of Buenaventura

Analyst: JR

Sample ID: Santa Clara River Estuary A2

Test Date: 03/17/2004  
*19*  
~~03/17~~

Test No: 0403-100

Test Type: Bivalve Embryo Dev.

Salinity of Effluent	3.1
Salinity of Brine	85
Target Salinity	30
Test Dilution Volume	150

Salinity Adjustment Factor:	TS - SE	TS = target salinity SE = salinity of effluent SB = salinity of brine
	SB - TS	

Salinity Adjustment Factor = 0.49

Concentration %	Effluent Volume (mL)	Salinity Adjustment	Brine Volume (mL)	Dilute to to: (mL)
Control	NA	NA	NA	150
6.25	9.4	0.49	4.6	150
12.5	18.8	0.49	9.2	150
25	37.5	0.49	18.3	150
50	75	0.49	37	150
67	101	0.49	49	150

**DI Volume**

Brine Control	90	0.55	49	150
			total brine	167.3

Brine Control Salinity Adjustment Factor

Brine Control Calculation: 
$$\frac{TS - 0}{SB - TS}$$

*QC:ML 4/28/04*

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Physical and Chemical  
 Measurements of Test Solutions  
 Salt Water Bioassays

Client: Buenaventura B-1  
 Contact: NA  
 Test No.: 0A03-107

Analyst: JR  
 Test Start: 3/19/04  
 Test End: 3/21/04  
 Date Collected: 3/19/04

Sample ID or Conc. %	DO (mg/L)			pH (pH units)			Salinity (ppt)			Temp °C		
	0	24	48	0	24	48	0	24	48	0	24	48
LC	8.2	9.1	8.2	8.06	8.14	8.02	30	29.5	29.8	14.8	15.0	14.9
BC	7.8	9.0	8.1	8.08	8.04	8.06	30	29.3	29.3	14.8	14.7	14.8
6.25	8.1	9.0	8.0	8.04	8.02	8.04	30	29.9	29.9	14.8	14.6	14.9
12.5	8.2	9.0	8.1	8.01	8.02	8.07	30	30.0	30.0	14.8	14.6	14.9
25	8.2	9.1	8.1	7.95	8.05	8.07	30	29.8	29.9	14.8	14.6	14.9
50	8.1	9.0	8.1	7.89	8.10	8.08	30	29.9	30.0	14.8	14.6	14.8
66	8.1	9.0	8.2	7.84	8.13	8.11	30	29.9	30.0	14.8	14.6	14.9

Comments: above lab control with 1-2

QA Check: MC 4/21/04

## Brine Dilution Worksheet

Client: City of Buenaventura

Analyst: JR

Sample ID: Santa Clara River Estuary B1

Test Date: 03/17/2004  
*19*  
*04/11*

Test No: 0403-107

Test Type: Bivalve Embryo Dev.

Salinity of Effluent	1.4
Salinity of Brine	85
Target Salinity	30
Test Dilution Volume	150

Salinity Adjustment Factor:	TS - SE	TS = target salinity
	SB - TS	SE = salinity of effluent
		SB = salinity of brine

Salinity Adjustment Factor = 0.52

Concentration %	Effluent Volume (mL)	Salinity Adjustment	Brine Volume (mL)	Dilute to to: (mL)
Control	NA	NA	NA	150
6.25	9.4	0.52	4.9	150
12.5	18.8	0.52	9.8	150
25	37.5	0.52	19.5	150
50	75	0.52	39	150
66	99	0.52	51	150

**DI Volume**

Brine Control	94	0.55	51	150
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total brine      175.8

Brine Control Salinity Adjustment Factor

Brine Control Calculation:

*QC: MLC 4/28/04*

TS - 0
SB - TS

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Physical and Chemical  
 Measurements of Test Solutions  
 Salt Water Bioassays

Client: Buencventura B-3  
 Contact: NA  
 Test No.: 0403-108

Analyst: JR  
 Test Start: 3/19/04  
 Test End: 3/21/04  
 Date Collected: 3/19/04

Sample ID or Conc.	DO (mg/L)			pH (pH units)			Salinity (ppt)			Temp °C		
	0	24	48	0	24	48	0	24	48	0	24	48
LC	8.5	9.1	8.0	8.08	8.06	8.03	30	29.8	29.9	14.8	14.7	14.9
BC	7.8	9.1	8.1	8.08	8.01	8.04	30	29.9	30.0	14.8	14.7	14.9
6.25	8.1	9.1	7.9	8.08	8.03	8.01	30	30.2	30.3	14.8	14.6	14.9
12.5	8.2	9.0	7.9	8.10	8.06	8.04	30	29.4	29.5	14.8	14.5	15.1
25	8.2	9.0	8.1	8.12	8.11	8.14	30	30.2	30.3	14.8	14.5	15.1
50	8.1	9.0	8.0	8.17	8.19	8.17	30	29.7	29.9	14.8	14.5	15.1
66 75 JK	8.2	9.0	8.1	8.18	8.24	8.28	30	30.3	30.4	14.8	14.6	15.0

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

QA Check: MP 4/21/04

## Brine Dilution Worksheet

Client: City of Buenaventura

Analyst: JR

Sample ID: Santa Clara River Estuary B3

Test Date: 03/17/2004  
*19*  
~~2/14~~

Test No: 0403-108

Test Type: Bivalve Embryo Dev.

Salinity of Effluent	12.1
Salinity of Brine	85
Target Salinity	30
Test Dilution Volume	150

Salinity Adjustment Factor:  $\frac{TS - SE}{SB - TS}$

TS = target salinity  
SE = salinity of effluent  
SB = salinity of brine

Salinity Adjustment Factor = 0.33

Concentration %	Effluent Volume (mL)	Salinity Adjustment	Brine Volume (mL)	Dilute to (mL)
Control	NA	NA	NA	150
6.25	12.5 <i>9.4</i>	0.33	4.1	150
12.5	18.8	0.33	6.1	150
25	37.5	0.33	12.2	150
50	75	0.33	24	150
75	113	0.33	37	150

**DI Volume**

Brine Control	68	0.55	37	150
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total brine      120.4

**Brine Control Salinity Adjustment Factor**

Brine Control Calculation:

*GL me 4/28/09*

$$\frac{TS - 0}{SB - TS}$$

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San Diego, CA 92121

AMEC Earth & Environmental  
 Bioassay Laboratory  
 5550 Morehouse Dr. Suite B  
 San Diego, CA 92121

Physical and Chemical  
 Measurements of Test Solutions  
 Salt Water Bioassays

Client: Buena Ventura C-3  
 Contact: NA  
 Test No.: 0403-109

Analyst: JR  
 Test Start: 3/19/04  
 Test End: 3/21/04  
 Date Collected: 3/19/04

Sample ID or Conc. %	DO (mg/L)			pH (pH units)			Salinity (ppt)			Temp °C		
	0	24	48	0	24	48	0	24	48	0	24	48
LC	8.2			8.06			30			14.8		
BC	7.8	9.0		8.08	8.09	8.14	30	29.3		14.8	14.7	
6.25	8.2	9.1	7.9	8.03	8.06	8.17	30	29.7	29.8	14.8	14.5	14.9
12.5	8.2	9.1	7.9	8.01	8.08	8.20	30	30.0	30.1	14.8	14.5	14.9
25	8.2	9.1	8.0	7.96	8.13	8.22	30	30.0	30.1	14.8	14.5	14.8
50	8.1	9.1	8.1	7.90	8.19	8.27	30	30.1	30.1	14.8	14.5	14.8
75 66 JK	8.0	9.0	8.1	7.89	8.21	8.29	30	30.0	30.0	14.8	14.5	14.6

Comments: shale controls with B-3

QA Check: MC 4/21/04

## Brine Dilution Worksheet

Client: City of Buenaventura

Analyst: JR

Sample ID: Santa Clara River Estuary C3

Test Date: 03/17/2004  
*19*  
*2004*

Test No: 0A03-109

Test Type: Bivalve Embryo Dev.

Salinity of Effluent	1.7
Salinity of Brine	85
Target Salinity	30
Test Dilution Volume	150

Salinity Adjustment Factor:	$\frac{TS - SE}{SB - TS}$	TS = target salinity SE = salinity of effluent SB = salinity of brine
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Salinity Adjustment Factor = 0.51

Concentration %	Effluent Volume (mL.)	Salinity Adjustment	Brine Volume (mL.)	Dilute to (mL.)
Control	NA	NA	NA	150
6.25	9.4	0.51	4.8	150
12.5	18.8	0.51	9.6	150
25	37.5	0.51	19.3	150
50	75	0.51	39	150
66	99	0.51	51	150

**DI Volume**

Brine Control	93	0.55	51	150
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total brine      174.3

Brine Control Salinity Adjustment Factor

Brine Control Calculation:  $\frac{TS - 0}{SB - TS}$

*QC: MC 4/28/04*

AMEC Earth and Environmental, Inc.  
 San Diego Bioassay Laboratory  
 5550 Morehouse Drive, Suite B  
 San Diego, CA 92121

*A. AFFINIS*



AMEC Earth & Environmental  
 Bioassay Laboratory  
 5550 Morehouse Dr., Suite B  
 San Diego, CA 92121

Raw Datasheet  
 Water Quality Measurements  
 Marine Chronic Bioassay

Client: City of Buena Ventura Test Species: A. affinis  
 Sample ID: SCORE A-2 Test Date: 3/17/04  
 Test No: 0403-094 Start/End Times: 1500 | 1500

Concentration	Lab Control #1							
Day	0	1	2	3	4	5	6	7
	initial							
pH	8.00	7.95	7.94	7.94	8.01	8.01	8.03	
DO (mg/L)	8.1	7.8	8.8	8.2	8.2	8.7	8.00	
Salinity (ppt)	29.6	29.9	29.8	29.9	30.0	29.9	29.2	
Temp (°C)	19.6	20.0	19.7	19.9	20.9	19.5	20.4	19.0
	Final							
pH		7.33	7.74	7.75	7.82	7.81	7.66	7.79
DO (mg/L)		7.2	6.9	6.8	6.3	6.3	6.2	6.1
Temp (°C)		20.4	20.3	20.2	20.3	20.4	20.6	20.3

Concentration	Salt Control #1							
Day	0	1	2	3	4	5	6	7
	initial							
pH	8.65	8.61	8.62	8.59	8.53	8.57	8.51	
DO (mg/L)	7.1	7.5	7.4	7.6	6.4	7.4	5.85	
Salinity (ppt)	29.9	30.0	29.9	29.9	30.0	29.9	30.1	
Temp (°C)	20.9	20.1	19.9	19.9	20.4	19.5	19.9	
	Final							
pH		8.37	8.28	8.29	8.20	8.24	8.11	8.26
DO (mg/L)		6.7	6.3	6.5	6.1	6.3	5.6	5.7
Temp (°C)		20.4	20.4	20.5	20.4	20.6	20.6	20.4

Concentration	10.25%							
Day	0	1	2	3	4	5	6	7
	initial							
pH	8.41	8.44	8.61	8.59	8.56	8.54	8.47	
DO (mg/L)	7.1	7.5	7.3	7.6	7.7	7.2	6.9	
Salinity (ppt)	30.1	30.0	29.8	29.9	29.8	30.0	29.7	
Temp (°C)	20.7	20.1	20.8	20.0	20.6	20.4	19.9	
	Final							
pH		8.23	8.26	8.27	8.23	8.24	8.16	8.14
DO (mg/L)		6.6	6.5	6.5	6.5	6.5	5.9	5.8
Temp (°C)		20.5	20.4	20.5	20.4	20.3	20.6	20.4

Concentration	12.5%							
Day	0	1	2	3	4	5	6	7
	initial							
pH	8.43	8.45	8.58	8.56	8.55	8.54	8.45	
DO (mg/L)	7.1	7.4	7.5	7.7	7.2	7.4	6.9	
Salinity (ppt)	30.1	30.0	29.7	29.8	29.8	30.0	29.7	
Temp (°C)	20.7	20.1	20.7	20.1	20.5	20.5	20.0	
	Final							
pH		8.23	8.27	8.27	8.23	8.27	8.16	8.12
DO (mg/L)		6.7	6.6	6.5	6.3	6.1	5.9	5.6
Temp (°C)		20.5	20.4	20.5	20.4	20.3	20.6	20.5

Analysts:	Initial:	0	1	2	3	4	5	6	7
		AW	RG	ME	ME	AH	RG	AW	
	Final:		SH	MC	SH	AH	AH	AW	mc

Comments:

Animal Source/Date Received:

ABS / 3/13/04

Animal Age at Initiation:

14 days old

QC Check:

MC 4/13/04

Final Review:

AW 5/24/04

AMEC Earth & Environmental  
 Bioassay Laboratory  
 5550 Morehouse Dr. Suite B  
 San Diego, CA 92121

Raw Data Sheet  
 Initial and Final Chemistries  
 Seven Day Chronic Bioassay

Test Species: A. affinis

Client: City of Buenaventura

Test Date/Time: 3/17/04

Sample ID: SCRF A2

Test No: 0403-094

Concentration	25%							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.43	8.38	8.53	8.51	8.51	8.50	8.42	
DO (mg/L)	7.3	7.1	7.6	7.8	7.8	7.5	7.0	
Salinity (ppt)	30.1	30.0	29.7	29.7	29.8	30.0	29.9	
Temp (°C)	20.7	20.0	20.6	20.1	20.5	20.5	19.9	
Final								
pH		8.24	8.26	8.26	8.23	8.28	8.19	8.19
DO (mg/L)		6.8	6.5	6.4	6.2	6.1	6.0	5.8
Temp (°C)		20.5	20.4	20.5	20.4	20.3	20.6	20.5

Concentration	50%							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.43	8.30	8.44	8.41	8.42	8.42	8.35	
DO (mg/L)	7.6	7.5	7.9	8.1	7.8	7.9	7.4	
Salinity (ppt)	30.1	30.1	29.6	29.8	29.7	30.0	29.8	
Temp (°C)	20.9	20.0	20.3	20.1	20.5	20.5	19.9	
Final								
pH		8.27	8.24	8.26	8.26	8.29	8.19	8.21
DO (mg/L)		6.7	6.5	6.5	6.2	6.2	5.7	5.8
Temp (°C)		20.5	20.4	20.5	20.4	20.3	20.6	20.6

Concentration	100%							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.26	8.17	8.36	8.28	8.30	8.30	8.25	
DO (mg/L)	8.2	7.7	9.3	8.9	8.9	8.7	8.2	
Salinity (ppt)	30.3	30.3	29.6	29.7	29.7	30.1	29.7	
Temp (°C)	21.0	20.1	20.0	20.2	20.5	20.3	19.9	
Final								
pH		8.24	8.21	8.22	8.27	8.27	8.22	8.27
DO (mg/L)		6.7	6.4	6.3	6.1	6.0	5.6	5.8
Temp (°C)		20.5	20.4	20.5	20.4	20.3	20.6	20.6

Comments: \_\_\_\_\_

Analysts: AH, SH, MC, AW, RB

Animal Source: ABS

Date Received: 3/13/04

QA Check: MC 4/13/04

Final Review: [Signature] 5/21/04

AMEC Earth & Environmental  
 Bioassay Laboratory  
 5550 Morehouse Dr., Suite B  
 San Diego, CA 92121

Raw Datasheet  
 Water Quality Measurements  
 Marine Chronic Bioassay

Client: City of Buena Ventura  
 Sample ID: SCRE B-1  
 Test No: 0403-095

Test Species: A. affinis  
 Test Date: 3/17/04  
 Start/End Times: 1500 | 1500

Concentration	Lab Control #1							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.00	7.95	7.97	7.94	8.01	8.01	<del>8.05</del>	8.05
DO (mg/L)	8.1	7.8	<del>8.8</del>	8.2	8.2	8.7	<del>20.0</del>	8.00
Salinity (ppt)	29.6	29.9	29.8	29.9	30.0	29.9	<del>29.9</del>	29.2
Temp (°C)	19.4	20.0	20.0	20.0	20.9	19.5	<del>19.8</del>	19.0
Final								
pH		7.83	7.74	7.75	7.82	7.81	7.66	7.79
DO (mg/L)		7.2	6.9	6.8	6.3	6.3	6.2	6.1
Temp (°C)		20.4	20.3	20.2	20.3	20.4	20.6	20.3

Concentration	Salt Control #1							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.65	8.61	8.62	8.59	8.53	8.59	<del>8.40</del>	8.51
DO (mg/L)	7.1	7.5	7.4	7.6	6.9	7.4	<del>20.0</del>	5.85
Salinity (ppt)	29.9	30.0	29.9	29.9	30.0	29.9	<del>29.9</del>	30.1
Temp (°C)	20.9	20.1	19.9	20.0	20.4	19.5	<del>19.8</del>	20.0
Final								
pH		8.37	8.28	8.29	8.20	8.27	8.11	8.26
DO (mg/L)		6.4	6.3	6.5	6.1	6.3	5.6	5.7
Temp (°C)		20.4	20.4	20.5	20.4	20.3	20.6	20.4

Concentration	6.25%							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.62	8.29	8.61	8.56	8.55	8.57	<del>8.40</del>	8.51
DO (mg/L)	7.1	6.7	7.4	7.5	7.1	7.4	<del>20.0</del>	7.0
Salinity (ppt)	30.1	29.9	29.7	29.8	29.9	30.0	<del>29.9</del>	29.9
Temp (°C)	20.9	20.1	20.8	20.1	20.6	20.4	<del>19.8</del>	20.0
Final								
pH		8.36	8.28	8.25	8.20	8.25	8.11	8.14
DO (mg/L)		6.7	6.6	6.6	6.2	6.3	5.8	6.6
Temp (°C)		20.5	20.5	20.5	20.4	20.4	20.6	20.6

Concentration	12.5%							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.58	8.25	8.58	8.48	8.54	8.56	<del>8.40</del>	8.44
DO (mg/L)	7.2	7.1	7.4	7.6	7.1	7.5	<del>20.0</del>	7.0
Salinity (ppt)	30.1	30.0	29.8	29.8	29.9	30.0	<del>29.9</del>	29.9
Temp (°C)	20.9	20.1	20.8	20.2	20.6	20.3	<del>19.4</del>	20.0
Final								
pH		8.35	8.28	8.27	8.22	8.25	8.15	8.14
DO (mg/L)		6.7	6.5	6.6	6.3	6.7	5.8	6.6
Temp (°C)		20.4	20.5	20.5	20.4	20.3	20.6	20.6

Analysts:	Initial:	0	1	2	3	4	5	6	7
		AW	RG	MC	MC	AH	RG	AW	
	Final:		SH	MC	SH	AH	AH	AW	MC

Comments:

Animal Source/Date Received:

ABS / 3-17-04  
 AH

Animal Age at Initiation: 14 days

QC Check: ME 4/13/04

Final Review: 2/11 5/24/04

AMEC Earth & Environmental  
 Bioassay Laboratory  
 5550 Morehouse Dr. Suite B  
 San Diego, CA 92121

Raw Data Sheet  
 Initial and Final Chemistries  
 Seven Day Chronic Bioassay

Test Species: A. affinis

Client: City of Buena Ventura

Test Date/Time: 3/17/04

Sample ID: SCRE B-1

Test No: 0403-095

Concentration	25%							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.52	8.25	8.61	8.39	8.48	8.49	8.39	
DO (mg/L)	7.3	7.2	7.6	7.7	7.3	7.7	7.3	
Salinity (ppt)	30.2	30.1	29.7	29.8	29.8	30.0	29.9	
Temp (°C)	20.9	20.1	20.6	20.3	20.6	20.5	19.2	
Final								
pH		8.33	8.26	8.23	8.23	8.27	8.19	8.17
DO (mg/L)		6.7	6.3	6.6	6.2	6.5	5.7	5.7
Temp (°C)		20.4	20.5	20.5	20.4	20.3	20.6	20.6

Concentration	50%							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.41	8.18	8.42	8.32	8.38	8.44	8.40	
DO (mg/L)	7.7	7.4	8.1	7.9	7.9	7.9	7.3	
Salinity (ppt)	30.4	30.2	29.6	29.7	29.8	30.0	29.9	
Temp (°C)	20.8	20.2	20.6	20.3	20.6	20.4	19.3	
Final								
pH		8.28	8.23	8.23	8.24	8.25	8.17	8.21
DO (mg/L)		6.7	6.3	6.2	6.2	6.3	5.8	5.8
Temp (°C)		20.4	20.5	20.5	20.3	20.3	20.6	20.6

Concentration	100%							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.23	8.05	8.23	8.24	8.23	8.32	8.31	
DO (mg/L)	8.4	8.1	8.9	8.3	9.3	8.1	8.0	
Salinity (ppt)	30.7	30.6	29.6	29.6	29.8	30.1	30.0	
Temp (°C)	21.0	19.9	20.3	20.3	20.6	20.3	19.0	
Final								
pH		8.23	8.28	8.20	8.27	8.24	8.22	8.27
DO (mg/L)		6.7	6.4	6.3	6.1	5.9	5.6	5.9
Temp (°C)		20.4	20.5	20.5	20.3	20.3	20.6	20.6

Comments: \_\_\_\_\_  
 Animal Source: ABS  
 QA Check: no 4/13/04

Analysts: AH, SH, MC, AW, 24  
 Date Received: 3/13/04  
 Final Review: AH 5/24/04

Client: City of Buena Ventura  
 Sample ID: SCRE B-3  
 Test No: 0403-0960

Test Species: A. affinis  
 Test Date: 3/17/04  
 Start/End Times: 1500 1150C

Concentration	Lab Control #2							
Day	0	1	2	3	4	5	6	7
	Initial							
pH	8.00	7.95	8.00	7.95	8.01			
DO (mg/L)	8.1	7.9	8.5	8.3	8.2			
Salinity (ppt)	29.6	29.9	29.8	29.9	30.0			
Temp (°C)	19.4	20.1	19.6	20.6	20.9			
	Final							
pH		7.87	7.84	7.88	7.82			
DO (mg/L)		7.2	7.0	7.0	6.3			
Temp (°C)		20.1	20.4	20.3	20.7			

Concentration	Salt Control #2							
Day	0	1	2	3	4	5	6	7
	Initial							
pH	8.65	8.61	8.65	8.62	8.53	8.59	8.51	
DO (mg/L)	7.0	7.5	7.3	7.5	6.4	7.4	5.9	
Salinity (ppt)	30.1	30.0	29.8	29.9	30.0	29.9	30.0	
Temp (°C)	20.7	20.1	20.9	20.0	20.4	19.5	20.0	
	Final							
pH		8.36	8.26	8.27	8.25	8.14	8.11	8.30
DO (mg/L)		6.5	6.2	6.4	6.4	6.3	5.6	5.7
Temp (°C)		20.2	20.4	20.3	20.1	20.1	20.5	20.4

Concentration	6.25%							
Day	0	1	2	3	4	5	6	7
	Initial							
pH	8.55	8.51	8.62	8.58	8.56	8.59	8.49	
DO (mg/L)	7.1	7.3	7.4	7.5	7.2	7.2	6.9	
Salinity (ppt)	30.3	30.0	29.7	29.8	29.8	30.0	30.0	
Temp (°C)	20.9	20.1	20.8	20.0	20.7	20.6	19.9	
	Final							
pH		8.31	8.28	8.31	8.24	8.20	8.14	8.15
DO (mg/L)		6.7	6.4	6.4	6.5	6.4	5.8	6.1
Temp (°C)		20.2	20.4	20.4	20.1	20.1	20.5	20.5

Concentration	12.5%							
Day	0	1	2	3	4	5	6	7
	Initial							
pH	8.47	8.51	8.61	8.50	8.56	8.58	8.48	
DO (mg/L)	7.1	7.4	7.4	7.5	7.2	7.3	6.9	
Salinity (ppt)	30.4	30.0	29.8	29.8	29.6	30.0	30.0	
Temp (°C)	20.7	20.1	20.7	20.0	20.8	20.6	19.8	
	Final							
pH		8.27	8.28	8.31	8.25	8.27	8.21	8.18
DO (mg/L)		6.7	6.3	6.2	6.3	6.2	5.4	6.0
Temp (°C)		20.3	20.4	20.4	20.1	20.2	20.5	20.5

Analysts:	Initial:	0	1	2	3	4	5	6	7
		AW	RG	mc	mc	AH	PG	AW	
	Final:		SH	mc	SH	AH	AH	AW	mc

Comments:

Animal Source/Date Received: ABS/ 3-13-04

Animal Age at Initiation: 14 days old

QC Check: re 4/13/04

Final Review: SH 5/24/04

AMEC Earth & Environmental  
 Bioassay Laboratory  
 5550 Morehouse Dr. Suite B  
 San Diego, CA 92121

Raw Data Sheet  
 Initial and Final Chemistries  
 Seven Day Chronic Bioassay

Test Species: A. affinis

Client: City of Buena Ventura

Test Date/Time: 3/17/04

Sample ID: SCRE B-3

Test No: 0403-096

Concentration	25%							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.44	8.49	8.58	8.47	8.51	8.55	8.48	
DO (mg/L)	7.3	7.4	7.5	7.6	7.4	7.4	7.1	
Salinity (ppt)	30.5	30.0	29.8	29.8	29.8	30.1	29.9	
Temp (°C)	20.8	20.1	20.6	20.0	20.6	20.7	19.7	
Final								
pH		8.27	8.32	8.32	8.28	8.26	8.21	8.21
DO (mg/L)		6.7	6.3	6.2	6.1	6.3	5.6	5.7
Temp (°C)		20.2	20.4	20.4	20.2	20.2	20.5	20.5

Concentration	50%							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.44	8.45	8.53	8.48	8.48	8.52	8.46	
DO (mg/L)	7.6	7.7	7.8	7.7	7.7	7.6	7.5	
Salinity (ppt)	30.6	30.1	29.8	29.8	29.7	30.2	30.1	
Temp (°C)	20.9	20.1	20.3	20.0	20.6	20.7	19.6	
Final								
pH		8.30	8.31	8.31	8.29	8.28	8.25	8.22
DO (mg/L)		6.7	6.6	6.3	6.3	6.3	5.5	5.9
Temp (°C)		20.3	20.4	20.4	20.2	20.2	20.4	20.5

Concentration	100%							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.45	8.37	8.45	8.48	8.40	8.49	8.43	
DO (mg/L)	8.4	8.1	8.8	8.6	8.8	8.4	8.1	
Salinity (ppt)	30.8	30.4	30.0	29.9	29.6	30.2	30.3	
Temp (°C)	21.0	20.0	20.0	20.0	20.9	20.7	19.5	
Final								
pH		8.33	8.31	8.30	8.32	8.31	8.26	8.26
DO (mg/L)		6.7	6.6	6.4	6.2	6.3	5.9	6.0
Temp (°C)		20.4	20.4	20.4	20.2	20.2	20.5	20.5

Comments: \_\_\_\_\_

Analysts: AM, MC, SH, RG, AW

Animal Source: ABS

Date Received: 3/13/04

QA Check: LC 4/13/04

Final Review: [Signature] 3/24/04

Client: City of Buena Ventura  
 Sample ID: SCRE C-3  
 Test No: 0403-097

Test Species: A. affinis  
 Test Date: 3/17/04  
 Start/End Times: 1500 / 1500

Concentration	Lab Control #2							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.00	7.95	8.00	7.95	8.01			
DO (mg/L)	8.1	7.8	8.5	8.3	8.2			
Salinity (ppt)	29.6	29.9	29.8	29.9	30.0			
Temp (°C)	19.4	20.1	19.6	19.9	20.9			
Final								
pH		7.87	7.84	7.88	7.82			
DO (mg/L)		7.2	7.0	7.0	6.3			
Temp (°C)		20.1	20.4	20.3	20.3			

Concentration	Salt Control #2							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.05	8.61	8.65	8.62	8.53	8.59	8.51	
DO (mg/L)	1.0	7.5	7.3	7.5	6.4	7.4	5.9	
Salinity (ppt)	30.1	30.0	29.8	29.9	30.0	29.9	30.0	
Temp (°C)	20.7	20.1	20.9	20.0	20.4	19.5	20.0	
Final								
pH		8.36	8.26	8.27	8.23	8.14	8.11	8.30
DO (mg/L)		6.5	6.2	6.4	6.4	6.3	5.6	5.7
Temp (°C)		20.2	20.4	20.3	20.1	20.1	20.5	20.4

Concentration	6.25%							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.60	8.51	8.58	8.55	8.54	8.57	8.46	
DO (mg/L)	7.2	7.5	7.4	7.5	7.2	7.3	7.0	
Salinity (ppt)	30.1	30.0	29.3	29.8	29.9	30.0	30.0	
Temp (°C)	20.7	20.1	20.7	20.0	20.6	20.6	19.5	
Final								
pH		8.33	8.28	8.30	8.21	8.28	8.18	8.16
DO (mg/L)		6.5	6.2	6.0	6.0	6.0	5.5	5.9
Temp (°C)		20.3	20.5	20.4	20.3	20.8	20.6	20.6

Concentration	12.5%							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.50	8.47	8.55	8.50	8.50	8.51	8.43	
DO (mg/L)	7.4	7.3	7.4	7.5	7.2	7.4	7.1	
Salinity (ppt)	30.1	30.0	29.8	29.8	29.9	30.0	30.0	
Temp (°C)	20.6	20.1	20.8	20.0	20.6	20.5	19.1	
Final								
pH		8.32	8.28	8.30	8.28	8.27	8.18	8.20
DO (mg/L)		6.4	6.2	6.5	6.3	6.2	5.7	6.1
Temp (°C)		20.3	20.4	20.4	20.2	20.2	20.5	20.6

Analysts:	Initial:	0	1	2	3	4	5	6	7
		AW	RG	mc	mc	AH	RG	AW	
	Final:		SH	mc	SH	AH	AH	AW	mc

Comments:

Animal Source/Date Received:

ABS / 3-13-04

Animal Age at Initiation: 14 days old

QC Check: mc 4/13/04

Final Review: AH 5/24/04

AMEC Earth & Environmental  
 Bioassay Laboratory  
 5550 Morehouse Dr. Suite B  
 San Diego, CA 92121

Raw Data Sheet  
 Initial and Final Chemistries  
 Seven Day Chronic Bioassay

Test Species: A. affinis

Client: City of Buenaventura

Test Date/Time: 3/17/04

Sample ID: SCORE C-3

Test No: 0403-097

Concentration	25%							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.47	8.38	8.47	8.43	8.41	8.45	8.38	
DO (mg/L)	7.7	7.3	7.5	7.6	7.3	7.6	7.4	
Salinity (ppt)	30.2	30.0	29.9	29.8	30.0	30.1	30.0	
Temp (°C)	20.5	20.1	20.8	20.0	20.6	20.5	1	
Final								
pH		8.31	8.27	8.29	8.30	8.27	8.21	8.23
DO (mg/L)		6.2	6.1	6.3	6.1	6.2	5.7	6.1
Temp (°C)		20.4	20.4	20.3	20.1	20.2	20.5	20.6

Concentration	50%							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.34	8.27	8.35	8.37	8.29	8.36	8.31	
DO (mg/L)	8.4	7.5	7.9	7.9	7.7	7.8	8.0	
Salinity (ppt)	30.4	30.0	29.9	29.9	30.1	30.2	30.1	
Temp (°C)	20.2	20.1	20.8	20.0	20.7	20.5		
Final								
pH		8.27	8.25	8.29	8.31	8.27	8.22	8.28
DO (mg/L)		6.3	6.1	6.1	6.2	6.2	5.3	6.1
Temp (°C)		20.4	20.4	20.3	20.1	20.2	20.4	20.5

Concentration	100%							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.16	8.14	8.19	8.22	8.13	8.20	8.21	
DO (mg/L)	9.5	8.1	8.9	8.3	8.7	8.7	9.4	
Salinity (ppt)	30.4	30.1	30.1	30.0	30.3	30.3	30.3	
Temp (°C)	20.2	20.1	20.8	20.0	20.7	20.3		
Final								
pH		8.02	8.06	8.01	8.06	8.05	7.99	8.08
DO (mg/L)		6.4	6.0	6.0	5.8	5.9	5.0	6.0
Temp (°C)		20.4	20.4	20.4	20.1	20.2	20.4	20.6

Comments: \_\_\_\_\_  
 Animal Source: ABS  
 QA Check: MC 4/13/04

Analysts: AH, SH, MC, RG, AW  
 Date Received: 3/17/04  
 Final Review: CAH 5/24/04



*A. BAHIA*

Marine Chronic Bioassay

Water Quality Measurements

Client: City of Buenaventura Test Species: M. bahia  
 Sample ID: SCRE A-2 Test Date: 3/17/04  
 Test No: 0403-098 Start/End Times: 1530 / 1430

Concentration	Lab Control #1							
Day	0	1	2	3	4	5	6	7
Initial:								
pH	8.00	7.95	7.97	7.94	8.01	8.01	8.03	
DO (mg/L)	8.1	7.8	8.8	8.2	8.2	8.7	8.0	
Salinity (ppt)	29.6	29.9	29.8	29.9	30.0	29.9	29.2	
Temp (°C)	25.0	24.7	24.5	24.5	24.3	25.1	24.5	
Final:								
pH		7.91	7.89	7.81	7.81	7.84	7.80	8.01
DO (mg/L)		6.0	6.0	6.2	5.8	5.5	6.6	5.6
Temp (°C)		24.7	24.6	24.2	24.2	24.3	24.2	24.6

Concentration	Salt Control #1							
Day	0	1	2	3	4	5	6	7
Initial:								
pH	8.65	8.61	8.62	8.59	8.53	8.59	8.51	
DO (mg/L)	7.1	7.5	7.4	7.6	6.4	7.4	5.9	
Salinity (ppt)	29.9	30.0	29.9	29.9	30.0	29.9	30.1	
Temp (°C)	25.1	24.9	25.0	25.1	24.4	24.5	24.5	
Final:								
pH		8.35	8.23	8.21	8.14	8.24	8.16	8.30
DO (mg/L)		5.7	5.6	6.2	5.8	5.6	6.7	5.4
Temp (°C)		24.9	24.9	24.3	24.2	24.3	24.3	24.9

Concentration	6.25%							
Day	0	1	2	3	4	5	6	7
Initial:								
pH	8.40	8.44	8.61	8.59	8.56	8.54	8.47	
DO (mg/L)	7.0	7.5	7.3	7.6	7.2	7.2	6.9	
Salinity (ppt)	30.1	30.0	29.8	29.9	29.8	30.0	29.9	
Temp (°C)	25.1	24.9	25.0	25.1	24.3	24.6	24.5	
Final:								
pH		8.32	8.26	8.22	8.21	8.33	8.19	8.25
DO (mg/L)		5.5	5.9	6.0	5.8	5.9	6.9	5.7
Temp (°C)		25.2	24.7	24.3	24.3	24.3	24.3	24.6

Concentration	12.5%							
Day	0	1	2	3	4	5	6	7
Initial:								
pH	8.44	8.45	8.58	8.56	8.55	8.54	8.45	
DO (mg/L)	7.3	7.4	7.5	7.7	7.2	7.4	6.9	
Salinity (ppt)	30.0	30.6	29.7	29.8	29.8	30.0	29.9	
Temp (°C)	25.1	24.8	25.0	25.1	24.3	24.7	24.5	
Final:								
pH		8.31	8.24	8.20	8.21	8.34	8.23	8.27
DO (mg/L)		5.5	5.5	6.1	5.8	5.9	7.0	5.6
Temp (°C)		25.1	24.8	24.2	24.3	24.3	24.3	24.7

Analysts:	Initial:	0	1	2	3	4	5	6	7
		KG	EG	MC	ME	AH	KG	AW/AH	
	Final:		SH	ME	SH	AH	AH	AW	me

Comments:

Animal Source/Date Received: ABS/3-16-04

Animal Age at Initiation: 7 days old

QC Check: me 4/13/04

Final Review: AW/AH 9/24/04

Marine Chronic Bioassay

Water Quality Measurements

Client: City of Buena Ventura Test Species: M. bahia  
 Sample ID: SCRE A-2 Test Date: 3/17/04  
 Test No: 0403-098 Start/End Times: 1530/1430

Concentration	25%							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.44	8.38	8.53	8.51	8.51	8.50	8.42	
DO (mg/L)	7.4	7.4	7.6	7.8	7.3	7.5	7.0	
Salinity (ppt)	30.1	30.0	29.7	29.7	29.8	30.0	29.9	
Temp (°C)	24.7	24.8	25.0	25.1	24.3	24.4	24.5	
Final								
pH		8.31	8.24	8.21	8.23	8.35	8.26	8.27
DO (mg/L)		5.3	5.0	5.7	5.6	5.7	6.3	5.4
Temp (°C)		25.4	25.1	24.2	24.3	24.3	24.4	24.9

Concentration	50%							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.41	8.30	8.44	8.41	8.42	8.42	8.35	
DO (mg/L)	7.2	7.5	7.9	8.1	7.8	7.9	7.4	
Salinity (ppt)	30.1	30.1	29.6	29.8	29.7	30.0	29.8	
Temp (°C)	24.8	24.7	25.0	25.1	24.3	24.5	24.5	
Final								
pH		8.28	8.28	8.23	8.27	8.36	8.29	8.32
DO (mg/L)		5.3	5.9	5.9	5.7	5.8	6.9	5.2
Temp (°C)		25.3	25.0	24.2	24.2	24.2	24.3	25.0

Concentration	100%							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.25	8.17	8.30	8.28	8.30	8.30	8.25	
DO (mg/L)	7.3	7.7	9.3	8.9	8.9	8.7	8.2	
Salinity (ppt)	30.3	30.3	29.6	29.7	29.7	30.1	29.7	
Temp (°C)	24.9	24.9	25.0	25.0	24.3	24.5	24.5	
Final								
pH		8.24	8.27	8.23	8.33	8.35	8.32	8.35
DO (mg/L)		5.4	5.8	5.8	5.4	5.7	6.8	5.2
Temp (°C)		25.4	24.7	24.2	24.1	24.3	24.3	25.0

Analysts:		0	1	2	3	4	5	6	7
Initial:		RG	RG	MC	MC	AH	RG	AH/AH	
Final:			SH	MC	SH	AH	AH	AH	MC

Comments: \_\_\_\_\_  
 Animal Source/Date Received: ABS / 3-16-04 Animal Age at Initiation: 7 days old  
 QC Check: MC 4/13/04 Final Review: CH 2/24/04

Client: City of Belenaventura Test Species: M. bahia  
 Sample ID: SCRE B-1 Test Date: 3/17/04  
 Test No: 0403-099 Start/End Times: 1530/1436

Concentration	Lab Control #1							
Day	0	1	2	3	4	5	6	7
Initial:								
pH	8.00	7.95	7.97	7.94	8.01	8.01	8.03	
DO (mg/L)	8.1	7.8	8.8	8.2	8.2	8.7	8.0	
Salinity (ppt)	29.6	29.9	29.8	29.9	30.0	29.9	29.7	
Temp (°C)	25.0	25.1	24.5	24.5	24.3	24.5	24.5	
Final:								
pH		7.91	7.89	7.81	7.81	7.84	7.80	8.01
DO (mg/L)		6.0	6.0	6.2	5.8	5.5	6.6	5.0
Temp (°C)		24.7	24.6	24.2	24.2	24.3	24.7	24.6

Concentration	Salt Control #1							
Day	0	1	2	3	4	5	6	7
Initial:								
pH	8.45	8.61	8.62	8.59	8.53	8.59	8.51	
DO (mg/L)	7.1	7.5	7.4	7.6	6.4	7.4	5.9	
Salinity (ppt)	29.9	30.0	29.9	29.9	30.0	29.9	30.1	
Temp (°C)	25.1	24.9	25.0	25.1	24.4	24.5	24.5	
Final:								
pH		8.35	8.28	8.21	8.14	8.24	8.16	8.30
DO (mg/L)		5.7	5.6	6.2	5.8	5.6	6.7	5.4
Temp (°C)		24.9	24.9	24.3	24.2	24.3	24.3	24.9

Concentration	6.25%							
Day	0	1	2	3	4	5	6	7
Initial:								
pH	8.58	8.29	8.61	8.50	8.55	8.57	8.48	
DO (mg/L)	7.1	6.7	7.4	7.5	7.1	7.7	7.0	
Salinity (ppt)	30.1	29.9	29.7	29.8	29.9	30.0	29.9	
Temp (°C)	24.3	24.9	25.0	25.0	24.4	25.4	24.5	
Final:								
pH		8.32	8.23	8.20	8.17	8.31	8.21	8.35
DO (mg/L)		5.3	5.4	6.1	5.5	5.9	6.8	5.7
Temp (°C)		25.3	25.1	24.2	24.2	24.4	24.3	24.7

Concentration	12.5%							
Day	0	1	2	3	4	5	6	7
Initial:								
pH	8.55	8.25	8.58	8.48	8.54	8.56	8.44	
DO (mg/L)	7.2	7.1	7.4	7.6	7.1	7.5	7.0	
Salinity (ppt)	30.1	30.0	29.8	29.8	29.9	30.0	29.9	
Temp (°C)	24.4	24.9	25.0	25.0	24.4	25.2	24.5	
Final:								
pH		8.31	8.25	8.26	8.19	8.32	8.27	8.27
DO (mg/L)		5.6	5.6	6.2	5.7	5.8	6.8	5.6
Temp (°C)		25.4	25.1	24.3	24.2	24.4	24.2	24.9

Analysts:	Initial:	0	1	2	3	4	5	6	7
		Rg	Rg	MC	MC	AH	Rg	AH/AH	
	Final:		SH	ML	SH	AH	AH	AV	MC

Comments:

Animal Source/Date Received: ABS/3-16-04 Animal Age at Initiation: 7 days old  
 QC Check: no 4/13/04 Final Review: ajh gpl/lot

Marine Chronic Bioassay

Water Quality Measurements

Client: City of Buena Ventura Test Species: A. bahia  
 Sample ID: SCRE B-1 Test Date: 3/17/04  
 Test No: 0403-099 Start/End Times: 1530 | 1430

Concentration	25%							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.51	8.25	8.51	8.39	8.48	8.49	8.39	
DO (mg/L)	7.2	7.2	7.6	7.7	7.3	7.7	7.3	
Salinity (ppt)	30.2	30.1	29.7	29.8	29.8	30.0	29.9	
Temp (°C)	25.1	24.9	25.0	25.0	24.4	25.1	24.5	
Final								
pH		8.30	8.25	8.21	8.21	8.33	8.24	8.30
DO (mg/L)		5.2	4.8	5.9	5.9	5.7	6.7	5.5
Temp (°C)		25.8	26.4	24.3	24.3	24.5	24.3	25.1

Concentration	50%							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.40	8.18	8.42	8.32	8.38	8.44	8.40	
DO (mg/L)	7.4	7.4	8.1	7.9	7.9	7.9	7.3	
Salinity (ppt)	30.1	30.2	29.6	29.7	29.8	30.0	29.9	
Temp (°C)	25.1	24.8	25.0	25.0	24.4	25.0	24.5	
Final								
pH		8.26	8.29	8.22	8.27	8.33	8.29	8.33
DO (mg/L)		5.4	5.7	6.1	5.5	5.8	6.7	5.5
Temp (°C)		25.7	25.4	24.2	24.4	24.5	24.3	25.1

Concentration	100%							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.24	8.05	8.23	8.24	8.23	8.32	8.31	
DO (mg/L)	7.9	8.1	8.9	8.3	9.3	8.1	8.0	
Salinity (ppt)	30.4	30.6	29.6	29.6	29.8	30.1	30.0	
Temp (°C)	25.0	24.7	25.0	25.0	24.4	25.0	24.5	
Final								
pH		8.24	8.27	8.22	8.31	8.32	8.11	8.42
DO (mg/L)		5.6	5.8	5.8	5.3	5.5	6.9	5.5
Temp (°C)		25.5	25.1	24.2	24.4	24.7	24.3	25.0

Analysts:	Initial:	0	1	2	3	4	5	6	7
		Ry	Ry	MC	MC	AH	Ry	AW/AH	
	Final:		SH	MC	SH	AH	AH	AW	MC

Comments:

Animal Source/Date Received: ABS / 3-16-04 Animal Age at Initiation: 7 days old  
 QC Check: no 4/12/04 Final Review: AW 5/24/04

Marine Chronic Bioassay

Water Quality Measurements

Client: City of Buena Ventura Test Species: M. bahia  
 Sample ID: SCRE B-3 Test Date: 3/17/04  
 Test No: 0403-100 Sart/End Times: 1530 | 1300

Concentration	Lab Control # 2							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.00	7.95	8.00	7.95	8.01	8.01		8.03
DO (mg/L)	8.1	7.8	8.5	8.3	8.2	8.7		8.0
Salinity (ppt)	29.4	29.9	29.8	29.9	30.0	29.9		29.2
Temp (°C)	25.0	24.7	25.0	24.6	24.2	25.1		24.5
Final								
pH		7.95	7.87	7.86	7.92	7.99	7.83	8.01
DO (mg/L)		6.0	5.8	6.2	5.7	5.8	6.9	5.8
Temp (°C)		25.2	25.0	24.3	24.2	24.3	24.2	24.5

Concentration	Salt Control # 2							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.65	8.61	8.65	8.62	8.53	8.59	8.51	
DO (mg/L)	7.1	7.5	7.3	7.5	6.4	7.1	5.9	
Salinity (ppt)	29.9	30.0	29.8	29.9	30.0	29.9	30.0	
Temp (°C)	25.1	24.9	25.0	25.0	24.3	24.5	24.5	
Final								
pH		8.32	8.27	8.21	8.15	8.30	8.20	8.29
DO (mg/L)		5.5	5.3	5.9	5.8	5.9	7.0	5.4
Temp (°C)		25.1	24.9	24.3	24.2	24.3	24.2	24.9

Concentration	6.75%							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.55	8.51	8.62	8.50	8.56	8.59	8.49	
DO (mg/L)	7.2	7.3	7.4	7.5	7.2	7.2	6.9	
Salinity (ppt)	30.3	30.0	29.7	29.8	29.8	30.0	30.0	
Temp (°C)	25.1	24.9	25.0	25.0	24.4	24.9	24.5	
Final								
pH		8.32	8.27	8.23	8.16	8.35	8.20	8.24
DO (mg/L)		5.6	6.0	6.3	5.5	5.7	6.8	5.7
Temp (°C)		25.2	24.4	24.2	24.1	24.5	24.3	24.6

Concentration	12.5%							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.49	8.51	8.61	8.50	8.56	8.56	8.48	
DO (mg/L)	7.2	7.4	7.4	7.5	7.2	7.3	6.9	
Salinity (ppt)	30.4	30.0	29.8	29.8	29.8	30.0	30.0	
Temp (°C)	24.9	24.7	25.0	25.0	24.4	24.9	24.5	
Final								
pH		8.34	8.30	8.22	8.20	8.37	8.20	8.27
DO (mg/L)		5.7	6.0	6.3	5.7	5.9	6.9	5.7
Temp (°C)		25.1	25.0	24.2	24.1	24.4	24.6	24.9

Analysts:	Initial:	0	1	2	3	4	5	6	7
		RH	RG	MC	ML	AH	Rg	AH/AW	
	Final:		SH	ME	SH	AH	AH	AW	mc

Comments: \_\_\_\_\_  
 Animal Source/Date Received: ABS/3-16-04 Animal Age at Initiation: 7 days old  
 QC Check: JE 4/13/04 Final Review: AH 5/24/04

Marine Chronic Bioassay

Water Quality Measurements

Client: City of Buena Ventura Test Species: M. bahia  
 Sample ID: SCRE B-3 Test Date: 3/17/04  
 Test No: 0403-100 Start/End Times: 1530/1800

Concentration	25%							
Day	0	1	2	3	4	5	6	7
Initial:								
pH	8.44	8.49	8.58	8.47	8.54	8.55	8.48	
DO (mg/L)	7.2	7.4	7.5	7.6	7.4	7.4	7.1	
Salinity (ppt)	30.4	30.0	29.8	29.8	29.8	30.1	29.9	
Temp (°C)	25.1	25.1	25.0	25.0	24.4	24.2	24.5	
Final:								
pH		8.35	8.30	8.25	8.23	8.36	8.28	8.27
DO (mg/L)		5.4	5.7	6.0	5.7	5.8	6.8	5.2
Temp (°C)		25.4	25.2	24.3	24.1	24.4	24.5	25.0

Concentration	50%							
Day	0	1	2	3	4	5	6	7
Initial:								
pH	8.45	8.45	8.53	8.48	8.48	8.52	8.46	
DO (mg/L)	7.3	7.7	7.8	7.7	7.7	7.6	7.5	
Salinity (ppt)	30.4	30.1	29.8	29.8	29.7	30.2	30.1	
Temp (°C)	24.9	25.1	25.0	25.0	24.4	24.4	24.5	
Final:								
pH		8.34	8.32	8.20	8.29	8.39	8.27	8.29
DO (mg/L)		5.6	5.8	6.0	5.7	5.9	6.8	5.1
Temp (°C)		25.3	25.3	24.5	24.1	24.3	24.5	25.0

Concentration	100%							
Day	0	1	2	3	4	5	6	7
Initial:								
pH	8.46	8.37	8.45	8.48	8.40	8.49	8.43	
DO (mg/L)	7.4	8.1	8.8	8.6	8.8	8.4	8.1	
Salinity (ppt)	30.7	30.4	30.0	29.9	29.6	30.2	30.3	
Temp (°C)	25.0	25.2	25.0	25.0	24.4	24.4	24.5	
Final:								
pH		8.33	8.30	8.27	8.30	8.31	8.32	8.23
DO (mg/L)		5.5	5.4	5.8	5.7	5.6	6.6	5.3
Temp (°C)		25.5	25.3	24.5	24.2	24.3	24.7	25.1

Analysts:	Initial:	0	1	2	3	4	5	6	7
		RG	RG	MC	MC	AH	RG	AW/AH	
	Final:		SH	ME	SH	AH	AH	AM	MC

Comments:

Animal Source/Date Received: ABS / 3-16-04 Animal Age at Initiation: 7 days old  
 QC Check: me 4/13/04 Final Review: [Signature] 5/21/04

Marine Chronic Bioassay

Water Quality Measurements

Client: City of Belenaventura Test Species: M. bahia  
 Sample ID: SCRE C-3 Test Date: 3/17/04  
 Test No: 0403-101 Start/End Times: 1530-11300

Concentration	Lab Control #2							
Day	0	1	2	3	4	5	6	7
Initial:								
pH	8.00	7.95	8.00	7.95	8.01	8.01		8.03
DO (mg/L)	8.1	7.8	8.5	8.3	8.2	8.7		5.0
Salinity (ppt)	29.6	29.9	29.8	29.9	30.0	29.9		29.2
Temp (°C)	25.0	24.7	25.0	24.6	24.2	25.1		24.5
Final:								
pH		7.96	7.87	7.86	7.92	7.99	7.93	8.01
DO (mg/L)		6.0	5.8	6.2	5.7	5.8	6.9	5.8
Temp (°C)		25.2	25.0	24.3	24.2	24.3	24.2	24.9

Concentration	Salt Control #2							
Day	0	1	2	3	4	5	6	7
Initial:								
pH	8.65	8.61	8.65	8.62	8.53	8.59	8.51	
DO (mg/L)	7.1	7.5	7.3	7.5	6.4	7.4	5.9	
Salinity (ppt)	29.9	30.0	29.8	29.9	30.0	29.9	30.0	
Temp (°C)	25.1	24.9	25.0	25.0	24.3	24.5	24.5	
Final:								
pH		8.32	8.27	8.21	8.15	8.30	8.20	8.29
DO (mg/L)		5.5	5.3	5.9	5.8	5.9	7.0	5.4
Temp (°C)		25.1	24.9	24.3	24.2	24.3	24.2	24.9

Concentration	6.25%							
Day	0	1	2	3	4	5	6	7
Initial:								
pH	8.53	8.51	8.58	8.55	8.54	8.57	8.46	
DO (mg/L)	7.0	7.5	7.4	7.5	7.2	7.3	7.0	
Salinity (ppt)	29.9	30.0	29.8	29.8	29.9	30.0	30.0	
Temp (°C)	24.2	24.6	25.0	25.0	24.3	25.0	24.5	
Final:								
pH		8.34	8.27	8.22	8.19	8.32	8.16	8.21
DO (mg/L)		5.4	5.9	6.3	5.9	5.8	6.6	5.3
Temp (°C)		25.4	24.6	24.2	24.3	24.4	24.6	24.4

Concentration	12.5%							
Day	0	1	2	3	4	5	6	7
Initial:								
pH	8.50	8.47	8.55	8.50	8.50	8.51	8.43	
DO (mg/L)	7.1	7.3	7.4	7.5	7.2	7.4	7.1	
Salinity (ppt)	30.0	30.0	29.8	29.8	29.9	30.0	30.0	
Temp (°C)	24.3	24.7	25.0	25.0	24.3	25.0	24.5	
Final:								
pH		8.31	8.30	8.22	8.20	8.34	8.21	8.27
DO (mg/L)		5.6	6.1	5.8	5.5	5.9	6.9	5.6
Temp (°C)		25.3	25.0	24.3	24.3	24.5	24.6	24.7

Analysts:	Initial:	0	1	2	3	4	5	6	7
		RG	RG	MC	MC	AH	RG	AH	
	Final:		SH	MC	SH	AH	AH	AW	MC

Comments:

Animal Source/Date Received: ABS/3-16-04

Animal Age at Initiation: 7 days old

QC Check: no 4/13/04

Final Review: [Signature] 4/24/04



Marine Chronic Bioassay

Water Quality Measurements

Client: City of Buena Ventura Test Species: M. bahia  
 Sample ID: SCRE C-3 Test Date: 3/17/04  
 Test No: 0403-101 Start/End Times: 1530 / 1300

Concentration	25%							
Day	0	1	2	3	4	5	6	7
Initial:								
pH	8.46	8.38	8.47	8.43	8.41	8.45	8.38	
DO (mg/L)	7.2	7.3	7.5	7.6	7.3	7.4	7.4	
Salinity (ppt)	30.1	30.0	29.9	29.8	30.0	30.1	30.0	
Temp (°C)	25.1	25.0	25.0	25.0	24.3	24.9	24.5	
Final:								
pH		8.30	8.31	8.25	8.28	8.34	8.24	8.31
DO (mg/L)		5.2	5.9	5.9	5.8	5.5	6.7	7.4
Temp (°C)		25.4	25.0	24.3	24.3	24.5	24.3	24.8

Concentration	50%							
Day	0	1	2	3	4	5	6	7
Initial:								
pH	8.39	8.27	8.35	8.37	8.29	8.34	8.31	
DO (mg/L)	8.6	7.5	7.9	7.9	7.7	7.8	8.0	
Salinity (ppt)	30.2	30.0	29.9	29.9	30.1	30.2	30.1	
Temp (°C)	25.1	24.9	25.0	25.0	24.3	24.9	24.5	
Final:								
pH		8.26	8.24	8.23	8.26	8.24	8.15	8.27
DO (mg/L)		5.2	6.0	5.7	5.7	5.5	6.4	5.6
Temp (°C)		25.4	25.6	24.3	24.2	24.4	24.4	24.8

Concentration	100%							
Day	0	1	2	3	4	5	6	7
Initial:								
pH	8.15	8.14	8.19	8.22	8.13	8.20	8.21	
DO (mg/L)	8.5	8.1	8.9	8.3	8.7	8.7	9.4	
Salinity (ppt)	30.2	30.1	30.1	30.0	30.3	30.3	30.3	
Temp (°C)	25.6	24.8	25.0	25.0	24.3	24.8	24.5	
Final:								
pH		8.01	8.06	7.92	8.04	8.03	8.02	8.03
DO (mg/L)		5.3	6.0	5.9	5.7	6.5	6.3	5.1
Temp (°C)		25.4	25.6	24.3	24.2	24.4	24.4	24.7

Analysts:	Initial:	0	1	2	3	4	5	6	7
		RG	RG	MC	MC	AH	Rb	AJ/AH	
	Final:		SH	UL	SH	AH	AH	AW	mc

Comments:

Animal Source/Date Received: ABS / 3-16-04 Animal Age at Initiation: 7 days old  
 QC Check: LR 4/13/04 Final Review: SAH 9/24/04

*M. PYRIFERA*

AMEC Earth and Environmental  
 Bioassay Laboratory  
 5550 Morehouse Dr. Suite B  
 San Diego, CA 92121

Raw Datasheet  
 Water Quality Measurements  
 Marine Chronic Bioassay

Client: City of Buena Ventura

Test Species: Macrocystis pyrifera

Sample ID: A-2

Start/End Dates: 3.17.04 / 3.19.04

Test No: 0403-102

Start/End Times: 1620 / 1820

Analyst: mc

Test Type: Kelp Spore Germination and Growth

Concentration (%)	Initial Readings			Final Readings		
	D.O. (mg/L)	pH (pH units)	Salinity (ppt)	D.O. (mg/L)	pH (pH units)	Salinity (ppt)
LC #1	8.0	8.00	33.4	7.2	8.02	33.7
BC #1	7.5	8.08	32.3	7.3	8.01	32.8
6.25	8.2	8.00	33.3	7.2	8.04	34.1
12.5	8.1	7.97	33.5	7.3	8.06	34.1
25	8.1	7.94	32.8	7.4	8.12	32.9
50	7.9	7.86	31.8	7.3	8.20	32.3
60	7.8	7.83	31.5	7.3	8.22	31.5
LC #3	9.1	7.93	31.5	7.3	7.98	31.3

Comments:

QC Check: mc 4/16/04

Final Review: [Signature] 9/24/04

## Brine Dilution Worksheet

Client: City of Buenaventura

Analyst: mc/AH

Sample ID: Santa Clara River Estuary A2

Test Date: 03/17/2004

Test No: 0403-102

Test Type: Kelp spore germ. & growth

Salinity of Effluent	3.1 *
Salinity of Brine	75.1
Target Salinity	32
Test Dilution Volume	200

Salinity Adjustment Factor:	$\frac{TS - SE}{SB - TS}$	TS = target salinity SE = salinity of effluent SB = salinity of brine
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Salinity Adjustment Factor = 0.67

Concentration %	Effluent Volume (mL)	Salinity Adjustment	Brine Volume (mL)	Dilute to to: (mL)
Control	NA	NA	NA	200
6.25	12.5	0.67	8.4	200
12.5	25.0	0.67	16.8	200
25	50.0	0.67	33.5	200
50	100	0.67	67	200
60	120	0.67	80	200

**DI Volume**

Brine Control	108	0.74	80	200
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total brine      **286.3**

Brine Control Salinity Adjustment Factor

Brine Control Calculation:  $\frac{TS - 0}{SB - TS}$

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Raw Datasheet  
 Water Quality Measurements  
 Marine Chronic Bioassay

Client: City of Buena Ventura

Test Species: Macrocystis pyrifera

Sample ID: B-1

Start/End Dates: 3.17.04 / 3.19.04

Test No: 0403-103

Start/End Times: 1620 / 1320

Analyst: mc

Test Type: Kelp Spore Germination and Growth

Concentration (%)	Initial Readings			Final Readings		
	D.O. (mg/L)	pH (pH units)	Salinity (ppt)	D.O. (mg/L)	pH (pH units)	Salinity (ppt)
LC #1	8.6	8.06	33.4	7.2	8.02	33.7
BC #1	7.5	8.08	32.3	7.3	8.01	32.8
6.25	7.9	7.98	33.1	7.3	8.04	33.5
12.5	8.0	7.99	33.3	7.3	8.07	33.4
25	7.9	7.94	32.1	7.3	8.12	32.5
50	7.7	7.84	32.1	7.3	8.28	<del>32.4</del> 33.4 mc
58	7.6	7.81	32.0	7.3	8.23	31.4

Comments: \_\_\_\_\_

QC Check: mc 4/14/04

Final Review: [Signature] 5/24/04

## Brine Dilution Worksheet

Client: City of Buenaventura

Analyst: MC/AH

Sample ID: Santa Clara River Estuary B1

Test Date: 03/17/2004

Test No: 0403-103

Test Type: Kelp spore germ. & growth

Salinity of Effluent	1.4
Salinity of Brine	75.1
Target Salinity	32
Test Dilution Volume	200

Salinity Adjustment Factor:	$\frac{TS - SE}{SB - TS}$	TS = target salinity SE = salinity of effluent SB = salinity of brine
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Salinity Adjustment Factor = 0.71

Concentration %	Effluent Volume (mL)	Salinity Adjustment	Brine Volume (mL)	Dilute to to: (mL)
Control	NA	NA	NA	200
6.25	12.5	0.71	8.9	200
12.5	25.0	0.71	17.7	200
25	50.0	0.71	35.5	200
50	100	0.71	71	200
58	117	0.71	83	200

**DI Volume**

<del>Brine Control</del>	<del>112</del>	<del>0.74</del>	<del>83</del>	<del>200</del>
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total brine      299.2

Brine Control Salinity Adjustment Factor

Brine Control Calculation:  $\frac{TS - 0}{SB - TS}$

cc. changed to A2

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 San Diego, CA 92121

Raw Datasheet  
 Water Quality Measurements  
 Marine Chronic Bioassay

Client: City of Buena Vista

Test Species: Macrocystis pyrifera

Sample ID: B-3

Start/End Dates: 3.17.04 / 3.19.04

Test No: 0403-104

Start/End Times: 1620 / 1320

Analyst: me

Test Type: Kelp Spore Germination and Growth

Concentration (%)	Initial Readings			Final Readings		
	D.O. (mg/L)	pH (pH units)	Salinity (ppt)	D.O. (mg/L)	pH (pH units)	Salinity (ppt)
LC#2	8.5	7.99	33.5	7.2	8.03	33.7
BC#2	7.6	8.08	32.0	7.1	8.01	32.4
6.25	8.9	8.05	33.1	7.2	8.05	33.7
12.5	9.0	8.08	33.3	7.2	8.06	33.8
25	8.9	8.12	32.9	7.2	8.12	33.3
50	8.7	8.19	32.0	7.1	8.20	32.4 33.1
68	8.8	8.23	31.8	7.2	8.24	32.0

Comments: \_\_\_\_\_

QC Check: me 4/14/04

Final Review: ajh 5/24/04

# Brine Dilution Worksheet

Client: City of Buenaventura

Analyst: mc/AH

Sample ID: Santa Clara River Estuary B3

Test Date: 03/17/2004

Test No: 0403-104

Test Type: Kelp spore germ. & growth

Salinity of Effluent	<u>12.1</u>
Salinity of Brine	<u>75.1</u>
Target Salinity	<u>32</u>
Test Dilution Volume	<u>200</u>

Salinity Adjustment Factor:  $\frac{TS - SE}{SB - TS}$       TS = target salinity  
SE = salinity of effluent  
SB = salinity of brine

Salinity Adjustment Factor = 0.46

Concentration %	Effluent Volume (mL)	Salinity Adjustment	Brine Volume (mL)	Dilute to to: (mL)
Control	NA	NA	NA	200
6.25	12.5	0.46	5.8	200
12.5	25.0	0.46	11.5	200
25	50.0	0.46	23.1	200
50	100	0.46	46	200
68	137	0.46	63	200

## DI Volume

Brine Control	85	0.74	63	200
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total brine 212.9

Brine Control Salinity Adjustment Factor

Brine Control Calculation:  $\frac{TS - 0}{SB - TS}$

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Raw Datasheet  
 Water Quality Measurements  
 Marine Chronic Bioassay

Client : City of Buena Ventura  
 Sample ID: C-3  
 Test No: 0403-105  
 Analyst: MC

Test Species: Macrocystis pyrifera  
 Start/End Dates: 8-17-04 / 8-19-04  
 Start/End Times: 1620 / 1320  
 Test Type: Kelp Spore Germination and Growth

Concentration ( $\mu$ g/L)	Initial Readings			Final Readings		
	D.O. (mg/L)	pH (pH units)	Salinity (ppt)	D.O. (mg/L)	pH (pH units)	Salinity (ppt)
LC #2	8.5	7.99	33.5	7.2	8.03	33.7
BC #2	7.6	8.08	32.0	7.1	8.0	32.4
6.25	8.8	8.08	33.4	7.3	8.07	33.3
12.5	8.8	7.96	33.5	7.4	8.11	33.8
25	8.8	7.91	<sup>MC</sup> <del>33.2</del> 32.8	7.4	8.20	33.2
50	8.6	7.85	31.7	7.4	8.33	32.0
59	8.6	7.83	31.4	7.3	8.37	31.7

Comments: \_\_\_\_\_

QC Check: MC 4/14/04

Final Review: [Signature] 8/24/04

## Brine Dilution Worksheet

Client: City of Buenaventura

Analyst: mc/AH

Sample ID: Santa Clara River Estuary C3

Test Date: 03/17/2004

Test No: 0403-105

Test Type: Kelp spore germ. & growth

Salinity of Effluent	1.7
Salinity of Brine	75.1
Target Salinity	32
Test Dilution Volume	200

Salinity Adjustment Factor:  $\frac{TS - SE}{SB - TS}$

TS = target salinity  
SE = salinity of effluent  
SB = salinity of brine

Salinity Adjustment Factor = 0.70

Concentration %	Effluent Volume (mL)	Salinity Adjustment	Brine Volume (mL)	Dilute to: (mL)
Control	NA	NA	NA	200
6.25	12.5	0.70	8.8	200
12.5	25.0	0.70	17.6	200
25	50.0	0.70	35.2	200
50	100	0.70	70	200
59	117	0.70	83	200

**DI Volume**

<del>Brine Control</del>	<del>111</del>	<del>0.74</del>	<del>83</del>	<del>200</del>
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total brine      296.9

**Brine Control Salinity Adjustment Factor**

Brine Control Calculation:

$$\frac{TS - 0}{SB - TS}$$

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BC  
trace  
w/ 100  
4/14/04

APPENDIX C  
REFERENCE TOXICANT DATA

CONCURRENT TO WHOLE SEDIMENT TESTING

*E. ESTUARIUS*

**Amphipod 10-day Survival Bioassay-Survival**

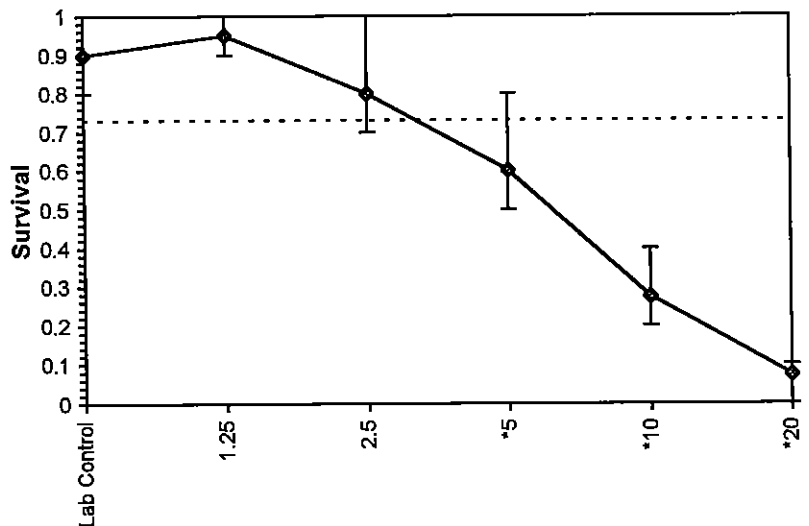
Start Date: 03/24/2004      Test ID: 040324eera      Sample ID: REF-Ref Toxicant  
 End Date: 03/28/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: CUCL-Copper chloride  
 Sample Date:      Protocol: ASTM 93      Test Species: EE-Eohaustorius estuarius  
 Comments:

Conc-mg/L	1	2	3	4
Lab Control	0.9000	0.8000	1.0000	0.9000
1.25	0.9000	1.0000	0.9000	1.0000
2.5	0.8000	0.7000	1.0000	0.7000
5	0.5000	0.5000	0.6000	0.8000
10	0.4000	0.2000	0.2000	0.3000
20	0.1000	0.1000	0.0000	0.1000

Conc-mg/L	Transform: Arcsin Square Root							t-Stat	1-Tailed Critical	MSD	Number Resp	Total Number
	Mean	N-Mean	Mean	Min	Max	CV%	N					
Lab Control	0.9000	1.0000	1.2543	1.1071	1.4120	9.935	4				4	40
1.25	0.9500	1.0556	1.3305	1.2490	1.4120	7.072	4	-0.815	2.410	0.2253	2	40
2.5	0.8000	0.8889	1.1254	0.9912	1.4120	17.662	4	1.379	2.410	0.2253	8	40
*5	0.6000	0.6667	0.8910	0.7854	1.1071	17.027	4	3.887	2.410	0.2253	16	40
*10	0.2750	0.3056	0.5479	0.4636	0.6847	19.408	4	7.557	2.410	0.2253	29	40
*20	0.0750	0.0833	0.2810	0.1588	0.3218	28.997	4	10.412	2.410	0.2253	37	40

Auxiliary Tests	Statistic	Critical	Skew	Kurt						
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.9255	0.884	0.79952	0.12084						
Bartlett's Test indicates equal variances (p = 0.71)	2.94814	15.0863								
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	2.5	5	3.53553		0.16903	0.18716	0.69499	0.01748	4.1E-09	5, 18

Parameter	Value	SE	95% Fiducial Limits		Maximum Likelihood-Probit						
					Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	2.94899	0.49528	1.97825	3.91974	0.1	1.02276	7.81472	0.8	0.82166	0.3391	4
Intercept	2.57693	0.45291	1.68922	3.46463							
TSCR	0.07594	0.03383	0.00964	0.14224							
Point	Probits	mg/L	95% Fiducial Limits								
EC01	2.674	1.07845	0.37862	1.8606							
EC05	3.355	1.83609	0.82762	2.80789							
EC10	3.718	2.43831	1.25144	3.50862							
EC15	3.964	2.95262	1.65026	4.08727							
EC20	4.158	3.4377	2.05192	4.62385							
EC25	4.326	3.9169	2.46862	5.15029							
EC40	4.747	5.44191	3.88128	6.84919							
EC50	5.000	6.63225	5.01759	8.25693							
EC60	5.253	8.08297	6.3682	10.139							
EC75	5.674	11.23	9.01385	14.9772							
EC80	5.842	12.7954	10.1957	17.7438							
EC85	6.036	14.8975	11.6845	21.7787							
EC90	6.282	18.0399	13.762	28.4055							
EC95	6.645	23.9568	17.3662	42.5314							
EC99	7.326	40.7871	26.4404	92.1516							



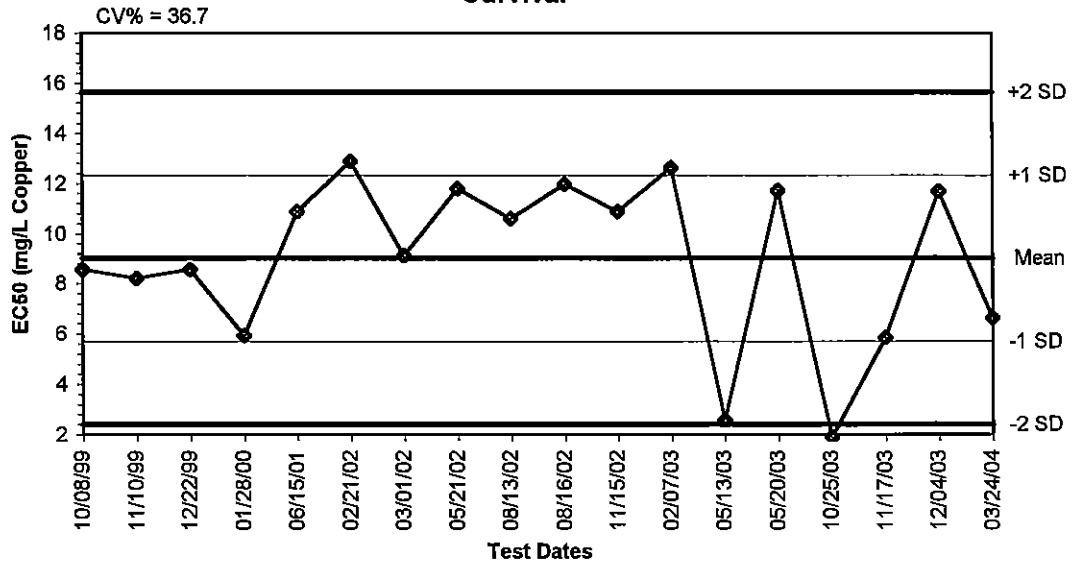
**Sediment Testing Reference Toxicant Results**  
**AMEC Bioassay Laboratory**

Client: Internal  
 Toxicant: CCl<sub>2</sub> 040324 EERA  
 Analysts: JR, AH

Test Organism: E. estuarius  
 Start Date/Time: 3/24/04  
 End Date/Time: 3/28/04

Conc. (mg/L)	Rep	Survival		DO (mg/L)					pH (pH units)					Salinity (ppt)					Temperature (°C)				
		0	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96
LC	A	10	9	9.2	7.8	7.9	7.8	7.2	8.06	7.91	7.92	8.04	7.87	29.8	29.8	29.8	29.8	30.1	15.0	15.0	15.0	15.0	15.1
	B	10	8							7.91													
	C	10	10																				
	D	10	9																				
1.25	A	10	9	9.4	7.9	7.8	7.9	7.8	8.09	7.92	7.92	8.06	7.98	29.9	30.0	30.0	30.1	30.4	14.7	15.0	15.0	14.9	15.0
	B	10	10																				
	C	10	9																				
	D	10	10																				
2.5	A	10	8	9.4	8.0	7.9	8.0	7.9	8.09	7.92	7.92	8.06	8.01	29.9	29.9	30.0	30.0	30.3	14.7	15.0	15.1	15.0	15.0
	B	10	7																				
	C	10	10																				
	D	10	7																				
5.0	A	10	5	9.4	8.0	7.8	8.0	8.0	8.09	7.90	7.91	8.06	8.02	29.8	30.0	30.0	30.0	30.2	14.6	15.0	15.1	15.0	15.0
	B	10	5																				
	C	10	6																				
	D	10	8																				
10	A	10	4	9.3	8.0	7.8	8.0	8.0	8.09	7.91	7.90	8.06	8.13	29.8	29.8	29.9	29.9	30.1	14.4	15.0	15.0	15.0	15.0
	B	10	2																				
	C	10	2																				
	D	10	3																				
20	A	10	1	9.2	7.9	7.9	8.1	7.9	8.09	7.90	7.90	8.07	8.03	29.7	29.7	29.8	29.8	30.1	14.6	15.0	15.0	14.9	14.9
	B	10	1																				
	C	10	0																				
	D	10	1																				

**Copper (II) Chloride Reference Toxicant Control Chart - Amphipod Survival**



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
10/08/99	8.5659	9.0192	5.7076	2.3961	12.3307	15.6423
11/10/99	8.2133	9.0192	5.7076	2.3961	12.3307	15.6423
12/22/99	8.5659	9.0192	5.7076	2.3961	12.3307	15.6423
01/28/00	5.9193	9.0192	5.7076	2.3961	12.3307	15.6423
06/15/01	10.8749	9.0192	5.7076	2.3961	12.3307	15.6423
02/21/02	12.8870	9.0192	5.7076	2.3961	12.3307	15.6423
03/01/02	9.1171	9.0192	5.7076	2.3961	12.3307	15.6423
05/21/02	11.7849	9.0192	5.7076	2.3961	12.3307	15.6423
08/13/02	10.5923	9.0192	5.7076	2.3961	12.3307	15.6423
08/16/02	11.9653	9.0192	5.7076	2.3961	12.3307	15.6423
11/15/02	10.8858	9.0192	5.7076	2.3961	12.3307	15.6423
02/07/03	12.6153	9.0192	5.7076	2.3961	12.3307	15.6423
05/13/03	2.5734	9.0192	5.7076	2.3961	12.3307	15.6423
05/20/03	11.7033	9.0192	5.7076	2.3961	12.3307	15.6423
10/25/03	1.9071	9.0192	5.7076	2.3961	12.3307	15.6423
11/17/03	5.8583	9.0192	5.7076	2.3961	12.3307	15.6423
12/04/03	11.6843	9.0192	5.7076	2.3961	12.3307	15.6423
03/24/04	6.6323	9.0192	5.7076	2.3961	12.3307	15.6423



*M. GALLOPROVINCIALIS*

**Bivalve Larval Survival and Development Test-Proportion Normal**

Start Date: 03/23/2004      Test ID: 040323mert      Sample ID: REF-Ref Toxicant  
 End Date: 03/25/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: CUCL-Copper chloride  
 Sample Date:      Protocol: ASTM 93      Test Species: ME-Mytilis edulis  
 Comments:

Conc-ug/L	1	2	3	4	5
L-Lab Control	0.5763	0.7647	0.5625	0.7941	0.7143
2.5	0.6438	0.7162	0.6849	0.5455	0.7021
5	0.6721	0.7037	0.5606	0.6410	0.6623
10	0.5714	0.5325	0.5634	0.4096	0.5067
20	0.0200	0.0563	0.0000	0.0000	0.0000
40	0.0000	0.0000	0.1176	0.0000	0.0000

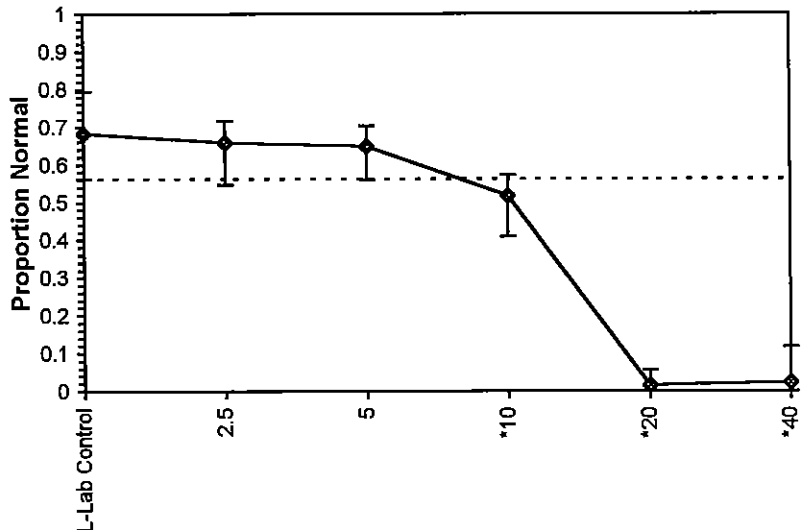
Conc-ug/L	Mean	N-Mean	Transform: Arcsin Square Root					N	t-Stat	1-Tailed Critical	MSD	Number Resp	Total Number
			Mean	Min	Max	CV%							
L-Lab Control	0.6824	1.0000	0.9762	0.8481	1.0998	11.843	5				105	333	
2.5	0.6585	0.9650	0.9479	0.8309	1.0090	7.552	5	0.533	2.360	0.1253	128	380	
5	0.6480	0.9496	0.9363	0.8462	0.9952	5.966	5	0.752	2.360	0.1253	127	363	
*10	0.5167	0.7572	0.8021	0.6945	0.8571	8.160	5	3.280	2.360	0.1253	183	376	
*20	0.0153	0.0224	0.1195	0.0578	0.2396	62.759	5	16.139	2.360	0.1253	281	286	
*40	0.0235	0.0345	0.1667	0.0946	0.3501	62.190	5	15.249	2.360	0.1253	88	90	

Auxiliary Tests	Statistic	Critical	Skew	Kurt						
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97637	0.9	0.26689	-0.1363						
Bartlett's Test indicates equal variances (p = 0.72)	2.88763	15.0863								
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	5	10	7.07107		0.12087	0.17614	0.81488	0.00704	5.5E-16	5, 24

Maximum Likelihood-Probit											
Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	7.03814	7.68106	-17.406	31.4827	0.31532	459.508	7.81472	2.8E-99	1.08715	0.14208	5
Intercept	-2.6515	8.69963	-30.338	25.0346							
TSCR	0.3302	0.18007	-0.2429	0.90327							

Point	Probits	ug/L	95% Fiducial Limits	
EC01	2.674	5.70973		
EC05	3.355	7.13583		
EC10	3.718	8.03644		
EC15	3.964	8.70745		
EC20	4.158	9.28048		
EC25	4.326	9.80205		
EC40	4.747	11.25		
EC50	5.000	12.2222		
EC60	5.253	13.2784		
EC75	5.674	15.24		
EC80	5.842	16.0965		
EC85	6.036	17.1558		
EC90	6.282	18.5882		
EC95	6.645	20.9342		
EC99	7.326	26.1628		

Significant heterogeneity detected (p = 2.84E-99)



Test: BV-Bivalve Larval Survival and Development Test      Test ID: 040323mert  
 Species: ME-Mytilis edulis      Protocol: ASTM ~~93~~ <sup>93</sup>  
 Sample ID: REF-Ref Toxicant      Sample Type: CUCL-Copper chloride  
 Start Date: 03/23/2004      End Date: 03/25/2004      Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
1	8	3	2.5			73	50	
2	17	2	10			77	41	
3	29	4	40			15	0	
4	20	5	10			75	38	
5	5	5	L-Lab Control			91	65	
6	6	1	2.5			73	47	
7	18	3	10			71	40	
8	26	1	40			14	0	
9	3	3	L-Lab Control			64	36	
10	30	5	40			16	0	
11	23	3	20			62	0	
12	4	4	L-Lab Control			68	54	
13	2	2	L-Lab Control			51	39	
14	10	5	2.5			94	66	
15	28	3	40			17	2	
16	11	1	5			61	41	
17	7	2	2.5			74	53	
18	1	1	L-Lab Control			59	34	
19	25	5	20			75	0	
20	21	1	20			50	1	
21	22	2	20			71	4	
22	12	2	5			81	57	
23	16	1	10			70	40	
24	15	5	5.0			77	51	
25	27	2	40			28	0	
26	19	4	10			83	34	
27	24	4	20			28	0	
28	14	4	5			78	50	
29	13	3	5			66	37	
30	9	4	2.5			66	36	

Comments:

data entry QCAH

Test: BV-Bivalve Larval Survival and Development Test  
 Species: ME-Mytilis edulis  
 Sample ID: REF-Ref Toxicant  
 Start Date: 03/23/2004      End Date: 03/25/2004

Test ID: 040323mert  
 Protocol: ASTM ~~82~~ 93  
 Sample Type: CUCL-Copper chloride  
 Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
1						73	50	SD
2						77	41	
3						15	0	
4						75	38	
5						91	65	
6						73	47	
7						71	40	
8						14	0	JWT
9						64	36	JWT
10						16	0	JWT
11						62	0	JWT
12						68	54	JWT
13						51	39	JWT
14						94	66	JWT
15						17	2	JWT
16						61	41	JWT
17						<del>183</del> 74	<del>74</del> 53	JWT
18						59	34	JWT
19						75	0	JWT
20						50	1	JWT
21						71	4	JWT
22						81	57	JWT
23						70	40	JWT
24						77	51	JWT
25						28	0	JWT
26						83	34	JWT
27						28	0	JWT
28						78	50	JWT
29						<del>88</del> 66	37	JWT
30						<del>100</del> 66	36	JWT

Comments:

QC1  
 QC2

48    35 - 73%  
 82    58 - 71%

Test: BV-Bivalve Larval Survival and Development Test  
 Species: ME-Mytilis edulis  
 Sample ID: REF-Ref Toxicant  
 Start Date: 03/23/2004

Test ID: 040323mert  
 Protocol: ASTM 8793 AH  
 Sample Type: CUCL-Copper chloride  
 Lab ID: AEESD-AMEC Bioassay SD

End Date: 03/25/2004

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
18	1	1	L-Lab Control					
13	2	2	L-Lab Control					
9	3	3	L-Lab Control					
12	4	4	L-Lab Control					
5	5	5	L-Lab Control					
6	6	1	2.5					
17	7	2	2.5					
1	8	3	2.5					
30	9	4	2.5					
14	10	5	2.5					
16	11	1	5					
22	12	2	5					
29	13	3	5					
28	14	4	5					
24	15	5	5					
23	16	1	10					
2	17	2	10					
7	18	3	10					
26	19	4	10					
4	20	5	10					
20	21	1	20					
21	22	2	20					
11	23	3	20					
27	24	4	20					
19	25	5	20					
8	26	1	40					
25	27	2	40					
15	28	3	40					
3	29	4	40					
10	30	5	40					

Comments:

QC:ME

# Bivalve Development Bioassay Worksheet

Client: Buenaventura + SPAWAR + CUCI<sub>2</sub> Start Date/Time: 3/23/04  
 Test No.: \_\_\_\_\_ End Date/Time: 3/25/04  
 Test Species: M. galloprovincialis Date Received: 3/22/04

Sample Type: inhaler sediment (Buenaventura),

Test Chamber Type and Sample Volume: 1L glass jars, 10ml shell vials

Spawn Initiation Time: 1145

	Male	Female
Number of Spawners:	<u>16</u>	<u>8</u>

Spawn Condition: Good

Fertilization Time: 1415

Egg Stock Density Calculation:  
 $\frac{1}{10}$

Eggs Counted (x):	<u>105</u>	<u>98</u>	}	Counts on 1:10 dilution
	<u>106</u>	<u>97</u>		
	<u>113</u>	<u>123</u>		
	<u>96</u>	<u>114</u>		
	<u>98</u>	<u>121</u>		

Mean 102.4      110.6      Overall Mean: 106.5

Mean: 106.5 X 42 = 4,473 eggs/ml

Stock Dilution Factor

Initial Stock - 44730 eggs/ml = 2.03  
 Inoculum Stock - 72000 eggs/ml

Percent Division Upon Inoculation: ~80%

Time of Inoculation: 1430

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Reviewed/ Date: 4/4/04

AMEC Bioassay Laboratory  
 5550 Morehouse Drive, Suite B  
 San Diego, CA 92121  
 (858) 458-9044

Marine Chronic Bioassay

Water Quality Measurements

Raw Datasheet

Client: Internal  
 Sample ID: CuCl<sub>2</sub>  
 Test No.: 040323MERT

Test Species: M. galloprovincialis  
 Start/End Dates: 3/23/04 3/25/04  
 Start/End Times: 1430 1300

Concentration <u>µg/L</u>	Temperature (°C)			Salinity (ppt)			Dissolved Oxygen (mg/L)			pH (pH units)		
	0	24	48	0	24	48	0	24	48	0	24	48
<u>LL</u>	<u>14.3</u>	<u>15.6</u>	<u>15.4</u>	<u>33.7</u>	<u>34.3</u>	<u>34.3</u>	<u>10.2</u>	<u>8.5</u>	<u>7.6</u>	<u>8.05</u>	<u>8.16</u>	<u>7.92</u>
<u>2.5</u>	<u>14.3</u>	<u>15.0</u>	<u>15.0</u>	<u>33.7</u>	<u>34.4</u>	<u>34.5</u>	<u>10.1</u>	<u>8.5</u>	<u>7.6</u>	<u>8.08</u>	<u>8.16</u>	<u>7.94</u>
<u>5.0</u>	<u>14.3</u>	<u>15.0</u>	<u>15.0</u>	<u>33.7</u>	<u>34.4</u>	<u>34.6</u>	<u>10.1</u>	<u>8.5</u>	<u>7.7</u>	<u>8.08</u>	<u>8.16</u>	<u>7.96</u>
<u>10</u>	<u>14.3</u>	<u>15.6</u>	<u>15.0</u>	<u>33.6</u>	<u>34.3</u>	<u>34.5</u>	<u>10.1</u>	<u>8.5</u>	<u>7.7</u>	<u>8.09</u>	<u>8.16</u>	<u>7.98</u>
<u>20</u>	<u>14.3</u>	<u>15.0</u>	<u>14.9</u>	<u>33.6</u>	<u>34.4</u>	<u>34.6</u>	<u>10.1</u>	<u>8.6</u>	<u>8.1</u>	<u>8.12</u>	<u>8.16</u>	<u>8.00</u>
<u>40</u>	<u>14.3</u>	<u>15.0</u>	<u>14.9</u>	<u>33.8</u>	<u>34.2</u>	<u>34.5</u>	<u>10.2</u>	<u>8.6</u>	<u>8.0</u>	<u>8.16</u>	<u>8.15</u>	<u>8.02</u>

Technician Initials: 

0	24	48
<u>MC</u>	<u>MC</u>	<u>AW</u>

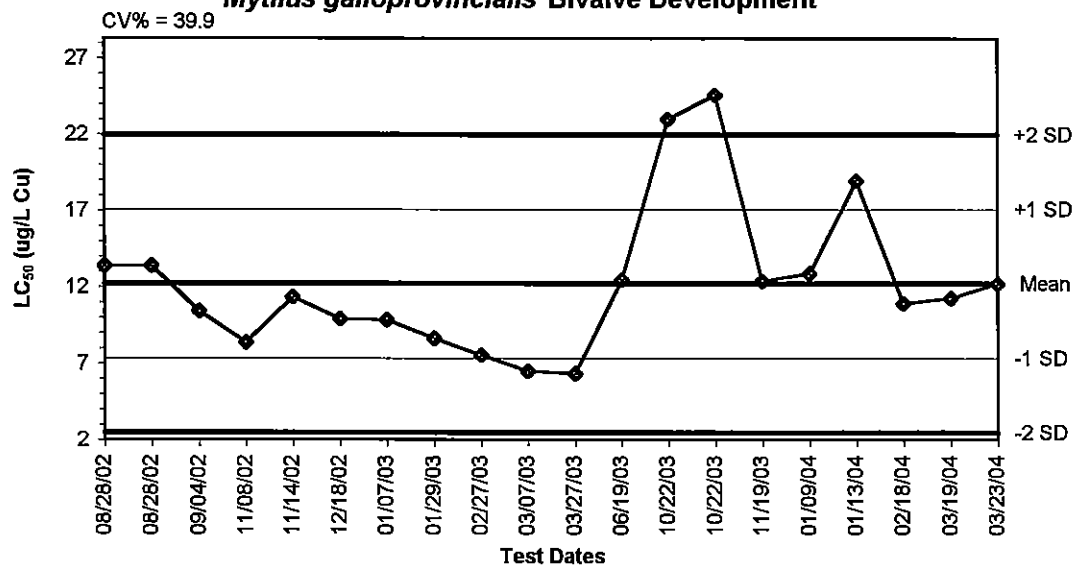
Animal Source/Date Received: Carlsbad Aquafarms / 3-22-04

Comments: 0 hrs: \_\_\_\_\_  
 24 hrs: \_\_\_\_\_  
 48 hrs: \_\_\_\_\_

QC Check: mc 4/8/04 Final Review: BCS 5/25/04

AMEC Earth and Environmental  
 Bioassay Laboratory  
 5550 Morehouse Dr., Suite B  
 San Diego, CA 92121

**Copper (II) Chloride Reference Toxicant Control Chart -  
*Mytilus galloprovincialis* Bivalve Development**



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
08/28/02	13.3760	12.2174	7.3379	2.4584	17.0969	21.9764
08/28/02	13.3760	12.2174	7.3379	2.4584	17.0969	21.9764
09/04/02	10.4338	12.2174	7.3379	2.4584	17.0969	21.9764
11/08/02	8.3754	12.2174	7.3379	2.4584	17.0969	21.9764
11/14/02	11.3155	12.2174	7.3379	2.4584	17.0969	21.9764
12/18/02	9.9361	12.2174	7.3379	2.4584	17.0969	21.9764
01/07/03	9.8373	12.2174	7.3379	2.4584	17.0969	21.9764
01/29/03	8.6253	12.2174	7.3379	2.4584	17.0969	21.9764
02/27/03	7.5397	12.2174	7.3379	2.4584	17.0969	21.9764
03/07/03	6.5174	12.2174	7.3379	2.4584	17.0969	21.9764
03/27/03	6.3338	12.2174	7.3379	2.4584	17.0969	21.9764
06/19/03	12.4539	12.2174	7.3379	2.4584	17.0969	21.9764
10/22/03	23.0103	12.2174	7.3379	2.4584	17.0969	21.9764
10/22/03	24.5820	12.2174	7.3379	2.4584	17.0969	21.9764
11/19/03	12.3871	12.2174	7.3379	2.4584	17.0969	21.9764
01/09/04	12.8695	12.2174	7.3379	2.4584	17.0969	21.9764
01/13/04	18.9772	12.2174	7.3379	2.4584	17.0969	21.9764
02/18/04	10.9125	12.2174	7.3379	2.4584	17.0969	21.9764
03/19/04	11.2668	12.2174	7.3379	2.4584	17.0969	21.9764
03/23/04	12.2223	12.2174	7.3379	2.4584	17.0969	21.9764



CONCURRENT TO AMBIENT WATER TESTING

FRESHWATER

*P. PROMELAS*

**Larval Fish Growth and Survival Test-7 Day Survival**

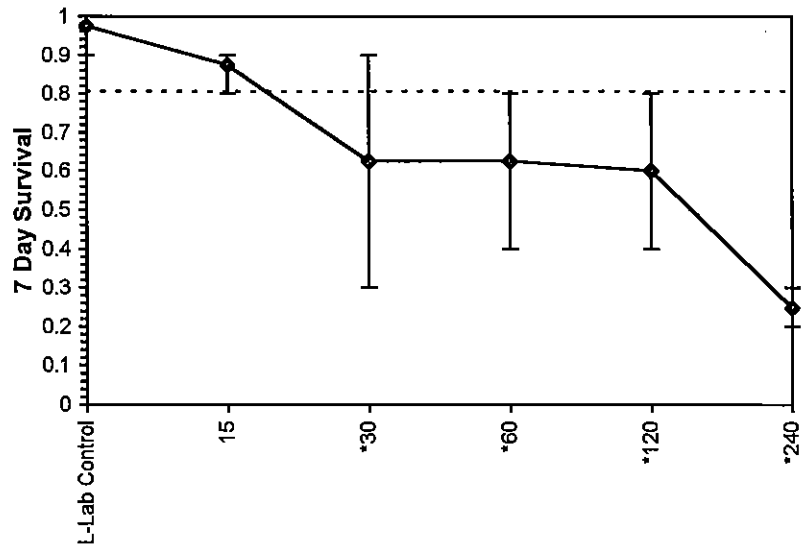
Start Date: 03/18/2004      Test ID: 040318PPRT      Sample ID: REF-Ref Toxicant  
 End Date: 03/25/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: CUCL-Copper chloride  
 Sample Date:                      Protocol: EPAF 02-EPA Freshwater C      Test Species: PP-Pimephales promelas  
 Comments:

Conc-ug/L	1	2	3	4
L-Lab Control	0.9000	1.0000	1.0000	1.0000
15	0.8000	0.9000	0.9000	0.9000
30	0.7000	0.9000	0.6000	0.3000
60	0.8000	0.4000	0.7000	0.6000
120	0.6000	0.4000	0.6000	0.8000
240	0.2000	0.3000	0.2000	0.3000

Conc-ug/L	Transform: Arcsin Square Root							1-Tailed			Number	
	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Resp	Total Number
L-Lab Control	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4				1	40
15	0.8750	0.8974	1.2136	1.1071	1.2490	5.846	4	1.388	2.410	0.2738	5	40
*30	0.6250	0.6410	0.9265	0.5796	1.2490	29.897	4	3.916	2.410	0.2738	15	40
*60	0.6250	0.6410	0.9173	0.6847	1.1071	19.559	4	3.997	2.410	0.2738	15	40
*120	0.6000	0.6154	0.8910	0.6847	1.1071	19.366	4	4.228	2.410	0.2738	16	40
*240	0.2500	0.2564	0.5216	0.4636	0.5796	12.838	4	7.480	2.410	0.2738	30	40

Auxiliary Tests	Statistic	Critical	Skew	Kurt						
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94701	0.884	-0.2428	1.2682						
Bartlett's Test indicates equal variances (p = 0.12)	8.73345	15.0863								
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	15	30	21.2132		0.16848	0.17537	0.34577	0.02581	1.5E-05	5, 18

Maximum Likelihood-Probit											
Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	1.23092	0.24846	0.74393	1.7179	0.025	6.98147	7.81472	0.07	2.03563	0.8124	3
Intercept	2.4943	0.47045	1.57222	3.41639							
TSCR	0.02483	0.02454	-0.0233	0.07292							
Point	Probits	ug/L	95% Fiducial Limits								
EC01	2.674	1.39864	0.09714	4.56334							
EC05	3.355	5.0044	0.78348	11.626							
EC10	3.718	9.87414	2.36056	19.3319							
EC15	3.964	15.6183	4.92467	27.4844							
EC20	4.158	22.4853	8.75121	36.7							
EC25	4.326	30.7381	14.1646	47.5857							
EC40	4.747	67.5795	42.8111	101.948							
EC50	5.000	108.551	73.1053	183.659							
EC60	5.253	174.363	113.937	362.513							
EC75	5.674	383.346	216.57	1234.93							
EC80	5.842	524.046	275.462	2037.65							
EC85	6.036	754.458	362.79	3671.17							
EC90	6.282	1193.35	510.513	7737.99							
EC95	6.645	2354.6	841.918	23507.1							
EC99	7.326	8424.9	2130.48	190883							



**Larval Fish Growth and Survival Test-7 Day Growth**

Start Date: 03/18/2004      Test ID: 040318PPRT      Sample ID:      Ref Toxicant  
 End Date: 03/25/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type:      Copper chloride  
 Sample Date:      Protocol: EPAF 02-EPA Freshwater C      Test Species:      PP-Pimephales promelas  
 Comments:

Conc-ug/L	1	2	3	4
L-Lab Control	0.3390	0.3610	0.3330	0.3290
15	0.2820	0.3200	0.3360	0.3510
30	0.1700	0.2710	0.2270	0.1250
60	0.3200	0.1270	0.2730	0.2830
120	0.2200	0.1110	0.1900	0.2280
240	0.0220	0.0120	0.0510	0.0260

Conc-ug/L	Transform: Untransformed							1-Tailed				
	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
L-Lab Control	0.3405	1.0000	0.3405	0.3290	0.3610	4.191	4				0.3405	0.0000
15	0.3223	0.9464	0.3223	0.2820	0.3510	9.207	4	0.507	2.410	0.0867	0.3223	0.0536
*30	0.1983	0.5822	0.1983	0.1250	0.2710	32.276	4	3.956	2.410	0.0867	0.1983	0.4178
*60	0.2508	0.7364	0.2508	0.1270	0.3200	33.875	4	2.496	2.410	0.0867	0.2508	0.2636
*120	0.1873	0.5499	0.1873	0.1110	0.2280	28.518	4	4.261	2.410	0.0867	0.1873	0.4501
*240	0.0278	0.0815	0.0278	0.0120	0.0510	59.750	4	8.697	2.410	0.0867	0.0278	0.9185

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.9273	0.884	-0.984	1.50589
Bartlett's Test indicates equal variances (p = 0.04)	11.3627	15.0863		

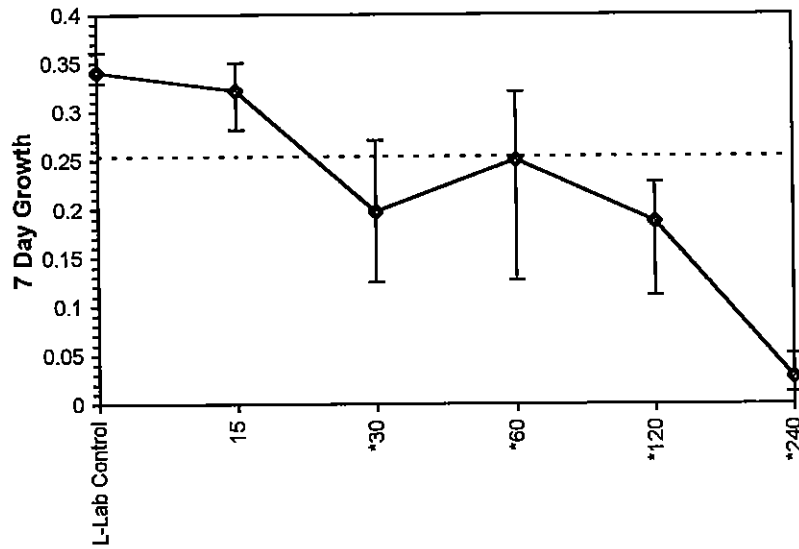
  

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	15	30	21.2132		0.08667	0.25454	0.05154	0.00259	9.1E-07	5, 18

Maximum Likelihood-Probit											
Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	1.66621	0.59443	0.50113	2.8313	0	4.74262	7.81472	0.19	1.95091	0.60016	6
Intercept	1.74936	1.14469	-0.4942	3.99296							

Point	Probits	ug/L	95% Fiducial Limits	
EC01	2.674	3.58693	0.00256	13.699
EC05	3.355	9.19878	0.05695	24.5704
EC10	3.718	15.1974	0.29361	33.9933
EC15	3.964	21.3246	0.87779	42.8033
EC20	4.158	27.9126	2.07026	52.047
EC25	4.326	35.1646	4.25587	62.5133
EC40	4.747	62.9304	22.2032	116.864
EC50	5.000	89.312	45.7122	223.407
EC60	5.253	126.753	72.733	552.625
EC75	5.674	226.837	120.833	3244.23
EC80	5.842	285.772	142.836	6776.37
EC85	6.036	374.058	171.779	16159.2
EC90	6.282	524.867	214.57	48699.7
EC95	6.645	867.14	294.985	252685
EC99	7.326	2223.81	526.377	5645482



Freshwater Chronic Bioassay

Larval Fish Survival & Weights

Test Species: P. promelas

Client Name: Intermed

Test Date: 3-18-04

Sample ID: 006b

Test No.: 040318PPRT

Conc. (µg/L)	Rep.	Test Day							Percent Survival	pan wt. (g)	pan + fish (g)	
		0	1	2	3	4	5	6				7
CC	a	10	9	9	9	9	9	9	9	90	0.02604	0.02943
	b	10	10	10	10	10	10	10	10	100	0.02888	0.03249
	c	10	10	10	10	10	10	10	10	100	0.03173	0.03506
	d	10	10	10	10	10	10	10	10	100	0.02398	0.02727
15	a	10	9	9	8	8	8	8	8	80	0.03631	0.03913
	b	10	10	10	10	9	9	9	9	90	0.03019	0.03339
	c	10	10	10	10	10	10	9	9	90	0.03419	0.03755
	d	10	10	10	9	9	9	9	9	90	0.03079	0.03430
30	a	10	9	8	8	8	8	8	8	70	0.03334	0.03504
	b	10	10	10	9	9	9	9	9	90	0.03276	0.03547
	c	10	9	9	9	6	6	6	6	100	0.03075	0.03302
	d	10	5	5	5	3	3	3	3	30	0.03500	0.03631
60	a	10	10	10	10	8	8	8	8	80	0.03201	0.03521
	b	10	7	7	7	5	5	5	4	40	0.03944	0.04071
	c	10	8	8	8	8	8	7	7	70	0.03464	0.03737
	d	10	8	8	5	6	6	6	6	60	0.02860	0.03143
120	a	10	7	7	7	6	6	6	6	60	0.03500	0.03770
	b	10	9	7	6	5	5	5	4	40	0.03289	0.03400
	c	10	8	7	7	7	7	7	6	60	0.02998	0.03188
	d	10	8	8	5	8	8	8	8	80	0.02861	0.03059
240	a	10	6	4	4	3	3	2	2	20	0.03321	0.03343
	b	10	8	4	3	3	3	3	3	30	0.02972	0.02994
	c	10	5	3	3	2	2	2	2	20	0.02941	0.02992
	d	10	4	4	4	4	4	3	3	20	0.03111	0.03137
	a	10										
	b	10										
	c	10										
	d	10										
Tech Initials		MT/SH	AW	SH	RG	RG	SH	RG	MC			

Feeding Times (day):

	0	1	2	3	4	5	6
—	0815	0906	0930	1245	0830	0815	
—	1245	1130	1510		1245	1445	
—	1515	1700	1400	150	1740	1630	1530

Comments: \_\_\_\_\_

Weight Data:

Date/Time in: 3-20-04 1740  
 Date/Time out: 3-26-04 1345  
 Oven Temp (°C): 58  
 Tech Initials: SD

QC Check: 3/29/04  
 Final Review: 3/29/04

Client: Internal

Test Species: P. promelas

Sample ID: CuCl<sub>2</sub>

Test Date: 3-18-04

Test No: 040318PPRT

Start/End Times: 1430 / 1300

Concentration	LC							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.20	8.26	8.18	8.11	7.92	7.90	8.11	
DO (mg/L)	7.4	8.1	8.1	8.0	7.6	7.7	6.8	
Cond. (µmhos-cm)	204	205	203	211	207	207	209	
Temp (°C)	25.3	25.3	25.0	24.1	25.0	24.7	24.9	
Final								
pH		8.22	7.91	7.83	8.04	8.00	8.15	7.91
DO (mg/L)		6.8	6.7	5.2	6.2	6.1	6.4	6.5
Temp (°C)		24.8	24.1	24.5	24.5	24.2	25.1	24.4

Concentration	600 µg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.23	8.28	8.15	8.14	7.97	7.89	8.11	
DO (mg/L)	7.3	8.2	8.2	8.1	7.5	7.8	7.9	
Cond. (µmhos-cm)	201	200	200	202	205	204	207	
Temp (°C)	24.4	25.4	25.1	24.6	24.9	25.0	25.0	
Final								
pH		8.14	8.00	7.92	8.04	7.91	7.98	7.85
DO (mg/L)		7.3	7.4	6.5	6.9	7.1	6.7	6.7
Temp (°C)		25.4	24.0	24.3	24.6	24.7	25.1	25.0

Concentration	15 µg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.22	8.26	8.15	8.12	7.95	7.97	8.10	
DO (mg/L)	7.8	8.1	8.1	8.2	7.5	7.7	7.9	
Cond. (µmhos-cm)	203	205	203	211	204	207	209	
Temp (°C)	24.7	25.4	25.6	24.6	25.2	25.0	24.9	
Final								
pH		8.15	7.96	7.68	8.02	7.90	8.05	7.91
DO (mg/L)		7.0	7.1	6.2	6.4	6.2	6.4	6.7
Temp (°C)		25.3	24.1	24.4	24.7	24.0	25.3	24.7

Concentration	120 µg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.24	8.25	8.17	8.15	7.94	7.88	8.11	
DO (mg/L)	7.8	8.2	8.2	8.1	7.5	7.8	7.9	
Cond. (µmhos-cm)	191	199	199	199	203	203	205	
Temp (°C)	24.3	25.5	25.1	24.7	24.8	25.5	25.0	
Final								
pH		8.13	8.00	7.96	8.05	7.95	8.01	7.83
DO (mg/L)		7.3	7.5	6.8	7.1	7.3	7.1	6.6
Temp (°C)		25.3	24.1	24.0	24.5	24.1	25.0	24.9

Concentration	30 µg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.23	8.27	8.19	8.12	7.96	7.90	8.10	
DO (mg/L)	7.7	8.2	8.1	8.1	7.6	7.8	7.9	
Cond. (µmhos-cm)	201	203	202	209	205	206	203	
Temp (°C)	24.9	25.6	25.1	24.6	25.2	25.0	24.9	
Final								
pH		8.15	7.98	7.91	8.00	7.81	8.00	7.84
DO (mg/L)		7.2	7.4	6.3	6.5	6.8	6.3	6.4
Temp (°C)		25.4	24.1	24.3	24.7	24.1	25.3	25.0

Concentration	240 µg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.26	8.27	8.15	8.17	7.94	7.87	8.10	
DO (mg/L)	7.7	8.3	8.2	8.1	7.5	7.9	7.9	
Cond. (µmhos-cm)	198	197	198	200	202	201	203	
Temp (°C)	24.6	25.4	25.1	24.7	24.7	25.0	25.0	
Final								
pH		8.13	8.02	8.01	8.05	7.99	8.05	7.99
DO (mg/L)		7.5	7.6	6.9	7.1	7.4	7.3	7.4
Temp (°C)		25.2	24.1	24.3	24.4	24.0	25.0	24.7

Animal Source/Date Received: ABS / 3-18-04

Analysts:	Initial:	KIC	ME	MC	RLG	AH	AW	RL
	Final:	KIC	SH	AH	AH	AW	MC	AW

Animal Age at Infiltration: < 48 hrs

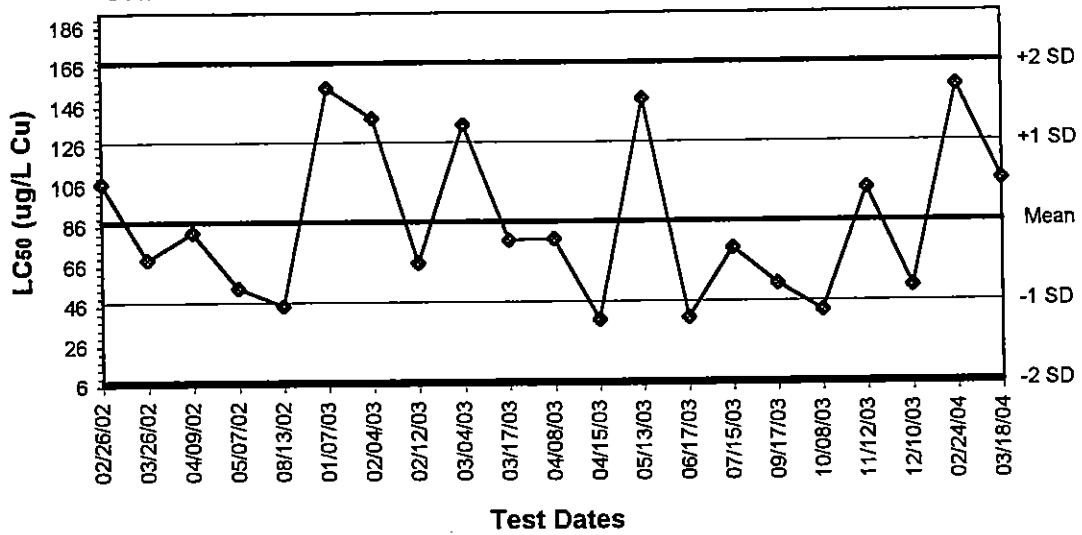
Comments:

QC Check: 3/29/04

Final Review: BOS 3-29-04

## Copper (II) Chloride Reference Toxicant Control Chart - *Pimephales promelas* 7-Day Survival

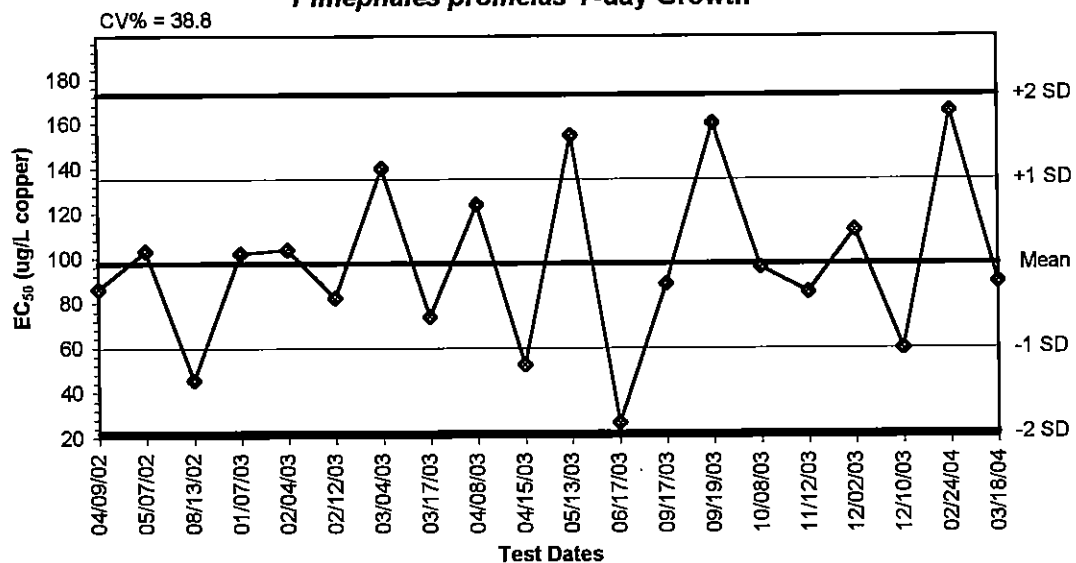
CV% = 45.6



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
02/26/02	107.4362	87.8545	47.8357	7.8169	127.8732	167.8920
03/26/02	69.5314	87.8545	47.8357	7.8169	127.8732	167.8920
04/09/02	82.7708	87.8545	47.8357	7.8169	127.8732	167.8920
05/07/02	55.1305	87.8545	47.8357	7.8169	127.8732	167.8920
08/13/02	45.8862	87.8545	47.8357	7.8169	127.8732	167.8920
01/07/03	155.4388	87.8545	47.8357	7.8169	127.8732	167.8920
02/04/03	140.0516	87.8545	47.8357	7.8169	127.8732	167.8920
02/12/03	67.5523	87.8545	47.8357	7.8169	127.8732	167.8920
03/04/03	136.7841	87.8545	47.8357	7.8169	127.8732	167.8920
03/17/03	78.6469	87.8545	47.8357	7.8169	127.8732	167.8920
04/08/03	79.2207	87.8545	47.8357	7.8169	127.8732	167.8920
04/15/03	38.5448	87.8545	47.8357	7.8169	127.8732	167.8920
05/13/03	149.7478	87.8545	47.8357	7.8169	127.8732	167.8920
06/17/03	39.5091	87.8545	47.8357	7.8169	127.8732	167.8920
07/15/03	74.4438	87.8545	47.8357	7.8169	127.8732	167.8920
09/17/03	56.5391	87.8545	47.8357	7.8169	127.8732	167.8920
10/08/03	43.1912	87.8545	47.8357	7.8169	127.8732	167.8920
11/12/03	104.2762	87.8545	47.8357	7.8169	127.8732	167.8920
12/10/03	55.3737	87.8545	47.8357	7.8169	127.8732	167.8920
02/24/04	156.3174	87.8545	47.8357	7.8169	127.8732	167.8920
03/18/04	108.5512	87.8545	47.8357	7.8169	127.8732	167.8920



**Copper (II) Chloride Reference Toxicant Control Chart -  
Pimephales promelas 7-day Growth**



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
04/09/02	85.9635	97.4437	59.6827	21.9218	135.2046	172.9656
05/07/02	103.1250	97.4437	59.6827	21.9218	135.2046	172.9656
08/13/02	45.6522	97.4437	59.6827	21.9218	135.2046	172.9656
01/07/03	101.9048	97.4437	59.6827	21.9218	135.2046	172.9656
02/04/03	103.5616	97.4437	59.6827	21.9218	135.2046	172.9656
02/12/03	82.1105	97.4437	59.6827	21.9218	135.2046	172.9656
03/04/03	140.0281	97.4437	59.6827	21.9218	135.2046	172.9656
03/17/03	73.5889	97.4437	59.6827	21.9218	135.2046	172.9656
04/08/03	123.7772	97.4437	59.6827	21.9218	135.2046	172.9656
04/15/03	52.4483	97.4437	59.6827	21.9218	135.2046	172.9656
05/13/03	154.7297	97.4437	59.6827	21.9218	135.2046	172.9656
06/17/03	26.3845	97.4437	59.6827	21.9218	135.2046	172.9656
09/17/03	88.2769	97.4437	59.6827	21.9218	135.2046	172.9656
09/19/03	160.1437	97.4437	59.6827	21.9218	135.2046	172.9656
10/08/03	95.8075	97.4437	59.6827	21.9218	135.2046	172.9656
11/12/03	84.6014	97.4437	59.6827	21.9218	135.2046	172.9656
12/02/03	112.3664	97.4437	59.6827	21.9218	135.2046	172.9656
12/10/03	59.6613	97.4437	59.6827	21.9218	135.2046	172.9656
02/24/04	165.4302	97.4437	59.6827	21.9218	135.2046	172.9656
03/18/04	89.3120	97.4437	59.6827	21.9218	135.2046	172.9656

*C. DUBIA*

**Ceriodaphnia Survival and Reproduction Test-7 Day Survival**

Start Date: 03/18/2004      Test ID: 040318CDRT      Sample ID: REF-Ref Toxicant  
 End Date: 03/25/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: CUCL-Copper chloride  
 Sample Date:      Protocol: EPAF 02-EPA Freshwater C      Test Species: CD-Ceriodaphnia dubia  
 Comments:

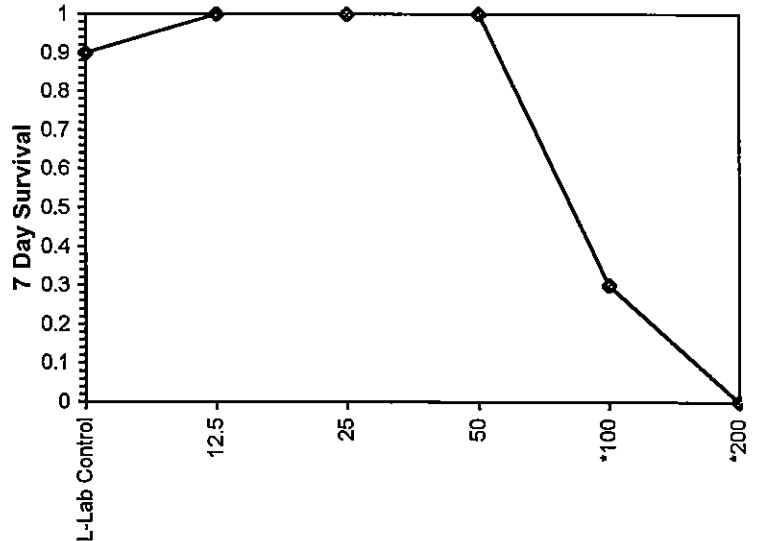
Conc-ug/L	1	2	3	4	5	6	7	8	9	10
L-Lab Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000
12.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1.0000
200	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-ug/L	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's 1-Tailed		Isotonic	
							Exact P	Critical	Mean	N-Mean
L-Lab Control	0.9000	1.0000	1	9	10	10			0.9750	1.0000
12.5	1.0000	1.1111	0	10	10	10	0.5000	0.0500	0.9750	1.0000
25	1.0000	1.1111	0	10	10	10	0.5000	0.0500	0.9750	1.0000
50	1.0000	1.1111	0	10	10	10	0.5000	0.0500	0.9750	1.0000
*100	0.3000	0.3333	7	3	10	10	0.0099	0.0500	0.3000	0.3077
*200	0.0000	0.0000	10	0	10	10	0.0001	0.0500	0.0000	0.0000

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	50	100	70.7107	

**Linear Interpolation (200 Resamples)**

Point	ug/L	SD	95% CL		Skew
IC05	53.611	1.117	52.500	56.500	3.1843
IC10	57.222	2.235	55.000	63.000	3.1843
IC15	60.833	3.352	57.500	69.500	3.1843
IC20	64.444	4.470	60.000	76.000	3.1843
IC25	68.056	5.355	62.500	82.500	2.6193
IC40	78.889	8.070	70.000	102.500	1.9119
IC50	86.111	10.380	75.000	118.750	1.7575



**Ceriodaphnia Survival and Reproduction Test-Reproduction**

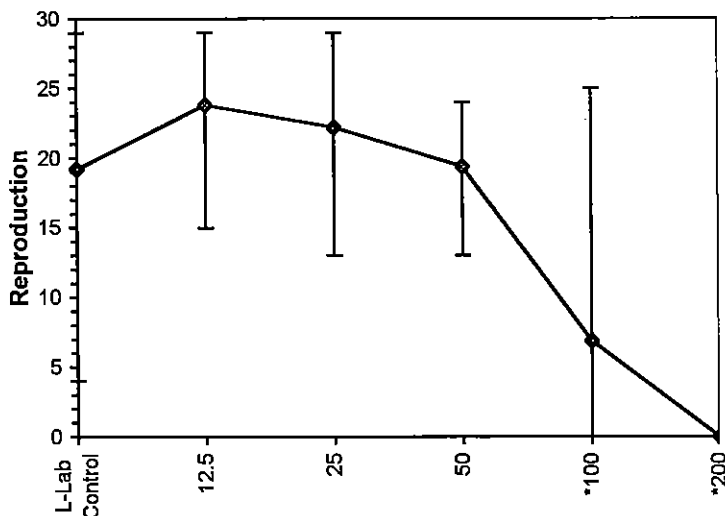
Start Date: 03/18/2004      Test ID: 040318CDRT      Sample ID: REF-Ref Toxicant  
 End Date: 03/25/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: CUCL-Copper chloride  
 Sample Date:      Protocol: EPAF 02-EPA Freshwater C      Test Species: CD-Ceriodaphnia dubia  
 Comments:

Conc-ug/L	1	2	3	4	5	6	7	8	9	10
L-Lab Control	4.000	27.000	22.000	29.000	24.000	24.000	5.000	25.000	17.000	15.000
12.5	15.000	29.000	22.000	29.000	27.000	23.000	25.000	29.000	20.000	19.000
25	29.000	27.000	28.000	27.000	26.000	24.000	13.000	16.000	14.000	18.000
50	24.000	13.000	23.000	24.000	18.000	23.000	19.000	21.000	16.000	13.000
100	25.000	12.000	0.000	0.000	5.000	0.000	15.000	0.000	0.000	12.000
200	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Conc-ug/L	Transform: Untransformed							Rank Sum	1-Tailed Critical	Isotonic	
	Mean	N-Mean	Mean	Min	Max	CV%	N			Mean	N-Mean
L-Lab Control	19.200	1.0000	19.200	4.000	29.000	45.920	10			21.733	1.0000
12.5	23.800	1.2396	23.800	15.000	29.000	20.373	10	119.50	75.00	21.733	1.0000
25	22.200	1.1563	22.200	13.000	29.000	28.155	10	115.50	75.00	21.733	1.0000
50	19.400	1.0104	19.400	13.000	24.000	22.164	10	96.00	75.00	19.400	0.8926
*100	6.900	0.3594	6.900	0.000	25.000	126.612	10	70.50	75.00	6.900	0.3175
*200	0.000	0.0000	0.000	0.000	0.000	0.000	10	55.00	75.00	0.000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates normal distribution (p > 0.01)	0.78457	1.035	-0.0858	0.71672
Equality of variance cannot be confirmed				
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	50	100	70.7107	

Linear Interpolation (200 Resamples)					
Point	ug/L	SD	95% CL		Skew
IC05	36.643	12.244	15.630	54.372	0.0550
IC10	48.286	12.621	19.391	58.852	-0.0090
IC15	53.707	10.714	23.104	63.786	-0.0422
IC20	58.053	9.146	36.319	69.231	0.6729
IC25	62.400	8.310	47.329	74.589	2.2357
IC40	75.440	9.505	63.634	94.951	2.3313
IC50	84.133	11.082	71.775	113.131	2.0353



Client/Sample ID: Internal CuCl<sub>2</sub>  
 Test No: CuCl<sub>2</sub> 040318edrt

Start Date: 3.18.04  
 Start Time: 1100

End Date: 3-25-04  
 End Time: 0950

Conc.	Rep	Daily Reproduction/ Survival								Total	QC
		1	2	3	4	5	6	7	8		
LL	1	0	0	0	2	0	2	0	✓	4	
	2	0	0	0	10	0	11	15	✓	27	
	3	0	0	0	6	7	9	0	✓	22	
	4	0	0	0	7	8	0	14	✓	29	13mc
	5	0	0	5	10	0	9	6	✓	24	
	6	0	0	5	0	9	10	0	✓	24	
	7	0	0	0	2	0	3	0	✓	5	
	8	0	0	0	6	10	0	9	✓	25	
	9	0	0	0	4	5	0	8	✓	17	
	10	0	0	0	6	9	crd	-	-	15	
Analyst	SD	AH	ME	MC	AW	AW	AW	SS			

Conc.	Rep	Daily Reproduction/ Survival								Total	QC
		1	2	3	4	5	6	7	8		
50	1	0	0	0	6	7	0	11	✓	24	
	2	0	0	0	4	0	9	0	✓	13	
	3	0	0	0	0	10	8	1	✓	23	1mc
	4	0	0	0	6	9	0	9	✓	24	
	5	0	0	5	6	0	7	13	✓	18	
	6	0	0	5	0	0	8	0	✓	23	
	7	0	0	0	2	7	0	10	✓	19	
	8	0	0	0	6	6	0	9	✓	21	
	9	0	0	0	4	5	7	0	✓	16	
	10	0	0	0	6	0	0	4	✓	13	

Conc.	Rep	Daily Reproduction/ Survival								Total	QC
		1	2	3	4	5	6	7	8		
12.5	1	0	0	0	5	5	0	5	✓	15	
	2	0	0	0	4	0	13	0	✓	27	
	3	0	0	0	4	9	0	9	✓	22	
	4	0	0	0	7	10	0	12	✓	29	
	5	0	0	5	9	0	13	16	✓	25	
	6	0	0	6	0	7	10	0	✓	23	0mc
	7	0	0	0	6	8	0	11	✓	25	
	8	0	0	0	7	10	0	12	✓	29	
	9	0	0	0	2	9	0	9	✓	20	
	10	0	0	0	5	7	0	7	✓	19	

Conc.	Rep	Daily Reproduction/ Survival								Total	QC
		1	2	3	4	5	6	7	8		
100	1	0	0	0	5	7	0	13	✓	25	
	2	0	0	0	4	0	5	0	✓	12	
	3	old	-	-	-	-	-	-	-	0/d	
	4	0	0	0	old	-	-	-	-	0/d	
	5	0	0	5	0	old	-	-	-	0/d	
	6	0	old	-	-	-	-	-	-	0/d	
	7	0	0	0	0	6	0	9/d	-	15/d	
	8	0	0	old	-	-	-	-	-	0/d	
	9	0	old	-	-	-	-	-	-	0/d	
	10	0	0	0	0	5	0	7	✓	12	9mc

Conc.	Rep	Daily Reproduction/ Survival								Total	QC
		1	2	3	4	5	6	7	8		
25	1	0	0	0	7	10	0	12	✓	29	
	2	0	0	0	9	9	1	12	✓	27	
	3	0	0	0	7	10	0	11	✓	28	
	4	0	0	0	6	9	0	12	✓	27	
	5	0	0	7	4	0	10	11	✓	25	
	6	0	0	7	0	8	9	0	✓	24	
	7	0	0	0	7	4	0	2	✓	13	
	8	0	0	0	3	5	0	7	✓	14	
	9	0	0	0	3	4	0	7	✓	14	4mc
	10	0	0	0	7	3	0	8	✓	18	

Conc.	Rep	Daily Reproduction/ Survival								Total	QC
		1	2	3	4	5	6	7	8		
200	1	0	0	old	-	-	-	-	-	0/d	
	2	0	0	old	-	-	-	-	-	0/d	
	3	0	old	-	-	-	-	-	-	0/d	
	4	0	old	-	-	-	-	-	-	0/d	
	5	0	old	-	-	-	-	-	-	0/d	
	6	old	-	-	-	-	-	-	-	0/d	
	7	0	old	-	-	-	-	-	-	0/d	
	8	old	-	-	-	-	-	-	-	0/d	
	9	0	old	-	-	-	-	-	-	0/d	
	10	0	old	-	-	-	-	-	-	0/d	

Time Fed (day): (0) 1100 (1) 1015 (2) 1030 (3) 1145 (4) 1330 (5) 1545 (6) 1100 (7) \_\_\_\_\_ (8) \_\_\_\_\_

Comments: \_\_\_\_\_

QC Check: AH 3/29/04

Final Review: BCS 3/30/04

Freshwater Chronic Bioassay

Brood Selection Datasheet

Client/Sample ID: Internal / CUC12  
Test Number: 040318cd rt  
Test Species: C. dubia

Start Date: 3.18.04  
Start Time: 1100

Test Rep #	Brood Board #	Cup #
1	14	2
2		3
3		6
4		7
5		8
6		10
7		12
8		15
9		16
10		17

Verified by: [Signature]

Comments: \_\_\_\_\_

QC Check: [Signature] 3/24/04

Final Review: Exs 4/1/04

Client: Internal

Sample ID: Cuc12

Test No: DA0318CDRT

Test Species: C. dubia

Test Date: 3.18.04

Start/End Times: 11:00, 0950

Concentration	LC							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.28	8.09	8.12	8.20	8.16	7.92	8.20	
DO (mg/L)	7.6	7.8	8.0	7.9	7.6	7.8	8.0	
Cond. (µmhos-cm)	205	201	209	204	209	205	205	
Temp (°C)	24.2	24.1	24.9	25.1	24.9	25.0	24.8	
Final								
pH		8.00	8.15	8.18	8.02	8.14	8.05	8.01
DO (mg/L)		8.1	8.2	7.9	8.3	8.4	8.4	7.5
Temp (°C)		25.0	25.5	24.8	24.0	25.1	25.0	25.0

Concentration	50 µg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.27	8.23	8.16	8.17	8.04	7.88	8.13	
DO (mg/L)	7.4	7.8	8.2	7.9	7.8	7.4	8.0	
Cond. (µmhos-cm)	198	197	202	203	205	204	205	
Temp (°C)	25.0	24.5	25.5	25.2	25.5	25.1	25.0	
Final								
pH		8.06	8.12	8.22	8.01	8.11	8.07	7.95
DO (mg/L)		8.0	8.2	7.9	8.4	8.3	8.2	7.3
Temp (°C)		25.0	25.5	24.9	24.0	25.1	25.0	25.0

Concentration	12.5 µg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.24	8.19	8.15	8.14	8.03	7.97	8.18	
DO (mg/L)	7.5	7.7	8.2	8.0	7.6	7.7	8.1	
Cond. (µmhos-cm)	198	206	203	204	208	205	205	
Temp (°C)	24.2	24.6	25.8	25.1	25.8	25.2	25.0	
Final								
pH		8.03	8.19	8.21	8.01	8.14	8.07	8.00
DO (mg/L)		8.3	8.4	7.8	8.3	8.3	8.2	7.5
Temp (°C)		25.0	25.5	24.9	24.0	25.1	25.0	25.0

Concentration	100 µg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.15	8.25	8.18	8.17	8.06	7.88	8.12	
DO (mg/L)	7.4	7.9	8.0	7.4	7.6	8.0	8.0	
Cond. (µmhos-cm)	197	197	199	200	204	204	204	
Temp (°C)	25.5	24.3	25.5	25.1	25.3	25.0	25.0	
Final								
pH		8.06	8.13	8.05	8.03	8.14	8.12	8.07
DO (mg/L)		8.0	8.2	8.1	8.3	8.1	8.4	7.8
Temp (°C)		25.0	25.5	24.9	24.0	25.1	25.0	25.0

Concentration	25 µg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.22	8.21	8.16	8.14	8.00	7.88	8.14	
DO (mg/L)	7.5	7.8	8.3	7.9	7.6	7.4	8.0	
Cond. (µmhos-cm)	198	206	202	203	205	206	205	
Temp (°C)	24.0	24.6	25.5	25.1	25.4	25.1	25.1	
Final								
pH		8.04	8.14	8.22	8.02	8.15	8.07	7.97
DO (mg/L)		7.8	8.3	7.9	8.4	8.5	8.1	7.3
Temp (°C)		25.0	25.5	24.9	24.0	25.1	25.0	25.0

Concentration	200 µg/L							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.18	8.25	8.19	8.16				
DO (mg/L)	7.7	7.9	8.2	7.4				
Cond. (µmhos-cm)	194	197	198	197				
Temp (°C)	24.0	24.2	25.5	25.2				
Final								
pH		8.10	8.12	8.15				
DO (mg/L)		8.2	8.2	8.1				
Temp (°C)		25.0	25.5	24.9	24.0			

Animal Source/Date Recolored: Internal N/A

Animal Age at Initiation: < 24 hrs

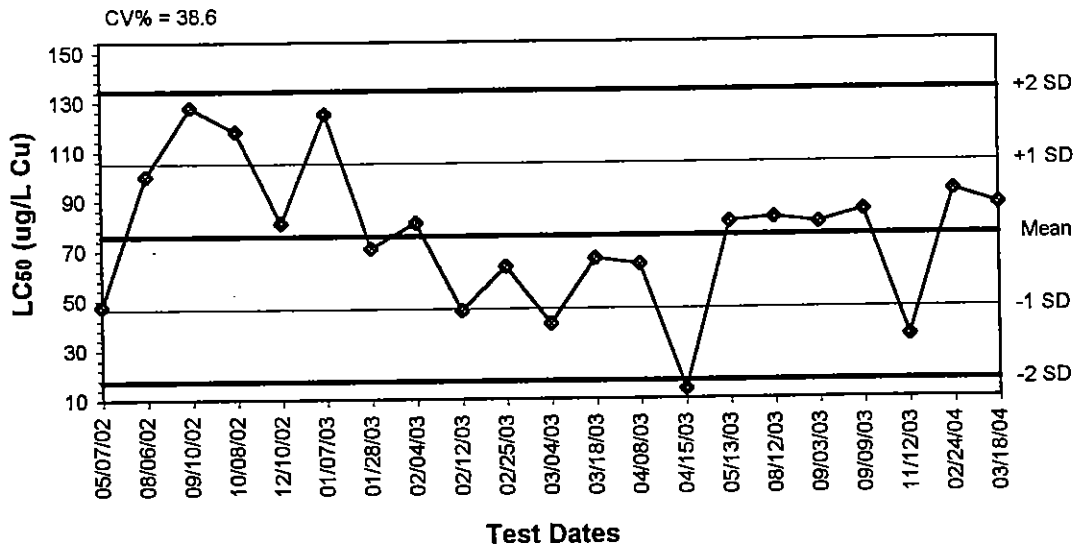
Comments:

QC Check: OK 3/29/04

Analysts:	Initial:	0	1	2	3	4	5	6	7
		SS	me	me	Rg	AH	AW	mc	
	Final:		AW	mc	Rg	AW	AW	AW	SS

Final Review: BKS 3/30/04

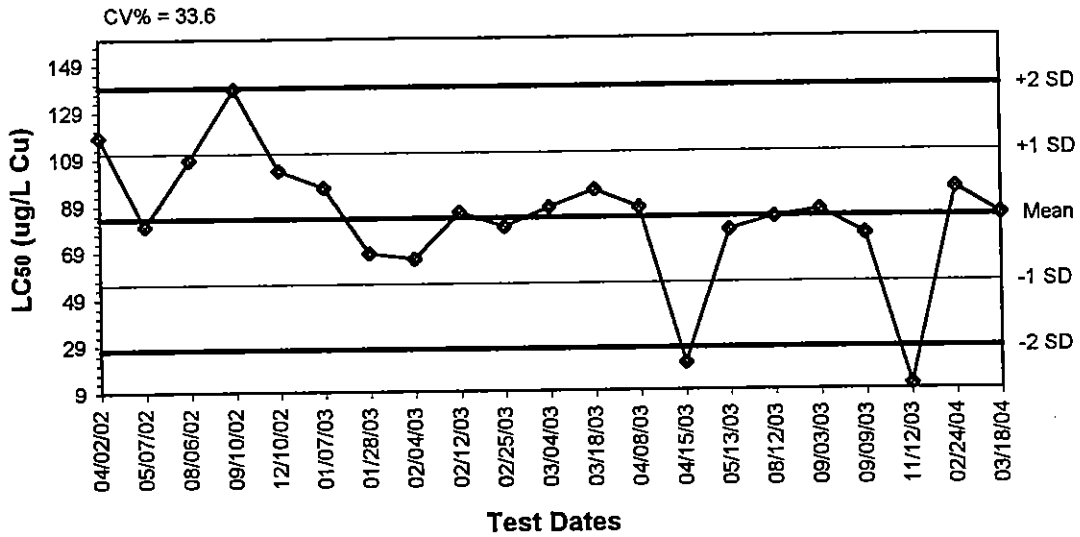
## Copper (II) Chloride Reference Toxicant Control Chart - *Ceriodaphnia dubia* 7-Day Survival



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
05/07/02	47.6766	75.7132	46.4802	17.2473	104.9462	134.1792
08/06/02	100.0000	75.7132	46.4802	17.2473	104.9462	134.1792
09/10/02	127.8699	75.7132	46.4802	17.2473	104.9462	134.1792
10/08/02	118.0938	75.7132	46.4802	17.2473	104.9462	134.1792
12/10/02	80.9976	75.7132	46.4802	17.2473	104.9462	134.1792
01/07/03	125.1388	75.7132	46.4802	17.2473	104.9462	134.1792
01/28/03	70.7107	75.7132	46.4802	17.2473	104.9462	134.1792
02/04/03	80.9921	75.7132	46.4802	17.2473	104.9462	134.1792
02/12/03	45.5731	75.7132	46.4802	17.2473	104.9462	134.1792
02/25/03	63.1922	75.7132	46.4802	17.2473	104.9462	134.1792
03/04/03	40.1284	75.7132	46.4802	17.2473	104.9462	134.1792
03/18/03	66.3130	75.7132	46.4802	17.2473	104.9462	134.1792
04/08/03	63.9491	75.7132	46.4802	17.2473	104.9462	134.1792
04/15/03	13.8366	75.7132	46.4802	17.2473	104.9462	134.1792
05/13/03	80.9976	75.7132	46.4802	17.2473	104.9462	134.1792
08/12/03	82.6376	75.7132	46.4802	17.2473	104.9462	134.1792
09/03/03	80.5363	75.7132	46.4802	17.2473	104.9462	134.1792
09/09/03	85.3795	75.7132	46.4802	17.2473	104.9462	134.1792
11/12/03	35.1305	75.7132	46.4802	17.2473	104.9462	134.1792
02/24/04	93.3033	75.7132	46.4802	17.2473	104.9462	134.1792
03/18/04	87.5205	75.7132	46.4802	17.2473	104.9462	134.1792



**Copper (II) Chloride Reference Toxicant Control Chart -  
Ceriodaphnia dubia Three Brood Reproduction**



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
04/02/02	118.3415	83.2815	55.3098	27.3380	111.2532	139.2250
05/07/02	80.2169	83.2815	55.3098	27.3380	111.2532	139.2250
08/06/02	108.4936	83.2815	55.3098	27.3380	111.2532	139.2250
09/10/02	138.8480	83.2815	55.3098	27.3380	111.2532	139.2250
12/10/02	103.9416	83.2815	55.3098	27.3380	111.2532	139.2250
01/07/03	96.7391	83.2815	55.3098	27.3380	111.2532	139.2250
01/28/03	68.2008	83.2815	55.3098	27.3380	111.2532	139.2250
02/04/03	65.8301	83.2815	55.3098	27.3380	111.2532	139.2250
02/12/03	85.6216	83.2815	55.3098	27.3380	111.2532	139.2250
02/25/03	79.4208	83.2815	55.3098	27.3380	111.2532	139.2250
03/04/03	87.5000	83.2815	55.3098	27.3380	111.2532	139.2250
03/18/03	94.8458	83.2815	55.3098	27.3380	111.2532	139.2250
04/08/03	87.2449	83.2815	55.3098	27.3380	111.2532	139.2250
04/15/03	20.7237	83.2815	55.3098	27.3380	111.2532	139.2250
05/13/03	77.6377	83.2815	55.3098	27.3380	111.2532	139.2250
08/12/03	82.9186	83.2815	55.3098	27.3380	111.2532	139.2250
09/03/03	86.1003	83.2815	55.3098	27.3380	111.2532	139.2250
09/09/03	75.6579	83.2815	55.3098	27.3380	111.2532	139.2250
11/12/03	11.1607	83.2815	55.3098	27.3380	111.2532	139.2250
02/24/04	95.3346	83.2815	55.3098	27.3380	111.2532	139.2250
03/18/04	84.1333	83.2815	55.3098	27.3380	111.2532	139.2250

*S. CAPRICORNUTUM*

**Phytoplankton Test-Growth-Cell Density**

Start Date: 03/18/2004 Test ID: 040318SCRT Sample ID: REF-Ref Toxicant  
 End Date: 03/22/2004 Lab ID: AEESD-AMEC Bioassay SD Sample Type: CUCL-Copper chloride  
 Sample Date: Protocol: EPAF 02-EPA Freshwater C Test Species: SC-Selenastrum capricornutum  
 Comments:

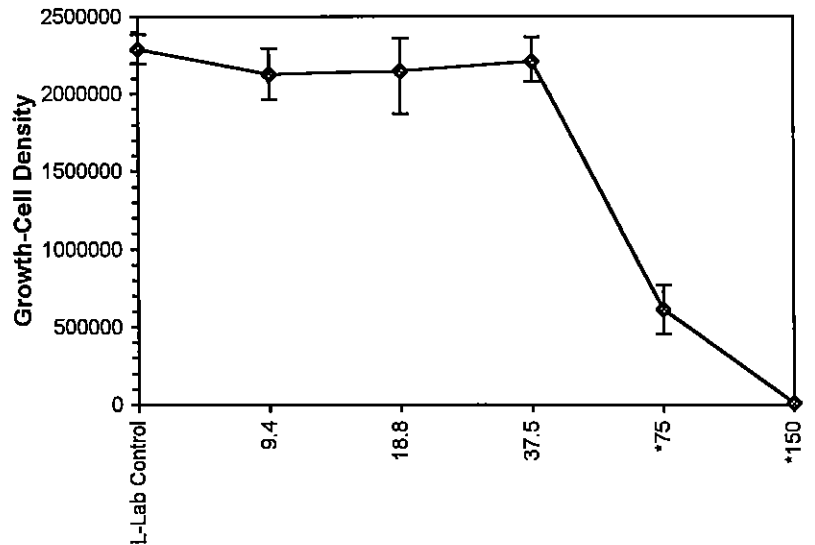
Conc-ug/L	1	2	3	4
L-Lab Control	2196000	2271000	2312000	2386000
9.4	2028000	1962000	2233000	2291000
18.8	1875000	2364000	2294000	2079000
37.5	2081000	2371000	2081000	2318000
75	455000	499000	772000	730000
150	12000	14000	17000	12000

Conc-ug/L	Transform: Untransformed							Rank Sum	1-Tailed Critical	Mean	N-Mean
	Mean	N-Mean	Mean	Min	Max	CV%	N				
L-Lab Control	2291250	1.0000	2291250	2196000	2386000	3.463	4			2291250	0.0000
9.4	2128500	0.9290	2128500	1962000	2291000	7.436	4	13.00	10.00	2128500	0.0710
18.8	2153000	0.9397	2153000	1875000	2364000	10.287	4	15.00	10.00	2153000	0.0603
37.5	2212750	0.9657	2212750	2081000	2371000	6.944	4	16.00	10.00	2212750	0.0343
*75	614000	0.2680	614000	455000	772000	26.080	4	10.00	10.00	614000	0.7320
*150	13750	0.0060	13750	12000	17000	17.185	4	10.00	10.00	13750	0.9940

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.95609	0.884	-0.2024	-0.8289
Bartlett's Test indicates unequal variances (p = 5.34E-04)	21.9552	15.0863		
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	37.5	75	53.033	

Parameter	Value	SE	95% Fiducial Limits		Maximum Likelihood-Probit						
			Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter		
Slope	8.09217	3.07174	2.07156	14.1128	0	1.82651	7.81472	0.61	1.79862	0.12358	6
Intercept	-9.5547	5.71609	-20.758	1.64882							

Point	Probits	ug/L	95% Fiducial Limits	
EC01	2.674	32.4443	3.1151	46.1873
EC05	3.355	39.3871	6.62171	51.7952
EC10	3.718	43.6767	9.88794	55.1152
EC15	3.964	46.8318	12.9501	57.5172
EC20	4.158	49.5011	16.0363	59.5403
EC25	4.326	51.9121	19.2506	61.3754
EC40	4.747	58.521	30.3388	66.6159
EC50	5.000	62.8955	39.5456	70.5874
EC60	5.253	67.5969	50.5786	76.2268
EC75	5.674	76.2027	67.1139	98.2653
EC80	5.842	79.9142	71.2736	114.5
EC85	6.036	84.4691	75.1311	139.238
EC90	6.282	90.5709	79.3218	180.252
EC95	6.645	100.435	85.1012	266.966
EC99	7.326	121.927	96.0111	564.072



Fluorometric & Microscopic Determination of Cell Density  
Turner Fluorometer Model TD-700

Test Species: S. capricornutum

Client: Internal

Test Date: 3/18/04

Sample ID: CuCl<sub>2</sub>

Start/End Times: 1405/1530

Test No: 040318SCT

Analyst: AH

Random Number	Dilution	Cell Density (fluorometric) (cells/ml * 10 <sup>6</sup> )	Cell Density (microscopic) (cells/ml * 10 <sup>4</sup> )
Blank	NA	0	
Cal Check 1 (NEW, Solid, Effluent Blanks)		0, 2.65	
29		0.14	
30		4.99	
31		23.64	
32		23.71	
33		22.33	
34		0.12	
35		20.81	
36		22.94	
37		20.81	
38		22.91	
39		23.12	
40		21.96	
Cal Check 2 (NEW, Solid, Effluent Blanks)		0, 2.65	
41		23.86	
42		22.71	
43		23.13	
44		7.30	
45		0.12	
46		18.75	
47		19.62	
48		4.55	
49		7.72	
50		20.28	
51		20.79	
52		0.17	
Cal Check 3 (NEW, Solid, Effluent Blanks)		0, 2.65	

Comments: \_\_\_\_\_

QC Check: ~~AH~~ 3/23/04

Final Review: BCS 3/30/04

Test: PY-Phytoplankton Test      Test ID: 040318SCRT  
 Species: SC-Selenastrum capricornutum      Protocol: EPAF 02-EPA FW Chronic  
 Sample ID: REF-Ref Toxicant      Sample Type: CUCL-Copper chloride  
 Start Date: 03/18/2004      End Date: 03/22/2004      Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Cell Density 10 <sup>6</sup> cell/mL	Absorbance OD/cm	Biomass mg/L	Chlorophyll a mg/m <sup>3</sup>	Notes
40	1	1	L-Lab Control					
42	2	2	L-Lab Control					
39	3	3	L-Lab Control					
41	4	4	L-Lab Control					
50	5	1	9.4					
47	6	2	9.4					
33	7	3	9.4					
38	8	4	9.4					
46	9	1	18.8					
31	10	2	18.8					
36	11	3	18.8					
51	12	4	18.8					
35	13	1	37.5					
32	14	2	37.5					
37	15	3	37.5					
43	16	4	37.5					
48	17	1	75					
30	18	2	75					
49	19	3	75					
44	20	4	75					
45	21	1	150					
29	22	2	150					
52	23	3	150					
34	24	4	150					

Comments:

QC:mc

Freshwater Chronic Bioassay

Algal Growth Inhibition Worksheet

Client : URS, Internal  
Sample ID: River Rock Casino, CuCl<sub>2</sub>  
Test No: 0403-130, 0403185CRT

Test Species: S. capricornutum  
Test Date: 3/18/04  
Analyst: ~~AB~~

Source/Date Stock Culture Started: 3/11/04 - in-house culture

Stock Cell Density Measurements: 40.74  
40.66  
39.91  
40.02  
40.22

Mean: 40.31

(mean no. \* 100,000)/(500,000) = x (dilution factor):

8.062 1 pt stock = 20 ml  
1.062 pt NEW = 141.2 ml

Prepare inoculum according to the dilution factor. This yields a solution with the desired cell density of 500,000 cells/ml.

Example: (35 \* 100,000)/(500,000) = 7 (e.g. 25 ml Stock + 150 ml NEW)

Inoculate 1 ml into 3 initial count flasks containing 50 ml of NEW, stir and count on the hemacytometer. Flasks should contain a final density of 10,000 cells/ml ± 10%.

Inoculum Cell Density Confirmation Counts: 10,000  
10,000  
10,000

Mean: 10,000

Test Initiation Time: 1605

Test Termination Time: ~~1530~~ 1530

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

QC Check: ~~AB~~ 3/23/04

Final Review: BCS 3/30/04

Freshwater Chronic Bioassay

Water Quality Measurements  
Algal Growth Inhibition

Test Species: *S. capricornutum*

Client: Internal

Test Date: 3/18/04

Sample ID: CuCl<sub>2</sub>

Start/End Times: 1605/1530

Test No: 040318SERT

Analyst: [Signature]

Concentration ( <del>μg/L</del> )	Initial Readings				Final Readings	
	D.O. (mg/L)	Conductivity (umhos-cm)	Alkalinity (mg/L)	Hardness (mg/L)	D.O. (mg/L)	Conductivity (umhos-cm)
Lab control	7.3	93.1	11	15	9.9	112.8
9.4	7.3	92.2	<del>10</del>	<del>14</del>	9.9	97.1
18.8	7.3	91.8	—	—	9.9	86.1
37.5	7.3	91.8	12	15	9.9	85.9
75	7.5	91.5	—	—	9.1	89.3
150	7.4	90.9	10	13	8.8	91.1

		0 Hour	24 Hour	48 Hour	72 Hour	96 Hour
pH/Temperature (°C):	control	7.58/24.9	7.13/26.8	7.41/24.7	8.71/25.6	8.93/26.1
pH/Temperature (°C):	9.4	7.53/24.7	7.4/27.4	7.41/24.3	9.07/25.9	8.86/26.2
pH/Temperature (°C):	18.8	7.48/25.0	7.08/27.4	7.40/24.1	9.04/25.9	8.88/26.3
pH/Temperature (°C):	37.5	7.44/25.3	6.99/27.2	7.37/24.2	9.14/26.0	8.90/26.2
pH/Temperature (°C):	75	7.34/24.9	7.00/27.4	7.34/24.1	8.32/25.9	8.20/26.2
pH/Temperature (°C):	150	7.30/24.6	6.96/27.5	7.21/24.3	7.84/26.0	7.82/26.2
pH/Temperature (°C):						

Comments:

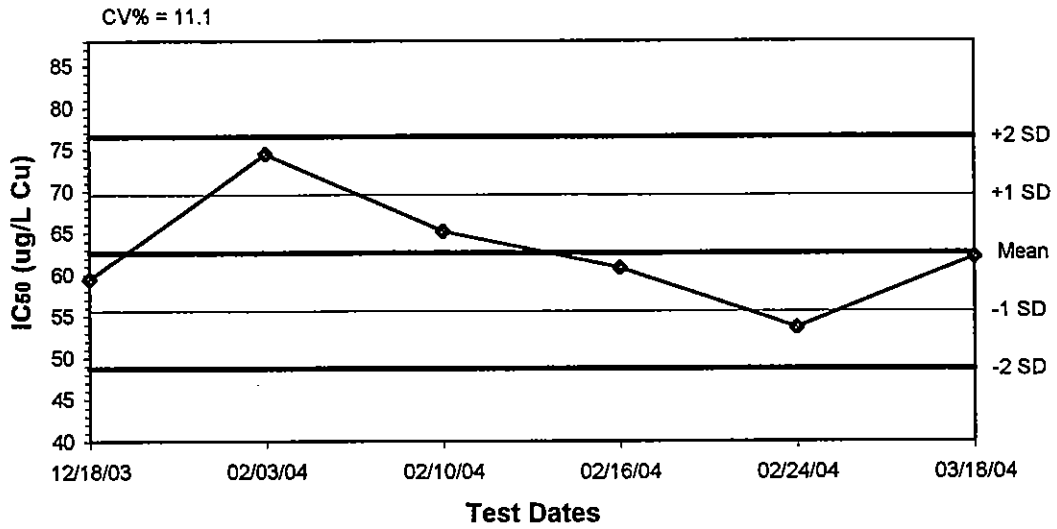
QC Check:

[Signature] 3/23/04

Final Review:

BCS 3/30/04

**Copper (II) Chloride Reference Toxicant Control Chart -  
Selenastrum capricornutum 96-hour Growth**



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
12/18/03	59.4301	62.6160	55.6573	48.6986	69.5747	76.5334
02/03/04	74.5147	62.6160	55.6573	48.6986	69.5747	76.5334
02/10/04	65.1499	62.6160	55.6573	48.6986	69.5747	76.5334
02/16/04	60.8128	62.6160	55.6573	48.6986	69.5747	76.5334
02/24/04	53.6442	62.6160	55.6573	48.6986	69.5747	76.5334
03/18/04	62.1443	62.6160	55.6573	48.6986	69.5747	76.5334



MARINE

*M. GALLOPROVINCIALIS*

**Bivalve Larval Survival and Development Test-Proportion Normal**

Start Date: 03/19/2004      Test ID: 040319mgrt      Sample ID:      Ref Toxicant  
 End Date: 03/21/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: Copper chloride  
 Sample Date:      Protocol: ASTM 93      Test Species: MG-Mytilis galloprovincialis  
 Comments:

Conc-ug/L	1	2	3	4	5
L-Lab Control	0.9011	0.9011	0.9200	0.8600	0.9400
2.5	0.9400	0.9200	0.9300	0.9000	0.9300
5	0.8900	0.9400	0.9200	0.9100	0.8900
10	0.7100	0.5200	0.6735	0.6100	0.6100
20	0.0000	0.0000	0.0000	0.0000	0.0000
40	0.0000	0.0227	0.0000	0.0000	0.0000

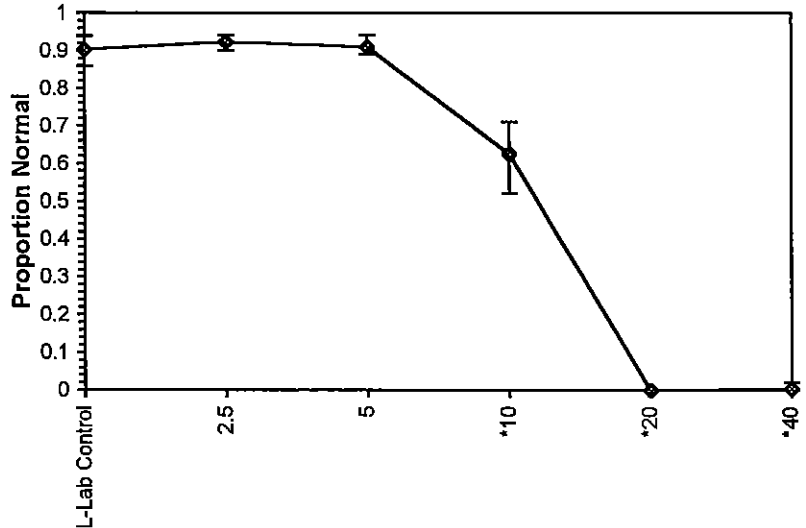
Conc-ug/L	Mean	N-Mean	Transform: Arcsin Square Root					Rank Sum	1-Tailed Critical	Number Resp	Total Number
			Mean	Min	Max	CV%	N				
L-Lab Control	0.9044	1.0000	1.2593	1.1873	1.3233	3.978	5			46	482
2.5	0.9240	1.0216	1.2925	1.2490	1.3233	2.165	5	32.00	16.00	38	500
5	0.9100	1.0061	1.2678	1.2327	1.3233	3.006	5	28.00	16.00	45	500
*10	0.6247	0.6907	0.9125	0.8054	1.0021	8.225	5	15.00	16.00	187	498
*20	0.0000	0.0000	0.0525	0.0500	0.0574	6.609	5	15.00	16.00	459	459
*40	0.0045	0.0050	0.0795	0.0522	0.1513	51.731	5	15.00	16.00	366	368

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.95985	0.9	-0.0653	1.11206
Bartlett's Test indicates unequal variances (p = 1.63E-03)	19.3834	15.0863		
<b>Hypothesis Test (1-tail, 0.05)</b>	<b>NOEC</b>	<b>LOEC</b>	<b>ChV</b>	<b>TU</b>
Steel's Many-One Rank Test	5	10	7.07107	

Parameter	Value	SE	95% Fiducial Limits	Maximum Likelihood-Probit						
				Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	8.37421	23.4348	-66.206 82.9542	0.09544	5825.26	7.81472	0.0E+00	1.0518	0.11941	5
Intercept	-3.808	24.7807	-82.671 75.0555							
TSCR	0.08585	0.32371	-0.9443 1.11602							

Point	Probits	ug/L	95% Fiducial Limits
EC01	2.674	5.94296	
EC05	3.355	7.16776	
EC10	3.718	7.92076	
EC15	3.964	8.473	
EC20	4.158	8.93924	
EC25	4.326	9.35963	
EC40	4.747	10.5087	
EC50	5.000	11.2668	
EC60	5.253	12.0797	
EC75	5.674	13.5627	
EC80	5.842	14.2005	
EC85	6.036	14.9819	
EC90	6.282	16.0265	
EC95	6.645	17.7101	
EC99	7.326	21.36	

Significant heterogeneity detected (p = 0.00E+00)



Test: BV-Bivalve Larval Survival and Development Test      Test ID: 040319mgrt  
 Species: MG-Mytilis galloprovincialis                      Protocol: ASTM 93  
 Sample ID: Ref Toxicant    Sample Type: Copper chloride  
 Start Date: 03/19/2004                      End Date: 03/21/2004                      Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
141	21	1	20			100	0	
142	18	3	10			98	66	
143	27	2	40			88	2	
144	5	5	L-Lab Control			100	94	
145	13	3	5			100	92	
146	7	2	2.5			100	92	
147	9	4	2.5			100	90	
148	14	4	5			100	91	
149	11	1	5			100	89	
150	1	1	L-Lab Control			91	82	
151	17	2	10			100	52	
152	22	2	20			83	0	
153	10	5	2.5			100	93	
154	15	5	5			100	89	
155	25	5	20			100	0	
156	28	3	40			81	0	
157	20	5	10			100	61	
158	3	3	L-Lab Control			100	92	
159	23	3	20			76	0	
160	8	3	2.5			100	93	
161	2	2	L-Lab Control			91	82	
162	16	1	10			100	71	
163	6	1	2.5			100	94	
164	30	5	40.0			44	0	
165	4	4	L-Lab Control			100	86	
166	24	4	20			100	0	
167	19	4	10			100	61	
168	29	4	40			92	0	
169	26	1	40			63	0	
170	12	2	5			100	94	

Comments: data entry OK *[Signature]*

Test: BV-Bivalve Larval Survival and Development Test

Test ID: 040317mgrt

Species: MG-Mytilis galloprovincialis

Protocol: ASTM ~~82~~ 93

Sample ID: REF-Ref Toxicant

Sample Type: CUCL-Copper chloride

Start Date: 03/17/2004

End Date: 03/19/2004

Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
141						100	0	MC
142						98	61e	MC
143						88	2	MC
144						100	94	
145						100	92	
146						100	92	
147						100	90	
148						100	91	
149						100	89	
150						91	82	
151						100	52	
152						83	0	
153						100	93	
154						100	89	
155						100	0	
156						81	0	
157						100	61	
158						100	92	
159						76	0	
160						100	93	
161						91	82	
162						100	71	
163						100	94	
164						94	0	SD
165						100	86	
166						100	0	
167						100	61	
168						92	0	
169						63	0	
170						100	94	

Comments:

Test: BV-Bivalve Larval Survival and Development Test      Test ID: 040317mgt  
 Species: MG-Mytilus galloprovincialis                      Protocol: ASTM 87  
 Sample ID: REF-Ref Toxicant                                      Sample Type: CUCL-Copper chloride  
 Start Date: 03/17/2004                                      End Date: 03/19/2004                                      Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
150	1	1	L-Lab Control					
161	2	2	L-Lab Control					
158	3	3	L-Lab Control					
165	4	4	L-Lab Control					
144	5	5	L-Lab Control					
163	6	1	2.5					
146	7	2	2.5					
160	8	3	2.5					
147	9	4	2.5					
153	10	5	2.5					
149	11	1	5					
170	12	2	5					
145	13	3	5					
148	14	4	5					
154	15	5	5					
162	16	1	10					
151	17	2	10					
142	18	3	10					
167	19	4	10					
157	20	5	10					
141	21	1	20					
152	22	2	20					
159	23	3	20					
166	24	4	20					
155	25	5	20					
169	26	1	40					
143	27	2	40					
156	28	3	40					
168	29	4	40					
164	30	5	40					

Comments: QCAFH

Bivalve Development Bioassay Worksheet

Client: City of Buena Vista (retest) Start Date/Time: 3/19/04 1630  
Test No.: 0403-106 → 109, 122-126, End Date/Time: 3/21/04 1700  
Test Species: M. galloprovincialis 0A0319MEKT Date Received: 3/19/04

Sample Type: 30ml Shell Vials Water effects ratio

Test Chamber Type and Sample Volume: 10 ml volume

Spawn Initiation Time: 13:20

Number of Spawners: Male 12 Female 9

Spawn Condition: good

Fertilization Time: 14:40

Egg Stock Density Calculation:

Eggs Counted (x):	<u>22</u>	<u>28</u>	
	<u>26</u>	<u>21</u>	
	<u>27</u>	<u>31</u>	
	<u>31</u>	<u>28</u>	
	<u>29</u>	<u>25</u>	
Mean	<u>27.0</u>	<u>26.6</u>	Overall Mean: <u>26.8</u>

Mean: 26.8 x 42 = 1126 eggs/ml

$$\frac{\text{Initial Stock} - \underline{1126} \text{ eggs/ml}}{\text{Inoculum Stock} - \underline{400} \text{ eggs/ml}} = \frac{\text{Stock Dilution Factor}}{\underline{2.81}}$$

Percent Division Upon Inoculation: 90

Time of Inoculation: 1630

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Reviewed/ Date: [Signature] 3/17/04

AMEC Bioassay Laboratory  
5550 Morehouse Drive, Suite B  
San Diego, CA 92121  
(858) 458-9044

AMEC Earth & Environmental  
 Bioassay Laboratory  
 5550 Morehouse Dr. Suite B  
 San Diego, CA 92121

Physical and Chemical  
 Measurements of Test Solutions  
 Salt Water Bioassays

Client: Internal CuCl<sub>2</sub>  
 Contact: \_\_\_\_\_  
 Test No.: 040319MERT

Analyst: JR  
 Test Start: 3/19/04  
 Test End: 3/21/04  
 Date Collected: 3/19/04

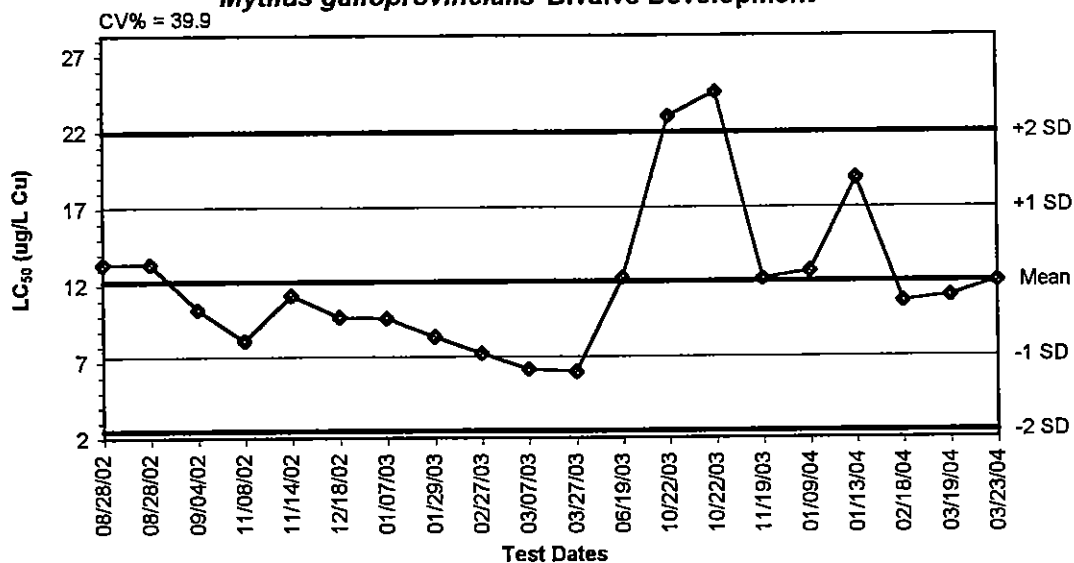
Sample ID or Conc. <i>μs/L</i>	DO (mg/L)			pH (pH units)			Salinity (ppt)			Temp °C		
	0	24	48	0	24	48	0	24	48	0	24	48
LC	8.7	9.1	7.9	8.09	8.09	8.02	34	33.7	34.3	14.8	14.6	14.9
25	8.6	9.1	7.9	8.07	8.06	8.03	34	33.9	34.4	14.8	14.6	14.9
50	8.5	9.2	7.8	8.07	8.05	8.04	34	34.0	34.4	14.8	14.5	15.0
10	8.5	9.2	7.9	8.07	8.05	8.02	34	34.2	34.5	14.8	14.4	15.1
20	8.5	9.2	8.0	8.08	8.05	8.02	34	34.2	34.6	14.8	14.4	15.1
40	8.5	9.2	8.0	8.08	8.05	8.04	34	34.1	34.4	14.8	14.4	15.1

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

QA Check: MR 4/21/04



**Copper (II) Chloride Reference Toxicant Control Chart -  
*Mytilus galloprovincialis* Bivalve Development**



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
08/28/02	13.3760	12.2174	7.3379	2.4584	17.0969	21.9764
08/28/02	13.3760	12.2174	7.3379	2.4584	17.0969	21.9764
09/04/02	10.4338	12.2174	7.3379	2.4584	17.0969	21.9764
11/08/02	8.3754	12.2174	7.3379	2.4584	17.0969	21.9764
11/14/02	11.3155	12.2174	7.3379	2.4584	17.0969	21.9764
12/18/02	9.9361	12.2174	7.3379	2.4584	17.0969	21.9764
01/07/03	9.8373	12.2174	7.3379	2.4584	17.0969	21.9764
01/29/03	8.6253	12.2174	7.3379	2.4584	17.0969	21.9764
02/27/03	7.5397	12.2174	7.3379	2.4584	17.0969	21.9764
03/07/03	6.5174	12.2174	7.3379	2.4584	17.0969	21.9764
03/27/03	6.3338	12.2174	7.3379	2.4584	17.0969	21.9764
06/19/03	12.4539	12.2174	7.3379	2.4584	17.0969	21.9764
10/22/03	23.0103	12.2174	7.3379	2.4584	17.0969	21.9764
10/22/03	24.5820	12.2174	7.3379	2.4584	17.0969	21.9764
11/19/03	12.3871	12.2174	7.3379	2.4584	17.0969	21.9764
01/09/04	12.8695	12.2174	7.3379	2.4584	17.0969	21.9764
01/13/04	18.9772	12.2174	7.3379	2.4584	17.0969	21.9764
02/18/04	10.9125	12.2174	7.3379	2.4584	17.0969	21.9764
03/19/04	11.2668	12.2174	7.3379	2.4584	17.0969	21.9764
03/23/04	12.2223	12.2174	7.3379	2.4584	17.0969	21.9764

*A. AFFINIS*

**Larval Fish Growth and Survival Test-7 Day Survival**

Start Date: 03/17/2004      Test ID: 040317aart      Sample ID: Ref Toxicant  
 End Date: 03/24/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: Copper chloride  
 Sample Date:      Protocol: EPAM 91-EPA Marine      Test Species: AA-Atherinops affinis  
 Comments:

Conc-ug/L	1	2	3	4	5
Lab Control	1.0000	1.0000	1.0000	1.0000	1.0000
25	1.0000	0.4000	0.8000	1.0000	1.0000
50	0.8000	1.0000	1.0000	1.0000	1.0000
100	1.0000	0.8000	1.0000	0.8000	1.0000
200	0.6000	0.2000	0.4000	0.6000	0.0000
400	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-ug/L	Transform: Arcsin Square Root							Rank Sum	1-Tailed Critical	Number Resp	Total Number
	Mean	N-Mean	Mean	Min	Max	CV%	N				
Lab Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	5			0	25
25	0.8400	0.8400	1.1655	0.6847	1.3453	24.700	5	22.50	16.00	4	25
50	0.9600	0.9600	1.2977	1.1071	1.3453	8.207	5	25.00	16.00	1	25
100	0.9200	0.9200	1.2500	1.1071	1.3453	10.434	5	22.50	16.00	2	25
*200	0.3600	0.3600	0.6292	0.2255	0.8861	45.332	5	15.00	16.00	16	25
*400	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	5	15.00	16.00	25	25

**Auxiliary Tests**

	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.88262	0.9	-1.194	2.37572

Equality of variance cannot be confirmed

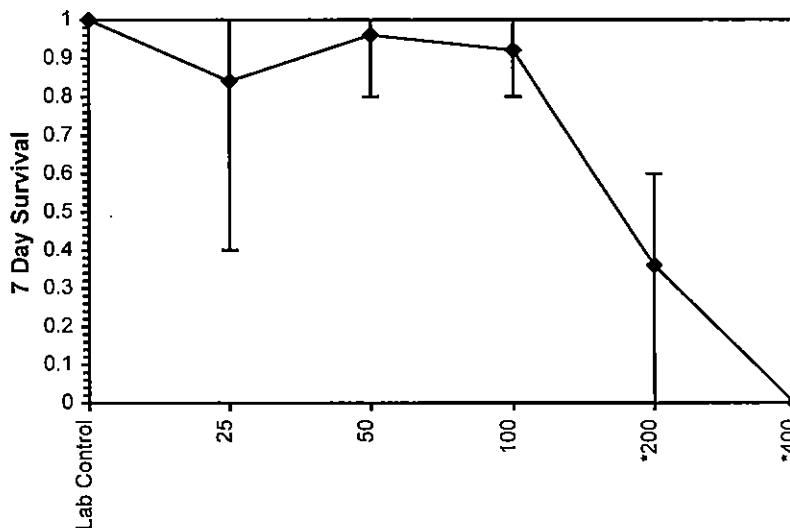
**Hypothesis Test (1-tail, 0.05)**

	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	200	141.421	

**Maximum Likelihood-Probit**

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	2.55071	1.25655	-1.4482	6.54962	0	30.9393	7.81472	8.8E-07	2.1631	0.39205	5
Intercept	-0.5174	2.68233	-9.0538	8.01896							

Point	Probits	ug/L	95% Fiducial Limits	
EC01	2.674	17.8263		
EC05	3.355	32.9791		
EC10	3.718	45.7795		
EC15	3.964	57.1175		
EC20	4.158	68.0997		
EC25	4.326	79.1897		
EC40	4.747	115.818		
EC50	5.000	145.58		
EC60	5.253	182.989		
EC75	5.674	267.629		
EC80	5.842	311.213		
EC85	6.036	371.051		
EC90	6.282	462.947		
EC95	6.645	642.633		
EC99	7.326	1188.89		



Significant heterogeneity detected (p = 8.75E-07)

**Larval Fish Growth and Survival Test-7 Day Growth**

Start Date: 03/17/2004      Test ID: 040317aart      Sample ID: Ref Toxicant  
 End Date: 03/24/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: Copper chloride  
 Sample Date:      Protocol: EPAM 91-EPA Marine      Test Species: AA-Atherinops affinis  
 Comments:

Conc-ug/L	1	2	3	4	5
Lab Control	1.0380	1.0760	1.2100	1.3460	1.3140
25	1.0560	0.5040	0.9660	1.1760	1.1280
50	0.8600	0.8360	1.0420	1.1080	1.2220
100	0.7800	0.6980	1.0400	1.1360	1.1440
200	0.4660	0.2720	0.4660	0.5960	0.0000
400	0.0000	0.0000	0.0000	0.0000	0.0000

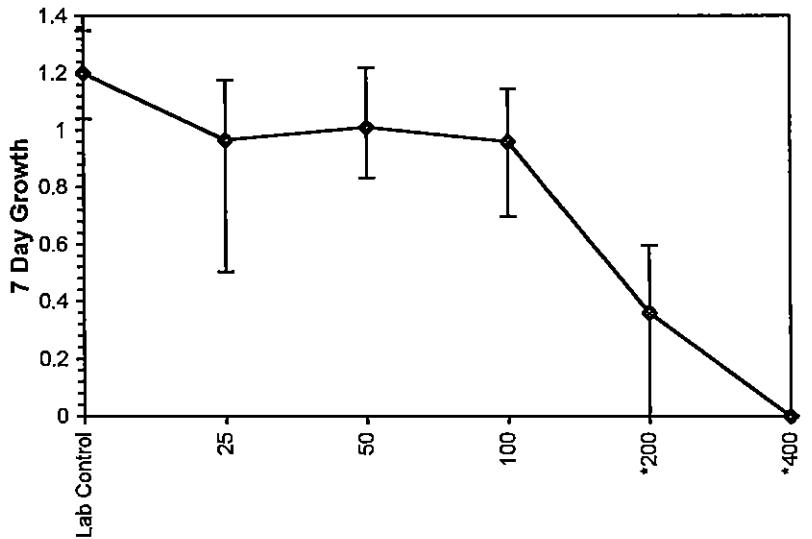
Conc-ug/L	Transform: Untransformed							Rank Sum	1-Tailed Critical	Mean	N-Mean
	Mean	N-Mean	Mean	Min	Max	CV%	N				
Lab Control	1.1968	1.0000	1.1968	1.0380	1.3460	11.516	5			1.1968	0.0000
25	0.9660	0.8072	0.9660	0.5040	1.1760	27.964	5	20.00	16.00	0.9660	0.1928
50	1.0136	0.8469	1.0136	0.8360	1.2220	16.232	5	21.00	16.00	1.0136	0.1531
100	0.9596	0.8018	0.9596	0.6980	1.1440	21.627	5	20.00	16.00	0.9596	0.1982
*200	0.3600	0.3008	0.3600	0.0000	0.5960	64.477	5	15.00	16.00	0.3600	0.6992
*400	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	5	15.00	16.00	0.0000	1.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.92638	0.9	-0.9178	0.55374
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	200	141.421	

Parameter	Value	SE	95% Fiducial Limits		Maximum Likelihood-Probit						
			Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter		
Slope	4.00168	1.02056	2.00138	6.00199	0	7.21701	7.81472	0.07	2.17359	0.24989	15
Intercept	-3.698	2.22636	-8.0617	0.66563							
TSCR											

Point	Probits	ug/L	95% Fiducial Limits	
EC01	2.674	39.1066	9.9346	63.0511
EC05	3.355	57.8831	21.4973	82.8927
EC10	3.718	71.341	32.2903	96.3572
EC15	3.964	82.1472	42.3351	107.046
EC20	4.158	91.8915	52.319	116.791
EC25	4.326	101.167	62.4991	126.342
EC40	4.747	128.909	94.9142	158.739
EC50	5.000	149.139	117.532	189.084
EC60	5.253	172.545	140.091	233.991
EC75	5.674	219.859	176.121	355.132
EC80	5.842	242.052	190.548	424.183
EC85	6.036	270.764	207.913	524.17
EC90	6.282	311.778	230.992	687.179
EC95	6.645	384.266	268.529	1032.12
EC99	7.326	568.767	353.052	2233.28



Test Species: A. affinis

Client Name: Internal

Test Date: 3/17/04

Sample ID: Cu Ref tox

Test No.: 040317AART

Conc. (ug/L)	Rep.	Survival on Test Day:								Percent Survival <sup>(A)</sup>	pan wt. (g)	pan + fish (g) <sup>(A)</sup>	
		0	1	2	3	4	5	6	7				
2.5	a	5	5	5	5	5	5	5	5	100	100	0.03168	0.03644
	b	5	5	3	3	4	4	4	4	80	100	0.03244	0.03760
	c	5	3	3	3	3	3	3	3	60	100	0.03070	0.03422
	d	5	3	2	2	1	1	1	1	20	100	0.03370	0.03489
	e	5	5	5	5	4	4	4	4	80	100	0.03527	0.03998
25	a	5	5	5	5	5	5	5	5	100		0.03437	0.03965
	b	5	4	2	2	2	2	2	2	40		0.03414	0.03666
	c	5	4	4	4	4	4	4	4	80		0.03105	0.03588
	d	5	5	5	5	5	5	5	5	100		0.03396	0.03984
	e	5	5	5	5	5	5	5	5	100		0.03303	0.03867
50	a	5	5	5	5	4	4	4	4	80		0.03436	0.03866
	b	5	5	3	5	5	5	5	5	100		0.03254	0.03672
	c	5	5	5	5	5	5	5	5	100		0.03356	0.03877
	d	5	5	5	5	5	5	5	5	100		0.03212	0.03766
	e	5	5	5	5	5	5	5	5	100		0.03355	0.03966
100	a	5	5	5	5	5	5	5	5	100		0.03661	0.04051
	b	5	5	4	4	4	4	4	4	80		0.03522	0.03871
	c	5	5	5	5	5	5	5	5	100		0.03377	0.03897
	d	5	4	4	4	4	4	4	4	80		0.02711	0.03279
	e	5	5	5	5	5	5	5	5	100		0.03184	0.03756
200	a	5	5	5	5	4	3	3	3	60		0.03317	0.03550
	b	5	5	5	2	2	2	1	1	20		0.03409	0.03545
	c	5	4	4	4	2	2	2	2	40		0.03550	0.03783
	d	5	4	4	3	3	3	3	3	60		0.03369	0.03667
	e	5	2	2	2	2	2	0	-	0		-	-
400	a	5	2	0	-	-	-	-	-	0		-	-
	b	5	1	0	-	-	-	-	-	0		-	-
	c	5	1	1	0	-	-	-	-	0		-	-
	d	5	0	-	-	-	-	-	-	0		-	-
	e	5	2	2	2	2	1	1	0	0		0.03196	-
	a												
	b												
	c												
	d												
	e												

Tech Initials: RJ/mi SH MC MC Ry AH SH SH

Feeding Times (day):

	0	1	2	3	4	5	6
1/630	0815	0815	0700	0930	0845	0830	
	1630	1515	1700	1400	1400	1745	1630

Weight Data:  
 Date/Time In: 3/24/04/1300  
 Date/Time out: 3/26/04/1030  
 Oven Temp (°C): 59  
 Tech Initials: AW

Comments: <sup>(A)</sup> Used controls from test 0403-094 for reftox analysis.

QC Check: RJ  
 Final Review: BRS 5/25/04

AMEC Earth and Environmental  
 Bioassay Laboratory  
 5550 Morehouse Dr., Suite B  
 San Diego, CA 92121

Raw Datasheet  
 Water Quality Measurements  
 Marine Chronic Bioassay

Client: Internal  
 Sample ID: Cu Ref tox  
 Test No: 040317 AART

Test Species: A. affinis  
 Test Date: 3-17-04  
 Start/End Times: 1600/1500

Concentration	LC							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.00	7.98	8.00	8.02	8.07	8.06	8.02	
DO (mg/L)	7.6	7.9	8.2	8.3	7.9	8.3	8.0	
Salinity (ppt)	29.9	30.1	29.9	29.9	29.7	30.0	29.3	
Temp (°C)	20.2	19.2	19.3	20.0	20.1	19.5		
Final								
pH		7.98	7.83	7.78	7.83	7.82	7.68	7.85
DO (mg/L)		7.1	7.0	6.9	6.1	6.1	5.9	6.0
Temp (°C)		20.2	20.4	20.3	20.3	20.2	20.5	20.6

Concentration	100							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.01	7.94	7.78	8.01	8.05	8.05	8.00	
DO (mg/L)	7.8	7.9	8.3	8.3	7.9	8.4	8.2	
Salinity (ppt)	29.4	29.7	29.2	29.4	29.3	29.8	29.6	
Temp (°C)	19.7	19.1	19.2	20.0	20.2	19.5	19.0	
Final								
pH		7.86	7.82	7.80	7.80	7.78	7.70	7.80
DO (mg/L)		7.3	7.1	7.2	6.2	6.2	5.9	6.0
Temp (°C)		20.2	20.4	20.2	20.0	20.1	20.2	20.5

Concentration	25 ug/ml							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.02	7.95	7.99	8.01	8.05	8.06	8.00	
DO (mg/L)	7.7	7.9	8.4	8.3	7.9	8.3	8.1	
Salinity (ppt)	29.6	30.0	29.4	29.7	29.5	30.0	29.9	
Temp (°C)	20.0	19.2	19.2	20.0	20.1	19.4	19.0	
Final								
pH		7.86	7.82	7.77	7.79	7.77	7.69	7.81
DO (mg/L)		7.1	7.0	6.9	6.1	6.0	5.8	5.8
Temp (°C)		20.2	20.4	20.3	20.1	20.1	20.3	20.6

Concentration	200							
Day	0	1	2	3	4	5	6	7
Initial								
pH	7.99	7.93	7.98	8.06	8.06	8.05	7.99	
DO (mg/L)	7.9	7.9	8.3	8.3	7.9	8.3	8.2	
Salinity (ppt)	29.1	29.5	28.9	29.1	29.0	29.7	29.4	
Temp (°C)	19.7	19.0	19.2	20.0	20.1	19.5	19.0	
Final								
pH		7.84	7.82	7.82	7.82	7.80	7.74	7.84
DO (mg/L)		7.3	7.2	7.4	6.9	6.3	6.2	6.2
Temp (°C)		20.3	20.4	20.2	20.0	20.1	20.2	20.6

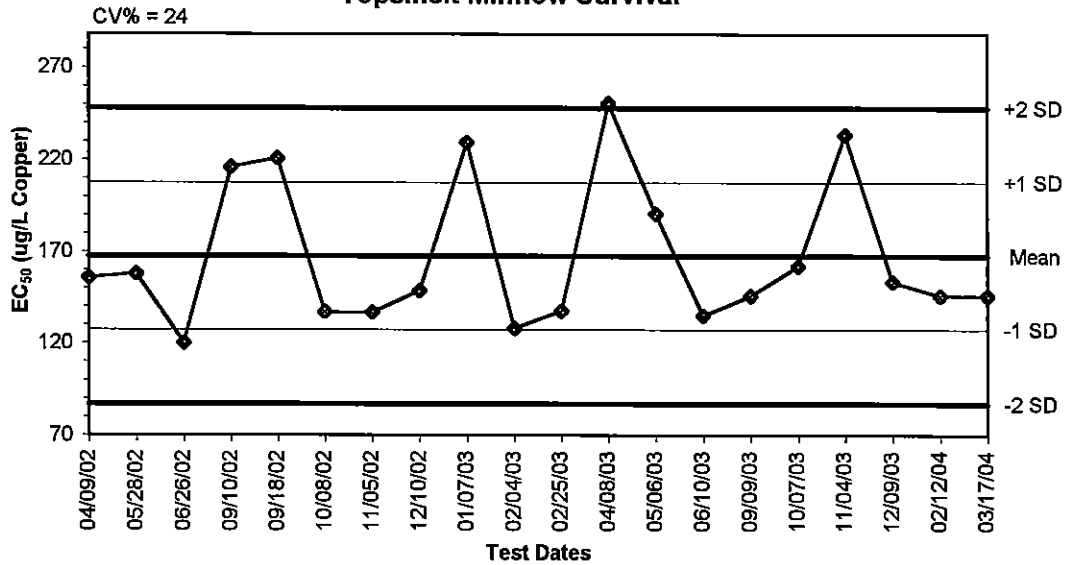
Concentration	50							
Day	0	1	2	3	4	5	6	7
Initial								
pH	8.00	7.94	7.99	8.01	8.05	8.05	8.00	
DO (mg/L)	7.8	7.8	8.4	8.3	8.0	8.2	8.1	
Salinity (ppt)	29.6	29.9	29.3	29.6	29.4	29.9	29.7	
Temp (°C)	19.9	19.2	19.1	20.0	20.1	19.5	19.0	
Final								
pH		7.86	7.82	7.77	7.80	7.78	7.70	7.80
DO (mg/L)		7.2	7.1	6.9	6.3	6.1	5.9	6.0
Temp (°C)		20.2	20.4	20.2	20.0	20.1	20.1	20.6

Concentration	400							
Day	0	1	2	3	4	5	6	7
Initial								
pH	7.99	7.93	7.97	8.06	8.04	8.05	7.99	
DO (mg/L)	7.9	8.0	8.3	8.2	7.9	8.3	8.2	
Salinity (ppt)	29.7	28.9	28.4	28.8	28.7	29.7	29.4	
Temp (°C)	19.7	19.0	19.3	20.0	20.1	19.4	19.0	
Final								
pH		7.84	7.81	7.84	7.83	7.83	7.78	7.88
DO (mg/L)		7.3	7.3	7.7	7.3	6.7	6.8	6.7
Temp (°C)		20.2	20.3	20.2	19.9	20.1	20.2	20.4

Animal Source/Date Received: ABS 3-13-04  
 Animal Age at Initiation: 14 days old  
 Comments: \_\_\_\_\_

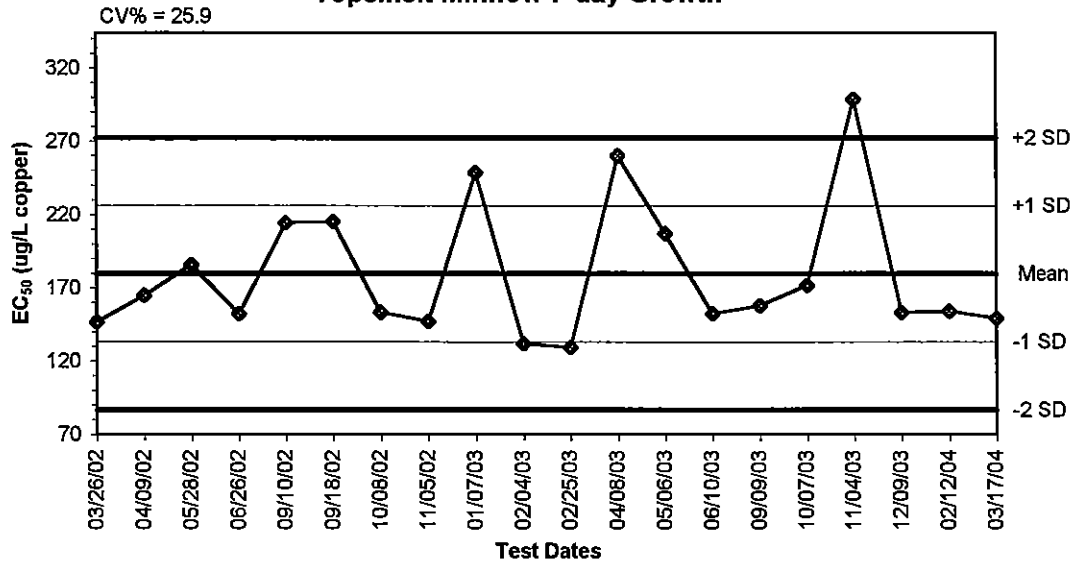
Analysts:	Initial:	0	1	2	3	4	5	6	7
		AW	SH	mc	me	Rk	pl	AW	
	Final:		SH	me	SH	AH	AH	AW	mc

**Copper (II) Chloride Reference Toxicant Control Chart -  
Topsmelt Minnow Survival**



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
04/09/02	155.7269	167.4193	127.2519	87.0845	207.5867	247.7541
05/28/02	157.6964	167.4193	127.2519	87.0845	207.5867	247.7541
06/26/02	120.1115	167.4193	127.2519	87.0845	207.5867	247.7541
09/10/02	215.6806	167.4193	127.2519	87.0845	207.5867	247.7541
09/18/02	220.6823	167.4193	127.2519	87.0845	207.5867	247.7541
10/08/02	136.8843	167.4193	127.2519	87.0845	207.5867	247.7541
11/05/02	136.6628	167.4193	127.2519	87.0845	207.5867	247.7541
12/10/02	148.5918	167.4193	127.2519	87.0845	207.5867	247.7541
01/07/03	229.3396	167.4193	127.2519	87.0845	207.5867	247.7541
02/04/03	128.1337	167.4193	127.2519	87.0845	207.5867	247.7541
02/25/03	137.4615	167.4193	127.2519	87.0845	207.5867	247.7541
04/08/03	250.5491	167.4193	127.2519	87.0845	207.5867	247.7541
05/06/03	190.5418	167.4193	127.2519	87.0845	207.5867	247.7541
06/10/03	134.8645	167.4193	127.2519	87.0845	207.5867	247.7541
09/09/03	145.6062	167.4193	127.2519	87.0845	207.5867	247.7541
10/07/03	161.8443	167.4193	127.2519	87.0845	207.5867	247.7541
11/04/03	233.4041	167.4193	127.2519	87.0845	207.5867	247.7541
12/09/03	153.2281	167.4193	127.2519	87.0845	207.5867	247.7541
02/12/04	145.7969	167.4193	127.2519	87.0845	207.5867	247.7541
03/17/04	145.5798	167.4193	127.2519	87.0845	207.5867	247.7541

**Copper (II) Chloride Reference Toxicant Control Chart -  
Topsmelt Minnow 7-day Growth**



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
03/26/02	146.4188	179.4787	133.0621	86.6454	225.8954	272.3120
04/09/02	164.6897	179.4787	133.0621	86.6454	225.8954	272.3120
05/28/02	185.3288	179.4787	133.0621	86.6454	225.8954	272.3120
06/26/02	152.2438	179.4787	133.0621	86.6454	225.8954	272.3120
09/10/02	214.0064	179.4787	133.0621	86.6454	225.8954	272.3120
09/18/02	215.0769	179.4787	133.0621	86.6454	225.8954	272.3120
10/08/02	152.7364	179.4787	133.0621	86.6454	225.8954	272.3120
11/05/02	146.7005	179.4787	133.0621	86.6454	225.8954	272.3120
01/07/03	248.4452	179.4787	133.0621	86.6454	225.8954	272.3120
02/04/03	131.7939	179.4787	133.0621	86.6454	225.8954	272.3120
02/25/03	129.1648	179.4787	133.0621	86.6454	225.8954	272.3120
04/08/03	260.1567	179.4787	133.0621	86.6454	225.8954	272.3120
05/06/03	206.8016	179.4787	133.0621	86.6454	225.8954	272.3120
06/10/03	152.1667	179.4787	133.0621	86.6454	225.8954	272.3120
09/09/03	157.5385	179.4787	133.0621	86.6454	225.8954	272.3120
10/07/03	171.5624	179.4787	133.0621	86.6454	225.8954	272.3120
11/04/03	298.7089	179.4787	133.0621	86.6454	225.8954	272.3120
12/09/03	153.0860	179.4787	133.0621	86.6454	225.8954	272.3120
02/12/04	153.8089	179.4787	133.0621	86.6454	225.8954	272.3120
03/17/04	149.1393	179.4787	133.0621	86.6454	225.8954	272.3120



*A. BAHIA*

**Mysid Survival, Growth and Fecundity Test-7 Day Survival**

Start Date: 04/27/2004      Test ID: 040427myrt      Sample ID: Ref Toxicant  
 End Date: 05/04/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: Copper chloride  
 Sample Date:      Protocol: EPAM 87-EPA Marine      Test Species: ~~MY-Mysidopsis bahia~~  
 Comments: ~~AM - Americamysis~~

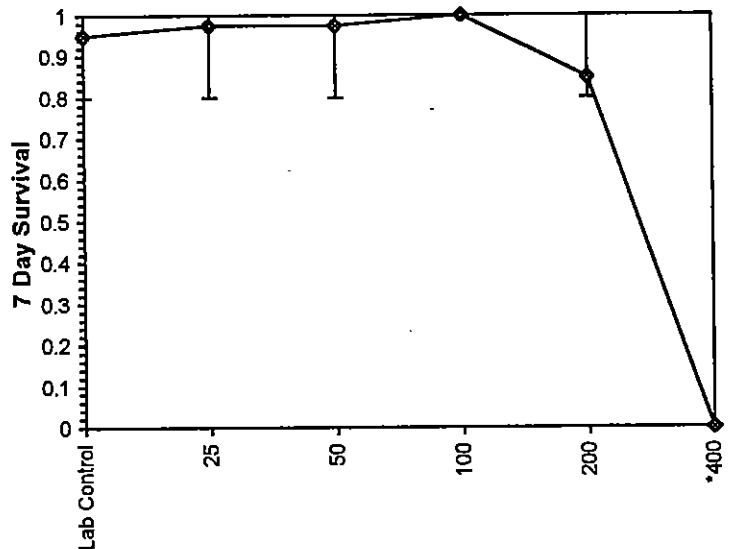
Conc-ug/L	1	2	3	4	5	6	7	8
Lab Control	1.0000	1.0000	1.0000	1.0000	0.8000	1.0000	1.0000	0.8000
25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8000
50	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8000	1.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
200	0.8000	0.8000	1.0000	0.8000	0.8000	0.8000	1.0000	0.8000
400	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-ug/L	Mean	N-Mean	Transform: Arcsin Square Root					Rank Sum	1-Tailed Critical	Isotonic	
			Mean	Min	Max	CV%	N			Mean	N-Mean
Lab Control	0.9500	1.0000	1.2857	1.1071	1.3453	8.574	8			0.9750	1.0000
25	0.9750	1.0263	1.3155	1.1071	1.3453	6.400	8	72.00	46.00	0.9750	1.0000
50	0.9750	1.0263	1.3155	1.1071	1.3453	6.400	8	72.00	46.00	0.9750	1.0000
100	1.0000	1.0526	1.3453	1.3453	1.3453	0.000	8	76.00	46.00	0.9750	1.0000
200	0.8500	0.8947	1.1667	1.1071	1.3453	9.449	8	52.00	46.00	0.8500	0.8718
*400	0.0000	0.0000	0.2255	0.2255	0.2255	0.000	8	36.00	46.00	0.0000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.82906	0.929	-0.907	2.68803
Equality of variance cannot be confirmed				
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	200	400	282.843	

**Linear Interpolation (200 Resamples)**

Point	ug/L	SD	95% CL		Skew
IC05	139.00	16.25	120.00	187.48	1.7130
IC10	178.00	17.31	152.67	209.08	0.3611
IC15	205.00	10.15	183.32	219.69	-0.4564
IC20	216.47	7.13	205.00	230.30	0.3023
IC25	227.94	6.68	217.19	240.90	0.3023
IC40	262.35	5.34	253.75	272.72	0.3023
IC50	285.29	4.45	278.13	293.94	0.3023



**Mysid Survival, Growth and Fecundity Test-Growth-Weight**

Start Date: 04/27/2004      Test ID: 040427myrt      Sample ID:      Ref Toxicant  
 End Date: 05/04/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: Copper chloride  
 Sample Date:      Protocol: EPAW 95-EPA West Coast      Test Species: AM-Americamysis bahia  
 Comments:

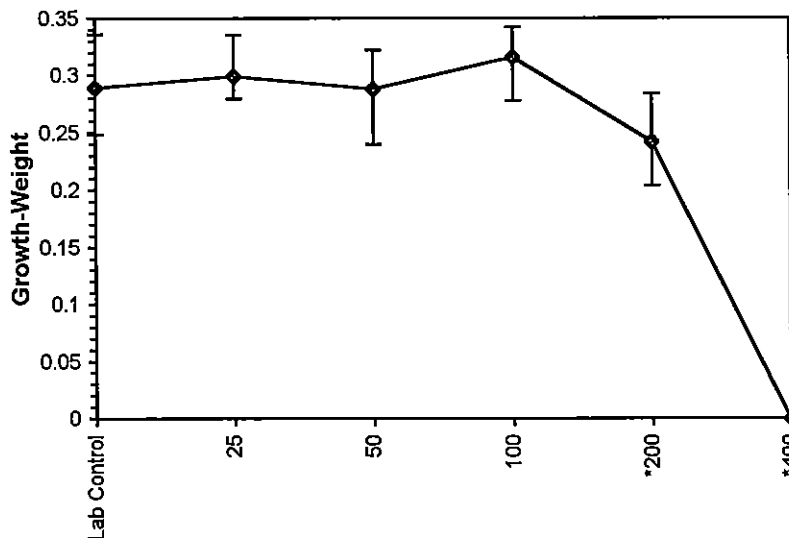
Conc-ug/L	1	2	3	4	5	6	7	8
Lab Control	0.3240	0.3100	0.3360	0.2520	0.2480	0.2680	0.2900	0.2840
25	0.2920	0.2900	0.2940	0.3360	0.3040	0.2800	0.3060	0.2920
50	0.3080	0.3000	0.2980	0.3220	0.2400	0.2400	0.2940	0.3020
100	0.3160	0.2780	0.3140	0.3420	0.3260	0.3160	0.3180	0.3180
200	0.2060	0.2180	0.2440	0.2040	0.2820	0.2640	0.2840	0.2340
400	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-ug/L	Transform: Untransformed							Rank Sum	1-Tailed Critical	Mean	N-Mean
	Mean	N-Mean	Mean	Min	Max	CV%	N				
Lab Control	0.2890	1.0000	0.2890	0.2480	0.3360	11.244	8			0.2890	0.0000
25	0.2993	1.0355	0.2993	0.2800	0.3360	5.659	8	76.00	46.00	0.2993	-0.0355
50	0.2880	0.9965	0.2880	0.2400	0.3220	10.694	8	67.00	46.00	0.2880	0.0035
100	0.3160	1.0934	0.3160	0.2780	0.3420	5.651	8	84.00	46.00	0.3160	-0.0934
*200	0.2420	0.8374	0.2420	0.2040	0.2840	13.282	8	44.50	46.00	0.2420	0.1626
*400	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	8	36.00	46.00	0.0000	1.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94035	0.929	-0.1816	-0.0659
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	200	141.421	

Trimmed Spearman-Kärber			
Trim Level	EC50	95% CL	
0.0%	248.27	204.99	300.68
5.0%	253.31	203.30	315.62
10.0%	257.46	196.26	337.75
20.0%	261.02	225.73	301.84
Auto-0.0%	248.27	204.99	300.68



Test Species: A. ~~N.~~ bahia

Client Name: Internal

Test Date: 4.27.04

Sample ID: CuCl<sub>2</sub>

Test No.: 040427myrt

Conc. <u>µg/L</u>	Rep.	Survival on Test Day:								Percent Survival	pan wt. (g)	pan + mysid (g) <u>WT</u>
		0	1	2	3	4	5	6	7			
<u>0</u>	a	5	5	5	5	5	5	5	5	100	0.03971	<del>0.04133</del> 0.04133
	b	5	5	5	5	5	5	5	5	100	0.03908	<del>0.04063</del> 0.04063
	c	5	5	5	5	5	5	5	5	100	0.03491	<del>0.03659</del> 0.03659
	d	5	5	5	5	5	5	5	5	100	0.03469	0.03595
	e	5	5	5	5	5	5	4	4	80	0.03665	0.03789
	f	5	5	5	5	5	5	5	5	100	0.04044	0.04178
	g	5	5	5	5	5	5	5	5	100	0.04035	0.04180
	h	5	4	4	4	4	4	4	4	80	0.03907	0.04049
<u>25</u>	a	5	5	5	5	5	5	5	5	100	0.03901	0.04047
	b	5	5	5	5	5	5	5	5	100	0.03865	0.04010
	c	5	5	5	5	5	5	5	5	100	0.03434	0.03581
	d	5	5	5	5	5	5	5	5	100	0.03625	0.03693
	e	5	5	5	5	5	5	5	5	100	0.03686	0.03836
	f	5	5	5	5	5	5	5	5	100	0.03902	0.04042
	g	5	5	5	5	5	5	5	5	100	0.03756	0.03909
	h	5	5	4	4	4	4	4	4	80	0.03757	0.04260
<u>50</u>	a	5	5	5	5	5	5	5	5	100	0.04118	0.04110
	b	5	5	5	5	5	5	5	5	100	0.04182	0.04332
	c	5	5	5	5	5	5	5	5	100	0.04255	0.04404
	d	5	5	5	5	5	5	5	5	100	0.03961	0.04451
	e	5	5	5	5	5	5	5	5	100	0.04343	0.04613
	f	5	5	5	5	5	5	5	5	100	0.04484	0.05014
	g	5	4	4	4	4	4	4	4	80	0.04879	0.04739
	h	5	5	5	5	5	5	5	5	100	0.04180	0.03888
<u>100</u>	a	5	5	5	5	5	5	5	5	100	0.05124	0.05282
	b	5	5	5	5	5	5	5	5	100	0.04552	0.04691
	c	5	5	5	5	5	5	5	5	100	0.04178	0.04335
	d	5	5	5	5	5	5	5	5	100	0.03594	0.03765
	e	5	5	5	5	5	5	5	5	100	0.04482	0.04645
	f	5	5	5	5	5	5	5	5	100	0.04498	0.04656
	g	5	5	5	5	5	5	5	5	100	0.04642	0.04801
	h	5	5	5	5	5	5	5	5	100	0.04338	0.04497
Tech Initials		Rg/MT	SD	Rg	SH	SH	AA	Rg	SH			

Feeding Times (day):

	0	1	2	3	4	5	6
-		0830	0815	0800	0800	1030	0930
1545	1540	1505	1545	1130	1815	1530	

Weight Data:

Date/Time in: 5-4-04/1430  
 Date/Time out: 5-5-04/1430  
 Oven Temp (°C): 59°C  
 Tech Initials: WT

Comments:

\_\_\_\_\_

QC Check: UC 5/10/04  
 Final Review: SCS 5/25/04

Test Species: A. N. balia

Client Name: Internal

Test Date: 4-27-04

Sample ID: CuCl2

Test No.: 040427myrt

Conc. (µg/L)	Rep.	Survival on Test Day:								Percent Survival	pan wt. (g)	pan + mysid (g)
		0	1	2	3	4	5	6	7			
200	a	5	5	5	5	4	4	4	4	80	0.04605	0.04703
	b	5	4	4	4	4	4	4	4	80	0.04658	0.04767
	c	5	5	5	5	5	5	5	5	100	0.04319	0.04441
	d	5	5	5	5	4	4	4	4	80	0.04227	0.04329
	e	5	5	4	4	4	4	4	4	80	0.04808	0.04949
	f	5	5	5	5	4	4	4	4	80	0.04608	0.04800
	g	5	5	5	5	5	5	5	5	100	0.04796	0.04938
	h	5	5	4	4	4	4	4	4	80	0.04240	0.04357
400	a	5	4	0	-	-	-	-	-	0		
	b	5	4	0	-	-	-	-	-	0		
	c	5	5	0	-	-	-	-	-	0		
	d	5	5	0	-	-	-	-	-	0		
	e	5	3	2	0	-	-	-	-	0		
	f	5	4	1	0	-	-	-	-	0		
	g	5	5	1	0	-	-	-	-	0		
	h	5	4	0	-	-	-	-	-	0		
	a											
	b											
	c											
	d											
	e											
	f											
	g											
	h											

Tech Initials: Rb/MT SD Rb SH SH AH Rb SH

Feeding Times (day):

	0	1	2	3	4	5	6
-		0830	0815	0810	0810	1030	0930
	1545	1540	1505	1545	1130	1515	1530

Weight Data:  
 Date/Time in: 5-4-04/1430  
 Date/Time out: 5-5-04/1430  
 Oven Temp (°C): 59°C  
 Tech Initials: MT

Comments: \_\_\_\_\_

QC Check: RLC 5/6/04  
 Final Review: BOG 5/25/04

Client: Internal  
 Sample ID: CuCl2  
 Test No: 040427myrt

Test Species: M. bakia  
 Test Date: 4.27.04  
 Start/End Times: 1445 /

Concentration		LC							
Day	0	1	2	3	4	5	6	7	
Initial									
pH	7.88	7.88	7.91	7.90	7.93	7.92	7.98		
DO (mg/L)	8.6	7.6	8.3	7.5	8.0	7.3	7.2		
Salinity (ppt)	29.6	30.2	30.0	29.7	30.0	30.0	30.1		
Temp (°C)	24.2	24.5	24.2	24.5	24.3	25.4	24.4		
Final									
pH		7.94	7.92	7.91	7.91	7.85	7.92	7.93	
DO (mg/L)		6.7	6.9	6.5	6.2	6.0	6.1	6.2	
Temp (°C)		25.0	24.4	24.5	24.2	24.8	25.1	24.4	

Concentration		100 µg/L							
Day	0	1	2	3	4	5	6	7	
Initial									
pH	7.89	7.90	7.93	7.92	7.94	7.95	7.97		
DO (mg/L)	8.0	7.5	7.9	7.4	7.9	7.1	7.1		
Salinity (ppt)	29.6	30.2	29.6	29.5	29.9	29.8	29.9		
Temp (°C)	24.0	24.4	24.4	24.6	24.2	25.1	24.5		
Final									
pH		7.90	7.91	7.92	7.93	7.93	7.90	7.94	
DO (mg/L)		6.6	7.0	6.5	6.2	5.9	6.1	6.1	
Temp (°C)		25.0	24.9	24.8	24.4	25.2	25.2	25.3	

Concentration		25 µg/L							
Day	0	1	2	3	4	5	6	7	
Initial									
pH	7.89	7.90	7.92	7.91	7.93	7.94	7.97		
DO (mg/L)	8.0	7.5	8.1	7.5	8.0	7.1	7.2		
Salinity (ppt)	29.7	30.4	29.8	29.7	30.0	30.0	30.2		
Temp (°C)	24.2	24.5	24.6	24.6	24.4	25.3	24.5		
Final									
pH		7.93	7.96	7.91	7.91	7.93	7.92	7.93	
DO (mg/L)		6.6	7.1	6.5	6.2	6.1	6.1	6.2	
Temp (°C)		25.0	24.8	24.5	24.3	24.4	25.2	25.1	

Concentration		200 µg/L							
Day	0	1	2	3	4	5	6	7	
Initial									
pH	7.89	7.89	7.93	7.92	7.94	7.95	7.97		
DO (mg/L)	7.9	7.4	7.7	7.4	7.9	7.1	7.1		
Salinity (ppt)	29.3	30.2	29.4	29.4	29.7	29.5	29.6		
Temp (°C)	24.0	24.3	24.7	24.3	24.4	25.1	24.5		
Final									
pH		7.90	7.92	7.93	7.94	7.97	7.92	7.98	
DO (mg/L)		6.6	7.2	6.7	6.2	6.1	6.0	6.4	
Temp (°C)		25.0	25.1	24.7	24.5	25.1	25.3	25.2	

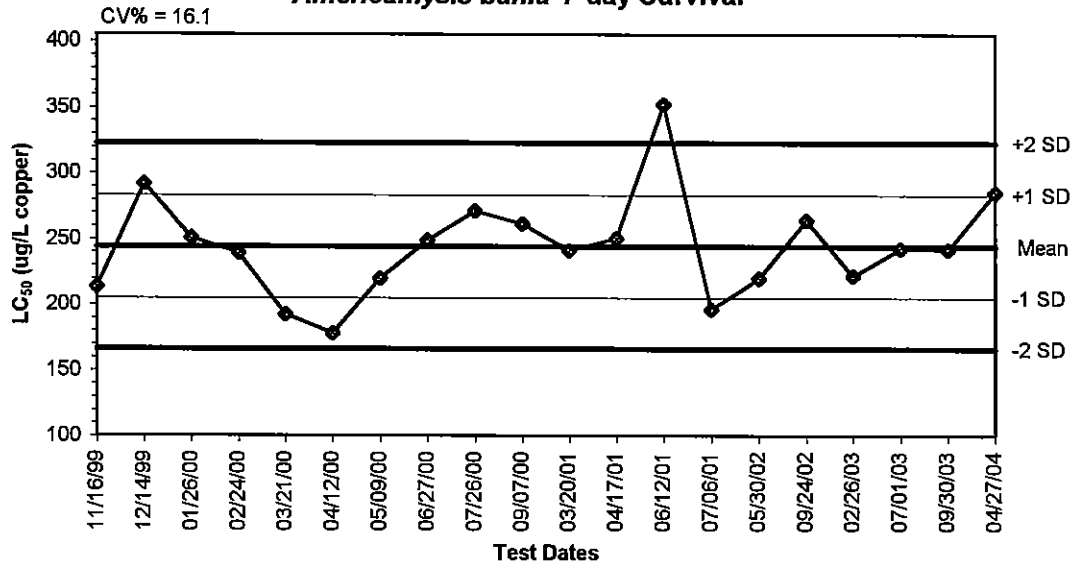
Concentration		50 µg/L							
Day	0	1	2	3	4	5	6	7	
Initial									
pH	7.89	7.89	7.93	7.92	7.94	7.94	7.96		
DO (mg/L)	8.0	7.4	8.0	7.4	7.8	7.1	7.2		
Salinity (ppt)	29.7	30.3	29.8	29.6	29.9	29.9	30.1		
Temp (°C)	24.1	24.4	24.6	24.6	24.3	25.2	24.2		
Final									
pH		7.91	7.85	7.91	7.92	7.93	7.90	7.95	
DO (mg/L)		6.6	7.0	6.4	6.2	6.0	6.0	6.1	
Temp (°C)		25.0	25.1	24.7	24.3	25.1	25.2	25.4	

Concentration		400 µg/L							
Day	0	1	2	3	4	5	6	7	
Initial									
pH	7.88	7.89	7.92	7.91					
DO (mg/L)	8.0	7.3	7.7	7.4					
Salinity (ppt)	28.8	29.3	28.9	29.0					
Temp (°C)	24.0	24.1	24.7	24.3					
Final									
pH		7.90	7.93	7.94					
DO (mg/L)		6.7	7.2	6.7					
Temp (°C)		25.0	24.9	24.5					

Animal Source/Date Received: ABS 4.27.04  
 Animal Age at Initiation: 7 days  
 Comments: \_\_\_\_\_

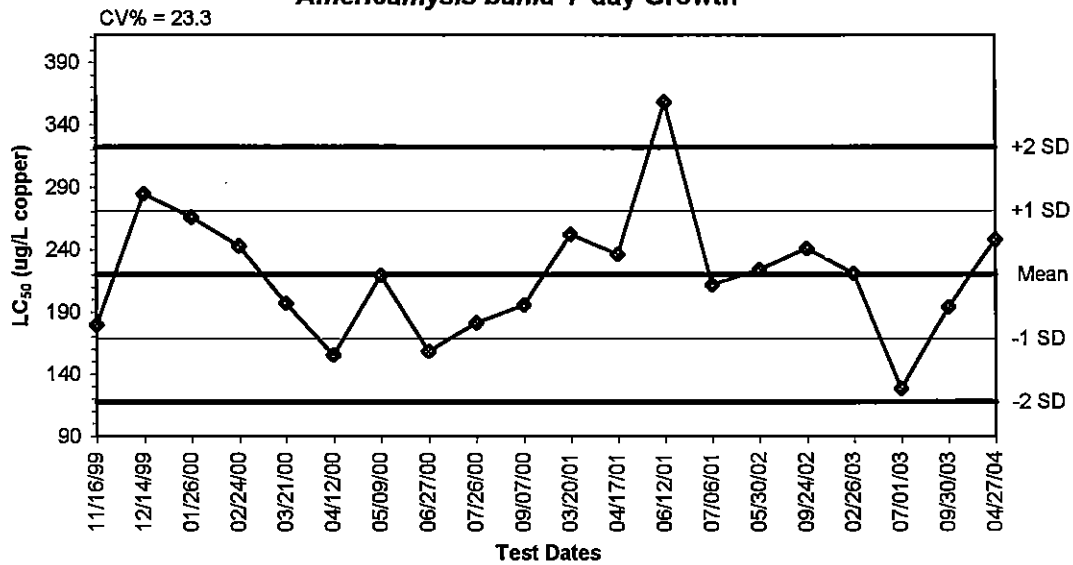
Analysts:	Initial:	MC	MC	MC	SH	SH	AH	RG	
	Final:		SH	RG	SH	SH	AH	RG	SD

**Copper (II) Chloride Reference Toxicant Control Chart -  
Americamysis bahia 7-day Survival**



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
11/16/99	213.4836	244.1365	204.9079	165.6793	283.3651	322.5937
12/14/99	291.6667	244.1365	204.9079	165.6793	283.3651	322.5937
01/26/00	250.8225	244.1365	204.9079	165.6793	283.3651	322.5937
02/24/00	239.3480	244.1365	204.9079	165.6793	283.3651	322.5937
03/21/00	192.2609	244.1365	204.9079	165.6793	283.3651	322.5937
04/12/00	178.0284	244.1365	204.9079	165.6793	283.3651	322.5937
05/09/00	219.8663	244.1365	204.9079	165.6793	283.3651	322.5937
06/27/00	248.8758	244.1365	204.9079	165.6793	283.3651	322.5937
07/26/00	271.1359	244.1365	204.9079	165.6793	283.3651	322.5937
09/07/00	261.6690	244.1365	204.9079	165.6793	283.3651	322.5937
03/20/01	241.0452	244.1365	204.9079	165.6793	283.3651	322.5937
04/17/01	250.3929	244.1365	204.9079	165.6793	283.3651	322.5937
06/12/01	352.2854	244.1365	204.9079	165.6793	283.3651	322.5937
07/06/01	196.0457	244.1365	204.9079	165.6793	283.3651	322.5937
05/30/02	219.6604	244.1365	204.9079	165.6793	283.3651	322.5937
09/24/02	264.5316	244.1365	204.9079	165.6793	283.3651	322.5937
02/26/03	222.0363	244.1365	204.9079	165.6793	283.3651	322.5937
07/01/03	242.4652	244.1365	204.9079	165.6793	283.3651	322.5937
09/30/03	241.8166	244.1365	204.9079	165.6793	283.3651	322.5937
04/27/04	285.2941	244.1365	204.9079	165.6793	283.3651	322.5937

**Copper (II) Chloride Reference Toxicant Control Chart -  
Americamysis bahia 7-day Growth**



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
11/16/99	179.7699	219.8767	168.6346	117.3925	271.1188	322.3609
12/14/99	284.9703	219.8767	168.6346	117.3925	271.1188	322.3609
01/26/00	266.2640	219.8767	168.6346	117.3925	271.1188	322.3609
02/24/00	242.9445	219.8767	168.6346	117.3925	271.1188	322.3609
03/21/00	197.3648	219.8767	168.6346	117.3925	271.1188	322.3609
04/12/00	155.3798	219.8767	168.6346	117.3925	271.1188	322.3609
05/09/00	219.4263	219.8767	168.6346	117.3925	271.1188	322.3609
06/27/00	158.5119	219.8767	168.6346	117.3925	271.1188	322.3609
07/26/00	181.1420	219.8767	168.6346	117.3925	271.1188	322.3609
09/07/00	195.4682	219.8767	168.6346	117.3925	271.1188	322.3609
03/20/01	252.1328	219.8767	168.6346	117.3925	271.1188	322.3609
04/17/01	236.2576	219.8767	168.6346	117.3925	271.1188	322.3609
06/12/01	358.3176	219.8767	168.6346	117.3925	271.1188	322.3609
07/06/01	211.7674	219.8767	168.6346	117.3925	271.1188	322.3609
05/30/02	224.4369	219.8767	168.6346	117.3925	271.1188	322.3609
09/24/02	241.1025	219.8767	168.6346	117.3925	271.1188	322.3609
02/26/03	221.3585	219.8767	168.6346	117.3925	271.1188	322.3609
07/01/03	128.5058	219.8767	168.6346	117.3925	271.1188	322.3609
09/30/03	194.1426	219.8767	168.6346	117.3925	271.1188	322.3609
04/27/04	248.2701	219.8767	168.6346	117.3925	271.1188	322.3609



*M. PYRIFERA*

**Macrocyctis Germination and Growth Test-Proportion Germinated**

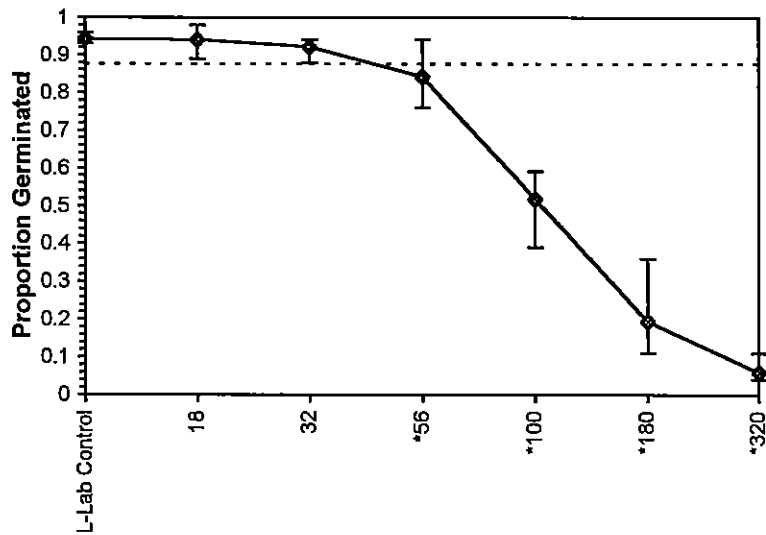
Start Date: 03/16/2004      Test ID: 040316mprt      Sample ID: Ref Toxicant  
 End Date: 03/18/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: Copper chloride  
 Sample Date:      Protocol: MBP 90-Anderson et al.      Test Species: MP-Macrocyctis pyrifera  
 Comments:

Conc-ug/L	1	2	3	4	5
L-Lab Control	0.9500	0.9400	0.9600	0.9400	0.9300
18	0.9200	0.9400	0.8900	0.9800	0.9700
32	0.9100	0.9400	0.9400	0.8800	0.9400
56	0.7600	0.8300	0.8900	0.7900	0.9400
100	0.5900	0.5700	0.3900	0.5000	0.5400
180	0.1900	0.1700	0.1500	0.3600	0.1100
320	0.1100	0.0400	0.0400	0.0600	0.0500

Conc-ug/L	Transform: Arcsin Square Root							t-Stat	1-Tailed Critical	MSD	Number Resp	Total Number
	Mean	N-Mean	Mean	Min	Max	CV%	N					
L-Lab Control	0.9440	1.0000	1.3329	1.3030	1.3694	1.899	5				28	500
18	0.9400	0.9958	1.3331	1.2327	1.4289	6.024	5	-0.005	2.409	0.1205	30	500
32	0.9220	0.9767	1.2906	1.2171	1.3233	3.720	5	0.845	2.409	0.1205	39	500
*56	0.8420	0.8919	1.1711	1.0588	1.3233	9.162	5	3.234	2.409	0.1205	79	500
*100	0.5180	0.5487	0.8034	0.6745	0.8759	9.921	5	10.584	2.409	0.1205	241	500
*180	0.1960	0.2076	0.4511	0.3381	0.6435	25.599	5	17.626	2.409	0.1205	402	500
*320	0.0600	0.0636	0.2428	0.2014	0.3381	23.331	5	21.790	2.409	0.1205	470	500

Auxiliary Tests	Statistic	Critical	Skew	Kurt						
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97159	0.91	0.5251	0.59012						
Bartlett's Test indicates equal variances (p = 0.16)	9.25319	16.8119								
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	32	56	42.332		0.06751	0.07148	1.02405	0.00626	1.8E-20	6, 28

Maximum Likelihood-Probit											
Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	3.65289	0.15388	3.35128	3.9545	0.056	6.60491	9.48773	0.16	2.04999	0.27376	3
Intercept	-2.4884	0.32356	-3.1225	-1.8542							
TSCR	0.0552	0.00682	0.04183	0.06857							
Point	Probits	ug/L	95% Fiducial Limits								
EC01	2.674	25.8902	22.1633	29.5713							
EC05	3.355	39.783	35.3065	44.0897							
EC10	3.718	50.0212	45.2187	54.5948							
EC15	3.964	58.379	53.4064	63.0961							
EC20	4.158	66.0066	60.9311	70.8192							
EC25	4.326	73.34	68.1965	78.2281							
EC40	4.747	95.6381	90.33	100.799							
EC50	5.000	112.198	106.653	117.755							
EC60	5.253	131.626	125.519	138.008							
EC75	5.674	171.645	163.249	181.104							
EC80	5.842	190.715	180.768	202.204							
EC85	6.036	215.633	203.327	230.203							
EC90	6.282	251.663	235.43	271.375							
EC95	6.645	316.428	292.034	346.957							
EC99	7.326	486.226	436.123	551.808							



**Macrocystis Germination and Growth Test-Growth-Length**

Start Date: 03/16/2004      Test ID: 040316mprt      Sample ID:      Ref Toxicant  
 End Date: 03/18/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: Copper chloride  
 Sample Date:      Protocol: MBP 90-Anderson et al.      Test Species: MP-Macrocystis pyrifera  
 Comments:

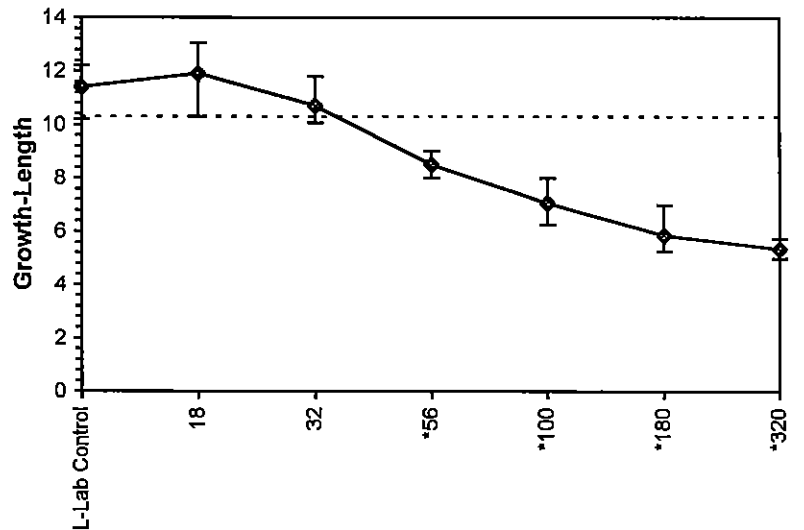
Conc-ug/L	1	2	3	4	5
L-Lab Control	12.250	11.750	10.250	10.750	12.250
18	12.000	13.000	11.000	13.000	10.250
32	11.750	10.000	10.250	10.500	10.750
56	8.250	9.000	8.250	8.000	9.000
100	8.000	7.000	6.250	7.000	7.000
180	5.250	5.250	5.750	6.000	7.000
320	5.500	5.250	5.750	5.250	5.000

Conc-ug/L	Mean	N-Mean	Transform: Untransformed					N	1-Tailed				
			Mean	Min	Max	CV%	t-Stat		Critical	MSD	Mean	N-Mean	
L-Lab Control	11.450	1.0000	11.450	10.250	12.250	7.933	5					11.450	0.0000
18	11.850	1.0349	11.850	10.250	13.000	10.292	5	-0.839	2.409	1.148	11.850	-0.0349	
32	10.650	0.9301	10.650	10.000	11.750	6.342	5	1.679	2.409	1.148	10.650	0.0699	
*56	8.500	0.7424	8.500	8.000	9.000	5.502	5	6.190	2.409	1.148	8.500	0.2576	
*100	7.050	0.6157	7.050	6.250	8.000	8.830	5	9.232	2.409	1.148	7.050	0.3843	
*180	5.850	0.5109	5.850	5.250	7.000	12.312	5	11.750	2.409	1.148	5.850	0.4891	
*320	5.350	0.4672	5.350	5.000	5.750	5.328	5	12.799	2.409	1.148	5.350	0.5328	

Auxiliary Tests	Statistic	Critical	Skew	Kurt						
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96621	0.91	-0.0139	-0.2587						
Bartlett's Test indicates equal variances (p = 0.22)	8.22913	16.8119								
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	32	56	42.332		1.14791	0.10025	36.1577	0.56786	5.0E-15	6, 28

Parameter	Value	SE	95% Fiducial Limits		Maximum Likelihood-Probit						
			Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter		
Slope	1.4269	0.50192	0.44314	2.41066	0	1.50237	9.48773	0.83	2.32529	0.70082	6
Intercept	1.68204	1.07308	-0.4212	3.78527							
TSCR											

Point	Probits	ug/L	95% Fiducial Limits	
EC01	2.674	4.95379	0.00334	19.9675
EC05	3.355	14.8779	0.1116	39.4993
EC10	3.718	26.7394	0.71288	57.7786
EC15	3.964	39.7132	2.45005	75.9319
EC20	4.158	54.3829	6.40166	96.3239
EC25	4.326	71.2183	14.1597	121.746
EC40	4.747	140.52	71.8914	319.804
EC50	5.000	211.489	123.81	882.276
EC60	5.253	318.301	178.388	2909.33
EC75	5.674	628.033	290.069	23862.2
EC80	5.842	822.454	346.343	55870.9
EC85	6.036	1126.26	423.63	151402
EC90	6.282	1672.72	543.031	533470
EC95	6.645	3006.3	779.635	3471999
EC99	7.326	9028.95	1520.08	1.2E+08



Test: MC-Macrocyctis Germination and Growth Test  
 Species: MP-Macrocyctis pyrifer  
 Sample ID: REF-Ref Toxicant  
 Start Date: 03/16/2004 End Date: 03/18/2004

Test ID: 040316mprt  
 Protocol: MBP 90-Anderson et al.  
 Sample Type: CUCL-Copper chloride  
 Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Total Counted	Number Germ	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	Cal Factor	Notes
141	15	5	32	100	94	7	4	4	5	5	3	3	4	4	4	2.5	
142	17	2	56	100	83	4	3	5	2	4	3	3	5	3	4	2.5	
143	10	5	18	100	97	3	5	5	5	4	5	3	4	4	3	2.5	
144	27	2	180	100	17	2	3	2	2	2	2	2	1	2	3	2.5	
145	22	2	100	100	57	2	2	4	3	4	3	4	2	2	2	2.5	
146	24	4	100	100	50	3	4	2	2	2	2	2	4	3	4	2.5	
147	14	4	32	100	88	3	4	5	5	4	4	5	3	5	4	2.5	
148	19	4	56	100	79	4	3	2	3	3	4	4	3	2	4	2.5	
149	4	4	L-Lab Control	100	94	4	4	3	6	4	6	4	3	5	4	2.5	
150	30	5	180	100	11	2	2	4	3	3	5	2	2	2	3	2.5	
151	1	1	L-Lab Control	100	95	5	4	7	6	4	4	5	5	4	5	2.5	
152	9	4	18	100	98	6	3	5	6	7	5	6	5	4	5	2.5	
153	20	5	56	100	94	4	2	5	3	4	3	5	3	3	4	2.5	
154	26	1	180	100	19	2	2	2	3	2	2	2	2	2	2	2.5	
155	23	3	100	100	39	3	2	2	3	4	2	2	2	3	2	2.5	
156	3	3	L-Lab Control	100	96	5	5	3	2	4	5	5	4	5	3	2.5	
157	13	3	32	100	94	4	5	4	4	4	3	5	3	5	4	2.5	
158	32	2	320	100	4	2	2	2	2	2	2	3	2	2	2	2.5	
159	6	1	18	100	92	7	5	5	3	3	5	3	7	4	6	2.5	
160	31	1	320	100	11	3	2	2	2	2	3	2	2	2	2	2.5	
161	12	2	32	100	94	4	3	3	3	4	5	5	4	5	4	2.5	
162	28	3	180	100	15	3	2	2	2	2	3	2	2	3	2	2.5	
163	11	1	32	100	91	6	3	5	5	4	4	5	4	7	4	2.5	
164	7	2	18.0	100	94	4	7	6	6	6	5	4	5	5	4	2.5	
165	29	4	180	100	36	3	2	2	2	2	2	2	2	3	4	2.5	
166	18	3	56	100	89	4	4	5	2	2	4	3	4	2	3	2.5	
167	2	2	L-Lab Control	100	94	5	5	5	4	6	2	4	4	6	6	2.5	
168	21	1	100	100	59	2	3	4	2	2	4	3	4	4	4	2.5	
169	34	4	320	100	6	2	2	2	2	2	2	3	2	2	2	2.5	
170	25	5	100	100	54	3	5	2	2	2	3	3	3	2	3	2.5	
171	8	3	18	100	89	5	5	4	4	4	5	4	5	4	4	2.5	
172	5	5	L-Lab Control	100	93	3	5	4	4	6	5	4	4	7	7	2.5	
173	35	5	320	100	5	2	2	2	2	2	2	2	2	2	2	2.5	
174	16	1	56	100	76	3	3	3	4	3	2	4	3	5	3	2.5	
175	33	3	320	100	4	2	3	3	2	2	3	2	2	2	2	2.5	data entry QC AK 4/20/04

Comments:

Test: MC-Macrocytis Germination and Growth Test

Test ID: 040316mprt

Species: MP-Macrocytis pyrifer

Protocol: MBP 90-Anderson et al.

Sample ID: REF-Ref Toxicant

Sample Type: CUCL-Copper chloride

Start Date: 03/16/2004

End Date: 03/18/2004

Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Total Counted	Number Germ	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	Cal Factor	Notes
141				100	94	7	4	4	5	5	3	3	4	4	4	2.5	AH
142					83	4	3	5	2	4	3	3	5	2	4	1	
143					97	3	5	5	5	4	5	3	4	4	3		
144					17	2	3	2	2	2	2	2	1	2	3		
145					57	2	2	4	3	4	3	4	2	2	2		
146					50	3	4	2	2	2	2	2	4	3	4		
147					88	3	4	5	5	4	4	5	3	5	4		
148					79	4	3	2	3	3	4	4	3	2	4		
149					94	4	4	3	6	4	6	4	3	5	4		
150					11	2	2	4	3	3	5	2	2	2	3		
151					95	5	4	7	6	4	4	5	5	4	5		
152					98	6	3	5	6	7	5	6	5	4	5		
153					94	4	2	5	3	4	3	5	3	3	4		
154					19	2	2	2	3	2	2	2	2	2	2		
155					39	3	2	2	3	4	2	2	2	3	2		
156					96	5	5	3	2	4	5	5	4	5	3		
157					94	4	5	4	4	4	3	5	3	3	4		
158					4	2	2	2	2	2	2	3	2	2	2		
159					92	7	5	5	3	3	5	3	7	4	6		
160					11	3	2	2	2	2	3	2	2	2	2		
161					94	4	3	3	3	4	5	5	4	5	4		
162					15	3	2	2	2	2	3	2	2	3	2		
163					91	6	3	5	5	4	4	5	4	7	4		
164					94	4	7	6	6	6	5	4	5	5	4		
165					36	3	2	2	2	2	2	2	2	3	4		
166					89	4	4	5	2	2	4	3	4	2	3		
167					94	5	5	5	4	6	2	4	4	6	6		
168					59	2	3	4	2	2	4	3	4	4	4		
169					6	2	2	2	2	2	2	3	2	2	2		
170					54	3	5	2	2	2	3	3	3	2	3		
171					89	5	5	4	4	4	5	4	5	4	4		
172					93	3	5	4	4	6	5	4	4	7	7		
173					5	2	2	2	2	2	2	2	2	2	2		
174					76	3	3	3	4	3	2	4	3	5	3		
175					4	2	3	3	2	2	3	2	2	2	2		

Comments:

Test: MC-Macrocyctis Germination and Growth Test  
 Species: MP-Macrocyctis pyrifer  
 Sample ID: REF-Ref Toxicant  
 Start Date: 03/16/2004

Test ID: 040316mprt  
 Protocol: MBP 90-Anderson et al.  
 Sample Type: CUCL-Copper chloride  
 Lab ID: AEESD-AMEC Bioassay SD

End Date: 03/18/2004

Pos	ID	Rep	Group	Total Counted	Number Germ	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	Cal Factor	Notes
151	1	1	L-Lab Control														
167	2	2	L-Lab Control														
156	3	3	L-Lab Control														
149	4	4	L-Lab Control														
172	5	5	L-Lab Control														
159	6	1	18														
164	7	2	18														
171	8	3	18														
152	9	4	18														
143	10	5	18														
163	11	1	32														
161	12	2	32														
157	13	3	32														
147	14	4	32														
141	15	5	32														
174	16	1	56														
142	17	2	56														
166	18	3	56														
148	19	4	56														
153	20	5	56														
168	21	1	100														
145	22	2	100														
155	23	3	100														
146	24	4	100														
170	25	5	100														
154	26	1	180														
144	27	2	180														
162	28	3	180														
165	29	4	180														
150	30	5	180														
160	31	1	320														
158	32	2	320														
175	33	3	320														
169	34	4	320														
173	35	5	320														

Comments: QC: MC

# Kelp Spore Germination Bioassay Worksheet

Client: Internal-CuCl2  
 Test No.: 040316amppt

Start/End Dates: 3-16-04 / 3-18-04  
 Start/End Times: 11:20 / 12:45  
 Test Species: Macrocystis pyrifera

Date Collected: 3-16-04  
 Kelp Collector: AH, JR  
 Collection Location: La Jolla Cove  
 Conditions (weather, etc.): Foggy, moderate surge, 10-15 ft visibility  
 Dilution Water Source (Client I): \_\_\_\_\_: Scirpus peir  
 Dilution Water Source (Client II): \_\_\_\_\_: \_\_\_\_\_  
 Dilution Water Source (Client III): \_\_\_\_\_: \_\_\_\_\_  
 Dilution Water Source (Reference Toxicant): \_\_\_\_\_

Time of Initial Rinsing and Dessication: \_\_\_\_\_  
 Time of Rinsing and Transfer to Release Beakers: 11:35 (keep kelp from each collecting bag separated)  
 Conditions of Zoospore Density and Motility (beaker 1): 14:00 (keep kelp from each collecting bag separated)  
 Time of Blade Removal From Release Beaker 1/Beaker 2 (if needed): \_\_\_\_\_

Density Counts (target = 90): 46 65 49 42 52 Mean: 50.8  
 Mean 50.8 \* 10,000 = 508,000 spores per ml (Density of Spore Release)

Calculate the volume of spore stock to add to each test container:  
 (225,000 spores/container)/(density of spore release) = 0.44 ml stock/container  
 In cases of a spore release = 900,000 spores/ml, the volume is 0.25 ml.

If density > 900,000 spores/ml, calculate a dilution factor, x, and create a new spore stock of 900,000 cells/ml and add 0.25 ml:

$$\text{Density of spore release} \times \frac{0.25 \text{ ml}}{1 \text{ container}} = \frac{\text{spores}}{225,000 \text{ spores}} = \text{_____} (x)$$

Example:  $980,000 * 0.25 / 225,000 = 1.09$  (100 ml stock + 9 ml sw)

In cases of a spore release from 450,000 to 899,000 spores/ml, the volume added should not exceed 0.5 ml. (This volume exceeds the EPA and MBP required volume of no greater than 1% of the total test solution volume. However, it may sometimes be necessary to exceed the required limit of 0.3 ml in order to achieve the desired spore density).

If the density of spore release is < 450,000 spores/ml, check the density of the spores in the second release beaker.

Time of Inoculation: 11:20 Amount inoculated: 0.5 ml

Comments: 24hr @ check - 90% germination

QC Check: AH 4/13/04 Final Review: MC 5/6/04

AMEC Earth & Environmental  
 Bioassay Laboratory  
 5550 Morehouse Drive, Suite B  
 San Diego, CA 92121

AMEC Earth and Environmental  
 Bioassay Laboratory  
 5550 Morehouse Dr. Suite B  
 San Diego, CA 92121

Raw Datasheet  
 Water Quality Measurements  
 Marine Chronic Bioassay

Client: Internal  
 Sample ID: CuCl<sub>2</sub>  
 Test No: 040316 mprt  
 Analyst: mc

Test Species: Macrocystis pyrifera  
 Start/End Dates: 3.16.04 / 3.18.04  
 Start/End Times: 16:20 / 12:45  
 Test Type: Kelp Spore Germination and Growth

Concentration (µg/L)	Initial Readings			Final Readings		
	D.O. (mg/L)	pH (pH units)	Salinity (ppt)	D.O. (mg/L)	pH (pH units)	Salinity (ppt)
LC	9.3	7.93	33.9	7.1	7.95	33.9
18	9.2	7.96	33.6	7.1	7.97	33.7
32	9.2	7.97	34.0	7.1	7.98	34.1
56	9.2	7.99	33.9	7.1	7.99	34.1
100	9.2	8.00	34.0	7.2	7.98	34.0
180	9.1	8.00	33.7	7.2	7.97	33.8
320	9.2	8.00	33.3	7.2	7.97	33.2

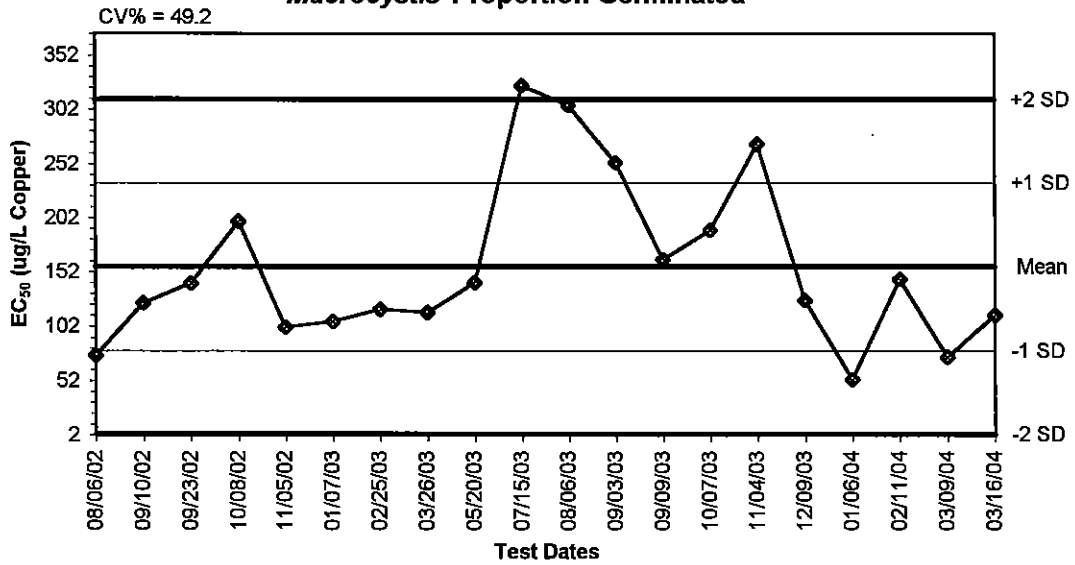
Comments: \_\_\_\_\_

QC Check: AH 4/13/04

Final Review: BCS 5/25/04

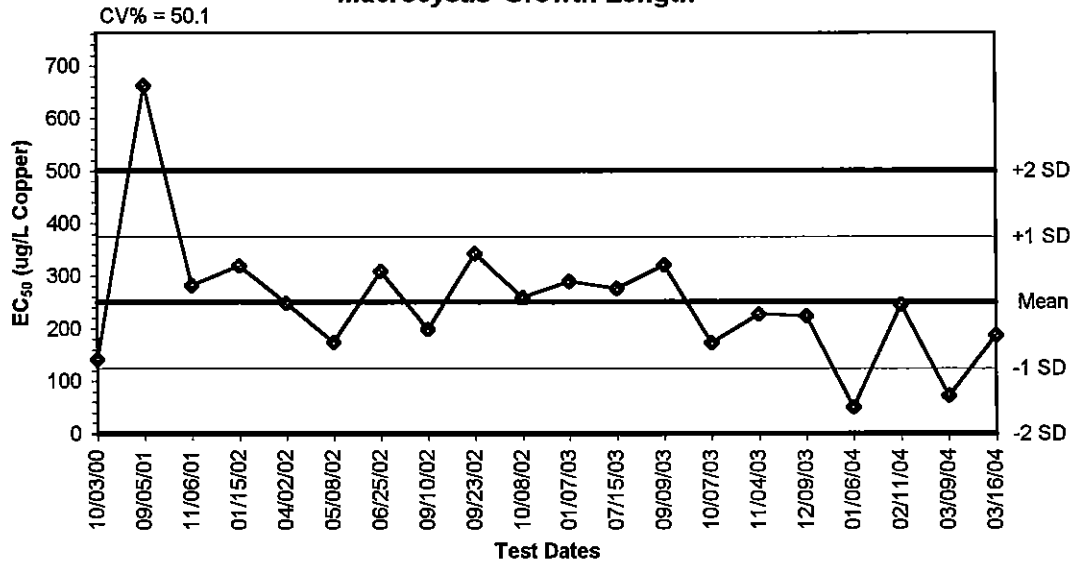


**Copper (II) Chloride Reference Toxicant Control Chart -  
Macrocystis Proportion Germinated**



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
08/06/02	75.4805	156.8042	79.6740	2.5439	233.9343	311.0644
09/10/02	123.3843	156.8042	79.6740	2.5439	233.9343	311.0644
09/23/02	141.3703	156.8042	79.6740	2.5439	233.9343	311.0644
10/08/02	198.6329	156.8042	79.6740	2.5439	233.9343	311.0644
11/05/02	101.1197	156.8042	79.6740	2.5439	233.9343	311.0644
01/07/03	106.2387	156.8042	79.6740	2.5439	233.9343	311.0644
02/25/03	117.3051	156.8042	79.6740	2.5439	233.9343	311.0644
03/26/03	114.8662	156.8042	79.6740	2.5439	233.9343	311.0644
05/20/03	141.9516	156.8042	79.6740	2.5439	233.9343	311.0644
07/15/03	323.8930	156.8042	79.6740	2.5439	233.9343	311.0644
08/06/03	305.9332	156.8042	79.6740	2.5439	233.9343	311.0644
09/03/03	252.7375	156.8042	79.6740	2.5439	233.9343	311.0644
09/09/03	163.1480	156.8042	79.6740	2.5439	233.9343	311.0644
10/07/03	190.3937	156.8042	79.6740	2.5439	233.9343	311.0644
11/04/03	269.9014	156.8042	79.6740	2.5439	233.9343	311.0644
12/09/03	125.8502	156.8042	79.6740	2.5439	233.9343	311.0644
01/06/04	53.0995	156.8042	79.6740	2.5439	233.9343	311.0644
02/11/04	145.1928	156.8042	79.6740	2.5439	233.9343	311.0644
03/09/04	73.3866	156.8042	79.6740	2.5439	233.9343	311.0644
03/16/04	112.1983	156.8042	79.6740	2.5439	233.9343	311.0644

**Copper (II) Chloride Reference Toxicant Control Chart -  
Macrocystis Growth Length**



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
10/03/00	141.5059	249.9288	124.6556	0.0000	375.2020	500.4752
09/05/01	663.2167	249.9288	124.6556	0.0000	375.2020	500.4752
11/06/01	281.3892	249.9288	124.6556	0.0000	375.2020	500.4752
01/15/02	319.8081	249.9288	124.6556	0.0000	375.2020	500.4752
04/02/02	247.5000	249.9288	124.6556	0.0000	375.2020	500.4752
05/08/02	174.5946	249.9288	124.6556	0.0000	375.2020	500.4752
06/25/02	308.1103	249.9288	124.6556	0.0000	375.2020	500.4752
09/10/02	198.1026	249.9288	124.6556	0.0000	375.2020	500.4752
09/23/02	341.7486	249.9288	124.6556	0.0000	375.2020	500.4752
10/08/02	258.3333	249.9288	124.6556	0.0000	375.2020	500.4752
01/07/03	288.9512	249.9288	124.6556	0.0000	375.2020	500.4752
07/15/03	275.5769	249.9288	124.6556	0.0000	375.2020	500.4752
09/09/03	320.0000	249.9288	124.6556	0.0000	375.2020	500.4752
10/07/03	172.6531	249.9288	124.6556	0.0000	375.2020	500.4752
11/04/03	227.8947	249.9288	124.6556	0.0000	375.2020	500.4752
12/09/03	223.1507	249.9288	124.6556	0.0000	375.2020	500.4752
01/06/04	50.7317	249.9288	124.6556	0.0000	375.2020	500.4752
02/11/04	246.0484	249.9288	124.6556	0.0000	375.2020	500.4752
03/09/04	72.2609	249.9288	124.6556	0.0000	375.2020	500.4752
03/16/04	187.0000	249.9288	124.6556	0.0000	375.2020	500.4752

APPENDIX D  
TOXICITY STATISTICAL ANALYSIS SUMMARIES & RAW DATA

## WHOLE SEDIMENT TESTING

**Appendix Table D-1. Non-parametric ANOVA Summary Results  
City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event**

**Test Initiation Date: 24 March 2004  
Test Species: *Eohaustorius estuarius***

<b>Parameter</b>	<b>Value</b>
Table Analyzed	
<b>Amphipod Survival</b>	
Kruskal-Wallis test	
P value	0.0011
Exact or approximate P value?	Gaussian Approximation
P value summary	**
Do the medians vary signif. (P < 0.05)	Yes
Number of groups	11
Kruskal-Wallis statistic	29.44

**Test Initiation Date: 23 March 2004  
Test Species: *Mytilus galloprovincialis***

<b>Parameter</b>	<b>Value</b>
Table Analyzed	
<b>Bivalve Effective Survival</b>	
Kruskal-Wallis test	
P value	0.0638
Exact or approximate P value?	Gaussian Approximation
P value summary	ns
Do the medians vary signif. (P < 0.05)	No
Number of groups	11
Kruskal-Wallis statistic	17.51

**Appendix Table D-1 (Cont.). ANOVA Summary Results  
City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event**

Test Initiation Date: 08 April 2004  
Test Species: *Mytilus galloprovincialis* - SITE B-1 RETEST

Parameter	Value		
Table Analyzed			
<b>Bivalve Effective Survival</b>			
One-way analysis of variance			
P value	0.0068		
P value summary	**		
Are means signif. different? (P < 0.05)	Yes		
Number of groups	3		
F	7.77		
R squared	0.5643		
Bartlett's test for equal variances			
Bartlett's statistic (corrected)	1.8		
P value	0.4065		
P value summary	ns		
Do the variances differ signif. (P < 0.05)	No		
ANOVA Table	SS	df	MS
Treatment (between columns)	0.2018	2	0.1009
Residual (within columns)	0.1558	12	0.01298
Total	0.3576	14	

**Appendix Table D-2. Summary of Whole Sediment t-test p values**  
**City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event**  
**Test Initiation Dates: 23-24 March 2004**

Test Site	Amphipod Survival	Bivalve Survival	Bivalve Normality	Bivalve Effective Survival
A-1	<b>0.0045<sup>a</sup></b>	<b>0.0497</b>	0.1360	0.3420
A-2	0.1875 <sup>a</sup>	0.1296	0.0596	0.0110
A-3	0.2238	0.3425 <sup>a</sup>	0.0750	0.1469
B-1	0.0864 <sup>a</sup>	<b>0.0239</b>	0.3815	0.0520
B-2	0.2860 <sup>a</sup>	0.0505	0.1851	0.0627
B-3	<b>0.0044<sup>a</sup></b>	0.1470 <sup>a</sup>	0.0288 <sup>a</sup>	0.0215
B-4	0.2577	0.2695	0.1844	0.1790
C-1	0.1683 <sup>a</sup>	0.0608	0.1039	0.0289
C-2	<b>0.0091<sup>a</sup></b>	0.4615	0.1110	0.1890
C-3	<b>0.0022<sup>a</sup></b>	0.2653	0.2748	0.2136

**Bold** indicates a statistically significant decrease compared to the sediment control (one-tailed t-test,  $p \leq 0.05$ )

<sup>a</sup> - indicates Welch's correction applied due to unequal variances

**Appendix Table D-2 (Cont.). Summary of Whole Sediment t-test p values**

**City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event**

**Test Initiation Dates: 23-24 March 2004**

<b>Test Site</b>	<b>Bivalve Survival</b>	<b>Bivalve Normality</b>	<b>Bivalve Effective Survival</b>
B-1	<b>0.0128</b>	0.0596	<b>0.0048</b>

**Bold** indicates a statistically significant decrease compared to the sediment control (one-tailed t-test,  $p \leq 0.05$ )



*E. ESTUARIUS*

**Appendix Table D-3. Summary of Pearson Correlations between Grain Size, TOC and Amphipod Survival**  
 City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event  
 Test Initiation Date: 24 March 2004  
 Test Species: *Eohaustorius estuarius*

Grain Size (% fine) vs:	Amphipod Survival
p- value	0.512
N	10
r <sup>2</sup>	0.056
Significance?	NO

Grain Size (% sand) vs:	Amphipod Survival
p- value	0.0189
N	10
r <sup>2</sup>	0.518
Significance?	YES

Grain Size (% gravel) vs:	Amphipod Survival
p- value	0.0176
N	10
r <sup>2</sup>	0.526
Significance?	YES

TOC (mg/kg) vs. :	Amphipod Survival
p- value	0.944
N	10
r <sup>2</sup>	0.001
Significance?	NO

**Appendix Table D-4. Summary of Pearson Correlations between Trace Metal Concentrations and Amphipod Survival**  
 City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event  
 Test Initiation Date: 24 March 2004  
 Test Species: *Eohaustorius estuarius*

Copper (mg/kg) vs. :	Amphipod Survival
p- value	0.379
N	10
r <sup>2</sup>	0.098
Significance?	NO

Nickel (mg/kg) vs. :	Amphipod Survival
p- value	0.089
N	10
r <sup>2</sup>	0.319
Significance?	NO

Zinc (mg/kg) vs. :	Amphipod Survival
p- value	0.226
N	10
r <sup>2</sup>	0.177
Significance?	NO

## 10-Day Sediment Survival Data AMEC Bioassay Laboratory

Client: Buenaventura  
 Project ID: Santa Clara River Estuary  
 Test Date: 4.3.04  
 Test Organism: F. estuarius

Random Number	Time	Number Alive	QA Check	Tech Initials
1	0825	19		JR
2		19		
3		20		
4		20		
5		17		
6		19		
7		20		
8		19		
9		13 ⊕		
10		20		
11		13 ⊕		
12		19		
13		14 ⊕		
14		14 ⊕		
15		17		
16		20		
17		20 ⊕		
18		18		
19		19		
20		17		
21		17		
22		19		
23		13 ⊕		
24		15 ⊕		
25		19		
26		20		
27		17 ⊕		
28		18 ⊕		
29		20		
30		19		
31		15 ⊕		
32		18 ⊕		
33		19		
34		19 ⊕		
35		19		

Air turned off for an undetermined amt. of time day 5.

⊕ Larger grain size

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QA Check: MC 4/7/04  
 Final Review: BCS 5/25/04

**10-Day Sediment Survival Data**  
**AMEC Bioassay Laboratory**

Client: Brenaventura  
 Project ID: Santa Clara River Estuary  
 Test Date: 4/3/04  
 Test Organism: E. estuarium

Random Number	Time	Number Alive	QA Check	Tech Initials
36	1050	19		VR
37		19		
38		17		
39		20		
40		19		
41		13		
42		18		
43		17		
44		20		
45		18		
46		19		
47		15		
48		20		
49		20		
50		16		
51		18		
52		16		
53		17		
54		20		
55		20		
56		19		
57		20		
58		20		
59		15		
60		16		

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QA Check: ME 4/7/04  
 Final Review: BCS 5/25/04

**Ten-Day Amphipod Bioassay - Ogden Bioassay Laboratory**  
**Day Ten Emergence Data**

Client: City of Buena Vista  
 Date: 4/3/04  
 Test Species: E. herbstianus

↓  
Survivability

Random Number	Number Emerged Alive	Comments/ Observations
Ee Control	20	
Macoma Control	19	
A-1	16	
A-2	19	
A-3	18	
B-1	17	
B-2	20	
B-3	17	
B-4	19	
C-1	20	
C-2	14	
C-3	18	

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QA Review/Date: JJC 4/7/04  
 Final Review/Date: BCS 5/25/04

City of Buenaventura  
 Whole Sediment Amphipod Test  
*Eohaustorius estuarius*

Site	Rep	Rand#
<b>CONTROL</b> Water only	A	19
	B	54
	C	49
	D	8
	E	7
	Surr	--
<b>CONTROL</b> Sed.	A	57
	B	30
	C	12
	D	26
	E	25
	Surr	--
<b>A-1</b>	A	38
	B	59
	C	22
	D	20
	E	42
	Surr	--
<b>A-2</b>	A	44
	B	46
	C	16
	D	15
	E	45
	Surr	--
<b>A-3</b>	A	18
	B	1
	C	29
	D	36
	E	39
	Surr	--

Site	Rep	Rand #
<b>B-2</b>	A	21
	B	51
	C	3
	D	33
	E	48
	Surr	--
<b>B-3</b>	A	31
	B	11
	C	14
	D	40
	E	41
	Surr	--
<b>B-4</b>	A	43
	B	37
	C	55
	D	35
	E	4
	Surr	--
<b>C-1</b>	A	17
	B	32
	C	6
	D	9
	E	34
	Surr	--
<b>C-2</b>	A	28
	B	27
	C	13
	D	52
	E	2
	Surr	--

*M. GALLOPROVINCIALIS*



**Appendix Table D-5. Summary of Pearson Correlations between Grain Size, TOC and Bivalve Results**

City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 23 March 2004

Test Species: *Mytilus galloprovincialis*

Grain Size (% fine) vs:	Survival	Normality	Effective Survival
p- value	0.7549	0.3927	0.9953
N	10	10	10
r <sup>2</sup>	0.013	0.093	<0.001
Significance?	NO	NO	NO

Grain Size (% sand) vs:	Survival	Normality	Effective Survival
p- value	0.988	0.846	0.994
N	10	10	10
r <sup>2</sup>	<0.001	0.005	<0.001
Significance?	NO	NO	NO

Grain Size (% gravel) vs:	Survival	Normality	Effective Survival
p- value	0.936	0.554	0.813
N	10	10	10
r <sup>2</sup>	0.001	0.046	0.007
Significance?	NO	NO	NO

TOC (mg/kg) vs. :	Survival	Normality	Effective Survival
p- value	0.844	0.285	0.561
N	10	10	10
r <sup>2</sup>	0.005	0.141	0.044
Significance?	NO	NO	NO

**Appendix Table D-6. Summary of Pearson Correlations between Trace Metals and Bivalve Results**

City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 23 March 2004

Test Species: *Mytilus galloprovincialis*

Copper (mg/kg) vs. :	Survival	Normality	Effective Survival
p- value	0.481	0.500	0.445
N	10	10	10
r <sup>2</sup>	0.064	0.059	0.075
Significance?	NO	NO	NO

Nickel (mg/kg) vs. :	Survival	Normality	Effective Survival
p- value	0.716	0.829	0.794
N	10	10	10
r <sup>2</sup>	0.017	0.006	0.009
Significance?	NO	NO	NO

Zinc (mg/kg) vs. :	Survival	Normality	Effective Survival
p- value	0.487	0.306	0.399
N	10	10	10
r <sup>2</sup>	0.062	0.130	0.090
Significance?	NO	NO	NO

## Bivalve Embryo Development Score Sheet AMEC Bioassay Laboratory

Client: City of Buena Vista Site ID: Whole Sediment  
 Test Species: M. galloprovincialis Project ID: \_\_\_\_\_  
 Analyst: \_\_\_\_\_ Date: 3-25-07

TPA- 96  
 B- 124  
 C- 124  
 D- 139  
 E- 109

Random No.	Number Normal	Total Number	Comments/ Observations
31	81	103	AT
32	55	77	
33	64	81	
34	62	70	
35	67	82	
36	63	79	
37	52	66	↓
38	45	49	SD
39	38	54	
40	43	50	
41	63	78	
42	46	52	
43	46	64	
44	52	66	
45	57	60	
46	46	56	
47	47	68	
48	57	68	
49	73	110	
50	57	69	↓
51	<del>31</del> 51	59	JWJ
52	26	44	
53	30	58	
54	49	75	
55	32	51	
56	24	44	↓
57	<del>(R) 66</del> 33	<del>(R) 33</del> 66	R6
58	39	65	R6
59	29	60	R6
60	18	40	R6

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QA Check: LLC 5/5/04

Final Review: BRS 5/25/04

## Bivalve Embryo Development Score Sheet AMEC Bioassay Laboratory

Client: City of Buena Vista Site ID: Whole Sediment  
 Test Species: m. galloprovincialis Project ID: \_\_\_\_\_  
 Analyst: \_\_\_\_\_ Date: 3.25.04

Random No.	Number Normal	Total Number	Comments/ Observations
1	35	43	SD
2	42	47	
3	48	62	
4	<del>57</del> 41	<del>58</del> 50	
5	<del>42</del> 38	<del>38</del> 42	
6	<del>44</del> <del>96</del> 61	<del>75</del> 49	MC R6
7	me 96 75	me 75 96	mc
8	70	89	me
9	me 61 43	me 44 57	mc
10	34	45	SD
11	55	66	MV
12	51 34	66 45	JR
13	62 51	66 75	
14	51	60	
15	56	81	
16	52	68	
17	67	87	
18	70	86	
19	56	93	
20	26	30	
21	70	81	
22	46	53	SD
23	39	50	
24	59	70	
25	39	<del>50</del> 58	
26	48	59	
27	51	63	
28	58	74	
29	43	55	
30	33	56	

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QA Check: Me 5/5/04

Final Review: Bcs 5/25/04

City of Buenaventura  
 Whole Sediment Bivalve Test  
*Mytilus galloprovincialis*

Site	Rep	Rand#
<b>CONTROL</b> Water Only	A	19
	B	54
	C	49
	D	8
	E	7
<b>CONTROL</b> Sed. Cont.	A	57
	B	30
	C	12
	D	26
	E	25
<b>A-1</b>	A	38
	B	59
	C	22
	D	20
	E	42
<b>A-2</b>	A	44
	B	46
	C	16
	D	15
	E	45
<b>A-3</b>	A	18
	B	1
	C	29
	D	36
	E	39
<b>B-1</b>	A	10
	B	56
	C	58
	D	5
	E	60

Site	Rep	Rand #
<b>B-2</b>	A	21
	B	51
	C	3
	D	33
	E	48
<b>B-3</b>	A	31
	B	11
	C	14
	D	40
	E	41
<b>B-4</b>	A	43
	B	37
	C	55
	D	35
	E	4
<b>C-1</b>	A	17
	B	32
	C	6
	D	9
	E	34
<b>C-2</b>	A	28
	B	27
	C	13
	D	52
	E	2
<b>C-3</b>	A	50
	B	53
	C	47
	D	23
	E	24

# Bivalve Development Bioassay Worksheet

Client: Buenaventura + SPAWAR Start Date/Time: 3/23/04  
Test No.: \_\_\_\_\_ End Date/Time: 3/25/04  
Test Species: M. galloprovincialis Date Received: 3/22/04

Sample Type: Whole sediment (Buenaventura),

Test Chamber Type and Sample Volume: 12 glass jars, 10ml shell vials

Spawn Initiation Time: 1145

Number of Spawners: Male 16 Female 8

Spawn Condition: Good

Fertilization Time: 1415

Egg Stock Density Calculation: 1:10

Eggs Counted (x):	<u>105</u>	<u>98</u>	} Counts on 1:10 dilution
	<u>106</u>	<u>97</u>	
	<u>113</u>	<u>123</u>	
	<u>96</u>	<u>114</u>	
	<u>98</u>	<u>121</u>	
Mean	<u>102.4</u>	<u>110.6</u>	

$$\text{Mean: } \underline{106.5} \times 42 = \underline{4,473} \text{ eggs/ml}$$

$$\begin{array}{l} \text{Initial Stock - } \underline{44730} \text{ eggs/ml} \\ \text{Inoculum Stock - } \underline{72000} \text{ eggs/ml} \end{array} = \frac{\text{Stock Dilution Factor}}{\underline{2.03}}$$

Percent Division Upon Inoculation: ~80%

Time of Inoculation: 1430

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Reviewed/ Date: 2/10/04

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San Diego, CA 92121  
(858) 458-9044

# Bivalve Embryo Development Score Sheet

## AMEC Bioassay Laboratory

Client: Buena Ventura  
 Test Species: Mytilus spp.  
 Analyst: TA

Site ID: B-1 (retest)  
 Project ID: \_\_\_\_\_  
 Date: 5/8/04

Random No.	Number Normal	Number Abnormal	Total Number	Comments/ Observations
1A	100	NA-	109	
2A	83		98	
3A	91		102	
4A	65		73	
5A	100		109	
6A	80		93	
7A	96		110	
8A	100		118	
9A	55		79	
10A	73		99	
11A	65		80	
12A	124		146	
13A	82		100	
14A	84		93	
15A	93		104	
1B	84		93	
2B	81		93	
3B	98		116	
4B	86		100	
5B	91		97	
6B	100		115	
7B	100		119	
8B	85		108	
9B	77		97	
10B	52		76	

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QA Check: BCS 5/24/04

Final Review: TA 5/25/04

# Bivalve Embryo Development Score Sheet

## AMEC Bioassay Laboratory

Client: <sup>TA</sup> Buena Vista Ventura  
Test Species: Mytilus spp.  
Analyst: TA

Site ID: B-1 (retest)  
Project ID:  
Date: 5/8/04

Random No.	Number Normal	Number Abnormal	Total Number	Comments/ Observations
11B	77		91	
12B	100		100	
13B	86		BS 207 107	
14B	75		95	
15B	83		91	
T0-1			162	
-2			161	
-3			146	
-4			135	
-5			171	

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QA Check: BS 5/24/04  
Final Review: [Signature] 5/25/04



City of Buenaventura  
Whole Sediment Bivalve Confirmation Retest  
*Mytilus galloprovincialis*  
Test Date: 5/7/04

Site	Rep	Rand#
<b>CONTROL</b>	A	13
<b>Water Only</b>	B	8
	C	2
	D	5
	E	3
<b>CONTROL</b>	A	6
<b>Sed. Cont.</b>	B	1
	C	15
	D	7
	E	12
<b>B-1</b>	A	14
	B	10
	C	4
	D	9
	E	11

# Bivalve Development Bioassay Worksheet

Client: SPAWARTIE, IJenaventura  
 Test No.: 0405-019  
 Test Species: M. galloprovincialis

Start Date/Time: 5/8/04 1300, 1330  
 End Date/Time: 5/18/04  
 Date Received: 5/8/04 8me

Sample Type: C18 Elution, Whole Sediment

Test Chamber Type and Sample Volume: 30ml shell vials, 1L Glass Jars

Spawn Initiation Time: 0945

Number of Spawners: Male 4 Female 1

Spawn Condition: moderate

Fertilization Time: 1130

Egg Stock Density Calculation:

Eggs Counted (x):	<u>51</u>	<u>42</u>
	<del>206</del>	
	<u>53</u>	<u>47</u>
	<u>49</u>	<u>46</u>
	<u>52</u>	<u>53</u>
	<u>59</u>	<u>54</u>

Mean 52.8      48.4      Overall Mean: 50.6

Mean: 50.6 X 42 = 2125 eggs/ml

Initial Stock - 2125 eggs/ml = 5.313 Stock Dilution Factor  
 Inoculum Stock - 400 eggs/ml

Percent Division Upon Inoculation: 85%

Time of Inoculation: 1300

<u>201</u>	<u>189</u>
<u>208</u>	<u>188</u>
<u>212</u>	<u>221</u>
<u>193</u>	<u>209</u>
<u>192</u>	<u>206</u>
$\bar{x} = 201$	<u>202.6</u> mean = 201.8
	stock = 8475.6

Comments: jars inoculated @ 1330  
w/ 3ml of 8500 eggs/ml  
stock (~ 25000 eggs/ml)

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Reviewed/ Date: 5/26/04      QC1 = 95% JR

## AMBIENT WATER TESTING

FRESHWATER

**Appendix Table D-7. Summary of Ambient Water t-test p Values for Freshwater Species**

City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Date: 17 March 2004

Test Site	Fathead Minnow		Water Flea		Algal Cell Density
	Survival	Growth	Survival	Reproduction	
A-2	0.2961	0.3280	0.3367	0.7019	<b>0.0119</b>
B-1	0.1141	0.0847 <sup>a</sup>	0.1717 <sup>a</sup>	0.1301	<b>0.0120</b>
B-3	-- <sup>b</sup>	-- <sup>b</sup>	-- <sup>b</sup>	1.0000	<0.0001
C-3	0.3652	0.0148	0.2780	0.2229	<b>0.0048<sup>a</sup></b>

**Bold** indicates a statistically significant decrease compared to the salt control ( $p \leq 0.05$ )

<sup>a</sup> - indicates Welch's correction applied due to unequal variances

<sup>b</sup> - No comparisons made due to greater toxicity on the salt controls.

*P. PROMELAS*

**Larval Fish Growth and Survival Test-7 Day Survival**

Start Date: 03/17/2004      Test ID: 0403-110      Sample ID: City of Buenaventura  
 End Date: 03/24/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: Ambient water  
 Sample Date: 03/16/2004      Protocol: EPAF 94-EPA Freshwater C      Test Species: PP-Pimephales promelas  
 Comments: A-2

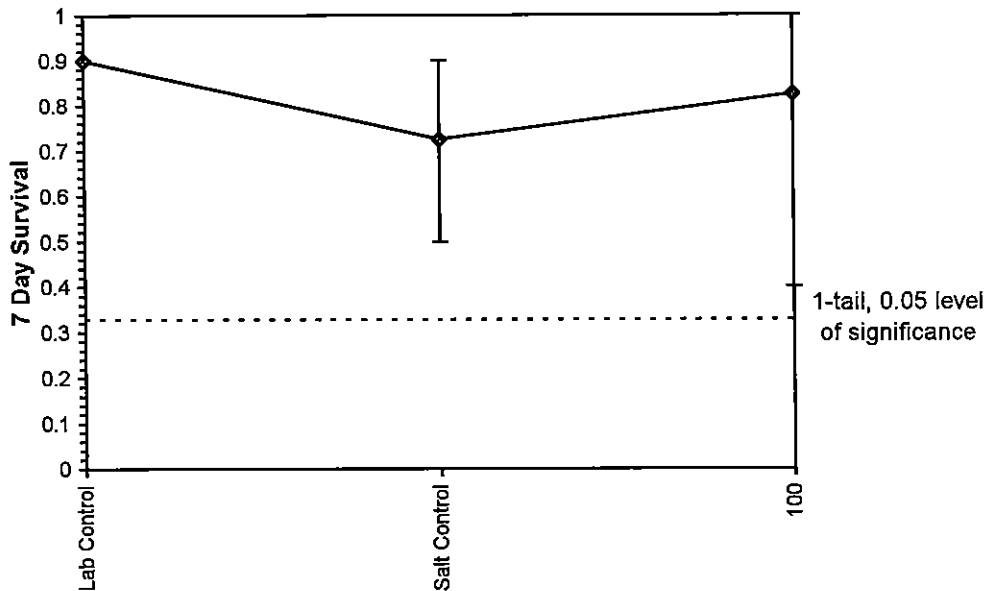
Conc-%	1	2	3	4
Lab Control	0.9000	0.9000	0.9000	0.9000
Salt Control	0.6000	0.9000	0.5000	0.9000
100	0.4000	1.0000	1.0000	0.9000

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root					N	t-Stat	1-Tailed Critical	MSD
			Mean	Min	Max	CV%					
Lab Control	0.9000	1.2414	1.2490	1.2490	1.2490	0.000	4				
Salt Control	0.7250	1.0000	1.0424	0.7854	1.2490	23.229	4				
100	0.8250	1.1379	1.1894	0.6847	1.4120	29.017	4	-0.698	1.943	0.4096	

(All data compared against salt control)

Auxiliary Tests	Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution ( $p > 0.01$ )	0.82531	0.749	-0.9916	-0.2668		
F-Test indicates equal variances ( $p = 0.58$ )	2.0318	47.4683				
The control means are not significantly different ( $p = 0.14$ )	1.70691	2.44691				
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences	0.39611	0.5311	0.04325	0.08888	0.51154	1, 6

**Dose-Response Plot**



**Larval Fish Growth and Survival Test-7 Day Growth**

Start Date: 03/17/2004	Test ID: 0403-110	Sample ID:	City of Buenaventura
End Date: 03/24/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type:	Ambient water
Sample Date: 03/16/2004	Protocol: EPAF 94-EPA Freshwater C	Test Species:	PP-Pimephales promelas
Comments: A-2			

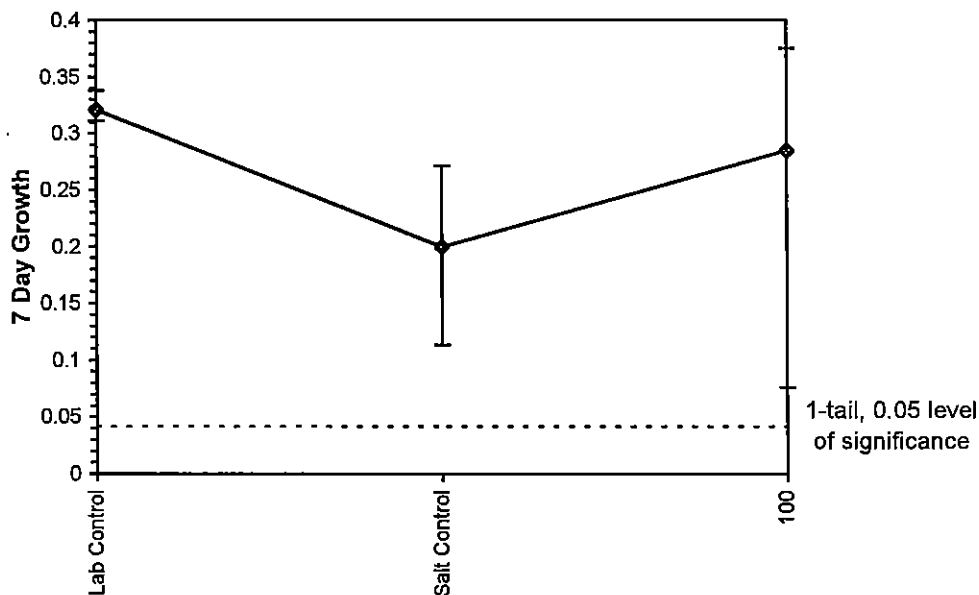
Conc-%	1	2	3	4
Lab Control	0.3380	0.3240	0.3120	0.3110
Salt Control	0.1500	0.2660	0.1140	0.2720
100	0.0760	0.3140	0.3750	0.3750

Conc-%	Mean	N-Mean	Transform: Untransformed					N	t-Stat	1-Tailed Critical	MSD
			Mean	Min	Max	CV%					
Lab Control	0.3213	1.6022	0.3213	0.3110	0.3380	3.932	4				
Salt Control	0.2005	1.0000	0.2005	0.1140	0.2720	40.144	4				
100	0.2850	1.4214	0.2850	0.0760	0.3750	49.919	4	-1.034	1.943	0.1588	

(All data compared against salt control)

Auxiliary Tests	Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution ( $p > 0.01$ )	0.84407	0.749	-1.2088	0.71378		
F-Test indicates equal variances ( $p = 0.37$ )	3.12436	47.4683				
The control means are significantly different ( $p = 0.03$ )	2.96416	2.44691				
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences	0.15882	0.7921	0.01428	0.01336	0.34105	1, 6

**Dose-Response Plot**





**Larval Fish Growth and Survival Test-7 Day Survival**

Start Date: 03/17/2004	Test ID: 0403-111	Sample ID:	City of Buenaventura
End Date: 03/24/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type:	Ambient water
Sample Date: 03/16/2004	Protocol: EPAF 94-EPA Freshwater C	Test Species:	PP-Pimephales promelas
Comments: B-1			

Conc-%	1	2	3	4
Lab Control	0.9000	0.9000	0.9000	0.9000
Salt Control	1.0000	1.0000	1.0000	0.8000
100	0.9000	0.9000	0.8000	0.9000

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root					Rank Sum	1-Tailed Critical
			Mean	Min	Max	CV%	N		
Lab Control	0.9000	0.9474	1.2490	1.2490	1.2490	0.000	4		
Salt Control	0.9500	1.0000	1.3358	1.1071	1.4120	11.411	4		
100	0.8750	0.9211	1.2136	1.1071	1.2490	5.846	4	13.50	11.00

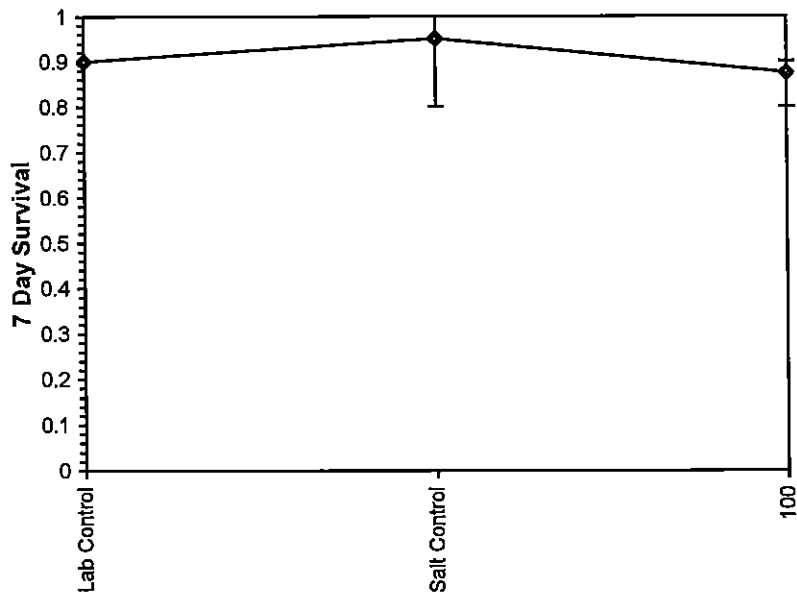
(All data compared against salt control)

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution ( $p \leq 0.01$ )	0.73338	0.749	-1.6707	2.03146
F-Test indicates equal variances ( $p = 0.24$ )	4.6161	47.4683		
The control means are not significantly different ( $p = 0.30$ )	1.13825	2.44691		

**Hypothesis Test (1-tail, 0.05)**

Wilcoxon Two-Sample Test indicates no significant differences

**Dose-Response Plot**



**Larval Fish Growth and Survival Test-7 Day Growth**

Start Date: 03/17/2004	Test ID: 0403-111	Sample ID:	City of Buenaventura
End Date: 03/24/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type:	Ambient water
Sample Date: 03/16/2004	Protocol: EPAF 94-EPA Freshwater C	Test Species:	PP-Pimephales promelas
Comments: B-1			

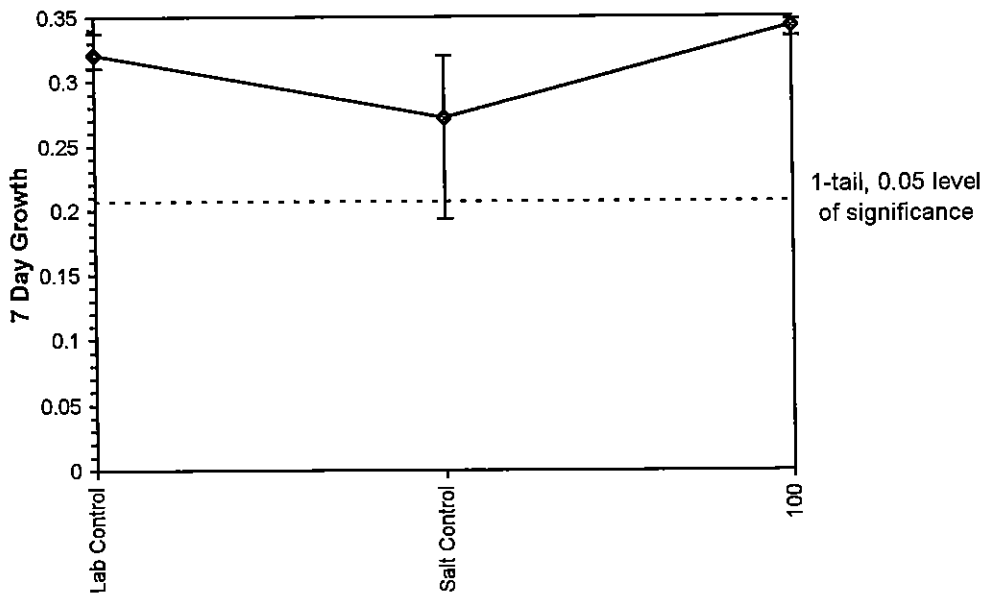
Conc-%	1	2	3	4
Lab Control	0.3380	0.3240	0.3120	0.3110
Salt Control	0.3200	0.2860	0.2890	0.1930
100	0.3480	0.3430	0.3470	0.3350

Conc-%	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed Critical	MSD
			Mean	Min	Max	CV%				
Lab Control	0.3213	1.1811	0.3213	0.3110	0.3380	3.932	4			
Salt Control	0.2720	1.0000	0.2720	0.1930	0.3200	20.170	4			
100	0.3433	1.2619	0.3433	0.3350	0.3480	1.721	4	-2.582	2.353	0.0649

**(All data compared against salt control)**

Auxiliary Tests	Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution ( $p > 0.01$ )	0.83603	0.749	-1.516	4.03634		
F-Test indicates unequal variances ( $p = 4.15E-03$ )	86.2053	47.4683				
The control means are not significantly different ( $p = 0.13$ )	1.74959	2.44691				
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Heteroscedastic t Test indicates no significant differences	0.06493	0.23871	0.01015	0.00152	0.04163	1, 6

**Dose-Response Plot**



**Larval Fish Growth and Survival Test-7 Day Survival**

Start Date: 03/17/2004      Test ID: 0403-112      Sample ID:      City of Buenaventura  
 End Date: 03/24/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: Ambient water  
 Sample Date: 03/16/2004      Protocol: EPAF 94-EPA Freshwater C      Test Species: PP-Pimephales promelas  
 Comments: B-3

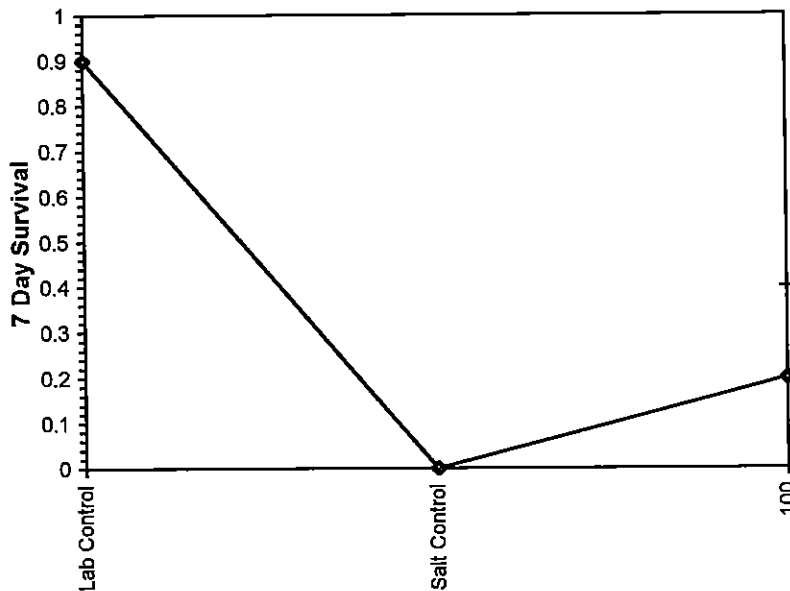
Conc-%	1	2	3	4
Lab Control	0.9000	0.9000	0.9000	0.9000
Salt Control	0.0000	0.0000	0.0000	0.0000
100	0.4000	0.3000	0.1000	0.0000

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root				N	t-Stat	1-Tailed Critical	MSD
			Mean	Min	Max	CV%				
Lab Control	0.9000		1.2490	1.2490	1.2490	0.000	4			
Salt Control	0.0000		0.1588	0.1588	0.1588	0.000	4			
100	0.2000		0.4362	0.1588	0.6847	54.954	4	-2.315	2.353	0.2821

(All data compared against salt control)

Auxiliary Tests	Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution ( $p > 0.01$ )	0.9276	0.749	-0.2248	0.94081		
Equality of variance cannot be confirmed						
The control means are significantly different ( $p = 4.02E-59$ )	1.1E+10	2.44691				
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Heteroscedastic t Test indicates no significant differences	0.00988	0.39502	0.15395	0.02873	0.05988	1, 6

**Dose-Response Plot**



**Larval Fish Growth and Survival Test-7 Day Growth**

Start Date: 03/17/2004	Test ID: 0403-112	Sample ID:	City of Buenaventura
End Date: 03/24/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type:	Ambient water
Sample Date: 03/16/2004	Protocol: EPAF 94-EPA Freshwater C	Test Species:	PP-Pimephales promelas
Comments: B-3			

Conc-%	1	2	3	4
Lab Control	0.3380	0.3240	0.3120	0.3110
Salt Control	0.0000	0.0000	0.0000	0.0000
100	0.1200	0.0990	0.0350	0.0000

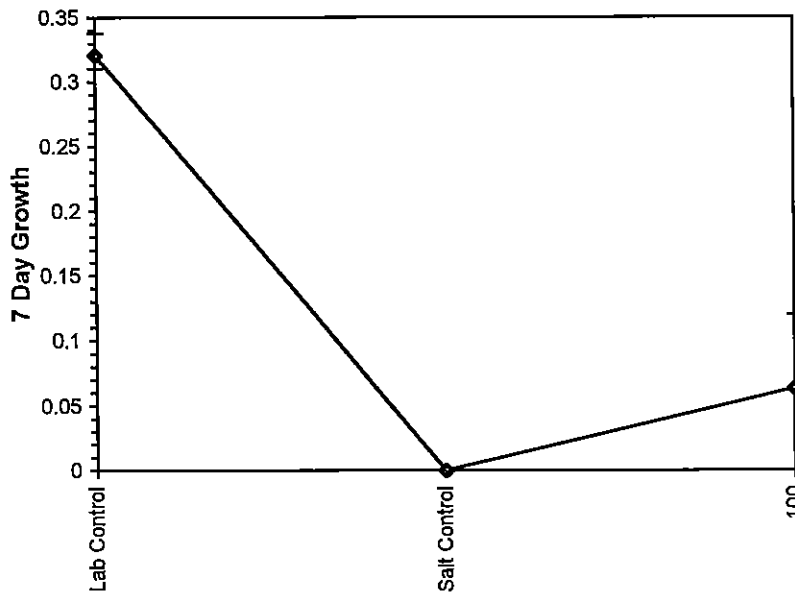
Conc-%	Mean	N-Mean	Transform: Untransformed				N	Rank Sum	1-Tailed Critical
			Mean	Min	Max	CV%			
Lab Control	0.3213		0.3213	0.3110	0.3380	3.932	4		
Salt Control	0.0000		0.0000	0.0000	0.0000	0.000	4		
100	0.0635		0.0635	0.0000	0.1200	87.667	4	24.00	11.00

**(All data compared against salt control)**

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution ( $p > 0.01$ )	0.92777	0.749	-0.2129	0.67786
Equality of variance cannot be confirmed				
The control means are significantly different ( $p = 3.88E-09$ )	50.8604	2.44691		

**Hypothesis Test (1-tail, 0.05)**  
 Wilcoxon Two-Sample Test indicates no significant differences

**Dose-Response Plot**



**Larval Fish Growth and Survival Test-7 Day Survival**

Start Date: 03/17/2004	Test ID: 0403-113	Sample ID:	City of Buenaventura
End Date: 03/24/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type:	Ambient water
Sample Date: 03/16/2004	Protocol: EPAF 94-EPA Freshwater C	Test Species:	PP-Pimephales promelas
Comments: C-3			

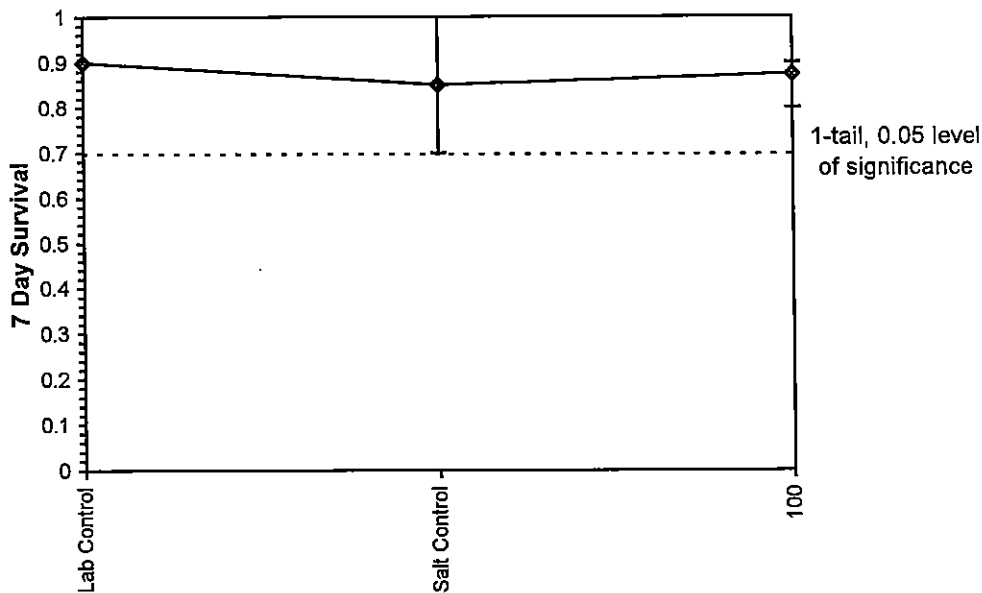
Conc-%	1	2	3	4
Lab Control	0.9000	0.9000	0.9000	0.9000
Salt Control	0.7000	0.8000	0.9000	1.0000
100	0.8000	0.9000	0.9000	0.9000

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root					N	1-Tailed		
			Mean	Min	Max	CV%	t-Stat		Critical	MSD	
Lab Control	0.9000	1.0588	1.2490	1.2490	1.2490	0.000	4				
Salt Control	0.8500	1.0000	1.1898	0.9912	1.4120	15.281	4				
100	0.8750	1.0294	1.2136	1.1071	1.2490	5.846	4	-0.243	1.943	0.1896	

(All data compared against salt control)

Auxiliary Tests	Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution ( $p > 0.01$ )	0.9397	0.749	0.1547	0.48587		
F-Test indicates equal variances ( $p = 0.16$ )	6.56777	47.4683				
The control means are not significantly different ( $p = 0.54$ )	0.65122	2.44691				
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences	0.1535	0.17812	0.00113	0.01905	0.81598	1, 6

**Dose-Response Plot**



**Larval Fish Growth and Survival Test-7 Day Growth**

Start Date: 03/17/2004	Test ID: 0403-113	Sample ID:	City of Buenaventura
End Date: 03/24/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type:	Ambient water
Sample Date: 03/16/2004	Protocol: EPAF 94-EPA Freshwater C	Test Species:	PP-Pimephales promelas
Comments: C-3			

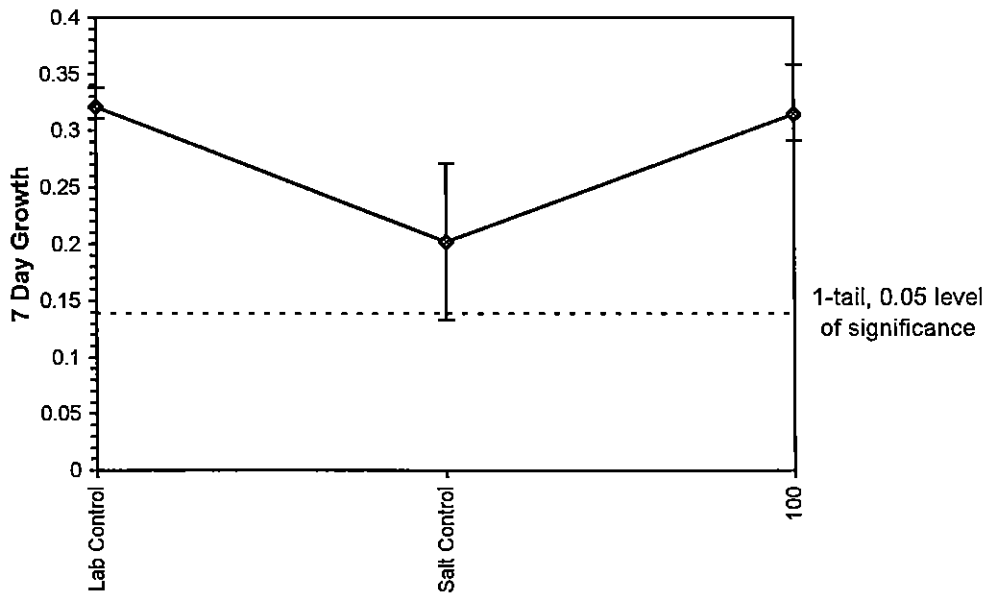
Conc-%	1	2	3	4
Lab Control	0.3380	0.3240	0.3120	0.3110
Salt Control	0.1330	0.2140	0.1900	0.2710
100	0.2940	0.2910	0.3120	0.3580

Conc-%	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed	
			Mean	Min	Max	CV%			Critical	MSD
Lab Control	0.3213	1.5903	0.3213	0.3110	0.3380	3.932	4			
Salt Control	0.2020	1.0000	0.2020	0.1330	0.2710	28.309	4			
100	0.3138	1.5532	0.3138	0.2910	0.3580	9.856	4	-3.438	1.943	0.0632

(All data compared against salt control)

Auxiliary Tests	Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution ( $p > 0.01$ )	0.96873	0.749	0.16595	0.28679		
F-Test indicates equal variances ( $p = 0.34$ )	3.41961	47.4683				
The control means are significantly different ( $p = 6.56E-03$ )	4.07256	2.44691				
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences	0.06316	0.31269	0.02498	0.00211	0.01384	1, 6

Dose-Response Plot



Freshwater Chronic Bioassay

Larval Fish Survival & Weights

Test Species: P. promelas

Client Name: Buenaventura

Test Date: 3/17/04

Sample ID: Santa Clara River Estuary

Test No.: 0403-110,111,112,113

Conc. (100%)	Rep.	Test Day								Percent Survival	pan wt. (g)	pan + fish (g)
		0	1	2	3	4	5	6	7			
Lab Control	a	10	10	10	10	10	10	9	9	90	0.04282	0.04670
	b	10	9	9	9	9	9	9	9	90	0.04182	0.04506
	c	10	9	9	9	9	9	9	9	90	0.04074	0.04386
	d	10	10	10	10	9	9	9	9	90	0.04285	0.04596
100% AZ	a	10	10	9	8	6	4	4	4	40	0.03551	0.03627
	b	10	10	10	10	10	10	10	10	100	0.04538	0.04852
	c	10	10	10	10	10	10	10	10	100	0.04125	0.04500
	d	10	10	10	10	10	10	9	9	90	0.04225	0.04600
B-1 100%	a	10	9	9	9	9	9	9	9	90	0.04205	0.04553
	b	10	10	9	9	9	9	9	9	90	0.03946	0.04289
	c	10	10	10	8	8	8	8	8	80	0.04046	0.04387
	d	10	9	9	9	9	9	9	9	90	0.02719	0.03054
B-3 100%	a	10	10	10	9	3	5	5	4	46	0.03434	0.03534
	b	10	10	10	10	10	7	5	3	30	0.03335	0.03434
	c	10	10	9	8	3	1	1	1	10	0.03241	0.03276
	d	10	10	7	1	1	0	-	-	0	0.03224	0.03518
C-2 100%	a	10	10	9	9	9	8	8	8	80	0.03194	0.03485
	b	10	10	10	9	9	9	9	9	90	0.03401	0.03713
	c	10	10	10	10	10	10	9	9	90	0.03337	0.03695
	d	10	10	10	10	10	10	9	9	90		
	a											
	b											
	c											
	d											
	a											
	b											
	c											
	d											
Tech Initials		SD	MT	AW	SA	RA	RA	SA	SA			

Feeding Times (day):

	0	1	2	3	4	5	6
1	0845	0815	0700	0930	0830	0830	0830
2	1300	1245	1130	1510	1245	1245	1245
3	1430	1545	1700	1400	1500	1630	1630

Comments: \_\_\_\_\_

Weight Data:  
 Date/Time in: 3/24/04 / 1500  
 Date/Time out: 3/26/04 / 1110  
 Oven Temp (°C): 59  
 Tech Initials: AW

QC Check: UC 4/13/04  
 Final Review: MT 5/12/04

Test Species: P. promelas

Client Name: City of Buena Ventura Test Date: 3/17/04 <sup>SD</sup> 3/18/04

Sample ID: Salt Controls Test No.: §0403-110,111,112,113

Conc. ( )	Rep.	Test Day								Percent Survival	pan wt. (g)	pan + fish (g)
		0	1	2	3	4	5	6	7			
SC A-2 3.1 ppt	a	10	10	10	10	9	8	8	6	60	0.02471	0.02621
	b	10	10	10	10	10	9	9	9	90	0.03050	0.03316
	c	10	10	10	9	8	8	5	5	50	0.03484	0.03598
	d	10	10	10	9	9	9	9	9	90	0.03030	0.03302
SC B-1 1.4 ppt	a	10	10	10	10	10	10	10	10	100	0.02590	0.02902 0.02910
	b	10	10	10	10	10	10	10	10	100	0.02437	0.02723
	c	10	10	10	10	10	10	10	10	100	0.02296	0.02585
	d	10	10	10	10	10	10	9	8	80	0.02260	0.02453
SC B-3 14.4 ppt	a	10	0	-	-	-	-	-	-	0		
	b	10	0	-	-	-	-	-	-	0		
	c	10	0	-	-	-	-	-	-	0		
	d	10	0	-	-	-	-	-	-	0		
SC C-3 1.7 ppt	a	10	10	10	9	9	7	7	7	70	0.02375	0.02508
	b	10	10	10	9	9	9	8	8	80	0.02136	0.02350
	c	10	10	10	10	10	10	10	9	90	0.02138	0.02328
	d	10	10	10	10	10	10	10	10	100	0.02392	0.02463
	a											
	b											
	c											
	d											
	a											
	b											
	c											
	d											
Tech Initials		SA	AW	SA	AH	RG	SA	RG	ML			

Feeding Times (day):

	0	1	2	3	4	5	6
✓	0815	0900	0930	0845	0830	0815	
✓	1245	1130	1510		1245	1145	
SD	1632	1700	1400	1800	1745	1630	1530

Comments: \_\_\_\_\_

Weight Data:

Date/Time in: 3-25-04 1340  
 Date/Time out: 3-26-04 1345  
 Oven Temp (°C): 50  
 Tech Initials: SD

QC Check: MLC/13/04  
 Final Review: MT 5/5/04



*C. DUBIA*

**Ceriodaphnia Survival and Reproduction Test-7 Day Survival**

Start Date: 03/17/2004	Test ID: 0403-114	Sample ID: City of Buenaventura
End Date: 03/24/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Ambient water
Sample Date: 03/16/2004	Protocol: EPAF 94-EPA Freshwater C	Test Species: CD-Ceriodaphnia dubia
Comments: A-2		

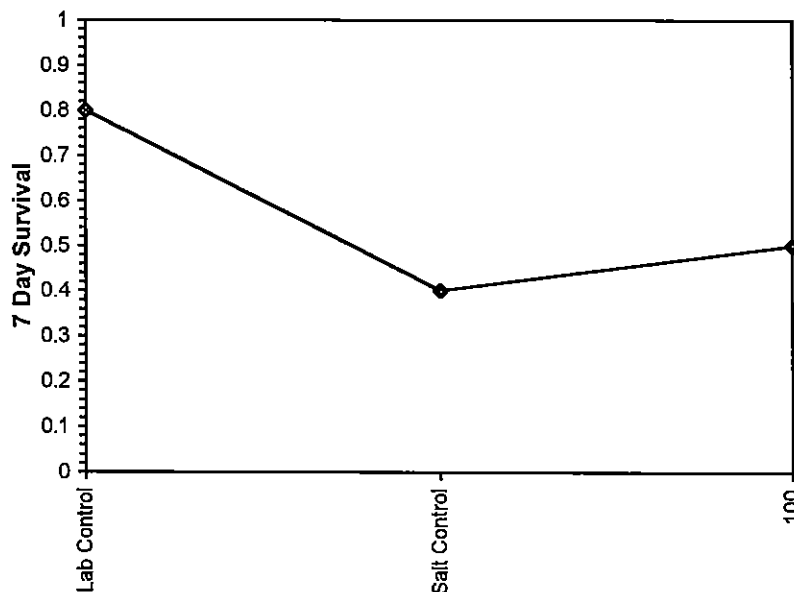
Conc-%	1	2	3	4	5	6	7	8	9	10
Lab Control	1.0000	0.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Salt Control	0.0000	1.0000	0.0000	0.0000	1.0000	0.0000	0.0000	1.0000	0.0000	1.0000
100	1.0000	0.0000	1.0000	0.0000	1.0000	0.0000	1.0000	0.0000	0.0000	1.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's 1-Tailed Exact P	1-Tailed Critical
Lab Control	0.8000	2.0000	2	8	10	10	0.2921	
Salt Control	0.4000	1.0000	6	4	10	10		
100	0.5000	1.2500	5	5	10	10	0.5000	0.0500

(all data compared against salt control)

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	100	>100		1

**Dose-Response Plot**



**Ceriodaphnia Survival and Reproduction Test-Reproduction**

Start Date: 03/17/2004	Test ID: 0403-114	Sample ID: City of Buenaventura
End Date: 03/24/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Ambient water
Sample Date: 03/16/2004	Protocol: EPAF 94-EPA Freshwater C	Test Species: CD-Ceriodaphnia dubia
Comments: A-2		

Conc-%	1	2	3	4	5	6	7	8	9	10
Lab Control	11.000	0.000	26.000	10.000	16.000	24.000	22.000	26.000	19.000	19.000
Salt Control	0.000	3.000	0.000	0.000	5.000	0.000	0.000	0.000	0.000	9.000
100	0.000	0.000	0.000	0.000	9.000	0.000	6.000	0.000	0.000	8.000

Conc-%	Mean	N-Mean	Transform: Untransformed				N	Rank Sum	1-Tailed Critical
			Mean	Min	Max	CV%			
Lab Control	17.300	10.1765	17.3000	0.0000	26.0000	47.903	10		
Salt Control	1.700	1.0000	1.7000	0.0000	9.0000	181.941	10		
100	2.300	1.3529	2.3000	0.0000	9.0000	164.031	10	107.00	82.00

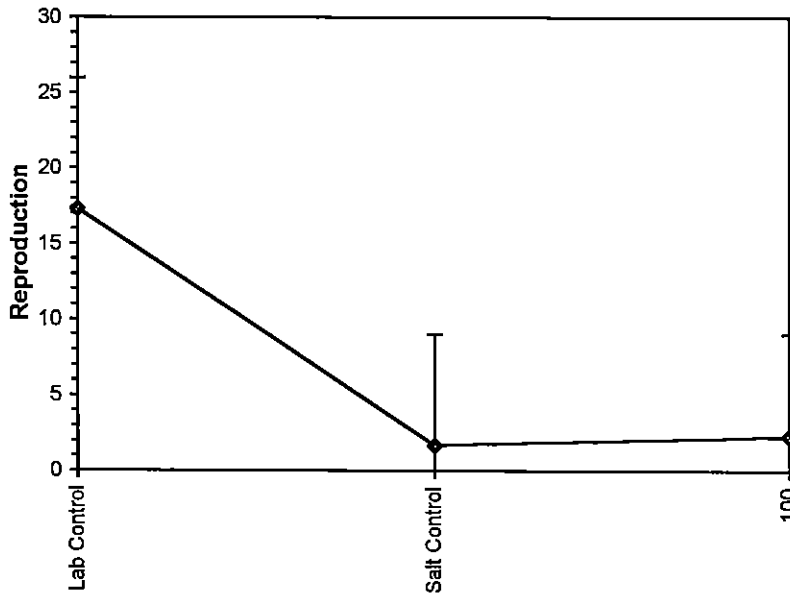
(All data compared against salt control)

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.69746	0.868	1.30422	0.14037
F-Test indicates equal variances (p = 0.56)	1.4878	6.54109		
The control means are significantly different (p = 2.71E-05)	5.57696	2.10092		

**Hypothesis Test (1-tail, 0.05)**

Wilcoxon Two-Sample Test indicates no significant differences

**Dose-Response Plot**



**Ceriodaphnia Survival and Reproduction Test-7 Day Survival**

Start Date: 03/17/2004      Test ID: 0403-115      Sample ID: City of Buenaventura  
 End Date: 03/24/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: Ambient water  
 Sample Date: 03/16/2004      Protocol: EPAF 94-EPA Freshwater C      Test Species: CD-Ceriodaphnia dubia  
 Comments: B-1

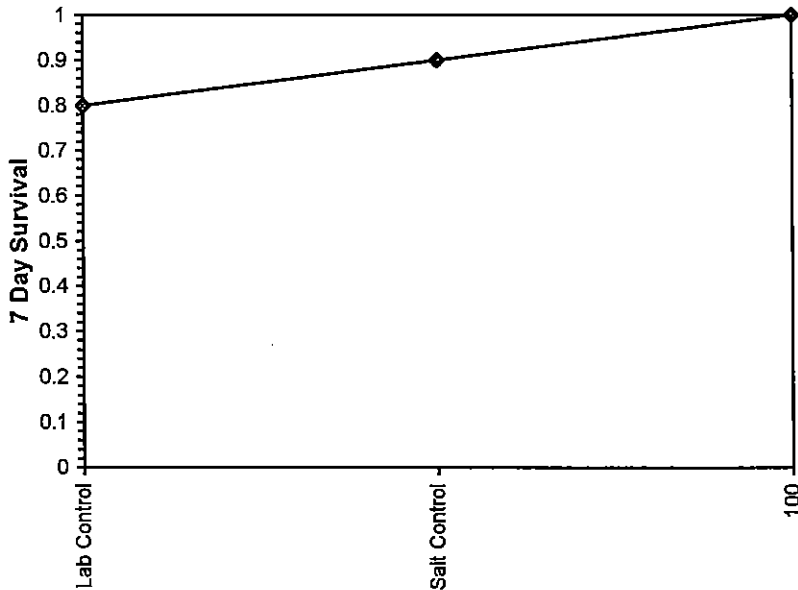
Conc-%	1	2	3	4	5	6	7	8	9	10
Lab Control	1.0000	0.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Salt Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical
Lab Control	0.8000	0.8889	2	8	10	10	0.5602	
Salt Control	0.9000	1.0000	1	9	10	10		
100	1.0000	1.1111	0	10	10	10	0.5000	0.0500

(All data compared against salt control)

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	100	>100		1

**Dose-Response Plot**



**Ceriodaphnia Survival and Reproduction Test-Reproduction**

Start Date: 03/17/2004	Test ID: 0403-115	Sample ID:	City of Buenaventura
End Date: 03/24/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type:	Ambient water
Sample Date: 03/16/2004	Protocol: EPAF 94-EPA Freshwater C	Test Species:	CD-Ceriodaphnia dubia
Comments: B-1			

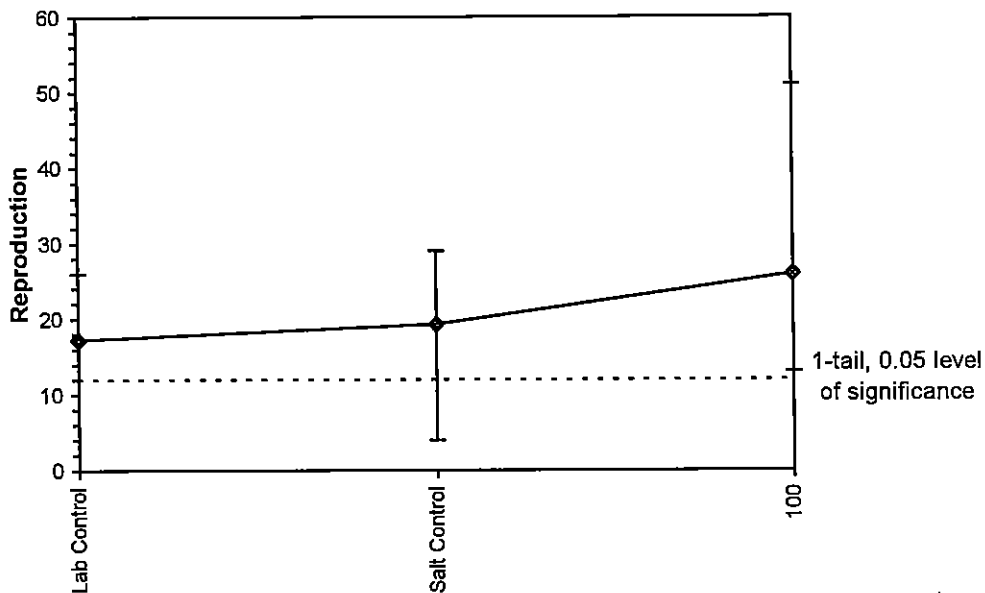
Conc-%	1	2	3	4	5	6	7	8	9	10
Lab Control	11.000	0.000	26.000	10.000	16.000	24.000	22.000	26.000	19.000	19.000
Salt Control	25.000	27.000	4.000	13.000	24.000	29.000	22.000	20.000	23.000	6.000
100	18.000	23.000	24.000	24.000	51.000	29.000	25.000	31.000	13.000	22.000

Conc-%	Mean	N-Mean	Transform: Untransformed					N	t-Stat	1-Tailed Critical	MSD
			Mean	Min	Max	CV%					
Lab Control	17.300	0.8964	17.300	0.000	26.000	47.903	10				
Salt Control	19.300	1.0000	19.300	4.000	29.000	45.041	10				
100	26.000	1.3472	26.000	13.000	51.000	39.013	10	-1.586	1.734	7.325	

(All data compared against salt control)

Auxiliary Tests	Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94466	0.868	0.63993	1.78022		
F-Test indicates equal variances (p = 0.65)	1.36156	6.54109				
The control means are not significantly different (p = 0.60)	0.5266	2.10092				
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences	7.32538	0.37955	224.45	89.2278	0.13014	1, 18

**Dose-Response Plot**



**Ceriodaphnia Survival and Reproduction Test-7 Day Survival**

Start Date: 03/17/2004      Test ID: 0403-116      Sample ID:      City of Buenaventura  
 End Date: 03/24/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type:      Ambient water  
 Sample Date: 03/16/2004      Protocol: EPAF 94-EPA Freshwater C      Test Species:      CD-Ceriodaphnia dubia  
 Comments: B-3

Conc-%	1	2	3	4	5	6	7	8	9	10
Lab Control	1.0000	0.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Salt Control	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

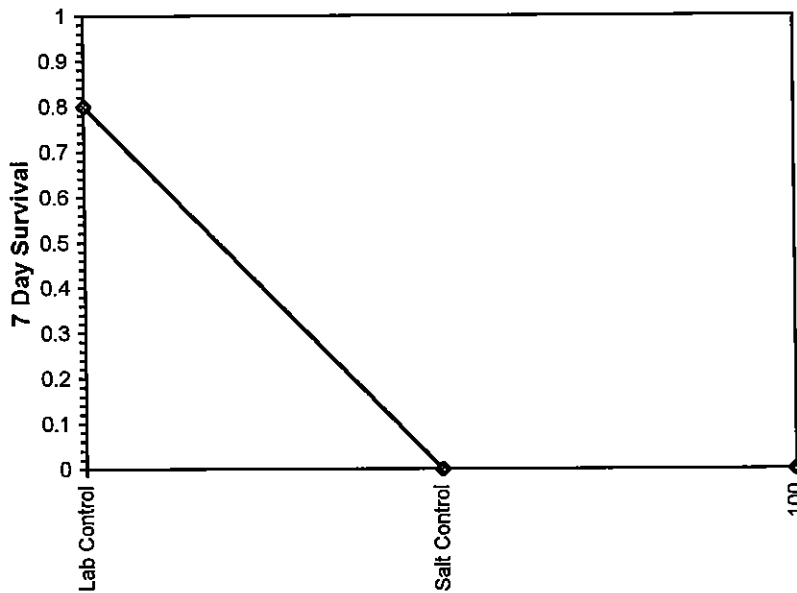
Conc-%	Mean	N-Mean	Transform: Arcsin Square Root				N	Rank Sum	1-Tailed Critical
			Mean	Min	Max	CV%			
Lab Control	0.8000		0.9425	0.5236	1.0472	23.424	10		
Salt Control	0.0000		0.5236	0.5236	0.5236	0.000	10		
100	0.0000		0.5236	0.5236	0.5236	0.000	10	105.00	82.00

(All data compared against salt control)

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	1	0.868		
Equality of variance cannot be confirmed				
The control means are significantly different (p = 1.13E-05)	6	2.10092		

**Hypothesis Test (1-tail, 0.05)**  
 Wilcoxon Two-Sample Test indicates no significant differences

**Dose-Response Plot**



**Ceriodaphnia Survival and Reproduction Test-Reproduction**

Start Date: 03/17/2004      Test ID: 0403-116      Sample ID: City of Buenaventura  
 End Date: 03/24/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: Ambient water  
 Sample Date: 03/16/2004      Protocol: EPAF 94-EPA Freshwater C      Test Species: CD-Ceriodaphnia dubia  
 Comments: B-3

Conc-%	1	2	3	4	5	6	7	8	9	10
Lab Control	11.000	0.000	26.000	10.000	16.000	24.000	22.000	26.000	19.000	19.000
Salt Control	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Conc-%	Mean	N-Mean	Transform: Untransformed				N	Rank Sum	1-Tailed Critical
			Mean	Min	Max	CV%			
Lab Control	17.300		17.3000	0.0000	26.0000	47.903	10		
Salt Control	0.000		0.0000	0.0000	0.0000	0.000	10		
100	0.000		0.0000	0.0000	0.0000	0.000	10	105.00	82.00

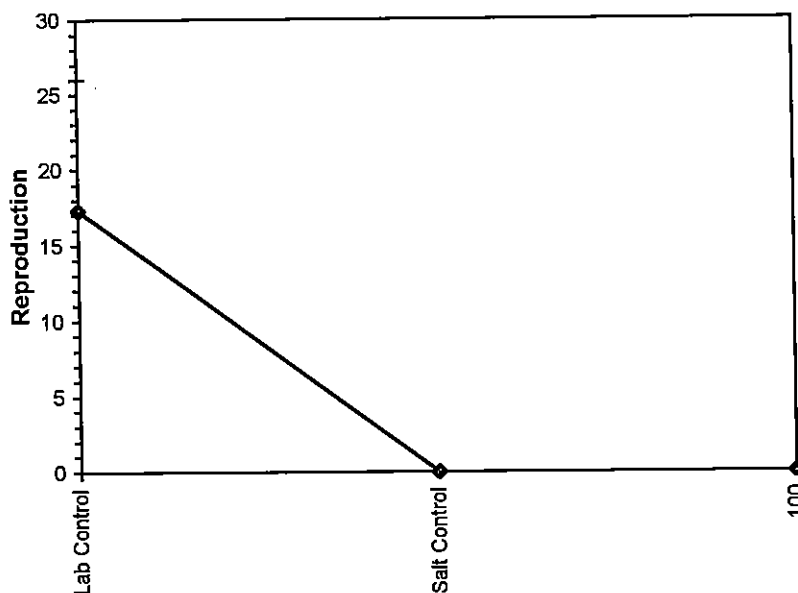
(All data compared to salt control)

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution ( $p > 0.01$ )	1	0.868		
Equality of variance cannot be confirmed				
The control means are significantly different ( $p = 3.37E-06$ )	6.60143	2.10092		

**Hypothesis Test (1-tail, 0.05)**

Wilcoxon Two-Sample Test indicates no significant differences

**Dose-Response Plot**



**Ceriodaphnia Survival and Reproduction Test-7 Day Survival**

Start Date: 03/17/2004      Test ID: 0403-117      Sample ID: City of Buenaventura  
 End Date: 03/24/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: Ambient water  
 Sample Date: 03/16/2004      Protocol: EPAF 94-EPA Freshwater C      Test Species: CD-Ceriodaphnia dubia  
 Comments: C-3

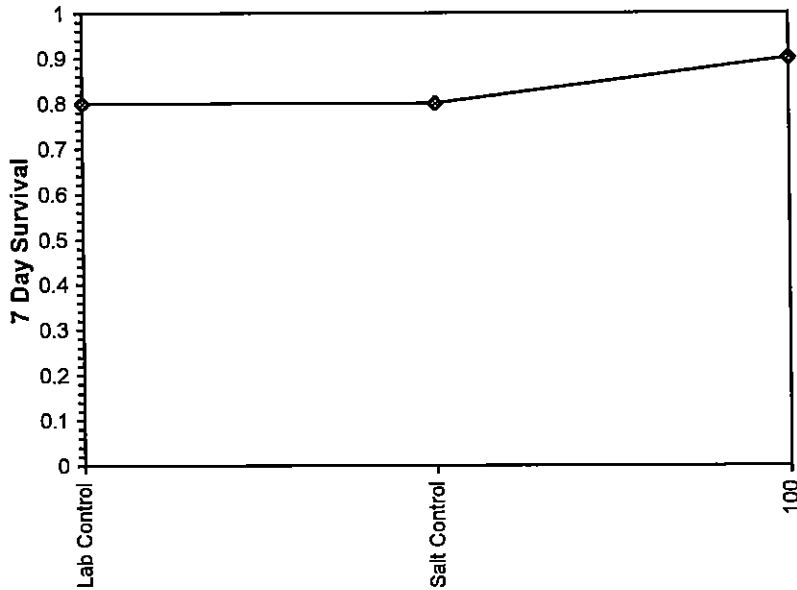
Conc-%	1	2	3	4	5	6	7	8	9	10
Lab Control	1.0000	0.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Salt Control	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000
100	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's 1-Tailed Exact P	Critical
Lab Control	0.8000	1.0000	2	8	10	10	0.6310	
Salt Control	0.8000	1.0000	2	8	10	10		
100	0.9000	1.1250	1	9	10	10	0.5000	0.0500

(All data compared against salt control)

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	100	>100		1

**Dose-Response Plot**





**Ceriodaphnia Survival and Reproduction Test-Reproduction**

Start Date: 03/17/2004      Test ID: 0403-117      Sample ID: City of Buenaventura  
 End Date: 03/24/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: Ambient water  
 Sample Date: 03/16/2004      Protocol: EPAF 94-EPA Freshwater C      Test Species: CD-Ceriodaphnia dubia  
 Comments: C-3

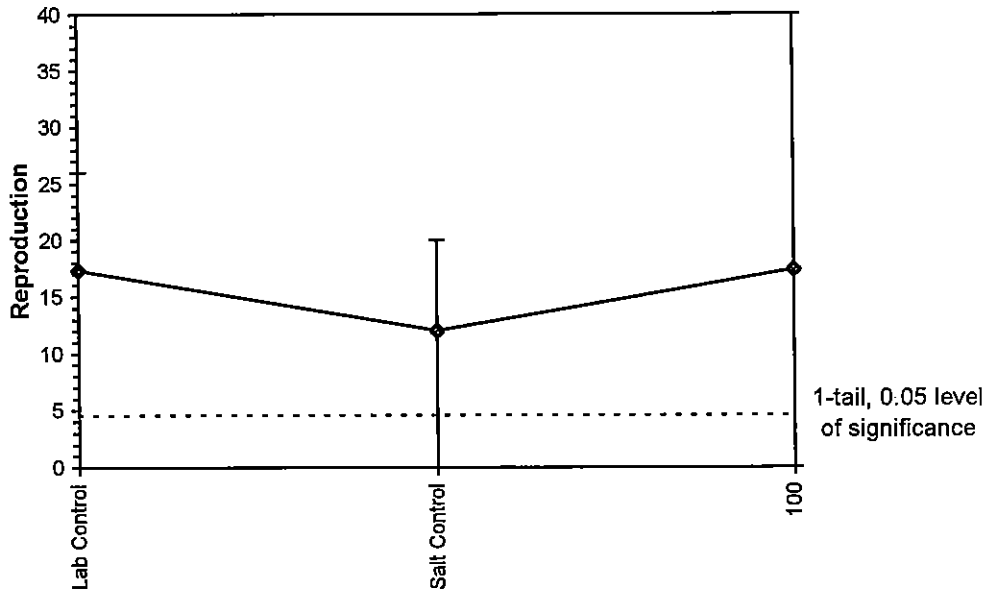
Conc-%	1	2	3	4	5	6	7	8	9	10
Lab Control	11.000	0.000	26.000	10.000	16.000	24.000	22.000	26.000	19.000	19.000
Salt Control	3.000	7.000	11.000	19.000	20.000	17.000	0.000	15.000	8.000	20.000
100	0.000	25.000	14.000	22.000	40.000	21.000	14.000	17.000	2.000	19.000

Conc-%	Mean	N-Mean	Transform: Untransformed					N	t-Stat	1-Tailed	
			Mean	Min	Max	CV%	Critical			MSD	
Lab Control	17.300	1.4417	17.3000	0.0000	26.0000	47.903	10				
Salt Control	12.000	1.0000	12.0000	0.0000	20.0000	60.731	10				
100	17.400	1.4500	17.4000	0.0000	40.0000	65.483	10	-1.263	1.734	7.4167	

(All data compared against salt control)

Auxiliary Tests	Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96065	0.868	0.14524	0.81408		
F-Test indicates equal variances (p = 0.20)	2.44435	6.54109				
The control means are not significantly different (p = 0.15)	1.5187	2.10092				
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences	7.41671	0.61806	145.8	91.4667	0.22286	1, 18

**Dose-Response Plot**



Client/Sample ID: City of Buena Ventura / SCRE

Start Date: 3/17/04

End Date: 3/24/04

Test No: 0403 - 114, 115, 116, 117

Start Time: 1400

End Time: 1310

Conc.	Rep	Daily Reproduction/ Survival								Total	QC
		1	2	3	4	5	6	7	8		
LC	1	0	0	0	4	0	4	1	✓	11	
	2	0	0/d	-	-	-	-	-	-	0/d	
	3	0	0	0	4	10	10	✓	✓	26	
	4	0	0	0	3	2	0/d	-	-	10/d	
	5	0	0	0	0	7	3	0	✓	16	
	6	0	0	0	6	9	0	9	✓	24	9 mc
	7	0	0	0	4	0	8	9	✓	22	
	8	0	0	0	5	5	0	16	✓	26	
	9	0	0	0	1	0	8	10	✓	19	
	10	0	0	0	4	8	7	0	✓	19	
Analyst	SD	MT	AH	MC	Pa	JR	AW	AH			

Conc.	Rep	Daily Reproduction/ Survival								Total	QC
		1	2	3	4	5	6	7	8		
B-3	1	0/d	-	-	-	-	-	-	-	0	
	2	0/d	-	-	-	-	-	-	-	0	
	3	0/d	-	-	-	-	-	-	-	0	
	4	0/d	-	-	-	-	-	-	-	0	
	5	0/d	-	-	-	-	-	-	-	0	
	6	0/d	-	-	-	-	-	-	-	0	
	7	0/d	-	-	-	-	-	-	-	0	
	8	0/d	-	-	-	-	-	-	-	0	
	9	0/d	-	-	-	-	-	-	-	0	
	10	0/d	-	-	-	-	-	-	-	0	

Conc.	Rep	Daily Reproduction/ Survival								Total	QC
		1	2	3	4	5	6	7	8		
A-2	1	0	0	0	0	0	0	0	✓	0	
	2	0/d	4	-	-	-	-	-	-	0	
	3	0	0	0	0	0	0	0	✓	0	
	4	0	0	0/d	-	-	-	-	-	0	
	5	0	0	0	3	0	0	4	✓	9	
	6	0/d	-	-	-	-	-	-	-	0	
	7	0	0	0	0	5	0	1	✓	6	
	8	0/d	-	-	-	-	-	-	-	0	
	9	0	0	0	0	0/d	-	-	-	0	
	10	0	0	0	2	1	5	0	✓	8	0 mc

Conc.	Rep	Daily Reproduction/ Survival								Total	QC	
		1	2	3	4	5	6	7	8			
C-3	1	0	0	0/d	-	-	-	-	-	0		
	2	0	0	0	5	0	9	11	✓	25		
	3	0	0	0	3	3	0	8	✓	14		
	4	0	0	0	3	4	0	15	✓	22		
	5	0	0	0	7	8	0	11	14	✓	40	
	6	0	0	0	4	9	8	0	✓	21		
	7	0	0	0	0	2	4	8	✓	14		
	8	0	0	0	0	3	7	0	7	✓	17	7 mc
	9	0	0	0	0	0	2	0	✓	2		
	10	0	0	0	0	4	7	8	0	✓	19	

Conc.	Rep	Daily Reproduction/ Survival								Total	QC
		1	2	3	4	5	6	7	8		
B-1	1	0	0	0	0	3	4	11	✓	18	
	2	0	0	0	4	7	0	12	✓	23	
	3	0	0	0	6	6	0	12	✓	24	12 mc
	4	0	0	0	4	3	2	15	✓	24	
	5	0	0	0	10	0	13	22	✓	51	
	6	0	0	0	7	7	13	0	✓	27	
	7	0	0	0	4	7	0	14	✓	25	
	8	0	0	0	9	8	14	0	✓	31	
	9	0	0	0	1	0	7	5	✓	13	
	10	0	0	0	0	6	16	0	✓	22	

Conc.	Rep	Daily Reproduction/ Survival								Total	QC
		1	2	3	4	5	6	7	8		
	1										
	2										
	3										
	4										
	5										
	6										
	7										
	8										
	9										
	10										

Time Fed (day): (0) 1400 (1) 1605 (2) 1746 (3) 1045 (4) 1600 (5) 1540 (6) 1500 (7) \_\_\_\_\_ (8) \_\_\_\_\_

Comments: \_\_\_\_\_

QC Check: MC 4/3/04

Final Review: MT 5/5/04

Freshwater Chronic Bioassay

Daphnid Survival and Reproduction Datasheet

Client/Sample ID: City of Buena Ventura / Salt Controls  
 Test No: 0403-114,115,116,117

Start Date: 3/17/04  
 Start Time: 1400

End Date: 3/24/04  
 End Time: 1300

Conc.	Rep	Daily Reproduction/ Survival								Total	QC
		1	2	3	4	5	6	7	8		
SC A-2 3.1 ppt	1	0	0/d	-	-	-	-	-	-	0	0 AH
	2	0	0	0	0	0	3	0	-	3	
	3	0	0	0	0	0/d	-	-	-	0	
	4	0/d	-	-	-	-	-	-	-	0	
	5	0	0	0	4	1	0	0	1	5	
	6	0/d	-	-	-	-	-	-	-	0	
	7	0	0/d	-	-	-	-	-	-	0	
	8	0	0	0	0	0	0	0	0	0	
	9	0/d	-	-	-	-	-	-	-	0	
	10	0	0	0	4	1	0	4	1	9	
Analyst	SD	MT	AH	ML	RY	JR	AW	AW			

Conc.	Rep	Daily Reproduction/ Survival								Total	QC	
		1	2	3	4	5	6	7	8			
SC B-1 1.4 ppt	1	0	0	0	1	5	0	13	✓	25	10 AH	
	2	0	0	0	5	0	10	12	✓	27		
	3	0	0	0	4	0	0	0	✓	4		
	4	0	0	0	2	0	6	5	✓	13		
	5	0	0	5	0	9	9	1	✓	24		
	6	0	0	0	8	11	0	10	✓	29		
	7	0	0	0	0	2	8	12	10	✓		22
	8	0	0	0	5	6	0	9	✓	20		
	9	0	0	0	1	6	0	10	✓	23		
	10	0	0	6	6	0	old	-	-	42		

Conc.	Rep	Daily Reproduction/ Survival								Total	QC
		1	2	3	4	5	6	7	8		
SC B-3 1.4 ppt 12.1	1	0/d	-	-	-	-	-	-	-	0	
	2	0/d	-	-	-	-	-	-	-	0	
	3	0/d	-	-	-	-	-	-	-	0	
	4	0/d	-	-	-	-	-	-	-	0	
	5	0/d	-	-	-	-	-	-	-	0	
	6	0/d	-	-	-	-	-	-	-	0	
	7	0/d	-	-	-	-	-	-	-	0	
	8	0/d	-	-	-	-	-	-	-	0	
	9	0/d	-	-	-	-	-	-	-	0	
	10	0/d	-	-	-	-	-	-	-	0	

Conc.	Rep	Daily Reproduction/ Survival								Total	QC
		1	2	3	4	5	6	7	8		
SC C-3 1.7 ppt	1	0	0	0	3	0	1	1	-	3	0 AH
	2	0	0	0	0	1	6	0	✓	7	
	3	0	0	0	1	5	5	0	✓	11	
	4	0	0	0	5	5	9	0	✓	19	
	5	0	0	0	4	5	7	0	✓	20	
	6	0	0	0	2	4	0	0	✓	17	
	7	0/d	-	-	-	-	-	-	-	0	
	8	0	0	0	2	5	0	3	✓	15	
	9	0	0	0	0	2	6	0	✓	8	
	10	0	0	0	2	6	10	2	✓	20	

Time Fed (day): (0) 1400 (1) 1105 (2) 0950 (3) 1050 (4) 1611 (5) 1600 (6) 1420 (7) 1345 (8)

Comments:

QC Check: ML 4/13/04

Final Review: MT 5/5/04

Freshwater Chronic Bioassay

Brood Selection Datasheet

Client/Sample ID: Buena Ventura  
Test Number: 0403-114, 115, 116, 117  
Test Species: C. dubia

Start Date: 3-17-04  
Start Time: 1400

Test Rep #	Brood Board #	Cup #
1	14	1
2	14	2
3	14	4
4	14	5
5	14	6
6	14	9
7	14	12
8	14	14
9	14	15
10	14	16

Verified by: MT

Comments: \_\_\_\_\_

QC Check: Me 4/13/04

Final Review: JS 5/25/04

*S. CAPRICORNUTUM*

**Phytoplankton Test-Growth-Cell Density**

Start Date: 03/17/2004	Test ID: 0403-118a	Sample ID: City of Buenaventura
End Date: 03/21/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Ambient water
Sample Date: 03/16/2004	Protocol: EPAF 02-EPA FW Chronic	Test Species: SC-Selenastrum capricornutum
Comments: Sample A-2		

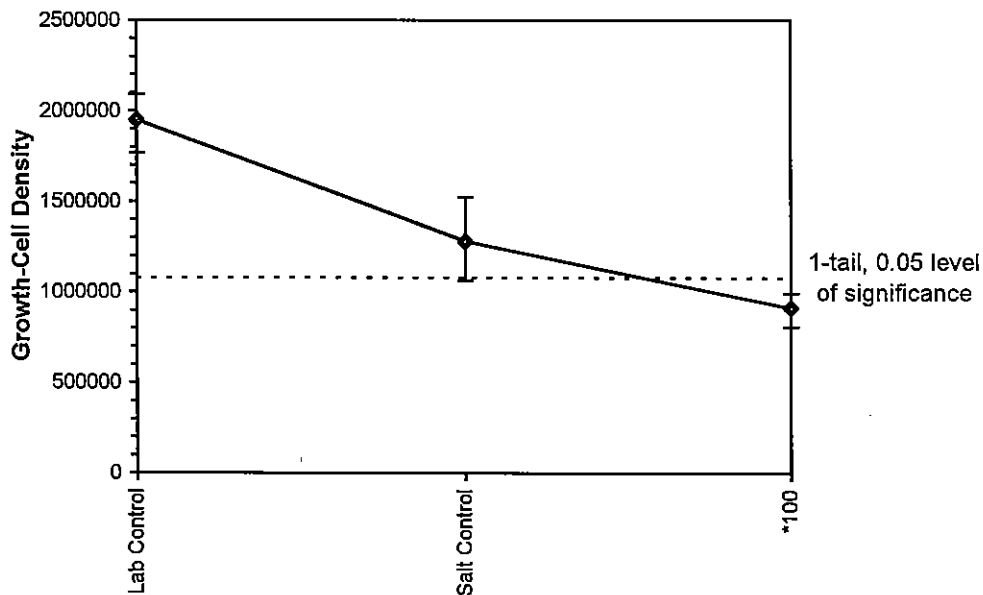
Conc-%	1	2	3	4
Lab Control	1772000	2096000	2020000	1927000
Salt Control	1303000	1525000	1235000	1066000
100	993000	808000	960000	894000

Conc-%	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed	
			Mean	Min	Max	CV%			Critical	MSD
Lab Control	1953750	1.5237	1953750	1772000	2096000	7.140	4			
Salt Control	1282250	1.0000	1282250	1066000	1525000	14.821	4			
*100	913750	0.7126	913750	808000	993000	8.934	4	3.563	1.943	200963

(Data compared against salt control)

Auxiliary Tests	Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.9813	0.749	0.26865	1.04951		
F-Test indicates equal variances (p = 0.20)	5.4197	47.4683				
The control means are significantly different (p = 1.26E-03)	5.69683	2.44691				
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates significant differences	200963	0.15673	2.7E+11	2.1E+10	0.01188	1, 6

**Dose-Response Plot**



Test: PY-Phytoplankton Test Species: SC-Selenastrum capricornutum Sample ID: City of Buenaventura Start Date: 03/17/2004	Test ID: 0403-118 Protocol: EPAF 02-EPA FW Chronic Sample Type: Ambient water End Date: 03/21/2004 Lab ID: AEESD-AMEC Bioassay SD
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Pos	ID	Rep	Group	Cell Density 10 <sup>6</sup> cell/mL	Absorbance OD/cm	Biomass mg/L	Chlorophyll a mg/m <sup>3</sup>	Notes
4	1	1	Lab Control	1.772				
2	2	2	Lab Control	2.096				
1	3	3	Lab Control	2.02				
8	4	4	Lab Control	1.927				
			Salt Control	1.303				
			Salt Control	1.525				
			Salt Control	1.235				
			Salt Control	1.066				
6	5	1	100	0.993				
5	6	2	100	0.808				
7	7	3	100	0.96				
3	8	4	100	0.894				

Comments: Sample A-2

**Phytoplankton Test-Growth-Cell Density**

Start Date: 03/17/2004	Test ID: 0403-119a	Sample ID: City of Buenaventura
End Date: 03/21/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Ambient water
Sample Date: 03/16/2004	Protocol: EPAF 02-EPA FW Chronic	Test Species: SC-Selenastrum capricornutum
Comments: Sample B-1		

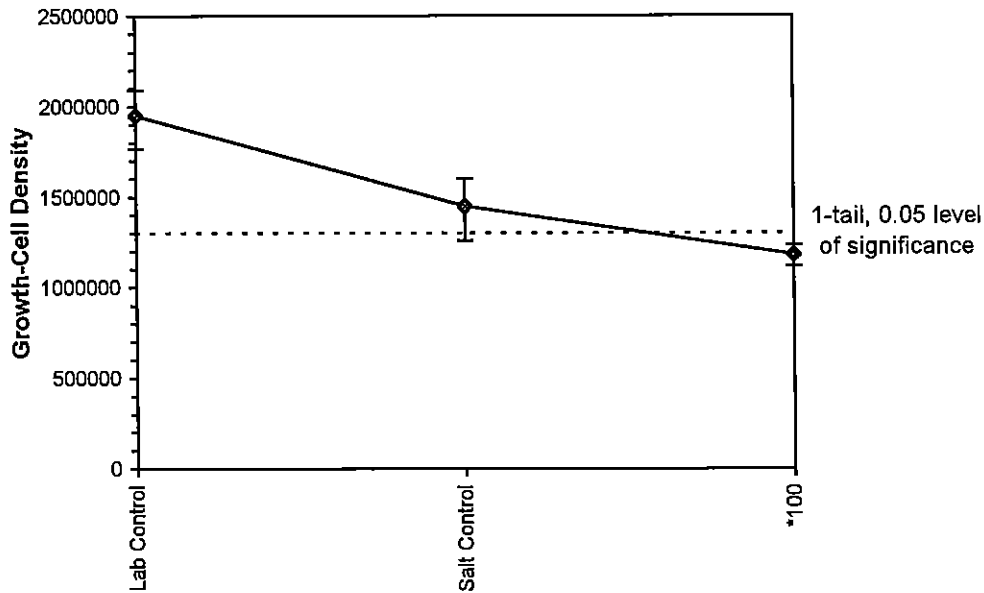
Conc-%	1	2	3	4
Lab Control	1927000	2096000	1772000	2020000
Salt Control	1258000	1468000	1600000	1465000
100	1121000	1238000	1189000	1182000

Conc-%	Mean	N-Mean	Transform: Untransformed					N	t-Stat	1-Tailed	
			Mean	Min	Max	CV%	Critical			MSD	
Lab Control	1953750	1.3495	1953750	1772000	2096000	7.140	4	3.555	1.943	144978	
Salt Control	1447750	1.0000	1447750	1258000	1600000	9.760	4				
*100	1182500	0.8168	1182500	1121000	1238000	4.057	4				

(Data compared against salt control)

Auxiliary Tests	Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.92236	0.749	-0.6847	2.09469		
F-Test indicates equal variances (p = 0.11)	8.67382	47.4683				
The control means are significantly different (p = 2.23E-03)	5.09697	2.44691				
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates significant differences	144978	0.10014	1.4E+11	1.1E+10	0.012	1, 6

**Dose-Response Plot**





Test: PY-Phytoplankton Test Species: SC-Selenastrum capricornutum Sample ID: City of Buenaventura Start Date: 03/17/2004	Test ID: 0403-119 Protocol: EPAF 02-EPA FW Chronic Sample Type: Ambient water End Date: 03/21/2004 Lab ID: AEESD-AMEC Bioassay SD
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Pos	ID	Rep	Group	Cell Density 10 <sup>6</sup> cell/mL	Absorbance OD/cm	Biomass mg/L	Chlorophyll a mg/m <sup>3</sup>	Notes
15	1	1	Lab Control	1.927				
12	2	2	Lab Control	2.096				
9	3	3	Lab Control	1.772				
13	4	4	Lab Control	2.02				
			Salt Control	1.258				
			Salt Control	1.468				
			Salt Control	1.6				
			Salt Control	1.465				
14	5	1	100	1.121				
16	6	2	100	1.238				
11	7	3	100	1.189				
10	8	4	100	1.182				

Comments: Sample B-1

**Phytoplankton Test-Growth-Cell Density**

Start Date: 03/17/2004	Test ID: 0403-120a	Sample ID: City of Buenaventura
End Date: 03/21/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Ambient water
Sample Date: 03/16/2004	Protocol: EPAF 02-EPA FW Chronic	Test Species: SC-Selenastrum capricornutum
Comments: Sample B-3		

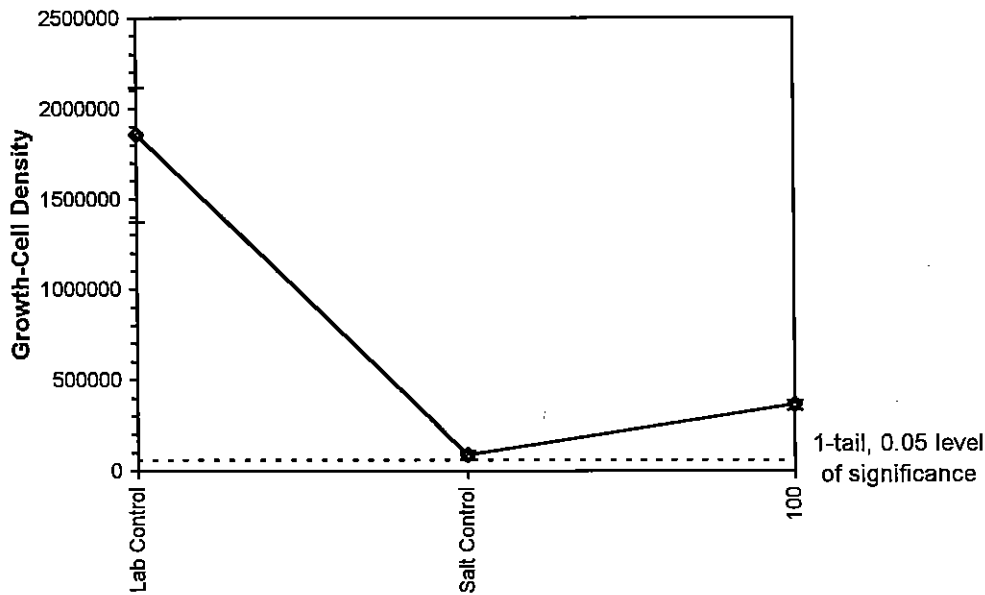
Conc-%	1	2	3	4
Lab Control	1369000	2110000	1986000	1961000
Salt Control	81000	110000	91000	65000
100	385000	335000	364000	376000

Conc-%	Mean	N-Mean	Transform: Untransformed					N	t-Stat	1-Tailed Critical	MSD
			Mean	Min	Max	CV%					
Lab Control	1856500	21.4006	1856500	1369000	2110000	17.854	4				
Salt Control	86750	1.0000	86750	65000	110000	21.717	4				
100	365000	4.2075	365000	335000	385000	5.965	4	-19.329	1.943	27973	

(Data compared against salt control)

Auxiliary Tests	Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution ( $p > 0.01$ )	0.9518	0.749	-0.4411	-0.8193		
F-Test indicates equal variances ( $p = 0.82$ )	1.33552	47.4683				
The control means are significantly different ( $p = 4.02E-05$ )	10.6611	2.44691				
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences	27973	0.32246	1.5E+11	4.1E+08	1.2E-06	1, 6

**Dose-Response Plot**



Test: PY-Phytoplankton Test Species: SC-Selenastrum capricornutum Sample ID: City of Buenaventura Start Date: 03/17/2004      End Date: 03/21/2004	Test ID: 0403-120 Protocol: EPAF 02-EPA FW Chronic Sample Type: Ambient water Lab ID: AEESD-AMEC Bioassay SD
---	---

Pos	ID	Rep	Group	Cell Density 10 <sup>6</sup> cell/mL	Absorbance OD/cm	Biomass mg/L	Chlorophyll a mg/m <sup>3</sup>	Notes
21	1	1	Lab Control	1.369				
19	2	2	Lab Control	2.11				
20	3	3	Lab Control	1.986				
17	4	4	Lab Control	1.961				
			Salt Control	0.081				
			Salt Control	0.11				
			Salt Control	0.091				
			Salt Control	0.065				
23	5	1	100	0.385				
22	6	2	100	0.335				
24	7	3	100	0.364				
18	8	4	100	0.376				

Comments: Sample B-3

**Phytoplankton Test-Growth-Cell Density**

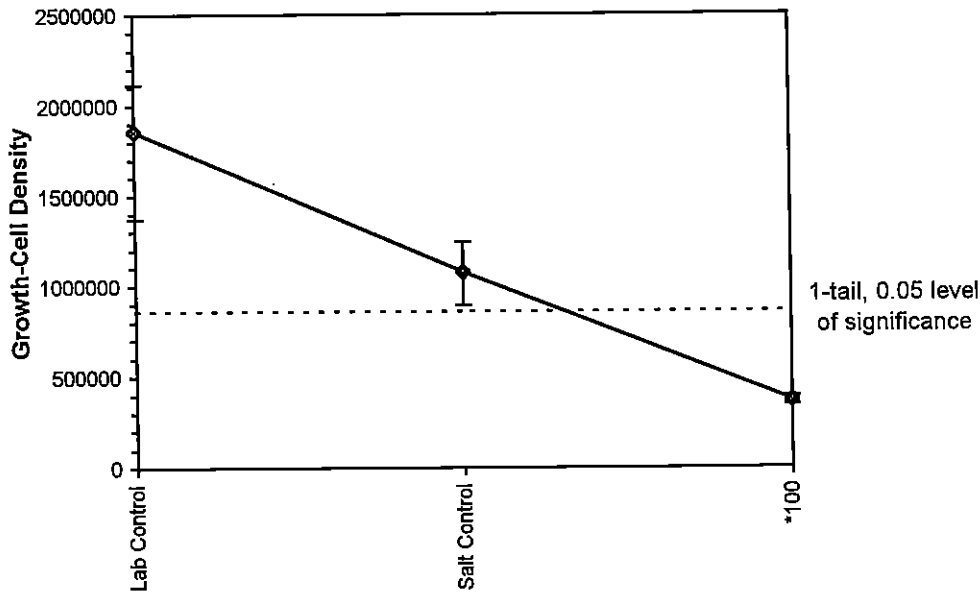
Start Date: 03/17/2004      Test ID: 0403-121a      Sample ID: City of Buenaventura  
 End Date: 03/21/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: Ambient water  
 Sample Date: 03/16/2004      Protocol: EPAF 02-EPA FW Chronic      Test Species: SC-Selenastrum capricornutum  
 Comments: Sample C-3

Conc-%	1	2	3	4
Lab Control	1961000	1986000	1369000	2110000
Salt Control	941000	897000	1237000	1246000
100	347000	377000	393000	360000

Conc-%	Mean	N-Mean	Transform: Untransformed					N	t-Stat	1-Tailed Critical	MSD
			Mean	Min	Max	CV%					
Lab Control	1856500	1.7186	1856500	1369000	2110000	17.854	4				
Salt Control	1080250	1.0000	1080250	897000	1246000	17.320	4				
*100	369250	0.3418	369250	347000	393000	5.427	4	7.557	2.353	221412	

Auxiliary Tests	Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.92729	0.749	-0.0455	-0.6374		
F-Test indicates unequal variances (p = 4.09E-03)	87.1673	47.4683				
The control means are significantly different (p = 6.51E-03)	4.07883	2.44691				
Hypothesis Test (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Heteroscedastic t Test indicates significant differences	221412	0.20496	1E+12	1.8E+10	2.8E-04	1, 6

**Dose-Response Plot**



Test: PY-Phytoplankton Test Test ID: 0403-121  
 Species: SC-Selenastrum capricornutum Protocol: EPAF 02-EPA FW Chronic  
 Sample ID: City of Buenaventura Sample Type: Ambient water  
 Start Date: 03/17/2004 End Date: 03/21/2004 Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Cell Density 10 <sup>6</sup> cell/mL	Absorbance OD/cm	Biomass mg/L	Chlorophyll a mg/m <sup>3</sup>	Notes
30	1	1	Lab Control	1.961				
28	2	2	Lab Control	1.986				
25	3	3	Lab Control	1.369				
26	4	4	Lab Control	2.11				
			Salt Control	0.942				
			Salt Control	0.897				
			Salt Control	1.237				
			Salt Control	1.246				
31	5	1	100	0.347				
29	6	2	100	0.377				
27	7	3	100	0.393				
32	8	4	100	0.36				

Comments: Sample C-3

Test: PY-Phytoplankton Test				Test ID: 0403-118				
Species: SC-Selenastrum capricornutum				Protocol: EPAF 91				
Sample ID: BUENA-City of Buenaventura				Sample Type: OTH-Other sample type				
Start Date: 03/17/2004		End Date: 03/21/2004			Lab ID: AEESD-AMEC Bioassay SD			
Pos	ID	Rep	Group	Cell Density 10 <sup>6</sup> cell/mL	Absorbance OD/cm	Biomass mg/L	Chlorophyll a mg/m <sup>3</sup>	Notes
1	3	3	L-Lab Control					
2	2	2	L-Lab Control					
3	8	4	100					
4	1	1	L-Lab Control					
5	6	2	100					
6	5	1	100					
7	7	3	100					
8	4	4	L-Lab Control					

Comments: Sample A-2

*Add salinity cont.*

Test: PY-Phytoplankton Test      Test ID: 0403-119  
 Species: SC-Selenastrum capricornutum      Protocol: EPAF 91  
 Sample ID: BUENA-City of Buenaventura      Sample Type: OTH-Other sample type  
 Start Date: 03/17/2004      End Date: 03/21/2004      Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Cell Density 10 <sup>6</sup> cell/mL	Absorbance OD/cm	Biomass mg/L	Chlorophyll a mg/m <sup>3</sup>	Notes
<del>15</del>	<del>1</del>	<del>1</del>	<del>L-Lab Control</del>					
<del>12</del>	<del>2</del>	<del>2</del>	<del>L-Lab Control</del>					
<del>9</del>	<del>3</del>	<del>3</del>	<del>L-Lab Control</del>					
<del>13</del>	<del>4</del>	<del>4</del>	<del>L-Lab Control</del>					
14	5	1	100					
16	6	2	100					
11	7	3	100					
10	8	4	100					

have  
 Cont.  
 ~A-2

Comments: Sample B-1

Add. Salinity Cont.

Test: PY-Phytoplankton Test Species: SC-Selenastrum capricornutum Sample ID: BUENA-City of Buenaventura Start Date: 03/17/2004	Test ID: 0403-120 Protocol: EPAF 91 Sample Type: OTH-Other sample type Lab ID: AEESD-AMEC Bioassay SD End Date: 03/21/2004
---	--

Pos	ID	Rep	Group	Cell Density 10 <sup>6</sup> cell/mL	Absorbance OD/cm	Biomass mg/L	Chlorophyll a mg/m <sup>3</sup>	Notes
21	1	1	L-Lab Control					
19	2	2	L-Lab Control					
20	3	3	L-Lab Control					
17	4	4	L-Lab Control					
23	5	1	100					
22	6	2	100					
24	7	3	100					
18	8	4	100					

Comments: Sample B-3

*Add Salinity Cont.*



Test: PY-Phytoplankton Test      Test ID: 0403-121  
 Species: SC-Selenastrum capricornutum      Protocol: EPAF 91  
 Sample ID: BUENA-City of Buenaventura      Sample Type: OTH-Other sample type  
 Start Date: 03/17/2004      End Date: 03/21/2004      Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Cell Density 10 <sup>6</sup> cell/mL	Absorbance OD/cm	Biomass mg/L	Chlorophyll a mg/m <sup>3</sup>	Notes
<del>30</del>	<del>1</del>	<del>1</del>	<del>L-Lab Control</del>					
<del>28</del>	<del>2</del>	<del>2</del>	<del>L-Lab Control</del>					
<del>25</del>	<del>3</del>	<del>3</del>	<del>L-Lab Control</del>					
<del>26</del>	<del>4</del>	<del>4</del>	<del>L-Lab Control</del>					
31	5	1	100					
29	6	2	100					
27	7	3	100					
32	8	4	100					

Share Cont. ~B-3

Comments: Sample ~~C-2~~ C-3

Add Salinity Cont.

Fluorometric & Microscopic Determination of Cell Density  
Turner Fluorometer Model TD-700

Test Species: S. capricornutum

Client: City of Buenaventura

Test Date: 3/17/04

Sample ID: Santa Clara River Estuary Start/End Times: 1735/1630

Test No: 0403-118 → 121

Analyst: AH

Random Number	Dilution	Cell Density (fluorometric) (cells/ml * 10 <sup>6</sup> )	Cell Density (microscopic) (cells/ml * 10 <sup>6</sup> )
Blank	NA		
Cal Check 1 (NEW, Solid, Effluent Blanks)		0.00, 2.62, <sup>0.18</sup> <sub>0.19</sub> <sup>0.39</sup> <sub>0.42</sub>	
25	—	—	—
26	—	—	—
27	—	3.93	—
28	—	—	—
29	—	3.77	—
30	—	—	—
31	—	3.47	—
32	—	3.60	—
A-2 salinity A		13.03	
A-2 salinity B		15.25	
A-2 salinity C		12.35	
A-2 salinity D		10.66	
Cal Check 2 (NEW, Solid, Effluent Blanks)		0.00, 2.62, <sup>0.18</sup> <sub>0.19</sub> <sup>0.39</sup> <sub>0.42</sub>	
B-1 salinity A		12.58	
B-1 salinity B		14.68	
B-1 salinity C		16.00	
B-1 salinity D		14.65	
B-3 salinity A		0.81	
B-3 salinity AB		1.10	
B-3 salinity C		0.91	
B-3 salinity D		0.65	
C-3 salinity A		9.42	
C-3 salinity B		8.97	
C-3 salinity C		12.37	
C-3 salinity D		12.46	
Cal Check 3 (NEW, Solid, Effluent Blanks)			

Blanks After 96 hrs  
A-2 7.29  
B-1 7.29  
B-3 3.78  
C-3 2.05

Comments: \_\_\_\_\_

QC Check: re 4/14/04

Final Review: MT

Fluorometric & Microscopic Determination of Cell Density  
Turner Fluorometer Model TD-700

Test Species: S. Capricornutum

Client: City of Buena Ventura

Test Date: 3/17/04

Sample ID: Santa Clara River Estuary Start/End Times: 1735/1630

Test No: 0403-118 → 121

Analyst: AT

Random Number	Dilution	Cell Density (fluorometric) (cells/ml * 10 <sup>5</sup> )	Cell Density (microscopic) (cells/ml * 10 <sup>4</sup> )
Blank	NA		
Cal Check 1 (NEW, Solid, Effluent Blanks)	0.00, 2.62, <sup>0.18</sup> <sub>0.137</sub> <sup>0.57</sup> →		
1		20.20	
2		20.96	
3		8.94	
4		17.72	
5		8.08	
6		9.93	
7		9.60	
8		19.27	
9	—	—	—
10		11.82	
11		11.89	
12	—	—	—
Cal Check 2 (NEW, Solid, Effluent Blanks)	0.00, 2.63, <sup>0.18</sup> <sub>0.137</sub> <sup>0.57</sup> →		
13	—	—	—
14		11.21	
15	—	—	—
16		12.38	
17		19.61	
18		3.76	
19		21.00	
20		19.86	
21		13.69	
22		3.35	
23		3.85	
24		3.64	
Cal Check 3 (NEW, Solid, Effluent Blanks)			

Comments: \_\_\_\_\_

QC Check: me 4/14/04

Final Review: MT

Freshwater Chronic Bioassay

Algal Growth Inhibition Worksheet

Client : City of Pavenaventura

Test Species: S. capricornutum

Sample ID: SCRE

Test Date: 3/17/04

Test No: 0403-118 → 121

Analyst: [Signature]

Source/Date Stock Culture Started: in-house / 3/11/04

Stock Cell Density Measurements:

21.58  
~~22.38~~ <sup>21.5A</sup>  
22.13  
21.02  
20.65

Mean: 21.38

(mean no. \* 100,000)/(500,000) = x (dilution factor):

4.28      1 part sele =  $\frac{70}{30}$  ml  
 3.28 part NEW = 328 ml  
 98.4

Prepare inoculum according to the dilution factor. This yields a solution with the desired cell density of 500,000 cells/ml.

Example: (35 \* 100,000)/(500,000) = 7 (e.g. 25 ml Sele stock + 150 ml NEW)

Inoculate 1 ml into 3 initial count flasks containing 50 ml of NEW, stir and count on the hemacytometer. Flasks should contain a final density of 10,000 cells/ml ± 10%.

Inoculum Cell Density Confirmation Counts:

10,000  
10,000  
10,000

Mean: 10,000

Test Initiation Time: 1735

Test Termination Time: 16:30

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

QC Check: UC 4/14/04

Final Review: [Signature] 5/25/04

MARINE

**Appendix Table D-8. Summary of Ambient Water t-test p Values for Marine Species**

City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event

Test Initiation Dates: 17 & 19 March 2004

Test Site	Bivalve Normality	Pacific Topsmelt		Opposum Shrimp		Giant Kelp	
		Survival	Growth	Survival	Growth	Germination	Growth
A-2	0.1699	0.1717 <sup>a</sup>	<b>0.0185</b>	0.2494	<b>0.0037<sup>a</sup></b>	0.1963	<b>0.0079</b>
B-1	0.0790 <sup>a</sup>	0.1717 <sup>a</sup>	<b>0.0179</b>	0.5000	0.1834 <sup>a</sup>	0.1373	0.2312
B-3	0.0523	0.3110	<b>0.0231</b>	0.2494	0.7636 <sup>a</sup>	0.1792 <sup>a</sup>	0.0815
C-3	0.1087	<b>0.0204</b>	<b>0.0001</b>	<b>0.0205<sup>a</sup></b>	0.0946	0.2836	0.6459

**Bold** indicates a statistically significant decrease compared to the salt or brine control ( $p \leq 0.05$ )

<sup>a</sup> - indicates Welch's correction applied due to unequal variances

*M. GALLOPROVINCIALIS*

# Bivalve Development Bioassay Worksheet

Client: City of Buena Vista (retest) Start Date/Time: 3/19/04 1630  
Test No.: 0403-106 → 109, 122-126 End Date/Time: 3/21/04 1700  
Test Species: M. galloprovincialis 040319MERT Date Received: 3/19/04

Sample Type: 30ml Shell Vials Water effects ratio

Test Chamber Type and Sample Volume: 10 ml volume

Spawn Initiation Time: 13:20

Number of Spawners: Male 12 Female 9

Spawn Condition: good

Fertilization Time: 14:40

Egg Stock Density Calculation:

Eggs Counted (x):	<u>22</u>	<u>28</u>	
	<u>26</u>	<u>21</u>	
	<u>27</u>	<u>31</u>	
	<u>31</u>	<u>28</u>	
	<u>29</u>	<u>25</u>	
Mean	<u>27.0</u>	<u>26.6</u>	Overall Mean: <u>26.8</u>

Mean: 26.8 X 42 = 1126 eggs/ml

Initial Stock - 1126 eggs/ml = 2.81 Stock Dilution Factor  
Inoculum Stock - 400 eggs/ml

Percent Division Upon Inoculation: 90

Time of Inoculation: 1630

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Reviewed/ Date: 5/1/04

AMEC Bioassay Laboratory  
5550 Morehouse Drive, Suite B  
San Diego, CA 92121  
(858) 458-9044



**Bivalve Larval Survival and Development Test-Proportion Normal**

Start Date: 03/19/2004	Test ID: 0403-106	Sample ID: City of Buenaventura
End Date: 03/21/2004	Lab ID: AMEC Bioassay SD	Sample Type: Ambient water
Sample Date: 03/16/2004	Protocol: ASTM 87	Test Species: MG-Mytilis galloprovincialis
Comments: Sample A-2		

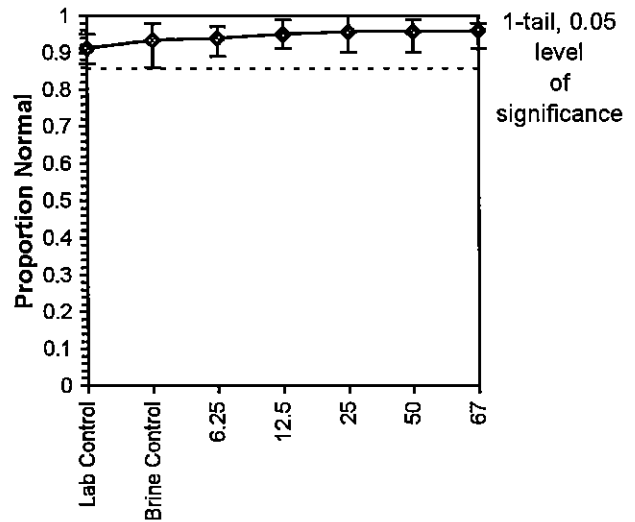
Conc-%	1	2	3	4	5
Lab Control	0.9200	0.9500	0.8900	0.9300	0.8700
Brine Control	0.8600	0.9100	0.9800	0.9700	0.9500
6.25	0.9200	0.9600	0.8900	0.9600	0.9700
12.5	0.9200	0.9900	0.9100	0.9700	0.9600
25	1.0000	0.9900	0.9300	0.9600	0.9000
50	0.9000	0.9400	0.9900	0.9800	0.9700
67	0.9800	0.9600	0.9700	0.9800	0.9100

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root					N	t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%	Mean					N-Mean	
Lab Control	0.9120	0.9764	1.2734	1.2019	1.3453	4.463	5						
Brine Control	0.9340	1.0000	1.3249	1.1873	1.4289	7.432	5					0.9493	1.0000
6.25	0.9400	1.0064	1.3305	1.2327	1.3967	5.198	5	-0.101	2.360	0.1316		0.9493	1.0000
12.5	0.9500	1.0171	1.3574	1.2661	1.4706	6.189	5	-0.583	2.360	0.1316		0.9493	1.0000
25	0.9560	1.0236	1.3826	1.2490	1.5208	8.182	5	-1.035	2.360	0.1316		0.9493	1.0000
50	0.9560	1.0236	1.3737	1.2490	1.4706	6.413	5	-0.876	2.360	0.1316		0.9493	1.0000
67	0.9600	1.0278	1.3780	1.2661	1.4289	4.885	5	-0.953	2.360	0.1316		0.9493	1.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94703	0.9	-0.232	-1.0828
Bartlett's Test indicates equal variances (p = 0.92)	1.46559	15.0863		
The control means are not significantly different (p = 0.34)	1.01206	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	67	>67		1.49254	0.0766	0.08142	0.00311	0.00777	0.84392	5, 24

Linear Interpolation (200 Resamples)				
Point	%	SD	95% CL(Exp)	Skew
IC05	>67			
IC10	>67			
IC15	>67			
IC20	>67			
IC25	>67			
IC40	>67			
IC50	>67			



Comparisons made against brine control.

Test: BV-Bivalve Larval Survival and Development Test      Test ID: 0403-106  
 Species: MG-Mytilus galloprovincialis                      Protocol: ASTM 87  
 Sample ID: BUENA-City of Buenaventura                      Sample Type: AMB1-Ambient water  
 Start Date: 03/19/2004                      End Date: 03/21/2004                      Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
	1	1	Lab Control			100	92	
	2	2	Lab Control			100	95	
	3	3	Lab Control			100	89	
	4	4	Lab Control			100	93	
	5	5	Lab Control			100	87	
	6	1	Brine Control			100	86	
	7	2	Brine Control			100	91	
	8	3	Brine Control			100	98	
	9	4	Brine Control			100	97	
	10	5	Brine Control			100	95	
	11	1	6.25			100	92	
	12	2	6.25			100	96	
	13	3	6.25			100	89	
	14	4	6.25			100	96	
	15	5	6.25			100	97	
	16	1	12.5			100	92	
	17	2	12.5			100	99	
	18	3	12.5			100	91	
	19	4	12.5			100	97	
	20	5	12.5			100	96	
	21	1	25			100	100	
	22	2	25			100	99	
	23	3	25			100	93	
	24	4	25.0			100	96	
	25	5	25			100	90	
	26	1	50			100	90	
	27	2	50			100	94	
	28	3	50			100	99	
	29	4	50			100	98	
	30	5	50			100	97	
	31	1	67			100	98	
	32	2	67			100	96	
	33	3	67			100	97	
	34	4	67			100	98	
	35	5	67			100	91	

Comments: Sample A-2

Test: BV-Bivalve Larval Survival and Development Test  
 Species: MG-Mytilis galloprovincialis  
 Sample ID: BUENA-City of Buenaventura  
 Start Date: 03/17/2004

Test ID: 0403-106  
 Protocol: ASTM 87  
 Sample Type: OTH-Other sample type  
 Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
1						100	89	MT
2							100	
3							95	
4							98	
5							98	
6							91	
7							90	
8							99	
9							99	
10							92	
11							96	
12							92	
13							89	
14							90	
15						↓	94	↓
16						100	91	MT
17							92	
18							93	
19							86	
20							96	
21							91	
22							96	
23							96	
24							98	
25							97	
26							98	
27							87	
28							95	
29							97	
30							97	
31							97	
32							96	
33							99	
34							97	
35						↓	93	↓

Comments: Sample A-2

Test: BV-Bivalve Larval Survival and Development Test      Test ID: 0403-106  
 Species: MG-Mytilis galloprovincialis                      Protocol: ASTM 87  
 Sample ID: BUENA-City of Buenaventura                      Sample Type: OTH-Other sample type  
 Start Date: 03/17/2004                      End Date: 03/18/2004                      Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
12	1	1	L-Lab Control					
28	2	2	L-Lab Control					
13	3	3	L-Lab Control					
35	4	4	L-Lab Control					
27	5	5	L-Lab Control					
19	6	1	B-Control					
21	7	2	B-Control					
5	8	3	B-Control					
31	9	4	B-Control					
3	10	5	B-Control					
10	11	1	6.25					
20	12	2	6.25					
1	13	3	6.25					
22	14	4	6.25					
34	15	5	6.25					
17	16	1	12.5					
8	17	2	12.5					
6	18	3	12.5					
29	19	4	12.5					
23	20	5	12.5					
2	21	1	25					
9	22	2	25					
18	23	3	25					
32	24	4	25					
7	25	5	25					
14	26	1	50					
15	27	2	50					
33	28	3	50					
24	29	4	50					
25	30	5	50					
4	31	1	100b					
11	32	2	100b					
30	33	3	100b					
26	34	4	100b					
16	35	5	100b					

Comments: Sample A-2

DC=AA ✓

**Bivalve Larval Survival and Development Test-Proportion Normal**

Start Date: 03/19/2004	Test ID: 0403-107	Sample ID: City of Buenaventura
End Date: 03/21/2004	Lab ID: AMEC Bioassay SD	Sample Type: Ambient water
Sample Date: 03/16/2004	Protocol: ASTM 87	Test Species: MG-Mytilis galloprovincialis
Comments: Sample B-1		

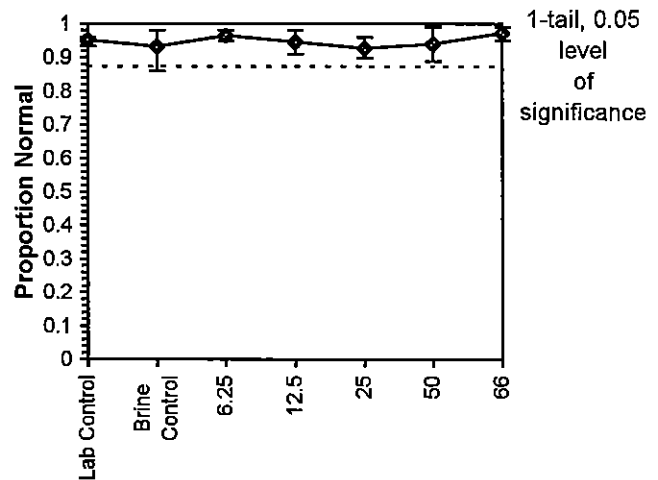
Conc-%	1	2	3	4	5
Lab Control	0.9600	0.9600	0.9340	0.9510	0.9541
Brine Control	0.8600	0.9500	0.9700	0.9800	0.9100
6.25	0.9802	0.9703	0.9600	0.9500	0.9700
12.5	0.9300	0.9100	0.9802	0.9515	0.9574
25	0.9000	0.9400	0.9200	0.9200	0.9608
50	0.9800	0.9070	0.9900	0.9400	0.8900
66	0.9800	0.9706	0.9910	0.9500	0.9806

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root					N	1-Tailed			Isotonic	
			Mean	Min	Max	CV%	t-Stat		Critical	MSD	Mean	N-Mean	
Lab Control	0.9518	1.0191	1.3505	1.3109	1.3694	1.781	5						
Brine Control	0.9340	1.0000	1.3249	1.1873	1.4289	7.432	5					0.9501	1.0000
6.25	0.9661	1.0344	1.3877	1.3453	1.4296	2.298	5	-1.410	2.360	0.1052		0.9501	1.0000
12.5	0.9458	1.0127	1.3421	1.2661	1.4296	4.629	5	-0.386	2.360	0.1052		0.9478	0.9976
25	0.9282	0.9937	1.3024	1.2490	1.3714	3.586	5	0.504	2.360	0.1052		0.9478	0.9976
50	0.9414	1.0079	1.3433	1.2327	1.4706	7.715	5	-0.413	2.360	0.1052		0.9478	0.9976
66	0.9744	1.0433	1.4159	1.3453	1.4757	3.400	5	-2.042	2.360	0.1052		0.9478	0.9976

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.98481	0.9	-0.0442	-0.3354
Bartlett's Test indicates equal variances (p = 0.20)	7.23693	15.0863		
The control means are not significantly different (p = 0.59)	0.56464	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	66	>66		1.51515	0.05904	0.06276	0.00873	0.00497	0.16024	5, 24

Linear Interpolation (200 Resamples)				
Point	%	SD	95% CL(Exp)	Skew
IC05	>66			
IC10	>66			
IC15	>66			
IC20	>66			
IC25	>66			
IC40	>66			
IC50	>66			



Test: BV-Bivalve Larval Survival and Development Test      Test ID: 0403-107  
 Species: MG-Mytilis galloprovincialis                      Protocol: ASTM 87  
 Sample ID: BUENA-City of Buenaventura                      Sample Type: AMB1-Ambient water  
 Start Date: 03/19/2004                      End Date: 03/21/2004                      Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
	1	1	Lab Control			100	96	
	2	2	Lab Control			100	96	
	3	3	Lab Control			106	99	
	4	4	Lab Control			102	97	
	5	5	Lab Control			109	104	
	6	1	Brine Control			100	86	
	7	2	Brine Control			100	95	
	8	3	Brine Control			100	97	
	9	4	Brine Control			100	98	
	10	5	Brine Control			100	91	
	11	1	6.25			101	99	
	12	2	6.25			101	98	
	13	3	6.25			100	96	
	14	4	6.25			100	95	
	15	5	6.25			100	97	
	16	1	12.5			100	93	
	17	2	12.5			100	91	
	18	3	12.5			101	99	
	19	4	12.5			103	98	
	20	5	12.5			94	90	
	21	1	25			100	90	
	22	2	25			100	94	
	23	3	25			100	92	
	24	4	25.0			100	92	
	25	5	25			102	98	
	26	1	50			100	98	
	27	2	50			86	78	
	28	3	50			100	99	
	29	4	50			100	94	
	30	5	50			100	89	
	31	1	66			100	98	
	32	2	66			102	99	
	33	3	66			111	110	
	34	4	66			100	95	
	35	5	66			103	101	data entry &c. <i>[Signature]</i>

Comments: Sample B-1

Test: BV-Bivalve Larval Survival and Development Test  
 Species: MG-Mytilis galloprovincialis  
 Sample ID: BUENA-City of Buenaventura  
 Start Date: 03/17/2004

Test ID: 0403-107  
 Protocol: ASTM 87  
 Sample Type: OTH-Other sample type  
 Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
36						100	93	YR
37						101	99	
38						111	110	
39						102	99	
40						100	96	
41						103	98	
42						100	96	
43						100	98	
44						106	99	
45						100	96	
46						102	98	
47						101	99	
48						109	104	
49						100	98	YR
50						-	-	-
51						101	98	YR
52						102	97	
53						103	101	
54						-	-	-
55						100	95	YR
56						100	97	YR
57						100	99	YR
58						100	95	YR
59						94	90	YR
60						100	92	MT
61						100	91	MT
62						100	94	MT
63						100	89	MT
64						-	-	-
65						100	90	MT
66						-	-	-
67						100	92	MT
68						100	<del>92</del> 94	MT
69						- 100	- <del>92</del>	- MT
70						86	78	MT

Comments: Sample B-1

Test: BV-Bivalve Larval Survival and Development Test      Test ID: 0403-107  
 Species: MG-Mytilis galloprovincialis      Protocol: ASTM 87  
 Sample ID: BUENA-City of Buenaventura      Sample Type: OTH-Other sample type  
 Start Date: 03/27/2004      End Date: 03/18/2004      Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
42	1	1	L-Lab Control					
40	2	2	L-Lab Control					
44	3	3	L-Lab Control					
52	4	4	L-Lab Control					
48	5	5	L-Lab Control					
64	6	1	B-Control					
69	7	2	B-Control					
50	8	3	B-Control					
66	9	4	B-Control					
54	10	5	B-Control					
47	11	1	6.25					
51	12	2	6.25					
45	13	3	6.25					
58	14	4	6.25					
56	15	5	6.25					
36	16	1	12.5					
61	17	2	12.5					
37	18	3	12.5					
41	19	4	12.5					
59	20	5	12.5					
65	21	1	25					
62	22	2	25					
60	23	3	25					
67	24	4	25					
46	25	5	25					
43	26	1	50					
70	27	2	50					
57	28	3	50					
68	29	4	50					
63	30	5	50					
49	31	1	100b					
39	32	2	100b					
38	33	3	100b					
55	34	4	100b					
53	35	5	100b					

there  
BCW/  
A-2

Comments: Sample B-1

QC=AH ✓



**Bivalve Larval Survival and Development Test-Proportion Normal**

Start Date: 03/19/2004	Test ID: 0403-108	Sample ID: City of Buenaventura
End Date: 03/21/2004	Lab ID: AMEC Bioassay SD	Sample Type: Ambient water
Sample Date: 03/16/2004	Protocol: ASTM 87	Test Species: MG-Mytilis galloprovincialis
Comments: Sample B-3		

Conc-%	1	2	3	4	5
Lab Control	0.9400	0.8558	0.9300	0.9300	0.8300
Brine Control	0.8500	0.9200	0.8900	0.9100	0.8800
6.25	0.8300	0.9700	0.9100	0.8800	0.8810
12.5	0.9200	0.9300	0.9000	0.9500	0.9300
25	0.9255	0.9700	0.9700	0.9100	0.9300
50	0.9700	0.8600	0.9700	0.9200	0.8700
75	0.9000	0.9200	0.9000	0.9500	0.9200

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root					N	1-Tailed			Isotonic	
			Mean	Min	Max	CV%	t-Stat		Critical	MSD	Mean	N-Mean	
Lab Control	0.8972	1.0080	1.2513	1.1458	1.3233	6.514	5						
Brine Control	0.8900	1.0000	1.2346	1.1731	1.2840	3.514	5					0.9147	1.0000
6.25	0.8942	1.0047	1.2488	1.1458	1.3967	7.459	5	-0.333	2.360	0.1007	0.9147	1.0000	
12.5	0.9260	1.0404	1.2969	1.2490	1.3453	2.691	5	-1.459	2.360	0.1007	0.9147	1.0000	
25	0.9411	1.0574	1.3314	1.2661	1.3967	4.595	5	-2.267	2.360	0.1007	0.9147	1.0000	
50	0.9180	1.0315	1.2933	1.1873	1.3967	7.834	5	-1.376	2.360	0.1007	0.9147	1.0000	
75	0.9180	1.0315	1.2823	1.2490	1.3453	3.066	5	-1.117	2.360	0.1007	0.9147	1.0000	

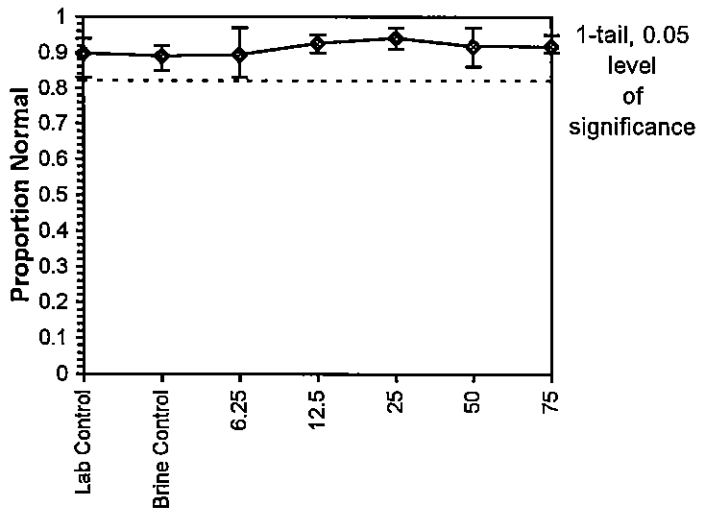
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.9703	0.9	0.42069	0.02023
Bartlett's Test indicates equal variances (p = 0.19)	7.37454	15.0863		
The control means are not significantly different (p = 0.70)	0.40399	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	75	>75		1.33333	0.07023	0.07881	0.00613	0.00456	0.2792	5, 24

Linear Interpolation (200 Resamples)				
Point	%	SD	95% CL(Exp)	Skew
IC05	>75			
IC10	>75			
IC15	>75			
IC20	>75			
IC25	>75			
IC40	>75			
IC50	>75			

Comparisons made against brine control.



Test: BV-Bivalve Larval Survival and Development Test      Test ID: 0403-108  
 Species: MG-Mytilus galloprovincialis                      Protocol: ASTM 87  
 Sample ID: BUENA-City of Buenaventura                      Sample Type: AMB1-Ambient water  
 Start Date: 03/19/2004                      End Date: 03/21/2004                      Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
	1	1	Lab Control			100	94	
	2	2	Lab Control			104	89	
	3	3	Lab Control			100	93	
	4	4	Lab Control			100	93	
	5	5	Lab Control			100	83	
	6	1	Brine Control			100	85	
	7	2	Brine Control			100	92	
	8	3	Brine Control			100	89	
	9	4	Brine Control			100	91	
	10	5	Brine Control			100	88	
	11	1	6.25			100	83	
	12	2	6.25			100	97	
	13	3	6.25			100	91	
	14	4	6.25			100	88	
	15	5	6.25			84	74	
	16	1	12.5			100	92	
	17	2	12.5			100	93	
	18	3	12.5			100	90	
	19	4	12.5			100	95	
	20	5	12.5			100	93	
	21	1	25			94	87	
	22	2	25			100	97	
	23	3	25			100	97	
	24	4	25.0			100	91	
	25	5	25			100	93	
	26	1	50			100	97	
	27	2	50			100	86	
	28	3	50			100	97	
	29	4	50			100	92	
	30	5	50			100	87	
	31	1	75			100	90	
	32	2	75			100	92	
	33	3	75			100	90	
	34	4	75			100	95	
	35	5	75			100	92	

Comments: Sample B-3

Test: BV-Bivalve Larval Survival and Development Test  
 Species: MG-Mytilis galloprovincialis  
 Sample ID: BUENA-City of Buenaventura  
 Start Date: 03/17/2004

Test ID: 0403-108  
 Protocol: ASTM 87  
 Sample Type: OTH-Other sample type  
 Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
71						100	90	MT
72						100	92	MT
73						94	87	MT
74						104	89	
75						100	97	
76						100	88	
77						100	89	
78						100	95	
79						100	83	
80						84	74	
81						100	97	↓
82						100	86	RG
83						100	94	↓
84						100	93	
85						100	92	↓
86						100	87	MT
87							91	
88							88	
89							92	
90							93	
91							97	
92							83	
93							93	
94							91	
95							93	
96							92	
97							92	
98							97	
99							95	
100							85	
101							97	
102							93	
103							90	
104							90	
105						↓	91	↓

Comments: Sample B-3

Test: BV-Bivalve Larval Survival and Development Test      Test ID: 0403-108  
 Species: MG-Mytilis galloprovincialis                      Protocol: ASTM 87  
 Sample ID: BUENA-City of Buenaventura                      Sample Type: OTH-Other sample type  
 Start Date: 03/17/2004                      End Date: 03/19/2004                      Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
83	1	1	L-Lab Control					
74	2	2	L-Lab Control					
84	3	3	L-Lab Control					
93	4	4	L-Lab Control					
92	5	5	L-Lab Control					
100	6	1	B-Control					
72	7	2	B-Control					
77	8	3	B-Control					
94	9	4	B-Control					
88	10	5	B-Control					
79	11	1	6.25					
101	12	2	6.25					
105	13	3	6.25					
76	14	4	6.25					
80	15	5	6.25					
89	16	1	12.5					
95	17	2	12.5					
71	18	3	12.5					
99	19	4	12.5					
90	20	5	12.5					
73	21	1	25					
91	22	2	25					
81	23	3	25					
87	24	4	25					
102	25	5	25					
75	26	1	50					
82	27	2	50					
98	28	3	50					
85	29	4	50					
86	30	5	50					
103	31	1	100b					
97	32	2	100b					
104	33	3	100b					
78	34	4	100b					
96	35	5	100b					

Comments: Sample B-3      C=AH

**Bivalve Larval Survival and Development Test-Proportion Normal**

Start Date: 03/19/2004	Test ID: 0403-109	Sample ID: City of Buenaventura
End Date: 03/21/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Ambient Water
Sample Date: 03/16/2004	Protocol: ASTM 87	Test Species: MG-Mytilis galloprovincialis
Comments: Sample C-3		

Conc-%	1	2	3	4	5
Lab Control	0.9600	0.9600	0.8600	0.9000	0.9600
Brine Control	0.9500	0.9800	0.8600	0.9100	0.9700
6.25	0.8900	0.9000	0.8700	0.8700	0.8500
12.5	0.9800	0.9200	0.8700	0.9100	0.8900
25	0.9900	0.9200	0.8667	0.8900	0.9600
50	0.9000	0.9500	0.9500	0.9300	0.9500
66	0.8700	0.9600	0.9000	0.9100	0.8000

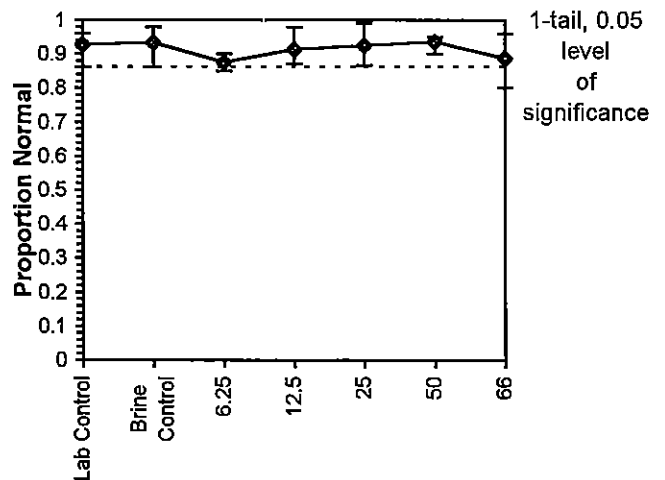
Conc-%	Transform: Arcsin Square Root							1-Tailed			Isotonic	
	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
Lab Control	0.9280	0.9936	1.3089	1.1873	1.3694	6.546	5					
Brine Control	0.9340	1.0000	1.3249	1.1873	1.4289	7.432	5				0.9340	1.0000
6.25	0.8760	0.9379	1.2117	1.1731	1.2490	2.447	5	2.153	2.360	0.1240	0.9127	0.9772
12.5	0.9140	0.9786	1.2827	1.2019	1.4289	6.827	5	0.802	2.360	0.1240	0.9127	0.9772
25	0.9253	0.9907	1.3108	1.1970	1.4706	8.422	5	0.268	2.360	0.1240	0.9127	0.9772
50	0.9360	1.0021	1.3176	1.2490	1.3453	3.222	5	0.138	2.360	0.1240	0.9127	0.9772
66	0.8880	0.9507	1.2387	1.1071	1.3694	7.723	5	1.640	2.360	0.1240	0.8880	0.9507

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97007	0.9	0.27001	-0.0673
Bartlett's Test indicates equal variances (p = 0.18)	7.66617	15.0863		
The control means are not significantly different (p = 0.79)	0.27287	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	66	>66		1.51515	0.07142	0.07592	0.01073	0.0069	0.21033	5, 24

Linear Interpolation (200 Resamples)				
Point	%	SD	95% CL(Exp)	Skew
IC05	>66			
IC10	>66			
IC15	>66			
IC20	>66			
IC25	>66			
IC40	>66			
IC50	>66			



Comparisons made against brine control.

Test: BV-Bivalve Larval Survival and Development Test  
 Species: MG-Mytilus galloprovincialis  
 Sample ID: CITY OF BU  
 Start Date: 03/19/2004

Test ID: 0403-109  
 Protocol: ASTM 87  
 Sample Type: AMBIENT WA  
 Lab ID: AEESD-AMEC Bioassay SD  
 End Date: 03/21/2004

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
	1	1	Lab Control			100	96	
	2	2	Lab Control			100	96	
	3	3	Lab Control			100	86	
	4	4	Lab Control			100	90	
	5	5	Lab Control			100	96	
	6	1	Brine Control			100	95	
	7	2	Brine Control			100	98	
	8	3	Brine Control			100	86	
	9	4	Brine Control			100	91	
	10	5	Brine Control			100	97	
	11	1	6.25			100	89	
	12	2	6.25			100	90	
	13	3	6.25			100	87	
	14	4	6.25			100	87	
	15	5	6.25			100	85	
	16	1	12.5			100	98	
	17	2	12.5			100	92	
	18	3	12.5			100	87	
	19	4	12.5			100	91	
	20	5	12.5			100	89	
	21	1	25			100	99	
	22	2	25			100	92	
	23	3	25			105	91	
	24	4	25.0			100	89	
	25	5	25			100	96	
	26	1	50			100	90	
	27	2	50			100	95	
	28	3	50			100	95	
	29	4	50			100	93	
	30	5	50			100	95	
	31	1	66			100	87	
	32	2	66			100	96	
	33	3	66			100	90	
	34	4	66			100	91	
	35	5	66			100	80	oktd entry ac <i>[signature]</i>

Comments: Sample C-3

Test: BV-Bivalve Larval Survival and Development Test  
 Species: MG-Mytilis galloprovincialis  
 Sample ID: BUENA-City of Buenaventura  
 Start Date: 03/17/2004

Test ID: 0403-109  
 Protocol: ASTM 87  
 Sample Type: OTH-Other sample type  
 Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
106						105	91	SD
107						100	86	
108						<del>100</del>	<del>88</del>	<del>off</del>
109						100	96	
110							92	
111							90	
112							89	
113							90	<del>off</del>
114							95	
115							87	
116							91	
117							90	
118							90	
119							85	<del>off</del>
120							87	
121							85	
122							87	<del>off</del>
123							92	
124							89	
125						<del>100</del>	<del>81</del>	MT <del>off</del>
126						100	95	YR
127						100	96	YR
128						100	96	YR
129						100	80	MT
130							89	
131							99	
132							87	
133							90	
134							91	
135							87	
136							98	
137							95	
138							96	
139							93	
140							96	

Comments: Sample ~~2~~  
 C-3

Test: BV-Bivalve Larval Survival and Development Test  
 Species: MG-Mytilus galloprovincialis  
 Sample ID: BUENA-City of Buenaventura  
 Start Date: 03/17/2004

Test ID: 0403-109  
 Protocol: ASTM 87  
 Sample Type: OTH-Other sample type  
 Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
138	1	1	L-Lab Control					
140	2	2	L-Lab Control					
107	3	3	L-Lab Control					
117	4	4	L-Lab Control					
109	5	5	L-Lab Control					
125	6	1	B-Control					Share B-Control with A/L 3/19/04 test
122	7	2	B-Control					
113	8	3	B-Control					
108	9	4	B-Control					
119	10	5	B-Control					
130	11	1	6.25					
111	12	2	6.25					
120	13	3	6.25					
132	14	4	6.25					
121	15	5	6.25					
136	16	1	12.5					
110	17	2	12.5					
115	18	3	12.5					
116	19	4	12.5					
112	20	5	12.5					
131	21	1	25					
123	22	2	25					
106	23	3	25					
124	24	4	25					
127	25	5	25					
133	26	1	50					
114	27	2	50					
137	28	3	50					
139	29	4	50					
126	30	5	50					
135	31	1	100b					
128	32	2	100b					
118	33	3	100b					
134	34	4	100b					
129	35	5	100b					

3/17/04  
 7 test

10 pts  
 ab  
 ont

Share B-Control with A/L 3/19/04 test

Comments: Sample ~~C2~~ QC = A4  
 C3



*A. AFFINIS*

**Larval Fish Growth and Survival Test-7 Day Survival**

Start Date: 03/17/2004	Test ID: 0403-094	Sample ID:	City of Buenaventura
End Date: 03/24/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type:	Ambient water
Sample Date: 03/16/2004	Protocol: EPAM 91-EPA Marine	Test Species:	AA-Atherinops affinis
Comments: Site A-2			

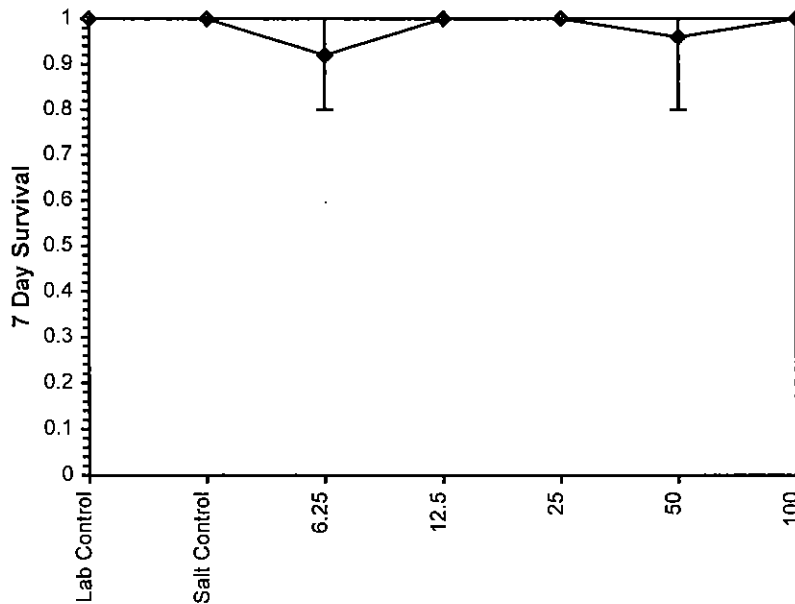
Conc-%	1	2	3	4	5
Lab Control	1.0000	1.0000	1.0000	1.0000	1.0000
Salt Control	1.0000	1.0000	1.0000	1.0000	1.0000
6.25	0.8000	1.0000	1.0000	1.0000	0.8000
12.5	1.0000	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000	1.0000
50	0.8000	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root				N	Rank Sum	1-Tailed Critical
			Mean	Min	Max	CV%			
Lab Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	5		
Salt Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	5		
6.25	0.9200	0.9200	1.2500	1.1071	1.3453	10.434	5	22.50	16.00
12.5	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	5	27.50	16.00
25	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	5	27.50	16.00
50	0.9600	0.9600	1.2977	1.1071	1.3453	8.207	5	25.00	16.00
100	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	5	27.50	16.00

(All data compared against salt control)

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.71382	0.9	-1.4688	3.36952
Equality of variance cannot be confirmed				
The control means are not significantly different (p = 1.00)	0	2.30601		
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1

**Dose-Response Plot**



**Larval Fish Growth and Survival Test-7 Day Growth**

Start Date: 03/17/2004	Test ID: 0403-094	Sample ID:	City of Buenaventura
End Date: 03/24/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type:	Ambient water
Sample Date: 03/16/2004	Protocol: EPAM 91-EPA Marine	Test Species:	AA-Atherinops affinis
Comments: Site A-2			

Conc-%	1	2	3	4	5
Lab Control	1.0380	1.0760	1.2100	1.3460	1.3140
Salt Control	1.3240	1.3640	1.1780	1.2140	1.4340
6.25	1.2780	1.0880	1.2560	1.0680	1.0560
12.5	1.2440	1.1420	1.2260	1.3080	1.1420
25	1.1960	1.0260	1.1920	1.3040	1.3780
50	1.0240	0.9920	0.9700	1.2140	1.2240
100	1.0820	0.8440	1.0220	0.9280	1.2120

Conc-%	Mean	N-Mean	Transform: Untransformed					N	1-Tailed		
			Mean	Min	Max	CV%	t-Stat		Critical	MSD	
Lab Control	1.1968	0.9186	1.1968	1.0380	1.3460	11.516	5				
Salt Control	1.3028	1.0000	1.3028	1.1780	1.4340	8.130	5				
6.25	1.1492	0.8821	1.1492	1.0560	1.2780	9.435	5	2.088	2.360	0.1736	
12.5	1.2124	0.9306	1.2124	1.1420	1.3080	5.866	5	1.229	2.360	0.1736	
25	1.2192	0.9358	1.2192	1.0260	1.3780	10.929	5	1.136	2.360	0.1736	
*50	1.0848	0.8327	1.0848	0.9700	1.2240	11.436	5	2.963	2.360	0.1736	
*100	1.0176	0.7811	1.0176	0.8440	1.2120	13.908	5	3.876	2.360	0.1736	

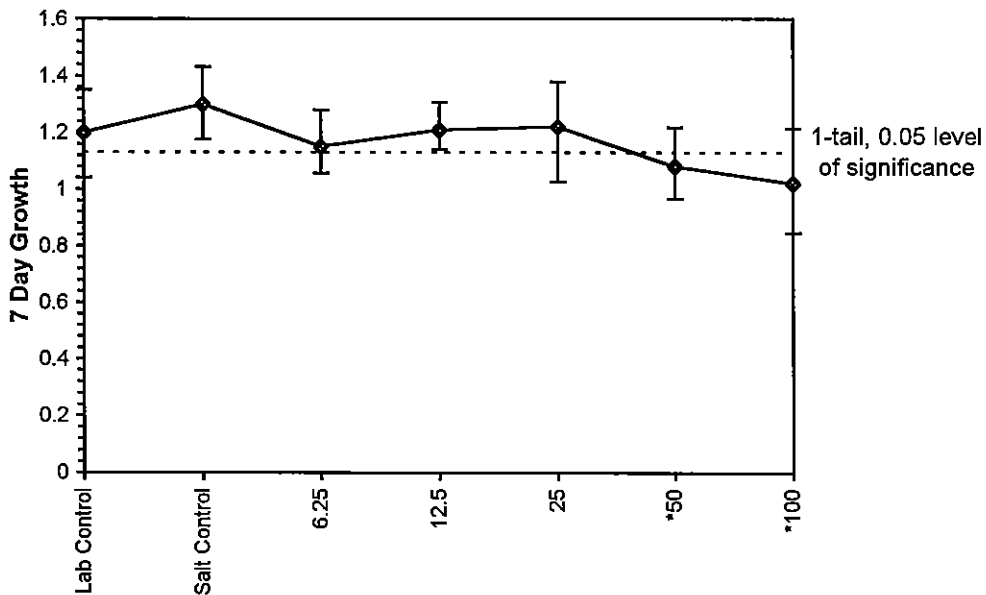
(All data compared against salt control)

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.95327	0.9	0.09955	-1.071
Bartlett's Test indicates equal variances (p = 0.86)	1.89892	15.0863		
The control means are not significantly different (p = 0.21)	1.36364	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	25	50	35.3553	4	0.17364	0.13328	0.05258	0.01353	0.01012	5, 24

**Dose-Response Plot**



Test Species: A. affinis

Client Name: City of Buena Ventura Test Date: 3/17/04

Sample ID: SCORE A-2 Test No.: 0403-094

Conc. (%)	Rep.	Survival on Test Day:								Percent Survival	pan wt. (g)	pan + fish (g)
		0	1	2	3	4	5	6	7			
Lab Cont. #1	a	5	5	5	5	5	5	5	5	100	0.03059	0.03578
	b	5	5	5	5	5	5	5	5	100	0.03065	0.03603
	c	5	5	5	5	5	5	5	5	100	0.02948	0.03553
	d	5	5	5	5	5	5	5	5	100	0.03488	0.04161
	e	5	5	5	5	5	5	5	5	100	0.02705	0.03362
Salt Cont. #1	a	5	5	5	5	5	5	5	5	100	0.03553	0.04215
	b	5	5	5	5	5	5	5	5	100	0.03440	0.04122
	c	5	5	5	5	5	5	5	5	100	0.03816	0.04405
	d	5	5	5	5	5	5	5	5	100	0.03537	0.04144
	e	5	5	5	5	5	5	5	5	100	0.03757	0.04474
6.25	a	5	5	4	4	4	4	4	4	80	0.03663	0.03630
	b	5	5	5	5	5	5	5	5	100	0.03844	0.04388
	c	5	5	5	5	5	5	5	5	100	0.03871	0.04499
	d	5	5	5	5	5	5	5	5	100	0.03684	0.04248
	e	5	5	4	4	4	4	4	4	80	0.03650	0.04178
12.5	a	5	5	5	5	5	5	5	5	100	0.03461	0.04083
	b	5	5	5	5	5	5	5	5	100	0.03260	0.03831
	c	5	5	5	5	5	5	5	5	100	0.03338	0.03751
	d	5	5	5	5	5	5	5	5	100	0.03204	0.03858
	e	5	5	5	5	5	5	5	5	100	0.03136	0.03707
25	a	5	5	5	5	5	5	5	5	100	0.03318	0.03916
	b	5	5	5	5	5	5	5	5	100	0.03247	0.03760
	c	5	5	5	5	5	5	5	5	100	0.03149	0.03745
	d	5	5	5	5	5	5	5	5	100	0.03079	0.03731
	e	5	5	5	5	5	5	5	5	100	0.02703	0.03392
50	a	5	4	4	4	4	4	4	4	80	0.03595	0.04107
	b	5	5	5	5	5	5	5	5	100	0.03193	0.03689
	c	5	5	5	5	5	5	5	5	100	0.03362	0.03847
	d	5	5	5	5	5	5	5	5	100	0.03433	0.04040
	e	5	5	5	5	5	5	5	5	100	0.03265	0.03877
100	a	5	5	5	5	5	5	5	5	100	0.03245	0.03786
	b	5	5	5	5	5	5	5	5	100	0.03444	0.03866
	c	5	5	5	5	5	5	5	5	100	0.03373	0.03884
	d	5	5	5	5	5	5	5	5	100	0.03225	0.03689
	e	5	5	5	5	5	5	5	5	100	0.03152	0.03758

Tech Initials: AG/MT SA ME SH RA AH SH RA

Feeding Times (day):

	0	1	2	3	4	5	6
1/30	0815	0815	0900	0930	0845	0830	
1/30	1515	1700	1400	1500	1745	1630	

Weight Data:  
 Date/Time In: 3-17-04/1500  
 Date/Time out: 3-26-04 0900  
 Oven Temp (°C): 59  
 Tech Initials: AW

Comments: \_\_\_\_\_

QC Check: via 4/13/04  
 Final Review: MT 5/5/04

**Larval Fish Growth and Survival Test-7 Day Survival**

Start Date: 03/17/2004	Test ID: 0403-095	Sample ID: City of Buenaventura
End Date: 03/24/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Ambient water
Sample Date: 03/16/2004	Protocol: EPAM 91-EPA Marine	Test Species: AA-Atherinops affinis
Comments: Site B-1		

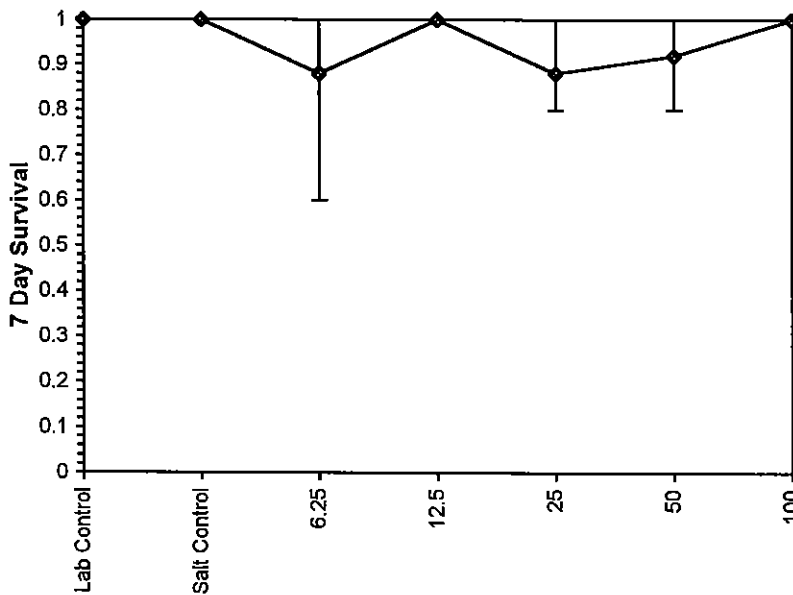
Conc-%	1	2	3	4	5
Lab Control	1.0000	1.0000	1.0000	1.0000	1.0000
Salt Control	1.0000	1.0000	1.0000	1.0000	1.0000
6.25	1.0000	1.0000	1.0000	0.8000	0.6000
12.5	1.0000	1.0000	1.0000	1.0000	1.0000
25	1.0000	0.8000	0.8000	1.0000	0.8000
50	1.0000	1.0000	1.0000	0.8000	0.8000
100	1.0000	1.0000	1.0000	1.0000	1.0000

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root					N	Rank Sum	1-Tailed Critical
			Mean	Min	Max	CV%				
Lab Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	5			
Salt Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	5			
6.25	0.8800	0.8800	1.2058	0.8861	1.3453	17.113	5	22.50	16.00	
12.5	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	5	27.50	16.00	
25	0.8800	0.8800	1.2024	1.1071	1.3453	10.848	5	20.00	16.00	
50	0.9200	0.9200	1.2500	1.1071	1.3453	10.434	5	22.50	16.00	
100	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	5	27.50	16.00	

**(All data compared against salt control)**

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.86829	0.9	-0.8677	1.92205
Equality of variance cannot be confirmed				
The control means are not significantly different (p = 1.00)	0	2.30601		
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1

**Dose-Response Plot**



**Larval Fish Growth and Survival Test-7 Day Growth**

Start Date: 03/17/2004	Test ID: 0403-095	Sample ID: City of Buenaventura
End Date: 03/24/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Ambient water
Sample Date: 03/16/2004	Protocol: EPAM 91-EPA Marine	Test Species: AA-Atherinops affinis
Comments: Site B-1		

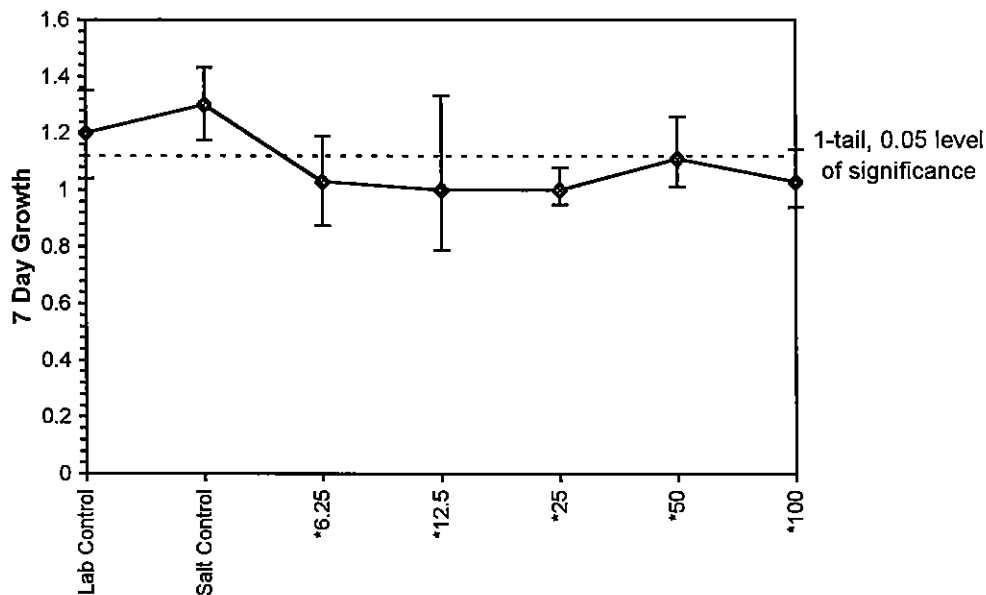
Conc-%	1	2	3	4	5
Lab Control	1.0380	1.0760	1.2100	1.3460	1.3140
Salt Control	1.3240	1.3640	1.1780	1.2140	1.4340
6.25	1.0660	1.1900	0.8740	1.0320	0.9920
12.5	1.0080	0.8740	0.7900	1.3340	1.0100
25	1.0800	0.9480	0.9520	1.0760	0.9480
50	1.2580	1.0320	1.2140	1.0120	1.0400
100	1.1180	1.0020	0.9560	0.9400	1.1440

Conc-%	Mean	N-Mean	Transform: Untransformed					N	t-Stat	1-Tailed Critical	MSD
			Mean	Min	Max	CV%					
Lab Control	1.1968	0.9186	1.1968	1.0380	1.3460	11.516	5				
Salt Control	1.3028	1.0000	1.3028	1.1780	1.4340	8.130	5				
*6.25	1.0308	0.7912	1.0308	0.8740	1.1900	11.133	5	3.429	2.360	0.1872	
*12.5	1.0032	0.7700	1.0032	0.7900	1.3340	20.649	5	3.777	2.360	0.1872	
*25	1.0008	0.7682	1.0008	0.9480	1.0800	7.045	5	3.808	2.360	0.1872	
*50	1.1112	0.8529	1.1112	1.0120	1.2580	10.388	5	2.416	2.360	0.1872	
*100	1.0320	0.7921	1.0320	0.9400	1.1440	9.074	5	3.414	2.360	0.1872	

(All data compared against salt control)

Auxiliary Tests	Statistic	Critical	Skew	Kurt						
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96619	0.9	0.69899	1.00297						
Bartlett's Test indicates equal variances (p = 0.40)	5.15223	15.0863								
The control means are not significantly different (p = 0.21)	1.36364	2.30601								
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	<6.25	6.25			0.18718	0.14368	0.06751	0.01573	0.00625	5, 24

**Dose-Response Plot**



Test Species: A. affinis

Client Name: City of Buena Ventura Test Date: 3/17/04

Sample ID: SCRE B-1 Test No.: 0403-095

Conc. (%)	Rep.	Survival on Test Day:								Percent Survival	pan wt. (g)	pan + fish (g)
		0	1	2	3	4	5	6	7			
Lab Cont. #1	a	5	5	5	5	5	5	5	5	100		
	b	5	5	5	5	5	5	5	5	100		
	c	5	5	5	5	5	5	5	5	100		
	d	5	5	5	5	5	5	5	5	100		
	e	5	5	5	5	5	5	5	5	100		
Salt Cont. #1	a	5	5	5	5	5	5	5	5	100		
	b	5	5	5	5	5	5	5	5	100		
	c	5	5	5	5	5	5	5	5	100		
	d	5	5	5	5	5	5	5	5	100		
	e	5	5	5	5	5	5	5	5	100		
6.25	a	5	5	5	5	5	5	5	5	100	0.02857	0.03390
	b	5	5	5	5	5	5	5	5	100	0.03583	0.04178
	c	5	5	5	5	5	5	5	5	100	0.03797	0.03834
	d	5	5	5	5	4	4	4	4	80	0.03225	0.03841
	e	5	4	4	4	3	3	3	3	60	0.03509	0.04005
12.5	a	5	5	5	5	5	5	5	5	100	0.03313	0.03817
	b	5	5	5	5	5	5	5	5	100	0.03326	0.03823
	c	5	5	5	5	5	5	5	5	100	0.03331	0.03726
	d	5	5	5	5	5	5	5	5	100	0.03391	0.04058
	e	5	5	5	5	5	5	5	5	100	0.03215	0.03720
25	a	5	5	5	5	5	5	5	5	100	0.03262	0.03802
	b	5	5	5	5	4	4	4	4	80	0.03081	0.03555
	c	5	5	5	5	5	5	4	4	80	0.03551	0.04027
	d	5	5	5	5	5	5	5	5	100	0.03796	0.03934
	e	5	5	4	4	4	4	4	4	80	0.03412	0.03886
50	a	5	5	5	5	5	5	5	5	100	0.03438	0.04067
	b	5	5	5	5	5	5	5	5	100	0.03314	0.03830
	c	5	5	5	5	5	5	5	5	100	0.03434	0.04041
	d	5	5	5	5	4	4	4	4	80	0.03554	0.04060
	e	5	5	5	5	4	4	4	4	80	0.03420	0.03940
100	a	5	5	5	5	5	5	5	5	100	0.03436	0.03995
	b	5	5	5	5	5	5	5	5	100	0.03043	0.03933
	c	5	5	5	5	5	5	5	5	100	0.03117	0.03595
	d	5	5	5	5	5	5	5	5	100	0.03463	0.03933
	e	5	5	5	5	5	5	5	5	100	0.03448	0.04020
Tech Initials		Rh/MT	SH	MC	Sit	Rg	AL	SH	Rg			

Feeding Times (day):

	0	1	2	3	4	5	6
✓	0845	0915	0700	0930	0845	0830	
	1030	1515	1200	1400	1600	1745	1630

Weight Data:  
 Date/Time in: 3-24-04/1500  
 Date/Time out: 3-25-04/0900  
 Oven Temp (°C): 59  
 Tech Initials: AW

Comments: \_\_\_\_\_

QC Check: we 4/13/04  
 Final Review: MT 5/5/04

**Larval Fish Growth and Survival Test-7 Day Survival**

Start Date: 03/17/2004      Test ID: 0403-096      Sample ID: City of Buenaventura  
 End Date: 03/24/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: Ambient water  
 Sample Date: 03/16/2004      Protocol: EPAM 91-EPA Marine      Test Species: AA-Atherinops affinis  
 Comments: Site B-3

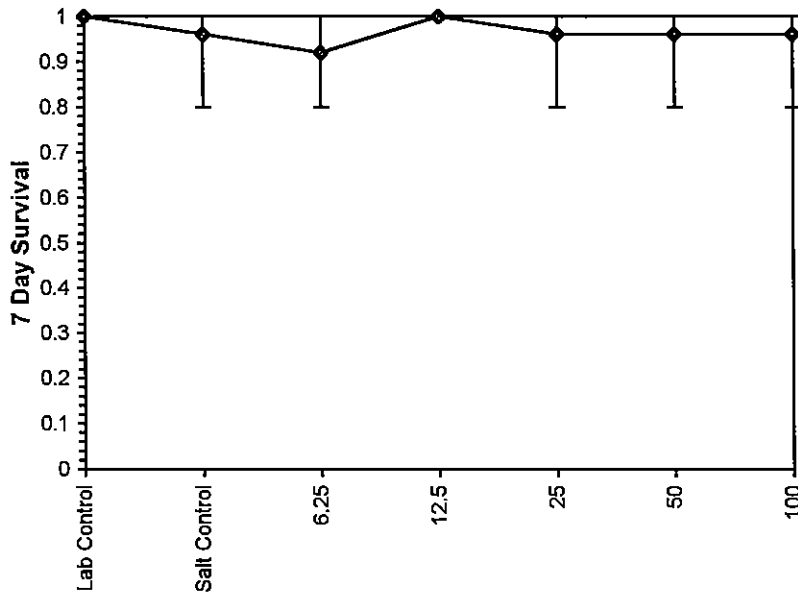
Conc-%	1	2	3	4	5
Lab Control	1.0000	1.0000	1.0000	1.0000	1.0000
Salt Control	0.8000	1.0000	1.0000	1.0000	1.0000
6.25	1.0000	1.0000	0.8000	0.8000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000	1.0000
25	0.8000	1.0000	1.0000	1.0000	1.0000
50	0.8000	1.0000	1.0000	1.0000	1.0000
100	0.8000	1.0000	1.0000	1.0000	1.0000

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root					Rank Sum	1-Tailed Critical
			Mean	Min	Max	CV%	N		
Lab Control	1.0000	1.0417	1.3453	1.3453	1.3453	0.000	5		
Salt Control	0.9600	1.0000	1.2977	1.1071	1.3453	8.207	5		
6.25	0.9200	0.9583	1.2500	1.1071	1.3453	10.434	5	25.00	
12.5	1.0000	1.0417	1.3453	1.3453	1.3453	0.000	5	30.00	
25	0.9600	1.0000	1.2977	1.1071	1.3453	8.207	5	27.50	
50	0.9600	1.0000	1.2977	1.1071	1.3453	8.207	5	27.50	
100	0.9600	1.0000	1.2977	1.1071	1.3453	8.207	5	27.50	

**(All data compared against salt control)**

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.70526	0.9	-1.3503	0.34809
Equality of variance cannot be confirmed				
The control means are not significantly different (p = 0.35)	1	2.30601		
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1

**Dose-Response Plot**





**Larval Fish Growth and Survival Test-7 Day Growth**

Start Date: 03/17/2004      Test ID: 0403-096      Sample ID: CITY OF BU  
 End Date: 03/24/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: AMBIENT WA  
 Sample Date: 03/16/2004      Protocol: EPAM 91-EPA Marine      Test Species: AA-Atherinops affinis  
 Comments: Site B-3

Conc-%	1	2	3	4	5
Lab Control	1.0380	1.0760	1.2100	1.3460	1.3140
Salt Control	1.1200	1.5400	1.2080	1.0340	1.0740
6.25	1.0140	0.9780	1.1840	0.9640	1.2460
12.5	1.1580	1.1020	1.1540	1.0680	1.1240
25	0.8040	0.9320	0.9260	0.9660	1.1680
50	1.0180	0.9200	1.1320	0.9880	0.9740
100	1.0280	0.9900	1.0200	0.8140	1.2480

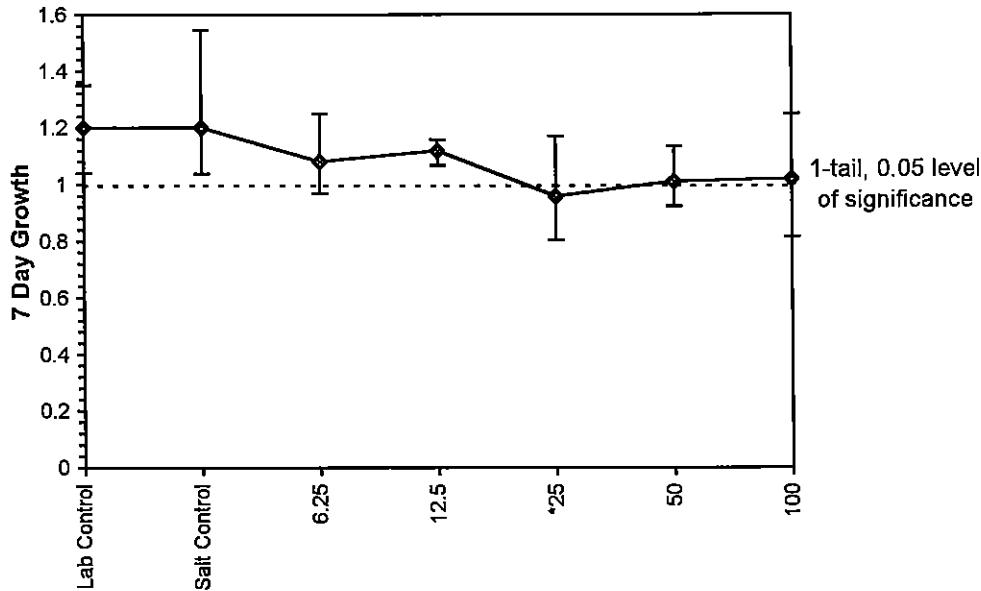
Conc-%	Mean	N-Mean	Transform: Untransformed					N	t-Stat	1-Tailed Critical	MSD
			Mean	Min	Max	CV%					
Lab Control	1.1968	1.0013	1.1968	1.0380	1.3460	11.516	5				
Salt Control	1.1952	1.0000	1.1952	1.0340	1.5400	17.013	5				
6.25	1.0772	0.9013	1.0772	0.9640	1.2460	11.974	5	1.398	2.360	0.1992	
12.5	1.1212	0.9381	1.1212	1.0680	1.1580	3.348	5	0.877	2.360	0.1992	
*25	0.9592	0.8025	0.9592	0.8040	1.1680	13.749	5	2.797	2.360	0.1992	
50	1.0064	0.8420	1.0064	0.9200	1.1320	7.818	5	2.237	2.360	0.1992	
100	1.0200	0.8534	1.0200	0.8140	1.2480	15.139	5	2.076	2.360	0.1992	

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.93139	0.9	0.98261	1.27014
Bartlett's Test indicates equal variances (p = 0.10)	9.29265	15.0863		
The control means are not significantly different (p = 0.99)	0.01456	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	12.5	25	17.6777	8	0.19916	0.16663	0.03689	0.0178	0.10427	5, 24

**Dose-Response Plot**



Test Species: A. affinis

Client Name: City of Buena Ventura Test Date: 3/17/04

Sample ID: SCRE B-3 Test No.: 0403-096

Conc. (%)	Rep.	Survival on Test Day:								Percent Survival	pan wt. (g)	pan + fish (g)	
		0	1	2	3	4	5	6	7				
Lab Cont. #2	a	5	5	3	3	2	Invented: Use Lab Cont #1						
	b	5	5	4	4	4							
	c	5	4	4	4	4							
	d	5	5	3	3	2							
	e	5	5	5	5	5							
Salt Cont. #2	a	5	5	4	4	4	4	4	4	80	0.03312	0.03872	
	b	5	5	5	5	5	5	5	5	100	0.03570	0.04340	
	c	5	5	5	5	5	5	5	5	100	0.03337	0.03941	
	d	5	5	5	5	5	5	5	5	100	0.03435	0.03952	
	e	5	5	5	5	5	5	5	5	100	0.03491	0.04028	
6.25	a	5	5	5	5	5	5	5	5	100	0.03477	0.03984	
	b	5	5	5	5	5	5	5	5	100	0.03424	0.03913	
	c	5	5	4	4	4	4	4	4	80	0.03022	0.03614	
	d	5	5	5	5	4	4	4	4	80	0.02971	0.03453	
	e	5	5	5	5	5	5	5	5	100	0.03577	0.04200	
12.5	a	5	5	5	5	5	5	5	5	100	0.03452	0.04031	
	b	5	5	5	5	5	5	5	5	100	0.03565	0.0416	
	c	5	5	5	5	5	5	5	5	100	0.03443	0.04020	
	d	5	5	5	5	5	5	5	5	100	0.03451	0.03985	
	e	5	5	5	5	5	5	5	5	100	0.03493	0.03995	
25	a	5	5	5	5	4	4	4	4	80	0.03505	0.03907	
	b	5	5	5	5	5	5	5	5	100	0.03501	0.03967	
	c	5	5	5	5	5	5	5	5	100	0.03415	0.03878	
	d	5	5	5	5	5	5	5	5	100	0.03604	0.03487	
	e	5	5	5	5	5	5	5	5	100	0.03413	0.03997	
50	a	5	4	4	4	4	4	4	4	80	0.03403	0.03912	
	b	5	5	5	5	5	5	5	5	100	0.03453	0.03913	
	c	5	5	5	5	5	5	5	5	100	0.03297	0.03963	
	d	5	5	5	5	5	5	5	5	100	0.03377	0.03871	
	e	5	5	5	5	5	5	5	5	100	0.03221	0.03708	
100	a	5	5	5	5	4	4	4	4	80	0.03296	0.03810	
	b	5	5	5	5	5	5	5	5	100	0.03496	0.03991	
	c	5	5	5	5	5	5	5	5	100	0.03447	0.03957	
	d	5	5	5	5	5	5	5	5	100	0.03179	0.03586	
	e	5	5	5	5	5	5	5	5	100	0.02997	0.03621	

Tech Initials: RM/MT SH MC SH RL AH SH RL

Feeding Times (day):

	0	1	2	3	4	5	6
0845		0845	0815	0706	0430	0845	0830
1630		1515	1200	1400	1800	1715	1630

Weight Data:  
 Date/Time In: 3-24-04/1500  
 Date/Time out: 3-26-04/0900  
 Oven Temp (°C): 59  
 Tech Initials: AW

Comments: \_\_\_\_\_

QC Check: LO 4/13/04  
 Final Review: MT 5/15/04

**Larval Fish Growth and Survival Test-7 Day Survival**

Start Date: 03/17/2004	Test ID: 0403-097	Sample ID:	City of Buenaventura
End Date: 03/24/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type:	Ambient water
Sample Date: 03/16/2004	Protocol: EPAM 91-EPA Marine	Test Species:	AA-Atherinops affinis
Comments: Site C-3			

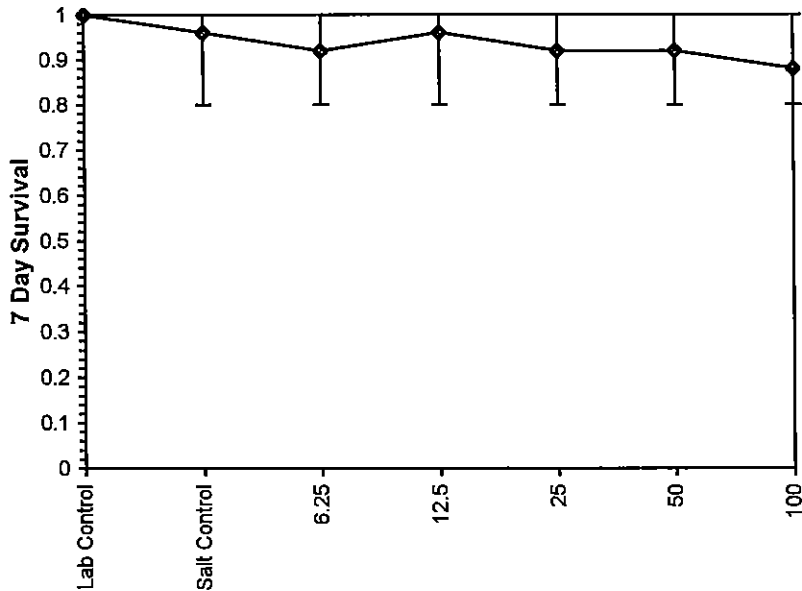
Conc-%	1	2	3	4	5
Lab Control	1.0000	1.0000	1.0000	1.0000	1.0000
Salt Control	0.8000	1.0000	1.0000	1.0000	1.0000
6.25	0.8000	1.0000	1.0000	0.8000	1.0000
12.5	0.8000	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	0.8000	1.0000	0.8000
50	1.0000	0.8000	0.8000	1.0000	1.0000
100	0.8000	1.0000	1.0000	0.8000	0.8000

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root					Rank Sum	1-Tailed Critical
			Mean	Min	Max	CV%	N		
Lab Control	1.0000	1.0417	1.3453	1.3453	1.3453	0.000	5		
Salt Control	0.9600	1.0000	1.2977	1.1071	1.3453	8.207	5	25.00	16.00
6.25	0.9200	0.9583	1.2500	1.1071	1.3453	10.434	5	27.50	16.00
12.5	0.9600	1.0000	1.2977	1.1071	1.3453	8.207	5	25.00	16.00
25	0.9200	0.9583	1.2500	1.1071	1.3453	10.434	5	25.00	16.00
50	0.9200	0.9583	1.2500	1.1071	1.3453	10.434	5	25.00	16.00
100	0.8800	0.9167	1.2024	1.1071	1.3453	10.848	5	22.50	16.00

**(All data compared against salt control)**

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.82098	0.9	-0.5132	-1.4421
Bartlett's Test indicates equal variances (p = 1.00)	0.37999	15.0863		
The control means are not significantly different (p = 0.35)	1	2.30601		
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1

**Dose-Response Plot**



**Larval Fish Growth and Survival Test-7 Day Growth**

Start Date: 03/17/2004	Test ID: 0403-097	Sample ID: CITY OF BU
End Date: 03/24/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: AMBIENT WA
Sample Date: 03/16/2004	Protocol: EPAM 91-EPA Marine	Test Species: AA-Atherinops affinis
Comments: Site C-3		

Conc-%	1	2	3	4	5
Lab Control	1.0380	1.0760	1.2100	1.3460	1.3140
Salt Control	1.1200	1.5400	1.2080	1.0340	1.0740
6.25	1.0240	1.2140	1.4080	0.9700	0.9680
12.5	0.7560	1.1800	1.0080	1.0080	1.1240
25	0.9220	0.8920	0.7160	0.9780	0.9660
50	1.0280	0.8140	0.8720	1.0600	0.9040
100	0.8620	0.5580	0.9020	0.8020	0.8380

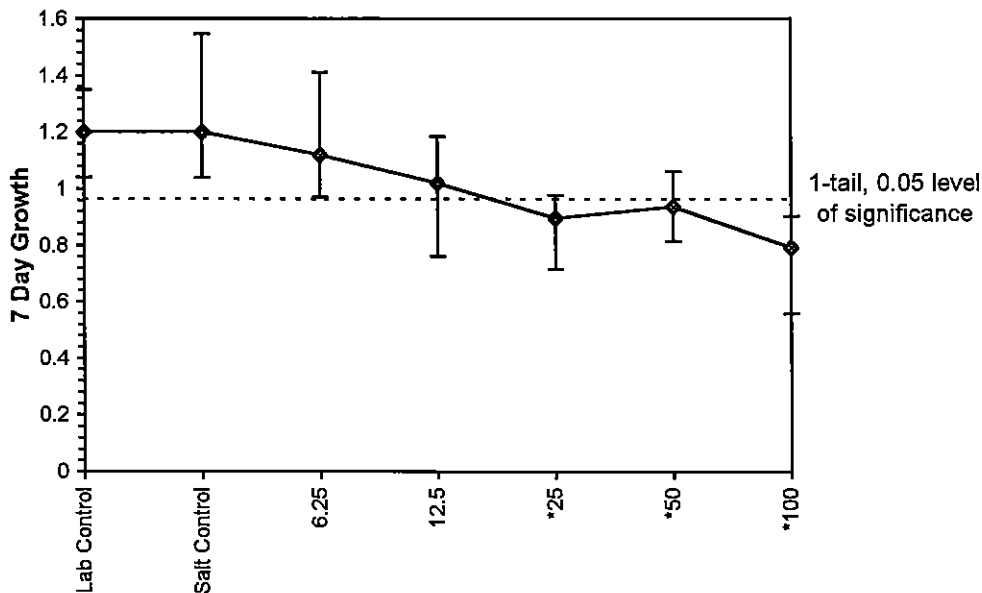
Conc-%	Mean	N-Mean	Transform: Untransformed					N	1-Tailed		
			Mean	Min	Max	CV%	t-Stat		Critical	MSD	
Lab Control	1.1968	1.0013	1.1968	1.0380	1.3460	11.516	5				
Salt Control	1.1952	1.0000	1.1952	1.0340	1.5400	17.013	5				
6.25	1.1168	0.9344	1.1168	0.9680	1.4080	17.139	5	0.797	2.360	0.2322	
12.5	1.0152	0.8494	1.0152	0.7560	1.1800	16.057	5	1.830	2.360	0.2322	
*25	0.8948	0.7487	0.8948	0.7160	0.9780	11.815	5	3.053	2.360	0.2322	
*50	0.9356	0.7828	0.9356	0.8140	1.0600	11.190	5	2.639	2.360	0.2322	
*100	0.7924	0.6630	0.7924	0.5580	0.9020	17.162	5	4.094	2.360	0.2322	

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97274	0.9	0.33951	0.21611
Bartlett's Test indicates equal variances (p = 0.72)	2.8765	15.0863		
The control means are not significantly different (p = 0.99)	0.01456	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	12.5	25	17.6777	8	0.23218	0.19426	0.10987	0.0242	0.0047	5, 24

**Dose-Response Plot**



Test Species: A. affinis

Client Name: City of Buena Ventura Test Date: 3/17/04

Sample ID: SCRE C-3 Test No.: 0403-097

Conc. ( $\mu$ /l)	Rep.	Survival on Test Day:								Percent Survival	pan wt. (g)	pan + fish (g)		
		0	1	2	3	4	5	6	7					
Lab Cont. #2	a	5	5	3	3	2	<i>Invalid: Use Lab Cont. #1</i>							
	b	5	5	4	4	4								
	c	5	4	4	4	4								
	d	5	5	3	3	2								
	e	5	5	5	5	5								
Salt Cont. #2	a	5	5	4	4	4	4*	4	4	80				
	b	5	5	5	5	5	5	5	5	100				
	c	5	5	5	5	5	5	5	5	100				
	d	5	5	5	5	5	5	5	5	100				
	e	5	5	5	5	5	5	5	5	100				
6.25	a	5	5	5	5	4	4	4	4	80	0.03292	0.03744		
	b	5	5	5	5	5	5	5	5	100	0.03390	0.03997		
	c	5	5	5	5	5	5	5	5	100	0.03510	0.04214		
	d	5	4	4	4	4	4	4	4	80	0.03364	0.03849		
	e	5	5	5	5	5	5	5	5	100	0.03404	0.03888		
12.5	a	5	4	4	4	4	4	4	4	80	0.03383	0.03761		
	b	5	5	5	5	5	5	5	5	100	0.03337	0.03927		
	c	5	5	5	5	5	5	5	5	100	0.03461	0.03965		
	d	5	5	5	5	5	5	5	5	100	0.03560	0.04064		
	e	5	5	5	5	5	5	5	5	100	0.03209	0.03771		
25	a	5	5	5	5	5	5	5	5	100	0.03052	0.03513		
	b	5	5	5	5	5	5	5	5	100	0.03265	0.03711		
	c	5	4	4	4	4	4	4	4	80	0.03414	0.03772		
	d	5	5	5	5	5	5	5	5	100	0.03700	0.04189		
	e	5	5	5	5	5	5	5	4	80	0.03583	0.04006		
50	a	5	5	5	5	5	5	5	5	100	0.03551	0.04065		
	b	5	5	4	4	4	4	4	4	80	0.03523	0.03930		
	c	5	5	4	4	4	4	4	4	80	0.03565	0.04001		
	d	5	5	5	5	5	5	5	5	100	0.03941	0.04471		
	e	5	5	5	5	5	5	5	5	100	0.03661	0.04113		
100	a	5	4	5	5	4	4	4	4	80	0.03290	0.03721		
	b	5	5	5	5	5	5	5	5	100	0.03101	0.03380		
	c	5	5	5	5	5	5	5	5	100	0.03239	0.03690		
	d	5	5	4	4	4	4	4	4	80	0.03160	0.03561		
	e	5	5	5	5	5	4	4	4	80	0.03378	0.03757		
Tech Initials		RG/MT	SH	ML	SH	RG	AH	SH	RG					

Feeding Times (day):

	0	1	2	3	4	5	6
0845	0845	0815	0700	0930	0845	0830	
1630	1515	1700	1400	1800	1745	1630	

Comments: \_\_\_\_\_

Weight Data:  
 Date/Time In: 3-24-04 / 1500  
 Date/Time out: 3-26-04 / 0700  
 Oven Temp (°C): 59  
 Tech Initials: AW

QC Check: MC 4/13/04  
 Final Review: MT 5/5/04

*A. BAHIA*

**Mysid Survival and Growth Test-7 Day Survival**

Start Date: 03/17/2004	Test ID: 0403-098	Sample ID: City of Buenaventura
End Date: 03/24/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Ambient water
Sample Date: 03/16/2004	Protocol: EPAM 91-EPA Marine	Test Species: <del>MY-Mysidopsis bahia</del> All-American Mysis
Comments: A-2		

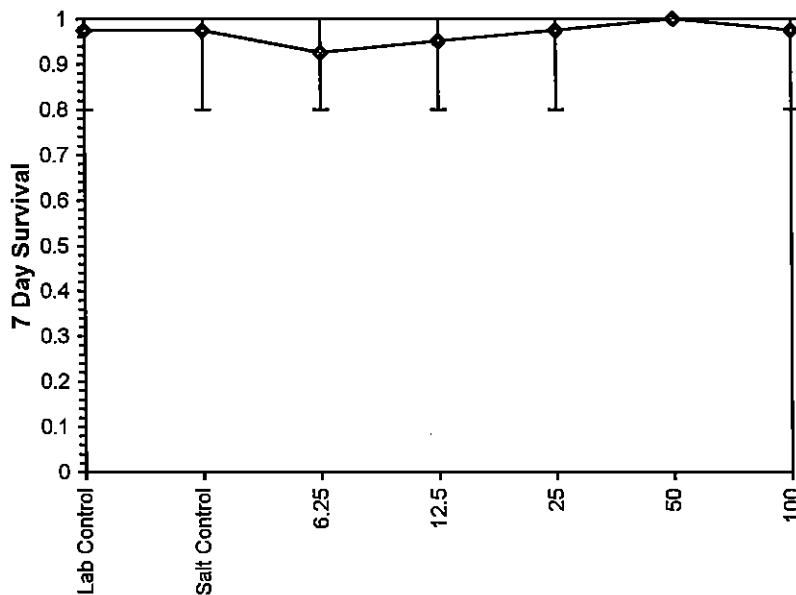
Conc-%	1	2	3	4	5	6	7	8
Lab Control	0.8000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Salt Control	0.8000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6.25	0.8000	0.8000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8000
12.5	1.0000	0.8000	1.0000	0.8000	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8000
50	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8000

Conc-%	Transform: Arcsin Square Root							Rank Sum	1-Tailed Critical
	Mean	N-Mean	Mean	Min	Max	CV%	N		
Lab Control	0.9750	1.0000	1.3155	1.1071	1.3453	6.400	8		
Salt Control	0.9750	1.0000	1.3155	1.1071	1.3453	6.400	8		
6.25	0.9250	0.9487	1.2560	1.1071	1.3453	9.813	8	60.00	46.00
12.5	0.9500	0.9744	1.2857	1.1071	1.3453	8.574	8	64.00	46.00
25	0.9750	1.0000	1.3155	1.1071	1.3453	6.400	8	68.00	46.00
50	1.0000	1.0256	1.3453	1.3453	1.3453	0.000	8	72.00	46.00
100	0.9750	1.0000	1.3155	1.1071	1.3453	6.400	8	68.00	46.00

(All data compared against salt control)

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.71592	0.929	-1.5515	1.21402
Equality of variance cannot be confirmed				
The control means are not significantly different (p = 1.00)	0	2.14479		
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1

**Dose-Response Plot**



**Mysid Survival, Growth and Fecundity Test-Growth-Weight**

Start Date: 03/17/2004	Test ID: 0403-098	Sample ID: City of Buenaventura
End Date: 03/24/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Ambient water
Sample Date: 03/16/2004	Protocol: EPAM 91-EPA Marine	Test Species: <del>MY</del> -Mysidopsis bahia
Comments: A-2		<del>NA</del> -Americamysis

Conc-%	1	2	3	4	5	6	7	8
Lab Control	0.2500	0.3900	0.4060	0.3500	0.3480	0.3060	0.3420	0.3200
Salt Control	0.2700	0.3300	0.3380	0.3820	0.3440	0.4220	0.4160	0.4040
6.25	0.3000	0.3080	0.3300	0.3340	0.3000	0.3440	0.3400	0.2880
12.5	0.3380	0.2800	0.3360	0.2800	0.3500	0.3020	0.3480	0.3940
25	0.4500	0.3600	0.4620	0.3620	0.4280	0.4160	0.3460	0.3720
50	0.4260	0.3980	0.3560	0.3440	0.3320	0.3740	0.3780	0.4060
100	0.3800	0.3860	0.3740	0.3600	0.3920	0.3860	0.4020	0.3280

Conc-%	Transform: Untransformed							1-Tailed		
	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD
Lab Control	0.3390	0.9332	0.3390	0.2500	0.4060	14.396	8			
Salt Control	0.3633	1.0000	0.3633	0.2700	0.4220	14.363	8			
*6.25	0.3180	0.8754	0.3180	0.2880	0.3440	6.732	8	2.435	2.306	0.0429
12.5	0.3285	0.9043	0.3285	0.2800	0.3940	11.894	8	1.870	2.306	0.0429
25	0.3995	1.0998	0.3995	0.3460	0.4620	11.245	8	-1.950	2.306	0.0429
50	0.3768	1.0372	0.3768	0.3320	0.4260	8.541	8	-0.726	2.306	0.0429
100	0.3760	1.0351	0.3760	0.3280	0.4020	6.124	8	-0.686	2.306	0.0429

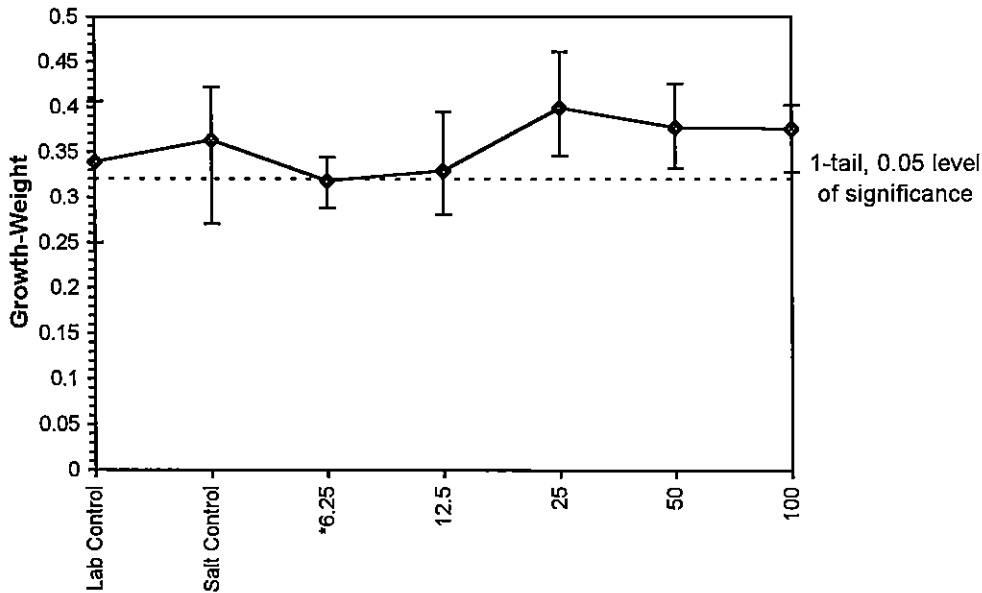
**(All data compared against salt control)**

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97366	0.929	-0.1832	-0.2553
Bartlett's Test indicates equal variances (p = 0.16)	7.91504	15.0863		
The control means are not significantly different (p = 0.35)	0.96007	2.14479		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.04285	0.11798	0.00778	0.00138	4.6E-04	5, 42

**Dose-Response Plot**





Test Species: A. M. bahia

Client Name: City of Buena Ventura

Test Date: 3/17/04

Sample ID: SCRE A-D

Test No.: 0403-098

Conc. (°/°)	Rep.	Survival on Test Day:								Percent Survival	pan wt. (g)	pan + mysid (g)
		0	1	2	3	4	5	6	7			
Lab Control #1	a	5	4	4	4	4	4	4	4	80	0.03262	0.03387
	b	5	5	5	5	5	5	5	5	100	0.03281	0.03476
	c	5	5	5	5	5	5	5	5	100	0.03187	0.03390
	d	5	5	5	5	5	5	5	5	100	0.03264	0.03434
	e	5	5	5	5	5	5	5	5	100	0.03232	0.03406
	f	5	5	5	5	5	5	5	5	100	0.03422	0.03575
	g	5	5	5	5	5	5	5	5	100	0.03402	0.03573
	h	5	5	5	5	5	5	5	5	100	0.03438	0.03598
Salt Control #1	a	5	5	5	5	5	4	4	4	80	0.03308	0.03443
	b	5	5	5	5	5	5	5	5	100	0.03343	0.03508
	c	5	5	5	5	5	5	5	5	100	0.03549	0.03718
	d	5	5	5	5	5	5	5	5	100	0.03540	0.03731
	e	5	5	5	5	5	5	5	5	100	0.03278	0.03450
	f	5	5	5	5	5	5	5	5	100	0.03403	0.03614
	g	5	5	5	5	5	5	5	5	100	0.03404	0.03612
	h	5	5	5	5	5	5	5	5	100	0.03454	0.03656
6.25	a	5	4	4	4	4	4	4	4	80	0.03212	0.03362
	b	5	4	4	4	4	4	4	4	80	0.03423	0.03577
	c	5	5	5	5	5	5	5	5	100	0.03291	0.03456
	d	5	5	5	5	5	5	5	5	100	0.03232	0.03379
	e	5	5	5	5	5	5	5	5	100	0.03482	0.03632
	f	5	5	5	5	5	5	5	5	100	0.03674	0.03846
	g	5	5	5	5	5	5	5	5	100	0.03263	0.03433
	h	5	5	5	5	5	5	5	4	80	0.03136	0.03280
12.5	a	5	5	5	5	5	5	5	5	100	0.03359	0.03528
	b	5	5	5	5	5	4	4	4	80	0.03345	0.03485
	c	5	5	5	5	5	5	5	5	100	0.03299	0.03467
	d	5	5	5	5	5	4	4	4	80	0.03486	0.03626
	e	5	5	5	5	5	5	5	5	100	0.03511	0.03686
	f	5	5	5	5	5	5	5	5	100	0.03162	0.03313
	g	5	5	5	5	5	5	5	5	100	0.03089	0.03263
	h	5	5	5	5	5	5	5	5	100	0.03137	0.03334
Tech Initials		SD	RL	SH	ML	AH	RL	AH	ML			

Feeding Times (day):

	0	1	2	3	4	5	6
MT	1630	1515	1700	1400	1800	1745	1630

Weight Data:

Date/Time in: 3-24-04 1430

Date/Time out: 3-25-04 1435

Oven Temp (°C): 60

Tech Initials: AW

Comments:

QC Check: NA 4/13/04

Final Review: MT 5/15/04

Test Species: A. M. bahia

Client Name: City of Buena Ventura

Test Date: 3/17/04

Sample ID: SCRE A-2

Test No.: 0403-098

Conc. (°/.)	Rep.	Survival on Test Day:								Percent Survival	pan wt. (g)	pan + mysid (g)
		0	1	2	3	4	5	6	7			
25	a	5	5	5	5	5	5	5	5	100	0.03298	0.03523
	b	5	5	5	5	5	5	5	5	100	0.03468	0.03648
	c	5	5	5	5	5	5	5	5	100	0.03544	0.03775
	d	5	5	5	5	5	5	5	5	100	0.03757	0.03938
	e	5	5	5	5	5	5	5	5	100	0.03545	0.03759
	f	5	5	5	5	5	5	5	5	100	0.03245	0.03453
	g	5	5	5	5	5	5	5	5	100	0.03234	0.03407
	h	5	5	5	5	5	5	5	4	80	0.03374	0.03560
50	a	5	5	5	5	5	5	5	5	100	0.03022	0.03235
	b	5	5	5	5	5	5	5	5	100	0.03321	0.03520
	c	5	5	5	5	5	5	5	5	100	0.03188	0.03366
	d	5	5	5	5	5	5	5	5	100	0.03177	0.03349
	e	5	5	5	5	5	5	5	5	100	0.03158	0.03324
	f	5	5	5	5	5	5	5	5	100	0.03240	0.03427
	g	5	5	5	5	5	5	5	5	100	0.03300	0.03489
	h	5	5	5	5	5	5	5	5	100	0.03320	0.03523
100	a	5	5	5	5	5	5	5	5	100	0.03222	0.03412
	b	5	5	5	5	5	5	5	5	100	0.03171	0.03364
	c	5	5	5	5	5	5	5	5	100	0.03193	0.03380
	d	5	5	5	5	5	5	5	5	100	0.03320	0.03500
	e	5	5	5	5	5	5	5	5	100	0.03345	0.03541
	f	5	5	5	5	5	5	5	5	100	0.02983	0.03176
	g	5	5	5	5	5	5	5	5	100	0.03217	0.03418
	h	5	5	5	5	5	5	4	4	80	0.03502	0.03666
	a											
	b											
	c											
	d											
	e											
	f											
	g											
	h											

Tech Initials: SP/mt Rlg SH MC AH RG AH mc

Feeding Times (day):

	0	1	2	3	4	5	6
	—	0845	0815	0700	0930	0845	0830
	1630	1515	1700	1400	1800	1745	1630

Weight Data:

Date/Time in: 3-24-04 14:35  
 Date/Time out: 3-25-04 14:35  
 Oven Temp (°C): 60  
 Tech Initials: AW

Comments: \_\_\_\_\_

QC Check: 3/17/04  
 Final Review: MTS 15/5/04

**Mysid Survival and Growth Test-7 Day Survival**

Start Date: 03/17/2004	Test ID: 0403-099	Sample ID:	City of Buenaventura
End Date: 03/24/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type:	Ambient water
Sample Date: 03/16/2004	Protocol: EPAM 91-EPA Marine	Test Species:	MY-Mysidopsis bahia AM-Americanmysis
Comments: B-1			

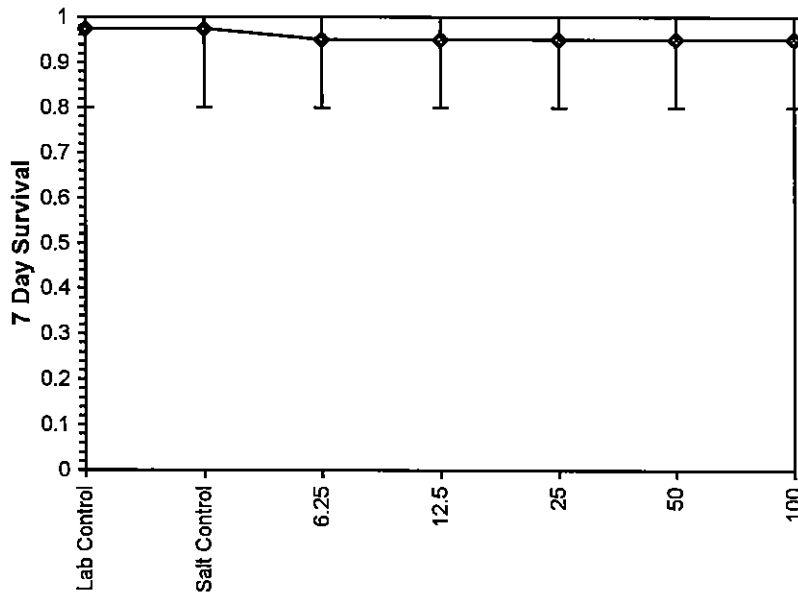
Conc-%	1	2	3	4	5	6	7	8
Lab Control	0.8000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Salt Control	0.8000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6.25	1.0000	1.0000	0.8000	1.0000	1.0000	0.8000	1.0000	1.0000
12.5	0.8000	1.0000	1.0000	0.8000	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000	0.8000	0.8000	1.0000	1.0000
50	0.8000	1.0000	1.0000	1.0000	0.8000	1.0000	1.0000	1.0000
100	0.8000	1.0000	1.0000	1.0000	0.8000	1.0000	1.0000	1.0000

Conc-%	Transform: Arcsin Square Root							Rank Sum	1-Tailed Critical
	Mean	N-Mean	Mean	Min	Max	CV%	N		
Lab Control	0.9750	1.0000	1.3155	1.1071	1.3453	6.400	8		
Salt Control	0.9750	1.0000	1.3155	1.1071	1.3453	6.400	8		
6.25	0.9500	0.9744	1.2857	1.1071	1.3453	8.574	8	64.00	46.00
12.5	0.9500	0.9744	1.2857	1.1071	1.3453	8.574	8	64.00	46.00
25	0.9500	0.9744	1.2857	1.1071	1.3453	8.574	8	64.00	46.00
50	0.9500	0.9744	1.2857	1.1071	1.3453	8.574	8	64.00	46.00
100	0.9500	0.9744	1.2857	1.1071	1.3453	8.574	8	64.00	46.00

(All data compared against salt control)

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.57567	0.929	-1.3005	-0.2556
Bartlett's Test indicates equal variances (p = 0.98)	0.71061	15.0863		
The control means are not significantly different (p = 1.00)	0	2.14479		
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1

**Dose-Response Plot**



**Mysid Survival, Growth and Fecundity Test-Growth-Weight**

Start Date: 03/17/2004	Test ID: 0403-099	Sample ID: City of Buenaventura
End Date: 03/24/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Ambient water
Sample Date: 03/16/2004	Protocol: EPAM 91-EPA Marine	Test Species: MY-Mysidopsis bahia AM-Americanysis
Comments: B-1		

Conc-%	1	2	3	4	5	6	7	8
Lab Control	0.2500	0.3900	0.4060	0.3500	0.3480	0.3060	0.3420	0.3200
Salt Control	0.2700	0.3300	0.3380	0.3820	0.3440	0.4220	0.4160	0.4040
6.25	0.2820	0.3440	0.2480	0.2880	0.2980	0.3380	0.2980	0.3300
12.5	0.2640	0.3120	0.3180	0.2720	0.6940	0.3300	0.2880	0.3200
25	0.3500	0.3620	0.3500	0.2740	0.2900	0.2640	0.2860	0.3280
50	0.3420	0.2860	0.3240	0.3140	0.2720	0.3320	0.3140	0.3260
100	0.2320	0.3120	0.2800	0.2820	0.2500	0.2880	0.3140	0.3440

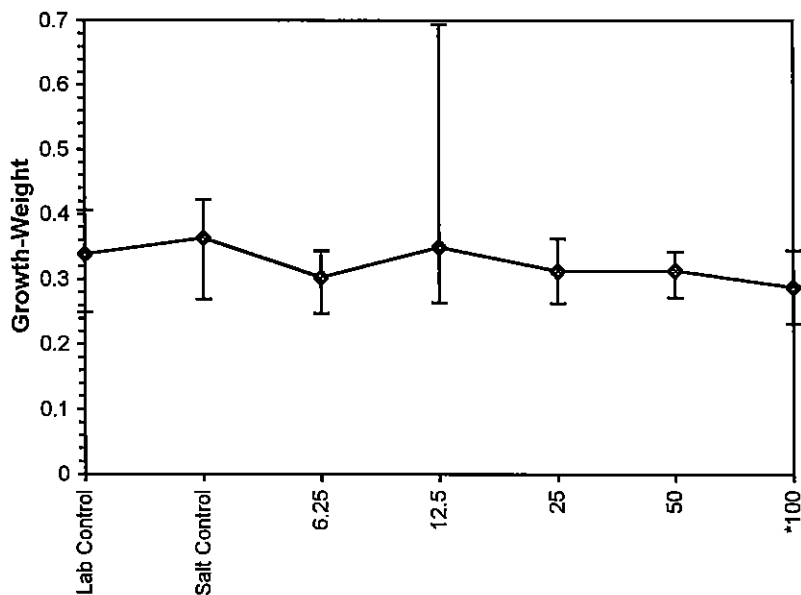
Conc-%	Mean	N-Mean	Transform: Untransformed					N	Rank Sum	1-Tailed Critical
			Mean	Min	Max	CV%				
Lab Control	0.3390	0.9332	0.3390	0.2500	0.4060	14.396	8			
Salt Control	0.3633	1.0000	0.3633	0.2700	0.4220	14.363	8			
6.25	0.3033	0.8348	0.3033	0.2480	0.3440	10.704	8	48.00	46.00	
12.5	0.3498	0.9628	0.3498	0.2640	0.6940	40.352	8	50.50	46.00	
25	0.3130	0.8617	0.3130	0.2640	0.3620	12.400	8	52.00	46.00	
50	0.3138	0.8637	0.3138	0.2720	0.3420	7.523	8	47.00	46.00	
*100	0.2878	0.7922	0.2878	0.2320	0.3440	12.508	8	45.00	46.00	

**(All data compared against salt control)**

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.73391	0.929	3.36593	18.1129
Bartlett's Test indicates unequal variances (p = 4.63E-06)	32.5443	15.0863		
The control means are not significantly different (p = 0.35)	0.96007	2.14479		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	50	100	70.7107	2

**Dose-Response Plot**



Test Species: A. bahia

Client Name: City of Buenaventura

Test Date: 3/17/04

Sample ID: SCORE B-1

Test No.: 0403-099

Conc. ( $\mu$ /L)	Rep.	Survival on Test Day:								Percent Survival	pan wt. (g)	pan + mysid (g)
		0	1	2	3	4	5	6	7			
Lab Control #1	a	5	4	4	4	4	4	4	4	80		
	b	5	5	5	5	5	5	5	5	100		
	c	5	5	5	5	5	5	5	5	100		
	d	5	5	5	5	5	5	5	5	100		
	e	5	5	5	5	5	5	5	5	100		
	f	5	5	5	5	5	5	5	5	100		
	g	5	5	5	5	5	5	5	5	100		
	h	5	5	5	5	5	5	5	5	100		
Salt Control #1	a	5	5	5	5	5	4	4	4	80		
	b	5	5	5	5	5	5	5	5	100		
	c	5	5	5	5	5	5	5	5	100		
	d	5	5	5	5	5	5	5	5	100		
	e	5	5	5	5	5	5	5	5	100		
	f	5	5	5	5	5	5	5	5	100		
	g	5	5	5	5	5	5	5	5	100		
	h	5	5	5	5	5	5	5	5	100		
6.25	a	5	5	5	5	5	5	5	5	100	0.03263	0.03404
	b	5	5	5	5	5	5	5	5	100	0.03373	0.03545
	c	5	5	5	5	4	4	4	4	80	0.03100	0.03224
	d	5	5	5	5	5	5	5	5	100	0.03354	0.03499
	e	5	5	5	5	5	5	5	5	100	0.03321	0.03470
	f	5	5	5	5	5	5	5	4	80	0.03461	0.03630
	g	5	5	5	5	5	5	5	5	100	0.03508	0.03657
	h	5	5	5	5	5	5	5	5	100	0.03440	0.03608
12.5	a	5	4	4	4	4	4	4	4	80	0.03540	0.03672
	b	5	5	5	5	5	5	5	5	100	0.03562	0.03718
	c	5	5	5	5	5	5	5	5	100	0.03619	0.03728
	d	5	5	5	5	5	4	4	4	80	0.03545	0.03681
	e	5	5	5	5	5	5	5	5	100	0.03248	0.03575
	f	5	5	5	5	5	5	5	5	100	0.03599	0.03764
	g	5	5	5	5	5	5	5	5	100	0.03368	0.03512
	h	5	5	5	5	5	5	5	5	100	0.03305	0.03465
Tech Initials		SD/MT	RG	SH	ME	AT	RL	AH	ML			

Feeding Times (day):

	0	1	2	3	4	5	6
—	0815	0815	0700	0930	0845	0830	
1630	1515	1700	1400	1800	1745	1630	

Comments: \_\_\_\_\_

Weight Data:  
 Date/Time in: 3-24-04 1438  
 Date/Time out: 3-25-04 1435  
 Oven Temp (°C): 60  
 Tech Initials: AW

QC Check: LE 4/13/04  
 Final Review: MT 5/15/04

Test Species: A  
M. bahia

Client Name: City of Buena Ventura Test Date: 3/17/04

Sample ID: SCRE B-1 Test No.: 0403-099

Conc. ( <u>°/°</u> )	Rep.	Survival on Test Day:								Percent Survival	pan wt. (g)	pan + mysid (g)
		0	1	2	3	4	5	6	7			
25	a	5	5	5	5	5	5	5	5	100	0.03247	0.03422
	b	5	5	5	5	5	5	5	5	100	0.03472	0.03615
	c	5	5	5	5	5	5	5	5	100	0.03478	0.03653
	d	5	5	5	5	5	5	5	5	100	0.03279	0.03416
	e	5	4	4	4	4	4	4	4	80	0.03221	0.03366
	f	5	5	5	5	5	5	5	4	80	0.03445	0.03577
	g	5	5	5	5	5	5	5	5	100	0.03133	0.03276
	h	5	5	5	5	5	5	5	5	100	0.02936	0.03100
50	a	5	4	4	4	4	4	4	4	80	0.03191	0.03362
	b	5	5	5	5	5	5	5	5	100	0.03164	0.03307
	c	5	5	5	5	5	5	5	5	100	0.03204	0.03366
	d	5	5	5	5	5	5	5	5	100	0.03266	0.03423
	e	5	4	4	4	4	4	4	4	80	0.03323	0.03459
	f	5	5	5	5	5	5	5	5	100	0.03318	0.03484
	g	5	5	5	5	5	5	5	5	100	0.03297	0.03454
	h	5	5	5	5	5	5	5	5	100	0.03246	0.03409
100	a	5	4	4	4	4	4	4	4	80	0.03371	0.03487
	b	5	5	5	5	5	5	5	5	100	0.03227	0.03383
	c	5	5	5	5	5	5	5	5	100	0.03556	0.03696
	d	5	5	5	5	5	5	5	5	100	0.03354	0.03495
	e	5	5	5	5	5	4	4	4	80	0.02904	0.03029
	f	5	5	5	5	5	5	5	5	100	0.03594	0.03738
	g	5	5	5	5	5	5	5	5	100	0.03511	0.03668
	h	5	5	5	5	5	5	5	5	100	0.03591	0.03763
	a											
	b											
	c											
	d											
	e											
	f											
	g											
	h											
Tech Initials		MT	RG	SA	ML	AH	RG	AH	ML			

Feeding Times (day):

	0	1	2	3	4	5	6
—	0815	0815	0700	0930	0845	0830	
1630	1515	1200	1400	1800	1745	1630	

Weight Data:  
 Date/Time in: 3-24-04 1430  
 Date/Time out: 3-25-04 1835  
 Oven Temp (°C): 60  
 Tech Initials: AW

Comments: \_\_\_\_\_

QC Check: 10/4/04  
 Final Review: MT 5/5/04

**Mysid Survival and Growth Test-7 Day Survival**

Start Date: 03/17/2004	Test ID: 0403-100	Sample ID:	City of Buenaventura
End Date: 03/24/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type:	Ambient water
Sample Date: 03/16/2004	Protocol: EPAM 91-EPA Marine	Test Species:	MY <del>Mysidopsis</del> bahia
Comments: B-3			Am-Americamys

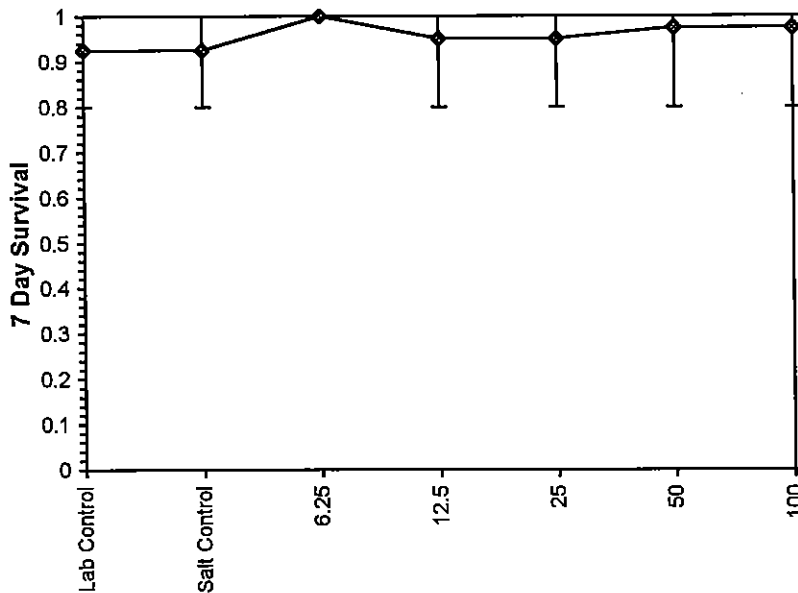
Conc-%	1	2	3	4	5	6	7	8
Lab Control	0.8000	0.8000	1.0000	1.0000	0.8000	1.0000	1.0000	1.0000
Salt Control	0.8000	0.8000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8000
6.25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	0.8000	1.0000	1.0000	1.0000	0.8000	1.0000
25	1.0000	1.0000	1.0000	0.8000	1.0000	1.0000	1.0000	0.8000
50	1.0000	1.0000	1.0000	0.8000	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000	0.8000	1.0000	1.0000

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root					N	Rank Sum	1-Tailed Critical
			Mean	Min	Max	CV%				
Lab Control	0.9250	1.0000	1.2560	1.1071	1.3453	9.813	8			
Salt Control	0.9250	1.0000	1.2560	1.1071	1.3453	9.813	8			
6.25	1.0000	1.0811	1.3453	1.3453	1.3453	0.000	8	80.00	46.00	
12.5	0.9500	1.0270	1.2857	1.1071	1.3453	8.574	8	72.00	46.00	
25	0.9500	1.0270	1.2857	1.1071	1.3453	8.574	8	72.00	46.00	
50	0.9750	1.0541	1.3155	1.1071	1.3453	6.400	8	76.00	46.00	
100	0.9750	1.0541	1.3155	1.1071	1.3453	6.400	8	76.00	46.00	

(All data compared against salt control)

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.73875	0.929	-1.3766	0.50339
Equality of variance cannot be confirmed				
The control means are not significantly different (p = 1.00)	#####	2.14479		
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1

**Dose-Response Plot**



**Mysid Survival, Growth and Fecundity Test-Growth-Weight**

Start Date: 03/17/2004      Test ID: 0403-100      Sample ID: City of Buenaventura  
 End Date: 03/24/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: Ambient water  
 Sample Date: 03/16/2004      Protocol: EPAM 91-EPA Marine      Test Species: MY-Mysidopsis bahia  
 Comments: B-3      ~~AM-Americamys~~

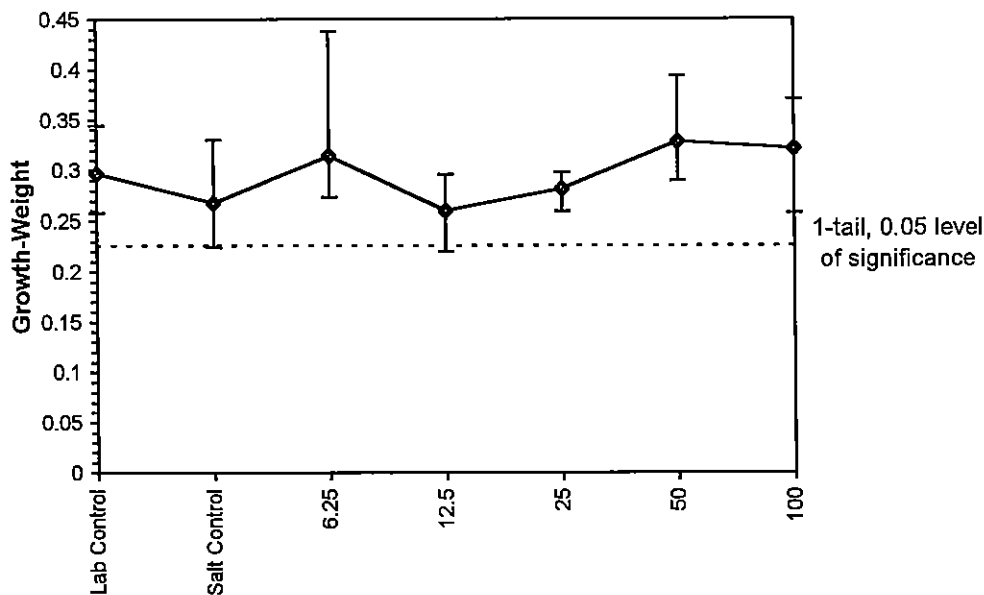
Conc-%	1	2	3	4	5	6	7	8
Lab Control	0.2940	0.2580	0.2840	0.3280	0.2740	0.3440	0.2880	0.3020
Salt Control	0.2420	0.2300	0.2420	0.2960	0.3300	0.3220	0.2580	0.2240
6.25	0.3020	0.2880	0.3080	0.4380	0.3240	0.2940	0.2740	0.2860
12.5	0.2780	0.2200	0.2600	0.2580	0.2600	0.2780	0.2300	0.2960
25	0.2920	0.2980	0.2680	0.2720	0.2960	0.2960	0.2600	0.2760
50	0.3000	0.2900	0.2980	0.3140	0.3020	0.3940	0.3580	0.3720
100	0.3120	0.2580	0.3420	0.3460	0.3080	0.3100	0.3700	0.3240

Conc-%	Mean	N-Mean	Transform: Untransformed					N	t-Stat	1-Tailed Critical	MSD
			Mean	Min	Max	CV%					
Lab Control	0.2965	1.1063	0.2965	0.2580	0.3440	9.456	8				
Salt Control	0.2680	1.0000	0.2680	0.2240	0.3300	15.689	8				
6.25	0.3143	1.1726	0.3143	0.2740	0.4380	16.629	8	-2.522	2.306	0.0423	
12.5	0.2600	0.9701	0.2600	0.2200	0.2960	9.695	8	0.436	2.306	0.0423	
25	0.2823	1.0532	0.2823	0.2600	0.2980	5.295	8	-0.777	2.306	0.0423	
50	0.3285	1.2257	0.3285	0.2900	0.3940	12.171	8	-3.299	2.306	0.0423	
100	0.3213	1.1987	0.3213	0.2580	0.3700	10.401	8	-2.903	2.306	0.0423	

(All data compared against salt control)

Auxiliary Tests	Statistic	Critical	Skew	Kurt						
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.9389	0.929	1.13147	2.21844						
Bartlett's Test indicates equal variances (p = 0.06)	10.4714	15.0863								
The control means are not significantly different (p = 0.13)	1.59507	2.14479								
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.04229	0.15779	0.00687	0.00135	9.5E-04	5, 42

Dose-Response Plot





Test Species: A. M. bahia

Client Name: City of Buena Ventura

Test Date: 3/17/04

Sample ID: SCRE B-3

Test No.: 0403-100

Conc. ( <u>°/°</u> )	Rep.	Survival on Test Day:								Percent Survival	pan wt. (g)	pan + mysid (g)
		0	1	2	3	4	5	6	7			
25	a	5	5	5	5	5	5	5	5	100	0.03552	0.03678
	b	5	5	5	5	5	5	5	5	100	0.03476	0.03625
	c	5	5	5	5	5	5	5	5	100	0.03653	0.03787
	d	5	4	4	4	4	4	4	4	80	0.03773	0.03909
	e	5	5	5	5	5	5	5	5	100	0.03381	0.03529
	f	5	5	5	5	5	5	5	5	100	0.03524	0.03672
	g	5	5	5	5	5	5	5	5	100	0.03326	0.03456
	h	5	5	5	5	5	4	4	4	80	0.03273	0.03411
50	a	5	5	5	5	5	5	5	5	100	0.03210	0.03360
	b	5	5	5	5	5	5	5	5	100	0.03312	0.03457
	c	5	4	4	4	5	5	5	5	100	0.03136	0.03285
	d	5	5	5	5	5	4	4	4	80	0.03451	0.03608
	e	5	5	5	5	5	5	5	5	100	0.03042	0.03193
	f	5	5	5	5	5	5	5	5	100	0.03456	0.03653
	g	5	5	5	5	5	5	5	5	100	0.03151	0.03330
	h	5	5	5	5	5	5	5	5	100	0.02950	0.03136
100	a	5	5	5	5	5	5	5	5	100	0.03337	0.03495
	b	5	5	5	5	5	5	5	5	100	0.03309	0.03458
	c	5	5	5	5	5	5	5	5	100	0.03152	0.03323
	d	5	5	5	5	5	5	5	5	100	0.03241	0.03414
	e	5	5	5	5	5	5	5	5	100	0.03418	0.03572
	f	5	4	4	4	4	4	4	4	80	0.03414	0.03569
	g	5	5	5	5	5	5	5	5	100	0.03397	0.03582
	h	5	5	5	5	5	5	5	5	100	0.03296	0.03458
	a											
	b											
	c											
	d											
	e											
	f											
	g											
	h											
Tech Initials		MT	RG	SH	MC	AH	RG	AH	MC			

Feeding Times (day):	0	1	2	3	4	5	6
	0845	0815	0700	0930	0845	0830	
	1630	1515	1700	1400	1400	1745	1630

Weight Data:  
 Date/Time in: 3-24-04 1300  
 Date/Time out: 3-25-04 1310  
 Oven Temp (°C): 60  
 Tech Initials: AW

Comments: \_\_\_\_\_

QC Check: MC 4/16/04  
 Final Review: MT 5/5/04

Test Species: A. bahia

Client Name: City of Buena Ventura

Test Date: 3/17/04

Sample ID: SCRE B-3

Test No.: 0403-100

Conc. (% / -)	Rep.	Survival on Test Day:								Percent Survival	pan wt. (g)	pan + mysid (g)
		0	1	2	3	4	5	6	7			
Lab Control #2	a	5	5	4	4	4	4	4	4	80	0.03227	0.03474
	b	5	5	5	5	4	4	4	4	80	0.03548	0.03677
	c	5	5	5	5	5	5	5	5	100	0.03570	0.03712
	d	5	5	5	5	5	5	5	5	100	0.03535	0.03699
	e	5	5	5	5	4	4	4	4	80	0.03124	0.03261
	f	5	5	5	5	5	5	5	5	100	0.03502	0.03674
	g	5	5	5	5	5	5	5	5	100	0.03269	0.03513
	h	5	5	5	5	5	5	5	5	100	0.03279	0.03430
Salt Control #2	a	5	5	4	4	4	4	4	4	80	0.03590	0.03711
	b	5	5	4	4	4	4	4	4	80	0.03410	0.03525
	c	5	5	5	5	5	5	5	5	100	0.03410	0.03531
	d	5	5	5	5	5	5	5	5	100	0.03110	0.03258
	e	5	5	5	5	5	5	5	5	100	0.03545	0.03710
	f	5	5	5	5	5	5	5	5	100	0.03624	0.03785
	g	5	5	5	5	5	5	5	5	100	0.03646	0.03775
	h	5	5	5	5	5	4	4	4	80	0.03182	0.03294
6.25	a	5	5	5	5	5	5	5	5	100	0.03444	0.03575
	b	5	5	5	5	5	5	5	5	100	0.03275	0.03419
	c	5	5	5	5	5	5	5	5	100	0.03227	0.03381
	d	5	5	5	5	5	5	5	5	100	0.03208	0.03427
	e	5	5	5	5	5	5	5	5	100	0.03280	0.03442
	f	5	5	5	5	5	5	5	5	100	0.03421	0.03568
	g	5	5	5	5	5	5	5	5	100	0.03414	0.03551
	h	5	5	5	5	5	5	5	5	100	0.03422	0.03565
12.5	a	5	5	5	5	5	5	5	5	100	0.03191	0.03330
	b	5	5	5	5	5	5	5	5	100	0.03166	0.03276
	c	5	5	4	4	4	4	4	4	80	0.02870	0.03000
	d	5	5	5	5	5	5	5	5	100	0.03487	0.03616
	e	5	5	5	5	5	5	5	5	100	0.03384	0.03514
	f	5	5	5	5	5	5	5	5	100	0.03263	0.03402
	g	5	5	5	5	5	5	5	4	80	0.03507	0.03622
	h	5	5	5	5	5	5	5	5	100	0.03583	0.03731
Tech Initials		SYMT	RY	SH	ML	ALT	KG	AH	ML			

Weight Data:

Date/Time in: 3-24-04 1300  
 Date/Time out: 3-25-04/1310  
 Oven Temp (°C): 60  
 Tech Initials: AW

QC Check: ML 4/15/04  
 Final Review: MT 5/15/04

Feeding Times (day):

	0	1	2	3	4	5	6
—	0845	0845	0700	0930	0845	0830	
1630	1515	1700	1400	1800	1745	1630	

Comments: \_\_\_\_\_

**Mysid Survival and Growth Test-7 Day Survival**

Start Date: 03/17/2004	Test ID: 0403-101	Sample ID: City of Buenaventura
End Date: 03/24/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Ambient water
Sample Date: 03/16/2004	Protocol: EPAM 91-EPA Marine	Test Species: <del>MY-Mysidopsis bahia</del> AM-Americanmysis
Comments: C-3		

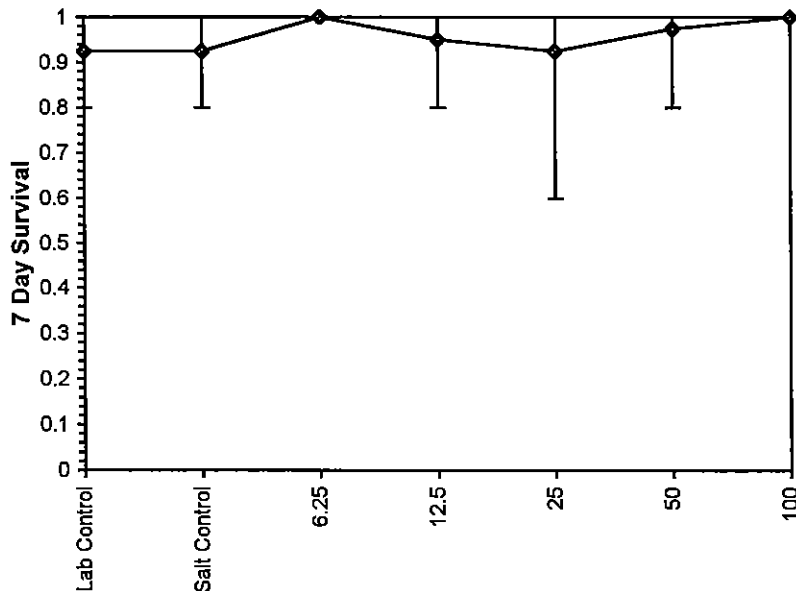
Conc-%	1	2	3	4	5	6	7	8
Lab Control	0.8000	0.8000	1.0000	1.0000	0.8000	1.0000	1.0000	1.0000
Salt Control	0.8000	0.8000	1.0000	1.0000	1.0000	1.0000	1.0000	0.8000
6.25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000	0.8000	1.0000	0.8000	1.0000
25	0.6000	1.0000	1.0000	1.0000	0.8000	1.0000	1.0000	1.0000
50	0.8000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root					N	Rank Sum	1-Tailed Critical
			Mean	Min	Max	CV%				
Lab Control	0.9250	1.0000	1.2560	1.1071	1.3453	9.813	8			
Salt Control	0.9250	1.0000	1.2560	1.1071	1.3453	9.813	8			
6.25	1.0000	1.0811	1.3453	1.3453	1.3453	0.000	8	80.00	46.00	
12.5	0.9500	1.0270	1.2857	1.1071	1.3453	8.574	8	72.00	46.00	
25	0.9250	1.0000	1.2581	0.8861	1.3453	13.661	8	70.50	46.00	
50	0.9750	1.0541	1.3155	1.1071	1.3453	6.400	8	76.00	46.00	
100	1.0000	1.0811	1.3453	1.3453	1.3453	0.000	8	80.00	46.00	

(All data compared against salt control)

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.77081	0.929	-1.8211	3.67339
Equality of variance cannot be confirmed				
The control means are not significantly different (p = 1.00)	#####	2.14479		
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	100	>100		1

**Dose-Response Plot**



**Mysid Survival, Growth and Fecundity Test-Growth-Weight**

Start Date: 03/17/2004	Test ID: 0403-101	Sample ID: City of Buenaventura
End Date: 03/24/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Ambient water
Sample Date: 03/16/2004	Protocol: EPAM 91-EPA Marine	Test Species: <del>MY-Mysidopsis bahia</del> AM-Americanus
Comments: C-3		

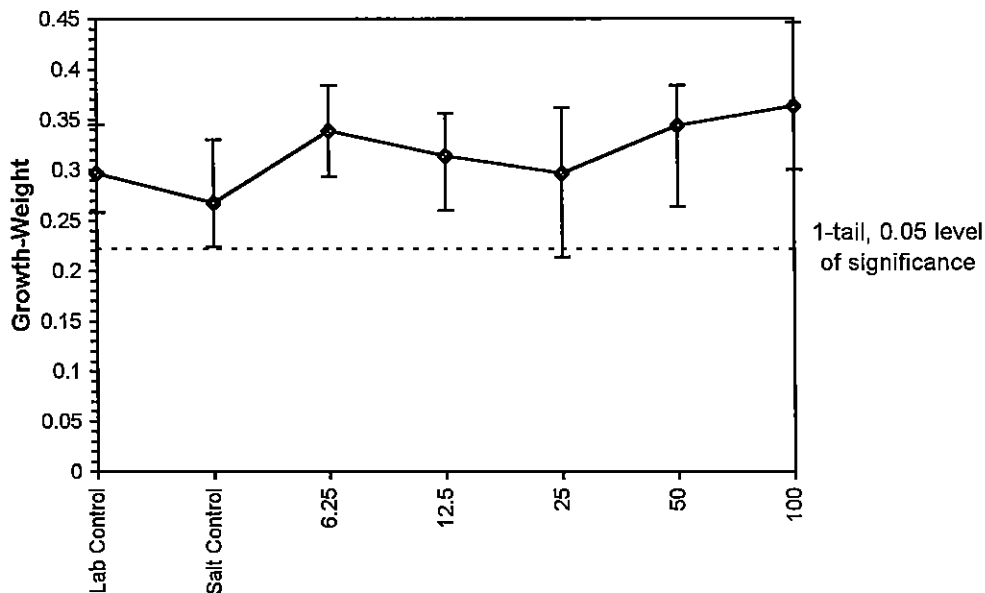
Conc-%	1	2	3	4	5	6	7	8
Lab Control	0.2940	0.2580	0.2840	0.3280	0.2740	0.3440	0.2880	0.3020
Salt Control	0.2420	0.2300	0.2420	0.2960	0.3300	0.3220	0.2580	0.2240
6.25	0.3060	0.3540	0.3600	0.3200	0.3580	0.2940	0.3840	0.3360
12.5	0.3400	0.3060	0.3140	0.2600	0.3020	0.3260	0.3060	0.3560
25	0.2140	0.3040	0.3200	0.2660	0.2860	0.3160	0.3080	0.3620
50	0.2640	0.3380	0.3820	0.3460	0.3560	0.3460	0.3360	0.3840
100	0.3000	0.3380	0.3340	0.3400	0.3400	0.3740	0.4460	0.4300

Conc-%	Mean	N-Mean	Transform: Untransformed					N	t-Stat	1-Tailed Critical	MSD
			Mean	Min	Max	CV%					
Lab Control	0.2965	1.1063	0.2965	0.2580	0.3440	9.456	8				
Salt Control	0.2680	1.0000	0.2680	0.2240	0.3300	15.689	8				
6.25	0.3390	1.2649	0.3390	0.2940	0.3840	9.014	8	-3.592	2.306	0.0456	
12.5	0.3138	1.1707	0.3138	0.2600	0.3560	9.152	8	-2.315	2.306	0.0456	
25	0.2970	1.1082	0.2970	0.2140	0.3620	14.652	8	-1.467	2.306	0.0456	
50	0.3440	1.2836	0.3440	0.2640	0.3840	10.819	8	-3.845	2.306	0.0456	
100	0.3628	1.3535	0.3628	0.3000	0.4460	13.976	8	-4.794	2.306	0.0456	

(All data compared against salt control)

Auxiliary Tests	Statistic	Critical	Skew	Kurt						
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.98541	0.929	0.01234	-0.0953						
Bartlett's Test indicates equal variances (p = 0.69)	3.05906	15.0863								
The control means are not significantly different (p = 0.13)	1.59507	2.14479								
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	100	>100		1	0.04557	0.17004	0.00965	0.00156	2.2E-04	5, 42

Dose-Response Plot



Test Species: A. bahia

Client Name: City of Buena Ventura

Test Date: 3/17/04

Sample ID: SCRE C-3

Test No.: 0403-101

Conc. (%/v)	Rep.	Survival on Test Day:								Percent Survival	pan wt. (g)	pan + mysid (g)
		0	1	2	3	4	5	6	7			
25	a	5	5	5	5	4	3	3	3	66	0.03114	0.03221
	b	5	5	5	5	5	5	5	5	100	0.03165	0.03317
	c	5	5	5	5	5	5	5	5	100	0.03428	0.03588
	d	5	5	5	5	5	5	5	5	100	0.03287	0.03420
	e	5	5	4	4	4	4	4	4	80	0.03578	0.03721
	f	5	5	5	5	5	5	5	5	100	0.03053	0.03211
	g	5	5	5	5	5	5	5	5	100	0.03202	0.03356
	h	5	5	5	5	5	5	5	5	100	0.03340	0.03521
50	a	5	4	4	4	4	4	4	4	80	0.03170	0.03302
	b	5	5	5	5	5	5	5	5	100	0.03492	0.03661
	c	5	5	5	5	5	5	5	5	100	0.03241	0.03432
	d	5	5	5	5	5	5	5	5	100	0.03198	0.03371
	e	5	5	5	5	5	5	5	5	100	0.03350	0.03528
	f	5	5	5	5	5	5	5	5	100	0.03560	0.03733
	g	5	5	5	5	5	5	5	5	100	0.03546	0.03714
	h	5	5	5	5	5	5	5	5	100	0.03426	0.03618
100	a	5	5	5	5	5	5	5	5	100	0.03483	0.03633
	b	5	5	5	5	5	5	5	5	100	0.03623	0.03792
	c	5	5	5	5	5	5	5	5	100	0.03296	0.03403
	d	5	5	5	5	5	5	5	5	100	0.03520	0.03690
	e	5	5	5	5	5	5	5	5	100	0.03647	0.03817
	f	5	5	5	5	5	5	5	5	100	0.03471	0.03658
	g	5	5	5	5	5	5	5	5	100	0.03360	0.03583
	h	5	5	5	5	5	5	5	5	100	0.03225	0.03440
	a											
	b											
	c											
	d											
	e											
	f											
	g											
	h											

Tech Initials: SM Rh SH ML AH Rh AH M

Feeding Times (day):

	0	1	2	3	4	5	6
✓	0845	0815	0700	0920	0845	0830	
	1630	1515	1700	1400	1800	1745	1630

Comments: \_\_\_\_\_

Weight Data:  
 Date/Time in: 3-24-04 1306  
 Date/Time out: 3-25-04 1310  
 Oven Temp (°C): 60  
 Tech Initials: AW

QC Check: MC 4/13/04  
 Final Review: MT 5/15/04

Test Species: A. bahia

Client Name: City of Buena Ventura

Test Date: 3/17/04

Sample ID: SCRE C-3

Test No.: 0403-101

Conc. (./.)	Rep.	Survival on Test Day:								Percent Survival	pan wt. (g)	pan + mysid (g)
		0	1	2	3	4	5	6	7			
Lab Control #2	a	5	5	4	4	4	4	4	4	80	0.0	0.03474
	b	5	5	5	5	4	4	4	4	80	0.0	0.03677
	c	5	5	5	5	5	5	5	5	100	0.0	0.03712
	d	5	5	5	5	5	5	5	5	100	0.0	0.03699
	e	5	5	5	5	4	4	4	4	80	0.0	0.03261
	f	5	5	5	5	5	5	5	5	100	0.0	0.03674
	g	5	5	5	5	5	5	5	5	100	0.0	0.03513
	h	5	5	5	5	5	5	5	5	100	0.0	0.03430
Salt Control #2	a	5	5	4	4	4	4	4	4	80	0.0	0.03711
	b	5	5	4	4	4	4	4	4	80	0.0	0.03525
	c	5	5	5	5	5	5	5	5	100	0.0	0.03531
	d	5	5	5	5	5	5	5	5	100	0.0	0.03258
	e	5	5	5	5	5	5	5	5	100	0.0	0.03710
	f	5	5	5	5	5	5	5	5	100	0.0	0.03785
	g	5	5	5	5	5	5	5	5	100	0.0	0.03775
	h	5	5	5	5	5	4	4	4	80	0.0	0.03294
6.25	a	5	5	5	5	5	5	5	5	100	0.03443	0.03596
	b	5	5	5	5	5	5	5	5	100	0.03373	0.03550
	c	5	5	5	5	5	5	5	5	100	0.03073	0.03253
	d	5	5	5	5	5	5	5	5	100	0.03441	0.03601
	e	5	5	5	5	5	5	5	5	100	0.03555	0.03734
	f	5	5	5	5	5	5	5	5	100	0.03334	0.03481
	g	5	5	5	5	5	5	5	5	100	0.03242	0.03434
	h	5	5	5	5	5	5	5	5	100	0.03392	0.03560
12.5	a	5	5	5	5	5	5	5	5	100	0.03130	0.03300
	b	5	5	5	5	5	5	5	5	100	0.03483	0.03636
	c	5	5	5	5	5	5	5	5	100	0.03278	0.03435
	d	5	5	5	5	5	5	5	5	100	0.03478	0.03608
	e	5	5	5	5	4	4	4	4	80	0.03656	0.03807
	f	5	5	5	5	5	5	5	5	100	0.03016	0.03179
	g	5	5	4	4	4	4	4	4	80	0.03159	0.03312
	h	5	5	5	5	5	5	5	5	100	0.03353	0.03531
Tech Initials		SPK	RG	SH	MC	AT	RG	AT	MC			

Feeding Times (day):

	0	1	2	3	4	5	6
—	0845	0845	0720	0930	0845	0830	
	1630	1515	1700	1400	1600	1745	1630

Weight Data:  
 Date/Time in: 3-24-04 1300  
 Date/Time out: 3-25-04 1310  
 Oven Temp (°C): 60  
 Tech Initials: AW

Comments: \_\_\_\_\_

QC Check: 11/4/04  
 Final Review: MT 5/5/04

*M. PYRIFERA*

# Kelp Spore Germination Bioassay Worksheet

Client: City of Buena Ventura  
Test No.: 0403 - 102 → 105

Start/End Dates: 3-17-04 / 3-19-04  
Start/End Times: 1620 / 1320  
Test Species: Macrocystis pyrifera

Date Collected: 3-16-04  
Kelp Collector: AH, JR  
Collection Location: Foggy La Jolla Cove  
Conditions (weather, etc.): foggy, moderate surge, 10-15 ft visibility  
Dilution Water Source (Client I): \_\_\_\_\_: scripps pier  
Dilution Water Source (Client II): \_\_\_\_\_:  
Dilution Water Source (Client III): \_\_\_\_\_:  
Dilution Water Source (Reference Toxicant): \_\_\_\_\_:

Time of Initial Rinsing and Dessication: 3/16/04 1130 (keep kelp from each collecting bag separated)  
Time of Rinsing and Transfer to Release Beakers: 3/17/04 1530 (keep kelp from each collecting bag separated)  
Conditions of Zoospore Density and Motility (beaker 1): high density, good motility  
Time of Blade Removal From Release Beaker 1/Beaker 2 (if needed): 1600

Density Counts (target = 90): 146 157 164 151 178  
Mean: 159.2  
Mean 159.2 \* 10,000 = 1,592,000 spores per ml (Density of Spore Release)

Calculate the volume of spore stock to add to each test container:  
(225,000 spores/container)/(density of spore release) = \_\_\_\_\_ ml stock/container

In cases of a spore release = 900,000 spores/ml, the volume is 0.25 ml.  
If density > 900,000 spores/ml, calculate a dilution factor, x, and create a new spore stock of 900,000 cells/ml and add 0.25 ml:

$$\text{Density of spore release } \frac{1,592,000}{1 \text{ container}} \times \frac{0.25 \text{ ml}}{1 \text{ container}} = \frac{398,000}{225,000} \frac{\text{spores}}{\text{spores}} = 1.77(x)$$

Example:  $980,000 \times 0.25 / 225,000 = 1.09$  (100 ml stock + 9 ml sw)

In cases of a spore release from 450,000 to 899,000 spores/ml, the volume added should not exceed 0.5 ml. (This volume exceeds the EPA and MBP required volume of no greater than 1% of the total test solution volume. However, it may sometimes be necessary to exceed the required limit of 0.3 ml in order to achieve the desired spore density).

If the density of spore release is < 450,000 spores/ml, check the density of the spores in the second release beaker.

Time of Inoculation: 1620 Amount inoculated: 0.25 mL

Comments: 24 hr QC: 76%

QC Check: MC 4/14/04 Final Review: Bcs 5/25/04

AMEC Earth & Environmental  
Bioassay Laboratory  
5550 Morehouse Drive, Suite B  
San Diego, CA 92121



**Macrocyctis Germination and Growth Test-Proportion Germinated**

Start Date: 03/17/2004	Test ID: 0403-102	Sample ID: City of Buenaventura
End Date: 03/19/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Ambient water
Sample Date: 03/16/2004	Protocol: MBP 90-Anderson et al.	Test Species: MP-Macrocyctis pyrifera
Comments: Sample A-2		

Conc-%	1	2	3	4	5
Lab Control	0.6600	0.7100	0.9300	0.8300	0.6600
Brine Control	0.7600	0.8100	0.8100	0.8800	0.8700
6.25	0.8600	0.7900	0.8600	0.7600	0.7800
12.5	0.8300	0.7000	0.8000	0.7600	0.8000
25	0.8200	0.8900	0.8700	0.8400	0.7700
50	0.8200	0.8100	0.8400	0.8100	0.8100
60	0.7700	0.7500	0.8400	0.7700	0.8600

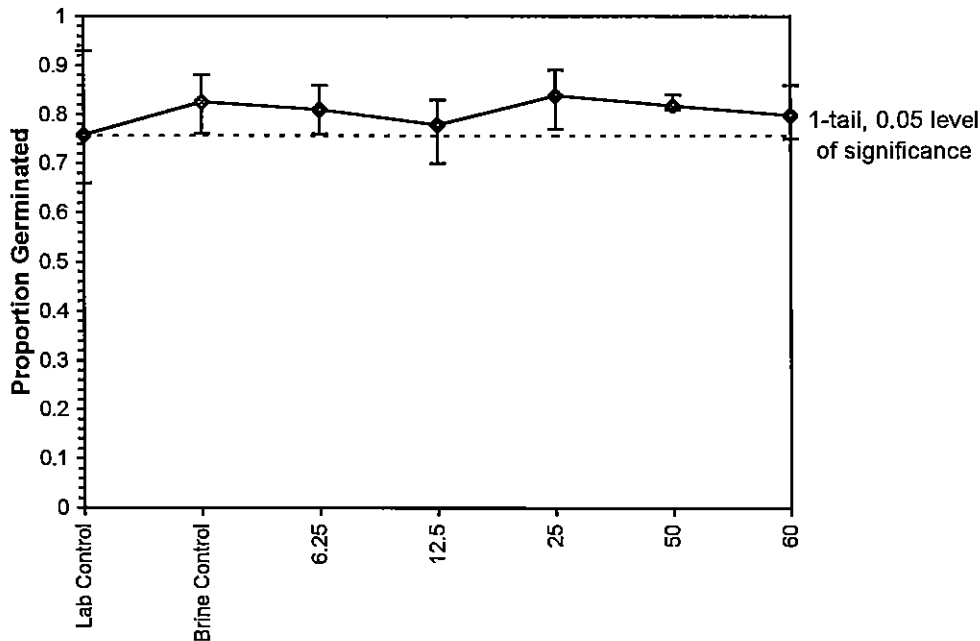
Conc-%	Mean	N-Mean	Transform: Arcsin Square Root					N	1-Tailed		
			Mean	Min	Max	CV%	t-Stat		Critical	MSD	
Lab Control	0.7580	0.9177	1.0695	0.9483	1.3030	14.356	5				
Brine Control	0.8260	1.0000	1.1435	1.0588	1.2171	5.722	5	0.590	2.360	0.0853	
6.25	0.8100	0.9806	1.1222	1.0588	1.1873	5.423	5	1.700	2.360	0.0853	
12.5	0.7780	0.9419	1.0820	0.9912	1.1458	5.492	5	-0.442	2.360	0.0853	
25	0.8380	1.0145	1.1594	1.0706	1.2327	5.418	5	0.366	2.360	0.0853	
50	0.8180	0.9903	1.1302	1.1198	1.1593	1.518	5	1.009	2.360	0.0853	
60	0.7980	0.9661	1.1070	1.0472	1.1873	5.606	5				

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.93798	0.9	-0.0441	-1.0473
Bartlett's Test indicates equal variances (p = 0.33)	5.76421	15.0863		
The control means are not significantly different (p = 0.35)	0.99108	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	60	>60		1.67	0.06882	0.08309	0.00373	0.00327	0.36615	5, 24

**Dose-Response Plot**



**Macrocyctis Germination and Growth Test-Growth-Length**

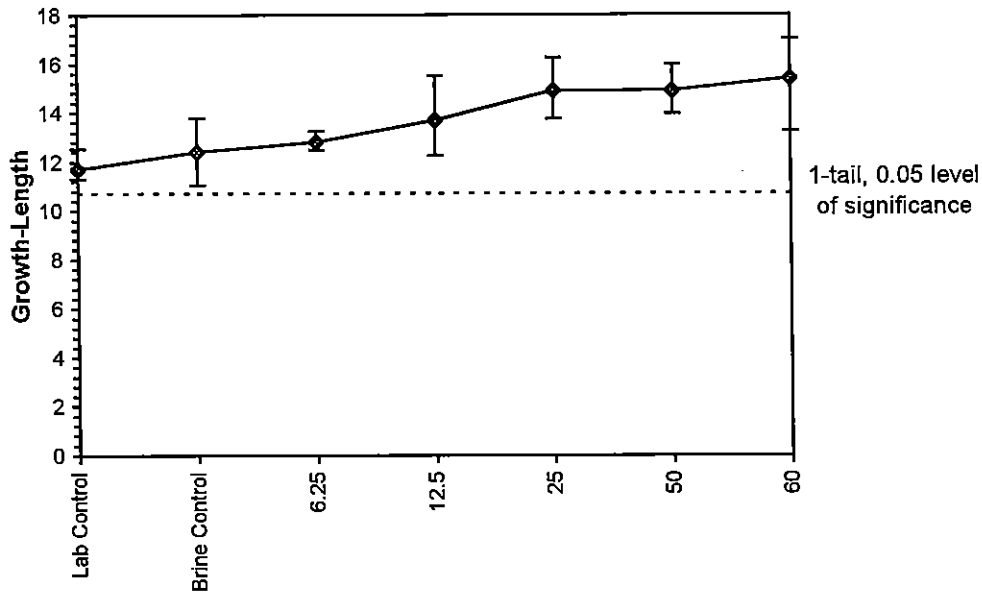
Start Date: 03/17/2004      Test ID: 0403-102      Sample ID: City of Buenaventura  
 End Date: 03/19/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: Ambient water  
 Sample Date: 03/16/2004      Protocol: MBP 90-Anderson et al.      Test Species: MP-Macrocyctis pyrifera  
 Comments: Sample A-2

Conc-%	1	2	3	4	5
Lab Control	11.750	11.250	12.500	11.250	11.500
Brine Control	12.000	11.750	11.000	13.250	13.750
6.25	12.500	12.750	13.000	12.500	13.250
12.5	12.250	14.000	15.500	12.250	14.500
25	14.000	15.000	15.500	13.750	16.250
50	14.500	14.750	14.000	15.500	16.000
60	14.250	16.250	13.250	16.250	17.000

Conc-%	Mean	N-Mean	Transform: Untransformed					N	t-Stat	1-Tailed Critical	MSD
			Mean	Min	Max	CV%					
Lab Control	11.650	0.9433	11.650	11.250	12.500	4.450	5				
Brine Control	12.350	1.0000	12.350	11.000	13.750	9.121	5				
6.25	12.800	1.0364	12.800	12.500	13.250	2.547	5	-0.631	2.360	1.683	
12.5	13.700	1.1093	13.700	12.250	15.500	10.435	5	-1.893	2.360	1.683	
25	14.900	1.2065	14.900	13.750	16.250	6.979	5	-3.577	2.360	1.683	
50	14.950	1.2105	14.950	14.000	16.000	5.341	5	-3.647	2.360	1.683	
60	15.400	1.2470	15.400	13.250	17.000	10.241	5	-4.278	2.360	1.683	

Auxiliary Tests	Statistic	Critical	Skew	Kurt						
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97464	0.9	-0.1462	-0.7865						
Bartlett's Test indicates equal variances (p = 0.16)	7.97645	15.0863								
The control means are not significantly different (p = 0.24)	1.26234	2.30601								
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	60	>60		1.67	1.68262	0.13624	7.92333	1.27083	7.7E-04	5, 24

**Dose-Response Plot**



Test: MC-Macrocyctis Germination and Growth Test  
 Species: MP-Macrocyctis pyrifer  
 Sample ID: City of Buenaventura  
 Start Date: 03/17/2004      End Date: 03/19/2004

Test ID: 0403-102  
 Protocol: MBP 90-Anderson et al.  
 Sample Type: Ambient water  
 Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Total Counted	Number Germ	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	Cal Factor	Notes
1	2	2	Lab Control	100	71	4	5	4	4	4	5	5	4	5	5	2.5	
2	14	4	6.25	100	76	7	5	5	4	6	5	4	4	4	6	2.5	
3	30	5	50	100	81	8	5	7	8	6	5	5	6	7	7	2.5	
4	12	2	6.25	100	79	7	5	5	5	3	4	6	6	6	4	2.5	
5	16	1	12.5	100	83	4	6	4	3	4	5	6	5	5	7	2.5	
6	34	4	60	100	77	8	6	6	5	5	5	8	7	7	8	2.5	
7	26	1	50	100	82	6	6	9	6	5	4	5	7	4	6	2.5	
8	22	2	25	100	89	7	6	7	6	5	6	6	8	5	4	2.5	
9	11	1	6.25	100	86	5	5	5	5	5	5	4	5	5	6	2.5	
10	5	5	Lab Control	100	66	4	6	6	4	5	4	3	4	6	4	2.5	
11	9	4	Brine Control	100	88	6	5	6	6	6	5	5	4	5	5	2.5	
12	20	5	12.5	100	80	4	7	8	7	7	5	5	4	6	5	2.5	
13	10	5	Brine Control	100	87	6	6	6	7	4	5	6	5	5	5	2.5	
14	3	3	Lab Control	100	93	5	4	5	5	5	6	5	5	5	5	2.5	
15	29	4	50	100	81	7	5	7	4	8	6	6	7	7	5	2.5	
16	1	1	Lab Control	100	66	4	6	4	4	4	5	7	4	4	5	2.5	
17	4	4	Lab Control	100	83	5	5	4	5	4	4	4	4	6	4	2.5	
18	17	2	12.5	100	70	5	7	6	6	5	3	7	5	7	5	2.5	
19	25	5	25	100	77	7	8	6	6	7	6	5	8	6	6	2.5	
20	35	5	60	100	86	6	6	6	5	9	8	7	8	6	7	2.5	
21	13	3	6.25	100	86	4	5	7	4	6	4	5	6	6	5	2.5	
22	27	2	50	100	81	7	6	6	3	6	6	5	6	7	7	2.5	
23	21	1	25	100	82	6	6	6	6	6	4	6	5	5	6	2.5	
24	33	3	60	100	84	5	6	5	6	4	4	7	5	5	6	2.5	
25	18	3	12.5	100	80	8	7	5	6	6	5	6	7	7	5	2.5	
26	28	3	50	100	84	6	7	5	7	4	6	6	6	3	6	2.5	
27	23	3	25	100	87	5	5	5	7	7	6	7	7	7	6	2.5	
28	24	4	25	100	84	5	6	5	5	5	8	6	5	5	5	2.5	
29	32	2	60	100	75	7	9	6	7	6	6	7	5	6	6	2.5	
30	6	1	Brine Control	100	76	5	5	5	5	5	5	4	4	5	5	2.5	
31	8	3	Brine Control	100	81	4	3	5	4	4	6	4	5	5	4	2.5	
32	31	1	60	100	77	6	6	4	7	5	6	4	7	7	5	2.5	
33	15	5	6.25	100	78	5	5	6	6	6	6	6	3	4	6	2.5	
34	7	2	Brine Control	100	81	4	6	5	6	5	4	5	4	4	4	2.5	
35	19	4	12.5	100	76	3	4	6	4	4	4	4	8	6	6	2.5	Data Entry QC: SH

Comments: Sample A-2

Test: MC-Macrocyctis Germination and Growth Test  
 Species: MP-Macrocyctis pyrifer  
 Sample ID: BUENA-City of Buenaventura  
 Start Date: 03/17/2004 End Date: 03/19/2004

Test ID: 0403-102  
 Protocol: MBP 90-Anderson et al.  
 Sample Type: OTH-Other sample type  
 Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Total Counted	Number Germ	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	Cal Factor	Notes
1				100	71	4	5	4	4	4	5	5	4	5	5	2.5	St
2					76	7	5	5	4	6	5	4	4	4	6		
3					81	8	5	5	8	6	5	5	6	7	7		
4					79	7	5	5	5	3	4	6	6	6	4		
5					83	5	6	4	3	4	5	6	5	5	7		
6					77	8	6	6	5	5	5	8	7	7	8		
7					82	6	6	9	6	5	4	5	7	4	6		
8					89	7	6	7	6	5	6	6	8	5	4		
9					86	5	5	5	5	5	4	4	5	5	6		
10					66	4	6	6	4	5	4	3	4	6	4		
11					88	6	5	6	6	6	5	5	4	5	5		
12					80	4	7	8	7	7	5	4	4	6	5		
13					87	6	6	6	7	4	5	6	5	5	5		
14					93	5	4	5	5	5	5	5	5	5	5		
15					81	7	5	7	4	8	6	6	7	7	5		
16					66	4	6	4	4	4	5	7	4	4	5		
17					83	5	5	4	5	4	4	4	4	6	4		
18					70	5	7	6	6	5	3	7	5	7	5		
19					77	7	8	6	6	7	6	5	8	6	6		
20					86	6	6	6	5	9	8	7	8	6	7		
21					86	4	5	7	4	6	4	5	6	6	8		
22					81	7	6	6	3	6	6	5	6	7	7		
23					82	6	6	6	6	6	4	6	5	5	6		
24					84	5	6	5	6	4	4	7	5	5	6		
25					80	8	7	5	6	6	5	6	7	7	5		
26					84	6	7	5	7	4	5	5	5	3	6		
27					87	5	5	5	7	7	6	7	7	7	6		
28					84	5	6	5	5	5	8	6	5	5	5		
29					75	7	9	6	7	6	6	4	5	6	6		
30					76	5	5	5	5	5	5	4	4	5	5		
31					81	4	3	5	4	4	6	4	5	5	4		
32					77	6	6	4	7	5	6	4	7	5	5		
33					78	5	5	6	6	6	6	6	2	4	6		
34					81	4	6	5	6	5	4	5	4	4	4		
35				V	76	3	4	6	4	4	4	4	8	6	6	V	V

Comments: Sample A-2

LC3-1  
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ToxCalc 5.0

Reviewed by: LC4/14/04

Test: MC-Macrocytosis Germination and Growth Test  
 Species: MP-Macrocytosis pyrifer  
 Sample ID: BUENA-City of Buenaventura  
 Start Date: 03/17/2004      End Date: 03/19/2004

Test ID: 0403-102  
 Protocol: MBP 90-Anderson et al.  
 Sample Type: OTH-Other sample type  
 Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Total Counted	Number Germ	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	Cal Factor	Notes
16	1	1	L-Lab Control														
1	2	2	L-Lab Control														
14	3	3	L-Lab Control														
17	4	4	L-Lab Control														
10	5	5	L-Lab Control														
30	6	1	B-Control														
34	7	2	B-Control														
31	8	3	B-Control														
11	9	4	B-Control														
13	10	5	B-Control														
9	11	1	6.25														
4	12	2	6.25														
21	13	3	6.25														
2	14	4	6.25														
33	15	5	6.25														
5	16	1	12.5														
18	17	2	12.5														
25	18	3	12.5														
35	19	4	12.5														
12	20	5	12.5														
23	21	1	25														
8	22	2	25														
27	23	3	25														
28	24	4	25														
19	25	5	25														
7	26	1	50														
22	27	2	50														
26	28	3	50														
15	29	4	50														
3	30	5	50														
32	31	1	100b														
29	32	2	100b														
24	33	3	100b														
6	34	4	100b														
20	35	5	100b														

Comments: Sample A-2

*QMC*  
*[Signature]*

Test: MC-Macrocyctis Germination and Growth Test  
 Species: MP-Macrocyctis pyrifer  
 Sample ID: BUENA-City of Buenaventura  
 Start Date: 03/17/2004 End Date: 03/19/2004

Test ID: 0403-102  
 Protocol: MBP 90-Anderson et al.  
 Sample Type: OTH-Other sample type  
 Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Total Counted	Number Germ	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	Cal Factor	Notes
16	1	1	L-Lab Control		66												
1	2	2	L-Lab Control		71												
14	3	3	L-Lab Control		93												
17	4	4	L-Lab Control		83												
10	5	5	L-Lab Control		66												
30	6	1	B-Control		76												
34	7	2	B-Control		81												
31	8	3	B-Control		81												
11	9	4	B-Control		88												
13	10	5	B-Control		87												
9	11	1	6.25		86												
4	12	2	6.25		79												
21	13	3	6.25		86												
2	14	4	6.25		76												
33	15	5	6.25		78												
5	16	1	12.5		83												
18	17	2	12.5		76												
25	18	3	12.5		80												
35	19	4	12.5		76												
12	20	5	12.5		80												
23	21	1	25		82												
8	22	2	25		89												
27	23	3	25		87												
28	24	4	25		84												
19	25	5	25		77												
7	26	1	50		82												
22	27	2	50		81												
26	28	3	50		84												
15	29	4	50		81												
3	30	5	50		81												
32	31	1	100b		77												
29	32	2	100b		75												
24	33	3	100b		84												
6	34	4	100b		77												
20	35	5	100b		86												

Comments: Sample A-2

QMC  
 [Signature]

**Macrocystis Germination and Growth Test-Proportion Germinated**

Start Date: 03/17/2004	Test ID: 0403-103	Sample ID: City of Buenaventura
End Date: 03/19/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: Ambient water
Sample Date: 03/16/2004	Protocol: MBP 90-Anderson et al.	Test Species: MP-Macrocystis pyrifera
Comments: Sample B-1		

Conc-%	1	2	3	4	5
Lab Control	0.6600	0.8300	0.9300	0.6600	0.7100
Brine Control	0.7600	0.8700	0.8100	0.8800	0.8100
6.25	0.6800	0.7600	0.7100	0.7000	0.7400
12.5	0.8000	0.7000	0.7400	0.7600	0.8200
25	0.6400	0.7200	0.7400	0.7400	0.7400
50	0.7200	0.7400	0.7500	0.8400	0.7900
58	0.8500	0.7600	0.8300	0.7900	0.6900

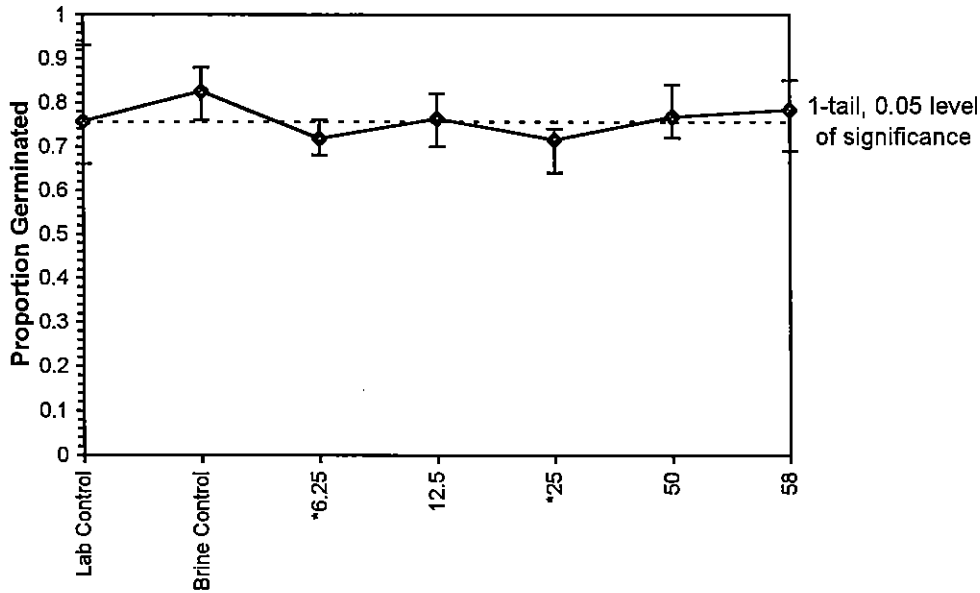
Conc-%	Mean	N-Mean	Transform: Arcsin Square Root					N	t-Stat	1-Tailed Critical	MSD
			Mean	Min	Max	CV%					
Lab Control	0.7580	0.9177	1.0695	0.9483	1.3030	14.356	5				
Brine Control	0.8260	1.0000	1.1435	1.0588	1.2171	5.722	5				
*6.25	0.7180	0.8692	1.0115	0.9695	1.0588	3.527	5	3.608	2.360	0.0863	
12.5	0.7640	0.9249	1.0651	0.9912	1.1326	5.290	5	2.142	2.360	0.0863	
*25	0.7160	0.8668	1.0095	0.9273	1.0357	4.655	5	3.661	2.360	0.0863	
50	0.7680	0.9298	1.0700	1.0132	1.1593	5.430	5	2.007	2.360	0.0863	
58	0.7840	0.9492	1.0906	0.9803	1.1731	6.960	5	1.446	2.360	0.0863	

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97188	0.9	-0.1771	-0.6605
Bartlett's Test indicates equal variances (p = 0.80)	2.31675	15.0863		
The control means are not significantly different (p = 0.35)	0.99108	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	58	>58		1.72	0.06968	0.08414	0.01278	0.00335	0.01096	5, 24

**Dose-Response Plot**



**Macrocystis Germination and Growth Test-Growth-Length**

Start Date: 03/17/2004      Test ID: 0403-103      Sample ID: City of Buenaventura  
 End Date: 03/19/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: Ambient water  
 Sample Date: 03/16/2004      Protocol: MBP 90-Anderson et al.      Test Species: MP-Macrocystis pyrifera  
 Comments: Sample B-1

Conc-%	1	2	3	4	5
Lab Control	11.500	11.250	12.500	11.750	11.250
Brine Control	12.000	13.750	11.750	13.250	11.000
6.25	10.250	8.750	8.500	11.250	11.000
12.5	12.750	13.000	13.250	13.000	12.500
25	13.250	12.500	13.750	8.750	11.000
50	13.250	11.500	14.750	15.250	13.750
58	11.750	12.750	13.500	15.000	13.500

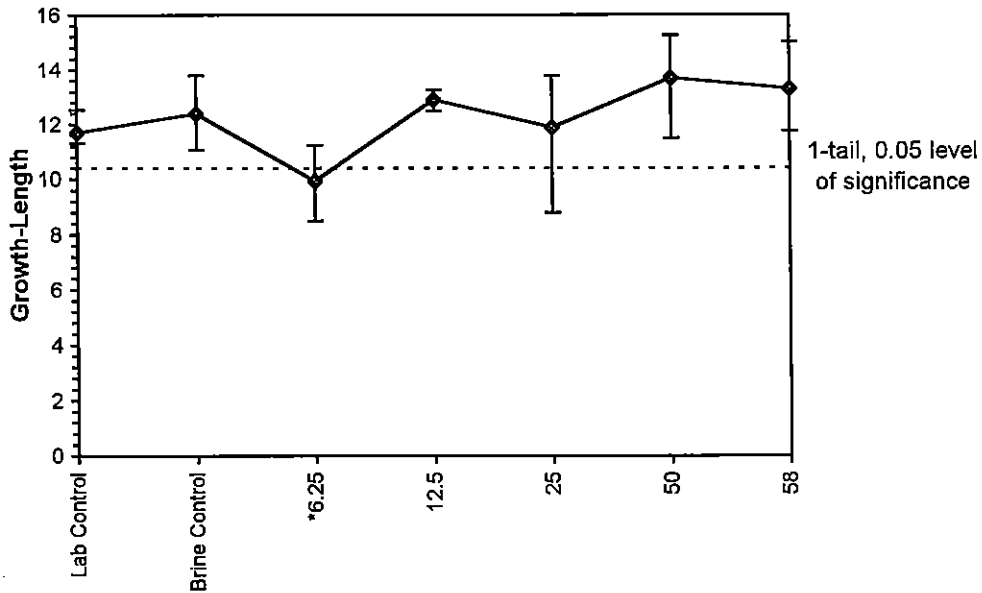
Conc-%	Mean	N-Mean	Transform: Untransformed					N	1-Tailed		
			Mean	Min	Max	CV%	t-Stat		Critical	MSD	
Lab Control	11.650	0.9433	11.650	11.250	12.500	4.450	5				
Brine Control	12.350	1.0000	12.350	11.000	13.750	9.121	5				
*6.25	9.950	0.8057	9.950	8.500	11.250	12.737	5	2.856	2.360	1.983	
12.5	12.900	1.0445	12.900	12.500	13.250	2.210	5	-0.654	2.360	1.983	
25	11.850	0.9595	11.850	8.750	13.750	17.048	5	0.595	2.360	1.983	
50	13.700	1.1093	13.700	11.500	15.250	10.672	5	-1.606	2.360	1.983	
58	13.300	1.0769	13.300	11.750	15.000	8.956	5	-1.130	2.360	1.983	

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96631	0.9	-0.544	0.10329
Bartlett's Test indicates equal variances (p = 0.08)	9.81935	15.0863		
The control means are not significantly different (p = 0.24)	1.26234	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	58	>58		1.72	1.98331	0.16059	9.03708	1.76563	0.00247	5, 24

**Dose-Response Plot**





Test: MC-Macrocyctis Germination and Growth Test  
 Species: MP-Macrocyctis pyrifera  
 Sample ID: City of Buenaventura  
 Start Date: 03/17/2004 End Date: 03/19/2004

Test ID: 0403-103  
 Protocol: MBP 90-Anderson et al.  
 Sample Type: Ambient water  
 Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Total Counted	Number Germ	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	Cal Factor	Notes
36	4	4	Lab Control	100	66	4	6	4	4	4	5	7	4	4	5	2.5	
37	14	4	6.25	100	70	5	5	5	6	3	4	6	3	3	5	2.5	
38	18	3	12.5	100	74	5	5	4	6	5	5	6	4	7	6	2.5	
39	21	1	25	100	64	5	6	5	4	4	6	7	6	5	5	2.5	
40	6	1	Brine Control	100	76	5	5	5	5	5	5	4	4	5	5	2.5	
41	31	1	58	100	85	4	3	4	6	4	5	5	6	5	5	2.5	
42	35	5	58	100	69	4	6	6	6	5	5	6	6	5	5	2.5	
43	32	2	58	100	76	3	6	5	5	6	6	8	6	3	3	2.5	
44	26	1	50	100	72	10	4	5	5	6	7	6	3	3	4	2.5	
45	8	3	Brine Control	100	81	4	6	5	6	5	4	5	4	4	4	2.5	
46	5	5	Lab Control	100	71	4	5	4	4	4	5	5	4	5	5	2.5	
47	34	4	58	100	79	8	6	7	5	5	7	6	8	4	4	2.5	
48	10	5	Brine Control	100	81	4	3	5	4	4	6	4	5	5	4	2.5	
49	11	1	6.25	100	68	4	6	4	3	3	5	5	4	4	3	2.5	
50	9	4	Brine Control	100	88	6	5	6	6	6	5	5	4	5	5	2.5	
51	19	4	12.5	100	76	5	8	4	6	3	5	6	5	5	5	2.5	
52	27	2	50	100	74	4	6	5	4	6	4	4	4	5	4	2.5	
53	30	5	50	100	79	6	5	7	7	6	6	6	4	4	4	2.5	
54	29	4	50	100	84	8	3	7	7	6	6	7	5	6	6	2.5	
55	22	2	25	100	72	4	3	6	6	5	7	5	5	5	4	2.5	
56	25	5	25	100	74	4	5	8	3	3	4	4	4	4	5	2.5	
57	3	3	Lab Control	100	93	5	4	5	5	5	6	5	5	5	5	2.5	
58	16	1	12.5	100	80	5	6	5	5	3	6	5	5	6	5	2.5	
59	24	4	25.0	100	74	4	4	3	3	3	4	5	3	3	3	2.5	
60	17	2	12.5	100	70	5	5	6	5	7	6	6	4	4	4	2.5	
61	12	2	6.25	100	76	4	4	3	3	3	4	5	3	3	3	2.5	
62	2	2	Lab Control	100	83	5	5	4	5	4	4	4	4	6	4	2.5	
63	20	5	12.5	100	82	4	5	5	4	4	4	7	7	4	6	2.5	
64	15	5	6.25	100	74	7	5	3	3	4	4	3	5	5	5	2.5	
65	33	3	58	100	83	6	5	8	7	6	5	5	5	4	3	2.5	
66	13	3	6.25	100	71	3	2	2	3	3	4	4	4	5	4	2.5	
67	28	3	50	100	75	7	9	5	6	4	3	5	5	7	8	2.5	
68	23	3	25	100	74	6	5	7	4	7	5	4	6	6	5	2.5	
69	1	1	Lab Control	100	66	4	6	6	4	5	4	3	4	6	4	2.5	
70	7	2	Brine Control	100	87	6	6	6	7	4	5	6	5	5	5	2.5	Data Entry @C: MC

Comments: Sample B-1

Test: MC-Macrocyctis Germination and Growth Test  
 Species: MP-Macrocyctis pyrifer  
 Sample ID: BUENA-City of Buenaventura  
 Start Date: 03/17/2004 End Date: 03/19/2004

Test ID: 0403-103  
 Protocol: MBP 90-Anderson et al.  
 Sample Type: OTH-Other sample type  
 Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Total Counted	Number Germ	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	Cal Factor	Notes
36					—											2.5	nc
37				100	70	5	5	5	6	3	4	6	3	3	5		
38					74	5	5	4	6	5	5	6	4	7	6		
39					64	5	6	5	4	4	6	7	6	5	5		
40					—												
41					85	4	3	4	6	4	5	5	6	5	5		
42					69	4	6	6	6	5	5	6	6	5	5		
43					76	3	6	5	5	6	6	8	6	3	3		
44					72	10	4	5	5	6	7	6	3	3	4		
45					—												
46					—												
47					79	8	6	7	5	5	7	6	8	4	4		
48					—												
49					68	4	6	4	3	3	5	5	4	4	3		
50					—												
51					76	5	8	4	6	3	5	6	5	5	5		
52					74	4	6	5	4	6	4	4	4	5	4		
53					79	6	5	7	7	6	6	6	4	4	4		
54					84	8	3	7	7	6	6	7	5	6	6		
55					72	4	3	6	6	5	7	5	5	5	4		
56					74	4	5	8	3	3	4	4	4	4	5		
57					—												
58					80	5	6	5	5	3	6	5	5	6	5		
59					74	4	4	5	4	6	4	5	3	3	5		
60					70	5	5	6	5	7	6	6	4	4	4		
61					76	4	4	3	3	3	4	5	3	3	3		
62					—												
63					82	4	5	5	4	4	4	7	7	4	6		
64					74	7	5	3	3	4	4	3	5	5	5		
65					83	6	5	8	7	6	5	5	5	4	3		
66					71	3	2	2	3	3	4	4	4	5	4		
67					75	7	9	5	6	4	3	5	5	7	8		
68					74	6	5	7	4	7	5	4	6	6	5		
69					—												
70					—												

Comments: Sample B-1

Test: MC-Macrocyctis Germination and Growth Test  
 Species: MP-Macrocyctis pyrifer  
 Sample ID: BUENA-City of Buenaventura  
 Start Date: 03/17/2004 End Date: 03/19/2004

Test ID: 0403-103  
 Protocol: MBP 90-Anderson et al.  
 Sample Type: OTH-Other sample type  
 Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Total Counted	Number Germ	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	Cal Factor	Notes
<del>69</del>	<del>1</del>	<del>1</del>	<del>L-Lab Control</del>		-												
<del>62</del>	<del>2</del>	<del>2</del>	<del>L-Lab Control</del>		-												
<del>57</del>	<del>3</del>	<del>3</del>	<del>L-Lab Control</del>		-												
<del>36</del>	<del>4</del>	<del>4</del>	<del>L-Lab Control</del>		-												
<del>46</del>	<del>5</del>	<del>5</del>	<del>L-Lab Control</del>		-												
<del>40</del>	<del>6</del>	<del>1</del>	<del>B-Control</del>		-												
<del>70</del>	<del>7</del>	<del>2</del>	<del>B-Control</del>		-												
<del>45</del>	<del>8</del>	<del>3</del>	<del>B-Control</del>		-												
<del>50</del>	<del>9</del>	<del>4</del>	<del>B-Control</del>		-												
<del>48</del>	<del>10</del>	<del>5</del>	<del>B-Control</del>		-												
49	11	1	6.25		68												
61	12	2	6.25		76												
66	13	3	6.25		71												
37	14	4	6.25		70												
64	15	5	6.25		74												
58	16	1	12.5		80												
60	17	2	12.5		70												
38	18	3	12.5		74												
51	19	4	12.5		76												
63	20	5	12.5		82												
39	21	1	25		64												
55	22	2	25		72												
68	23	3	25		74												
59	24	4	25		74												
56	25	5	25		74												
44	26	1	50		72												
52	27	2	50		74												
67	28	3	50		75												
54	29	4	50		84												
53	30	5	50		79												
41	31	1	100b		85												
43	32	2	100b		76												
65	33	3	100b		83												
47	34	4	100b		79												
42	35	5	100b		69												

will share controls  
A-2

Comments: Sample B-1

OK MC  
DPA

Test: MC-Macrocystis Germination and Growth Test  
 Species: MP-Macrocystis pyrifera  
 Sample ID: BUENA-City of Buenaventura  
 Start Date: 03/17/2004 End Date: 03/19/2004

Test ID: 0403-103  
 Protocol: MBP 90-Anderson et al.  
 Sample Type: OTH-Other sample type  
 Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Total Counted	Number Germ	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	Cal Factor	Notes
<del>60</del>	<del>1</del>	<del>1</del>	<del>L-Lab Control</del>														
<del>62</del>	<del>2</del>	<del>2</del>	<del>L-Lab Control</del>														
<del>57</del>	<del>3</del>	<del>3</del>	<del>L-Lab Control</del>														
<del>36</del>	<del>4</del>	<del>4</del>	<del>L-Lab Control</del>														
<del>46</del>	<del>5</del>	<del>5</del>	<del>L-Lab Control</del>														
<del>40</del>	<del>6</del>	<del>1</del>	<del>B-Control</del>														
<del>70</del>	<del>7</del>	<del>2</del>	<del>B-Control</del>														
<del>45</del>	<del>8</del>	<del>3</del>	<del>B-Control</del>														
<del>50</del>	<del>9</del>	<del>4</del>	<del>B-Control</del>														
<del>48</del>	<del>10</del>	<del>5</del>	<del>B-Control</del>														
49	11	1	6.25														
61	12	2	6.25														
66	13	3	6.25														
37	14	4	6.25														
64	15	5	6.25														
58	16	1	12.5														
60	17	2	12.5														
38	18	3	12.5														
51	19	4	12.5														
63	20	5	12.5														
39	21	1	25														
55	22	2	25														
68	23	3	25														
59	24	4	25														
56	25	5	25														
44	26	1	50														
52	27	2	50														
67	28	3	50														
54	29	4	50														
53	30	5	50														
41	31	1	100b														
43	32	2	100b														
65	33	3	100b														
47	34	4	100b														
42	35	5	100b														

will share controls  
A-2

Comments: Sample B-1

OR MC  
OFF

**Macrocyctis Germination and Growth Test-Proportion Germinated**

Start Date: 03/17/2004      Test ID: 0403-104      Sample ID: City of Buenaventura  
 End Date: 03/19/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: Ambient water  
 Sample Date: 03/16/2004      Protocol: MBP 90-Anderson et al.      Test Species: MP-Macrocyctis pyrifer  
 Comments: Sample B-3

Conc-%	1	2	3	4	5
Lab Control	0.8400	0.7600	0.8800	0.8200	0.8000
Brine Control	0.8500	0.9100	0.8900	0.8900	0.9100
6.25	0.8600	0.8500	0.9200	0.8800	0.9100
12.5	0.8000	0.9100	0.8900	0.8400	0.8700
25	0.9000	0.8800	0.9400	0.8500	0.9300
50	0.8900	0.9000	0.9100	0.8800	0.9200
68	0.9000	0.9100	0.9000	0.9100	0.8900

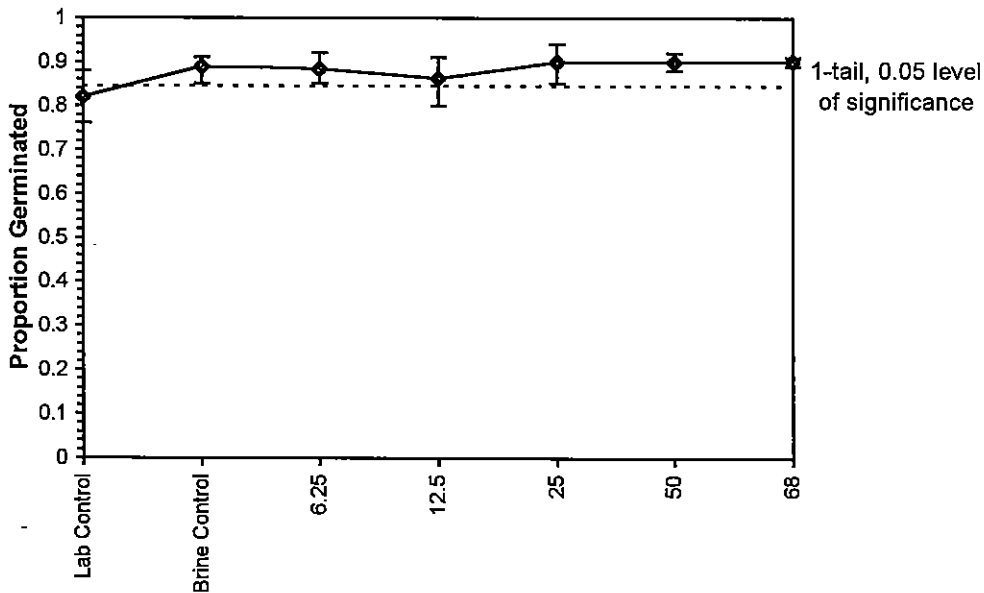
Conc-%	Mean	N-Mean	Transform: Arcsin Square Root					N	1-Tailed		
			Mean	Min	Max	CV%	t-Stat		Critical	MSD	
Lab Control	0.8200	0.9213	1.1350	1.0588	1.2171	5.195	5				
Brine Control	0.8900	1.0000	1.2342	1.1731	1.2661	3.078	5	0.301	2.360	0.0677	
6.25	0.8840	0.9933	1.2255	1.1731	1.2840	3.946	5	1.419	2.360	0.0677	
12.5	0.8620	0.9685	1.1934	1.1071	1.2661	5.217	5	-0.661	2.360	0.0677	
25	0.9000	1.0112	1.2531	1.1731	1.3233	4.910	5	-0.545	2.360	0.0677	
50	0.9000	1.0112	1.2498	1.2171	1.2840	2.118	5	-0.643	2.360	0.0677	
68	0.9020	1.0135	1.2526	1.2327	1.2661	1.118	5				

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.9751	0.9	-0.2211	-0.3611
Bartlett's Test indicates equal variances (p = 0.12)	8.78179	15.0863		
The control means are significantly different (p = 0.01)	3.16118	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	68	>68		1.47	0.04566	0.05125	0.00267	0.00206	0.29684	5, 24

**Dose-Response Plot**



**Macrocystis Germination and Growth Test-Growth-Length**

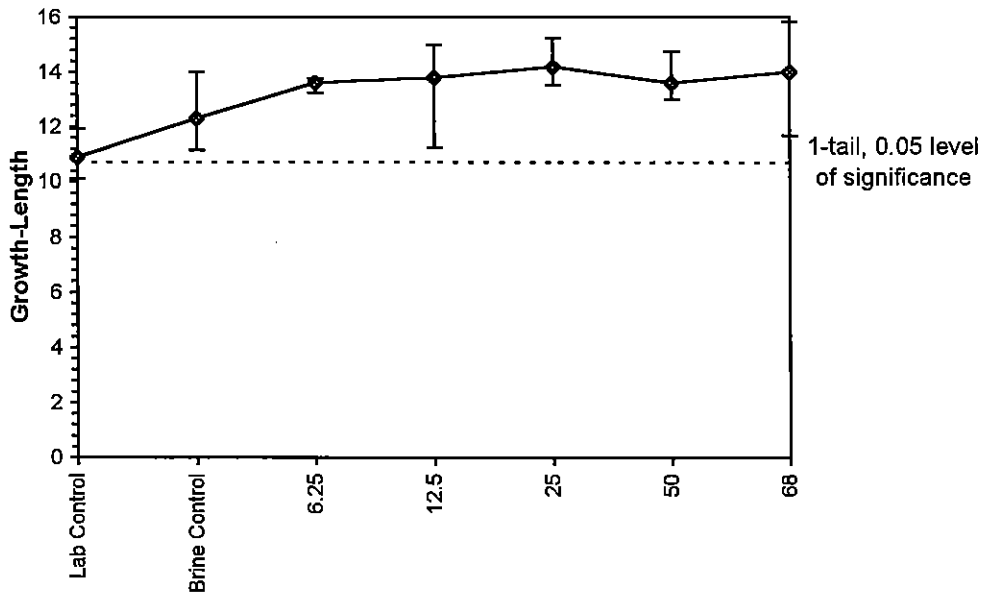
Start Date: 03/17/2004      Test ID: 0403-104      Sample ID: City of Buenaventura  
 End Date: 03/19/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: Ambient water  
 Sample Date: 03/16/2004      Protocol: MBP 90-Anderson et al.      Test Species: MP-Macrocystis pyrifera  
 Comments: Sample B-3

Conc-%	1	2	3	4	5
Lab Control	11.180	10.140	11.960	10.660	10.660
Brine Control	12.480	12.500	14.040	11.500	11.180
6.25	13.780	13.520	13.780	13.780	13.250
12.5	14.820	15.000	14.250	11.250	13.780
25	13.780	15.250	13.520	15.000	13.520
50	14.750	13.750	13.000	13.500	13.000
68	14.820	13.750	14.040	15.860	11.700

Conc-%	Mean	N-Mean	Transform: Untransformed					N	t-Stat	1-Tailed Critical	MSD
			Mean	Min	Max	CV%					
Lab Control	10.920	0.8849	10.920	10.140	11.960	6.299	5				
Brine Control	12.340	1.0000	12.340	11.180	14.040	9.048	5				
6.25	13.622	1.1039	13.622	13.250	13.780	1.736	5	-1.851	2.360	1.635	
12.5	13.820	1.1199	13.820	11.250	15.000	10.964	5	-2.136	2.360	1.635	
25	14.214	1.1519	14.214	13.520	15.250	5.931	5	-2.705	2.360	1.635	
50	13.600	1.1021	13.600	13.000	14.750	5.296	5	-1.819	2.360	1.635	
68	14.034	1.1373	14.034	11.700	15.860	10.970	5	-2.445	2.360	1.635	

Auxiliary Tests	Statistic	Critical	Skew	Kurt						
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94896	0.9	-0.5883	1.07391						
Bartlett's Test indicates equal variances (p = 0.05)	11.1535	15.0863								
The control means are significantly different (p = 0.04)	2.42122	2.30601								
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	68	>68		1.47	1.63483	0.13248	2.20169	1.19966	0.14389	5, 24

**Dose-Response Plot**



Test: MC-Macrocyctis Germination and Growth Test  
 Species: MP-Macrocyctis pyrifer  
 Sample ID: City of Buenaventura  
 Start Date: 03/17/2004 End Date: 03/19/2004

Test ID: 0403-104  
 Protocol: MBP 90-Anderson et al.  
 Sample Type: Ambient water  
 Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Total Counted	Number Germ	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	Cal Factor	Notes
71	11	1	6.25	100	86	6	5	6	4	6	5	6	6	5	4	2.6	
72	5	5	Lab Control	100	80	5	4	3	4	5	3	6	3	4	4	2.6	
73	2	2	Lab Control	100	76	4	5	4	4	2	6	3	4	4	3	2.6	
74	23	3	25	100	94	6	6	4	4	4	3	8	5	7	5	2.6	
75	33	3	68	100	90	5	4	7	5	4	7	8	5	4	5	2.6	
76	25	5	25	100	93	5	5	5	4	6	3	6	7	5	6	2.6	
77	12	2	6.25	100	85	5	5	4	7	4	5	5	6	5	6	2.6	
78	3	3	Lab Control	100	88	7	3	4	4	3	4	6	4	6	5	2.6	
79	1	1	Lab Control	100	84	6	4	5	3	3	4	3	6	5	4	2.6	
80	13	3	6.25	100	92	7	4	7	6	3	7	5	5	4	5	2.6	
81	4	4	Lab Control	100	82	4	4	5	5	4	3	3	5	4	4	2.6	
82	14	4	6.25	100	88	6	6	5	5	5	5	6	4	6	5	2.6	
83	10	5	Brine Control	100	91	6	3	5	3	3	5	5	3	5	5	2.6	
84	20	5	12.5	100	87	6	5	7	4	5	5	7	5	5	4	2.6	
85	28	3	50	100	91	5	6	6	3	6	5	7	3	5	4	2.6	
86	35	5	68	100	89	4	3	5	5	5	5	4	5	4	5	2.6	
87	16	1	12.5	100	80	7	6	5	7	4	5	5	6	7	5	2.6	
88	6	1	Brine Control	100	85	4	6	6	4	4	4	5	3	7	5	2.6	
89	34	4	68	100	91	7	4	7	8	5	6	7	4	7	6	2.6	
90	8	3	Brine Control	100	89	7	5	6	5	6	5	6	4	6	4	2.6	
91	31	1	68	100	90	6	7	6	4	6	7	4	6	6	5	2.6	
92	21	1	25	100	90	5	5	7	4	7	6	4	5	5	5	2.6	
93	7	2	Brine Control	100	91	5	4	5	5	5	7	5	5	3	6	2.5	
94	17	2	12.5	100	91	5	7	5	8	6	8	4	6	4	7	2.5	
95	9	4	Brine Control	100	89	5	6	4	4	4	5	4	5	3	6	2.5	
96	30	5	50	100	92	5	5	5	6	7	3	6	6	4	5	2.5	
97	19	4	12.5	100	84	5	6	3	4	3	4	4	5	6	5	2.5	
98	18	3	12.5	100	89	8	5	3	6	4	6	7	6	7	5	2.5	
99	26	1	50	100	89	6	6	5	8	6	5	4	7	5	7	2.5	
100	22	2	25	100	88	6	5	7	6	7	7	5	6	5	7	2.5	
101	15	5	6.25	100	91	5	4	6	4	6	4	6	6	7	5	2.5	
102	27	2	50	100	90	5	5	6	6	4	5	7	7	4	6	2.5	
103	24	4	25	100	85	8	6	4	7	6	7	5	4	7	6	2.5	
104	29	4	50	100	88	5	8	4	3	7	6	5	6	4	6	2.5	
105	32	2	68	100	91	6	4	5	3	7	8	5	6	6	5	2.5	QC data entry: MC

Comments: Sample B-3

Test: MC-Macrocystis Germination and Growth Test  
 Species: MP-Macrocystis pyrifera  
 Sample ID: BUENA-City of Buenaventura  
 Start Date: 03/17/2004 End Date: 03/19/2004

Test ID: 0403-104  
 Protocol: MBP 90-Anderson et al.  
 Sample Type: OTH-Other sample type  
 Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Total Counted	Number Germ	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	Cal Factor	Notes
71				100	87	6	5	6	4	6	5	6	6	5	4	2.6	SC
72				100	80	5	4	3	4	5	3	6	3	4	4		
73				100	76	4	5	4	4	2	6	3	4	4	3		
74				100	94	6	6	4	4	4	3	8	5	7	5		
75				100	90	5	4	7	5	4	7	8	5	4	5		
76				100	93	5	5	5	4	6	3	6	7	5	6		
77				100	85	5	5	4	7	4	5	5	6	5	6		
78				100	88	7	3	4	4	3	4	6	4	6	5		
79				100	84	6	4	5	3	3	4	3	6	5	4		
80				100	92	7	4	7	6	3	7	5	5	4	5		
81				100	82	4	4	5	5	4	3	3	5	4	4		
82				100	88	6	6	5	5	5	5	6	4	6	5		
83				100	91	6	3	5	3	3	5	5	3	5	5		
84				100	87	6	5	7	4	5	5	7	5	5	4		
85				100	91	5	6	6	3	6	5	7	3	5	4		
86				100	89	4	3	5	5	5	5	4	5	4	5		
87				100	80	7	6	5	7	4	5	5	6	7	5		
88				100	85	4	6	6	4	4	4	5	3	7	5		
89				100	91	7	4	7	8	5	6	7	4	7	6		
90				100	89	7	5	6	5	6	5	6	4	6	4		
91				100	90	6	7	6	4	6	7	4	6	6	5		
92				100	90	5	5	7	4	7	6	4	5	5	5		
93				100	91	5	4	5	5	5	7	5	5	3	6	2.5	
94				100	91	5	7	5	8	6	8	4	6	4	7		
95				100	89	5	6	4	4	4	5	4	5	3	6		
96				100	92	5	5	5	6	7	3	6	6	4	5		
97				100	89	5	6	3	4	3	4	4	5	6	5		
98				100	89	8	5	3	6	4	6	7	6	7	5		
99				100	89	6	6	5	8	6	5	4	7	5	7		
100				100	88	6	5	7	6	7	7	5	6	5	7		
101				100	91	5	4	6	4	6	4	6	6	7	5		
102				100	90	5	5	6	6	4	5	7	7	4	6		
103				100	85	8	6	4	7	6	7	5	4	7	6		
104				100	88	5	8	4	3	7	6	5	6	4	6		
105				100	91	6	4	5	3	7	8	5	6	6	5		

Comments: Sample B-3



Test: MC-Macrocyctis Germination and Growth Test  
 Species: MP-Macrocyctis pyrifer  
 Sample ID: BUENA-City of Buenaventura  
 Start Date: 03/17/2004 End Date: 03/19/2004

Test ID: 0403-104  
 Protocol: MBP 90-Anderson et al.  
 Sample Type: OTH-Other sample type  
 Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Total Counted	Number Germ	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	Cal Factor	Notes
79	1	1	L-Lab Control		84												
73	2	2	L-Lab Control		76												
78	3	3	L-Lab Control		88												
81	4	4	L-Lab Control		82												
72	5	5	L-Lab Control		80												
88	6	1	B-Control		85												
93	7	2	B-Control		91												
90	8	3	B-Control		89												
95	9	4	B-Control		89												
83	10	5	B-Control		91												
71	11	1	6.25		86												
77	12	2	6.25		85												
80	13	3	6.25		92												
82	14	4	6.25		88												
101	15	5	6.25		91												
87	16	1	12.5		80												
94	17	2	12.5		91												
98	18	3	12.5		89												
97	19	4	12.5		84												
84	20	5	12.5		87												
92	21	1	25		90												
100	22	2	25		88												
74	23	3	25		94												
103	24	4	25		85												
76	25	5	25		93												
99	26	1	50		89												
102	27	2	50		90												
85	28	3	50		91												
104	29	4	50		88												
96	30	5	50		92												
91	31	1	100b		90												
105	32	2	100b		91												
75	33	3	100b		90												
89	34	4	100b		91												
86	35	5	100b		89												

Comments: Sample B-3

*GCME*  
*[Signature]*

Test: MC-Macrocyctis Germination and Growth Test  
 Species: MP-Macrocyctis pyrifer  
 Sample ID: BUENA-City of Buenaventura  
 Start Date: 03/17/2004 End Date: 03/19/2004

Test ID: 0403-104  
 Protocol: MBP 90-Anderson et al.  
 Sample Type: OTH-Other sample type  
 Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Total Counted	Number Germ	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	Cal Factor	Notes
79	1	1	L-Lab Control														
73	2	2	L-Lab Control														
78	3	3	L-Lab Control														
81	4	4	L-Lab Control														
72	5	5	L-Lab Control														
88	6	1	B-Control														
93	7	2	B-Control														
90	8	3	B-Control														
95	9	4	B-Control														
83	10	5	B-Control														
71	11	1	6.25														
77	12	2	6.25														
80	13	3	6.25														
82	14	4	6.25														
101	15	5	6.25														
87	16	1	12.5														
94	17	2	12.5														
98	18	3	12.5														
97	19	4	12.5														
84	20	5	12.5														
92	21	1	25														
100	22	2	25														
74	23	3	25														
103	24	4	25														
76	25	5	25														
99	26	1	50														
102	27	2	50														
85	28	3	50														
104	29	4	50														
96	30	5	50														
91	31	1	100b														
105	32	2	100b														
75	33	3	100b														
89	34	4	100b														
86	35	5	100b														

Comments: Sample B-3

*OCME*  
*off*

**Macrocystis Germination and Growth Test-Proportion Germinated**

Start Date: 03/17/2004	Test ID: 0403-105	Sample ID: City of Buenaventura
End Date: 03/19/2004	Lab ID: AMEC Bioassay SD	Sample Type: Ambient water
Sample Date: 03/16/2004	Protocol: MBP 90-Anderson et al.	Test Species: MP-Macrocystis pyrifera
Comments: Sample C-3		

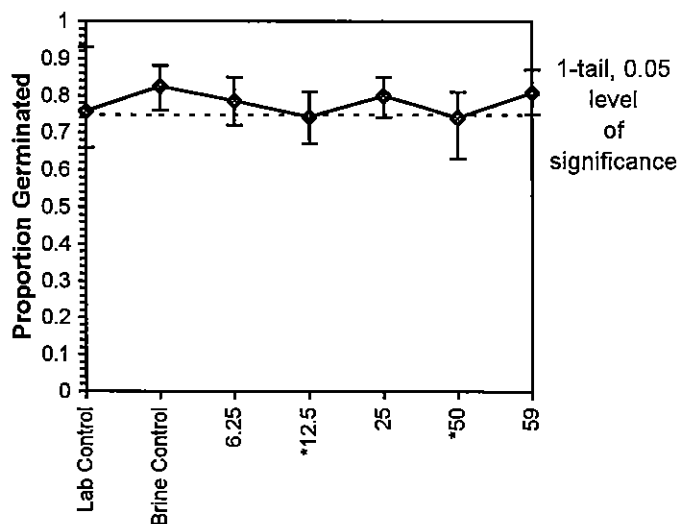
Conc-%	1	2	3	4	5
Lab Control	0.6600	0.7100	0.9300	0.8300	0.6600
Brine Control	0.7600	0.8100	0.8100	0.8800	0.8700
6.25	0.8500	0.7700	0.7200	0.7900	0.8000
12.5	0.6900	0.7600	0.8100	0.7800	0.6700
25	0.7400	0.7800	0.8500	0.8500	0.7800
50	0.8100	0.7700	0.6300	0.7700	0.7200
59	0.8700	0.8100	0.7500	0.7800	0.8300

Conc-%	Transform: Arcsin Square Root							1-Tailed			Isotonic	
	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD	Mean	N-Mean
Lab Control	0.7580	0.9177	1.0695	0.9483	1.3030	14.356	5					
Brine Control	0.8260	1.0000	1.1435	1.0588	1.2171	5.722	5				0.8260	1.0000
6.25	0.7860	0.9516	1.0918	1.0132	1.1731	5.317	5	1.251	2.360	0.0975	0.7860	0.9516
*12.5	0.7420	0.8983	1.0401	0.9589	1.1198	6.571	5	2.503	2.360	0.0975	0.7725	0.9352
25	0.8000	0.9685	1.1094	1.0357	1.1731	5.516	5	0.824	2.360	0.0975	0.7725	0.9352
*50	0.7400	0.8959	1.0382	0.9169	1.1198	7.475	5	2.547	2.360	0.0975	0.7725	0.9352
59	0.8080	0.9782	1.1195	1.0472	1.2019	5.299	5	0.581	2.360	0.0975	0.7725	0.9352

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.93985	0.9	-0.1951	-1.0328
Bartlett's Test indicates equal variances (p = 0.99)	0.44622	15.0863		
The control means are not significantly different (p = 0.35)	0.99108	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	59	>59		1.69492	0.07931	0.09576	0.00928	0.00427	0.09079	5, 24

Linear Interpolation (200 Resamples)				
Point	%	SD	95% CL(Exp)	Skew
IC05	6.8519			
IC10	>59			
IC15	>59			
IC20	>59			
IC25	>59			
IC40	>59			
IC50	>59			



Comparisons made against the brine control.

**Macrocyctis Germination and Growth Test-Growth-Length**

Start Date: 03/17/2004      Test ID: 0403-105      Sample ID: City of Buenaventura  
 End Date: 03/19/2004      Lab ID: AMEC Bioassay SD      Sample Type: Ambient water  
 Sample Date: 03/16/2004      Protocol: MBP 90-Anderson et al.      Test Species: MP-Macrocyctis pyrifera  
 Comments: Sample C-3

Conc-%	1	2	3	4	5
Lab Control	11.750	11.250	12.500	11.250	11.500
Brine Control	12.000	11.750	11.000	13.250	13.750
6.25	13.500	12.750	11.750	12.250	13.000
12.5	11.000	13.250	10.750	10.250	11.000
25	11.250	11.250	14.000	10.000	14.500
50	13.750	11.500	13.750	11.250	13.750
59	11.750	14.000	12.750	12.500	12.250

Conc-%	Mean	N-Mean	Transform: Untransformed					N	t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%	Mean					N-Mean	
Lab Control	11.650	0.9433	11.650	11.250	12.500	4.450	5						
Brine Control	12.350	1.0000	12.350	11.000	13.750	9.121	5					12.500	1.0000
6.25	12.650	1.0243	12.650	11.750	13.500	5.340	5	-0.382	2.360	1.855		12.500	1.0000
12.5	11.250	0.9109	11.250	10.250	13.250	10.304	5	1.399	2.360	1.855		12.225	0.9780
25	12.200	0.9879	12.200	10.000	14.500	15.965	5	0.191	2.360	1.855		12.225	0.9780
50	12.800	1.0364	12.800	11.250	13.750	10.186	5	-0.572	2.360	1.855		12.225	0.9780
59	12.650	1.0243	12.650	11.750	14.000	6.643	5	-0.382	2.360	1.855		12.225	0.9780

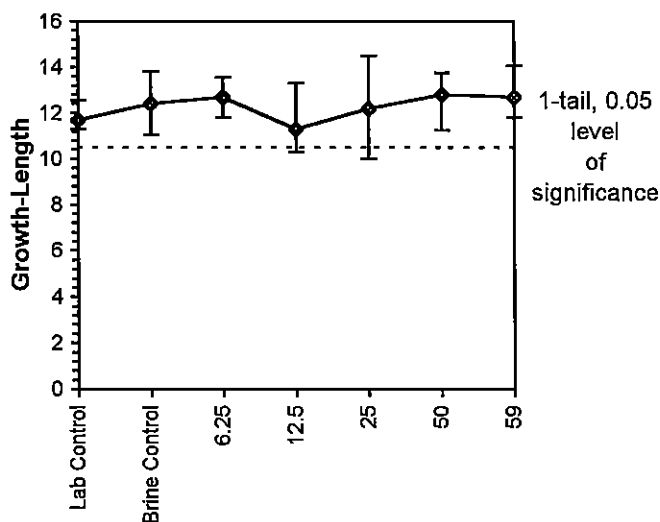
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96695	0.9	0.29175	-0.6157
Bartlett's Test indicates equal variances (p = 0.43)	4.90094	15.0863		
The control means are not significantly different (p = 0.24)	1.26234	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	59	>59		1.69492	1.85514	0.15021	1.60833	1.54479	0.41657	5, 24

**Linear Interpolation (200 Resamples)**

Point	%	SD	95% CL(Exp)	Skew
IC05	>59			
IC10	>59			
IC15	>59			
IC20	>59			
IC25	>59			
IC40	>59			
IC50	>59			

Comparisons made against brine control.



Test: MC-Macrocyctis Germination and Growth Test  
 Species: MP-Macrocyctis pyrifera  
 Sample ID: BUENA-City of Buenaventura  
 Start Date: 03/17/2004      End Date: 03/19/2004

Test ID: 0403-105  
 Protocol: MBP 90-Anderson et al.  
 Sample Type: AMB1-Ambient water  
 Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Total Counted	Number Germ	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	Cal Factor	Notes
	1	1	Lab Control	100	66	4	6	4	4	4	5	7	4	4	5	2.5	
	2	2	Lab Control	100	71	4	5	4	4	4	5	5	4	5	5	2.5	
	3	3	Lab Control	100	93	5	4	5	5	5	6	5	5	5	5	2.5	
	4	4	Lab Control	100	83	5	5	4	5	4	4	4	4	6	4	2.5	
	5	5	Lab Control	100	66	4	6	6	4	5	4	3	4	6	4	2.5	
	6	1	Brine Control	100	76	5	5	5	5	5	5	4	4	5	5	2.5	
	7	2	Brine Control	100	81	4	6	5	6	5	4	5	4	4	4	2.5	
	8	3	Brine Control	100	81	4	3	5	4	4	6	4	5	5	4	2.5	
	9	4	Brine Control	100	88	6	5	6	6	6	5	5	4	5	5	2.5	
	10	5	Brine Control	100	87	6	6	6	7	4	5	6	5	5	5	2.5	
	11	1	6.25	100	85	6	5	5	5	7	6	6	6	4	4	2.5	
	12	2	6.25	100	77	5	4	5	5	6	6	8	4	4	4	2.5	
	13	3	6.25	100	72	4	4	5	4	4	5	5	5	6	5	2.5	
	14	4	6.25	100	79	4	4	4	4	5	5	6	5	6	6	2.5	
	15	5	6.25	100	80	4	5	6	6	6	4	5	7	5	4	2.5	
	16	1	12.5	100	69	3	4	4	4	6	5	5	3	3	7	2.5	
	17	2	12.5	100	76	5	6	5	5	6	7	7	4	3	5	2.5	
	18	3	12.5	100	81	3	4	3	4	5	5	4	5	5	5	2.5	
	19	4	12.5	100	78	5	5	3	3	3	4	5	4	5	4	2.5	
	20	5	12.5	100	67	4	5	3	3	3	4	6	3	8	5	2.5	
	21	1	25	100	74	3	4	4	4	4	5	5	7	4	5	2.5	
	22	2	25	100	78	5	6	4	4	4	4	5	4	6	3	2.5	
	23	3	25	100	85	4	4	8	7	6	6	6	5	4	6	2.5	
	24	4	25.0	100	85	4	4	4	5	4	4	4	3	3	5	2.5	
	25	5	25	100	78	4	6	3	6	10	4	8	5	6	6	2.5	
	26	1	50	100	81	5	3	9	8	6	6	5	3	5	5	2.5	
	27	2	50	100	77	5	3	4	4	5	5	4	6	7	3	2.5	
	28	3	50	100	63	5	7	7	6	5	4	4	5	6	6	2.5	
	29	4	50	100	77	3	3	7	4	5	4	7	4	4	4	2.5	
	30	5	50	100	72	9	6	4	5	4	5	6	6	5	5	2.5	
	31	1	59	100	87	5	5	3	3	5	4	5	6	6	5	2.5	
	32	2	59	100	81	6	6	6	5	7	7	4	5	6	4	2.5	
	33	3	59	100	75	3	6	6	7	4	4	7	4	4	6	2.5	
	34	4	59	100	78	8	4	4	5	5	4	4	6	4	6	2.5	
	35	5	59	100	83	4	3	3	6	6	5	6	6	5	5	2.5	<i>data entry see data</i>

Comments: Sample C-3

Test: MC-Macrocyctis Germination and Growth Test  
 Species: MP-Macrocyctis pyrifer  
 Sample ID: BUENA-City of Buenaventura  
 Start Date: 03/17/2004 End Date: 03/19/2004

Test ID: 0403-105  
 Protocol: MBP 90-Anderson et al.  
 Sample Type: OTH-Other sample type  
 Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Total Counted	Number Germ	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	Cal Factor	Notes
106					—											2.5	mc
107				100	87	5	5	3	3	5	4	5	6	6	5		
108					78	4	6	3	6	10	4	8	5	6	6		
109					77	5	3	4	4	5	5	4	6	7	3		
110					78	5	6	4	4	4	4	5	4	6	3		
111					85	4	4	4	5	4	4	4	3	3	3		
112					81	3	4	3	4	5	5	4	5	5	5		
113					85	6	5	5	5	7	6	6	6	4	4		
114					79	4	4	4	4	5	5	6	5	6	6		
115					72	4	4	5	4	4	5	5	5	6	5		
116					83	4	3	3	6	6	5	6	6	5	5		
117					85	4	4	8	7	6	6	6	5	4	6		
118					—												
119					74	3	4	4	4	4	5	5	7	4	5		
120					—												
121					76	5	6	5	5	6	7	7	4	3	5		
122					75	3	6	6	7	4	4	7	4	4	6		
123					69	3	4	4	4	6	5	5	3	3	7		
124					—												
125					77	3	3	7	4	5	4	7	4	4	4		
126					—												
127					78	8	4	4	5	5	4	4	6	4	6		
128					81	6	6	6	5	4	7	4	5	6	4		
129					—												
130					—												
131					80	4	5	6	6	6	4	5	7	5	4		
132					72	9	6	4	5	4	5	6	6	5	5		
133					—												
134					—												
135					—												
136					77	5	4	5	5	6	6	8	4	4	4		
137					63	5	7	7	6	5	4	4	5	6	6		
138					81	5	3	9	8	6	6	5	3	5	5		
139					67	4	5	3	3	3	4	6	3	8	5		
140					78	5	5	3	3	3	4	5	4	5	4		

Comments: Sample C-23

Test: MC-Macrocytis Germination and Growth Test  
 Species: MP-Macrocytis pyrifer  
 Sample ID: BUENA-City of Buenaventura  
 Start Date: 03/17/2004 End Date: 03/19/2004

Test ID: 0403-105  
 Protocol: MBP 90-Anderson et al.  
 Sample Type: OTH-Other sample type  
 Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Total Counted	Number Germ	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	Cal Factor	Notes
<del>130</del>	1	1	L-Lab Control														
<del>126</del>	2	2	L-Lab Control														
<del>124</del>	3	3	L-Lab Control														
<del>129</del>	4	4	L-Lab Control														
<del>118</del>	5	5	L-Lab Control														
<del>134</del>	6	1	B-Control														
<del>135</del>	7	2	B-Control														
<del>133</del>	8	3	B-Control														
<del>120</del>	9	4	B-Control														
<del>106</del>	10	5	B-Control														
113	11	1	6.25	85													
136	12	2	6.25	77													
115	13	3	6.25	72													
114	14	4	6.25	79													
131	15	5	6.25	80													
123	16	1	12.5	69													
121	17	2	12.5	76													
112	18	3	12.5	81													
140	19	4	12.5	78													
139	20	5	12.5	67													
119	21	1	25	74													
110	22	2	25	78													
117	23	3	25	85													
111	24	4	25	85													
108	25	5	25	78													
138	26	1	50	81													
109	27	2	50	77													
137	28	3	50	63													
125	29	4	50	77													
132	30	5	50	72													
107	31	1	100b	87													
128	32	2	100b	81													
122	33	3	100b	75													
127	34	4	100b	78													
116	35	5	100b	83													

will share  
 by controls  
 A-203  
 MC

Comments: Sample C-2 C-3  
 MC  
 [Signature]

Test: MC-Macrocytist Germination and Growth Test  
 Species: MP-Macrocytist pyrifer  
 Sample ID: BUENA-City of Buenaventura  
 Start Date: 03/17/2004 End Date: 03/19/2004

Test ID: 0403-105  
 Protocol: MBP 90-Anderson et al.  
 Sample Type: OTH-Other sample type  
 Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Total Counted	Number Germ	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	Cal Factor	Notes
<del>130</del>	1	1	L-Lab Control														
<del>126</del>	2	2	L-Lab Control														
<del>124</del>	3	3	L-Lab Control														
<del>129</del>	4	4	L-Lab Control														
<del>118</del>	5	5	L-Lab Control														
<del>134</del>	6	1	B-Control														
<del>135</del>	7	2	B-Control														
<del>133</del>	8	3	B-Control														
<del>120</del>	9	4	B-Control														
<del>106</del>	10	5	B-Control														
113	11	1	6.25														
136	12	2	6.25														
115	13	3	6.25														
114	14	4	6.25														
131	15	5	6.25														
123	16	1	12.5														
121	17	2	12.5														
112	18	3	12.5														
140	19	4	12.5														
139	20	5	12.5														
119	21	1	25														
110	22	2	25														
117	23	3	25														
111	24	4	25														
108	25	5	25														
138	26	1	50														
109	27	2	50														
137	28	3	50														
125	29	4	50														
132	30	5	50														
107	31	1	100b														
128	32	2	100b														
122	33	3	100b														
127	34	4	100b														
116	35	5	100b														

*will share  
 by controls  
 by C-mc  
 by A-20*

Comments: Sample C-2 C-2  
 C-mc  
*[Signature]*



APPENDIX E  
GRAIN SIZE ANALYSES

**Appendix Table E-1. Grain Size Summary Results**  
**City of Buenaventura**  
**Santa Clara River Estuary Wet Weather Sampling Event**  
**Sample Collection Date: 16 March 2004**

<b>Site</b>	<b>Percent Gravel</b>	<b>Percent Sand</b>	<b>Percent Silt</b>	<b>Percent Clay</b>	<b>Percent Fine (Silt+Clay)</b>
<b>A-1</b>	12.08	84.22	1.23	2.47	3.70
<b>A-2</b>	1.73	95.76	1.25	1.25	2.51
<b>A-3</b>	0.39	91.92	3.85	3.85	7.69
<b>B-1</b>	1.69	97.03	0.00	1.28	1.28
<b>B-2</b>	5.11	93.80	1.09	0.00	1.09
<b>B-3</b>	9.18	88.36	1.23	1.23	2.46
<b>B-4</b>	0.12	92.12	5.17	2.58	7.75
<b>C-1</b>	11.04	87.93	0.00	1.03	1.03
<b>C-2</b>	14.37	83.20	1.22	1.22	2.43
<b>C-3</b>	29.02	69.76	0.00	1.22	1.22
<b>D-1</b>	17.44	81.35	0.00	1.21	1.21

## Grain Size Analysis Summary AMEC Bioassay Laboratory

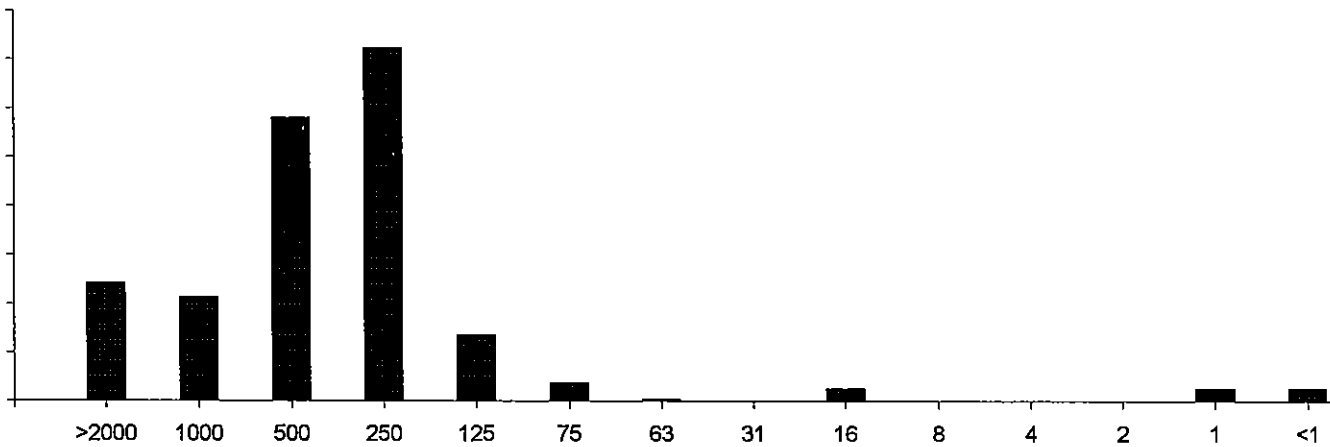
Client ID: City of Buena Ventura  
 Project ID: Santa Clara River Estuary

Sample I.D.: Site A-1  
 Sample Date: 03/16/04  
 Analysis Date: Initiated 04/06/04

Particle Size (µm)	Particle Size (mm)	phi	Incremental Percent	Cumulative Percent
>2000	>2	-1	12.08%	12.08%
1000	1	0	10.56%	22.63%
500	0.50	1	28.92%	51.55%
250	0.25	2	36.04%	87.59%
125	0.125	3	6.76%	94.35%
75	0.075	3.5	1.81%	96.16%
63	0.063	4	0.14%	96.30%
31	0.031	5	0.00%	96.30%
16	0.016	6	1.23%	97.53%
8	0.008	7	0.00%	97.53%
4	0.004	8	0.00%	97.53%
2	0.002	9	0.00%	97.53%
1	0.001	10	1.23%	98.77%
<1	>0.001	>10	1.23%	100.00%

% Gravel	12.1%	>2000 µm
% Sand	84.2%	>63 µm
% Silt	1.2%	>2 µm
% Clay	2.5%	<2 µm

Sample ID: Site A-1



## Grain Size Analysis Summary AMEC Bioassay Laboratory

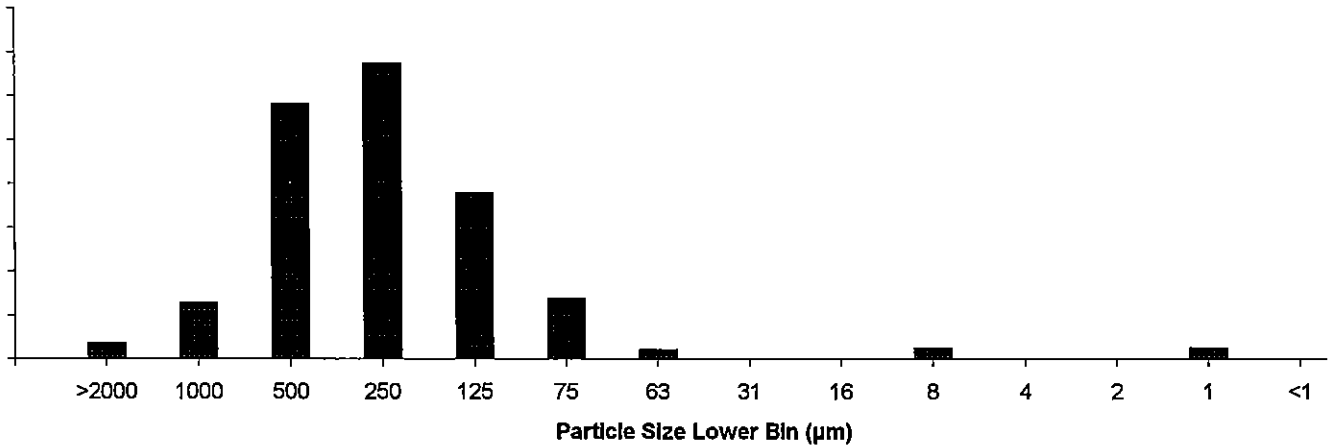
Client ID: City of Buenaventura  
 Project ID: Santa Clara River Estuary

Sample I.D.: Site A-2  
 Sample Date: 03/16/04  
 Analysis Date: Initiated 04/06/04

Particle Size (µm)	Particle Size (mm)	phi	Incremental Percent	Cumulative Percent
>2000	>2	-1	1.73%	1.73%
1000	1	0	6.34%	8.07%
500	0.50	1	29.07%	37.14%
250	0.25	2	33.65%	70.78%
125	0.125	3	18.85%	89.63%
75	0.075	3.5	6.85%	96.49%
63	0.063	4	1.01%	97.49%
31	0.031	5	0.00%	97.49%
16	0.016	6	0.00%	97.49%
8	0.008	7	1.25%	98.75%
4	0.004	8	0.00%	98.75%
2	0.002	9	0.00%	98.75%
1	0.001	10	1.25%	100.00%
<1	>0.001	>10	0.00%	100.00%

% Gravel	1.7%	>2000 µm
% Sand	95.8%	>63 µm
% Silt	1.3%	>2 µm
% Clay	1.3%	<2 µm

Sample ID: Site A-2



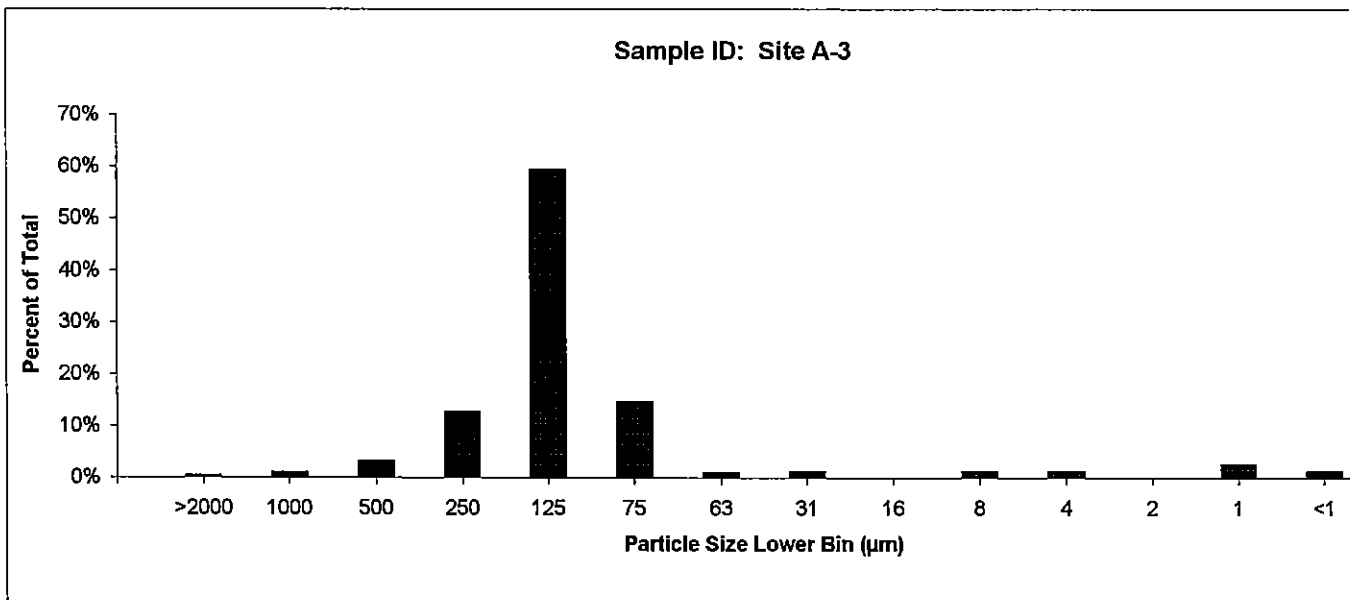
## Grain Size Analysis Summary AMEC Bioassay Laboratory

Client ID: City of Buenaventura  
 Project ID: Santa Clara River Estuary

Sample I.D.: Site A-3  
 Sample Date: 03/16/04  
 Analysis Date: Initiated 04/06/04

Particle Size (µm)	Particle Size (mm)	phi	Incremental Percent	Cumulative Percent
>2000	>2	-1	0.39%	0.39%
1000	1	0	0.96%	1.35%
500	0.50	1	3.21%	4.56%
250	0.25	2	12.72%	17.28%
125	0.125	3	59.38%	76.66%
75	0.075	3.5	14.72%	91.38%
63	0.063	4	0.93%	92.31%
31	0.031	5	1.28%	93.59%
16	0.016	6	0.00%	93.59%
8	0.008	7	1.28%	94.87%
4	0.004	8	1.28%	96.15%
2	0.002	9	0.00%	96.15%
1	0.001	10	2.56%	98.72%
<1	>0.001	>10	1.28%	100.00%

% Gravel	0.4%	>2000 µm
% Sand	91.9%	>63 µm
% Silt	3.8%	>2 µm
% Clay	3.8%	<2 µm



## Grain Size Analysis Summary AMEC Bioassay Laboratory

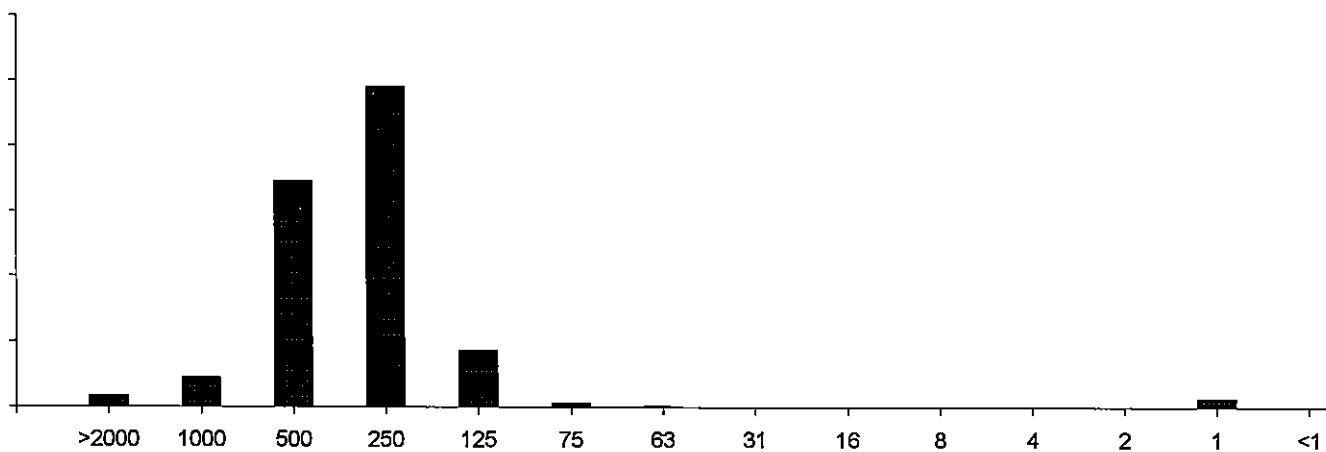
Client ID: City of Buenaventura  
 Project ID: Santa Clara River Estuary

Sample I.D.: Site B-1  
 Sample Date: 03/16/04  
 Analysis Date: Initiated 04/06/04

Particle Size (µm)	Particle Size (mm)	phi	Incremental Percent	Cumulative Percent
>2000	>2	-1	1.69%	1.69%
1000	1	0	4.41%	6.10%
500	0.50	1	34.46%	40.56%
250	0.25	2	48.97%	89.53%
125	0.125	3	8.51%	98.05%
75	0.075	3.5	0.62%	98.67%
63	0.063	4	0.05%	98.72%
31	0.031	5	0.00%	98.72%
16	0.016	6	0.00%	98.72%
8	0.008	7	0.00%	98.72%
4	0.004	8	0.00%	98.72%
2	0.002	9	0.00%	98.72%
1	0.001	10	1.28%	100.00%
<1	>0.001	>10	0.00%	100.00%

% Gravel	1.7%	>2000 µm
% Sand	97.0%	>63 µm
% Silt	0.0%	>2 µm
% Clay	1.3%	<2 µm

Sample ID: Site B-1



## Grain Size Analysis Summary AMEC Bioassay Laboratory

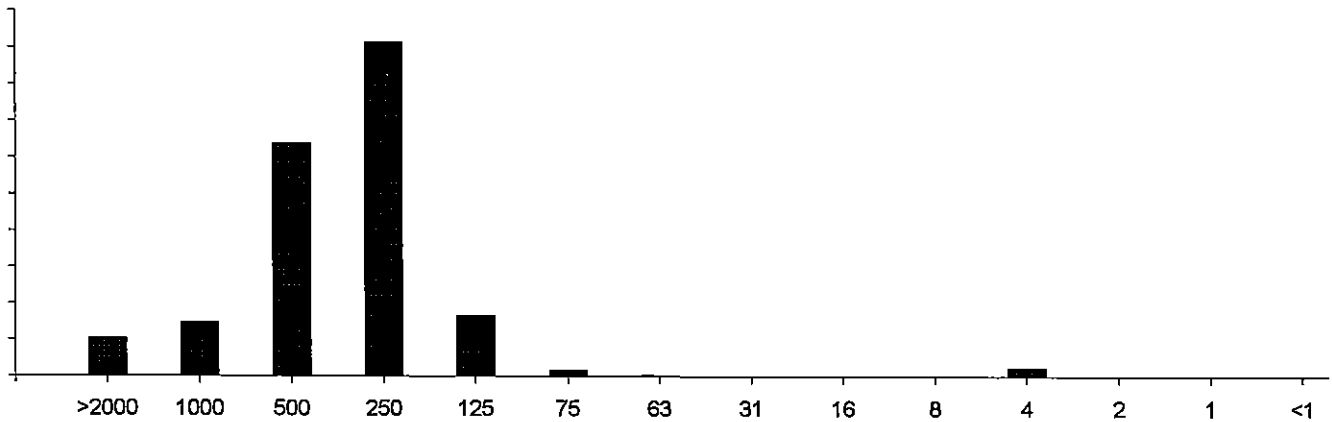
Client ID: City of Buenaventura  
 Project ID: Santa Clara River Estuary

Sample I.D.: Site B-2  
 Sample Date: 03/16/04  
 Analysis Date: Initiated 04/06/04

Particle Size (µm)	Particle Size (mm)	phi	Incremental Percent	Cumulative Percent
>2000	>2	-1	5.11%	5.11%
1000	1	0	7.28%	12.39%
500	0.50	1	31.80%	44.19%
250	0.25	2	45.60%	89.79%
125	0.125	3	8.23%	98.03%
75	0.075	3.5	0.77%	98.80%
63	0.063	4	0.11%	98.91%
31	0.031	5	0.00%	98.91%
16	0.016	6	0.00%	98.91%
8	0.008	7	0.00%	98.91%
4	0.004	8	1.09%	100.00%
2	0.002	9	0.00%	100.00%
1	0.001	10	0.00%	100.00%
<1	>0.001	>10	0.00%	100.00%

% Gravel	5.1%	>2000 µm
% Sand	93.8%	>63 µm
% Silt	1.1%	>2 µm
% Clay	0.0%	<2 µm

Sample ID: Site B-2



## Grain Size Analysis Summary AMEC Bioassay Laboratory

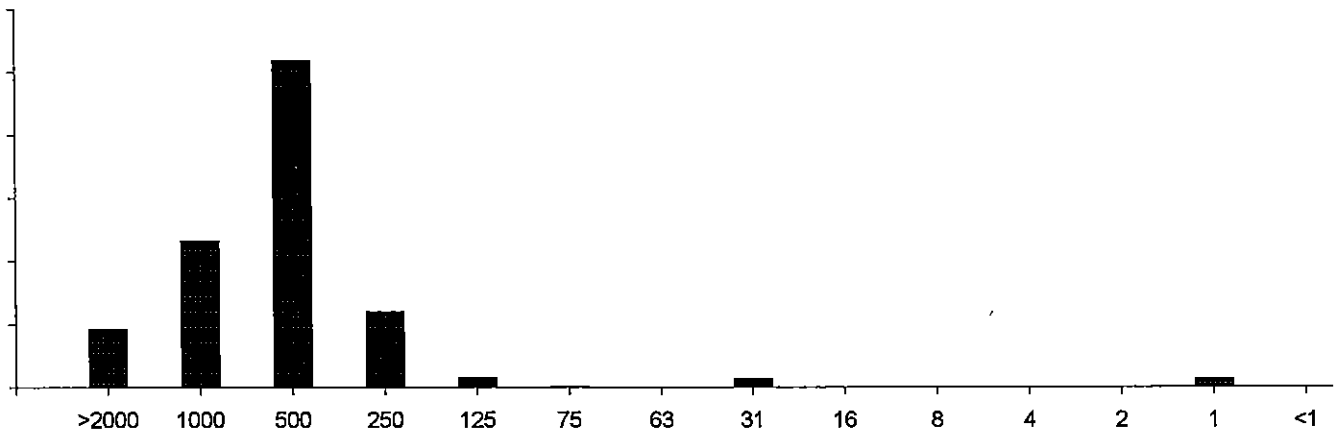
Client ID: City of Buena Ventura  
Project ID: Santa Clara River Estuary

Sample I.D.: Site B-3  
Sample Date: 03/16/04  
Analysis Date: Initiated 04/06/04

Particle Size (µm)	Particle Size (mm)	phi	Incremental Percent	Cumulative Percent
>2000	>2	-1	9.18%	9.18%
1000	1	0	23.14%	32.32%
500	0.50	1	51.74%	84.06%
250	0.25	2	11.90%	95.96%
125	0.125	3	1.48%	97.44%
75	0.075	3.5	0.10%	97.54%
63	0.063	4	0.00%	97.54%
31	0.031	5	1.23%	98.77%
16	0.016	6	0.00%	98.77%
8	0.008	7	0.00%	98.77%
4	0.004	8	0.00%	98.77%
2	0.002	9	0.00%	98.77%
1	0.001	10	1.23%	100.00%
<1	>0.001	>10	0.00%	100.00%

% Gravel	9.2%	>2000 µm
% Sand	88.4%	>63 µm
% Silt	1.2%	>2 µm
% Clay	1.2%	<2 µm

Sample ID: Site B-3





## Grain Size Analysis Summary AMEC Bioassay Laboratory

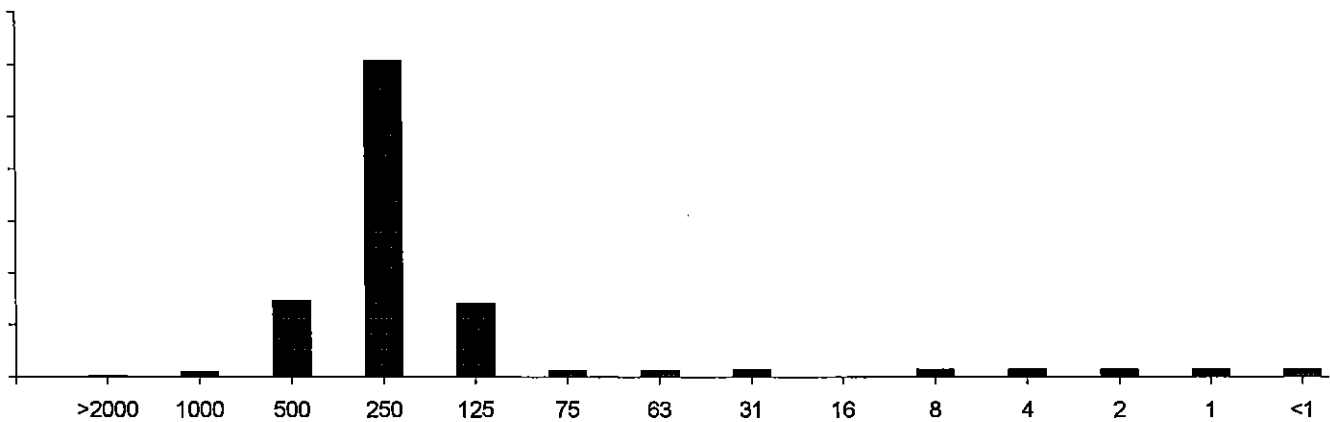
Client ID: City of Buenaventura  
 Project ID: Santa Clara River Estuary

Sample I.D.: Site B-4  
 Sample Date: 03/16/04  
 Analysis Date: Initiated 04/06/04

Particle Size (µm)	Particle Size (mm)	phi	Incremental Percent	Cumulative Percent
>2000	>2	-1	0.12%	0.12%
1000	1	0	0.89%	1.01%
500	0.50	1	14.51%	15.52%
250	0.25	2	60.54%	76.06%
125	0.125	3	13.93%	89.99%
75	0.075	3.5	1.09%	91.09%
63	0.063	4	1.16%	92.25%
31	0.031	5	1.29%	93.54%
16	0.016	6	0.00%	93.54%
8	0.008	7	1.29%	94.83%
4	0.004	8	1.29%	96.12%
2	0.002	9	1.29%	97.42%
1	0.001	10	1.29%	98.71%
<1	>0.001	>10	1.29%	100.00%

% Gravel	0.1%	>2000 µm
% Sand	92.1%	>63 µm
% Silt	5.2%	>2 µm
% Clay	2.6%	<2 µm

Sample ID: Site B-4



## Grain Size Analysis Summary AMEC Bioassay Laboratory

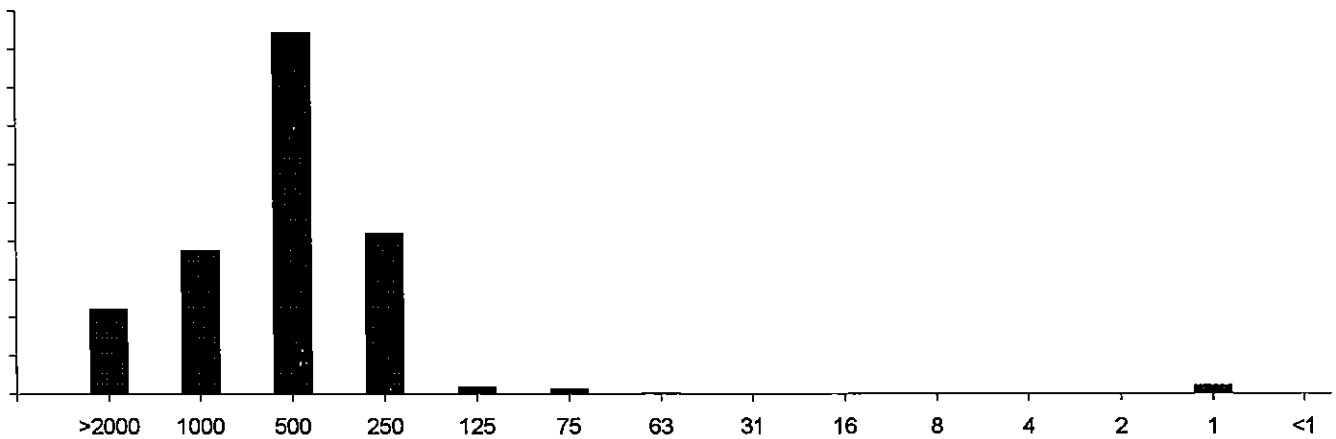
Client ID: City of Buenaventura  
 Project ID: Santa Clara River Estuary

Sample I.D.: Site C-1  
 Sample Date: 03/16/04  
 Analysis Date: Initiated 04/06/04

Particle Size (µm)	Particle Size (mm)	phi	Incremental Percent	Cumulative Percent
>2000	>2	-1	11.04%	11.04%
1000	1	0	18.61%	29.64%
500	0.50	1	46.96%	76.60%
250	0.25	2	20.92%	97.51%
125	0.125	3	0.86%	98.37%
75	0.075	3.5	0.55%	98.92%
63	0.063	4	0.04%	98.97%
31	0.031	5	0.00%	98.97%
16	0.016	6	0.00%	98.97%
8	0.008	7	0.00%	98.97%
4	0.004	8	0.00%	98.97%
2	0.002	9	0.00%	98.97%
1	0.001	10	1.03%	100.00%
<1	>0.001	>10	0.00%	100.00%

% Gravel	11.0%	>2000 µm
% Sand	87.9%	>63 µm
% Silt	0.0%	>2 µm
% Clay	1.0%	<2 µm

Sample ID: Site C-1



## Grain Size Analysis Summary AMEC Bioassay Laboratory

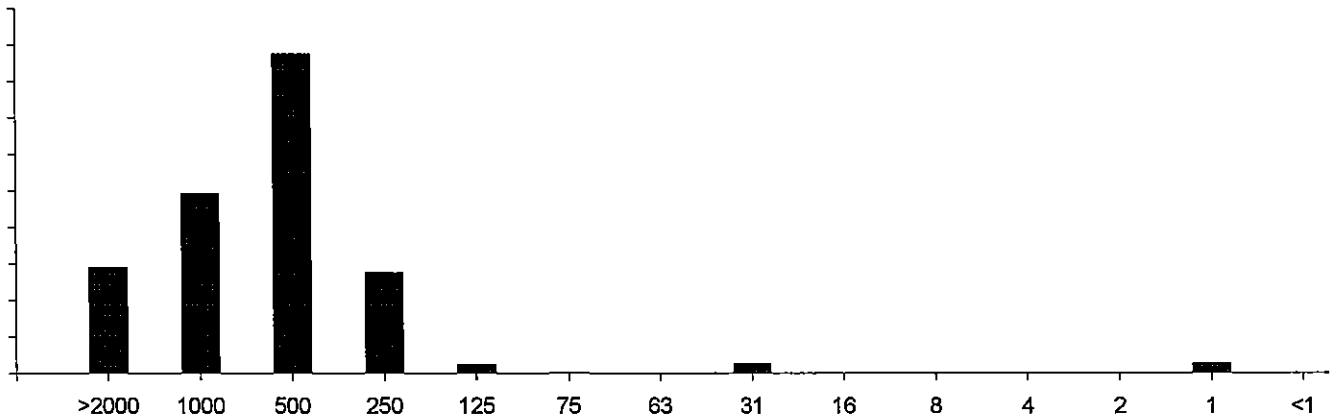
Client ID: City of Buena Ventura  
 Project ID: Santa Clara River Estuary

Sample I.D.: Site C-2  
 Sample Date: 03/16/04  
 Analysis Date: Initiated 04/06/04

Particle Size (µm)	Particle Size (mm)	phi	Incremental Percent	Cumulative Percent
>2000	>2	-1	14.37%	14.37%
1000	1	0	24.55%	38.92%
500	0.50	1	43.68%	82.60%
250	0.25	2	13.69%	96.29%
125	0.125	3	1.12%	97.42%
75	0.075	3.5	0.11%	97.53%
63	0.063	4	0.04%	97.57%
31	0.031	5	1.22%	98.78%
16	0.016	6	0.00%	98.78%
8	0.008	7	0.00%	98.78%
4	0.004	8	0.00%	98.78%
2	0.002	9	0.00%	98.78%
1	0.001	10	1.22%	100.00%
<1	>0.001	>10	0.00%	100.00%

% Gravel	14.4%	>2000 µm
% Sand	83.2%	>63 µm
% Silt	1.2%	>2 µm
% Clay	1.2%	<2 µm

Sample ID: Site C-2



## Grain Size Analysis Summary AMEC Bioassay Laboratory

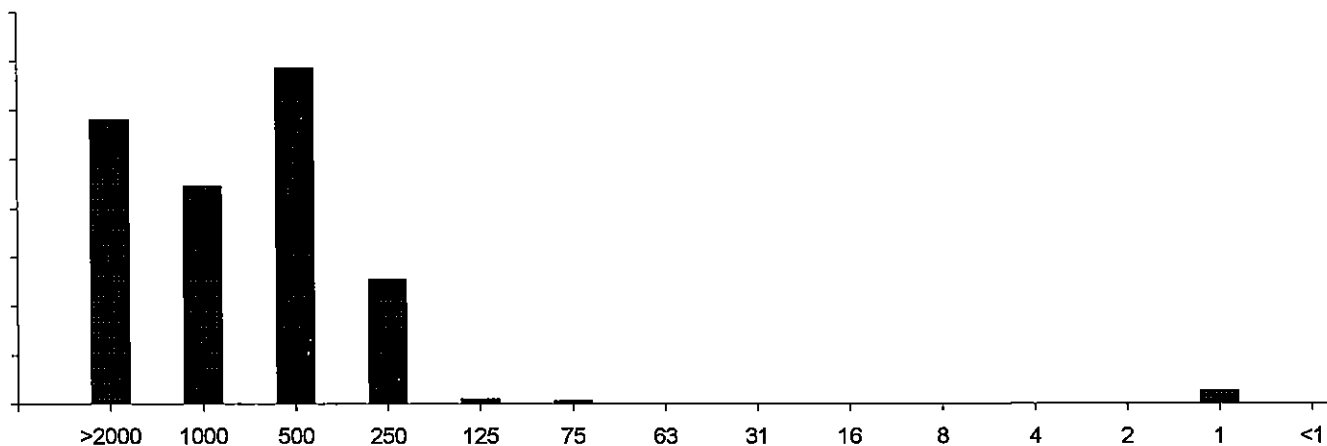
Client ID: City of Buenaventura  
 Project ID: Santa Clara River Estuary

Sample I.D.: Site C-3  
 Sample Date: 03/16/04  
 Analysis Date: Initiated 04/06/04

Particle Size (µm)	Particle Size (mm)	phi	Incremental Percent	Cumulative Percent
>2000	>2	-1	29.02%	29.02%
1000	1	0	22.17%	51.19%
500	0.50	1	34.28%	85.47%
250	0.25	2	12.63%	98.09%
125	0.125	3	0.43%	98.52%
75	0.075	3.5	0.26%	98.78%
63	0.063	4	0.00%	98.78%
31	0.031	5	0.00%	98.78%
16	0.016	6	0.00%	98.78%
8	0.008	7	0.00%	98.78%
4	0.004	8	0.00%	98.78%
2	0.002	9	0.00%	98.78%
1	0.001	10	1.22%	100.00%
<1	>0.001	>10	0.00%	100.00%

% Gravel	29.0%	>2000 µm
% Sand	69.8%	>63 µm
% Silt	0.0%	>2 µm
% Clay	1.2%	<2 µm

Sample ID: Site C-3



## Grain Size Analysis Summary AMEC Bioassay Laboratory

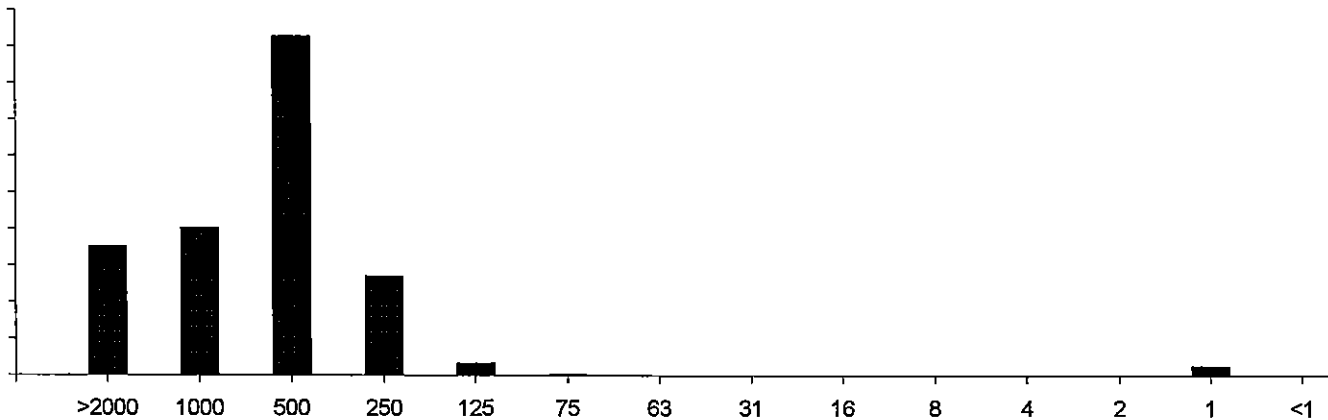
Client ID: City of Buenaventura  
 Project ID: Santa Clara River Estuary

Sample I.D.: Site D-1  
 Sample Date: 03/16/04  
 Analysis Date: Initiated 04/06/04

Particle Size (µm)	Particle Size (mm)	phi	Incremental Percent	Cumulative Percent
>2000	>2	-1	17.44%	17.44%
1000	1	0	19.94%	37.37%
500	0.50	1	46.32%	83.69%
250	0.25	2	13.42%	97.11%
125	0.125	3	1.55%	98.66%
75	0.075	3.5	0.13%	98.79%
63	0.063	4	0.00%	98.79%
31	0.031	5	0.00%	98.79%
16	0.016	6	0.00%	98.79%
8	0.008	7	0.00%	98.79%
4	0.004	8	0.00%	98.79%
2	0.002	9	0.00%	98.79%
1	0.001	10	1.21%	100.00%
<1	>0.001	>10	0.00%	100.00%

% Gravel	17.4%	>2000 µm
% Sand	81.3%	>63 µm
% Silt	0.0%	>2 µm
% Clay	1.2%	<2 µm

Sample ID: Site D-1



APPENDIX F  
ANALYTICAL CHEMISTRY DATA

**SEDIMENT SAMPLES**

**Appendix Table F-1. Sediment Trace Metal and TOC Measurements**  
**City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event**  
**Sample Collection Date: 16 March 2004**

<b>Sample</b>	<b>Copper (mg/kg)</b>	<b>Nickel (mg/kg)</b>	<b>Selenium (mg/kg)</b>	<b>Zinc (mg/kg)</b>	<b>TOC (mg/kg)</b>
A-1	3.25	3.81	ND	12.1	2400
A-2	4.13	5.48	ND	16.2	4000
A-3	2.69	6.35	ND	11.50	3300
B-1	3.79	4.77	ND	15.7	2400
B-2	3.07	4.41	ND	12.4	2500
B-3	3.20	4.35	ND	12.5	3900
B-4	4.06	5.16	ND	15.4	3800
C-1	2.87	4.09	ND	11.5	1700
C-2	3.00	4.35	ND	12.1	6700
C-3	2.91	4.34	ND	11.5	1400
D-1	3.77	5.35	ND	13.7	8100

All results reported on a dry weight basis.



May 05, 2004

**Supplemental Report**

Chris Stransky  
AMEC Earth and Environmental  
5510 Morehouse Drive, Suite 300  
San Diego, CA 92121-3723

Subject:           **Calscience Work Order No.:**           **04-03-1864**  
                          **Client Reference:**                           **City of Buenaventura / SCR**

Dear Client:

Enclosed is an analytical report for the above-referenced project. The samples included in this report were received 03/31/04 and analyzed in accordance with the attached chain-of-custody. This report has been reported to present data on a dry weight basis.

Unless otherwise noted, all analytical testing was accomplished in accordance with the guidelines established in our Quality Assurance Program Manual, applicable standard operating procedures, and other related documentation. The original report of any subcontracted analysis is provided herein, and follows the standard Calscience data package. The results in this analytical report are limited to the samples tested and any reproduction thereof must be made in its entirety.

If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Sincerely,

  
Calscience Environmental  
Laboratories, Inc.  
Robert Stearns  
Project Manager

  
\_\_\_\_\_  
Michael J. Crisostomo  
Quality Assurance Manager

AMEC Earth and Environmental  
 5510 Morehouse Drive, Suite 300  
 San Diego, CA 92121-3723

Date Received: 03/31/04  
 Work Order No: 04-03-1864  
 Preparation: N/A  
 Method: EPA 160.3

Project: City of Buenaventura / SCR

Page 1 of 2

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
SCR A-1	04-03-1864-1	03/16/04	Solid	N/A	05/04/04	40504TSD1

Parameter	Result	RL	DF	Qual	Units
Solids, Total	92.2	0.1	1		%

SCR A-2	04-03-1864-2	03/16/04	Solid	N/A	05/04/04	40504TSD1
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Parameter	Result	RL	DF	Qual	Units
Solids, Total	83.5	0.1	1		%

SCR A-3	04-03-1864-3	03/16/04	Solid	N/A	05/04/04	40504TSD1
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Parameter	Result	RL	DF	Qual	Units
Solids, Total	81.9	0.1	1		%

SCR B-1	04-03-1864-4	03/16/04	Solid	N/A	05/04/04	40504TSD1
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Parameter	Result	RL	DF	Qual	Units
Solids, Total	78.1	0.1	1		%

SCR B-2	04-03-1864-5	03/16/04	Solid	N/A	05/04/04	40504TSD1
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Parameter	Result	RL	DF	Qual	Units
Solids, Total	94.9	0.1	1		%

SCR B-3	04-03-1864-6	03/16/04	Solid	N/A	05/04/04	40504TSD1
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Parameter	Result	RL	DF	Qual	Units
Solids, Total	87.0	0.1	1		%

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

AMEC Earth and Environmental  
5510 Morehouse Drive, Suite 300  
San Diego, CA 92121-3723

Date Received: 03/31/04  
Work Order No: 04-03-1864  
Preparation: N/A  
Method: EPA 160.3

Project: City of Buenaventura / SCR

Page 2 of 2

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
SCR B-4	04-03-1864-7	03/16/04	Solid	N/A	05/04/04	40504TSD1

Parameter	Result	RL	DF	Qual	Units
Solids, Total	80.9	0.1	1		%

SCR C-1	04-03-1864-8	03/16/04	Solid	N/A	05/04/04	40504TSD1
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Parameter	Result	RL	DF	Qual	Units
Solids, Total	98.3	0.1	1		%

SCR C-2	04-03-1864-9	03/16/04	Solid	N/A	05/04/04	40504TSD1
---------	--------------	----------	-------	-----	----------	-----------

Parameter	Result	RL	DF	Qual	Units
Solids, Total	83.0	0.1	1		%

SCR C-3	04-03-1864-10	03/16/04	Solid	N/A	05/04/04	40504TSD1
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Parameter	Result	RL	DF	Qual	Units
Solids, Total	83.9	0.1	1		%

SCR D-1	04-03-1864-11	03/16/04	Solid	N/A	05/04/04	40504TSD1
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Parameter	Result	RL	DF	Qual	Units
Solids, Total	83.7	0.1	1		%

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

AMEC Earth and Environmental  
 5510 Morehouse Drive, Suite 300  
 San Diego, CA 92121-3723

Date Received: 03/31/04  
 Work Order No: 04-03-1864  
 Preparation: EPA 3050B  
 Method: EPA 6020  
 Units: mg/kg

Project: City of Buenaventura / SCR

Page 1 of 2

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
SCR A-1	04-03-1864-1	03/16/04	Solid	04/02/04	04/02/04	040402L01

Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Copper	3.25	0.10	10.86		Selenium	ND	0.543	10.86	
Nickel	3.81	0.10	10.86		Zinc	12.1	1.0	10.86	

SCR A-2	04-03-1864-2	03/16/04	Solid	04/02/04	04/02/04	040402L01
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Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Copper	4.13	0.11	11.9		Selenium	ND	0.595	11.9	
Nickel	5.48	0.11	11.9		Zinc	16.2	1.1	11.9	

SCR A-3	04-03-1864-3	03/16/04	Solid	04/02/04	04/02/04	040402L01
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Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Copper	2.69	0.12	12.2		Selenium	ND	0.610	12.2	
Nickel	6.35	0.12	12.2		Zinc	11.5	1.2	12.2	

SCR B-1	04-03-1864-4	03/16/04	Solid	04/02/04	04/02/04	040402L01
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Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Copper	3.79	0.12	12.82		Selenium	ND	0.641	12.82	
Nickel	4.77	0.12	12.82		Zinc	15.7	1.2	12.82	

SCR B-2	04-03-1864-5	03/16/04	Solid	04/02/04	04/02/04	040402L01
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Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Copper	3.07	0.10	10.52		Selenium	ND	0.526	10.52	
Nickel	4.42	0.10	10.52		Zinc	12.4	1.0	10.52	

SCR B-3	04-03-1864-6	03/16/04	Solid	04/02/04	04/02/04	040402L01
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Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Copper	3.20	0.11	11.5		Selenium	ND	0.575	11.5	
Nickel	4.35	0.11	11.5		Zinc	12.5	1.1	11.5	

SCR B-4	04-03-1864-7	03/16/04	Solid	04/02/04	04/02/04	040402L01
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Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Copper	4.06	0.12	12.34		Selenium	ND	0.617	12.34	
Nickel	5.16	0.12	12.34		Zinc	15.4	1.2	12.34	

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

AMEC Earth and Environmental  
 5510 Morehouse Drive, Suite 300  
 San Diego, CA 92121-3723

Date Received: 03/31/04  
 Work Order No: 04-03-1864  
 Preparation: EPA 3050B  
 Method: EPA 6020  
 Units: mg/kg

Project: City of Buenaventura / SCR

Page 2 of 2

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
SCR C-1	04-03-1864-8	03/16/04	Solid	04/02/04	04/02/04	040402L01

Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Copper	2.87	0.10	10.2		Selenium	ND	0.510	10.2	
Nickel	4.09	0.10	10.2		Zinc	11.5	1.0	10.2	

SCR C-2	04-03-1864-9	03/16/04	Solid	04/02/04	04/02/04	040402L01
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Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Copper	3.00	0.12	12.04		Selenium	ND	0.602	12.04	
Nickel	4.35	0.12	12.04		Zinc	12.1	1.2	12.04	

SCR C-3	04-03-1864-10	03/16/04	Solid	04/02/04	04/02/04	040402L01
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Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Copper	2.91	0.11	11.9		Selenium	ND	0.595	11.9	
Nickel	4.34	0.11	11.9		Zinc	11.5	1.1	11.9	

SCR D-1	04-03-1864-11	03/16/04	Solid	04/02/04	04/02/04	040402L01
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Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Copper	3.77	0.11	11.9		Selenium	ND	0.595	11.9	
Nickel	5.35	0.11	11.9		Zinc	13.7	1.1	11.9	

Method Blank	096-10-002-293	N/A	Solid	04/02/04	04/02/04	040402L01
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Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Copper	ND	0.100	10		Selenium	ND	0.500	10	
Nickel	ND	0.100	10		Zinc	ND	1.00	10	

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

AMEC Earth and Environmental  
 5510 Morehouse Drive, Suite 300  
 San Diego, CA 92121-3723

Date Received: 03/31/04  
 Work Order No: 04-03-1864  
 Preparation: N/A  
 Method: EPA 9060

Project: City of Buenaventura / SCR

Page 1 of 2

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
SCR A-1	04-03-1864-1	03/16/04	Solid	N/A	04/06/04	40406TOCL1

Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Units
Carbon, Total Organic	2400	540	1.08		mg/kg

SCR A-2	04-03-1864-2	03/16/04	Solid	N/A	04/06/04	40406TOCL1
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Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Units
Carbon, Total Organic	4000	600	1.2		mg/kg

SCR A-3	04-03-1864-3	03/16/04	Solid	N/A	04/06/04	40406TOCL1
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Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Units
Carbon, Total Organic	3300	610	1.22		mg/kg

SCR B-1	04-03-1864-4	03/16/04	Solid	N/A	04/06/04	40406TOCL1
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Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Units
Carbon, Total Organic	2400	640	1.28		mg/kg

SCR B-2	04-03-1864-5	03/16/04	Solid	N/A	04/06/04	40406TOCL1
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Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Units
Carbon, Total Organic	2500	530	1.05		mg/kg

SCR B-3	04-03-1864-6	03/16/04	Solid	N/A	04/06/04	40406TOCL1
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Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Units
Carbon, Total Organic	3900	580	1.15		mg/kg

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

AMEC Earth and Environmental  
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 San Diego, CA 92121-3723

Date Received: 03/31/04  
 Work Order No: 04-03-1864  
 Preparation: N/A  
 Method: EPA 9060

Project: City of Buenaventura / SCR

Page 2 of 2

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
SCR B-4	04-03-1864-7	03/16/04	Solid	N/A	04/06/04	40406TOCL1

Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Units
Carbon, Total Organic	3800	620	1.24		mg/kg

SCR C-1	04-03-1864-8	03/16/04	Solid	N/A	04/06/04	40406TOCL1
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Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Units
Carbon, Total Organic	1700	510	1.02		mg/kg

SCR C-2	04-03-1864-9	03/16/04	Solid	N/A	04/06/04	40406TOCL1
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Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Units
Carbon, Total Organic	6700	600	1.2		mg/kg

SCR C-3	04-03-1864-10	03/16/04	Solid	N/A	04/06/04	40406TOCL1
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Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Units
Carbon, Total Organic	1400	600	1.19		mg/kg

SCR D-1	04-03-1864-11	03/16/04	Solid	N/A	04/06/04	40406TOCL1
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Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Units
Carbon, Total Organic	8100	600	1.19		mg/kg

Method Blank	099-06-013-22	N/A	Solid	N/A	04/06/04	40406TOCL1
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Parameter	Result	RL	DF	Qual	Units
Carbon, Total Organic	ND	500	1		mg/kg

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

AMEC Earth and Environmental  
 5510 Morehouse Drive, Suite 300  
 San Diego, CA 92121-3723

Date Received: 03/31/04  
 Work Order No: 04-03-1864  
 Preparation: N/A  
 Method: EPA 160.3

Project: City of Buenaventura / SCR

Quality Control Sample ID	Matrix	Instrument	Date Prepared:	Date Analyzed:	Duplicate Batch Number
SCR D-1	Solid	N/A	N/A	05/04/04	40504TSD1

Parameter	Sample Conc.	DUP Conc	RPD	RPD CL	Qualifiers
Solids, Total	83.7	84.6	1	0-25	



AMEC Earth and Environmental  
 5510 Morehouse Drive, Suite 300  
 San Diego, CA 92121-3723

Date Received: 03/31/04  
 Work Order No: 04-03-1864  
 Preparation: EPA 3050B  
 Method: EPA 6020

Project: City of Buenaventura / SCR

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
SCR B-2	Solid	ICP/MS A	04/02/04	04/02/04	040402S01

<u>Parameter</u>	<u>MS %REC</u>	<u>MSD %REC</u>	<u>%REC CL</u>	<u>RPD</u>	<u>RPD CL</u>	<u>Qualifiers</u>
Copper	102	99	80-120	2	0-20	
Nickel	100	98	80-120	2	0-20	
Selenium	104	101	80-120	3	0-20	
Zinc	104	100	80-120	3	0-20	

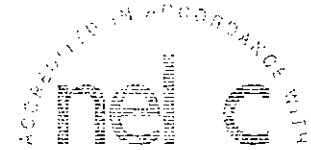
AMEC Earth and Environmental  
 5510 Morehouse Drive, Suite 300  
 San Diego, CA 92121-3723

Date Received: 03/31/04  
 Work Order No: 04-03-1864  
 Preparation: EPA 3050B  
 Method: EPA 6020

Project: City of Buenaventura / SCR

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	PDS/PSD Batch Number
SCR B-2	Solid	ICP/MS A	04/02/04	04/02/04	040402S01

Parameter	PDS %REC	PSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Copper	98	97	75-125	1	0-20	
Nickel	96	95	75-125	1	0-20	
Selenium	99	97	75-125	2	0-20	
Zinc	98	97	75-125	1	0-20	



AMEC Earth and Environmental  
 5510 Morehouse Drive, Suite 300  
 San Diego, CA 92121-3723

Date Received:  
 Work Order No:  
 Preparation:  
 Method:

N/A  
 04-03-1864  
 EPA 3050B  
 EPA 6020

Project: City of Buenaventura / SCR

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
096-10-002-293	Solid	ICP/MS A	04/02/04	04/05/04	040402L01

<u>Parameter</u>	<u>LCS %REC</u>	<u>LCSD %REC</u>	<u>%REC CL</u>	<u>RPD</u>	<u>RPD CL</u>	<u>Qualifiers</u>
Copper	98	98	80-120	0	0-20	
Nickel	95	94	80-120	1	0-20	
Selenium	94	93	80-120	1	0-20	
Zinc	97	97	80-120	1	0-20	

AMEC Earth and Environmental  
 5510 Morehouse Drive, Suite 300  
 San Diego, CA 92121-3723

Date Received: 03/31/04  
 Work Order No: 04-03-1864  
 Preparation: N/A  
 Method: EPA 9060

Project: City of Buenaventura / SCR

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
SCR A-1	Solid	TOC 4	N/A	04/06/04	40406TOCS1

<u>Parameter</u>	<u>MS %REC</u>	<u>MSD %REC</u>	<u>%REC CL</u>	<u>RPD</u>	<u>RPD CL</u>	<u>Qualifiers</u>
Carbon, Total Organic	97	93	70-130	4	0-25	



**Environmental Quality Control - Laboratory Control Sample**  
**Laboratories, Inc.**



AMEC Earth and Environmental  
 5510 Morehouse Drive, Suite 300  
 San Diego, CA 92121-3723

Date Received: N/A  
 Work Order No: 04-03-1864  
 Preparation: N/A  
 Method: EPA 9060

Project: City of Buenaventura / SCR

Quality Control Sample ID	Matrix	Instrument	Date Analyzed	Lab File ID	LCS Batch Number
099-06-013-22	Solid	TOC 4	04/06/04		40406TOCL1

Parameter	Conc Added	Conc Recovered	LCS %Rec	%Rec CL	Qualifiers
Carbon, Total Organic	6000	5700	96	80-120	





Work Order Number: 04-03-1864

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<u>Qualifier</u>	<u>Definition</u>
ND	Not detected at indicated reporting limit.

A handwritten signature or scribble in black ink, located at the bottom left of the page.

WORK ORDER #:

04 - 03 - 1864

Cooler 1 of 1

**SAMPLE RECEIPT FORM**

CLIENT: Amec

DATE: 3/31/4

**TEMPERATURE - SAMPLES RECEIVED BY:**

**CALSCIENCE COURIER:**

- Chilled, cooler with temperature blank provided.
- Chilled, cooler without temperature blank.
- Chilled and placed in cooler with wet ice.
- Ambient and placed in cooler with wet ice.
- Ambient temperature.
- 4.5 °C Temperature blank.

**LABORATORY (Other than Calscience Courier):**

- °C Temperature blank.
- °C IR thermometer.
- Ambient temperature.

Initial: [Signature]

**CUSTODY SEAL INTACT:**

Sample(s): \_\_\_\_\_ Cooler: \_\_\_\_\_ No (Not Intact) : \_\_\_\_\_ Not Applicable (N/A): [Signature]

Initial: [Signature]

**SAMPLE CONDITION:**

	Yes	No	N/A
Chain-Of-Custody document(s) received with samples.....	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sample container label(s) consistent with custody papers.....	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sample container(s) intact and good condition.....	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Correct containers for analyses requested.....	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Proper preservation noted on sample label(s).....	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
VOA vial(s) free of headspace.....	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Tedlar bag(s) free of condensation.....	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Initial: [Signature]

**COMMENTS:**

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**CALSCIENCE ENVIRONMENTAL LABORATORIES, INC.**

7440 LINCOLN WAY  
GARDEN GROVE, CA 92841-1432  
TEL: (714) 895-5494 • FAX: (714) 894-7501

**CHAIN OF CUSTODY RECORD**

Date 3/31/04

Page 1 of 2

LABORATORY CLIENT: <b>AMEC</b>		CLIENT PROJECT NAME / NUMBER: <b>City of Buena Vista / SCR</b>		P.O. NO.:
ADDRESS: <b>5510 Monarchs Dr</b>		PROJECT CONTACT: <b>Chris Stransky</b>		LAB USE ONLY: 0 3 1 8 6 4
CITY: <b>San Diego</b>	STATE: <b>CA</b>	ZIP: <b>92121</b>	SAMPLER(S) (SIGNATURE): <i>Chris Stransky</i>	
TEL: <b>858 458-9044</b>	FAX: <b>858 587-3961</b>	E-MAIL: <b>chris.stransky@amec.com</b>	COELT LOG CODE: <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	COOLER RECEIPT: TEMP: _____ °C

TURNAROUND TIME: Standard

SAME DAY    24 HR    48 HR    72 HR    5 DAYS    10 DAYS

SPECIAL REQUIREMENTS (ADDITIONAL COSTS MAY APPLY)

RWQCB REPORTING    COELT REPORTING

SPECIAL INSTRUCTIONS:

**REQUESTED ANALYSES**

LAB USE ONLY	GEIMS ID	SAMPLE ID	SAMPLING		MATRIX	NO. OF CONT.	TPH (G)	TPH (D) or	BTEX / MTBE (8021B)	HALOCARBONS (8021B)	VOCs (8260B)	VOCs (5035 / 8260B) EnCore	SVOCs (8270C)	PEST (8081A)	PCBs (8082)	EDB / DBCP (504.1) or (8011)	CAC, T22 METALS (6010B)	PNAs (8310)	VOCs (T0-14A) or (T0-15)	Handwritten: <b>Copper, Zn, Se, Ni, TOC</b>		
			DATE	TIME																X	X	
		SCR A-1	3/16/04		Sed	1															X	X
		A-2																				
		A-3																				
		B-1																				
		B-2																				
		B-3																				
		B-4																				
		C-1																				
		C-2																				
		C-3																				

Relinquished by: (Signature) <i>Chris Stransky</i>	Received by: (Signature) <i>[Signature]</i>	Date: <b>3/31/04</b>	Time: <b>1230</b>
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature) <i>[Signature]</i>	Received for Laboratory by: (Signature) <i>[Signature]</i>	Date: <b>3/31/4</b>	Time: <b>1700</b>

DISTRIBUTION: White with final report Green to File, Yellow and Pink to Client.  
Please note that pages 1 and 2 of 2 of our J/Cs are printed on the reverse side of the Yellow and Pink copies respectively.



**CALSCIENCE ENVIRONMENTAL  
LABORATORIES, INC.**

7440 LINCOLN WAY  
GARDEN GROVE, CA 92841-1432  
TEL: (714) 895-5494 • FAX: (714) 894-7501

**CHAIN OF CUSTODY RECORD**

Date 3/31/04

Page 2 of 2

LABORATORY CLIENT: <b>AMEC</b>					CLIENT PROJECT NAME / NUMBER: <b>City of Buena Vista / SCR</b>										P.O. NO.:																															
ADDRESS: <b>5510 Monchouse Dr</b>					PROJECT CONTACT: <b>Chris</b>										LAB. USE ONLY: <input type="checkbox"/> 0 <input checked="" type="checkbox"/> 3 <input type="checkbox"/> 7 <input type="checkbox"/> 8 <input type="checkbox"/> 6 <input type="checkbox"/> 4																															
CITY: <b>San Diego</b>		STATE: <b>CA</b>			ZIP: <b>92121</b>		SAMPLER(S): (SIGNATURE)					COELT LOG CODE <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		COOLER RECEIPT TEMP: _____ °C																																
TEL: <b>858 458-9044</b>		FAX: <b>858 587-3961</b>		E-MAIL: <b>chris.stransky@amec.com</b>			<b>REQUESTED ANALYSES</b> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>TPH (G)</td> <td>TPH (D) or</td> <td>BTEX / MTBE (8021B)</td> <td>HALOCARBONS (8021B)</td> <td>VOCs (8260B)</td> <td>VOCs (5035 / 8260B) EnCore</td> <td>SVOCs (8270C)</td> <td>PEST (8081A)</td> <td>PCBs (8082)</td> <td>EDB / DBCP (504.1) or (8011)</td> <td>CAC, T22 METALS (6010B)</td> <td>PNAs (8310)</td> <td>VOCs (TO-14A) or (TO-15)</td> <td><b>Cu, Se, Zn, Ni</b></td> <td><b>TAC</b></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>X</td> <td>X</td> </tr> </table>										TPH (G)	TPH (D) or	BTEX / MTBE (8021B)	HALOCARBONS (8021B)	VOCs (8260B)	VOCs (5035 / 8260B) EnCore	SVOCs (8270C)	PEST (8081A)	PCBs (8082)	EDB / DBCP (504.1) or (8011)	CAC, T22 METALS (6010B)	PNAs (8310)	VOCs (TO-14A) or (TO-15)	<b>Cu, Se, Zn, Ni</b>	<b>TAC</b>														X	X
TPH (G)	TPH (D) or	BTEX / MTBE (8021B)	HALOCARBONS (8021B)	VOCs (8260B)	VOCs (5035 / 8260B) EnCore	SVOCs (8270C)											PEST (8081A)	PCBs (8082)	EDB / DBCP (504.1) or (8011)	CAC, T22 METALS (6010B)	PNAs (8310)	VOCs (TO-14A) or (TO-15)	<b>Cu, Se, Zn, Ni</b>	<b>TAC</b>																						
																							X	X																						
TURNAROUND TIME: <b>Standard</b> <input type="checkbox"/> SAME DAY <input type="checkbox"/> 24 HR <input type="checkbox"/> 48 HR <input type="checkbox"/> 72 HR <input type="checkbox"/> 5 DAYS <input type="checkbox"/> 10 DAYS																																														
SPECIAL REQUIREMENTS (ADDITIONAL COSTS MAY APPLY) <input type="checkbox"/> RWQCB REPORTING <input type="checkbox"/> COELT REPORTING																																														
SPECIAL INSTRUCTIONS:																																														
LAB USE ONLY	GEIMS ID	SAMPLE ID	SAMPLING		MATRIX	NO. OF CONT.																																								
			DATE	TIME																																										
		<b>SCR D-1</b>	<b>3/16/04</b>		<b>Sed</b>	<b>1</b>																																								

Relinquished by: (Signature) 	Received by: (Signature) 	Date: <b>3/31/04</b>	Time: <b>1240</b>
Relinquished by: (Signature) 	Received by: (Signature) 	Date:	Time:
Relinquished by: (Signature) 	Received for Laboratory by: (Signature) 	Date: <b>3/31/4</b>	Time: <b>1700</b>

DISTRIBUTION: White with final report, Green to File, Yellow and Pink to Client.  
Please note that pages 1 and 2 of 2 of our T/Cs are printed on the reverse side of the Yellow and Pink copies respectively.

Q&Q Graphic (714) 898-9702

AMBIENT WATER SAMPLES

**Appendix Table F-2. Ambient Water Trace Metal Measurements**  
**City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event**  
**Sample Collection Date: 16 March 2004**

Sample	Form	Concentration ( $\mu\text{g/L}$ )			
		Copper	Nickel	Selenium	Zinc
Field Blank	Total	0.19	0.26	0.13	1.89
A-2	Total	4.49	4.18	1.73	22.3
	Dissolved	3.1	3.26	2.1	17.7
B-1	Total	3.75	3.26	0.61	22.5
	Dissolved	2.93	1.31	0.57	22
B-3	Total	3	5.04	4.54	3.98
	Dissolved	2.19	4.11	3.82	3.19
C-3	Total	1.95	6.26	2.51	2.43
	Dissolved	1.83	6.12	2.58	2.39



**CRG**

**Laboratories, Inc.**

2020 Del Amo Boulevard Suite 200, Torrance, CA 90501 • (310) 533-5190 • FAX (310) 533-5003 • [mborja@crqlabs.com](mailto:mborja@crqlabs.com)

---

May 5, 2004

AMEC Earth & Environmental  
5510 Morehouse Drive  
San Diego, CA 92121

Re: CRG Project ID # 2471  
AMEC City of Buena Ventura/ SCRE Project

ATTN: Mr. Nick Buhbe

CRG Laboratories is pleased to provide you with the enclosed analytical data report for your City of Buena Ventura/ SCRE Project. According to the chain-of-custody, 6 samples were received intact and cool at CRG on March 18, 2004. Per your instructions the samples were processed and analyzed for:

- Total and Dissolved Copper, Zinc, Selenium and Zinc By ICPMS Using EPA Methods 1640

Please don't hesitate to call if you have any questions and thank you very much for using our laboratory for your analytical needs.

Regards,  
Misty R. Borja  
Project Manager

Reviewed and Approved

  
Signature  
Not Verified

**Misty R.  
Borja**



Digitally signed by  
Misty R. Borja  
DN: cn=Misty R.  
Borja, o=CRG  
Manne  
Laboratories, Inc.,  
c=US  
Date: 2004.05.05  
10:03:08 -08'00'  
Location: Torrance

# **DATA REPORT**

# CRG Marine Laboratories, Inc.

2020 Del Amo Blvd., Suite 200, Torrance, CA 90501-1206 (310) 533-5190 FAX (310) 533-5003 crglabs@sbcglobal.net

## Trace Elements By EPA Method 1640 ICPMS #1: HP4500

CRG ID#: **16969** Replicate #: R1-Dissolved Project ID: 2471 Batch ID: 2471-9145 Matrix: Aqueous

Sample Description: Field Blank  
City of Buena Ventura/SCRE  
Client Name: AMEC Earth & Environmental  
Time Collected: 16:00  
Project Officer: Howard Bailey  
Date Sampled: 16-Mar-04 Date Processed: 05-Apr-04 Analyst: Pat Hershelman  
Date Received: 18-Mar-04 Date Analyzed: 23-Apr-04

CONSTITUENT	RESULT	MDL	ML	UNITS	DILUTION FACTOR
Copper (Cu)	0.19	0.005	0.01	µg/L	1
Nickel (Ni)	0.26	0.005	0.01	µg/L	1
Selenium (Se)	0.13	0.01	0.015	µg/L	1
Zinc (Zn)	1.89	0.005	0.01	µg/L	1

MDL= Method Detection Limit (CFR 40 Part 136); ML= Minimum Level (SWRCB); E= Estimated Value below the ML and above the MDL; ND= Not Detected

California ELAP Certificate # 2261

# CRG Marine Laboratories, Inc.

2020 Del Amo Blvd., Suite 200, Torrance, CA 90501-1206 (310) 533-5190 FAX (310) 533-5003 crglabs@sbcglobal.net

## Trace Elements By EPA Method 1640 ICPMS #1: HP4500

CRG ID#: **16969**    Replicate #: R1-Total    Project ID: 2471    Batch ID: 2471-9145    Matrix: Aqueous

Sample Description: Field Blank    Client Name: AMEC Earth & Environmental  
City of Buena Ventura/SCRE

Time Collected: 16:00    Project Officer: Howard Bailey

Date Sampled: 16-Mar-04    Date Processed: 05-Apr-04    Analyst: Pat Hershelman

Date Received: 18-Mar-04    Date Analyzed: 23-Apr-04

CONSTITUENT	RESULT	MDL	ML	UNITS	DILUTION FACTOR
Copper (Cu)	E 0.01	0.005	0.01	µg/L	1
Nickel (Ni)	0.03	0.005	0.01	µg/L	1
Selenium (Se)	0.05	0.01	0.015	µg/L	1
Zinc (Zn)	ND	0.005	0.01	µg/L	1

MDL= Method Detection Limit (CFR 40 Part 136); ML= Minimum Level (SWRCB); E= Estimated Value below the ML and above the MDL; ND= Not Detected

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## Trace Elements By EPA Method 1640 ICPMS #1: HP4500

CRG ID#: **16970** Replicate #: R1-Dissolved Project ID: 2471 Batch ID: 2471-9145 Matrix: Aqueous

Sample Description: SCRE-A2  
City of Buena Ventura/SCRE Client Name: AMEC Earth & Environmental

Time Collected: 12:27 Project Officer: Howard Bailey

Date Sampled: 16-Mar-04 Date Processed: 05-Apr-04 Analyst: Pat Hershelman

Date Received: 18-Mar-04 Date Analyzed: 23-Apr-04

CONSTITUENT	RESULT	MDL	ML	UNITS	DILUTION FACTOR
Copper (Cu)	3.1	0.005	0.01	µg/L	1
Nickel (Ni)	3.26	0.005	0.01	µg/L	1
Selenium (Se)	2.1	0.01	0.015	µg/L	1
Zinc (Zn)	17.7	0.005	0.01	µg/L	1

MDL= Method Detection Limit (CFR 40 Part 136); ML= Minimum Level (SWRCB); E= Estimated Value below the ML and above the MDL; ND= Not Detected

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## Trace Elements By EPA Method 1640 ICPMS #1: HP4500

CRG ID#: **16970** Replicate #: R1-Total Project ID: 2471 Batch ID: 2471-9145 Matrix: Aqueous

Sample SCRE-A2 Client Name: AMEC Earth & Environmental

Description: City of Buena Ventura/SCRE

Time Collected: 12:27

Project Officer: Howard Bailey

Date Sampled: 16-Mar-04

Date Processed: 05-Apr-04

Analyst: Pat Hershelman

Date Received: 18-Mar-04

Date Analyzed: 23-Apr-04

CONSTITUENT	RESULT	MDL	ML	UNITS	DILUTION FACTOR
Copper (Cu)	4.49	0.005	0.01	µg/L	1
Nickel (Ni)	4.18	0.005	0.01	µg/L	1
Selenium (Se)	1.73	0.01	0.015	µg/L	1
Zinc (Zn)	22.3	0.005	0.01	µg/L	1

MDL= Method Detection Limit (CFR 40 Part 136); ML= Minimum Level (SWRCB); E= Estimated Value below the ML and above the MDL; ND= Not Detected

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## Trace Elements By EPA Method 1640 ICPMS #1: HP4500

CRG ID#: **16971** Replicate #: R1-Dissolved Project ID: 2471 Batch ID: 2471-9145 Matrix: Aqueous

Sample Description: SCRE-A2Dup Client Name: AMEC Earth & Environmental  
City of Buena Ventura/SCRE

Time Collected: 12:27 Project Officer: Howard Bailey

Date Sampled: 16-Mar-04 Date Processed: 05-Apr-04 Analyst: Pat Hershelman

Date Received: 18-Mar-04 Date Analyzed: 23-Apr-04

CONSTITUENT	RESULT	MDL	ML	UNITS	DILUTION FACTOR
Copper (Cu)	2.95	0.005	0.01	µg/L	1
Nickel (Ni)	1.38	0.005	0.01	µg/L	1
Selenium (Se)	0.35	0.01	0.015	µg/L	1
Zinc (Zn)	20.1	0.005	0.01	µg/L	1

MDL= Method Detection Limit (CFR 40 Part 136); ML= Minimum Level (SWRCB); E= Estimated Value below the ML and above the MDL; ND= Not Detected

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## Trace Elements By EPA Method 1640 ICPMS #1: HP4500

CRG ID#: **16971** Replicate #: R1-Total Project ID: 2471 Batch ID: 2471-9145 Matrix: Aqueous

Sample Description: SCRE-A2Dup Client Name: AMEC Earth & Environmental  
City of Buena Ventura/SCRE

Time Collected: 12:27 Project Officer: Howard Bailey

Date Sampled: 16-Mar-04 Date Processed: 05-Apr-04 Analyst: Pat Hershelman

Date Received: 18-Mar-04 Date Analyzed: 23-Apr-04

CONSTITUENT	RESULT	MDL	ML	UNITS	DILUTION FACTOR
Copper (Cu)	4.49	0.005	0.01	µg/L	1
Nickel (Ni)	4.12	0.005	0.01	µg/L	1
Selenium (Se)	1.34	0.01	0.015	µg/L	1
Zinc (Zn)	22.2	0.005	0.01	µg/L	1

MDL= Method Detection Limit (CFR 40 Part 136); ML= Minimum Level (SWRCB); E= Estimated Value below the ML and above the MDL; ND= Not Detected

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## Trace Elements By EPA Method 1640 ICPMS #1: HP4500

CRG ID#: **16972** Replicate #: R1-Dissolved Project ID: 2471 Batch ID: 2471-9145 Matrix: Aqueous

Sample Description: SCRE-B1 Client Name: AMEC Earth & Environmental  
City of Buena Ventura/SCRE

Time Collected: 11:24 Project Officer: Howard Bailey

Date Sampled: 16-Mar-04 Date Processed: 05-Apr-04 Analyst: Pat Hershelman

Date Received: 18-Mar-04 Date Analyzed: 23-Apr-04

CONSTITUENT	RESULT	MDL	ML	UNITS	DILUTION FACTOR
Copper (Cu)	2.93	0.005	0.01	µg/L	1
Nickel (Ni)	1.31	0.005	0.01	µg/L	1
Selenium (Se)	0.57	0.01	0.015	µg/L	1
Zinc (Zn)	22	0.005	0.01	µg/L	1

MDL= Method Detection Limit (CFR 40 Part 136); ML= Minimum Level (SWRCB); E= Estimated Value below the ML and above the MDL; ND= Not Detected

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## Trace Elements By EPA Method 1640 ICPMS #1: HP4500

CRG ID#: **16972** Replicate #: R1-Total Project ID: 2471 Batch ID: 2471-9145 Matrix: Aqueous

Sample Description: SCRE-B1  
City of Buena Ventura/SCRE Client Name: AMEC Earth & Environmental

Time Collected: 11:24 Project Officer: Howard Bailey

Date Sampled: 16-Mar-04 Date Processed: 05-Apr-04 Analyst: Pat Hershelman

Date Received: 18-Mar-04 Date Analyzed: 23-Apr-04

CONSTITUENT	RESULT	MDL	ML	UNITS	DILUTION FACTOR
Copper (Cu)	3.75	0.005	0.01	µg/L	1
Nickel (Ni)	3.26	0.005	0.01	µg/L	1
Selenium (Se)	0.61	0.01	0.015	µg/L	1
Zinc (Zn)	22.5	0.005	0.01	µg/L	1

MDL= Method Detection Limit (CFR 40 Part 136); ML= Minimum Level (SWRCB); E= Estimated Value below the ML and above the MDL; ND= Not Detected

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## Trace Elements By EPA Method 1640 ICPMS #1: HP4500

CRG ID#: **16973** Replicate #: R1-Dissolved Project ID: 2471 Batch ID: 2471-9145 Matrix: Aqueous

Sample Description: SCRE-B3  
City of Buena Ventura/SCRE Client Name: AMEC Earth & Environmental

Time Collected: 13:17 Project Officer: Howard Bailey

Date Sampled: 16-Mar-04 Date Processed: 05-Apr-04 Analyst: Pat Hershelman

Date Received: 18-Mar-04 Date Analyzed: 23-Apr-04

CONSTITUENT	RESULT	MDL	ML	UNITS	DILUTION FACTOR
Copper (Cu)	2.19	0.005	0.01	µg/L	1
Nickel (Ni)	4.11	0.005	0.01	µg/L	1
Selenium (Se)	3.82	0.01	0.015	µg/L	1
Zinc (Zn)	3.19	0.005	0.01	µg/L	1

MDL= Method Detection Limit (CFR 40 Part 136); ML= Minimum Level (SWRCB); E= Estimated Value below the ML and above the MDL; ND= Not Detected

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## Trace Elements By EPA Method 1640 ICPMS #1: HP4500

CRG ID#: **16973** Replicate #: R1-Total Project ID: 2471 Batch ID: 2471-9145 Matrix: Aqueous

Sample Description: SCRE-B3 City of Buena Ventura/SCRE Client Name: AMEC Earth & Environmental

Time Collected: 13:17 Project Officer: Howard Bailey

Date Sampled: 16-Mar-04 Date Processed: 05-Apr-04 Analyst: Pat Hershelman

Date Received: 18-Mar-04 Date Analyzed: 23-Apr-04

CONSTITUENT	RESULT	MDL	ML	UNITS	DILUTION FACTOR
Copper (Cu)	3	0.005	0.01	µg/L	1
Nickel (Ni)	5.04	0.005	0.01	µg/L	1
Selenium (Se)	4.54	0.01	0.015	µg/L	1
Zinc (Zn)	3.98	0.005	0.01	µg/L	1

MDL= Method Detection Limit (CFR 40 Part 136); ML= Minimum Level (SWRCB); E= Estimated Value below the ML and above the MDL; ND= Not Detected

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## Trace Elements By EPA Method 1640 ICPMS #1: HP4500

CRG ID#: **16974** Replicate #: R1-Dissolved Project ID: 2471 Batch ID: 2471-9145 Matrix: Aqueous

Sample Description: SCRE-C3 Client Name: AMEC Earth & Environmental

City of Buena Ventura/SCRE

Time Collected: 08:30

Project Officer: Howard Bailey

Date Sampled: 16-Mar-04

Date Processed: 05-Apr-04

Analyst: Pat Hershelman

Date Received: 18-Mar-04

Date Analyzed: 23-Apr-04

CONSTITUENT	RESULT	MDL	ML	UNITS	DILUTION FACTOR
Copper (Cu)	1.83	0.005	0.01	µg/L	1
Nickel (Ni)	6.12	0.005	0.01	µg/L	1
Selenium (Se)	2.58	0.01	0.015	µg/L	1
Zinc (Zn)	2.39	0.005	0.01	µg/L	1

MDL= Method Detection Limit (CFR 40 Part 136); ML= Minimum Level (SWRCB); E= Estimated Value below the ML and above the MDL; ND= Not Detected

California ELAP Certificate # 2261



# CRG Marine Laboratories, Inc.

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## Trace Elements By EPA Method 1640 ICPMS #1: HP4500

CRG ID#: **16974** Replicate #: R2-Dissolved Project ID: 2471 Batch ID: 2471-9145 Matrix: Aqueous

Sample Description: SCRE-C3  
City of Buena Ventura/SCRE Client Name: AMEC Earth & Environmental

Time Collected: 08:30 Project Officer: Howard Bailey

Date Sampled: 16-Mar-04 Date Processed: 05-Apr-04 Analyst: Pat Hershelman

Date Received: 18-Mar-04 Date Analyzed: 23-Apr-04

CONSTITUENT	RESULT	MDL	ML	UNITS	DILUTION FACTOR
Copper (Cu)	1.95	0.005	0.01	µg/L	1
Nickel (Ni)	6.26	0.005	0.01	µg/L	1
Selenium (Se)	2.51	0.01	0.015	µg/L	1
Zinc (Zn)	2.43	0.005	0.01	µg/L	1

MDL= Method Detection Limit (CFR 40 Part 136); ML= Minimum Level (SWRCB); E= Estimated Value below the ML and above the MDL; ND= Not Detected

California ELAP Certificate # 2261

# CRG Marine Laboratories, Inc.

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## Trace Elements By EPA Method 1640 ICPMS #1: HP4500

CRG ID#: **16974** Replicate #: R1-Total Project ID: 2471 Batch ID: 2471-9145 Matrix: Aqueous

Sample Description: SCRE-C3 Client Name: AMEC Earth & Environmental  
City of Buena Ventura/SCRE

Time Collected: 08:30 Project Officer: Howard Bailey

Date Sampled: 16-Mar-04 Date Processed: 05-Apr-04 Analyst: Pat Hershelman

Date Received: 18-Mar-04 Date Analyzed: 23-Apr-04

CONSTITUENT	RESULT	MDL	ML	UNITS	DILUTION FACTOR
Copper (Cu)	1.89	0.005	0.01	µg/L	1
Nickel (Ni)	6.79	0.005	0.01	µg/L	1
Selenium (Se)	1.67	0.01	0.015	µg/L	1
Zinc (Zn)	0.83	0.005	0.01	µg/L	1

MDL= Method Detection Limit (CFR 40 Part 136); ML= Minimum Level (SWRCB); E= Estimated Value below the ML and above the MDL; ND= Not Detected

California ELAP Certificate # 2261

# CRG Marine Laboratories, Inc.

2020 Del Amo Blvd., Suite 200, Torrance, CA 90501-1206 (310) 533-5190 FAX (310) 533-5003 crglabs@sbcglobal.net

## Trace Elements By EPA Method 1640 ICPMS #1: HP4500

CRG ID#: **16974** Replicate #: R2-Total Project ID: 2471 Batch ID: 2471-9145 Matrix: Aqueous

Sample Description: SCRE-C3 City of Buena Ventura/SCRE Client Name: AMEC Earth & Environmental

Time Collected: 08:30 Project Officer: Howard Bailey

Date Sampled: 16-Mar-04 Date Processed: 05-Apr-04 Analyst: Pat Hershelman

Date Received: 18-Mar-04 Date Analyzed: 23-Apr-04

CONSTITUENT	RESULT	MDL	ML	UNITS	DILUTION FACTOR
Copper (Cu)	1.94	0.005	0.01	µg/L	1
Nickel (Ni)	6.79	0.005	0.01	µg/L	1
Selenium (Se)	2.97	0.01	0.015	µg/L	1
Zinc (Zn)	0.9	0.005	0.01	µg/L	1

MDL= Method Detection Limit (CFR 40 Part 136); ML= Minimum Level (SWRCB); E= Estimated Value below the ML and above the MDL; ND= Not Detected

California ELAP Certificate # 2261

# **QUALITY CONTROL REPORT**

# CRG Marine Laboratories, Inc.

2020 Del Amo Blvd., Suite 200, Torrance, CA 90501-1206 (310) 533-5190 FAX (310) 533-5003 crglabs@sbcglobal.net

## Trace Elements By EPA Method 1640 ICPMS #1: HP4500

CRG ID#: **16864** Replicate #: B1 Project ID: 2471 Batch ID: 2471-9145 Matrix: DI Water

Sample Description: QAQC  
Procedural Blank Client Name: AMEC Earth & Environmental

Time Collected: Project Officer: Howard Bailey

Date Sampled: Date Processed: 05-Apr-04 Analyst: Pat Hershelman

Date Received: Date Analyzed: 23-Apr-04

CONSTITUENT	RESULT	MDL	ML	UNITS	DILUTION FACTOR
Copper (Cu)	ND	0.005	0.01	µg/L	1
Nickel (Ni)	ND	0.005	0.01	µg/L	1
Selenium (Se)	ND	0.01	0.015	µg/L	1
Zinc (Zn)	ND	0.005	0.01	µg/L	1

MDL= Method Detection Limit (CFR 40 Part 136); ML= Minimum Level (SWRCB); E= Estimated Value below the ML and above the MDL; ND= Not Detected

California ELAP Certificate # 2261

# CRG Marine Laboratories, Inc.

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## Trace Elements By EPA Method 1640 ICPMS #1: HP4500

CRG ID#: **16954** Replicate #: LCM1 Project ID: 2471 Batch ID: 2471-9145 Matrix: Seawater

Sample Description: QAQC LCM-CRG Seawater Client Name: AMEC Earth & Environmental

Time Collected: Project Officer: Howard Bailey

Date Sampled: Date Processed: 05-Apr-04 Analyst: Pat Hershelman

Date Received: Date Analyzed: 23-Apr-04

CONSTITUENT	RESULT	MDL	ML	UNITS	DILUTION FACTOR
Copper (Cu)	0.84	0.005	0.01	µg/L	1
Nickel (Ni)	0.61	0.005	0.01	µg/L	1
Selenium (Se)	2.97	0.01	0.015	µg/L	1
Zinc (Zn)	1.83	0.005	0.01	µg/L	1

MDL= Method Detection Limit (CFR 40 Part 136); ML= Minimum Level (SWRCB); E= Estimated Value below the ML and above the MDL; ND= Not Detected

California ELAP Certificate # 2261

# CRG Marine Laboratories, Inc.

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## Trace Elements By EPA Method 1640 ICPMS #1: HP4500

CRG ID#: **16954** Replicate #: LCM2 Project ID: 2471 Batch ID: 2471-9145 Matrix: Seawater

Sample Description: QAQC LCM-CRG Seawater Client Name: AMEC Earth & Environmental

Time Collected: Project Officer: Howard Bailey

Date Sampled: Date Processed: 05-Apr-04 Analyst: Pat Hershelman

Date Received: Date Analyzed: 23-Apr-04

CONSTITUENT	RESULT	MDL	ML	UNITS	DILUTION FACTOR
Copper (Cu)	1.02	0.005	0.01	µg/L	1
Nickel (Ni)	0.72	0.005	0.01	µg/L	1
Selenium (Se)	3.89	0.01	0.015	µg/L	1
Zinc (Zn)	2.07	0.005	0.01	µg/L	1

MDL= Method Detection Limit (CFR 40 Part 136); ML= Minimum Level (SWRCB); E= Estimated Value below the ML and above the MDL; ND= Not Detected

California ELAP Certificate # 2261

# CRG Marine Laboratories, Inc.

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## QAQC REPORT- ACCURACY Trace Elements

CRG ID#: **16954** Replicate #: MS1 Project ID: 2471 Batch ID 2471-9145 Matrix: Seawater

Sample Description: QAQC LCM-CRG Seawater Client Name: AMEC Earth & Environmental

Project Officer: Howard Bailey

Date Sampled: Date Processed: 05-Apr-04 Analyst: Pat Hershelman

Date Received: Date Analyzed: 23-Apr-04

CONSTITUENT	% RECOVERY	TRUE VALUE	ACCEPTANCE RANGE	COMMENT
Copper (Cu)	87	20 µg/L	72 - 128%	PASS
Nickel (Ni)	95	20 µg/L	68 - 118%	PASS
Selenium (Se)	85	20 µg/L	55 - 110%	PASS
Zinc (Zn)	77	20 µg/L	62 - 108%	PASS



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## QAQC REPORT- ACCURACY Trace Elements

CRG ID#: **16954** Replicate #: MS2 Project ID: 2471 Batch ID 2471-9145 Matrix: Seawater

Sample Description: QAQC LCM-CRG Seawater Client Name: AMEC Earth & Environmental

Project Officer: Howard Bailey

Date Sampled: Date Processed: 05-Apr-04 Analyst: Pat Hershelman

Date Received: Date Analyzed: 23-Apr-04

CONSTITUENT	% RECOVERY	TRUE VALUE	ACCEPTANCE RANGE	COMMENT
Copper (Cu)	88	20 µg/L	72 - 128%	PASS
Nickel (Ni)	96	20 µg/L	68 - 118%	PASS
Selenium (Se)	87	20 µg/L	55 - 110%	PASS
Zinc (Zn)	79	20 µg/L	62 - 108%	PASS

APPENDIX G  
FIELD COLLECTION DATA

## SEDIMENT SAMPLES

### Appendix Table G-1. Field Sample Collection Summary

City of Beunaventura - Santa Clara River Estuary Wet Weather Sampling Event

Sample Collection Date: 16 March 2004

Site	Collection Time <sup>a</sup>	Latitude 34°...	Longitude 119°...	Mean Water Sample Depth (m)	Mean Sediment Grab Penetration Depth (cm)
A-1	1210	13.982	15.895	0.2	4-5
A-2	1227	13.885	15.840	0.3	4-5
A-3	1243	13.790	15.813	0.8	4-5
B-1	1124	14.091	15.782	0.3	5-6
B-2	1200	13.970	15.706	0.0	3-4
B-3	1317	13.917	15.655	0.1	4-5
B-4	1338	13894	15.570	0.0	6
C-1	0913	14.067	15.397	0.0	4-5
C-2	0902	14.054	15.396	0.0	4-5
C-3	0830	14.031	15.394	0.3	4-5
D-1	0919	14.070	15.341	0.1	3.4

<sup>a</sup> Start of collection time at each site location

m

Santa Clara River Estuary Evaluation  
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BENTHIC SAMPLE COLLECTION DATA SHEET

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Station: <u>A-1</u>	Date: <u>3/16/04</u>
Vessel Name:	Arrival Time: <u>12:10</u> Depart Time:
Grab Sampler Type: <u>Van Dorn</u>	Latitude: <u>32° 34' 13.982</u> Longitude: <u>114° 15.895</u>
Weather: <u>Foggy</u>	Wind (kts/dir): <u>5W</u> Sampler Initials: <u>SC, RB, SM</u>

Grab Num.	Field Rep (A,B,C)	Sample Depth (ft)	Pen. Depth (cm)	% Intact/ Volume (L)	Sed. Comp <sup>3</sup>	Sed. Color <sup>4</sup>	Sed. Odor <sup>5</sup>	Grab Sample Type <sup>6</sup>	Comments: Sample Description, # of Macroinverts, Photo?
1		6"	4-5		Sand w/ cobble w/ clay	Tan surface Black mud	NONE		<del>Fine Amphipods</del> 3 photos.
2									
3									
4									
5									
6									
7									
8									
9									
10									

<sup>1</sup> Weather List: clear, partly cloudy, continuous cloud layer, fog, haze, drizzle, rain, showers, thunderstorms

<sup>2</sup> Direction in compass headings: N, S, E, W, NE, NW, SE, SW

<sup>3</sup> Sediment Composition: coarse sand, fine sand, sil/clay, gravel, shell hash

<sup>4</sup> Sediment Color: brown, tan, black, gray, olive green, red

<sup>5</sup> Sediment Odor: none, petroleum, hydrogen sulfide, other

<sup>6</sup> Grab Type: infauna (INF), sediment chemistry (Chem), toxicity (Tox)

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BENTHIC SAMPLE COLLECTION DATA SHEET

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Station: <u>A-2</u>	Date: <u>3/16/04</u>
Vessel Name: _____	Arrival Time: <u>12:27</u>
Grab Sampler Type: <u>Vanier</u>	Depart Time: _____
Latitude: <u>32° 34' 13.885</u>	Longitude: <u>117° 19' 15.840</u>
Weather <sup>1</sup> : _____	Wind (kts/dir) <sup>2</sup> : _____
Sampler Initials: _____	

Grab Num.	Field Rep (A,B,C)	Sample Depth (ft)	Pen. Depth (cm)	% Intact/Volume (L)	Sed. Comp <sup>3</sup>	Sed. Color <sup>4</sup>	Sed. Odor <sup>5</sup>	Grab Sample Type <sup>6</sup>	Comments: Sample Description, # of Macroinverts, Photo?
1	A-2	1'	4-5 cm						Discharge channel <sup>near</sup> outlet to main creek channel
2									4-5' mm layer fine brown surface. Rest is uniform tan grey sand
3									
4									
5									
6									
7									
8									
9									
10									

<sup>1</sup> Weather List: clear, partly cloudy, continuous cloud layer, fog, haze, drizzle, rain, showers, thunderstorms

<sup>2</sup> Direction in compass headings: N, S, E, W, NE, NW, SE, SW

<sup>3</sup> Sediment Composition: coarse sand, fine sand, silt/clay, gravel, shell hash

<sup>4</sup> Sediment Color: brown, tan, black, gray, olive green, red

<sup>5</sup> Sediment Odor: none, petroleum, hydrogen sulfide, other

<sup>6</sup> Grab Type: infauna (INF), sediment chemistry (Chem), toxicity (Tox)

**Santa Clara River Estuary Evaluation**  
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BENTHIC SAMPLE COLLECTION DATA SHEET

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Station: <u>A-3</u>	Date: <u>3/16/04</u>
Vessel Name:	Arrival Time: <u>12:43</u> Depart Time:
Grab Sampler Type: <u>Vanvane</u>	Latitude: <u>32° 34' 13.790</u> Longitude: <u>117° 19' 15.813</u>
Weather <sup>1</sup> :	Wind (kts/dir) <sup>2</sup> : Sampler Initials: <u>SC, RGS, SM</u>

Grab Num.	Field Rep (A,B,C)	Sample Depth (ft)	Pen. Depth (cm)	% Intact/Volume (L)	Sed. Comp <sup>3</sup>	Sed. Color <sup>4</sup>	Sed. Odor <sup>5</sup>	Grab Sample Type <sup>6</sup>	Comments: Sample Description, # of Macroinverts, Photo?
1	A-3	2.5	4-5		<del>Sand</del>	TAN-BROWN	NONE		consistent medium sand
2						with some black			sed. comp
3									
4									
5									
6									
7									
8									
9									
10									

<sup>1</sup> Weather List: clear, partly cloudy, continuous cloud layer, fog, haze, drizzle, rain, showers, thunderstorms  
<sup>2</sup> Direction in compass headings: N, S, E, W, NE, NW, SE, SW  
<sup>3</sup> Sediment Composition: coarse sand, fine sand, silt/clay, gravel, shell hash  
<sup>4</sup> Sediment Color: brown, tan, black, gray, olive green, red  
<sup>5</sup> Sediment Odor: none, petroleum, hydrogen sulfide, other  
<sup>6</sup> Grab Type: infauna (INF), sediment chemistry (Chem), toxicity (Tox)

**Santa Clara River Estuary Evaluation**  
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BENTHIC SAMPLE COLLECTION DATA SHEET

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Station: <u>B-1</u>	Date: <u>3/16/04</u>
Vessel Name: <u>Vanessa</u>	Arrival Time: <u>11:24</u> Depart Time: _____
Grab Sampler Type: _____	Latitude: <u>32° 34' 14.091</u> Longitude: <u>117° 19' 15.782</u>
Weather: <u>Foggy</u>	Wind (kts/dir): <u>SW</u> Sampler Initials: <u>SC, GR, SM</u>

Grab Num.	Field Rep (A,B,C)	Sample Depth (ft)	Pen. Depth (cm)	% Intact/ Volume (L)	Sed. Comp <sup>3</sup>	Sed. Color <sup>4</sup>	Sed. Odor <sup>5</sup>	Grab Sample Type <sup>6</sup>	Comments: Sample Description, # of Macroinverts, Photo?
1	B-1	1'	5-6 cm		uniform sand	3mm <del>to 1mm</del> <del>tan</del>		Vanessa	
2									
3									
4									
5									
6									
7									
8									
9									
10									

<sup>1</sup> Weather List: clear, partly cloudy, continuous cloud layer, fog, haze, drizzle, rain, showers, thunderstorms  
<sup>2</sup> Direction in compass headings: N, S, E, W, NE, NW, SE, SW  
<sup>3</sup> Sediment Composition: coarse sand, fine sand, silt/clay, gravel, shell hash  
<sup>4</sup> Sediment Color: brown, tan, black, gray, olive green, red  
<sup>5</sup> Sediment Odor: none, petroleum, hydrogen sulfide, other  
<sup>6</sup> Grab Type: infauna (INF), sediment chemistry (Chem), toxicity (Tox)



Santa Clara River Estuary Evaluation  
City of Buenaventura  
Oct 2003 - Oct 2004

BENTHIC SAMPLE COLLECTION DATA SHEET

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Station: <u>B-2</u>	Date: <u>3/16/04</u>
Vessel Name: <u>Vanner</u>	Arrival Time: <u>12:00</u> Depart Time: _____
Grab Sampler Type: _____	Latitude: <u>32° 39' 13.970</u> Longitude: <u>117° 19' 15.706</u>
Weather <sup>1</sup> : <u>Foggy</u>	Wind (kts/dir) <sup>2</sup> : <u>SW</u> Sampler Initials: <u>SC, RG, SM</u>

Grab Num.	Field Rep (A,B,C)	Sample Depth (ft)	Pen. Depth (cm)	% Intact/ Volume (L)	Sed. Comp <sup>3</sup>	Sed. Color <sup>4</sup>	Sed. Odor <sup>5</sup>	Grab Sample Type <sup>6</sup>	Comments: Sample Description, # of Macroinverts, Photo?
1		<u>0</u> <u>No water</u>	<u>3-4</u> <u>cm</u>		<u>Sandy/Tan</u> <u>some silt</u>		<u>none</u>		<u>Southern</u> <u>Dry, Edge of Reeds</u>
2									
3									
4									
5									
6									
7									
8									
9									
10									

<sup>1</sup> Weather List: clear, partly cloudy, continuous cloud layer, fog, haze, drizzle, rain, showers, thunderstorms  
<sup>2</sup> Direction in compass headings: N, S, E, W, NE, NW, SE, SW  
<sup>3</sup> Sediment Composition: coarse sand, fine sand, silt/clay, gravel, shell hash  
<sup>4</sup> Sediment Color: brown, tan, black, gray, olive green, red  
<sup>5</sup> Sediment Odor: none, petroleum, hydrogen sulfide, other  
<sup>6</sup> Grab Type: infauna (INF), sediment chemistry (Chem), toxicity (Tox)

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BENTHIC SAMPLE COLLECTION DATA SHEET

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Station: <u>B-3</u>	Date: <u>3/16/04</u>
Vessel Name: _____	Arrival Time: <u>1:17</u> Depart Time: _____
Grab Sampler Type: <u>Vaneev</u>	Latitude: <u>32° 34' 13.917</u> Longitude: <u>117° 119' 15.655</u>
Weather <sup>1</sup> : <u>Foggy (cold)</u>	Wind (kts/dir) <sup>2</sup> : <u>5W</u> Sampler Initials: <u>SC, RG, SM</u>

Grab Num.	Field Rep (A,B,C)	Sample Depth (ft)	Pen. Depth (cm)	% Intact/ Volume (L)	Sed. Comp <sup>3</sup>	Sed. Color <sup>4</sup>	Sed. Odor <sup>5</sup>	Grab Sample Type <sup>6</sup>	Comments: Sample Description, # of Macroinverts, Photo?
1		3"	4-5 cm		coarse Sandy w/ Brown top layer (2-3 mm)		NONE		Top layer sticky
2									
3									
4									
5									
6									
7									
8									
9									
10									

<sup>1</sup> Weather List: clear, partly cloudy, continuous cloud layer, fog, haze, drizzle, rain, showers, thunderstorms  
<sup>2</sup> Direction in compass headings: N, S, E, W, NE, NW, SE, SW  
<sup>3</sup> Sediment Composition: coarse sand, fine sand, silt/clay, gravel, shell hash  
<sup>4</sup> Sediment Color: brown, tan, black, gray, olive green, red  
<sup>5</sup> Sediment Odor: none, petroleum, hydrogen sulfide, other  
<sup>6</sup> Grab Type: infauna (INF), sediment chemistry (Chem), toxicity (Tox)

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BENTHIC SAMPLE COLLECTION DATA SHEET

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Station: <u>B-4</u>	Date: <u>3/16/04</u>
Vessel Name:	Arrival Time: <u>1:38</u> Depart Time:
Grab Sampler Type: <u>Vanner</u>	Latitude: <u>32° 34' 13.894</u> Longitude: <u>117° 19' 15.570</u>
Weather <sup>1</sup> : <u>Foggy (cold)</u>	Wind (kts/dir) <sup>2</sup> : <u>5W</u> Sampler Initials: <u>SC, RG, SM</u>

Grab Num.	Field Rep (A,B,C)	Sample Depth (ft)	Pen. Depth (cm)	% Intact/Volume (L)	Sed. Comp <sup>3</sup>	Sed. Color <sup>4</sup>	Sed. Odor <sup>5</sup>	Grab Sample Type <sup>6</sup>	Comments: Sample Description, # of Macroinverts, Photo?
1	B-4	0	6cm		Uniform Sand	Grey	NONE		2mm fine Brown layer (organic)
2									
3									
4									
5									
6									
7									
8									
9									
10									

<sup>1</sup> Weather List: clear, partly cloudy, continuous cloud layer, fog, haze, drizzle, rain, showers, thunderstorms  
<sup>2</sup> Direction in compass headings: N, S, E, W, NE, NW, SE, SW  
<sup>3</sup> Sediment Composition: coarse sand, fine sand, silt/clay, gravel, shell hash  
<sup>4</sup> Sediment Color: brown, tan, black, gray, olive green, red  
<sup>5</sup> Sediment Odor: none, petroleum, hydrogen sulfide, other  
<sup>6</sup> Grab Type: infauna (INF), sediment chemistry (Chem), toxicity (Tox)

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BENTHIC SAMPLE COLLECTION DATA SHEET

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Station: <u>SCR C-1</u>	Date: <u>3/16/04</u>
Vessel Name:	Arrival Time: <u>9:13</u> Depart Time:
Grab Sampler Type: <u>Vanueen</u>	Latitude: <u>32° 34' 14.067</u> Longitude: <u>117° 15.397</u>
Weather <sup>1</sup> :	Wind (kts/dir) <sup>2</sup> : Sampler Initials: <u>CS, RB, SM</u>

Grab Num.	Field Rep (A,B,C)	Sample Depth (ft)	Pen. Depth (cm)	% Intact/ Volume (L)	Sed. Comp <sup>3</sup>	Sed. Color <sup>4</sup>	Sed. Odor <sup>5</sup>	Grab Sample Type <sup>6</sup>	Comments: Sample Description, # of Macroinverts, Photo?
1	C-1	0	4-5		Sandy Gravel	Tan			Dry
2									
3									
4									
5									
6									
7									
8									
9									
10									

<sup>1</sup> Weather List: clear, partly cloudy, continuous cloud layer, fog, haze, drizzle, rain, showers, thunderstorms

<sup>2</sup> Direction in compass headings: N, S, E, W, NE, NW, SE, SW

<sup>3</sup> Sediment Composition: coarse sand, fine sand, silt/clay, gravel, shell hash

<sup>4</sup> Sediment Color: brown, tan, black, gray, olive green, red

<sup>5</sup> Sediment Odor: none, petroleum, hydrogen sulfide, other

<sup>6</sup> Grab Type: infauna (INF), sediment chemistry (Chem), toxicity (Tox)

**Santa Clara River Estuary Evaluation  
City of Buenaventura  
Oct 2003 - Oct 2004**

BENTHIC SAMPLE COLLECTION DATA SHEET

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Station: <u>SCR-C-2</u>	Date: <u>3/16/04</u>
Vessel Name: <u>Vanuee</u>	Arrival Time: <u>9:02</u> Depart Time:
Grab Sampler Type:	Latitude: <u>32° 34' 14.054</u> Longitude: <u>119° 15.396</u>
Weather <sup>1</sup> : <u>overcast</u>	Wind (kts/dir) <sup>2</sup> : <u>5W</u> Sampler Initials: <u>CS, RG, SM</u>

Grab Num.	Field Rep (A,B,C)	Sample Depth (ft)	Pen. Depth (cm)	% Intact/ Volume (L)	Sed. Comp <sup>3</sup>	Sed. Color <sup>4</sup>	Sed. Odor <sup>5</sup>	Grab Sample Type <sup>6</sup>	Comments: Sample Description, # of Macroinverts, Photo?
1	C-2	<u>0</u> <i>no water</i>	<u>4-5</u>		<u>fine</u> <i>surface</i> <u>coarse sand</u> <u>gravel</u>	<u>Brown</u> <u>gray</u> <u>black</u>		<u>Vanuee</u>	<u>Depositional material</u> <u>Fine surface log 1-2mm (Brown)</u> <u>Under coarse sand &amp; gravel</u>
2									
3									
4									
5									
6									
7									
8									
9									
10									

<sup>1</sup> Weather List: clear, partly cloudy, continuous cloud layer, fog, haze, drizzle, rain, showers, thunderstorms  
<sup>2</sup> Direction in compass headings: N, S, E, W, NE, NW, SE, SW  
<sup>3</sup> Sediment Composition: coarse sand, fine sand, silt/clay, gravel, shell hash  
<sup>4</sup> Sediment Color: brown, tan, black, gray, olive green, red  
<sup>5</sup> Sediment Odor: none, petroleum, hydrogen sulfide, other  
<sup>6</sup> Grab Type: infauna (INF), sediment chemistry (Chem), toxicity (Tox)

**Santa Clara River Estuary Evaluation  
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**BENTHIC SAMPLE COLLECTION DATA SHEET**

Station: <del>SEP</del> C-3	Date: 9/30/03
Vessel Name: NA	Arrival Time: 8:30
Grab Sampler Type:	Depart Time:
Latitude: 32° 39' 4.031	Longitude: 117° 15.394
Weather <sup>1</sup> : overcast	Wind (kts/dir) <sup>2</sup> : SW
Sampler Initials: GSM, CS, RB	

Grab Num.	Field Rep (A,B,C)	Sample Depth (ft)	Pen. Depth (cm)	% Intact/ Volume (L)	Sed. Comp <sub>3</sub>	Sed. Color <sub>4</sub>	Sed. Odor <sub>5</sub>	Grab Sample Type <sub>6</sub>	Comments: Sample Description, # of Macroinverts, Photo?
1	C-3	1'	4.5cm		Gravel/Sand	Mixed (tan)	NOR	Vanveen	Amphipod
2									
3									
4									
5									
6									
7									
8									
9									
10									

<sup>1</sup> Weather List: clear, partly cloudy, continuous cloud layer, fog, haze, drizzle, rain, showers, thunderstorms  
<sup>2</sup> Direction in compass headings: N, S, E, W, NE, NW, SE, SW  
<sup>3</sup> Sediment Composition: coarse sand, fine sand, silt/clay, gravel, shell hash  
<sup>4</sup> Sediment Color: brown, tan, black, gray, olive green, red  
<sup>5</sup> Sediment Odor: none, petroleum, hydrogen sulfide, other  
<sup>6</sup> Grab Type: infauna (INF), sediment chemistry (Chem), toxicity (Tox)

**Santa Clara River Estuary Evaluation  
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**BENTHIC SAMPLE COLLECTION DATA SHEET**

Station: <u>D-1</u>	Date: <u>3/16/04</u>
Vessel Name: _____	Arrival Time: <u>9:19</u>
Grab Sampler Type: <u>Vanuein</u>	Depart Time: _____
Latitude: <u>32° 34' 14.070</u>	Longitude: <u>117° 19' 15.341</u>
Weather <sup>1</sup> : _____	Wind (kts/dir) <sup>2</sup> : _____
	Sampler Initials: <u>CS</u>

Grab Num.	Field Rep (A,B,C)	Sample Depth (ft)	Pen. Depth (cm)	% Intact/ Volume (L)	Sed. Comp <sub>3</sub>	Sed. Color <sub>4</sub>	Sed. Odor <sub>5</sub>	Grab Sample Type <sub>6</sub>	Comments: Sample Description, # of Macroinverts, Photo?
1	D-1	4" incl	<del>3-4</del> 3-4		Cobble	Mixed			Cobble top layer / Gravel
2	D-1	Water edge	3-4		Sandy	Grey / tan			Sandy
3									
4									
5									
6									
7									
8									
9									
10									

<sup>1</sup> Weather List: clear, partly cloudy, continuous cloud layer, fog, haze, drizzle, rain, showers, thunderstorms  
<sup>2</sup> Direction in compass headings: N, S, E, W, NE, NW, SE, SW  
<sup>3</sup> Sediment Composition: coarse sand, fine sand, silt/clay, gravel, shell hash  
<sup>4</sup> Sediment Color: brown, tan, black, gray, olive green, red  
<sup>5</sup> Sediment Odor: none, petroleum, hydrogen sulfide, other  
<sup>6</sup> Grab Type: infauna (INF), sediment chemistry (Chem), toxicity (Tox)

AMBIENT WATER SAMPLES



## Appendix Table G-2. Field Water Quality Measurements

City of Buenaventura - Santa Clara River Estuary Wet Weather Sampling Event

Sample Collection Date: 16 March 2004

Sample	Water Depth (m)	Temperature (°C)	Salinity (ppt)	pH (units)	DO (mg/L)
A-1	0.2	20.4	1.5	7.58	9.3
A-2	0.3	20.5	3.1	7.79	10.5
A-3	0.0 0.8	18.5 18.5	6.3 30.0	8.17 8.52	11.6 13.0
B-1	0.3	19.8	1.4	7.46	8.7
B-2	no water present				
B-3	0.1	20.2	14.4	8.64	12
B-4	0.0	19.0	12.7	7.44	11.3
C-1	no water present				
C-2	no water present				
C-3	0.3	15.2	1.7	7.62	10.9
D-1	0.1	16.4	1.5	8.05	10.9

# Santa Clara River Estuary Evaluation City of Buenaventura

## Field Water Quality Measurement Log

2003 - 2004

Sample Collection Date: 3/16/04

Sampler: SC, RG, SM

Sample ID	Depth (ft)	Temp °C	Salinity (ppt)	Cond. (umhos-cm)	pH	DO (mg/L)	Comments/Observations
A-1	4"	20.4	1.5		7.58	9.3	Discharge channel Clear channel
A-2	1' (2' max)	20.5	3.1		7.79	10.5	<del>Dist</del> Discharge channel near outlet to main channel
surface → A-3		18.5	6.3		8.17	11.6	Mouth entrance
	2.5'	16.5	30.0		8.52	13.0	

# Santa Clara River Estuary Evaluation City of Buenaventura

## Field Water Quality Measurement Log

2003 - 2004

Sample Collection Date: 3/16/04

Sampler: SCGRSM

Sample ID	Depth (ft)	Temp °C	Salinity (ppt)	Cond. (umhos-cm)	pH	DO (mg/L)	Comments/ Observations
B-1	1'	19.8	1.4		7.46	8.7	Discharge channel @ fork
B-3	4"	20.2	14.4		8.64	12.00	In main channel
B-4	4"	19.0	12.7		7.44	11.3	Side channel near south bank

# Santa Clara River Estuary Evaluation City of Buenaventura

## Field Water Quality Measurement Log

2003 - 2004

Sample Collection Date: 3/16/04

Sampler: CS, RG, SM

Sample ID	Depth (ft)	Temp °C	Salinity (ppt)	Cond. (umhos-cm)	pH	DO (mg/L)	Comments/ Observations
C-1							
C-2							
C-3	1'	15.2	1.7		7.62	10.9	
D-1	4"	16.4	1.5		8.05	10.9	

APPENDIX H  
CHAIN-OF-CUSTODY FORMS



# Earth & Environmental, Inc.

AMEC San Diego Bloassay Laboratory  
5550 Morehouse Drive, Suite B  
San Diego, CA 92121  
Phone: 858-458-9044 FAX 858-587-3961

## Chain of Custody

Date 3/16/04 Page 1 of 2

Sample Collection by: <u>Chris Stransky, Rob Gamber</u>						Mail Report to (if different)		ANALYSIS REQUIRED													
Company <u>AMEC</u>						Company _____		<u>TOC - Green Size</u> <u>Tox - Edmuntstus</u> <u>Tox - Bivalve</u> <u>Copper</u>													
Address _____						Address _____															
City <u>San Diego</u> State _____ Zip _____						City _____ State _____ Zip _____															
Contact _____						Contact _____															
Phone No. _____						Phone No. _____															
SAMPLE ID	DATE	TIME	MATRIX	CONTAINER TYPE	NUMBER OF CONTAINERS	COMMENTS															
<u>SCRE-A-1s</u>	<u>3/16/04</u>		<u>Sed</u>	<u>Plastic Bag</u>	<u>1</u>																
<u>A-2s</u>	<u> </u>		<u> </u>	<u> </u>	<u> </u>																
<u>A-3s</u>	<u> </u>		<u> </u>	<u> </u>	<u> </u>																
<u>B-1s</u>	<u> </u>		<u> </u>	<u> </u>	<u> </u>																
<u>B-2s</u>	<u> </u>		<u> </u>	<u> </u>	<u> </u>																
<u>B-3s</u>	<u> </u>		<u> </u>	<u> </u>	<u> </u>																
<u>B-4s</u>	<u> </u>		<u> </u>	<u> </u>	<u> </u>																
PROJECT INFORMATION			SAMPLE RECEIPT			RELINQUISHED BY				RELINQUISHED BY											
CLIENT <u>City of Buena Vista</u>			TOTAL NO. OF CONTAINERS _____			(Signature) <u>[Signature]</u> (Time) <u>2:00</u>				(Signature) _____ (Time) _____											
P.O. NO. _____			CHAIN OF CUSTODY SEALS _____			(Printed Name) <u>Chris Stransky</u> (Date) <u>3/16/04</u>				(Printed Name) _____ (Date) _____											
SHIPPED VIA: _____			REC'D. GOOD CONDITION/COLD _____			(Company) <u>AMEC</u>				(Company) _____											
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						(Printed Name) _____ (Date) _____				(Printed Name) <u>Angie Hott</u> (Date) <u>3/16/04</u>											
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Date 3/16/04 Page 2 of 2

Sample Collection by: <u>Chris Stransky, Bob Gamber</u>						Mail Report to (if different)						ANALYSIS REQUIRED											
Company <u>AMEC</u>						Company _____						TDC, Grain Size Tox - Exhaustives Tox - Bivalve Copper											
Address _____						Address _____																	
City <u>San Diego</u> State _____ Zip _____						City _____ State _____ Zip _____																	
Contact _____						Contact _____																	
Phone No. _____						Phone No. _____																	
SAMPLE ID	DATE	TIME	MATRIX	CONTAINER TYPE	NUMBER OF CONTAINERS	COMMENTS																	
<u>SCRE - C-1s</u>	<u>3/16/04</u>		<u>Sed</u>	<u>Plastic Tox</u>	<u>1</u>																		
<u>↓ C-2s</u>	<u>↓</u>		<u>↓</u>	<u>↓</u>	<u>↓</u>																		
<u>↓ C-3s</u>	<u>↓</u>		<u>↓</u>	<u>↓</u>	<u>↓</u>																		
<u>↓ D-1s</u>	<u>↓</u>		<u>↓</u>	<u>↓</u>	<u>↓</u>																		
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								(Printed Name) _____ (Date) _____						(Printed Name) <u>Angie Lopez</u> (Date) <u>3/16/04</u>									
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Date 3/16/04 Page 21 of 2

Sample Collection by: <u>Chris Stransky, Bob Gamber</u>						Mail Report to (If different)						ANALYSIS REQUIRED										
Company <u>AMEC</u>						Company _____						pH, DO, salinity, Cond Tox - aa-c, MY-C mp-c, Me-C, pp-c cd-c, Selenium Bivalve WER										
Address _____						Address _____																
City <u>San Diego</u> State _____ Zip _____						City _____ State _____ Zip _____																
Contact _____						Contact _____																
Phone No. _____						Phone No. _____																
SAMPLE ID	DATE	TIME	MATRIX	CONTAINER TYPE	NUMBER OF CONTAINERS	COMMENTS																
SCRE-A-1w	<u>3/16/04</u>		<u>AQ</u>																			
SCRE-A-2w	↓		↓																			
SCRE-A-3w	↓		↓																			
SCRE-B-1w	↓		↓																			
SCRE B-2w	↓		↓																			
SCRE B-3w	↓		↓																			
SCRE B-4w	↓		↓																			
PROJECT INFORMATION				SAMPLE RECEIPT				RELINQUISHED BY				RELINQUISHED BY										
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P.O. NO.				CHAIN OF CUSTODY SEALS				(Time) <u>2:00</u>				(Time) _____										
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SPECIAL INSTRUCTIONS/COMMENTS:				CONFORMS TO RECORD				(Date) <u>3/16/04</u>				(Date) _____										
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								(Time) _____				(Time) <u>2:00</u>										
								(Printed Name) _____				(Printed Name) <u>Angi Hotz</u>										
								(Date) _____				(Date) <u>3/16/04</u>										
								(Company) _____				(Company) <u>OK-0331 → 333</u>										
												AMEC Bioassay Lab Log-In No.										

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Company <u>AMEC</u>			Address _____			City <u>San Diego</u> State <u>CA</u> Zip _____			Contact _____			Phone No. _____			Company _____			Address _____			City _____ State _____ Zip _____			Contact _____			Phone No. _____		
SAMPLE ID	DATE	TIME	MATRIX	CONTAINER TYPE	NUMBER OF CONTAINERS	COMMENTS																							
<u>SCRE C-1w</u>	<u>3/16/04</u>		<u>AQ</u>																										
<u>SCRE C-2w</u>	↓		↓																										
<u>SCRE C-3w</u>	↓		↓																										
<u>SCRE D-1w</u>	↓		↓																										
PROJECT INFORMATION				SAMPLE RECEIPT		RELINQUISHED BY					RELINQUISHED BY																		
CLIENT <u>City of Buena Vista</u>		TOTAL NO. OF CONTAINERS				(Signature) <u>[Signature]</u>		(Time) <u>2:00</u>			(Signature) _____		(Time) _____																
P.O. NO.		CHAIN OF CUSTODY SEALS				(Printed Name) <u>Chris Stransky</u>		(Date) <u>3/16/04</u>			(Printed Name) _____		(Date) _____																
SHIPPED VIA: <u>AMEC</u>		REC'D. GOOD CONDITION/COLD				(Company) <u>AMEC</u>					(Company) _____																		
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						(Signature) _____		(Time) _____			(Signature) <u>[Signature]</u>		(Time) <u>2:00</u>																
						(Printed Name) _____		(Date) _____			(Printed Name) <u>Angie Hotz</u>		(Date) <u>3/16/04</u>																
						(Company) _____					(Company) <u>4-033A</u>																		
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**CHAIN OF CUSTODY RECORD**

Date 3/31/04  
Page 1 of 2

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<b>REQUESTED ANALYSES</b>																					
LAB USE ONLY	GEIMS ID	SAMPLE ID	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. OF CONT.	TPH (G)	TPH (D) or	BTEX / MTBE (8021B)	HALOCARBONS (8021B)	VOCs (8260B)	VOCs (5035 / 8260B) EnCore	SVOCs (8270C)	PEST (8081A)	PCBs (8082)	EDB / DBCP (504.1) or (8011)	CAC, T22 METALS (6010B)	PNAs (8310)	VOCs (10-14A) or (10-15)	Copper, Zn, Se, Ni	TOC
		SCR A-1	3/16/04		Soil	1														X	X
		A-2																			
		A-3																			
		B-1																			
		B-2																			
		B-3																			
		B-4																			
		C-1																			
		C-2																			
		C-3																			
Relinquished by: (Signature) <u>[Signature]</u>				Received by: (Signature) <u>[Signature]</u>				Date: <u>3/31/04</u>				Time: <u>1230</u>									
Relinquished by: (Signature)				Received by: (Signature)				Date:				Time:									
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Date 3/31/04  
Page 2 of 2

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ADDRESS: <u>5510 Warehouse Dr</u>			PROJECT CONTACT: <u>Chris</u>			LAB USE ONLY <input type="checkbox"/> <input type="checkbox"/> - <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>												
CITY: <u>San Diego</u>		STATE: <u>CA</u>	ZIP: <u>92121</u>		SAMPLER(S): (SIGNATURE)		COELT LOG CODE <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>											
TEL: <u>858-458-9044</u>	FAX: <u>858-587-3961</u>	E-MAIL: <u>Chris.Stanley@amec.com</u>			COOLER RECEIPT		TEMP = _____ °C											
TURNAROUND TIME: <u>Standard</u>			<b>REQUESTED ANALYSES</b>															
<input type="checkbox"/> SAME DAY <input type="checkbox"/> 24 HR <input type="checkbox"/> 48 HR <input type="checkbox"/> 72 HR <input type="checkbox"/> 5 DAYS <input type="checkbox"/> 10 DAYS			SPECIAL REQUIREMENTS (ADDITIONAL COSTS MAY APPLY)	TPH (G)	TPH (D) or	BTEX / MTBE (8021B)	HALOCARBONS (8021B)	VOCs (8260B)	VOCs (5035 / 8260B) EnCore	SVOCs (8270C)	PEST (8081A)	PCBs (8082)	EDB / DBCP (504.1) or (8011)	CAC, T22 METALS (6010B)	PNAs (8310)	VOCs (TO-14A) or (TO-15)	Cust. Zn. Ni:	TOC
<input type="checkbox"/> RWQCB REPORTING <input type="checkbox"/> COELT REPORTING			SPECIAL INSTRUCTIONS:															
LAB USE ONLY	GEIMS ID	SAMPLE ID	SAMPLING		MATRIX	NO. OF CONT.												
		<u>SCR D-1</u>	DATE	TIME														
			<u>3/16/04</u>		<u>Soil</u>	<u>1</u>												
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**City of Buenaventura  
Water-Effect Ratio Report  
March 04 Wet Weather Sampling Event  
Santa Clara River Estuary**

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**Prepared by  
Nautilus Environmental  
5550 Morehouse Drive, Suite 150  
San Diego, California 92121  
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## **INTRODUCTION**

As part of a continued monitoring and characterization effort of the Santa Clara River Estuary (SCRE), a water-effect ratio (WER) was determined for copper using ambient water samples collected on March 16, 2004. The WER was conducted following guidance and procedure published in EPA Method 822-R-01-005 (Streamlined Water-Effect Ratio Procedure for Discharge of Copper). Blue mussel larvae (*Mytilus galloprovincialis*) bioassays were initiated on March 17, 2004 at the AMEC Earth & Environmental Bioassay Laboratory (AMEC) located in San Diego, CA. However, these tests did not meet test acceptability criteria, and bioassays were re-initiated on March 19, 2004. The embryo development test was chosen for this WER due to its sensitivity to copper; toxicity to bivalve larvae is the primary driver for EPA's derivation of water quality criterion for copper in marine waters (3.1 µg/L, US EPA 2000). Measurements of copper concentrations in support of the WER were performed by Calscience Environmental Laboratories (CEL) located in Garden Grove, CA.

In addition to the WER, ambient water toxicity was evaluated using other freshwater (e.g. alga *Selenastrum capricornutum*, the water flea *Ceriodaphnia dubia*, and the fathead minnow *Pimephales promelas*) and marine organisms (e.g. giant kelp *Macrocystis pyrifera*, the opossum shrimp *Americamysis bahia* (formerly *Mysidopsis bahia*), and the Pacific topsmelt *Atherinops affinis*). Results for these bioassays were presented in a previous report issued in May 2004.

## **METHODS AND MATERIALS**

### **SAMPLE COLLECTION, TRANSPORT, AND PREPARATION**

Ambient water samples were collected from four of the eleven ambient monitoring locations (specifically sites A-2, B-1, B-3, and C-3). Sites for water collection were selected based on location within the estuary and water depth (i.e. centrally located sites with enough water to provide an adequate sample volume for testing). Sample collection time, global positioning system (GPS) coordinates, water depth, temperature, dissolved oxygen (DO), salinity, and pH were recorded in a field logbook and is summarized in Appendix E.

All equipment used for water collection was cleaned thoroughly with Alconox soap and rinsed with site water. Collections were performed using a hand pump connected to ½" clear PVC tubing. The end of the tubing was held at mid-depth to collect the water and pumped into 20-L plastic-lined buckets; a total of five buckets were collected at each site. AMEC personnel transported all samples to the laboratory where samples were placed in a 4°C cold room overnight. The same day, the contents of all sample containers from each were composited and water quality parameters of temperature, DO, conductivity, salinity, pH, total residual chlorine, alkalinity, and hardness were measured and recorded in a logbook. A portion of each composited sample was removed, amended with hypersaline brine (to raise the salinity to 30 ppt), and spiked with nominal copper concentrations of 0, 4.3, 7.1, 12, 20, 33, and 55 µg/L. For comparison, polished laboratory seawater (PSW) was also spiked with copper on the same day with final concentrations of 0, 1.8, 3.0, 5.1, 8.4, 14, 23, and 39 µg/L. Laboratory seawater was polished by filtration through a Gelman 0.20-µm filter. Spiked samples were placed in a 15°C temperature-controlled room and allowed to equilibrate overnight. Subsamples of all test concentrations were collected prior to test initiation for analytical verification of copper concentrations.

#### **BIOASSAY PROTOCOLS**

Test conditions and Quality Assurance/Quality Control (QA/QC) requirements for the blue mussel embryo development test are summarized in Table 1.

**Table 1. Test Conditions and QA/QC Summary for the 48-Hour Bivalve Embryo Development Test.**

Test organism	<i>Mytilus galloprovincialis</i>
Test organism source	Field Collected by Nautilus Personnel
Test duration	48 Hours
Test solution renewal	None
Feeding	None
Test initiation date and time	Within 24 hours of copper addition to samples
Test chamber	30-ml glass scintillation vial
Test solution volume	10 ml
Test temperature	15 ± 1°C
Dilution water	None
Test concentrations (µg/L copper added to brine-amended sample) <sup>a</sup>	0, 4.3, 7.1, 12, 20, 33, and 55
Number of organisms/chamber	250-300
Number of replicates	5
Photoperiod	16 hours light/8 hours dark
Aeration	None
Test Protocol	ASTM Designation E 724-98
Test acceptability criteria for controls	≥ 90% normal
Reference toxicant	Copper chloride
Reference toxicant test concentrations (µg/L)	
Polished Seawater <sup>b</sup>	0, 1.8, 3.0, 5.1, 8.4, 14, 23, and 39
Natural Seawater <sup>c</sup>	0, 2.5, 5.0, 10, 20, and 40

<sup>a</sup> Due to low sample salinities, addition of hypersaline brine was required to raise the salinity of each sample to 30 ppt. As a result, modest dilution of the samples occurred; the highest testable concentrations were 66, 67, 75, and 66 percent sample for sites A-2, B-1, B-3, and C-3, respectively. An additional control composed of hypersaline brine and deionized water was tested concurrent to each sample to ensure observed adverse effects were not due to the addition of brine.

<sup>b</sup> The polished seawater copper reference toxicant test was used for calculation of the water-effect ratio for each estuary sample.

<sup>c</sup> The copper reference toxicant test using natural seawater is performed concurrently with all bivalve embryo tests conducted at Nautilus to evaluate variability in test procedures and sensitivity of organisms over time.

## **STATISTICAL ANALYSES**

Analysis of ambient water and reference toxicant data was conducted using ToxCalc<sup>®</sup> Comprehensive Toxicity Data Analysis and Database Software, Version 5.0. Statistical differences from the control and No Observed Effect Concentrations (NOEC) were determined for each test using Dunnett's, Wilcoxon Rank Sum, or Steel's Many-One Rank Tests. Median Effect Concentration (EC<sub>50</sub>) values were determined using Maximum Likelihood Probit (linear regression), or Trimmed Spearman-Kärber Analyses. The choice of statistical method used was dependent upon specific assumptions met by the data.

## **CHEMICAL ANALYSES**

Analysis of total and dissolved copper in selected estuary samples was performed by CEL (Appendix D).

## **WATER-EFFECT RATIO CALCULATION FOR COPPER**

A combination of nominal and measured concentrations of copper was used for WER calculations presented in this report. Copper was measured in copper-spiked test concentrations that bracketed dose-responses, and these values were substituted for nominal concentrations for calculation of EC<sub>50</sub> values. The WER was calculated for each site by dividing the EC<sub>50</sub> for copper in the sample, by the EC<sub>50</sub> for copper in Scripps polished seawater.

## **RESULTS AND DISCUSSION**

A detailed data summary is contained in Appendix A. Statistical analyses and raw data can be found in Appendix B, and reference toxicant data are located in Appendix C. Analytical chemistry data reports and field collection data can be found in Appendices D, and E, respectively. Finally, chain-of-custody information is provided in Appendix F.

Copper EC<sub>50</sub> values and WER calculations are summarized in Table 2. Mean normal development was 89 to 97 percent in the unspiked estuary samples, compared to 88 to 89 percent in the corresponding brine controls. Total copper EC<sub>50</sub> values calculated for estuary samples based on measured copper concentrations ranged from 24.8 to 84.4 µg/L. For comparison, the mean EC<sub>50</sub> calculated for polished seawater spiked with copper was 14.0 µg/L. The calculated WER values ranged from 1.77 to 6.03, with a



geometric mean of 2.94.

**Table 2. Total Copper WER Values for Santa Clara River Estuary Samples Calculated using Scripps Polished Seawater (measured concentrations) <sup>a</sup>**

Sample	EC <sub>50</sub> (µg/L Total Cu)	Water-Effect Ratio
Site A-2	>53.4	>3.81
Site B-1	84.4	6.03
Site B-3	25.7	1.84
Site C-3	24.8	1.77
Polished Scripps Seawater <sup>a</sup>	14.0	NA
Scripps Seawater <sup>b</sup>	11.3	NA

<sup>a</sup> Seawater from Scripps (see footnote b) was polished at AMEC by passing it through a 0.2-µm filter.

<sup>b</sup> Seawater from the Scripps Institute of Oceanography was sand filtered on-site prior to collection. This seawater was used used to conduct a standard copper reference toxicant test included here and in the laboratory reference toxicant control chart.

### QA/QC

The bivalve development tests conducted on estuary samples resulted in lab controls with mean normal development of 87 to 89 percent, just below the 90 percent criterion. However, the results were deemed acceptable for reporting purposes because: 1) the mean values for normal development were close to the criterion; and 2) the range of values among control replicates included several values exceeding the criterion.

The reference toxicant test conducted met test acceptability criteria, and the EC<sub>50</sub> fell within two standard deviations of laboratory control chart mean (Appendix C).

**LITERATURE CITED**

American Society for Testing and Materials (ASTM), 1999. Standard guide for conducting static acute toxicity tests starting with embryos of four species of saltwater bivalve molluscs. ASTM Designation: E 724-98.

Tidepool Scientific Software, 1992-1994. ToxCalc Comprehensive Toxicity Data Analysis and Database Software, Version 5.0.

U.S. EPA. 2000. Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California. Federal Register Volume 65 No. 97, May 2000.

U.S. EPA, 2001. Streamlined Water-Effect Ratio Procedure for Discharges of Copper. U.S EPA Office of Water, Washington DC. (EPA-822-R-01-005), March 2001.

APPENDIX A  
TEST RESULT SUMMARY

## Appendix Table A-1. Water-Effect Ratio Summary Results

### City of Buenaventura Santa Clara River Estuary Wet Weather Sampling Event Test Initiation Date: March 19, 2004 Test Species: *Mytilus galloprovincialis*

Site ID	Nominal Spiked Copper (µg/L) a	Measured Total Copper (µg/L) b	Mean Percent Normal Development c	EC50 (µg/L total copper) d
<b>A-2</b> (66% sample)	Lab Control	NM	87	<b>&gt;53.4</b>
	Brine Control	NM	89	
	0 (Unspiked Sample)	4.49	96	
	4.3	NM	91	
	7.1	NM	92	
	12	NM	91	
	20	NM	84	
	33	NM	85	
	55	53.4	81	
<b>B-1</b> (67% sample)	Lab Control	NM	88	<b>84.4</b> (69.7-124.2)
	Brine Control	NM	89	
	0 (Unspiked Sample)	3.75	97	
	4.3	NM	91	
	7.1	NM	89	
	12	NM	90	
	20	20.2	84	
	33	33.3	80	
	55	50.2	66	
<b>B-3</b> (75% sample)	Lab Control	NM	89	<b>25.6</b> <i>25.7</i> (24.9-26.4)
	Brine Control	NM	88	
	0 (Unspiked Sample)	3.00	93	
	4.3	NM	92	
	7.1	NM	92	
	12	NM	92	
	20	NM	77	
	33	31.0	21	
	55	51.2	0.40	
<b>C-3</b> (66% sample)	Lab Control	NM	89	<b>24.8</b> (24.5-25.1)
	Brine Control	NM	88	
	0 (Unspiked Sample)	1.95	89	
	4.3	NM	79	
	7.1	NM	80	
	12	NM	70	
	20	20.1	87	
	33	31.6	1.0	
	55	NM	0.00	
<b>Laboratory Polished Seawater (PSW)</b>	Lab Control	NM	90	<b>14.0</b>
	1.8	NM	89	
	3.0	NM	85	
	5.1	NM	88	
	8.4	9.1	87	
	14	13.7	52	
	23	22.5	0.00	
	39	NM	0.00	
<b>Copper Reference Toxicant Test</b>	Lab Control	NM	90	<b>11.3</b>
	2.5	NM	92	
	5.0	NM	91	
	10	NM	62	
	20	NM	0.00	
	40	NM	0.40	

<sup>a</sup> Nominal spiked concentrations do not include the background concentrations of copper in the field samples.

<sup>b</sup> Total measured copper includes spiked plus background concentrations of copper in each sample.

<sup>c</sup> Values presented for mean percent normal development in unspiked samples are results from the screening tests initiated concurrently on March 19, 2004 for the highest testable concentration for each sample following amendment with hypersaline brine.

<sup>d</sup> Total copper concentrations were measured in test concentrations exhibiting a dose-response. These measured values were substituted for nominal values in order to calculate EC<sub>50</sub> values. EC<sub>50</sub> values were based on comparison to the brine controls.

Values in **bold** indicate a significant decrease in normal development was observed in that test concentration relative to the control.

NM - Not measured

**APPENDIX B**  
**STATISTICAL ANALYSIS SUMMARIES**  
**& RAW BENCH DATASHEETS**



**Bivalve Larval Survival and Development Test-Proportion Normal**

Start Date: 03/19/2004      Test ID: 0403-122b      Sample ID: BUENA-City of Buenaventura  
 End Date: 03/21/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: OTH-Other sample type  
 Sample Date: 03/16/2004      Protocol: ASTM 87      Test Species: MG-Mytilis galloprovincialis  
 Comments: Sample A-2, WER Study, 100% Spiked sample (Measured Values)

Conc-ug/L	1	2	3	4	5
L-Lab Control	0.8400	0.9300	0.8381	0.8515	0.9100
B-Control	0.9180	0.9000	0.8700	0.8716	0.8900
4.3	0.9600	0.8800	0.8200	0.9200	0.9505
7.1	0.9159	0.9200	0.8900	0.9307	0.9535
11.9	0.9310	0.8800	0.8900	0.9100	0.9300
19.8	0.8200	0.8800	0.8800	0.8100	0.8100
33	0.8200	0.8100	0.8400	0.8800	0.9100
53.4	0.7100	0.8300	0.8200	0.8100	0.8700

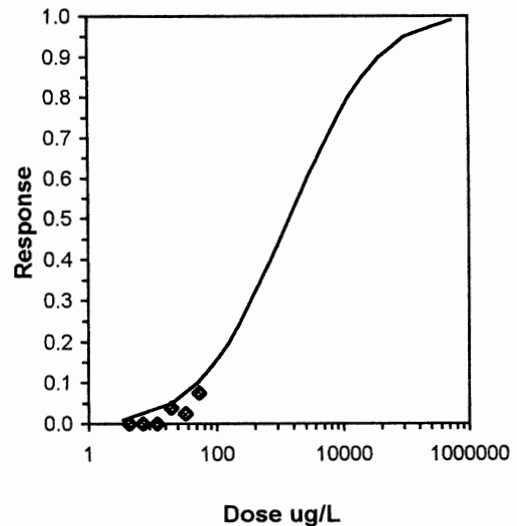
Conc-ug/L	Transform: Arcsin Square Root							t-Stat	1-Tailed Critical	MSD	Number Resp	Total Number
	Mean	N-Mean	Mean	Min	Max	CV%	N					
L-Lab Control	0.8739	0.9820	1.2121	1.1567	1.3030	5.597	5				64	506
B-Control	0.8899	1.0000	1.2337	1.2019	1.2804	2.657	5					
4.3	0.9061	1.0182	1.2699	1.1326	1.3694	7.634	5	-1.415	2.409	0.0985	47	501
7.1	0.9220	1.0361	1.2902	1.2327	1.3534	3.406	5	-1.911	2.409	0.0985	39	494
11.9	0.9082	1.0206	1.2648	1.2171	1.3051	3.161	5	-1.289	2.409	0.0985	47	516
19.8	0.8400	0.9439	1.1613	1.1198	1.2171	4.409	5	1.242	2.409	0.0985	80	500
33	0.8520	0.9574	1.1790	1.1198	1.2661	5.208	5	0.809	2.409	0.0985	74	500
53.4	0.8080	0.9079	1.1205	1.0021	1.2019	6.533	5	2.239	2.409	0.0985	96	500

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96011	0.91	-0.1894	-0.4077
Bartlett's Test indicates equal variances (p = 0.65)	4.21183	16.8119		
The control means are not significantly different (p = 0.54)	0.64177	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	53.4	>53.4			0.07165	0.08172	0.02023	0.00418	0.00167	6, 28

Maximum Likelihood-Probit											
Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	0.8942	0.88386	-0.8382	2.62657	0.12648	7.61233	9.48773	0.11	3.13665	1.11832	50
Intercept	2.19521	1.45767	-0.6618	5.05225							
TSCR	0.09711	0.00897	0.07953	0.1147							
Point	Probits	ug/L	95% Fiducial Limits								
EC01	2.674	3.42811									
EC05	3.355	19.8235									
EC10	3.718	50.5205									
EC15	3.964	94.9703									
EC20	4.158	156.837									
EC25	4.326	241.188									
EC40	4.747	713.389									
EC50	5.000	1369.77									
EC60	5.253	2630.09									
EC75	5.674	7779.33									
EC80	5.842	11963.2									
EC85	6.036	19756.5									
EC90	6.282	37138.9									
EC95	6.645	94649.1									
EC99	7.326	547323									





**Bivalve Larval Survival and Development Test-Proportion Normal**

Start Date: 03/19/2004      Test ID: 0403-122      Sample ID: BUENA-City of Buenaventura  
 End Date: 03/21/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: OTH-Other sample type  
 Sample Date: 03/16/2004      Protocol: ASTM 87      Test Species: MG-Mytilis galloprovincialis  
 Comments: Sample A-2, WER Study, 400% Spiked sample

Conc-ug/L	1	2	3	4	5
L-Lab Control	0.8400	0.9300	0.8381	0.8515	0.9100
B-Control	0.9180	0.9000	0.8700	0.8716	0.8900
4.3	0.9600	0.8800	0.8200	0.9200	0.9505
7.1	0.9159	0.9200	0.8900	0.9307	0.9535
11.9	0.9310	0.8800	0.8900	0.9100	0.9300
20	0.8200	0.8800	0.8800	0.8100	0.8100
33	0.8200	0.8100	0.8400	0.8800	0.9100
55	0.7100	0.8300	0.8200	0.8100	0.8700

Conc-ug/L	Transform: Arcsin Square Root							t-Stat	1-Tailed Critical	MSD	Number Resp	Total Number
	Mean	N-Mean	Mean	Min	Max	CV%	N					
L-Lab Control	0.8739	0.9820	1.2121	1.1567	1.3030	5.597	5					
B-Control	0.8899	1.0000	1.2337	1.2019	1.2804	2.657	5				58	531
4.3	0.9061	1.0182	1.2699	1.1326	1.3694	7.634	5	-0.945	2.409	0.0924	47	501
7.1	0.9220	1.0361	1.2902	1.2327	1.3534	3.406	5	-1.474	2.409	0.0924	39	494
11.9	0.9082	1.0206	1.2648	1.2171	1.3051	3.161	5	-0.811	2.409	0.0924	47	516
20	0.8400	0.9439	1.1613	1.1198	1.2171	4.409	5	1.888	2.409	0.0924	80	500
33	0.8520	0.9574	1.1790	1.1198	1.2661	5.208	5	1.426	2.409	0.0924	74	500
*55	0.8080	0.9079	1.1205	1.0021	1.2019	6.533	5	2.952	2.409	0.0924	96	500

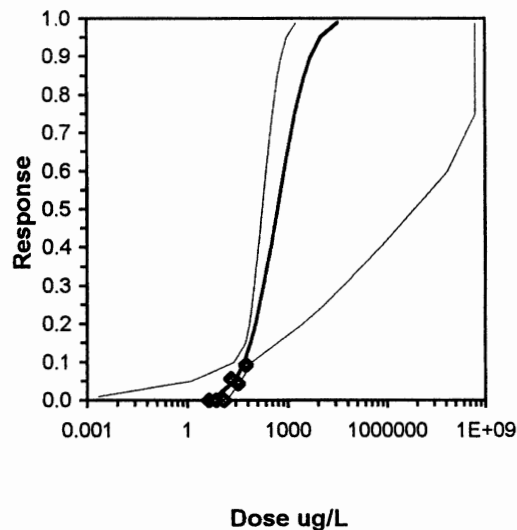
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97174	0.91	-0.3223	0.0925
Bartlett's Test indicates equal variances (p = 0.40)	6.24353	16.8119		
The control means are not significantly different (p = 0.54)	0.64177	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	33	55	42.6028		0.064	0.07187	0.0205	0.00368	6.6E-04	6, 28

**Maximum Likelihood-Probit**

Parameter	Value	SE	95% Fiducial Limits	Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	1.27103	0.52274	0.24646 2.2956	0.10923	9.05345	9.48773	0.06	2.68671	0.78676	50
Intercept	1.5851	0.84297	-0.0671 3.23731							
TSCR	0.09192	0.00938	0.07354 0.1103							

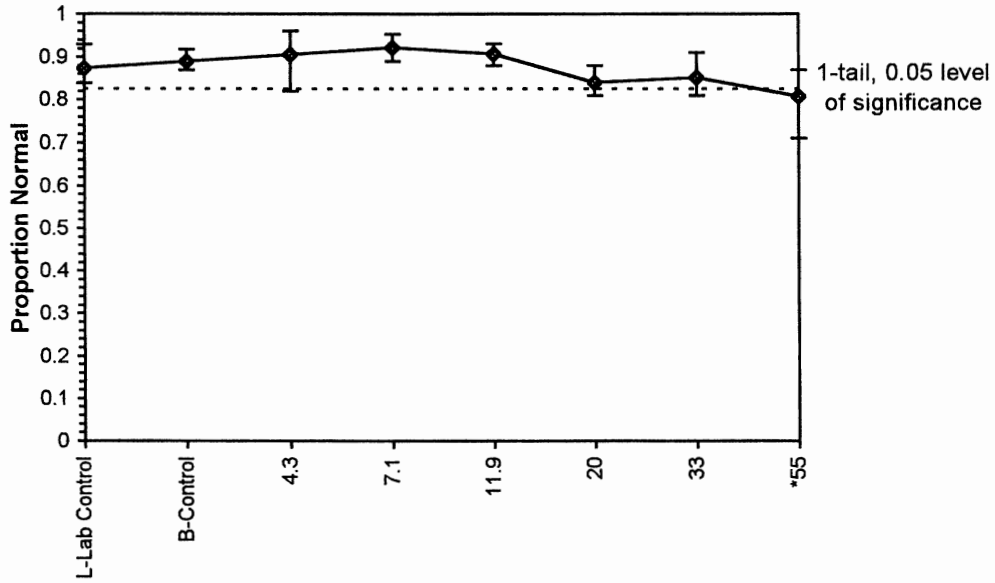
Point	Probits	ug/L	95% Fiducial Limits
EC01	2.674	7.18506	0.00218 17.7418
EC05	3.355	24.6947	1.18918 37.4742
EC10	3.718	47.6911	24.1045 79.2903
EC15	3.964	74.351	52.4631 460.041
EC20	4.158	105.818	68.742 2634.71
EC25	4.326	143.235	83.5004 12223.6
EC40	4.747	307.178	131.13 607305
EC50	5.000	486.087	170.457 6423898
EC60	5.253	769.197	220.976 6.8E+07
EC75	5.674	1649.59	339.132 4.9E+08
EC80	5.842	2232.9	401.706 4.9E+08
EC85	6.036	3177.9	489.207 4.9E+08
EC90	6.282	4954.39	626.644 4.9E+08
EC95	6.645	9568.03	903.983 4.9E+08
EC99	7.326	32884.9	1795.56 4.9E+08



**Bivalve Larval Survival and Development Test-Proportion Normal**

Start Date: 03/17/2004      Test ID: 0403-122      Sample ID: BUENA-City of Buenaventura  
End Date: 03/19/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: OTH-Other sample type  
Sample Date: 03/16/2004      Protocol: ASTM 93      Test Species: MG-Mytilis galloprovincialis  
Comments: Sample A-2, WER Study, 100% Spiked sample

**Dose-Response Plot**



Test: BV-Bivalve Larval Survival and Development Test      Test ID: 0403-122  
 Species: MG-Mytilis galloprovincialis                      Protocol: ASTM 87  
 Sample ID: BUENA-City of Buenaventura                      Sample Type: OTH-Other sample type  
 Start Date: 03/19/2004                      End Date: 03/21/2004                      Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
	1	1	L-Lab Control			100	84	
	2	2	L-Lab Control			100	93	
	3	3	L-Lab Control			105	88	
	4	4	L-Lab Control			101	86	
	5	5	L-Lab Control			100	91	
	6	1	B-Control			122	112	
	7	2	B-Control			100	90	
	8	3	B-Control			100	87	
	9	4	B-Control			109	95	
	10	5	B-Control			100	89	
	11	1	4.3			100	96	
	12	2	4			100	88	
	13	3	4.3			100	82	
	14	4	4.3			100	92	
	15	5	4.3			101	96	
	16	1	7.1			107	98	
	17	2	7.1			100	92	
	18	3	7.1			100	89	
	19	4	7.1			101	94	
	20	5	7.1			86	82	
	21	1	12			116	108	
	22	2	11.9			100	88	
	23	3	11.9			100	89	
	24	4	11.9			100	91	
	25	5	11.9			100	93	
	26	1	20			100	82	
	27	2	20			100	88	
	28	3	20			100	88	
	29	4	20			100	81	
	30	5	20			100	81	
	31	1	33			100	82	
	32	2	33			100	81	
	33	3	33			100	84	
	34	4	33			100	88	
	35	5	33			100	91	
	36	1	55			100	71	
	37	2	55			100	83	
	38	3	55			100	82	
	39	4	55			100	81	
	40	5	55			100	87	

Comments: Sample A-2, WER Study, ~~100~~ 100% Spiked sample  
*lc*

Test: BV-Bivalve Larval Survival and Development Test  
 Species: MG-Mytilis galloprovincialis  
 Sample ID: BUENA-City of Buenaventura  
 Start Date: 03/19/2004

Test ID: 0403-122  
 Protocol: ASTM 87  
 Sample Type: OTH-Other sample type  
 Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
1						116	108	DB
2						109	95	DB
3						101	94	DB
4						86	82	DB
5						107	98	DB
6						101	86	DB
7						100	88	MT
8						105	88	DB
9						100	84	MT
10						100	81	SH
11						100	82	SH
12						100	82	MT
13						122	112	DB
14						101	96	DB
15						100	91	MT
16						100	91	SA
17						100	93	
18						100	96	
19						100	88	↓
20						100	87	SH
21						100	82	MC
22						100	84	MC
23						100	82	MT
24						100	92	MC
25						100	83	SH
26						100	89	MC
27						100	89	MC
28						100	88	MT
29						100	81	MT
30						100	88	MC
31						100	89	MC
32						100	92	MC
33						100	71	SH
34						100	93	MC
35						100	90	MC
36						100	91	MC
37						100	88	MT
38						100	81	MT
39						100	81	MT
40						100	87	MC

Comments: Sample A-2, WER Study, 100% Spiked sample

86

# Bivalve Development Bioassay Worksheet

Client: City of Buena Vista (retest) Start Date/Time: 3/19/04 1630  
Test No.: 0403-106 → 109 End Date/Time: 3/21/04 1700  
Test Species: M. galloprovincialis Date Received: 3/19/04

Sample Type: 30ml Shell Vials water effects ratio

Test Chamber Type and Sample Volume: 10 ml volume

Spawn Initiation Time: 13:20

Number of Spawners: Male 12 Female 9

Spawn Condition: good

Fertilization Time: 14:40

Egg Stock Density Calculation:

Eggs Counted (x):	<u>22</u>	<u>28</u>	
	<u>26</u>	<u>21</u>	
	<u>27</u>	<u>31</u>	
	<u>31</u>	<u>28</u>	
	<u>29</u>	<u>25</u>	
Mean	<u>27.0</u>	<u>26.6</u>	Overall Mean: <u>26.8</u>

Mean: 26.8 X 42 = 1126 eggs/ml

Initial Stock - 1126 eggs/ml = 2.81 Stock Dilution Factor  
Inoculum Stock - 400 eggs/ml

Percent Division Upon Inoculation: 90

Time of Inoculation: 1630

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Reviewed/ Date: [Signature] 4/10/05

AMEC Bioassay Laboratory  
5550 Morehouse Drive, Suite B  
San Diego, CA 92121  
(858) 458-9044

AMEC Earth & Environmental  
 Bioassay Laboratory  
 5550 Morehouse Dr. Suite B  
 San Diego, CA 92121

Physical and Chemical  
 Measurements of Test Solutions  
 Salt Water Bioassays

Client: Quenaventura - WER AZ  
 Contact: NA  
 Test No.: 0403-122b

Analyst: JK  
 Test Start: 3/19/04  
 Test End: 3/21/04  
 Date Collected: 3/19/04

Sample ID <sup>mg/L</sup> or Conc.	DO (mg/L)			pH (pH units)			Salinity (ppt)			Temp °C		
	0	24	48	0	24	48	0	24	48	0	24	48
LC	8.2	8.6	(A)	8.06	<del>7.94</del> 8.05	(A)	30	<del>30.8</del> 21.8	(A)	14.8	15.0	(A)
BC	8.0	8.6	7.9	7.90	7.94	7.93	30	30.8	31.1	14.8	15.0	14.5
4.3	7.7	8.9	8.1	8.15	8.22	8.21	30	31.0	31.1	14.8	14.9	14.7
7.1	7.6	8.8	8.1	8.15	8.23	8.27	30	31.3	31.4	14.8	15.0	14.8
11.9	7.6	8.9	8.0	8.14	8.23	8.26	30	31.6	31.5	14.8	15.0	14.9
20	7.7	8.9	8.1	8.14	8.22	8.25	30	31.2	31.4	14.8	15.0	15.0
33	7.6	8.8	8.0	8.15	8.23	8.21	30	31.6	31.8	14.8	14.9	15.1
55	7.6	8.9	8.1	8.16	8.23	8.24	30	31.8	32.0	14.8	15.0	15.1

Comments: (A) surrogate cup for water quality measurements spilled prior to test termination  
\* copper added to 67% brined sample

QA Check: JK 4/19/05

## Brine Dilution Worksheet

Client: City of Buenaventura

Analyst: JR

Sample ID: Santa Clara River Estuary A2

Test Date: 03/17/2004  
~~03/17~~

Test No: 0403-100, 0403-122b

Test Type: Bivalve Embryo Dev.

Salinity of Effluent	3.1
Salinity of Brine	85
Target Salinity	30
Test Dilution Volume	150

Salinity Adjustment Factor:  $\frac{TS - SE}{SB - TS}$

TS = target salinity  
SE = salinity of effluent  
SB = salinity of brine

Salinity Adjustment Factor = 0.49

Concentration %	Effluent Volume (mL)	Salinity Adjustment	Brine Volume (mL)	Dilute to to: (mL)
Control	NA	NA	NA	150
6.25	9.4	0.49	4.6	150
12.5	18.8	0.49	9.2	150
25	37.5	0.49	18.3	150
50	75	0.49	37	150
67	101	0.49	49	150

**DI Volume**

Brine Control	90	0.55	49	150
---------------	----	------	----	-----

total brine      **167.3**

**Brine Control Salinity Adjustment Factor**

Brine Control Calculation:

$$\frac{TS - 0}{SB - TS}$$

*QC: ml 4/28/04*

AMEC Earth and Environmental, Inc.  
San Diego Bioassay Laboratory  
5550 Morehouse Drive. Suite B  
San Diego, CA 92121

B-1



**Bivalve Larval Survival and Development Test-Proportion Normal**

Start Date: 03/19/2004      Test ID: 0403-123b      Sample ID: BUENA-City of Buenaventura  
 End Date: 03/21/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: OTH-Other sample type  
 Sample Date: 03/16/2004      Protocol: ASTM 87      Test Species: MG-Mytilis galloprovincialis  
 Comments: Sample B-1, WER Study, 100% Spiked sample (Measured Values)

Conc-ug/L	1	2	3	4	5
L-Lab Control	0.8600	0.8100	0.9300	0.9400	0.8400
B-Control	0.9180	0.8700	0.8716	0.9000	0.8900
4.3	0.8700	0.9200	0.9600	0.9300	0.8700
7.1	0.8600	0.9600	0.8500	0.8700	0.9000
11.9	0.8900	0.9500	0.8900	0.8700	0.8900
20.2	0.9000	0.8800	0.8200	0.8000	0.8200
33.3	0.6700	0.7300	0.8500	0.8700	0.9000
50.2	0.6900	0.5900	0.6500	0.6800	0.6900

Conc-ug/L	Mean	N-Mean	Transform: Arcsin Square Root					N	1-Tailed			Number Resp	Total Number
			Mean	Min	Max	CV%	t-Stat		Critical	MSD			
L-Lab Control	0.8760	0.9844	1.2185	1.1198	1.3233	7.382	5				62	500	
B-Control	0.8899	1.0000	1.2337	1.2019	1.2804	2.654	5						
4.3	0.9100	1.0226	1.2721	1.2019	1.3694	5.617	5	-1.071	2.409	0.1204	45	500	
7.1	0.8880	0.9978	1.2362	1.1731	1.3694	6.455	5	-0.353	2.409	0.1204	56	500	
11.9	0.8980	1.0091	1.2491	1.2019	1.3453	4.436	5	-0.611	2.409	0.1204	51	500	
20.2	0.8440	0.9484	1.1677	1.1071	1.2490	5.275	5	1.017	2.409	0.1204	78	500	
33.3	0.8040	0.9035	1.1215	0.9589	1.2490	11.037	5	1.942	2.409	0.1204	98	500	
*50.2	0.6600	0.7416	0.9488	0.8759	0.9803	4.670	5	5.398	2.409	0.1204	170	500	

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96806	0.91	0.09342	-0.5676
Bartlett's Test indicates equal variances (p = 0.53)	5.07971	16.8119		
The control means are not significantly different (p = 0.73)	0.35364	2.30601		

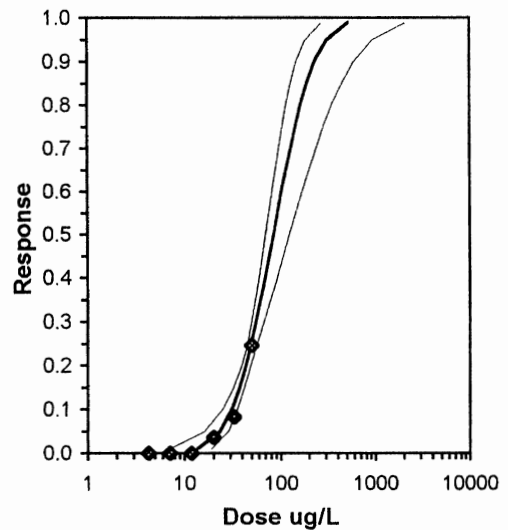
  

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	33.3	50.2	40.8859		0.0882	0.10011	0.0622	0.00624	6.7E-06	6, 28

Maximum Likelihood-Probit											
Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	2.94281	0.54134	1.88178	4.00385	0.124	4.58951	9.48773	0.33	1.92658	0.33981	4
Intercept	-0.6696	0.87806	-2.3906	1.05145							
TSCR	0.10761	0.00753	0.09285	0.12238							

Point	Probits	ug/L	95% Fiducial Limits	
EC01	2.674	13.6791	6.97975	18.884
EC05	3.355	23.3151	15.922	28.2033
EC10	3.718	30.9807	24.4879	35.2492
EC15	3.964	37.5306	32.2618	41.5807
EC20	4.158	43.7104	39.1948	48.5885
EC25	4.326	49.817	45.0602	57.0857
EC40	4.747	69.2607	59.7437	91.8362
EC50	5.000	84.4456	69.6727	124.209
EC60	5.253	102.96	80.9723	168.572
EC75	5.674	143.145	103.615	280.986
EC80	5.842	163.143	114.199	344.352
EC85	6.036	190.007	127.876	436.574
EC90	6.282	230.177	147.394	588.634
EC95	6.645	305.856	181.865	917.023
EC99	7.326	521.31	269.541	2107.99



**Bivalve Larval Survival and Development Test-Proportion Normal**

Start Date: 03/19/2004 Test ID: 0403-123 Sample ID: BUENA-City of Buenaventura  
 End Date: 03/21/2004 Lab ID: AEESD-AMEC Bioassay SD Sample Type: OTH-Other sample type  
 Sample Date: 03/16/2004 Protocol: ASTM 87 Test Species: MG-Mytilis galloprovincialis  
 Comments: Sample B-1, WER Study, 100% Spiked sample

Conc-ug/L	1	2	3	4	5
L-Lab Control	0.8600	0.8100	0.9300	0.9400	0.8400
B-Control	0.9180	0.8700	0.8716	0.9000	0.8900
4.3	0.8700	0.9200	0.9600	0.9300	0.8700
7.1	0.8600	0.9600	0.8500	0.8700	0.9000
11.9	0.8900	0.9500	0.8900	0.8700	0.8900
20	0.9000	0.8800	0.8200	0.8000	0.8200
33	0.6700	0.7300	0.8500	0.8700	0.9000
55	0.6900	0.5900	0.6500	0.6800	0.6900

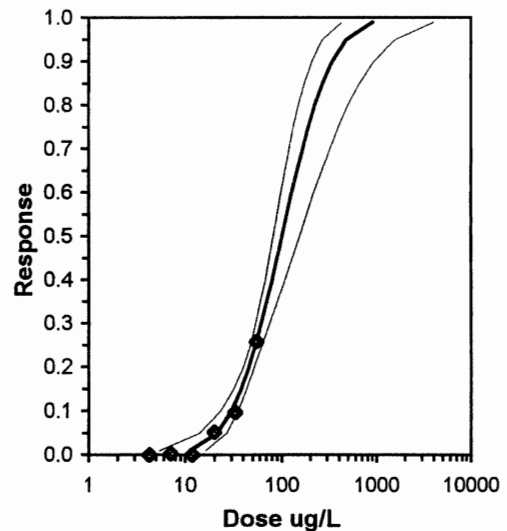
Conc-ug/L	Transform: Arcsin Square Root							1-Tailed			Number Resp	Total Number
	Mean	N-Mean	Mean	Min	Max	CV%	N	t-Stat	Critical	MSD		
L-Lab Control	0.8760	0.9844	1.2185	1.1198	1.3233	7.382	5					
B-Control	0.8899	1.0000	1.2337	1.2019	1.2804	2.654	5				55	500
4.3	0.9100	1.0226	1.2721	1.2019	1.3694	5.617	5	-0.839	2.409	0.1103	45	500
7.1	0.8880	0.9978	1.2362	1.1731	1.3694	6.455	5	-0.054	2.409	0.1103	56	500
11.9	0.8980	1.0091	1.2491	1.2019	1.3453	4.436	5	-0.336	2.409	0.1103	51	500
20	0.8440	0.9484	1.1677	1.1071	1.2490	5.275	5	1.441	2.409	0.1103	78	500
*33	0.8040	0.9035	1.1215	0.9589	1.2490	11.037	5	2.451	2.409	0.1103	98	500
*55	0.6600	0.7416	0.9488	0.8759	0.9803	4.670	5	6.223	2.409	0.1103	170	500

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.98006	0.91	0.0661	0.05609
Bartlett's Test indicates equal variances (p = 0.24)	7.98698	16.8119		
The control means are not significantly different (p = 0.73)	0.35364	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	20	33	25.6905		0.07776	0.08731	0.0635	0.00524	1.1E-06	6, 28

**Maximum Likelihood-Probit**

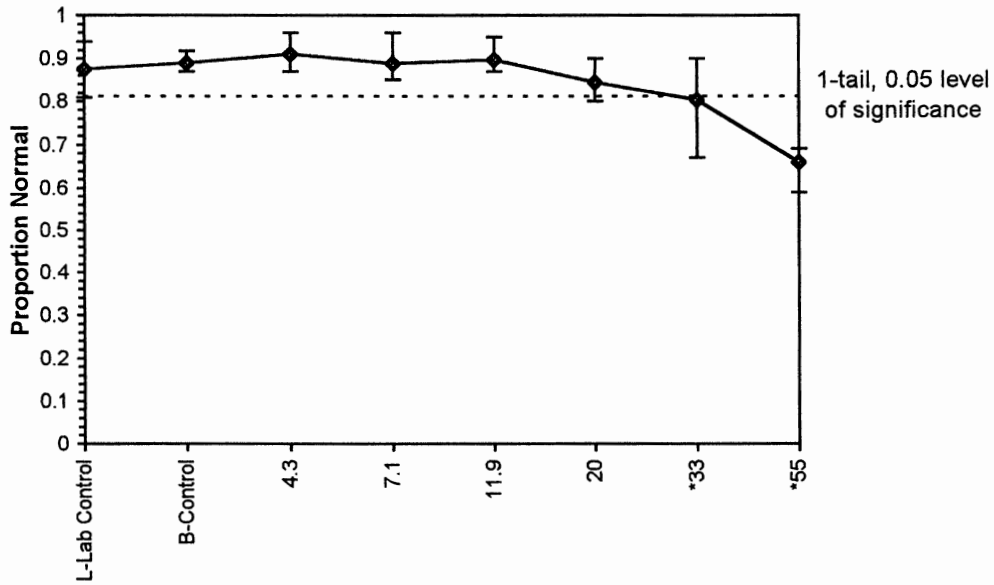
Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	2.44199	0.41549	1.62763	3.25635	0.11	3.16113	9.48773	0.53	2.00321	0.4095	3
Intercept	0.10817	0.67898	-1.2226	1.43898							
TSCR	0.102	0.0079	0.08651	0.1175							
Point	Probits	ug/L	95% Fiducial Limits								
EC01	2.674	11.2349	5.41669	16.2964							
EC05	3.355	21.362	14.0478	26.681							
EC10	3.718	30.0895	23.1032	35.0683							
EC15	3.964	37.9133	31.8097	42.845							
EC20	4.158	45.5583	40.012	51.4974							
EC25	4.326	53.3345	47.3719	62.0103							
EC40	4.747	79.3354	67.0595	107.053							
EC50	5.000	100.743	81.0481	151.626							
EC60	5.253	127.926	97.5231	215.707							
EC75	5.674	190.291	132.09	389.203							
EC80	5.842	222.771	148.878	492.294							
EC85	6.036	267.692	171.103	647.612							
EC90	6.282	337.296	203.766	914.772							
EC95	6.645	475.099	263.859	1527.04							
EC99	7.326	903.353	428.056	3996.75							



**Bivalve Larval Survival and Development Test-Proportion Normal**

Start Date: 03/19/2004      Test ID: 0403-123      Sample ID: BUENA-City of Buenaventura  
End Date: 03/21/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: OTH-Other sample type  
Sample Date: 03/16/2004      Protocol: ASTM 87      Test Species: MG-Mytilis galloprovincialis  
Comments: Sample B-1, WER Study, 100% Spiked sample

**Dose-Response Plot**



Test: BV-Bivalve Larval Survival and Development Test      Test ID: 0403-123  
 Species: MG-Mytilis galloprovincialis      Protocol: ASTM 87  
 Sample ID: BUENA-City of Buenaventura      Sample Type: OTH-Other sample type  
 Start Date: 03/19/2004      End Date: 03/21/2004      Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
56	1	1	L-Lab Control			100	86	
79	2	2	L-Lab Control			100	81	
50	3	3	L-Lab Control			100	93	
66	4	4	L-Lab Control			100	94	
43	5	5	L-Lab Control			100	84	
42	6	1	B-Control			100	91.8	
46	7	2	B-Control			100	87	
47	8	3	B-Control			100	87.16	
45	9	4	B-Control			100	90	
49	10	5	B-Control			100	89	
64	11	1	4.3			100	87	
70	12	2	4.3			100	92	
57	13	3	4.3			100	96	
53	14	4	4.3			100	93	
69	15	5	4.3			100	87	
76	16	1	7.1			100	86	
72	17	2	7			100	96	
48	18	3	7.1			100	85	
77	19	4	7.1			100	87	
62	20	5	7.1			100	90	
55	21	1	11.9			100	89	
71	22	2	11.9			100	95	
59	23	3	11.9			100	89	
80	24	4	11.9			100	87	
63	25	5	11.9			100	89	
61	26	1	20			100	90	
68	27	2	20			100	88	
54	28	3	20			100	82	
41	29	4	20			100	80	
44	30	5	20			100	82	
60	31	1	33			100	67	
58	32	2	33			100	73	
67	33	3	33			100	85	
78	34	4	33			100	87	
65	35	5	33			100	90	
74	36	1	55			100	69	
51	37	2	55			100	59	
75	38	3	55			100	65	
52	39	4	55			100	68	
73	40	5	55			100	69	

Comments: Sample B-1, WER Study, <sup>67</sup>100% Spiked sample

Test: BV-Bivalve Larval Survival and Development Test  
 Species: MG-Mytilis galloprovincialis  
 Sample ID: BUENA-City of Buenaventura  
 Start Date: 03/17/2004

Test ID: 0403-123  
 Protocol: ASTM 87  
 Sample Type: OTH-Other sample type  
 Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
41						100	80	MT
42								
43						100	84	SD
44						100	82	MT
45								
46								
47								
48						100	85	SD
49								
50						100	93	SD
51						100	<del>24</del> 59	SH
52						100	68	SH
53						100	93	SD
54						100	82	MT
55						100	89	SD
56						100	86	SD
57						100	96	SD
58						100	73	MT
59						100	84	SD
60						100	67	MT
61						100	90	SD
62						100	90	SD
63						100	89	SD
64						100	87	SD
65						100	90	SD
66						100	94	SD
67						100	85	SD
68						100	88	SD
69						100	87	SD
70						100	90	SD
71						100	95	SD
72						100	96	SD
73						100	69	SH
74						100	69	SH
75						100	65	SH
76						100	80	SD
77						100	87	SD
78						100	87	SD
79						100	87	SD
80						100	87	SD

Comments: Sample B-1, WER Study, 100% Spiked sample  
 67

AMEC Earth & Environmental  
 Bioassay Laboratory  
 5550 Morehouse Dr. Suite B  
 San Diego, CA 92121

Physical and Chemical  
 Measurements of Test Solutions  
 Salt Water Bioassays

Client: Buenaventura WER B-1  
 Contact: NA  
 Test No.: 0403-123b

Analyst: JR  
 Test Start: 3/19/04  
 Test End: 3/21/04  
 Date Collected: 3/19/04

Sample ID or Conc. <i>‰</i>	DO (mg/L)			pH (pH units)			Salinity (ppt)			Temp °C		
	0	24	48	0	24	48	0	24	48	0	24	48
LC	8.2	8.6	(A)	8.06	8.05	(A)	30	29.8	(A)	14.8	15.0	(A)
BC	7.6	8.6	7.9	8.06	7.94	7.93	30	30.8	31.3	14.8	15.0	14.5
4.3	7.6	9.0	8.0	8.14	8.23	8.31	30	30.5	30.7	14.8	15.0	15.1
7.1	7.7	8.9	8.0	8.16	8.23	8.32	30	30.9	31.2	14.8	15.0	15.2
11.9	7.7	9.0	8.1	8.15	8.23	8.35	30	31.2	31.3	14.8	15.0	15.1
20	7.7	9.0	8.1	8.17	8.23	8.36	30	31.4	31.5	14.8	15.0	15.1
33	7.7	9.0	8.0	8.16	8.24	8.35	30	31.8	31.9	14.8	15.0	15.0
55	7.7	8.9	8.0	8.18	8.24	8.35	30	31.8	32.0	14.8	15.0	15.1

Comments: (A) surrogate cups for water quality measurements spilled prior to test termination  
\* copper added to 46% brined sample

QA Check: ~~JR~~ 4/15/05

## Brine Dilution Worksheet

Client: City of Buenaventura Analyst: JR

Sample ID: Santa Clara River Estuary B1 Test Date: 03/17/2004  
19  
07/04

Test No: 0403-107, 0403-123b Test Type: Bivalve Embryo Dev.

Salinity of Effluent 1.4  
 Salinity of Brine 85  
 Target Salinity 30  
 Test Dilution Volume 150

Salinity Adjustment Factor:  $\frac{TS - SE}{SB - TS}$  TS = target salinity  
 SE = salinity of effluent  
 SB = salinity of brine

Salinity Adjustment Factor = 0.52

Concentration %	Effluent Volume (mL)	Salinity Adjustment	Brine Volume (mL)	Dilute to to: (mL)
Control	NA	NA	NA	150
6.25	9.4	0.52	4.9	150
12.5	18.8	0.52	9.8	150
25	37.5	0.52	19.5	150
50	75	0.52	39	150
66	99	0.52	51	150

**DI Volume**

Brine Control	94	0.55	51	150
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total brine 175.8

Brine Control Salinity Adjustment Factor

Brine Control Calculation:

*QC: MCC 4/28/04*

$$\frac{TS - 0}{SB - TS}$$

AMEC Earth and Environmental, Inc.  
 San Diego Bioassay Laboratory  
 5550 Morehouse Drive, Suite B  
 San Diego, CA 92121





**Bivalve Larval Survival and Development Test-Proportion Normal**

Start Date: 03/19/2004	Test ID: 0403-124b	Sample ID: BUENA-City of Buenaventura
End Date: 03/21/2004	Lab ID: AEESD-AMEC Bioassay SD	Sample Type: OTH-Other sample type
Sample Date: 03/16/2004	Protocol: ASTM 87	Test Species: MG-Mytilis galloprovincialis
Comments: Sample B-3, WER Study, 100% Spiked sample (Measured Values)		

Conc-ug/L	1	2	3	4	5
L-Lab Control	0.9100	0.8900	0.8300	0.8900	0.9200
B-Control	0.8400	0.8800	0.8900	0.8600	0.9300
4.3	0.9400	0.9300	0.9400	0.9100	0.8800
7.1	0.9100	0.9200	0.9200	0.9600	0.8700
11.9	0.9000	0.9600	0.9200	0.9300	0.9000
19.8	0.8000	0.7900	0.7400	0.8400	0.6800
31	0.0600	0.1700	0.1196	0.3100	0.3700
51.2	0.0000	0.0000	0.0000	0.0000	0.0200

Conc-ug/L	Mean	N-Mean	Transform: Arcsin Square Root				N	t-Stat	1-Tailed Critical	MSD	Number Resp	Total Number
			Mean	Min	Max	CV%						
L-Lab Control	0.8880	1.0091	1.2323	1.1458	1.2840	4.313	5				56	500
B-Control	0.8800	1.0000	1.2199	1.1593	1.3030	4.456	5					
4.3	0.9200	1.0455	1.2866	1.2171	1.3233	3.525	5	-1.061	2.409	0.1233	40	500
7.1	0.9160	1.0409	1.2811	1.2019	1.3694	4.669	5	-0.954	2.409	0.1233	42	500
11.9	0.9220	1.0477	1.2909	1.2490	1.3694	3.847	5	-1.146	2.409	0.1233	39	500
*19.8	0.7700	0.8750	1.0733	0.9695	1.1593	6.780	5	3.107	2.409	0.1233	115	500
*31	0.2059	0.2340	0.4540	0.2475	0.6539	36.903	5	15.207	2.409	0.1233	390	492
*51.2	0.0040	0.0045	0.0754	0.0500	0.1419	52.262	5	22.604	2.409	0.1233	422	424

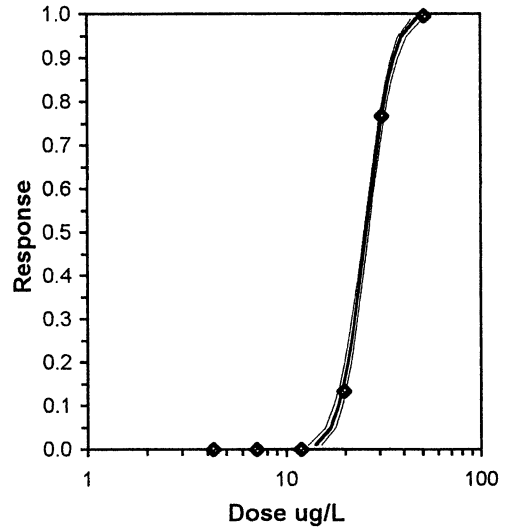
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97315	0.91	0.02033	1.90237
Bartlett's Test indicates equal variances (p = 0.03)	13.7941	16.8119		
The control means are not significantly different (p = 0.72)	0.36478	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	11.9	19.8	15.3499		0.08823	0.09917	1.20397	0.00655	3.7E-21	6, 28

**Maximum Likelihood-Probit**

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	8.9206	0.49268	7.95494	9.88625	0.112	1.59375	9.48773	0.81	1.40915	0.1121	3
Intercept	-7.5705	0.70582	-8.9539	-6.1871							
TSCR	0.0881	0.00639	0.07558	0.10062							

Point	Probits	ug/L	95% Fiducial Limits	
EC01	2.674	14.0725	12.9309	15.0781
EC05	3.355	16.779	15.7253	17.7003
EC10	3.718	18.4286	17.4455	19.2892
EC15	3.964	19.6322	18.705	20.4478
EC20	4.158	20.6447	19.7652	21.424
EC25	4.326	21.5548	20.7169	22.3044
EC40	4.747	24.03	23.2846	24.7278
EC50	5.000	25.6539	24.9377	26.3556
EC60	5.253	27.3876	26.6616	28.1395
EC75	5.674	30.5326	29.6749	31.5031
EC80	5.842	31.8786	30.927	32.9853
EC85	6.036	33.5226	32.4336	34.8223
EC90	6.282	35.7121	34.4103	37.3054
EC95	6.645	39.2231	37.5288	41.3537
EC99	7.326	46.7668	44.0885	50.2523



**Bivalve Larval Survival and Development Test-Proportion Normal**

Start Date: 03/19/2004      Test ID: 0403-124      Sample ID: BUENA-City of Buenaventura  
 End Date: 03/21/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: OTH-Other sample type  
 Sample Date: 03/16/2004      Protocol: ASTM 87      Test Species: MG-Mytilis galloprovincialis  
 Comments: Sample B-3, WER Study, 100% Spiked sample

Conc-ug/L	1	2	3	4	5
L-Lab Control	0.9100	0.8900	0.8300	0.8900	0.9200
B-Control	0.8400	0.8800	0.8900	0.8600	0.9300
4.3	0.9400	0.9300	0.9400	0.9100	0.8800
7.1	0.9100	0.9200	0.9200	0.9600	0.8700
11.9	0.9000	0.9600	0.9200	0.9300	0.9000
20	0.8000	0.7900	0.7400	0.8400	0.6800
33	0.0600	0.1700	0.1196	0.3100	0.3700
55	0.0000	0.0000	0.0000	0.0000	0.0200

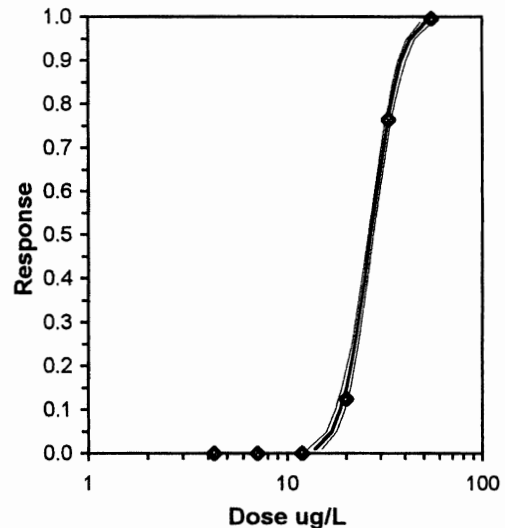
Conc-ug/L	Mean	N-Mean	Transform: Arcsin Square Root				N	t-Stat	1-Tailed Critical	MSD	Number Resp	Total Number
			Mean	Min	Max	CV%						
L-Lab Control	0.8880	1.0091	1.2323	1.1458	1.2840	4.313	5					
B-Control	0.8800	1.0000	1.2199	1.1593	1.3030	4.456	5				60	500
4.3	0.9200	1.0455	1.2866	1.2171	1.3233	3.525	5	-1.301	2.409	0.1234	40	500
7.1	0.9160	1.0409	1.2811	1.2019	1.3694	4.669	5	-1.195	2.409	0.1234	42	500
11.9	0.9220	1.0477	1.2909	1.2490	1.3694	3.847	5	-1.386	2.409	0.1234	39	500
*20	0.7700	0.8750	1.0733	0.9695	1.1593	6.780	5	2.860	2.409	0.1234	115	500
*33	0.2059	0.2340	0.4540	0.2475	0.6539	36.903	5	14.943	2.409	0.1234	390	492
*55	0.0040	0.0045	0.0754	0.0500	0.1419	52.262	5	22.330	2.409	0.1234	422	424

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97034	0.91	0.08214	1.87071
Bartlett's Test indicates equal variances (p = 0.03)	13.7022	16.8119		
The control means are not significantly different (p = 0.72)	0.36478	2.30601		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test	11.9	20	15.4272		0.09047	0.10259	1.19837	0.00657	4.1E-21	6, 28

Parameter	Value	SE	95% Fiducial Limits		Maximum Likelihood-Probit						
			Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter		
Slope	8.17266	0.44134	7.30763	9.0377	0.12	2.07565	9.48773	0.72	1.42694	0.12236	3
Intercept	-6.6619	0.64329	-7.9228	-5.4011							
TSCR	0.09026	0.00648	0.07756	0.10295							

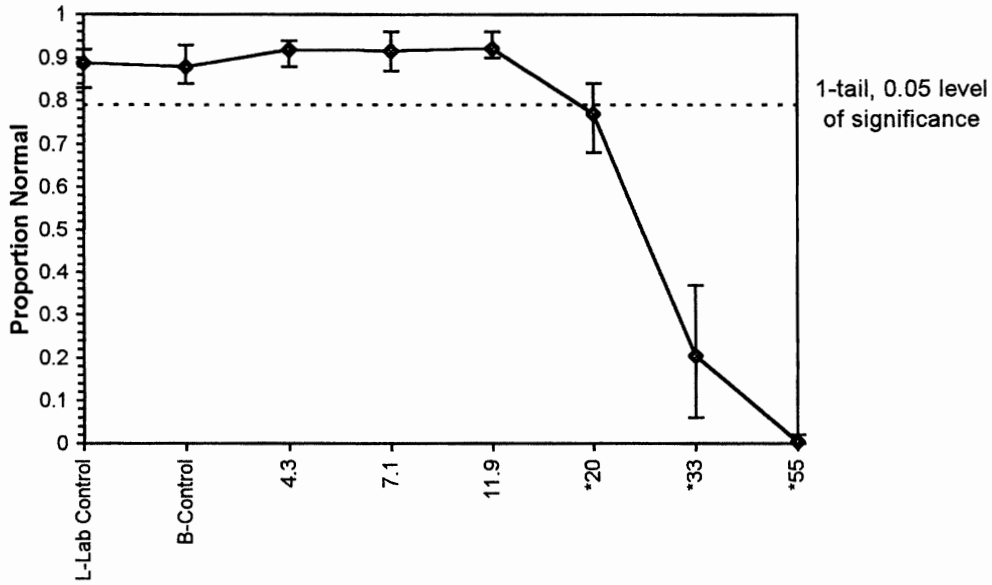
Point	Probits	ug/L	95% Fiducial Limits	
EC01	2.674	13.877	12.6613	14.9603
EC05	3.355	16.8144	15.6666	17.8282
EC10	3.718	18.6267	17.5413	19.5855
EC15	3.964	19.9585	18.9248	20.8752
EC20	4.158	21.0846	20.0961	21.9667
EC25	4.326	22.1011	21.1527	22.9548
EC40	4.747	24.8854	24.0282	25.6891
EC50	5.000	26.7267	25.8987	27.5354
EC60	5.253	28.7041	27.8657	29.5666
EC75	5.674	32.3202	31.3389	33.4208
EC80	5.842	33.8785	32.7927	35.1307
EC85	6.036	35.79	34.549	37.2599
EC90	6.282	38.349	36.8642	40.1548
EC95	6.645	42.4822	40.5401	44.9129
EC99	7.326	51.4748	48.3601	55.5178



**Bivalve Larval Survival and Development Test-Proportion Normal**

Start Date: 03/19/2004      Test ID: 0403-124      Sample ID: BUENA-City of Buenaventura  
End Date: 03/21/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: OTH-Other sample type  
Sample Date: 03/16/2004      Protocol: ASTM 87      Test Species: MG-Mytilis galloprovincialis  
Comments: Sample B-3, WER Study, 100% Spiked sample

**Dose-Response Plot**



Test: BV-Bivalve Larval Survival and Development Test      Test ID: 0403-124  
 Species: MG-Mytilus galloprovincialis      Protocol: ASTM 87  
 Sample ID: BUENA-City of Buenaventura      Sample Type: OTH-Other sample type  
 Start Date: 03/19/2004      End Date: 03/21/2004      Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
86	1	1	L-Lab Control			100	91	
90	2	2	L-Lab Control			100	89	
113	3	3	L-Lab Control			100	83	
107	4	4	L-Lab Control			100	89	
117	5	5	L-Lab Control			100	92	
93	6	1	B-Control			100	84	
100	7	2	B-Control			100	88	
119	8	3	B-Control			100	89	
103	9	4	B-Control			100	86	
112	10	5	B-Control			100	93	
92	11	1	4.3			100	94	
87	12	2	4.3			100	93	
108	13	3	4.3			100	94	
116	14	4	4.3			100	91	
89	15	5	4.3			100	88	
111	16	1	7.1			100	91	
96	17	2	7.1			100	92	
115	18	3	7.1			100	92	
114	19	4	7.1			100	96	
99	20	5	7.1			100	87	
105	21	1	11.9			100	90	
88	22	2	11.9			100	96	
106	23	3	11.9			100	92	
81	24	4	11.9			100	93	
118	25	5	11.9			100	90	
109	26	1	20			100	80	
84	27	2	20			100	79	
83	28	3	20			100	74	
94	29	4	20			100	84	
120	30	5	20			100	68	
101	31	1	33			100	6	
91	32	2	33			100	17	
97	33	3	33			92	11	
85	34	4	33			100	31	
102	35	5	33			100	37	
110	36	1	55			94	0	
82	37	2	55			38	0	
104	38	3	55			92	0	
98	39	4	55			100	0	
95	40	5	55			100	2	

Comments: Sample B-3, WER Study, 100% Spiked sample

Test: BV-Bivalve Larval Survival and Development Test

Test ID: 0403-124

Species: MG-Mytilis galloprovincialis

Protocol: ASTM 87

Sample ID: BUENA-City of Buenaventura

Sample Type: OTH-Other sample type

Start Date: 03/17/2004

End Date: 03/18/2004

Lab ID: AEEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
81						161	93	Rg
82						38	0	Rg
83						100	74	MT
84						100	79	MT
85						100	31	MT
86						100, 100	17, 91	MT Rg
87						100	93	Rg
88						100	96	Rg
89						100	88	Rg
90						100	89	SD
91						100	17	MT
92						100	94	SD
93						100	84	SD
94						100	84	MT
95						100	2	SD
96						100	92	SD
97						92	11	MT
98						100	0	SD
99						100	87	SD
100						100	88	SD
101						100	6	MT
102						100	37	MT
103						100	86	SD
104						92	0	SD
105						100	90	SD
106							92	
107							89	
108							94	
109						100	80	MT
110						94	0	SD
111						100	91	
112							93	
113							83	
114							90	
115							92	
116							91	
117							92	
118							90	
119							89	
120						100	68	MT

Comments: Sample B-3, WER Study, 100% Spiked sample

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 San Diego, CA 92121

Physical and Chemical  
 Measurements of Test Solutions  
 Salt Water Bioassays

Client: Buena Ventura WER B-3  
 Contact: NA  
 Test No.: 403-1246

Analyst: JR  
 Test Start: 3/15/04  
 Test End: 3/21/04  
 Date Collected: 3/19/04

Sample ID or Conc. <i>mg/L</i>	DO (mg/L)			pH (pH units)			Salinity (ppt)			Temp °C		
	0	24	48	0	24	48	0	24	48	0	24	48
LC	8.2	8.6	(A)	8.06	8.05	(A)	30	29.8	(A)	14.8	15.0	(A)
BC	7.6	8.9	7.9	8.06	7.97	7.42	30	31.5	31.6	14.8	14.7	14.4
4.3	7.5	9.0	8.1	8.22	8.29	8.35	30	30.7	31.0	14.8	14.7	14.8
7.1	7.6	8.8	8.0	8.22	8.30	8.36	30	30.9	31.1	14.8	14.6	14.7
11.9	7.6	8.9	8.1	8.22	8.30	8.37	30	31.1	31.3	14.8	14.7	14.7
20	7.6	9.0	8.1	8.23	8.30	8.35	30	31.3	31.4	14.8	14.7	14.7
33	7.7	9.0	8.1	8.22	8.29	8.29	30	31.5	31.6	14.8	14.6	14.7
55	7.7	9.0	8.1	8.22	8.29	8.31	30	31.8	31.9	14.8	14.7	14.7

Comments: (A) surrogate cup for water quality measurements spilled prior to test termination  
\*copper added to 75% brined sample

QA Check: (Signature) 4/15/05

## Brine Dilution Worksheet

Client: City of Buenaventura

Analyst: JR

Sample ID: Santa Clara River Estuary B3

Test Date: 03/17/2004  
~~03/17~~

Test No: 0403-108, 0403-124<sup>B</sup>

Test Type: Bivalve Embryo Dev.

Salinity of Effluent	12.1
Salinity of Brine	85
Target Salinity	30
Test Dilution Volume	150

Salinity Adjustment Factor:	$\frac{TS - SE}{SB - TS}$	TS = target salinity SE = salinity of effluent SB = salinity of brine
-----------------------------	---------------------------	---

Salinity Adjustment Factor = 0.33

Concentration %	Effluent Volume (mL)	Salinity Adjustment	Brine Volume (mL)	Dilute to to: (mL)
Control	NA	NA	NA	150
6.25	12.5 <sup>94</sup>	0.33	4.1	150
12.5	18.8	0.33	6.1	150
25	37.5	0.33	12.2	150
50	75	0.33	24	150
75	113	0.33	37	150

**DI Volume**

Brine Control	68	0.55	37	150
---------------	----	------	----	-----

total brine      120.4

**Brine Control Salinity Adjustment Factor**

Brine Control Calculation:

*60 ml @ 4/28/04*

$$\frac{TS - 0}{SB - TS}$$

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 San Diego, CA 92121





**Bivalve Larval Survival and Development Test-Proportion Normal**

Start Date: 03/19/2004      Test ID: 0403-125b      Sample ID: BUENA-City of Buenaventura  
 End Date: 03/21/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: OTH-Other sample type  
 Sample Date: 03/16/2004      Protocol: ASTM 87      Test Species: MG-Mytilis galloprovincialis  
 Comments: Sample C-3, WER Study, 100% Spiked sample (Measured Values)

Conc-ug/L	1	2	3	4	5
L-Lab Control	<del>0.8600</del>	<del>0.8532</del>	<del>0.7723</del>	<del>0.7686</del>	
B-Control	0.8900	0.9300	0.8400	0.8800	0.8600
4.3	0.7228	0.9020	0.8020	0.8265	0.6990
7.1	0.8942	0.6923	0.8431	0.8173	0.7647
11.9	0.8158	0.5000	0.6566	0.8431	0.6907
20.1	0.8800	0.8400	0.8700	0.9000	0.8500
31.6	0.0233	0.0200	0.0000	0.0000	0.0000
55	0.0000	0.0000	0.0000	0.0000	0.0000

*share w/ B-3 due to loss of replicati*

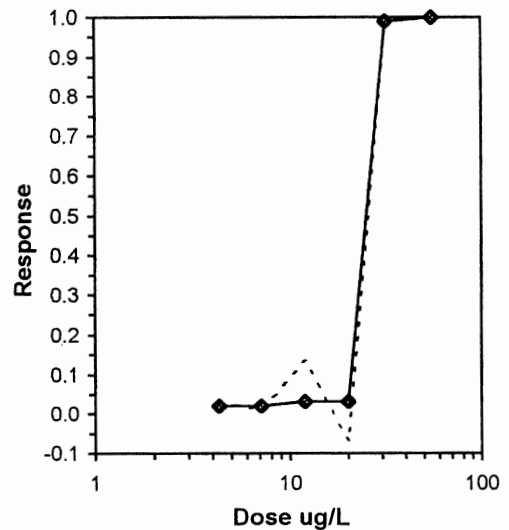
Conc-ug/L	Mean	N-Mean	Transform: Arcsin Square Root					Rank Sum	1-Tailed Critical	Number Resp	Total Number
			Mean	Min	Max	CV%	N				
L-Lab Control	<del>0.8135</del>	0.9244	1.1268	1.0689	1.1873	5.719	4			78	418
B-Control	0.8800	1.0000	1.2199	1.1593	1.3030	4.456	5				
4.3	0.7905	0.8982	1.1019	0.9901	1.2523	9.525	5	23.00	15.00	106	505
7.1	0.8023	0.9117	1.1159	0.9828	1.2396	8.748	5	23.00	15.00	102	516
11.9	0.7012	0.7969	1.0004	0.7854	1.1636	15.194	5	19.00	15.00	151	512
20.1	0.8680	0.9864	1.2001	1.1593	1.2490	2.970	5	31.00	15.00	66	500
*31.6	0.0087	0.0098	0.0893	0.0500	0.1531	59.708	5	15.00	15.00	477	481
*55	0.0000	0.0000	0.0710	0.0594	0.0982	22.154	5	15.00	15.00	272	272

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.97235	0.908	-0.1646	0.94659
Bartlett's Test indicates unequal variances (p = 6.51E-03)	17.8919	16.8119		
The control means are significantly different (p = 0.05)	2.35662	2.36462		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Wilcoxon Rank Sum Test	20.1	31.6	25.2024	

**Trimmed Spearman-Kärber**

Trim Level	EC50	95% CL	
0.0%			
5.0%	25.067	24.957	25.178
10.0%	25.067	24.957	25.178
20.0%	25.067	24.957	25.178
Auto-2.1%	24.825	24.517	25.138



**Bivalve Larval Survival and Development Test-Proportion Normal**

Start Date: 03/19/2004      Test ID: 0403-125      Sample ID: BUENA-City of Buenaventura  
 End Date: 03/21/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: OTH-Other sample type  
 Sample Date: 03/16/2004      Protocol: ASTM 87      Test Species: MG-Mytilis galloprovincialis  
 Comments: Sample C-3, WER Study, <sup>100%</sup> 100% Spiked sample

Conc-ug/L	1	2	3	4	5
L-Lab Control	<del>0.8600</del>	<del>0.8632</del>	<del>0.7723</del>	<del>0.7685</del>	*
B-Control	0.8900	0.9300	0.8400	0.8800	0.8600
4.3	0.7228	0.9020	0.8020	0.8265	0.6990
7.1	0.8942	0.6923	0.8431	0.8173	0.7647
11.9	0.8158	0.5000	0.6566	0.8431	0.6907
20	0.8800	0.8400	0.8700	0.9000	0.8500
33	0.0233	0.0200	0.0000	0.0000	0.0000
55	0.0000	0.0000	0.0000	0.0000	0.0000

\* share w/ p-3 due to loss of replicate

\* - Replicate missing, excluded from analysis

Conc-ug/L	Transform: Arcsin Square Root							Rank Sum	1-Tailed Critical	Number Resp	Total Number
	Mean	N-Mean	Mean	Min	Max	CV%	N				
L-Lab Control	<del>0.8135</del>	0.9244	1.1268	1.0689	1.1873	5.719	4				
B-Control	0.8800	1.0000	1.2199	1.1593	1.3030	4.456	5			60	500
4.3	0.7905	0.8982	1.1019	0.9901	1.2523	9.525	5	19.00	16.00	106	505
7.1	0.8023	0.9117	1.1159	0.9828	1.2396	8.748	5	20.00	16.00	102	516
*11.9	0.7012	0.7969	1.0004	0.7854	1.1636	15.194	5	16.00	16.00	151	512
20	0.8680	0.9864	1.2001	1.1593	1.2490	2.970	5	25.00	16.00	66	500
*33	0.0087	0.0098	0.0893	0.0500	0.1531	59.708	5	15.00	16.00	477	481
*55	0.0000	0.0000	0.0710	0.0594	0.0982	22.154	5	15.00	16.00	272	272

**Auxiliary Tests**

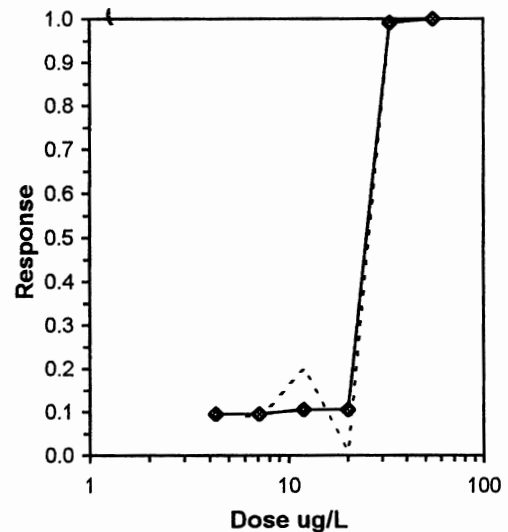
	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.96915	0.91	-0.1465	1.11057
Bartlett's Test indicates unequal variances (p = 4.61E-03)	18.7478	16.8119		
The control means are significantly different (p = 0.05)	2.35662	2.36462		

**Hypothesis Test (1-tail, 0.05)**

	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	20	33	25.6905	

**Trimmed Spearman-Kärber**

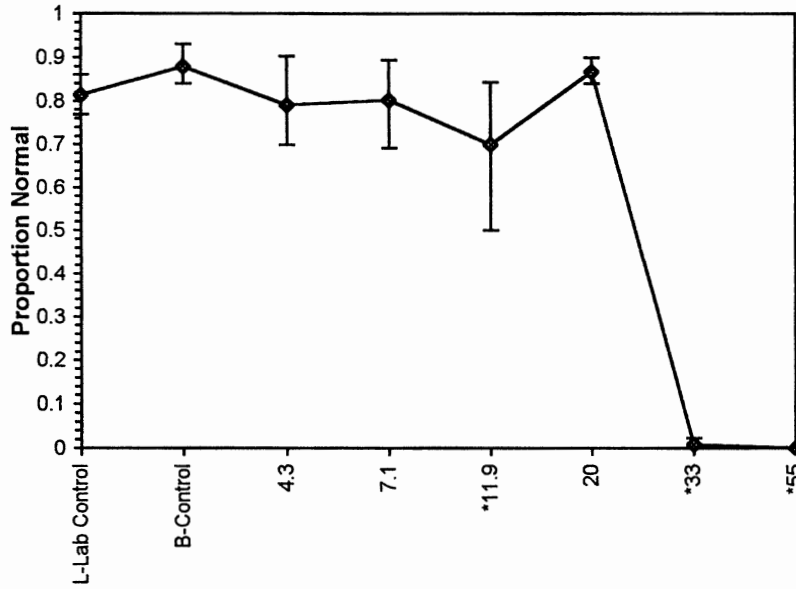
Trim Level	EC50	95% CL	
0.0%			
5.0%			
10.0%	24.868	24.280	25.470
20.0%	24.996	24.774	25.221
Auto-9.5%	24.735	24.101	25.386



**Bivalve Larval Survival and Development Test-Proportion Normal**

Start Date: 03/19/2004 Test ID: 0403-125 Sample ID: BUENA-City of Buenaventura  
End Date: 03/21/2004 Lab ID: AEESD-AMEC Bioassay SD Sample Type: OTH-Other sample type  
Sample Date: 03/16/2004 Protocol: ASTM 87 Test Species: MG-Mytilis galloprovincialis  
Comments: Sample C-3, WER Study, 400% Spiked sample

**Dose-Response Plot**



Test: BV-Bivalve Larval Survival and Development Test      Test ID: 0403-125  
 Species: MG-Mytilis galloprovincialis                              Protocol: ASTM 87  
 Sample ID: BUENA-City of Buenaventura                              Sample Type: OTH-Other sample type  
 Start Date: 03/19/2004                              End Date: 03/21/2004                              Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
	1	1	L-Lab Control					
	2	2	L-Lab Control			100	86	
	3	3	L-Lab Control			109	93	
	4	4	L-Lab Control			101	78	
	5	5	L-Lab Control			108	83	
	6	1	B-Control			100	89	
	7	2	B-Control			100	93	
	8	3	B-Control			100	84	
	9	4	B-Control			100	88	
	10	5	B-Control			100	86	
	11	1	4.3			101	73	
	12	2	4			102	92	
	13	3	4.3			101	81	
	14	4	4.3			98	81	
	15	5	4.3			103	72	
	16	1	7.1			104	93	
	17	2	7.1			104	72	
	18	3	7.1			102	86	
	19	4	7.1			104	85	
	20	5	7.1			102	78	
	21	1	12			114	93	
	22	2	11.9			100	50	
	23	3	11.9			99	65	
	24	4	11.9			102	86	
	25	5	11.9			97	67	
	26	1	20			100	88	
	27	2	20			100	84	
	28	3	20			100	87	
	29	4	20			100	90	
	30	5	20			100	85	
	31	1	33			86	2	
	32	2	33			100	2	
	33	3	33			95	0	
	34	4	33			100	0	
	35	5	33			100	0	
	36	1	55			51	0	
	37	2	55			61	0	
	38	3	55			26	0	
	39	4	55			71	0	
	40	5	55			63	0	

Comments: Sample C-3, WER Study, 100% Spiked sample  
*62*

Test: BV-Bivalve Larval Survival and Development Test      Test ID: 0403-125  
 Species: MG-Mytilis galloprovincialis      Protocol: ASTM 87  
 Sample ID: BUENA-City of Buenaventura      Sample Type: OTH-Other sample type  
 Start Date: 03/17/2004      End Date: 03/19/2004      Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
121				<del>100</del>	90	100	90	SD
122					84	100	84	SD
123					<del>2</del> 50	101	81	RS
124					<del>88</del> 2	100	2	SD
125						102	78	RS
126						26	0	RS
127					88	100	88	SD
128					<del>0</del>	100	0	↓
129				<del>365</del>	2	86	2	↓
130						109	93	RS
131						97	67	RS
132						100	87	SD
133						100	86	RS
134						57	0	RS
135						104	93	RS
136						63	0	RS
137						102	92	RS
138								
139						100	85	SD
140						100	0	SD
141						<del>60</del> 95	0	RS
142						<del>85</del>	23	<del>RS</del> RS
143						83 + 2	86 23	RS
144						102 + 3	86 31 72	RS
145						103 + 4	72 72	RS RS RS
146						<del>101</del>	<del>78</del>	<del>RS</del> RS
147						104	72	RS
148								
149						101	78	RS
150						104	85	RS
151						102	86	RS
152						101	73	RS
153						108	83	RS
154						98	81	RS
155								
156						114	93	RS
157						93	0	SD
158						99	65	RS
159						100	50	RS
160						71	0	RS

Comments: Sample C-7, WER Study, 100% Spiked sample

*[Signature]*  
4/15/05

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 San Diego, CA 92121

Physical and Chemical  
 Measurements of Test Solutions  
 Salt Water Bioassays

Client: Buena Ventura WER C-3  
 Contact: NA  
 Test No.: 0403-125b

Analyst: JR  
 Test Start: 3/19/04  
 Test End: 3/21/04  
 Date Collected: 3/19/04

Sample ID or Conc. <sup>μs/L</sup>	DO (mg/L)			pH (pH units)			Salinity (ppt)			Temp °C		
	0	24	48	0	24	48	0	24	48	0	24	48
LC	8.2	8.6	(A)	8.06	8.05	(A)	30	29.8	(A)	14.8	15.0	(A)
BC	7.6	8.9	7.9	8.06	7.97	7.92	30	31.5	31.6	14.8	14.7	14.4
4.3	7.5	8.9	7.9	8.30	8.41	8.41	30	31.0	31.1	14.8	14.7	15.0
7.1	7.6	8.9	8.0	8.29	8.40	8.44	30	31.3	31.7	14.8	14.6	15.0
11.9	7.7	9.0	8.1	8.29	8.39	8.45	30	31.4	31.4	14.8	14.6	15.1
20	7.7	8.9	8.1	8.29	8.39	8.46	30	31.5	31.4	14.8	14.6	15.1
33	7.6	8.9	8.1	8.29	8.39	8.48	30	31.8	31.7	14.8	14.7	15.0
50	7.5	9.0	8.1	8.42	8.39	8.41	30	32.2	32.3	14.8	14.6	15.0

Comments: (A) surrogate cup for water quality measurements spilled prior to test termination  
\* copper added to 66% brined sample

QA Check: [Signature] 4/15/05

## Brine Dilution Worksheet

Client: City of Buenaventura

Analyst: JR

Sample ID: Santa Clara River Estuary C3

Test Date: 03/17/2004  
*19*  
*2004*

Test No: 0A03-109, 0A03-125b

Test Type: Bivalve Embryo Dev.

Salinity of Effluent	1.7
Salinity of Brine	85
Target Salinity	30
Test Dilution Volume	150

Salinity Adjustment Factor:	$\frac{TS - SE}{SB - TS}$	TS = target salinity SE = salinity of effluent SB = salinity of brine
-----------------------------	---------------------------	---

Salinity Adjustment Factor = 0.51

Concentration %	Effluent Volume (mL)	Salinity Adjustment	Brine Volume (mL)	Dilute to to: (mL)
Control	NA	NA	NA	150
6.25	9.4	0.51	4.8	150
12.5	18.8	0.51	9.6	150
25	37.5	0.51	19.3	150
50	75	0.51	39	150
66	99	0.51	51	150

**DI Volume**

Brine Control	93	0.55	51	150
total brine			174.3	

**Brine Control Salinity Adjustment Factor**

Brine Control Calculation:

$$\frac{TS - 0}{SB - TS}$$

*QC: MC 4/28/04*

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 San Diego, CA 92121

APPENDIX C  
REFERENCE TOXICANT DATA



POLISHED SEAWATER

**Bivalve Larval Survival and Development Test-Proportion Normal**

Start Date: 03/19/2004      Test ID: 0403-126b      Sample ID: BUENA-City of Buenaventura  
 End Date: 03/21/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: OTH-Other sample type  
 Sample Date: 03/16/2004      Protocol: ASTM 87      Test Species: MG-Mytilis galloprovincialis  
 Comments: Polished Seawater Reflux - Cu WER (Measured Values)

Conc-ug/L	1	2	3	4	5
L-Lab Control	0.9100	0.9000	0.8600	0.8800	0.9300
1.8	0.8800	0.8500	0.9200	0.9300	0.8514
3	0.8131	0.7941	0.9000	0.9300	0.8137
5.1	0.9000	0.8900	0.9200	0.8900	0.8073
9.1	0.8900	0.8242	0.7872	0.9500	0.8900
13.7	0.3100	0.5100	0.8200	0.6300	0.3300
22.5	0.0000	0.0000	0.0000	0.0000	0.0000
39	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-ug/L	Mean	N-Mean	Transform: Arcsin Square Root				Rank Sum	1-Tailed Critical	Number Resp	Total Number
			Mean	Min	Max	CV%				
L-Lab Control	0.8960	1.0000	1.2445	1.1873	1.3030	3.580	5	52	500	
1.8	0.8863	0.9891	1.2304	1.1731	1.3030	4.924	5	25.00	16.00	
3	0.8502	0.9489	1.1800	1.0998	1.3030	7.648	5	22.00	16.00	
5.1	0.8815	0.9838	1.2230	1.1164	1.2840	5.165	5	25.50	16.00	
9.1	0.8683	0.9691	1.2080	1.0914	1.3453	8.127	5	24.00	16.00	
*13.7	0.5200	0.5804	0.8095	0.5905	1.1326	27.840	5	15.00	16.00	
*22.5	0.0000	0.0000	0.0500	0.0500	0.0500	0.000	5	15.00	16.00	
*39	0.0000	0.0000	0.0506	0.0500	0.0530	2.654	5	15.00	16.00	

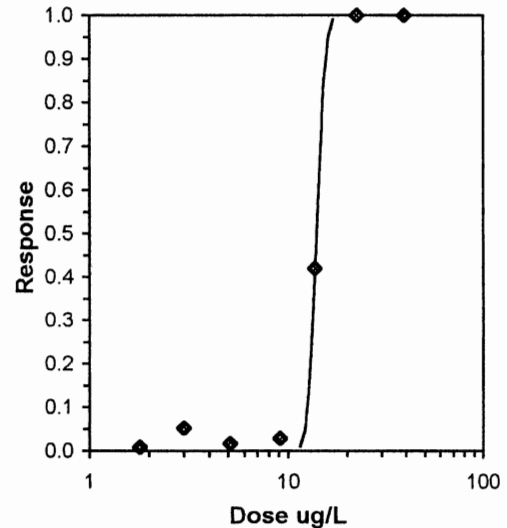
**Auxiliary Tests**      **Statistic**      **Critical**      **Skew**      **Kurt**  
 Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)      0.91336      0.919      0.67619      4.17279  
 Equality of variance cannot be confirmed

**Hypothesis Test (1-tail, 0.05)**      **NOEC**      **LOEC**      **ChV**      **TU**  
 Steel's Many-One Rank Test      9.1      13.7      11.1656

**Maximum Likelihood-Probit**

Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	27.3927	443.08	-841.04	895.83	0.104	4.34644	11.0705	0.5	1.14533	0.03651	35
Intercept	-26.374	503.658	-1013.5	960.797							
TSCR	0.12344	0.00661	0.11049	0.13639							

Point	Probits	ug/L	95% Fiducial Limits	
EC01	2.674	11.4922		
EC05	3.355	12.1698		
EC10	3.718	12.5472		
EC15	3.964	12.8084		
EC20	4.158	13.0199		
EC25	4.326	13.2041		
EC40	4.747	13.6799		
EC50	5.000	13.9743		
EC60	5.253	14.2751		
EC75	5.674	14.7895		
EC80	5.842	14.9987		
EC85	6.036	15.2464		
EC90	6.282	15.5638		
EC95	6.645	16.0464		
EC99	7.326	16.9925		



**Bivalve Larval Survival and Development Test-Proportion Normal**

Start Date: 03/19/2004      Test ID: 0403-126      Sample ID: BUENA-City of Buenaventura  
 End Date: 03/21/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: OTH-Other sample type  
 Sample Date: 03/16/2004      Protocol: ASTM 87      Test Species: MG-Mytilus galloprovincialis  
 Comments: Polished Seawater Reftox - Cu WER

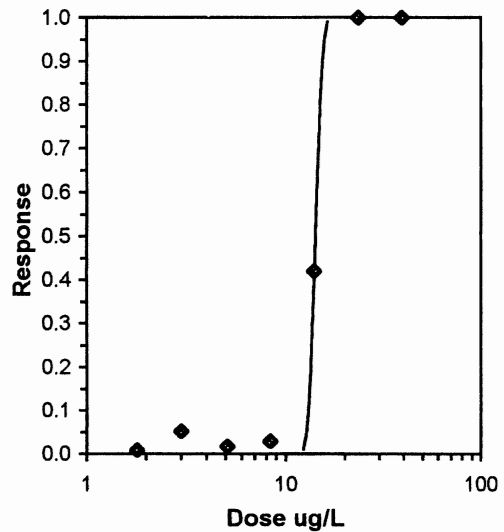
Conc-ug/L	1	2	3	4	5
L-Lab Control	0.9100	0.9000	0.8600	0.8800	0.9300
1.8	0.8800	0.8500	0.9200	0.9300	0.8514
3	0.8131	0.7941	0.9000	0.9300	0.8137
5.1	0.9000	0.8900	0.9200	0.8900	0.8073
8.4	0.8900	0.8242	0.7872	0.9500	0.8900
14	0.3100	0.5100	0.8200	0.6300	0.3300
23.4	0.0000	0.0000	0.0000	0.0000	0.0000
39	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-ug/L	Transform: Arcsin Square Root						Rank Sum	1-Tailed Critical	Number Resp	Total Number
	Mean	N-Mean	Mean	Min	Max	CV%				
L-Lab Control	0.8960	1.0000	1.2445	1.1873	1.3030	3.580	5		52	500
1.8	0.8863	0.9891	1.2304	1.1731	1.3030	4.924	5	25.00	16.00	474
3	0.8502	0.9489	1.1800	1.0998	1.3030	7.648	5	22.00	16.00	511
5.1	0.8815	0.9838	1.2230	1.1164	1.2840	5.165	5	25.50	16.00	509
8.4	0.8683	0.9691	1.2080	1.0914	1.3453	8.127	5	24.00	16.00	485
*14	0.5200	0.5804	0.8095	0.5905	1.1326	27.840	5	15.00	16.00	500
*23.4	0.0000	0.0000	0.0500	0.0500	0.0500	0.000	5	15.00	16.00	500
*39	0.0000	0.0000	0.0506	0.0500	0.0530	2.654	5	15.00	16.00	489

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.01)	0.91336	0.919	0.67619	4.17279
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	8.4	14	10.8444	

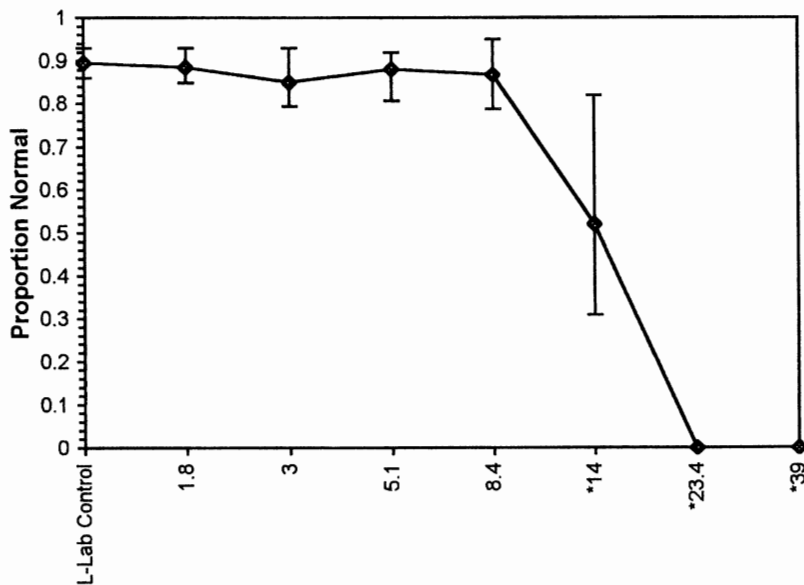
Maximum Likelihood-Probit											
Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	37.1518	1301233	-3E+06	2550455	0.104	3.02859	11.0705	0.7	1.15261	0.02692	49
Intercept	-37.821	1491380	-3E+06	2923067							
TSCR	0.12618	0.00742	0.11165	0.14072							
Point	Probits	ug/L	95% Fiducial Limits								
EC01	2.674	12.3024									
EC05	3.355	12.8331									
EC10	3.718	13.1253									
EC15	3.964	13.3263									
EC20	4.158	13.4881									
EC25	4.326	13.6286									
EC40	4.747	13.989									
EC50	5.000	14.2104									
EC60	5.253	14.4353									
EC75	5.674	14.817									
EC80	5.842	14.9713									
EC85	6.036	15.1532									
EC90	6.282	15.3851									
EC95	6.645	15.7355									
EC99	7.326	16.4143									



**Bivalve Larval Survival and Development Test-Proportion Normal**

Start Date: 03/19/2004      Test ID: 0403-126      Sample ID: BUENA-City of Buenaventura  
End Date: 03/21/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: OTH-Other sample type  
Sample Date: 03/16/2004      Protocol: ASTM 87      Test Species: MG-Mytilis galloprovincialis  
Comments: Polished Seawater Reftox - Cu WER

**Dose-Response Plot**



Test: BV-Bivalve Larval Survival and Development Test      Test ID: 0403-126  
 Species: MG-Mytilus galloprovincialis      Protocol: ASTM 87  
 Sample ID: BUENA-City of Buenaventura      Sample Type: OTH-Other sample type  
 Start Date: 03/19/2004      End Date: 03/21/2004      Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
	1	1	L-Lab Control			100	91	
	2	2	L-Lab Control			100	90	
	3	3	L-Lab Control			100	86	
	4	4	L-Lab Control			100	88	
	5	5	L-Lab Control			100	93	
	6	1	1.8			100	88	
	7	2	1.8			100	85	
	8	3	1.8			100	92	
	9	4	1.8			100	93	
	10	5	1.8			74	63	
	11	1	3			107	87	
	12	2	3			102	81	
	13	3	3			100	90	
	14	4	3			100	93	
	15	5	3			102	83	
	16	1	5			100	90	
	17	2	5			100	89	
	18	3	5			100	92	
	19	4	5			100	89	
	20	5	5			109	88	
	21	1	8.4			100	89	
	22	2	8.4			91	75	
	23	3	8.4			94	74	
	24	4	8.4			100	95	
	25	5	8.4			100	89	
	26	1	14			100	31	
	27	2	14			100	51	
	28	3	14			100	82	
	29	4	14			100	63	
	30	5	14			100	33	
	31	1	23			100	0	
	32	2	23			100	0	
	33	3	23			100	0	
	34	4	23			100	0	
	35	5	23			100	0	
	36	1	39			100	0	
	37	2	39			100	0	
	38	3	39			89	0	
	39	4	39			100	0	
	40	5	39			100	0	

Comments: Polished Seawater Reftox - Cu WER

Test: BV-Bivalve Larval Survival and Development Test      Test ID: 0403-126  
 Species: MG-Mytilis galloprovincialis      Protocol: ASTM 87  
 Sample ID: BUENA-City of Buenaventura      Sample Type: OTH-Other sample type  
 Start Date: 03/17/2004      End Date: 03/19/2004      Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
161						100	63	MT
162						100	89	SH
163						100	0	SH
164						100	0	SH
165						100	90	SH
166						100	0	MT
167						89	0	SD
168						100	88	
169							93	
170							92	
171							95	
172							90	
173							91	
174							86	
175							0	
176							92	
177							0	
178						↓	0	↓
179						100	0	MT
180						100	89	SD
181						100	85	SD
182						100	51	MT
183						100	0	MT
184						100	90	SD
185						100	93	SD
186						100	82	MT
187						100	0	MT
188						100	88	SD
189						100	89	SD
190						100	93	SD
191						91	75	RS
192						102	83	RS
193						102	81	RS
194						74	63	RS
195						100	33	MT
196						100	31	MT
197						94	74	RS
198						109	88	RS
199						100	0	MT
200						107	87	RS

Comments: Polished Seawater Reftox  
 PSW

AMEC Earth & Environmental  
 Bioassay Laboratory  
 5550 Morehouse Dr. Suite B  
 San Diego, CA 92121

Physical and Chemical  
 Measurements of Test Solutions  
 Salt Water Bioassays

Client: Puenteventura - Polished Sea H<sub>2</sub>O  
 Contact: NA  
 Test No.: 0403-1266

Analyst: JR  
 Test Start: 3/19/04  
 Test End: 3/21/04  
 Date Collected: ~~3/16/04~~ 3/19/04

Sample ID. <sup>g/L</sup> or Conc.	DO (mg/L)			pH (pH units)			Salinity (ppt)			Temp °C		
	0	24	48	0	24	48	0	24	48	0	24	48
LC	7.8	<del>8.8</del> <del>8.6</del>	(A)	7.88	(A) 8.05	(A)	30	(A) 29.8	(A)	14.8	(A) 15.0	(A)
1.8	7.8	8.8	8.2	7.89	7.99	8.02	30	30.8	30.7	14.8	15.0	15.1
3.0	7.8	8.9	8.2	7.90	8.00	8.02	30	30.9	30.8	14.8	15.0	15.1
5.0	7.8	9.0	8.1	7.91	7.99	8.02	30	30.9	30.4	14.8	15.0	15.0
8.4	7.8	8.9	8.1	7.92	7.99	8.03	30	30.8	30.8	14.8	15.0	15.0
14	7.8	9.0	8.1	7.92	7.99	8.04	31	30.9	30.9	14.8	15.0	15.0
23	7.8	9.0	8.2	7.92	7.99	8.04	30	30.7	30.7	14.8	15.0	15.0
39	7.8	9.0	8.2	7.93	7.99	8.04	30	30.7	30.7	14.8	15.0	15.0

Comments: (A) surrogate cup for water quality measurements spilled prior to test termination

QA Check: ~~JR~~ 4/15/05

NATURAL SEAWATER



**Bivalve Larval Survival and Development Test-Proportion Normal**

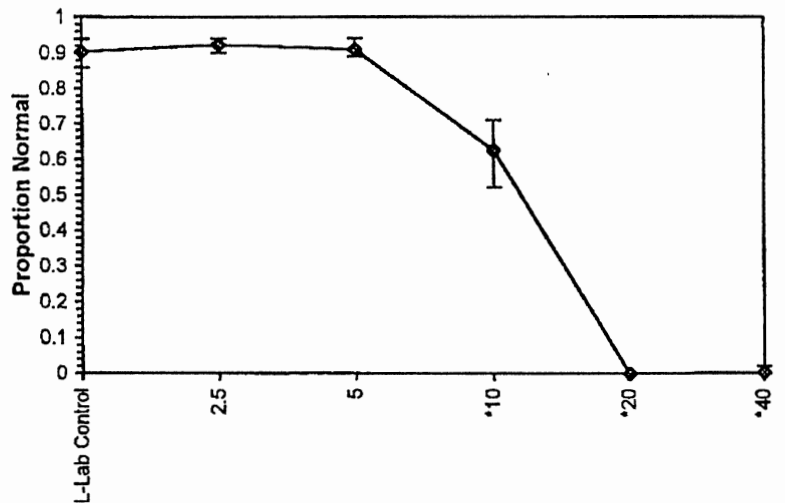
Start Date: 03/19/2004      Test ID: 040319mrgt      Sample ID:      Ref Toxicant  
 End Date: 03/21/2004      Lab ID: AEESD-AMEC Bioassay SD      Sample Type: Copper chloride  
 Sample Date:      Protocol: ASTM 93      Test Species: MG-Mytilis galloprovincialis  
 Comments:

Conc-ug/L	1	2	3	4	5
L-Lab Control	0.9011	0.9011	0.9200	0.8600	0.9400
2.5	0.9400	0.9200	0.9300	0.9000	0.9300
5	0.8900	0.9400	0.9200	0.9100	0.8900
10	0.7100	0.5200	0.6735	0.6100	0.6100
20	0.0000	0.0000	0.0000	0.0000	0.0000
40	0.0000	0.0227	0.0000	0.0000	0.0000

Conc-ug/L	Transform: Arcsin Square Root							Rank Sum	1-Tailed Critical	Number Resp	Total Number
	Mean	N-Mean	Mean	Min	Max	CV%	N				
L-Lab Control	0.9044	1.0000	1.2593	1.1873	1.3233	3.978	5			46	482
2.5	0.9240	1.0216	1.2925	1.2490	1.3233	2.165	5	32.00	16.00	38	500
5	0.9100	1.0061	1.2678	1.2327	1.3233	3.006	5	28.00	16.00	45	500
*10	0.6247	0.6907	0.9125	0.8054	1.0021	8.225	5	15.00	16.00	187	498
*20	0.0000	0.0000	0.0525	0.0500	0.0574	6.609	5	15.00	16.00	459	459
*40	0.0045	0.0050	0.0795	0.0522	0.1513	51.731	5	15.00	16.00	366	368

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.95985	0.9	-0.0653	1.11206
Bartlett's Test indicates unequal variances (p = 1.63E-03)	19.3834	15.0863		
<b>Hypothesis Test (1-tail, 0.05)</b>	<b>NOEC</b>	<b>LOEC</b>	<b>ChV</b>	<b>TU</b>
Steel's Many-One Rank Test	5	10	7.07107	

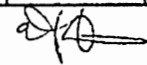
Maximum Likelihood-Probit											
Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	8.37421	23.4348	-66.206	82.9542	0.09544	5825.26	7.81472	0.0E+00	1.0518	0.11941	5
Intercept	-3.808	24.7807	-82.671	75.0555							
TSCR	0.08585	0.32371	-0.9443	1.11602							
Point	Probits	ug/L	95% Fiducial Limits								
EC01	2.674	5.94296									
EC05	3.355	7.16776									
EC10	3.718	7.92076									
EC15	3.964	8.473									
EC20	4.158	8.93924									
EC25	4.326	9.35963									
EC40	4.747	10.5087									
EC50	5.000	11.2668									
EC60	5.253	12.0797									
EC75	5.674	13.5627									
EC80	5.842	14.2005									
EC85	6.036	14.9819									
EC90	6.282	16.0265									
EC95	6.645	17.7101									
EC99	7.326	21.36									



Significant heterogeneity detected (p = 0.00E+00)

Test: BV-Bivalve Larval Survival and Development Test      Test ID: 040319mgrt  
 Species: MG-Mytilis galloprovincialis                      Protocol: ASTM 93  
 Sample ID: Ref Toxicant    Sample Type: Copper chloride  
 Start Date: 03/19/2004    End Date: 03/21/2004    Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
141	21	1	20			100	0	
142	18	3	10			98	66	
143	27	2	40			88	2	
144	5	5	L-Lab Control			100	94	
145	13	3	5			100	92	
146	7	2	2.5			100	92	
147	9	4	2.5			100	90	
148	14	4	5			100	91	
149	11	1	5			100	89	
150	1	1	L-Lab Control			91	82	
151	17	2	10			100	52	
152	22	2	20			83	0	
153	10	5	2.5			100	93	
154	15	5	5			100	89	
155	25	5	20			100	0	
156	28	3	40			81	0	
157	20	5	10			100	61	
158	3	3	L-Lab Control			100	92	
159	23	3	20			76	0	
160	8	3	2.5			100	93	
161	2	2	L-Lab Control			91	82	
162	16	1	10			100	71	
163	6	1	2.5			100	94	
164	30	5	40.0			44	0	
165	4	4	L-Lab Control			100	86	
166	24	4	20			100	0	
167	19	4	10			100	61	
168	29	4	40			92	0	
169	26	1	40			63	0	
170	12	2	5			100	94	

Comments: data entry QC 

Test: BV-Bivalve Larval Survival and Development Test  
 Species: MG-Mytilus galloprovincialis  
 Sample ID: REF-Ref Toxicant  
 Start Date: 03/17/2004

Test ID: 040317mgrt  
 Protocol: ASTM 87 93  
 Sample Type: CUCL-Copper chloride  
 Lab ID: AEESD-AMEC Bloassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
141						100	0	MC
142						98	66	MC
143						88	2	MC
144						100	94	
145						100	92	
146						100	92	
147						100	90	
148						100	91	
149						100	89	
150						91	82	
151						100	52	
152						83	0	
153						100	93	
154						100	89	
155						100	0	
156						81	0	
157						100	61	
158						100	92	
159						76	0	
160						100	93	
161						91	82	
162						100	71	
163						100	94	
164						44	0	SD
165						100	86	
166						100	0	
167						100	61	
168						92	0	
169						63	0	
170						100	94	

Comments:

Test: BV-Bivalve Larval Survival and Development Test      Test ID: 040317mgmt  
 Species: MG-Mytilis galloprovincialis                      Protocol: ASTM 87  
 Sample ID: REF-Ref Toxicant                                      Sample Type: CUCL-Copper chloride  
 Start Date: 03/17/2004                                      End Date: 03/19/2004                      Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
150	1	1	L-Lab Control					
161	2	2	L-Lab Control					
158	3	3	L-Lab Control					
165	4	4	L-Lab Control					
144	5	5	L-Lab Control					
163	6	1	2.5					
146	7	2	2.5					
160	8	3	2.5					
147	9	4	2.5					
153	10	5	2.5					
149	11	1	5					
170	12	2	5					
145	13	3	5					
148	14	4	5					
154	15	5	5					
162	16	1	10					
151	17	2	10					
142	18	3	10					
167	19	4	10					
157	20	5	10					
141	21	1	20					
152	22	2	20					
159	23	3	20					
166	24	4	20					
155	25	5	20					
169	26	1	40					
143	27	2	40					
156	28	3	40					
168	29	4	40					
164	30	5	40					

Comments: QCAFH

## Bivalve Development Bioassay Worksheet

Client: City of Buena Vista (retest) Start Date/Time: 3/19/04 1630  
 Test No.: 0403-106 → 109, 122-126, End Date/Time: 3/21/04 1700  
 Test Species: M. galloprovincialis 0A0319MEKT Date Received: 3/19/04

Sample Type: 30ml shell vials water effects ratio

Test Chamber Type and Sample Volume: 10 ml volume

Spawn Initiation Time: 13:20

Number of Spawners: Male 12 Female 9

Spawn Condition: good

Fertilization Time: 14:40

**Egg Stock Density Calculation:**

Eggs Counted (x):	<u>22</u>	<u>28</u>			
	<u>26</u>	<u>21</u>			
	<u>27</u>	<u>31</u>			
	<u>31</u>	<u>28</u>			
	<u>29</u>	<u>25</u>			
Mean	<u>27.0</u>	<u>26.6</u>	Overall Mean:	<u>26.8</u>	

Mean: 26.8 x 42 = 1126 eggs/ml

Initial Stock - 1126 eggs/ml = 2.81 Stock Dilution Factor  
 Inoculum Stock - 400 eggs/ml

Percent Division Upon Inoculation: 90

Time of Inoculation: 1630

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Reviewed/ Date: afh 3/1/04

AMEC Bioassay Laboratory  
 5550 Morehouse Drive, Suite B  
 San Diego, CA 92121  
 (858) 458-9044

AMEC Earth & Environmental  
 Bioassay Laboratory  
 5550 Morehouse Dr. Suite B  
 San Diego, CA 92121

Physical and Chemical  
 Measurements of Test Solutions  
 Salt Water Bioassays

Client: Internal CuCl<sub>2</sub>  
 Contact: \_\_\_\_\_  
 Test No.: D40319MERT

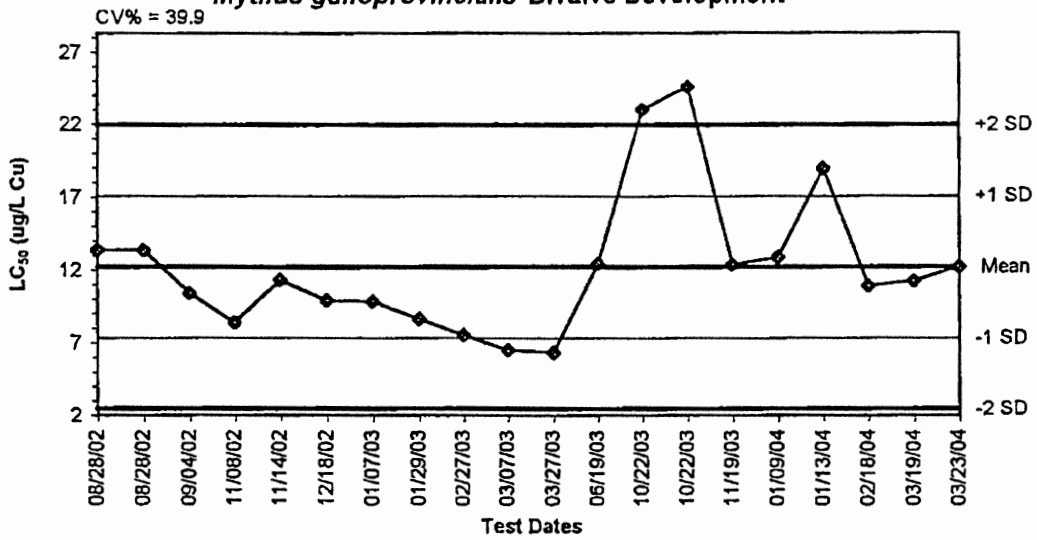
Analyst: JR  
 Test Start: 3/19/04  
 Test End: 3/21/04  
 Date Collected: 3/19/04

Sample ID or Conc. <i>mg/L</i>	DO (mg/L)			pH (pH units)			Salinity (ppt)			Temp °C		
	0	24	48	0	24	48	0	24	48	0	24	48
LC	8.7	9.1	7.9	8.09	8.09	8.02	34	33.7	31.3	14.8	14.6	14.9
25	8.6	9.1	7.9	8.07	8.06	8.03	34	33.9	34.4	14.8	14.6	14.9
50	8.5	9.2	7.9	8.07	8.05	8.04	34	34.0	34.4	14.8	14.5	15.0
10	8.5	9.2	7.9	8.07	8.05	8.02	34	34.2	34.5	14.8	14.4	15.1
20	8.5	9.2	8.0	8.08	8.05	8.02	34	34.2	34.6	14.8	14.4	15.1
40	8.5	9.2	8.0	8.08	8.05	8.04	34	34.1	34.4	14.8	14.4	15.1

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

QA Check: MC 4/21/04

**Copper (II) Chloride Reference Toxicant Control Chart -  
Mytilus galloprovincialis Bivalve Development**



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
08/28/02	13.3760	12.2174	7.3379	2.4584	17.0969	21.9764
08/28/02	13.3760	12.2174	7.3379	2.4584	17.0969	21.9764
09/04/02	10.4338	12.2174	7.3379	2.4584	17.0969	21.9764
11/08/02	8.3754	12.2174	7.3379	2.4584	17.0969	21.9764
11/14/02	11.3155	12.2174	7.3379	2.4584	17.0969	21.9764
12/18/02	9.9361	12.2174	7.3379	2.4584	17.0969	21.9764
01/07/03	9.8373	12.2174	7.3379	2.4584	17.0969	21.9764
01/29/03	8.6253	12.2174	7.3379	2.4584	17.0969	21.9764
02/27/03	7.5397	12.2174	7.3379	2.4584	17.0969	21.9764
03/07/03	6.5174	12.2174	7.3379	2.4584	17.0969	21.9764
03/27/03	6.3338	12.2174	7.3379	2.4584	17.0969	21.9764
06/19/03	12.4539	12.2174	7.3379	2.4584	17.0969	21.9764
10/22/03	23.0103	12.2174	7.3379	2.4584	17.0969	21.9764
10/22/03	24.5820	12.2174	7.3379	2.4584	17.0969	21.9764
11/19/03	12.3871	12.2174	7.3379	2.4584	17.0969	21.9764
01/09/04	12.8695	12.2174	7.3379	2.4584	17.0969	21.9764
01/13/04	18.9772	12.2174	7.3379	2.4584	17.0969	21.9764
02/18/04	10.9125	12.2174	7.3379	2.4584	17.0969	21.9764
03/19/04	11.2668	12.2174	7.3379	2.4584	17.0969	21.9764
03/23/04	12.2223	12.2174	7.3379	2.4584	17.0969	21.9764

APPENDIX D  
ANALYTICAL CHEMISTRY DATA



CRG Marine Laboratories, Inc  
 Client: AMEC Earth & Environmental  
 Project: Santa Clara River Estuary Water-Effect Ratio Samples  
 Mar-04

Sample ID	Project ID	Client Sample ID	Sample Description	Time Collected	Replicate Number	Parameter	Qualifier	Result	Units	MDL	RL
16864	2471	QAQC	Procedural Blank		B1	Copper (Cu)	ND		µg/L	0.005	0.01
16954	2471	QAQC	LCM-CRG Seawater		LCM1	Copper (Cu)		0.3	µg/L	0.005	0.01
16954	2471	QAQC	LCM-CRG Seawater		LCM2	Copper (Cu)		0.49	µg/L	0.005	0.01
16980	2471	PSW-8.4	City of Buena Ventura/SCRE	10:00	R1-Dissolved	Copper (Cu)		8.61	µg/L	0.005	0.01
16980	2471	PSW-8.4	City of Buena Ventura/SCRE	10:00	R1-Total	Copper (Cu)		9.03	µg/L	0.005	0.01
16980	2471	PSW-8.4	City of Buena Ventura/SCRE	10:00	R2-Dissolved	Copper (Cu)		8.47	µg/L	0.005	0.01
16980	2471	PSW-8.4	City of Buena Ventura/SCRE	10:00	R2-Total	Copper (Cu)		9.23	µg/L	0.005	0.01
16981	2471	PSW-14	City of Buena Ventura/SCRE	10:00	R1-Dissolved	Copper (Cu)		12.6	µg/L	0.005	0.01
16981	2471	PSW-14	City of Buena Ventura/SCRE	10:00	R1-Total	Copper (Cu)		13.7	µg/L	0.005	0.01
16982	2471	PSW-23	City of Buena Ventura/SCRE	10:00	R1-Dissolved	Copper (Cu)		20	µg/L	0.005	0.01
16982	2471	PSW-23	City of Buena Ventura/SCRE	10:00	R1-Total	Copper (Cu)		22.5	µg/L	0.005	0.01
16989	2471	A2-55	City of Buena Ventura/SCRE	09:45	R1-Dissolved	Copper (Cu)		41.4	µg/L	0.005	0.01
16989	2471	A2-55	City of Buena Ventura/SCRE	09:45	R1-Total	Copper (Cu)		53.4	µg/L	0.005	0.01
16994	2471	B1-33	City of Buena Ventura/SCRE	10:45	R1-Dissolved	Copper (Cu)		29.5	µg/L	0.005	0.01
16994	2471	B1-33	City of Buena Ventura/SCRE	10:45	R1-Total	Copper (Cu)		33.3	µg/L	0.005	0.01
16995	2471	B1-55	City of Buena Ventura/SCRE	10:45	R1-Dissolved	Copper (Cu)		44.3	µg/L	0.005	0.01
16995	2471	B1-55	City of Buena Ventura/SCRE	10:45	R1-Total	Copper (Cu)		50.2	µg/L	0.005	0.01
16999	2471	B1-20	City of Buena Ventura/SCRE	10:45	R1-Dissolved	Copper (Cu)		16.4	µg/L	0.005	0.01
16999	2471	B1-20	City of Buena Ventura/SCRE	10:45	R1-Total	Copper (Cu)		20.2	µg/L	0.005	0.01
17000	2471	B3-33	City of Buena Ventura/SCRE	10:30	R1-Dissolved	Copper (Cu)		25	µg/L	0.005	0.01
17000	2471	B3-33	City of Buena Ventura/SCRE	10:30	R1-Total	Copper (Cu)		31	µg/L	0.005	0.01
17002	2471	B3-55	City of Buena Ventura/SCRE	10:30	R1-Dissolved	Copper (Cu)		42.4	µg/L	0.005	0.01
17002	2471	B3-55	City of Buena Ventura/SCRE	10:30	R1-Total	Copper (Cu)		51.2	µg/L	0.005	0.01
17006	2471	C3-20	City of Buena Ventura/SCRE	10:15	R1-Dissolved	Copper (Cu)		16.8	µg/L	0.005	0.01
17006	2471	C3-20	City of Buena Ventura/SCRE	10:15	R1-Total	Copper (Cu)		20.1	µg/L	0.005	0.01
17007	2471	C3-33	City of Buena Ventura/SCRE	10:15	R1-Dissolved	Copper (Cu)		27.2	µg/L	0.005	0.01
17007	2471	C3-33	City of Buena Ventura/SCRE	10:15	R1-Total	Copper (Cu)		31.6	µg/L	0.01	0.01

APPENDIX E  
FIELD COLLECTION DATA

**Appendix Table E-1. Field Sample Collection Summary**  
**City of Buenaventura**  
**Santa Clara River Estuary Wet Weather Sampling Event**  
**Sample Collection Date: March 16, 2004**

<b>Site</b>	<b>Collection Time <sup>a</sup></b>	<b>Latitude 34°...</b>	<b>Longitude 119°...</b>	<b>Mean Water Sample Depth (m)</b>
<b>A-2</b>	1227	13.885	15.840	0.3
<b>B-1</b>	1124	14.091	15.782	0.3
<b>B-3</b>	1317	13.917	15.655	0.1
<b>C-3</b>	0830	14.031	15.394	0.3

<sup>a</sup> Start of collection time at each site location

**Appendix Table E-2. Field Water Quality Measurements**

**City of Buenaventura**

**Santa Clara River Estuary Wet Weather Sampling Event**

**Sample Collection Date: March 16, 2004**

<b>Sample</b>	<b>Water Depth (m)</b>	<b>Temperature ( °C)</b>	<b>Salinity (ppt)</b>	<b>pH (units)</b>	<b>DO (mg/L)</b>
<b>A-2</b>	0.3	20.5	3.1	7.79	10.5
<b>B-1</b>	0.3	19.8	1.4	7.46	8.7
<b>B-3</b>	0.1	20.2	14.4	8.64	12
<b>C-3</b>	0.3	15.2	1.7	7.62	10.9

**APPENDIX F**  
**CHAIN-OF-CUSTODY FORMS**

CRG Marine Laboratories, Inc.

CHAIN-OF-CUSTODY RECORD

2020 Del Amo Blvd., Suite 200, Torrance, CA 90501-1206  
 (310) 533-5190 FAX (310) 533-5003

Client Name and Address:					REQUESTED ANALYSIS										
Sampled By: <i>Chris Stransky</i>					(b) Filter for Dissolved Cu										
Phone: <i>858 458-9044</i>															
FAX: <i>858 597-3961</i>															
Project Manager: <i>Howard Bailey / Chris Stransky</i>															
Project/PO Number:															
Client Sample ID	Sample Date	Sample Time (a)	Sample Matrix	Container		X									
				#	Type										
1 <i>AZ-4.3</i>	<i>3/17/04</i>	<i>0945</i>	<i>AG</i>	<i>1</i>	<i>250 ml plastic</i>	<input checked="" type="checkbox"/>									
2 <i>AZ-7.1</i>															
3 <i>AZ-11.9</i>															
4 <i>AZ-20</i>															
5 <i>AZ-33</i>															
6 <i>AZ-55</i>															
7 <i>BI-4.3</i>		<i>1045</i>													
8 <i>BI-7.1</i>															
9 <i>BI-11.9</i>															
10 <i>BI-20</i>															
Correct Containers:	Yes	No			REQUISINSHED BY										
Sample Temperature:	Ambient	Cold	Warm		Signature:	<i>[Signature]</i>									
Sample Preservative:	Yes	No			Print:	<i>John Reddolph</i>									
Turnaround Time:	Specify:	Standard TAT			Company:	<i>Amecc</i>									
Comments: (a) Time of copper spikes, Toxicity tests initiated 1940  (b) Please Filter <sup>approx.</sup> samples for dissolved and total copper analyses. Hold samples until AMEC provides a final list of which ones to analyze.  * Samples are saline - 30 ppt	DATE:	<i>3/18/04</i>		TIME:	<i>0915</i>										
	RECEIVED BY														
	Signature:	<i>[Signature]</i>													
	Print:	<i>M. Bayji</i>													
	Company:	<i>CRG</i>													
DATE:	<i>3/18/04</i>		TIME:	<i>0915</i>											

CRG Marine Laboratories, Inc.

CHAIN-OF-CUSTODY RECORD

2020 Del Amo Blvd., Suite 200, Torrance, CA 90501-1206  
 (310) 533-5190 FAX (310) 533-5003

Client Name and Address:					REQUESTED ANALYSIS											
Sampled By: <i>Chris Stransky</i>					(b) Filter for Dissolved Cu											
Phone: <i>858 458-9044</i>																
FAX: <i>858 587-3961</i>																
Project Manager: <i>Howard Bailey / Chris Stransky</i>																
Project/PO Number:																
Client Sample ID	Sample Date	Sample Time @	Sample Matrix	Container												
				#	Type											
1 B1-33	3/17/04	1045	AG	1	250ml Plastic											
2 B1-55	↓	↓	↓	↓	↓											
3 B3-4.3	↓	1030	↓	↓	↓											
4 B3-7.1	↓	↓	↓	↓	↓											
5 B3-11.9	↓	↓	↓	↓	↓											
6 B3-20	↓	↓	↓	↓	↓											
7 B3-33	↓	↓	↓	↓	↓											
8 B3-55	↓	↓	↓	↓	↓											
9 C3-4.3	↓	1015	↓	↓	↓											
10 C3-7.1	↓	↓	↓	↓	↓											
Correct Containers:	Yes	No			RELIQUISHED BY											
Sample Temperature:	Ambient	Cold	Warm		Signature:	<i>John Rudolph</i>										
Sample Preservative:	Yes	No			Print:	<i>John Rudolph</i>										
Turnaround Time:	Specify:	Standard TAT			Company:	<i>Amec</i>										
Comments: @ - Time of copper spikes, Toxicity tests Initiated 1940  (b) Filter and preserve samples for total and dissolved copper analyses. Please hold samples until Amec provides a final analytical list.  * All samples are Saline -30-34ppt					DATE:	<i>3/18/04</i>			TIME:	<i>0915</i>						
					RECEIVED BY											
					Signature:	<i>M. Burger</i>										
					Print:	<i>M. Burger</i>										
					Company:	<i>CRG</i>										
DATE:	<i>3/18/04</i>			TIME:	<i>0915</i>											

CRG Marine Laboratories, Inc.

CHAIN-OF-CUSTODY RECORD

2020 Del Amo Blvd., Suite 200, Torrance, CA 90501-1206  
 (310) 533-5190 FAX (310) 533-5003

Client Name and Address:				AMEC 5510 Morehouse Dr San Diego, CA 92121				REQUESTED ANALYSIS															
Sampled By:				Chris Stransky				(b) Filter For Dissolved Cu															
Phone:				858 458-9044																			
FAX:				858 587-3961																			
Project Manager:				Howard Bailey																			
Project/PO Number:				City of Buena Vista / SCRF																			
Client Sample ID		Sample Date	Sample Time (a)	Sample Matrix	Container		(b) Filter For Dissolved Cu																
					#	Type																	
1 C3-11.9		3/17/04	1015	AQ	1	250ml Plastic																	
2 C3-20		↓	↓	↓	↓	↓																	
3 C3-33		↓	↓	↓	↓	↓																	
4 C3-55		↓	↓	↓	↓	↓																	
5																							
6																							
7																							
8																							
9																							
10																							
Correct Containers:		Yes	No				RELIQUISHED BY																
Sample Temperature:		Ambient	Cold	Warm			Signature:																
Sample Preservative:		Yes	No				Print:	John Rudolph															
Turnaround Time:		Specify:	Standard TAT				Company:	AMEC															
DATE:		3/18/04			TIME		0915																
		RECEIVED BY																					
Signature:																							
Print:		M. Brja																					
Company:		CRG U																					
DATE:		3/18/04			TIME:		0915.																
Comments:		(a) - Sample time = Sample spikes, Toxicity tests Initiated 1940  (b) Filter and preserve samples for dissolved and total copper analyses. Please hold samples until AMEC provides a final analytical list.  * All samples are saline - 30 to 34 ppt																					



CRG Marine Laboratories, Inc.

CHAIN-OF-CUSTODY RECORD

2020 Del Amo Blvd., Suite 200, Torrance, CA 90501-1206  
 (310) 533-5190 FAX (310) 533-5003

Client Name and Address:				AMEC 5510 Morehouse Dr San Diego, CA 92121				REQUESTED ANALYSIS										
Sampled By:				Chris Szransky				Filter for Total Dissolved Copper 300										
Phone:				858 458-9044														
FAX:				858 587-3961														
Project Manager:				Howard Bailey														
Project/PO Number:				City of Bonaventura / SCRE														
Client Sample ID				Sample Date	Sample Time	Sample Matrix	Container											
							#	Type										
1	Lab Control			3/17/04	1000	AG	1	250ml plastic	X									
2	PSW-0																	
3	PSW-1.8																	
4	PSW-3																	
5	PSW-5																	
6	PSW-8.4																	
7	PSW-14																	
8	PSW-23																	
9	PSW-39																	
10																		
Correct Containers:				Yes	No			REQUISISHED BY										
Sample Temperature:				Ambient	Cold	Warm			Signature: <i>John Rudolph</i>									
Sample Preservative:				Yes	No			Print: John Rudolph										
Turnaround Time:				Specify:	Standard TAT				Company: AMEC									
DATE:				3/18/04				TIME		0915								
Comments:				(a) Time of sample spikes, Toxicity tests initiated 1940 (b) Filter samples for dissolved and total copper analyses. Hold samples until AMEC provides a final list of which ones to analyze * All samples are saline - 30 to 34 ppt														
								RECEIVED BY										
								Signature: <i>M. Burgin</i>										
								Print: M. Burgin										
								Company: CRG										
								DATE:		3/18/04								
								TIME:		0915								