

**City of Buena Ventura
Toxicity and Chemical Evaluation
October 2003 Dry Weather Sampling Event
Santa Clara River Estuary**

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INTRODUCTION

Toxicity tests and chemical analyses were conducted on estuary sediments collected from the Santa Clara River Estuary in the City of Buenaventura, CA on 17 October 2003. This initial sampling effort for the project was characterized as a “dry weather” event as there was little to no rainfall prior to the sample collection date, the beach berm was intact, and the estuary was inundated with water. 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 the amphipod *Eohaustorius estuarius* and the bivalve *Mytilus galloprovincialis* (formerly *Mytilus edulis*). Bioassay testing was conducted between 22 October and 14 November 2003 at the AMEC Bioassay Laboratory in San Diego, CA. Chemical analyses were performed by Calscience Environmental Laboratories (CEL) located in Garden Grove, CA.

METHODS AND MATERIALS

SAMPLE COLLECTION AND TRANSPORT

Sediment samples were collected 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 cm² 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 the following day. Samples for grain size analysis were stored at room temperature.

ORGANISM PROCUREMENT AND HANDLING

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 oxygenated seawater. Upon arrival at AMEC, water quality parameters of temperature, dissolved oxygen (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 prior to test initiation. During the acclimation period, the animals were observed for any indications of stress (e.g. abnormal swimming or burrowing behavior) or significant mortality of greater than ten percent.

BIVALVES

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 date of organism receipt and arrival condition were recorded in a logbook. The mussels were then acclimated to test temperature and salinity prior to test initiation.

BIOASSAY PROTOCOL

AMPHIPOD BIOASSAY

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-µm 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 µm 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 to perform 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 (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.

BIVALVE EMBRYO DEVELOPMENT BIOASSAYS

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- μm 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 (CuCl_2) was conducted in conjunction with the sediment test.

STATISTICAL ANALYSIS OF TOXICITY DATA

Eohaustorius responses were analyzed using a one-way analysis of variance (ANOVA) or non-parametric 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.

Analysis of bivalve response data among test sediments was conducted using one-way non-parametric ANOVA (Kruskal-Wallis). 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. Analysis of reference toxicant data was conducted using ToxCalc[®] Comprehensive Toxicity Data Analysis and Database Software, Version 5.0. Median Lethal Concentration (LC_{50}) or Median Effect Concentration (EC_{50}) values were determined using Maximum Likelihood Probit, Trimmed Spearman-Karber, or Linear Interpolation

Analysis. The choice of statistical method used was dependent upon specific assumptions met by the data.

CHEMICAL ANALYSES

Analysis of total organic carbon (TOC), copper, nickel, zinc, and selenium in the sediments was performed by CEL (Appendix F).

RESULTS AND DISCUSSION

Amphipod and bivalve result summaries are shown in Figures 1 and 2. Detailed 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 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.

SUMMARY OF TOXICITY TEST RESULTS

In summary, no toxicity to *Eohaustorius estuarius* in whole sediments was observed. Toxicity to bivalve larvae was observed in several samples with greatest responses occurring in Sites B-1 and B-3.

AMPHIPOD BIOASSAYS

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 controls and the sediment controls was 90 and 89 percent respectively (Appendix A-1). Recommended EPA acceptability criterion for this test is a mean of 90 percent survival in the controls. The test was deemed acceptable for reporting purposes as the two control results bracket this value by one percent with a combined mean of 89.5 percent. Mean survival among the individual field replicates ranged from 82 to 91 percent. One-way ANOVA found no significant differences among the sites. Pair-wise comparisons using one-tailed Student's t-tests also indicated that no sites exhibited a statistically significant reduction in survival when compared to the control (Appendix D-1).

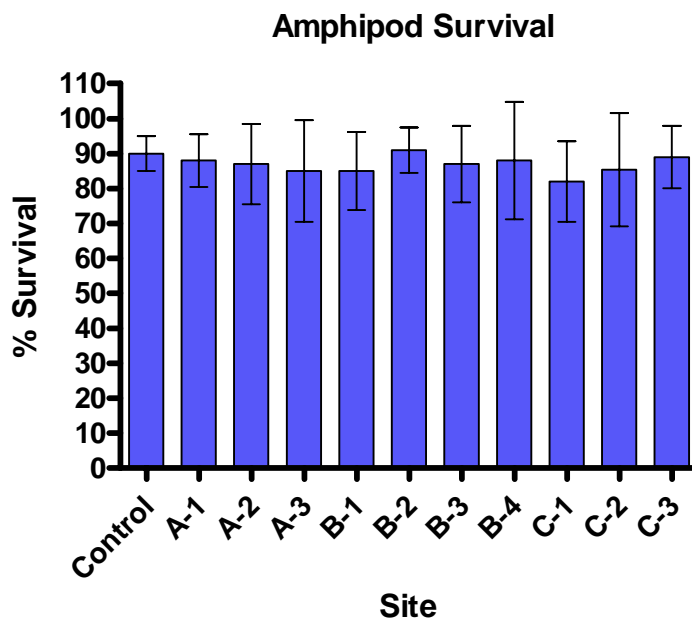


Figure 1. Amphipod survival results (mean \pm 1 SD, n=5). Santa Clara River Estuary dry weather monitoring event, 17 October 2003. No statistically significant decreases relative to the control were observed ($p < 0.05$, one-tailed t-test).

Correlations to Sediment Characteristics

No statistically significant relationships between amphipod survival and sediment trace metals were observed (Appendix D-3). A negative relationship, however, was observed with percent sand and gravel.

Reference Toxicant Test

A concurrent reference toxicant test using 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 LC_{50} was determined to be 5.86 mg/L 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).

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 WHOLE SEDIMENT EMBRYO DEVELOPMENT BIOASSAYS

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 92 and 89 percent, respectively, indicating that the test organisms were healthy and test conditions were adequate. The water only value exceeds the recommended acceptability criterion of 90 percent (ASTM 1991). Mean normal development in the test samples ranged from 55 to 96 percent among all field replicates. Student t-tests identified statistically significant reductions in normal development of bivalve larvae in Sites A-2, B-1, and B-3 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 subsample 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 39 to 110 percent. Student t-tests detected several sites which showed a statistically significant reduction in survival when compared with the control. Sites A-1, B-1, B-3, and B-4.

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

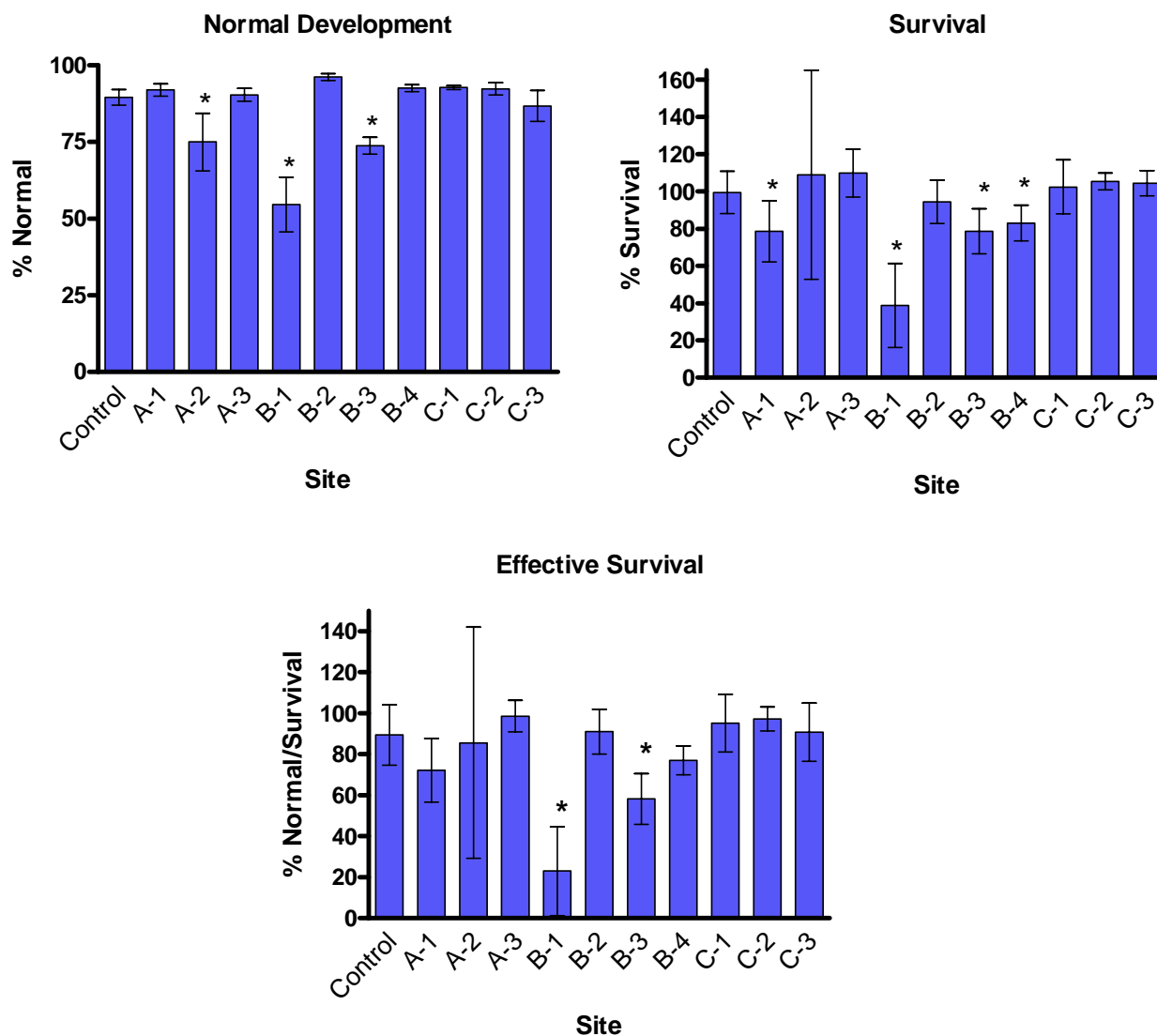


Figure 2. Summary of bivalve embryo development test results (means \pm 1SD, n=5). Santa Clara River Estuary dry weather monitoring event, 17 October 2003. * Indicates statistically significant decreases relative to the sediment control ($p < 0.05$, one-tailed t-test).

viable adults. The effective survival for the laboratory sediment control was 89 percent. This value exceeds the recommended acceptability criterion of 70 percent (ASTM 1991, PSEP 1995). The effective survival ranged from 23 to 99 percent among all sediment samples. Student t-tests identified statistically significant reductions in the effective survival when compared to the control in Sites A-1, A-2, B-1, and B-3.

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. The water-only control also serves as a comparison to ensure that there are no problems with the test and normal development for all embryos, including any unviable ones remaining on the bottom of the jar was 92 percent for this test series.

Correlations to Sediment Characteristics

No statistically significant relationships between bivalve responses and grain size or sediment trace metals were observed (Appendix D-3).

Reference Toxicant Test

A reference toxicant test using 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 EC_{50} value was determined to be 23.01 $\mu\text{g/L}$ CuCl_2 (as copper) by the Trimmed Spearman-Kärber method. This value falls outside of internal control chart limits of ± 2 standard deviations (4 to 19 $\mu\text{g/L}$, Appendix C), but was deemed reportable, as there was a clear dose response relationship 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 for ammonia measurement at the beginning and end of the test period. Total ammonia levels in overlying water ranged from <0.1 to 1.6 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 mg/L) reported to effect bivalve embryos (Tang, 1997).

SEDIMENT QUALITY

Copper concentrations were relatively low at all sites, generally between 2.3 and 4.2 mg/kg, except at sites A-1 and B-4 where they reached 16.9 and 19.3 mg/Kg, respectively (Figure 3). These two sites were also associated with the highest concentrations of organic carbon, with TOCs of 10,920 and 16,950 mg/Kg, respectively. TOC at the other sites ranged from 1590 to 7070 mg/Kg. These data are shown in Appendix Table F-1, which also includes selenium, nickel and zinc concentrations in the different samples. Concentrations of nickel ranged between 0.6 and 20.4 mg/Kg, with no apparent trend across sites. Selenium concentrations were below the detection limit of 0.5 mg/Kg at most sites; the highest concentration was 0.9 mg/Kg. Concentrations of zinc were somewhat more variable, and ranged from below detection to 63.1 mg/Kg across the sites; however, there was no apparent relationship between zinc concentrations and the location of the site sampled.

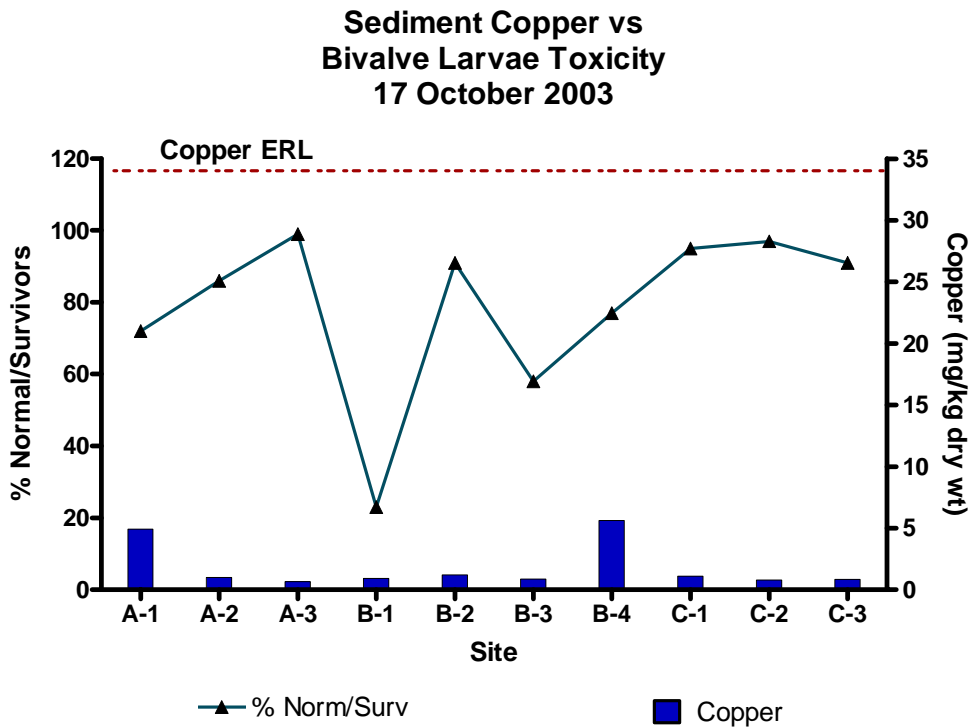


Figure 3. Relationship between sediment copper levels, copper effects-range low (ERL) values, and bivalve embryo development. Santa Clara River Estuary dry weather monitoring event, 17 October 2003.

To determine if these metals concentrations are likely to cause adverse effect on the benthic community, these concentrations were compared with the “effects range-low” (ERL) values proposed for marine and brackish waters by Long *et al.* (1995). These values correspond to the 10th percentile concentration at which biological effects were reported in a large dataset compiled by these investigators. All measured concentrations were below their respective ERL values (no value is available for selenium). However, the two highest concentrations of nickel were slightly over 20 mg/Kg; the ERL for nickel is 20.9 mg/Kg. The relationship between sediment copper levels, copper effects-range low (ERL) values, and bivalve embryo development is graphically shown in Figure 3.

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. Percent fines ranged between 1.3 and 5.6 percent, except for sites A-1 and B-4, which exhibited 47.9 and 60.8 percent fines, respectively. These two sites were also associated with the highest concentrations of TOC and copper.

AMBIENT WATER QUALITY AND FIELD CONDITIONS

Water depths ranged between 3.0 and 7.0 feet, depending upon location. The deepest points were associated with the lower portion of the main river channel (sites A-2 and B-3). There was little indication of temperature stratification; temperatures across all sites and depths ranged between 20.7 and 22.2°C. pH was highest above the bridge (9.2) and lowest at the effluent discharge point (7.1). Otherwise, pH at all sites ranged between 8.6 and 8.9. Salinity and conductivity exhibited similar patterns, with most sites averaging between 2.0 and 2.4 ppt, regardless of depth. Exceptions included sites A-2 and B-3, which exhibited noticeably higher salinities (11 - 12 ppt) at the bottom depth compared with the surface and mid-water sampling points. Site A-1 exhibited a modest increase in salinity at the bottom, compared with mid-water and surface measurements; this site was located in the discharge channel. The lowest salinity (1.5 ppt) was observed at the surface at the effluent discharge point, and increased with increasing depth to a maximum of 2.9 ppt at this site. Dissolved oxygen was supersaturated at all sites, except at the discharge point which was 7.5 mg/L. These data are presented in Appendix Table G-2.

REFERENCES

- American Society for Testing and Materials (ASTM), 1993. Conducting 10-day static sediment toxicity tests with marine and estuarine amphipods. ASTM Designation E 1367-92.
- American Society for Testing and Materials (ASTM), 1993. Standard guide for conducting static acute toxicity tests starting with embryos of four species of saltwater bivalve molluscs, ASTM Designation: E 724-89.
- GraphPad Software Inc. 1994-2000. GraphPad Prism, Version 4.00
- Kohn, N.P., J.Q. Word, D.K. Niyogi, L.T. Ross, T. Dillon, and D.W. Moore. 1994. Acute toxicity of ammonia to four species of marine amphipod. *Marine Env. Res.* 38: 1-15.
- Puget Sound Estuary Program (PSEP). 1995. Recommended Guidelines for Conducting Laboratory Bioassays on Puget Sound Sediments. Interim Final. U.S. Environmental Protection Agency Region 10, Office of Puget Sound, Seattle, WA, July 1995.
- U.S. Environmental Protection Agency (EPA) 1994. Methods for Assessing the Toxicity of Sediment-associated Contaminants to Estuarine and Marine Amphipods. U.S. EPA Office of Research and Development, Washington DC. EPA 600/R-94/025, June 1994.
- Tang, A., J.G. Kalocai, S. Santos, B. Jamil, J. Stewart. 1997. Sensitivity of blue mussel and purple sea urchin larvae to ammonia. Poster, Society of Environmental Toxicology and Chemistry, 18th Annual Meeting, San Francisco, CA.
- Tidepool Scientific Software, 1992-1994. ToxCalc Comprehensive Toxicity Data Analysis and Database Software, Version 5.0.

APPENDIX A
TOXICITY TEST SUMMARIES

E. ESTUARIUS

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

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

Test Initiation Date: 14 November 2003

Test Species: *Eohaustorius estuarius*

Site	Mean Percent Survival \pm 1 SD
Sediment Control	89 \pm 4.2
A-1	88 \pm 7.6
A-2	87 \pm 12
A-3	85 \pm 15
B-1	85 \pm 11
B-2	91 \pm 6.5
B-3	87 \pm 11
B-4	88 \pm 17
C-1	82 \pm 12
C-2	86 \pm 15
C-3	89 \pm 8.9

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

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

Test Initiation Date: 14 November 2003

Test Species: *Eohaustorius estuarius*

Site	Replicate	Randon No.	No. Alive	Percent Survival	Mean Percent Survival
CONTROL - Water Only	A	25	17	85	90
	B	38	19	95	
	C	53	18	90	
	D	18	19	95	
	E	59	17	85	
CONTROL - Sediment	A	19	19	95	89
	B	40	18	90	
	C	48	18	90	
	D	34	17	85	
	E	45	17	85	
A-1	A	54	17	85	88
	B	37	18	90	
	C	23	17	85	
	D	22	20	100	
	E	29	16	80	
A-2	A	9	20	100	87
	B	15	18	90	
	C	55	15	75	
	D	28	15	75	
	E	43	19	95	
A-3	A	1	20	100	85
	B	51	19	95	
	C	57	13	65	
	D	33	18	90	
	E	41	15	75	
B-1	A	26	17	85	85
	B	4	20	100	
	C	50	16	80	
	D	60	14	70	
	E	20	18	90	

Site	Replicate	Randon No.	No. Alive	Percent Survival	Mean Percent Survival
B-2	A	14	18	90	91
	B	49	20	100	
	C	8	17	85	
	D	36	19	95	
	E	16	17	85	
B-3	A	47	14	70	87
	B	32	18	90	
	C	58	17	85	
	D	2	20	100	
	E	17	18	90	
B-4	A	6	20	100	88
	B	52	19	95	
	C	56	12	60	
	D	42	17	85	
	E	7	20	100	
C-1	A	24	20	100	82
	B	30	15	75	
	C	35	17	85	
	D	21	16	80	
	E	31	14	70	
C-2	A	44	13	65	86
	B	10	19	95	
	C	13	19	95	
	D	3	15	75	
	E	5	20	100	
C-3	A	39	16	80	89
	B	46	16	80	
	C	11	20	100	
	D	27	18	90	
	E	12	19	95	

M. GALLOPROVINCIALIS

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

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

Test Initiation Date: 22 October 2003

Test Species: *Mytilus galloprovincialis*

Site	Mean Percent Survival \pm 1 SD		
	Survival	Normality	Effective Survival
Sediment Control	99 \pm 11	90 \pm 5.7	89 \pm 15
A-1	79 \pm 16	92 \pm 4.6	72 \pm 16
A-2	109 \pm 56	75 \pm 9.4	86 \pm 56
A-3	110 \pm 13	90 \pm 4.7	99 \pm 7.7
B-1	39 \pm 23	55 \pm 20	23 \pm 22
B-2	94 \pm 12	96 \pm 2.7	91 \pm 11
B-3	79 \pm 12	74 \pm 6.1	58 \pm 12
B-4	83 \pm 9.5	93 \pm 2.5	77 \pm 7.0
C-1	102 \pm 15	93 \pm 1.5	95 \pm 14
C-2	105 \pm 4.5	921 \pm 4.5	97 \pm 5.9
C-3	104 \pm 6.8	87 \pm 11	91 \pm 14

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 Dry Weather Sampling Event
Test Initiation Date: 22 October 2003
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 ^a	Mean Percent Effective Survival	Percent Effective Survival Std Dev
CONTROL - Water Only	A	57	93	108	95	88			116			102		
	B	58	93	91	79	87			98			85		
	C	62	93	108	100	93	92	5	116	111	8	108	102	10
	D	25	93	102	101	99			110			109		
	E	45	93	107	100	93			115			108		
CONTROL - Sediment	A	60	93	85	71	84			91			76		
	B	7	93	78	66	85			84			71		
	C	43	93	103	92	89	89	6	111	100	11	99	89	15
	D	33	93	98	96	98			105			103		
	E	30	93	99	91	92			106			98		
A-1	A	3	93	69	63	91			74			68		
	B	48	93	94	89	95			101			96		
	C	59	93	53	52	98	92	5	57	79	16	56	72	15
	D	38	93	69	59	86			74			63		
	E	18	93	81	73	90			87			78		
A-2	A	12	93	190	169	89			204			182		
	B	41	93	78	54	69			84			58		
	C	22	93	103	81	79	75	9	111	109	56	87	86	56
	D	21	93	57	37	65			61			40		
	E	34	93	78	57	73			84			61		
A-3	A	63	93	104	95	91			112			102		
	B	8	93	105	94	90			113			101		
	C	19	93	82	79	96	90	5	88	110	13	85	99	8
	D	6	93	106	97	92			114			104		
	E	1	93	113	94	83			122			101		

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 Dry Weather Sampling Event

Test Initiation Date: 22 October 2003

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 ^a	Mean Percent Effective Survival	Percent Effective Survival Std Dev
B-1	A	28	93	36	18	50			39			19		
	B	47	93	35	9	26			38			10		
	C	4	93	70	57	81	55	20	75	39	23	61	23	22
	D	27	93	26	16	62			28			17		
	E	53	93	13	7	54			14			8		
B-2	A	20	93	85	79	93			91			85		
	B	49	93	88	87	99			95			94		
	C	10	93	106	101	95	96	3	114	94	12	109	91	11
	D	42	93	81	77	95			87			83		
	E	61	93	79	78	99			85			84		
B-3	A	65	93	88	67	76			95			72		
	B	37	93	65	42	65			70			45		
	C	56	93	66	52	79	74	6	71	78	12	56	58	12
	D	46	93	64	45	70			69			48		
	E	16	93	82	65	79			88			70		
B-4	A	29	93	84	76	90			90			82		
	B	44	93	78	74	95			84			80		
	C	23	93	71	66	93	93	3	76	83	9	71	77	7
	D	9	93	87	78	90			94			84		
	E	32	93	66	63	95			71			68		
C-1	A	24	93	97	89	92			104			96		
	B	52	93	82	76	93			88			82		
	C	11	93	115	109	95	93	1	124	103	14	117	95	14
	D	36	93	99	90	91			106			97		
	E	13	93	84	78	93			90			84		
C-2	A	31	93	99	96	97			106			103		
	B	5	93	96	86	90			103			92		
	C	17	93	101	97	96	92	4	109	105	4	104	97	6
	D	2	93	92	86	93			99			92		
	E	64	93	102	88	86			110			95		
C-3	A	35	93	94	85	90			101			91		
	B	55	93	96	89	93			103			96		
	C	39	93	99	66	67	87	12	106	105	7	71	91	14
	D	26	93	107	102	95			115			110		
	E	15	93	90	80	89			97			86		

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

APPENDIX B
TOXICITY TEST WATER QUALITY DATA

E. ESTUARIUS

Appendix Table B-1 . 10-Day Amphipod Sediment Bioassay Water Quality Results

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

Test Initiation Date: 14 November 2003

Test Species: *Eohaustorius estuarius*

Control 1						
Day	Dissolved Oxygen (mg/L)	pH (units)	Salinity (ppt)	Temperature (°C)	Total NH ₃ (mg/L)	
					Overlying Water	Porewater
0	8.3	7.73	30	15.5	0.1	NA
1	8.2	7.73	30	15.7	--	--
2	8.0	7.94	30	15.8	--	--
3	8.0	7.78	30	15.2	--	--
4	8.1	7.84	30	15.2	--	--
5	9.3	7.79	30	15.2	--	--
6	8.8	7.90	30	15.2	--	--
7	8.4	7.82	30	15.3	--	--
8	8.1	7.89	30	15.3	--	--
9	8.1	7.87	30	15.2	--	--
10	8.5	7.89	30	15.2	0.5	--

NA: Not available for analysis, no porewater present.

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

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

Test Initiation Date: 14 November 2003

Test Species: *Eohaustorius estuarius*

Control 2						
Day	Dissolved Oxygen (mg/L)	pH (units)	Salinity (ppt)	Temperature (°C)	Total NH ₃ (mg/L)	
					Overlying Water	Porewater
0	8.2	7.76	30	15.6	0.1	NA
1	8.1	7.77	30	15.6	--	--
2	7.9	7.98	30	15.4	--	--
3	8.0	7.73	30	15.1	--	--
4	7.9	7.85	30	15.1	--	--
5	9.3	7.85	30	15.1	--	--
6	8.8	7.93	30	15.2	--	--
7	8.4	7.87	30	15.2	--	--
8	8.0	7.97	30	15.1	--	--
9	7.9	8.00	30	15.2	--	--
10	8.6	7.98	30	15.2	0.5	--

NA: Not available for analysis, no porewater present.

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

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

Test Initiation Date: 14 November 2003

Test Species: *Eohaustorius estuarius*

A-1						
Day	Dissolved Oxygen (mg/L)	pH (units)	Salinity (ppt)	Temperature (°C)	Total NH ₃ (mg/L)	
					Overlying Water	Porewater
0	8.1	7.73	30	15.5	1.2	2.6
1	7.8	7.78	29	15.7	--	--
2	7.9	7.94	29	15.5	--	--
3	7.7	7.85	29	15.3	--	--
4	7.9	7.94	29	15.4	--	--
5	9.1	7.83	29	15.3	--	--
6	8.4	7.90	29	15.4	--	--
7	8.2	7.90	29	15.3	--	--
8	7.8	7.93	29	15.3	--	--
9	7.5	7.99	29	15.2	--	--
10	8.2	8.03	29	15.3	1.3	--

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

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

Test Initiation Date: 14 November 2003

Test Species: *Eohaustorius estuarius*

A-2						
Day	Dissolved Oxygen (mg/L)	pH (units)	Salinity (ppt)	Temperature (°C)	Total NH ₃ (mg/L)	
					Overlying Water	Porewater
0	8.2	7.78	30	15.5	1.7	12.6
1	8.1	7.79	29	15.6	--	--
2	8.0	7.97	29	15.4	--	--
3	7.9	7.81	29	15.2	--	--
4	8.0	7.95	29	15.3	--	--
5	9.2	7.92	29	15.2	--	--
6	8.7	7.98	29	15.3	--	--
7	8.3	7.96	29	15.3	--	--
8	7.9	8.02	29	15.3	--	--
9	7.9	8.11	29	15.2	--	--
10	8.6	8.05	29	15.2	2.9	--

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

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

Test Initiation Date: 14 November 2003

Test Species: *Eohaustorius estuarius*

A-3						
Day	Dissolved Oxygen (mg/L)	pH (units)	Salinity (ppt)	Temperature (°C)	Total NH ₃ (mg/L)	
					Overlying Water	Porewater
0	8.3	7.86	29	15.5	0.5	0.7
1	8.1	7.85	29	15.6	--	--
2	7.9	8.05	29	15.4	--	--
3	7.9	7.89	29	15.2	--	--
4	8.0	7.98	29	15.2	--	--
5	9.3	7.93	29	15.2	--	--
6	8.7	8.01	29	15.2	--	--
7	8.5	7.97	29	15.3	--	--
8	8.0	8.10	29	15.3	--	--
9	8.0	8.17	29	15.1	--	--
10	8.7	8.13	29	15.2	0.7	--

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

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

Test Initiation Date: 14 November 2003

Test Species: *Eohaustorius estuarius*

B-1						
Day	Dissolved Oxygen (mg/L)	pH (units)	Salinity (ppt)	Temperature (°C)	Total NH ₃ (mg/L)	
					Overlying Water	Porewater
0	8.1	7.72	30	15.6	3.1	10.4
1	7.7	7.74	29	15.7	--	--
2	7.8	7.94	29	15.5	--	--
3	7.5	7.85	29	15.3	--	--
4	7.8	7.98	29	15.4	--	--
5	9.2	7.93	29	15.3	--	--
6	8.6	7.99	29	15.4	--	--
7	8.3	7.98	29	15.4	--	--
8	7.8	8.00	29	15.4	--	--
9	7.8	8.13	29	15.3	--	--
10	8.4	8.06	29	15.3	4.0	--

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

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

Test Initiation Date: 14 November 2003

Test Species: *Eohaustorius estuarius*

B-2						
Day	Dissolved Oxygen (mg/L)	pH (units)	Salinity (ppt)	Temperature (°C)	Total NH ₃ (mg/L)	
					Overlying Water	Porewater
0	8.0	7.79	30	15.6	0.6	2.1
1	7.9	7.82	29	15.8	--	--
2	7.8	7.99	29	15.5	--	--
3	7.8	7.84	29	15.4	--	--
4	8.0	7.97	29	15.5	--	--
5	9.4	7.94	29	15.3	--	--
6	8.8	8.03	29	15.4	--	--
7	8.4	8.04	29	15.4	--	--
8	8.0	8.12	29	15.4	--	--
9	7.9	8.30	29	15.3	--	--
10	8.6	8.24	29	15.3	0.7	--

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

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

Test Initiation Date: 14 November 2003

Test Species: *Eohaustorius estuarius*

B-3						
Day	Dissolved Oxygen (mg/L)	pH (units)	Salinity (ppt)	Temperature (°C)	Total NH ₃ (mg/L)	
					Overlying Water	Porewater
0	8.0	7.81	30	15.6	1.5	14.2
1	7.6	7.81	29	15.8	--	--
2	7.8	8.00	29	15.6	--	--
3	7.8	7.87	29	15.4	--	--
4	8.1	8.00	29	15.5	--	--
5	9.3	8.00	29	15.3	--	--
6	8.8	8.07	29	15.4	--	--
7	8.4	8.07	29	15.5	--	--
8	7.9	8.12	29	15.5	--	--
9	7.9	8.28	29	15.4	--	--
10	8.7	8.19	29	15.4	1.0	--

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

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

Test Initiation Date: 14 November 2003

Test Species: *Eohaustorius estuarius*

B-4						
Day	Dissolved Oxygen (mg/L)	pH (units)	Salinity (ppt)	Temperature (°C)	Total NH ₃ (mg/L)	
					Overlying Water	Porewater
0	7.9	7.74	30	15.7	2.6	15.4
1	7.5	7.74	29	15.8	--	--
2	7.5	7.87	29	15.5	--	--
3	7.6	7.82	29	15.5	--	--
4	8.0	7.92	29	15.5	--	--
5	9.1	7.89	29	15.4	--	--
6	8.6	7.96	29	15.5	--	--
7	8.2	7.97	29	15.5	--	--
8	7.9	8.01	29	15.5	--	--
9	7.9	8.12	29	15.4	--	--
10	8.2	8.09	29	15.4	5.7	--

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

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

Test Initiation Date: 14 November 2003

Test Species: *Eohaustorius estuarius*

C-1						
Day	Dissolved Oxygen (mg/L)	pH (units)	Salinity (ppt)	Temperature (°C)	Total NH ₃ (mg/L)	
					Overlying Water	Porewater
0	7.9	7.89	29	15.8	0.7	1.7
1	7.7	7.86	29	15.8	--	--
2	7.9	8.08	29	15.5	--	--
3	7.7	7.99	29	15.5	--	--
4	8.0	7.90	29	15.4	--	--
5	9.5	8.01	29	15.5	--	--
6	8.9	8.09	29	15.5	--	--
7	8.5	8.10	29	15.6	--	--
8	8.0	8.11	29	15.4	--	--
9	7.9	8.28	29	15.3	--	--
10	8.7	8.20	29	15.4	0.4	--

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

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

Test Initiation Date: 14 November 2003

Test Species: *Eohaustorius estuarius*

C-2						
Day	Dissolved Oxygen (mg/L)	pH (units)	Salinity (ppt)	Temperature (°C)	Total NH ₃ (mg/L)	
					Overlying Water	Porewater
0	8.1	7.88	29	15.7	0.5	1.0
1	7.6	7.85	29	15.8	--	--
2	7.8	8.07	29	15.6	--	--
3	7.7	7.92	29	15.5	--	--
4	7.8	7.96	29	15.5	--	--
5	9.2	7.98	29	15.5	--	--
6	8.9	8.05	29	15.5	--	--
7	8.5	8.06	29	15.5	--	--
8	7.9	8.10	29	15.5	--	--
9	8.0	8.26	29	15.4	--	--
10	8.6	8.16	29	15.4	1.5	--

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

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

Test Initiation Date: 14 November 2003

Test Species: *Eohaustorius estuarius*

C-3						
Day	Dissolved Oxygen (mg/L)	pH (units)	Salinity (ppt)	Temperature (°C)	Total NH ₃ (mg/L)	
					Overlying Water	Porewater
0	8.0	7.82	30	15.7	0.2	1.3
1	7.6	7.79	30	15.8	--	--
2	7.6	7.98	30	15.5	--	--
3	7.6	7.86	29	15.5	--	--
4	7.8	7.98	29	15.5	--	--
5	9.3	7.96	29	15.4	--	--
6	8.8	8.03	29	15.5	--	--
7	8.2	8.07	30	15.6	--	--
8	7.9	8.10	29	15.5	--	--
9	7.6	8.25	29	15.4	--	--
10	8.5	8.14	29	15.4	0.6	--

M. GALLOPROVINCIALIS

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

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

Test Initiation Date: 22 October 2003

Test Species: *Mytilus galloprovincialis*

Site	Dissolved Oxygen (mg/L)			pH (units)			Salinity (ppt)			Temperature (°C)			NH ₃ (mg/L)	
	0	24	48	0	24	48	0	24	48	0	24	48	0	48
Control - Water Only	9.5	8.0	8.0	7.95	7.92	7.83	30	30	30	15.5	15.6	15.6	0.2	0.1
Control - Sediment	9.5	8.1	7.8	7.94	7.90	7.80	30	30	30	15.4	15.5	15.3	0.2	0.1
A-1	7.0	6.5	7.1	7.95	7.86	7.79	30	30	30	15.4	15.5	15.4	0.7	1.0
A-2	7.4	7.1	7.5	7.92	7.86	7.79	30	30	30	15.4	15.5	15.4	0.6	0.4
A-3	9.7	8.1	7.8	8.00	7.94	7.85	30	30	30	15.4	15.5	15.4	< 0.1	1.0
B-1	8.3	7.2	7.2	7.91	7.85	7.78	30	30	30	15.6	15.5	15.5	0.2	0.5
B-2	9.4	8.0	7.5	7.95	7.90	7.85	30	30	30	15.5	15.5	15.4	0.5	0.4
B-3	7.5	6.7	7.1	7.94	7.88	7.83	30	30	30	15.5	15.5	15.4	0.4	0.5
B-4	7.1	7.0	7.2	7.91	7.84	7.79	30	30	30	15.6	15.5	15.4	1.6	1.1
C-1	10.1	8.1	7.6	8.00	7.9	7.87	30	30	30	15.5	15.5	15.3	0.1	0.6
C-2	9.9	8.0	7.5	7.97	7.90	7.85	30	30	30	15.5	15.5	15.4	< 0.1	0.2
C-3	9.3	7.7	7.4	7.95	7.87	7.82	30	30	30	15.6	15.5	15.5	0.5	0.7

APPENDIX C
REFERENCE TOXICANT DATA

E. ESTUARIUS

Amphipod 96-Hr Survival Bioassay-Survival

Start Date: 11/17/2003 Test ID: 031117eera Sample ID: REF-Ref Toxicant
 End Date: 11/21/2003 Lab ID: AEESD-AMEC Bioassay SD Sample Type: CDCL-Cadmium chloride
 Sample Date: Protocol: ASTM 93 Test Species: EE-Eohaustorius estuarius
 Comments:

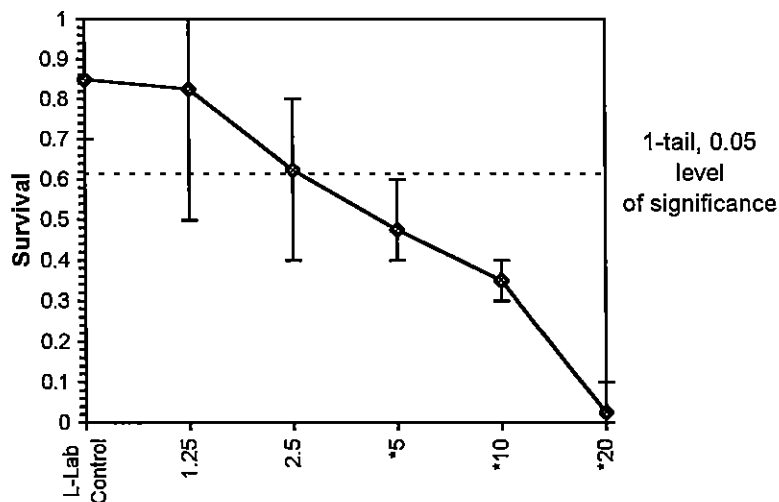
Conc-mg/L	1	2	3	4
L-Lab Control	0.9000	1.0000	0.7000	0.8000
1.25	0.9000	0.5000	0.9000	1.0000
2.5	0.4000	0.7000	0.6000	0.8000
5	0.4000	0.6000	0.4000	0.5000
10	0.4000	0.3000	0.4000	0.3000
20	0.1000	0.0000	0.0000	0.0000

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					
L-Lab Control	0.8500	1.0000	1.1898	0.9912	1.4120	15.281	4				6	40
1.25	0.8250	0.9706	1.1739	0.7854	1.4120	23.013	4	0.139	2.410	0.2764	7	40
2.5	0.6250	0.7353	0.9173	0.6847	1.1071	19.559	4	2.377	2.410	0.2764	15	40
*5	0.4750	0.5588	0.7602	0.6847	0.8861	12.679	4	3.746	2.410	0.2764	21	40
*10	0.3500	0.4118	0.6322	0.5796	0.6847	9.597	4	4.862	2.410	0.2764	26	40
*20	0.0250	0.0294	0.1995	0.1588	0.3218	40.840	4	8.635	2.410	0.2764	39	40

Auxiliary Tests	Statistic	Critical	Skew	Kurt						
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.94708	0.884	-0.708	1.22015						
Bartlett's Test indicates equal variances (p = 0.17)	7.79052	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		0.23511	0.27282	0.55596	0.02631	5.9E-07	5, 18

Maximum Likelihood-Probit											
Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	2.44835	0.47049	1.52619	3.37051	0.15	5.2399	7.81472	0.16	0.76778	0.40844	4
Intercept	3.12022	0.4268	2.28369	3.95674							
TSCR	0.15442	0.05075	0.05495	0.25389							

Point	Probits	mg/L	95% Fiducial Limits	
EC01	2.674	0.65706	0.13179	1.39107
EC05	3.355	1.24725	0.36377	2.2445
EC10	3.718	1.75526	0.62268	2.90744
EC15	3.964	2.21033	0.8926	3.47098
EC20	4.158	2.65476	1.18576	4.00457
EC25	4.326	3.10662	1.50963	4.5371
EC40	4.747	4.61635	2.73374	6.30643
EC50	5.000	5.85835	3.83908	7.82491
EC60	5.253	7.4345	5.26752	9.93724
EC75	5.674	11.0475	8.29092	15.8914
EC80	5.842	12.9278	9.68561	19.6215
EC85	6.036	15.5272	11.4616	25.4131
EC90	6.282	19.5528	13.9743	35.6703
EC95	6.645	27.5167	18.4359	59.9524
EC99	7.326	52.2329	30.2227	162.878



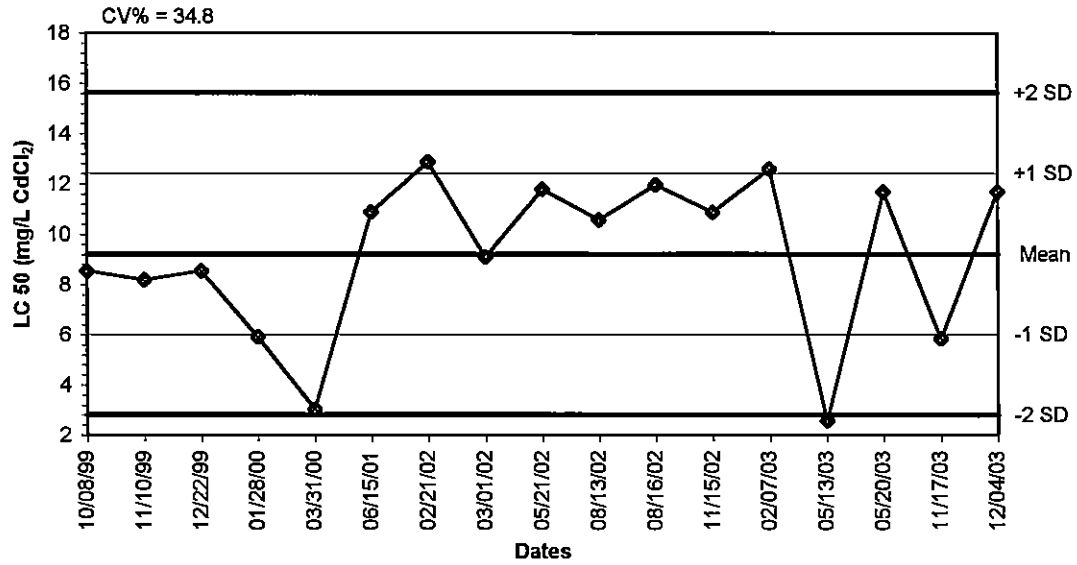
Sediment Testing Reference Toxicant Results AMEC Bioassay Laboratory

Client: Internal
 Toxicant: CdCl₂ 03117 eera
 Analysts: JR

Test Organism: F. estuarius
 Start Date/Time: 11/17/03 1636
 End Date/Time: 11/21/03 1435

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	8.6	7.6	8.3	7.0	5.8	7.92	7.69	7.68	7.65	7.50	30	30.4	29.9	29.9	29.9	14.9	16.4	15.7	15.2	15.4
	B	10	10																				
	C	10	7																				
	D	10	8																				
1.25	A	10	9	8.7	7.7	8.4	7.9	7.4	7.92	7.73	7.71	7.74	7.72	30	29.8	29.9	29.9	29.8	14.8	16.0	15.8	15.3	15.5
	B	10	5																				
	C	10	9																				
	D	10	10																				
2.5	A	10	4	8.7	7.9	8.4	8.0	7.4	7.92	7.75	7.72	7.75	7.73	30	29.7	29.9	29.9	29.9	14.8	15.8	15.8	15.3	15.6
	B	10	7																				
	C	10	6																				
	D	10	8																				
5.0	A	10	4	8.7	7.8	8.4	8.0	7.5	7.94	7.76	7.69	7.74	7.71	30	29.7	29.8	29.8	29.8	14.8	15.9	15.8	15.4	15.6
	B	10	6																				
	C	10	4																				
	D	10	5																				
10	A	10	4	8.7	7.8	8.7	8.0	7.8	7.94	7.78	7.72	7.76	7.75	30	29.7	29.7	29.7	29.8	14.8	15.8	15.8	15.5	15.7
	B	10	3																				
	C	10	4																				
	D	10	3																				
20	A	10	1	8.7	7.9	8.8	8.0	7.6	7.95	7.80	7.73	7.76	7.72	30	29.6	29.6	29.6	29.6	14.8	15.8	15.7	15.7	15.9
	B	10	0																				
	C	10	0																				
	D	10	0																				

Reference Toxicant Control Chart - *Eohaustorius* 96hr Survival



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
10/08/99	8.5659	9.2266	6.0144	2.8023	12.4388	15.6510
11/10/99	8.2133	9.2266	6.0144	2.8023	12.4388	15.6510
12/22/99	8.5659	9.2266	6.0144	2.8023	12.4388	15.6510
01/28/00	5.9193	9.2266	6.0144	2.8023	12.4388	15.6510
03/31/00	3.0465	9.2266	6.0144	2.8023	12.4388	15.6510
06/15/01	10.8749	9.2266	6.0144	2.8023	12.4388	15.6510
02/21/02	12.8870	9.2266	6.0144	2.8023	12.4388	15.6510
03/01/02	9.1171	9.2266	6.0144	2.8023	12.4388	15.6510
05/21/02	11.7849	9.2266	6.0144	2.8023	12.4388	15.6510
08/13/02	10.5923	9.2266	6.0144	2.8023	12.4388	15.6510
08/16/02	11.9653	9.2266	6.0144	2.8023	12.4388	15.6510
11/15/02	10.8858	9.2266	6.0144	2.8023	12.4388	15.6510
02/07/03	12.6153	9.2266	6.0144	2.8023	12.4388	15.6510
05/13/03	2.5734	9.2266	6.0144	2.8023	12.4388	15.6510
05/20/03	11.7033	9.2266	6.0144	2.8023	12.4388	15.6510
11/17/03	5.8583	9.2266	6.0144	2.8023	12.4388	15.6510
12/04/03	11.6843	9.2266	6.0144	2.8023	12.4388	15.6510

M. GALLOPROVINCIALIS

Bivalve Larval Survival and Development Test-Proportion Normal

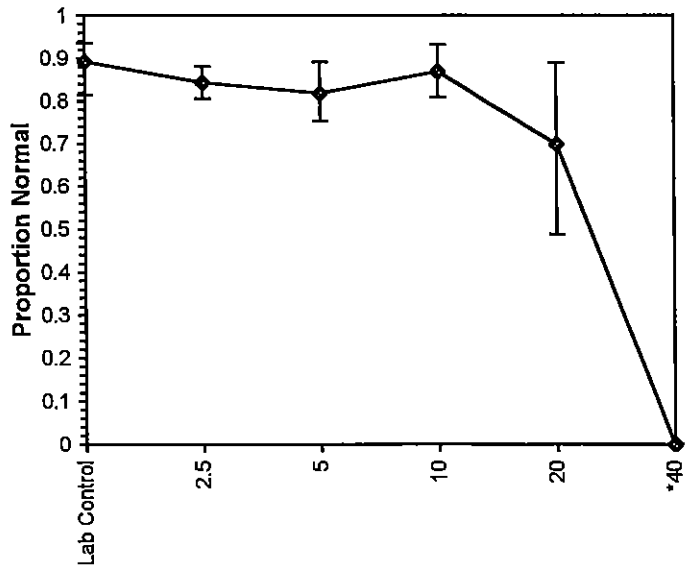
Start Date: 10/22/2003 Test ID: 031022mert Sample ID: REF-Ref Toxicant
 End Date: 10/24/2003 Lab ID: AEESD-AMEC Bioassay SD Sample Type: CUCL-Copper chloride
 Sample Date: Protocol: ASTM 87 Test Species: ME-Mytilis edulis
 Comments:

Conc-ug/L	1	2	3	4	5
Lab Control	0.9348	0.9175	0.8750	0.8144	0.9213
2.5	0.8065	0.8557	0.8316	0.8800	0.8400
5	0.8250	0.8144	0.7528	0.8916	0.8082
10	0.8095	0.8700	0.8991	0.9310	0.8370
20	0.7381	0.7000	0.8900	0.4878	0.6739
40	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	0.8926	1.0000	1.2427	1.1254	1.3126	6.104	5			50	463
2.5	0.8427	0.9441	1.1641	1.1153	1.2171	3.261	5	20.00	16.00	76	485
5	0.8184	0.9169	1.1336	1.0504	1.2352	5.852	5	18.50	16.00	77	422
10	0.8693	0.9739	1.2058	1.1192	1.3051	6.106	5	23.00	16.00	61	472
20	0.6980	0.7819	0.9987	0.7732	1.2327	16.465	5	17.00	16.00	135	458
*40	0.0000	0.0000	0.0581	0.0500	0.0763	17.978	5	15.00	16.00	394	394

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)	0.92392	0.9	0.07351	3.68073
Bartlett's Test indicates unequal variances (p = 1.03E-03)	20.4439	15.0863		
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	20	40	28.2843	

Maximum Likelihood-Probit											
Parameter	Value	SE	95% Fiducial Limits		Control	Chi-Sq	Critical	P-value	Mu	Sigma	Iter
Slope	15.2358	2.64773	10.0462	20.4253	0.10799	6.73547	7.81472	0.08	1.36192	0.06564	50
Intercept	-15.75	3.45776	-22.527	-8.9727							
TSCR	0.14332	0.00816	0.12732	0.15932							
Point	Probits	ug/L	95% Fiducial Limits								
EC01	2.674	16.1894	14.3527	17.2261							
EC05	3.355	17.9458	16.71	18.6786							
EC10	3.718	18.9586	18.0612	19.567							
EC15	3.964	19.6741	18.9645	20.2642							
EC20	4.158	20.262	19.6404	20.9146							
EC25	4.326	20.7803	20.1752	21.5577							
EC40	4.747	22.1459	21.3813	23.4922							
EC50	5.000	23.0103	22.0655	24.8237							
EC60	5.253	23.9084	22.7466	26.2594							
EC75	5.674	25.4796	23.897	28.8667							
EC80	5.842	26.1313	24.3638	29.9788							
EC85	6.036	26.9121	24.9168	31.3326							
EC90	6.282	27.9278	25.6274	33.1272							
EC95	6.645	29.5041	26.7136	35.9838							
EC99	7.326	32.7048	28.8672	42.0374							



Test: BV-Bivalve Larval Survival and Development Test Test ID: 031022mert
 Species: ME-Mytilus edulis Protocol: ASTM 87
 Sample ID: REF-Ref Toxicant Sample Type: CUCL-Copper chloride
 Start Date: 10/22/2003 End Date: 10/24/2003 Lab ID: AEESD-AMEC Bioassay SD

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
1						100	0	SH
2						100	88	SH
3						100	84	SH
4						88	77	SH
5						97	83	SH
6						100	87	SH
7						83	74	SH
8						43	0	KT
9						100	70	KT
10						92	112	KT
11						97	89	KT
12						87	81	KT
13						89	82	KT
14						84	62	KT
15						82	40	KT
16						89	462/67	KT
17						83	0	KT
18						89	0	KT
19						93	75	KT
20						95	79	KT
21						79	0	KT
22						100	89	KT
23						97	79	KT
24						73	59 3 _{KT}	KT
25						84	68	MC
26						80	66	MC
27						97	79	
28						92	86	
29						92	77	
30						109	98	

Comments:

Test: BV-Bivalve Larval Survival and Development Test
 Species: ME-Mytilis edulis
 Sample ID: REF-Ref Toxicant
 Start Date: 10/22/2003

Test ID: 031022mert
 Protocol: ASTM 87
 Sample Type: CUCL-Copper chloride
 Lab ID: AEESD-AMEC Bioassay SD

End Date: 10/24/2003

Pos	ID	Rep	Group	Initial Density	Final Density	Total Counted	Number Normal	Notes
28	1	1	L-Lab Control			113		
11	2	2	L-Lab Control			117		
4	3	3	L-Lab Control			89		
27	4	4	L-Lab Control			117		
13	5	5	L-Lab Control			117		
19	6	1	2.5					
5	7	2	2.5					
20	8	3	2.5					
2	9	4	2.5					
3	10	5	2.5					
26	11	1	5					
23	12	2	5					
16	13	3	5					
7	14	4	5					
24	15	5	5					
25	16	1	10					
6	17	2	10					
30	18	3	10					
12	19	4	10					
29	20	5	10					
14	21	1	20					
9	22	2	20					
22	23	3	20					
15	24	4	20					
10	25	5	20					
18	26	1	40					
8	27	2	40					
21	28	3	40					
17	29	4	40					
1	30	5	40					

Comments:

Bivalve Development Bioassay Worksheet

Client: Buena Ventura
 Test No.: _____
 Test Species: M. edulis

Start Date/Time: 10/22/03 1600
 End Date/Time: 10/24/03 1330
 Date Received: 10/21/03

Sample Type: 1L Jar Whole Sediment

Test Chamber Type and Sample Volume: _____

Spawn Initiation Time: 10N

Number of Spawners: Male Female
 8 8

Spawn Condition: Good

Fertilization Time: _____

Egg Stock Density Calculation:

	JK	JK		
Eggs Counted (x):	<u>285</u> 118	<u>386</u> 92	}	
	<u>285</u> 118	<u>425</u> 107		10x dilution
	<u>270</u> 118	<u>422</u> 117		
	<u>280</u> 130	<u>411</u> 104		
10x dilution →	<u>28</u> 152	<u>41</u> 113		
Mean	<u>278.6</u>	<u>416</u>	Overall Mean: <u>347.3</u>	
	<u>127.2</u>	<u>114.6</u>	<u>120.9</u>	

Mean: $\frac{1209}{2} \times 42 = 50778$ eggs/ml
~~JK 30000~~

Initial Stock - $\frac{50778 \text{ eggs/ml}}{25000 \text{ eggs/ml}} =$ Stock Dilution Factor 2.03
 Inoculum Stock - $\frac{50778 \text{ eggs/ml}}{25000 \text{ eggs/ml}} =$ 2.03 less / 1.03 water

Percent Division Upon Inoculation: 80

Time of Inoculation: 1600

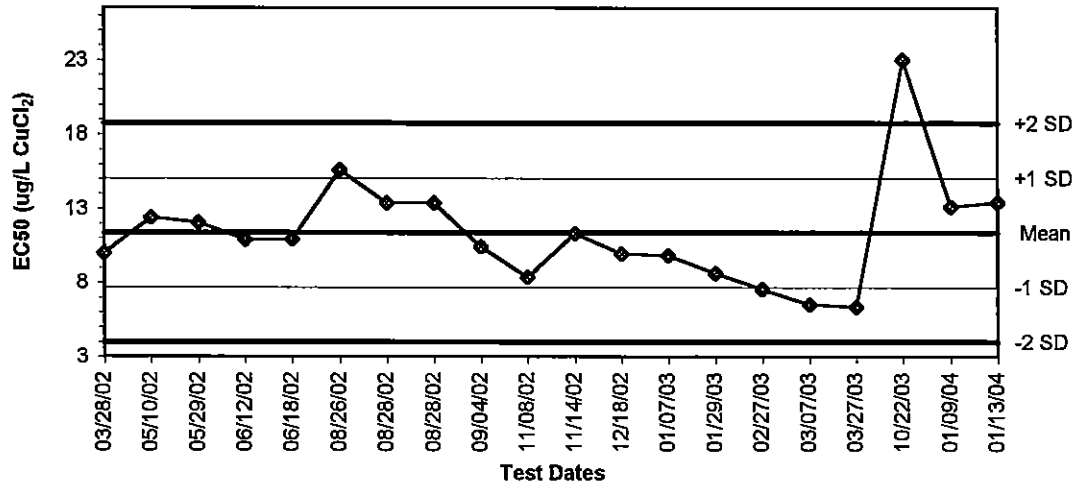
Comments: _____

QA Check: _____

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

Reference Toxicant Control Chart - Bivalve Larval Development

CV% = 32.5



Dates	Values	Mean	-1 SD	-2 SD	+1 SD	+2 SD
03/28/02	10.0096	11.3570	7.6711	3.9853	15.0428	18.7286
05/10/02	12.3924	11.3570	7.6711	3.9853	15.0428	18.7286
05/29/02	12.0485	11.3570	7.6711	3.9853	15.0428	18.7286
06/12/02	10.8878	11.3570	7.6711	3.9853	15.0428	18.7286
06/18/02	10.9317	11.3570	7.6711	3.9853	15.0428	18.7286
08/26/02	15.6155	11.3570	7.6711	3.9853	15.0428	18.7286
08/28/02	13.3760	11.3570	7.6711	3.9853	15.0428	18.7286
08/28/02	13.3760	11.3570	7.6711	3.9853	15.0428	18.7286
09/04/02	10.4338	11.3570	7.6711	3.9853	15.0428	18.7286
11/08/02	8.3754	11.3570	7.6711	3.9853	15.0428	18.7286
11/14/02	11.3155	11.3570	7.6711	3.9853	15.0428	18.7286
12/18/02	9.9361	11.3570	7.6711	3.9853	15.0428	18.7286
01/07/03	9.8373	11.3570	7.6711	3.9853	15.0428	18.7286
01/29/03	8.6253	11.3570	7.6711	3.9853	15.0428	18.7286
02/27/03	7.5397	11.3570	7.6711	3.9853	15.0428	18.7286
03/07/03	6.5174	11.3570	7.6711	3.9853	15.0428	18.7286
03/27/03	6.3338	11.3570	7.6711	3.9853	15.0428	18.7286
10/22/03	23.0103	11.3570	7.6711	3.9853	15.0428	18.7286
01/09/04	13.1416	11.3570	7.6711	3.9853	15.0428	18.7286
01/13/04	13.4358	11.3570	7.6711	3.9853	15.0428	18.7286

APPENDIX D
TOXICITY STATISTICAL ANALYSIS SUMMARIES & RAW DATA

Appendix Table D-1. ANOVA Summary Results
City of Buenaventura - Santa Clara River Estuary Dry Weather Sampling Event

Test Initiation Date: 14 November 2003

Test Species: *Eohaustorius estuarius*

Whole Sediment

Parameter	Value		
Table Analyzed			
Amphipod Survival			
One-way analysis of variance			
P value	0.9888		
P value summary	ns		
Are means signif. different? (P < 0.05)	No		
Number of groups	11		
F	0.2484		
R squared	0.05344		
Bartlett's test for equal variances			
Bartlett's statistic (corrected)	9.181		
P value	0.515		
P value summary	ns		
Do the variances differ signif. (P < 0.05)	No		
ANOVA Table	SS	df	MS
Treatment (between columns)	0.03327	10	0.003327
Residual (within columns)	0.5893	44	0.01339
Total	0.6226	54	

Test Initiation Date: 22 October 2003

Test Species: *Mytilus galloprovincialis*

Parameter	Value
Table Analyzed	
Bivalve Effective Survival	
Kruskal-Wallis test	
P value	0.0004
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	32.12

**Appendix Table D-2. Summary of Whole Sediment t-test p values
 City of Buenaventura - Santa Clara River Estuary Dry Weather Sampling Event
 Test Initiation Dates: 22 October 2003, 14 November 2003**

Test Site	Amphipod Survival	Bivalve Survival	Bivalve Normality	Bivalve Effective Survival
A-1	0.3178	0.0242	0.2426	0.0551
A-2	0.3038	0.3660 ^a	0.0088	0.4439 ^a
A-3	0.2444	0.1058	0.4074	0.1256
B-1	0.1940	0.0003	0.0098^a	0.0002
B-2	0.3962	0.2555	0.0234	0.4253
B-3	0.2964	0.0115	0.0015	0.0034
B-4	0.4026	0.0193	0.1559	0.0642
C-1	0.0959	0.3627	0.1450 ^a	0.2704
C-2	0.2807	0.1523	0.2066	0.1519
C-3	0.4164	0.2114	0.3172	0.4412

Bold indicates a statistically significant decrease ($P \leq 0.05$)

^a - Indicates Welch's correction applied due to unequal variances

E. ESTUARIUS

Appendix Table D-3. Summary of Pearson Correlations between Grain Size, TOC and Amphipod Survival
 City of Buenaventura - Santa Clara River Estuary Dry Weather Sampling Event
 Test Initiation Date: 14 November 2003
 Test Species: *Eohaustorius estuarius*

Grain Size (% fine) vs:	Amphipod Survival
p- value	0.154
N	10
r^2	0.237
Significance?	NO

Grain Size (% sand) vs:	Amphipod Survival
p- value	0.665
N	10
r^2	0.025
Significance?	NO

Grain Size (% gravel) vs:	Amphipod Survival
p- value	0.3089
N	10
r^2	0.147
Significance?	NO

TOC (mg/kg) vs. :	Amphipod Survival
p- value	0.4135
N	10
r^2	0.0851
Significance?	NO

Appendix Table D-4. Summary of Pearson Correlations between Trace Metal Concentrations and Amphipod Survival
 City of Buenaventura - Santa Clara River Estuary Dry Weather Sampling Event
 Test Initiation Date: 14 November 2003
 Test Species: *Eohaustorius estuarius*

Copper (mg/kg) vs. :	Amphipod Survival
p- value	0.563
N	10
r ²	0.044
Significance?	NO

Nickel (mg/kg) vs. :	Amphipod Survival
p- value	0.186
N	10
r ²	0.207
Significance?	NO

Zinc (mg/kg) vs. :	Amphipod Survival
p- value	0.140
N	10
r ²	0.284
Significance?	NO

**Ten-Day Amphipod Bioassay - Ogden Bioassay Laboratory
Survival/Reburial Data**

Client: City of Buenaventura #2
 Test Date: 11/14/03
 Test Species: E. estuaris

Random Number	Time	Number Alive	Number Reburied	Comments/ Observations
1	1100	20	0	JR
2		20	0	
3		15	0	
4		20	0	
5		20	0	
6		20	0	
7		20	0	
8		17	0	
9		20	0	
10		19	0	
11		20	0	
12		19	0	
13		19	0	
14		18	0	
15		18	0	
16		17	0	
17		18	0	
18		19	0	
19		19	0	
20		18	0	
21		16	0	
22		20	0	
23		17	0	
24		20	0	
25		17	0	
26		17	0	
27		18	0	
28		15	0	
29		16	0	
30		15	0	
31		14	0	
32		18	0	
33		18	0	
34		17	0	
35		17	0	

Ogden Bioassay Laboratory - 5550 Morehouse Dr., Suite B. San Diego, CA 92121.
 QA Review/Date: MC 12/15/03
 Final Review/Date: MC 12/16/03

**Ten-Day Amphipod Bioassay - Ogden Bioassay Laboratory
Survival/Reburial Data**

Client: City of Buena Ventura
 Test Date: 11/14/07
 Test Species: E. estuarius

Random Number	Time	Number Alive	Number Reburied	Comments/Observations
36	1100	19	0	✓K
37		18	0	
38		19	0	
39		16	0	
40		18	0	
41		15	0	
42		17	0	
43		19	0	
44		13	0	
45		17	0	
46		16	0	
47		14	0	
48		18	0	
49		20	0	
50		16	0	
51		19	0	
52		19	0	
53		18	0	
54		0	0	no bodies
55		15	0	
56		12	0	
57		13	0	
58		17	0	
59		17	0	
60		18 14	0	✓L
Surv A-3		17	0	

Ogden Bioassay Laboratory - 5550 Morehouse Dr., Suite B. San Diego, CA 92121.

QA Review/Date: llc 12-5-07
 Final Review/Date: llc 12-16-07

Buenaventura Sediments
RE-TEST DATE: November 14, 2003
 Amphipod - *Eohaustorius estuarius*

Site	Rep	Rand#
CONTROL #1	A	25
	B	38
	C	53
	D	18
	E	59
CONTROL #2	A	19
	B	40
	C	48
	D	34
	E	45
A-1	A	1
	B	51
	C	57
	D	33
	E	41
A-2	A	9
	B	15
	C	55
	D	28
	E	43
A-3	A	54
	B	37
	C	23
	D	22
	E	29
B-1	A	26
	B	4
	C	50
	D	60
	E	20

Site	Rep	Rand #
B-2	A	14
	B	49
	C	8
	D	36
	E	16
B-3	A	47
	B	32
	C	58
	D	2
	E	17
B-4	A	6
	B	52
	C	56
	D	42
	E	7
C-1	A	39
	B	46
	C	11
	D	27
	E	12
C-2	A	44
	B	10
	C	13
	D	3
	E	5
C-3	A	24
	B	30
	C	35
	D	21
	E	31

M. GALLOPROVINCIALIS

Appendix Table D-5. Summary of Pearson Correlations between Grain Size, TOC and Bivalve Results

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

Test Initiation Date: 22 October 2003

Test Species: *Mytilus galloprovincialis*

Grain Size (% fine) vs:	Survival	Normality	Effective Survival
p- value	0.3830	0.4863	0.6127
N	10	10	10
r ²	0.096	0.062	0.034
Significance?	NO	NO	NO

Grain Size (% sand) vs:	Survival	Normality	Effective Survival
p- value	0.3983	0.8959	0.4682
N	10	10	10
r ²	0.091	0.002	0.068
Significance?	NO	NO	NO

Grain Size (% gravel) vs:	Survival	Normality	Effective Survival
p- value	0.8615	0.8881	0.8683
N	10	10	10
r ²	0.005	0.003	0.004
Significance?	NO	NO	NO

TOC (mg/kg) vs. :	Survival	Normality	Effective Survival
p- value	0.2542	0.7126	0.3027
N	10	10	10
r ²	0.159	0.018	0.132
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 Dry Weather Sampling Event
 Test Initiation Date: 22 October 2003
 Test Species: *Mytilus galloprovincialis*

Copper (mg/kg) vs. :	Survival	Normality	Effective Survival
p- value	0.3867	0.9539	0.4637
N	10	10	10
r ²	0.095	0.000	0.069
Significance?	NO	NO	NO

Nickel (mg/kg) vs. :	Survival	Normality	Effective Survival
p- value	0.2663	0.5725	0.4782
N	10	10	10
r ²	0.151	0.041	0.065
Significance?	NO	NO	NO

Zinc (mg/kg) vs. :	Survival	Normality	Effective Survival
p- value	0.8137	0.7700	0.8596
N	10	10	10
r ²	0.008	0.013	0.005
Significance?	NO	NO	NO

Bivalve Embryo Development Score Sheet AMEC Bioassay Laboratory

Client: City of Buenaventura
 Test Species: M. edulis
 Analyst: RG, SD

Site ID: A1 → C3
 Project ID: SOKE
 Date: 10/25/2003

Random No.	Number Normal	Number Abnormal	Total Number	Comments/ Observations
1	94		113	SH
2	86		92	SH
3	63		69	R6
4	57		70	R6
5	86		96	SD
6	97		106	SD
7	66		78	R6
8	94		105	SD
9	78		87	↓
10	101		100	↓
11	109		115	↓
12	169		190	↓
13	78		84	↓
14	83		93	R6
15	80		90	R6
16	65		82	↓
17	97		101	↓
18	73		81	↓
19	79		82	↓
20	79		85	↓
21	37		57	SD
22	81		103	↓
23	66		71	↓
24	89		97	↓
25	101		102	R6
26	102		109	SD
27	16		26	R6 A lot of debris
28	18		36	R6 " "
29	76		84	R6
30	91		99	R6
31	96		99	R6
32	63		66	R6
33	96		98	R6
34	57		78	R6
35	85 85		94	R6

AMEC Bioassay Laboratory - 5550 Morehouse Dr., Suite B. San Diego, CA 92121.

QA Check: BCS 12/3/03

Final Review: MO 12/16/03

Bivalve Embryo Development Score Sheet AMEC Bioassay Laboratory

Client: City of Buenaventura
 Test Species: M. edulis
 Analyst: RG, SD

Site ID: A1-C3
 Project ID: SCPE
 Date: 10/25/2003

Random No.	Number Normal	Number Abnormal	Total Number	Comments/Observations
36	RG 99 90		99	RG
37	42		65	↓
38	59		69	↓
39	66		99	↓
40	60		73	RG
41	54		78	↓
42	(RG) 87 77		(RG) 77 81	↓
43	92		103	RG
44	(RG) 78 74		(RG) 74 78	RG
45	BCS 107 100		BCS 124 107	RG RG
46	(RG) 64 45		(RG) 45 64	RG
47	(RG) 35 9		(RG) 9 35	RG
48	89		94	SD
49	87		88	SD
50	104		120	RE
51	83		100	RG
52	76		82	RG
53	7		13	RG
54	69		85	RG
55	89		96	RG
56	(RG) 66 52		(RG) 52 66	RG
57	95		108	RG
58	(RG) BCS 74 79		BCS 83 91	RG
59	52		53	RG
60	71		85	RG
61	78		79	RG
62	100		108	RG
63	(RG) 104 95		RG 95 104	RG
64	88		102	RG
65	67		88	RG
66				
67				
68				
69				
70				

AMEC Bioassay Laboratory - 5550 Morehouse Dr., Suite B. San Diego, CA 92121.

QA Check: BCS 12/13/03

Ⓢ Vial re-scored by JR. Appeared to be an outlier from the 1st count.

Final Review: UA 12-16-03

Buenaventura Sediments
 TEST DATE: October 22, 2003
 Bivalve - *Mytilus edulis* (Whole sediment)

Site	Rep	Rand#
Control Water Only	A	57
	B	58
	C	62
	D	25
	E	45
Control Sed.	A	60
	B	7
	C	43
	D	33
	E	30
Control Sed. w/vial	A	14
	B	40
	C	51
	D	50
	E	54
A-1	A	63
	B	8
	C	19
	D	6
	E	1
A-2	A	12
	B	41
	C	22
	D	21
	E	34
A-3	A	3
	B	48
	C	59
	D	38
	E	18
B-1	A	28
	B	47
	C	4
	D	27
	E	53

Site	Rep	Rand #
B-2	A	20
	B	49
	C	10
	D	42
	E	61
B-3	A	65
	B	37
	C	56
	D	46
	E	16
B-4	A	29
	B	44
	C	23
	D	9
	E	32
C-1	A	35
	B	55
	C	39
	D	26
	E	15
C-2	A	31
	B	5
	C	17
	D	2
	E	64
C-3	A	24
	B	52
	C	11
	D	36
	E	13

APPENDIX E
GRAIN SIZE ANALYSES

Appendix Table E-1. Grain Size Summary Results
City of Buenaventura
Santa Clara River Estuary Dry Weather Sampling Event
Sample Collection Date: 17 October 2003

Site	Percent Gravel	Percent Sand	Percent Silt	Percent Clay	Percent Fine (Silt+Clay)
A-1	1.1	51.0	32.9	15.0	47.9
A-2	16.2	81.2	1.3	1.3	2.6
A-3	0.2	98.5	1.3	0.0	1.3
B-1	2.3	95.1	1.3	1.3	2.6
B-2	1.9	92.7	2.7	2.7	5.4
B-3	2.2	95.2	1.3	1.3	2.6
B-4	0.0	39.2	42.4	18.4	60.8
C-1	0.2	98.5	1.3	0.0	1.3
C-2	7.6	91.1	0.0	1.3	1.3
C-3	13.2	84.2	1.3	1.3	2.6
D-1	30.0	68.8	0.0	1.3	1.3

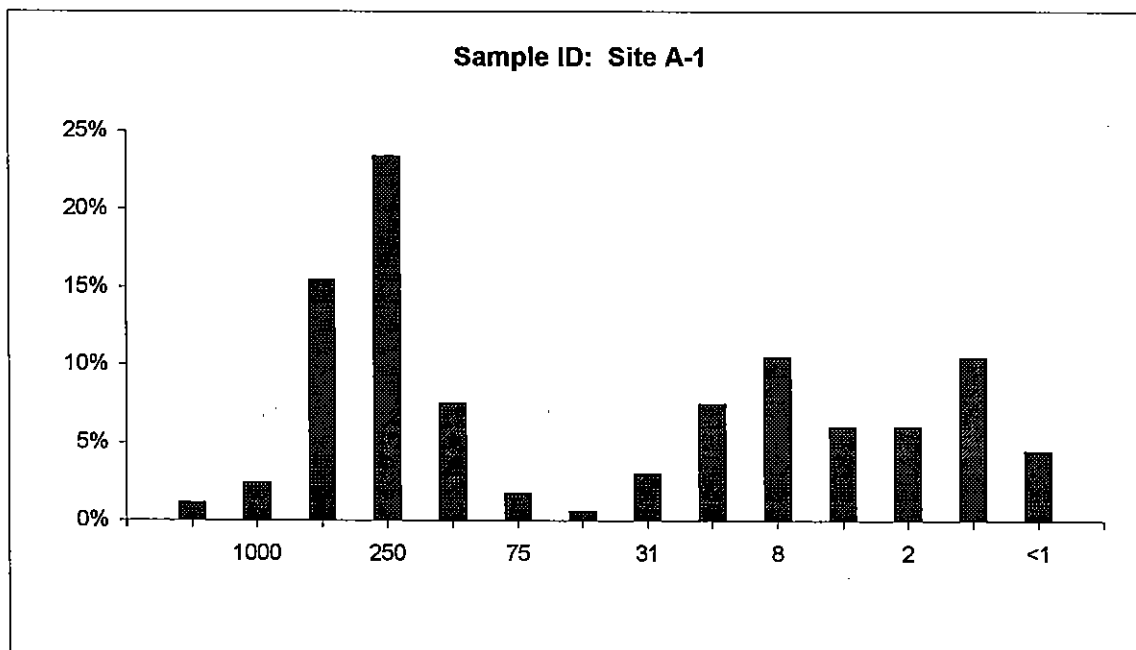
Grain Size Analysis Summary AMEC Bioassay Laboratory

Client ID: City of Buenaventura
Project ID: Santa Clara River Estuary

Sample I.D.: Site A-1
Sample Date: 10/17/2003
Analysis Date: initiated 12/15/03

Particle Size (µm)	Particle Size (mm)	phi	Incremental Percent	Cumulative Percent
>2000	>2	-1	1.11%	1.11%
1000	1	0	2.43%	3.54%
500	0.50	1	15.44%	18.97%
250	0.25	2	23.37%	42.34%
125	0.125	3	7.51%	49.85%
75	0.075	3.5	1.72%	51.58%
63	0.063	4	0.57%	52.15%
31	0.031	5	2.99%	55.14%
16	0.016	6	7.48%	62.62%
8	0.008	7	10.47%	73.08%
4	0.004	8	5.98%	79.06%
2	0.002	9	5.98%	85.05%
1	0.001	10	10.47%	95.51%
<1	>0.001	>10	4.49%	100.00%

% Gravel	1.1%	>2000 µm
% Sand	51.0%	>63 µm
% Silt	32.9%	>2 µm
% Clay	15.0%	<2 µm



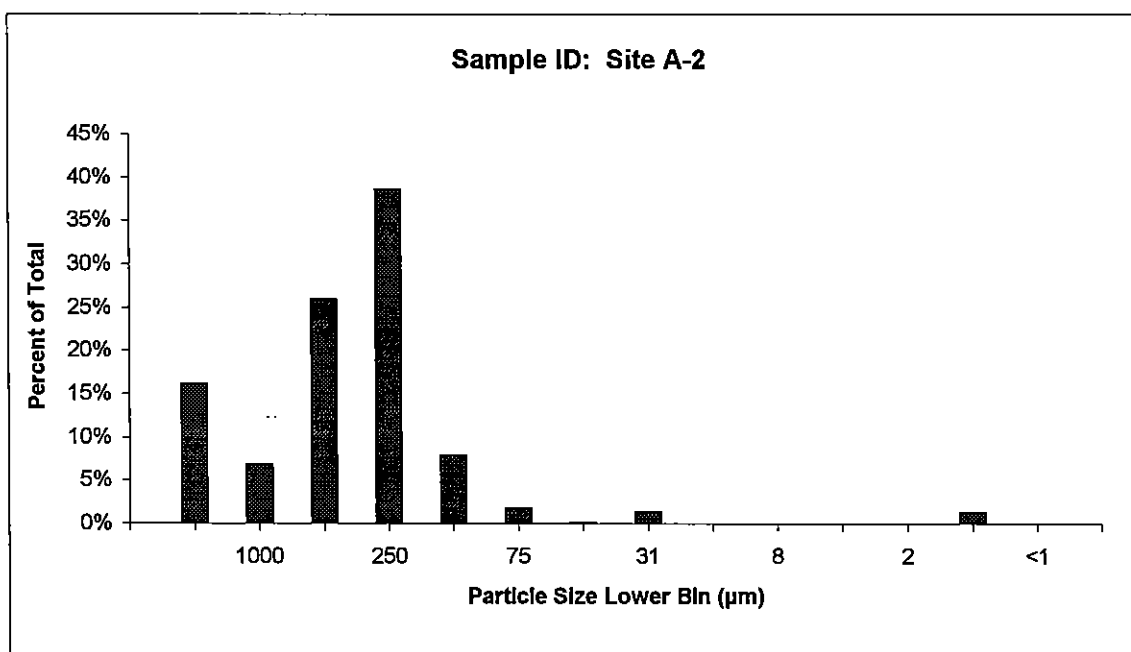
Grain Size Analysis Summary AMEC Bioassay Laboratory

Client ID: City of Buenaventura
Project ID: Santa Clara River Estuary

Sample I.D.: Site A-2
Sample Date: 10/17/2003
Analysis Date: initiated 12/15/03

Particle Size (μm)	Particle Size (mm)	phi	Incremental Percent	Cumulative Percent
>2000	>2	-1	16.17%	16.17%
1000	1	0	6.80%	22.97%
500	0.50	1	25.95%	48.92%
250	0.25	2	38.57%	87.49%
125	0.125	3	7.91%	95.40%
75	0.075	3.5	1.79%	97.19%
63	0.063	4	0.18%	97.37%
31	0.031	5	1.32%	98.68%
16	0.016	6	0.00%	98.68%
8	0.008	7	0.00%	98.68%
4	0.004	8	0.00%	98.68%
2	0.002	9	0.00%	98.68%
1	0.001	10	1.32%	100.00%
<1	>0.001	>10	0.00%	100.00%

% Gravel	16.2%	>2000 μm
% Sand	81.2%	>63 μm
% Silt	1.3%	>2 μm
% Clay	1.3%	<2 μm



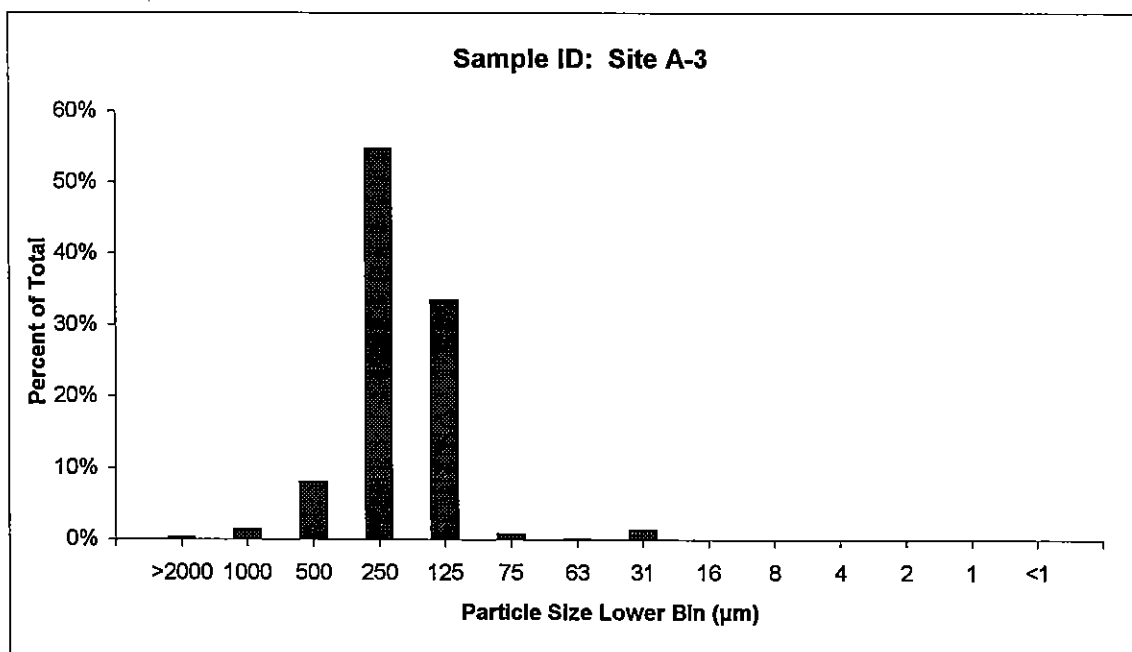
Grain Size Analysis Summary AMEC Bioassay Laboratory

Client ID: City of Buenaventura
Project ID: Santa Clara River Estuary

Sample I.D.: Site A-3
Sample Date: 10/17/2003
Analysis Date: initiated 12/15/03

Particle Size (μm)	Particle Size (mm)	phi	Incremental Percent	Cumulative Percent
>2000	>2	-1	0.25%	0.25%
1000	1	0	1.42%	1.67%
500	0.50	1	8.05%	9.72%
250	0.25	2	54.71%	64.42%
125	0.125	3	33.42%	97.85%
75	0.075	3.5	0.78%	98.62%
63	0.063	4	0.07%	98.70%
31	0.031	5	1.30%	100.00%
16	0.016	6	0.00%	100.00%
8	0.008	7	0.00%	100.00%
4	0.004	8	0.00%	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	0.2%	>2000 μm
% Sand	98.5%	>63 μm
% Silt	1.3%	>2 μm
% Clay	0.0%	<2 μm



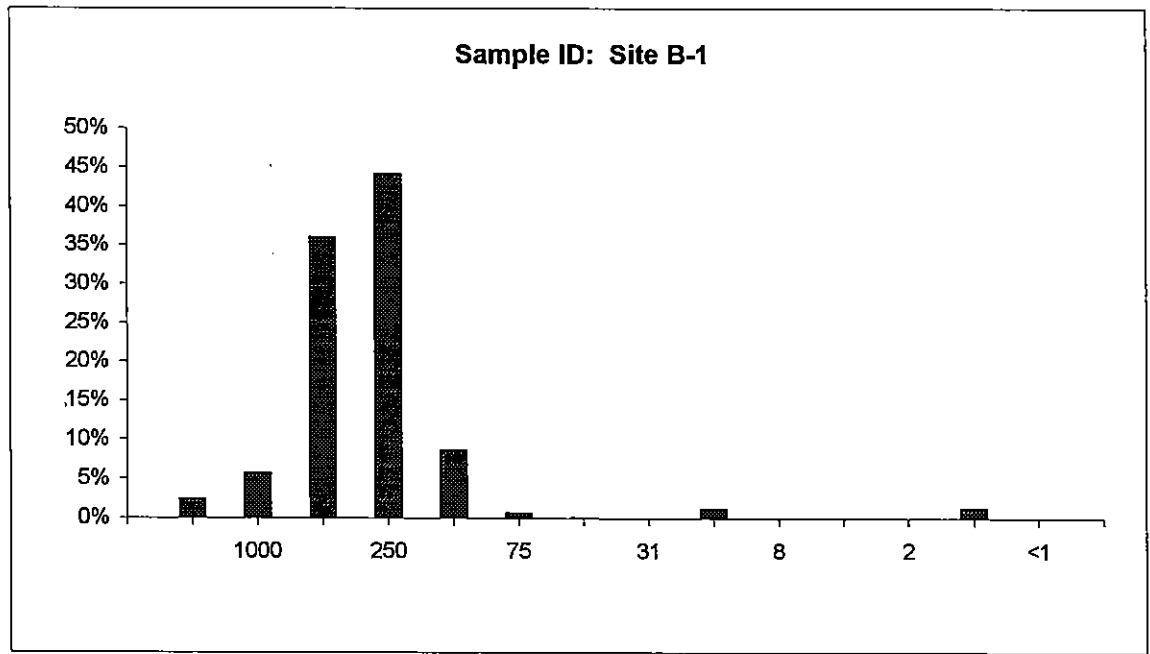
Grain Size Analysis Summary AMEC Bioassay Laboratory

Client ID: City of Buenaventura
Project ID: Santa Clara River Estuary

Sample I.D.: Site B-1
Sample Date: 10/17/2003
Analysis Date: initiated 12/15/03

Particle Size (μm)	Particle Size (mm)	phi	Incremental Percent	Cumulative Percent
>2000	>2	-1	2.35%	2.35%
1000	1	0	5.69%	8.03%
500	0.50	1	35.92%	43.96%
250	0.25	2	44.13%	88.08%
125	0.125	3	8.59%	96.67%
75	0.075	3.5	0.68%	97.35%
63	0.063	4	0.10%	97.46%
31	0.031	5	0.00%	97.46%
16	0.016	6	1.27%	98.73%
8	0.008	7	0.00%	98.73%
4	0.004	8	0.00%	98.73%
2	0.002	9	0.00%	98.73%
1	0.001	10	1.27%	100.00%
<1	>0.001	>10	0.00%	100.00%

% Gravel	2.3%	>2000 μm
% Sand	95.1%	>63 μm
% Silt	1.3%	>2 μm
% Clay	1.3%	<2 μm

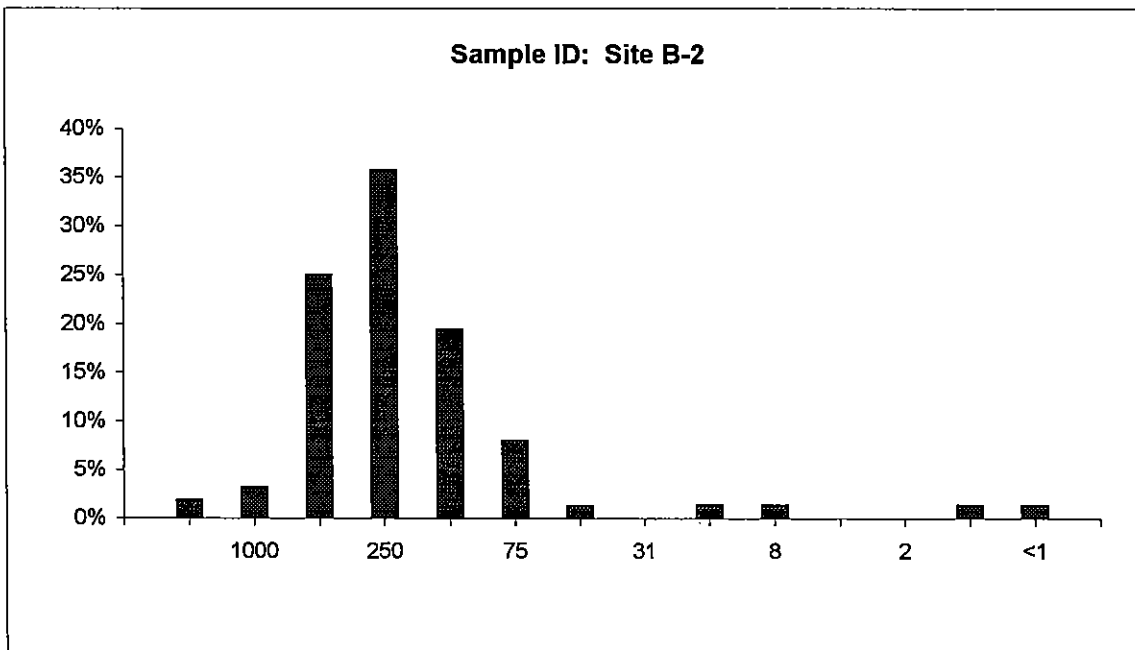


Grain Size Analysis Summary AMEC Bioassay Laboratory

Client ID: City of Buenaventura **Sample I.D.:** Site B-2
Project ID: Santa Clara River Estuary **Sample Date:** 10/17/2003
Analysis Date: initiated 12/15/03

Particle Size (μm)	Particle Size (mm)	phi	Incremental Percent	Cumulative Percent
>2000	>2	-1	1.85%	1.85%
1000	1	0	3.14%	4.99%
500	0.50	1	25.04%	30.03%
250	0.25	2	35.74%	65.77%
125	0.125	3	19.46%	85.23%
75	0.075	3.5	8.03%	93.26%
63	0.063	4	1.30%	94.56%
31	0.031	5	0.00%	94.56%
16	0.016	6	1.36%	95.92%
8	0.008	7	1.36%	97.28%
4	0.004	8	0.00%	97.28%
2	0.002	9	0.00%	97.28%
1	0.001	10	1.36%	98.64%
<1	>0.001	>10	1.36%	100.00%

% Gravel	1.9%	>2000 μm
% Sand	92.7%	>63 μm
% Silt	2.7%	>2 μm
% Clay	2.7%	<2 μm

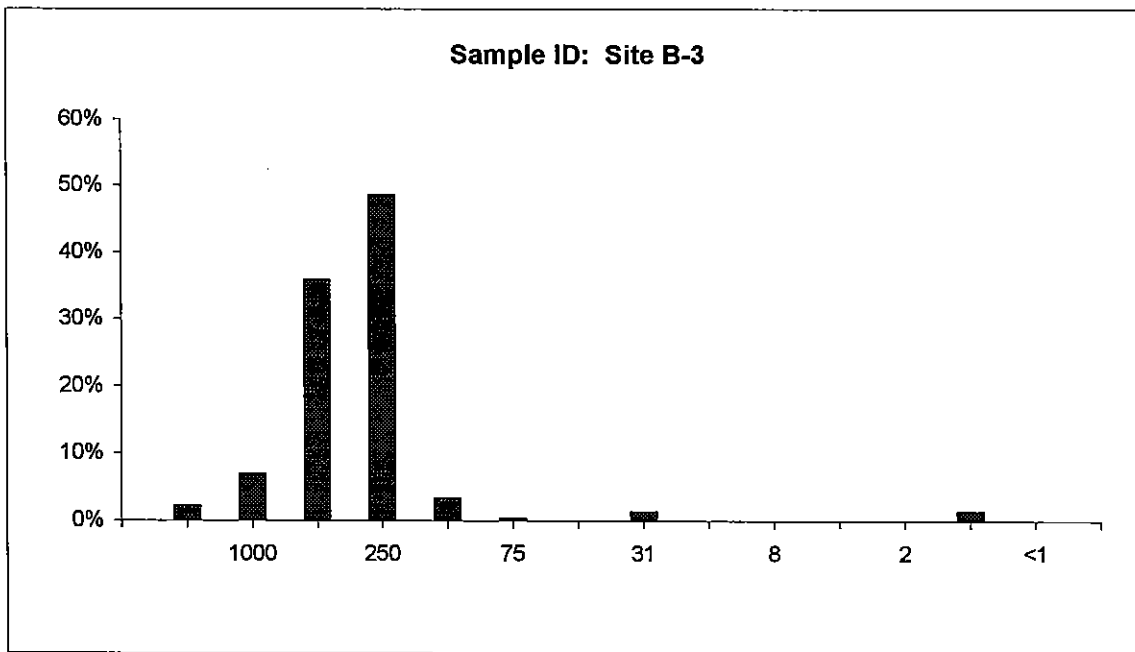


Grain Size Analysis Summary AMEC Bioassay Laboratory

Client ID: City of Buenaventura **Sample I.D.:** Site B-3
Project ID: Santa Clara River Estuary **Sample Date:** 10/17/2003
Analysis Date: initiated 12/15/03

Particle Size (μm)	Particle Size (mm)	phi	Incremental Percent	Cumulative Percent
>2000	>2	-1	2.19%	2.19%
1000	1	0	6.97%	9.16%
500	0.50	1	35.90%	45.06%
250	0.25	2	48.61%	93.67%
125	0.125	3	3.37%	97.03%
75	0.075	3.5	0.29%	97.32%
63	0.063	4	0.05%	97.37%
31	0.031	5	1.32%	98.68%
16	0.016	6	0.00%	98.68%
8	0.008	7	0.00%	98.68%
4	0.004	8	0.00%	98.68%
2	0.002	9	0.00%	98.68%
1	0.001	10	1.32%	100.00%
<1	>0.001	>10	0.00%	100.00%

% Gravel	2.2%	>2000 μm
% Sand	95.2%	>63 μm
% Silt	1.3%	>2 μm
% Clay	1.3%	<2 μm



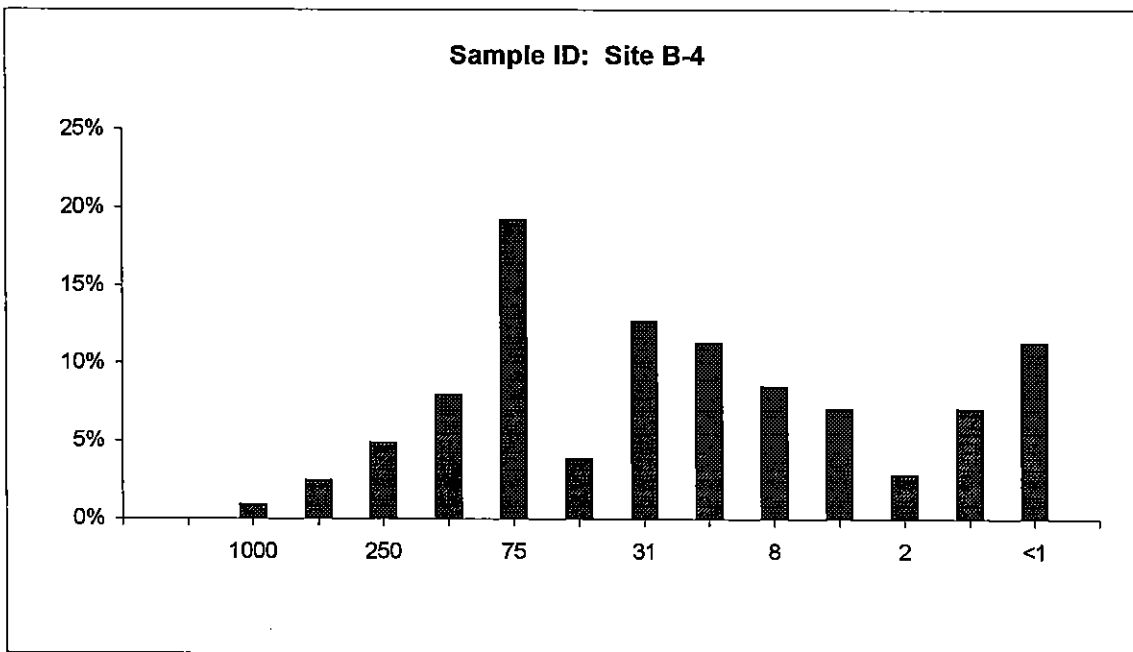
Grain Size Analysis Summary AMEC Bioassay Laboratory

Client ID: City of Buenaventura
Project ID: Santa Clara River Estuary

Sample I.D.: Site B-4
Sample Date: 10/17/2003
Analysis Date: initiated 12/15/03

Particle Size (μm)	Particle Size (mm)	phi	Incremental Percent	Cumulative Percent
>2000	>2	-1	0.01%	0.01%
1000	1	0	0.91%	0.91%
500	0.50	1	2.45%	3.36%
250	0.25	2	4.87%	8.24%
125	0.125	3	7.96%	16.20%
75	0.075	3.5	19.19%	35.38%
63	0.063	4	3.86%	39.24%
31	0.031	5	12.72%	51.96%
16	0.016	6	11.30%	63.26%
8	0.008	7	8.48%	71.74%
4	0.004	8	7.07%	78.80%
2	0.002	9	2.83%	81.63%
1	0.001	10	7.07%	88.70%
<1	>0.001	>10	11.30%	100.00%

% Gravel	0.0%	>2000 μm
% Sand	39.2%	>63 μm
% Silt	42.4%	>2 μm
% Clay	18.4%	<2 μm

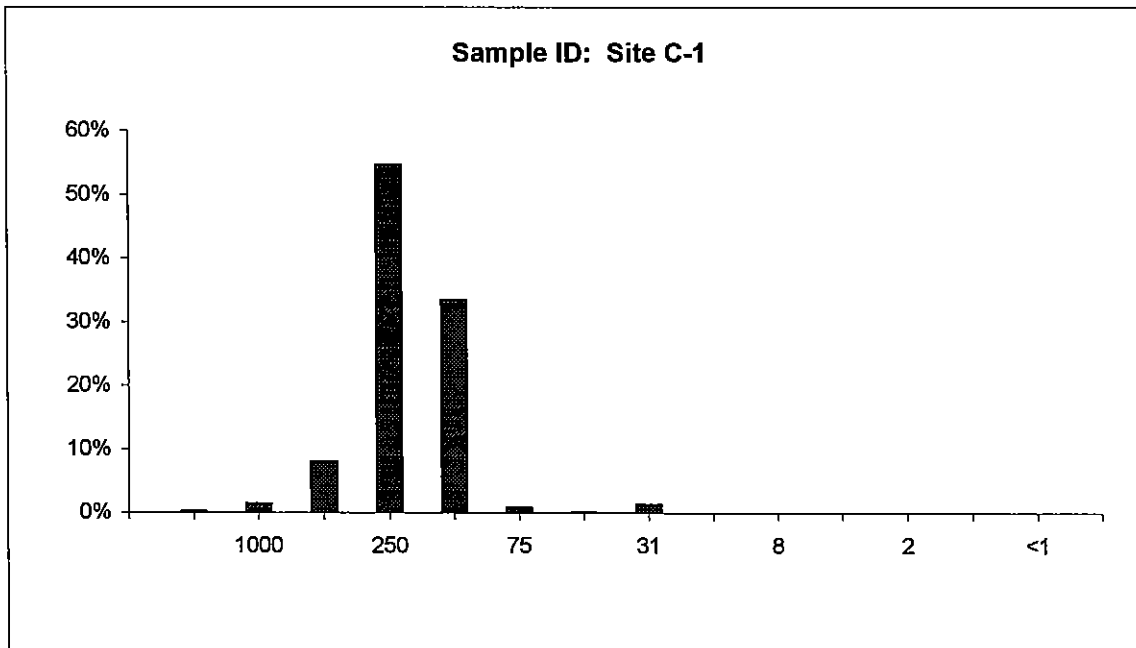


Grain Size Analysis Summary AMEC Bioassay Laboratory

Client ID: City of Buenaventura **Sample I.D.:** Site C-1
Project ID: Santa Clara River Estuary **Sample Date:** 10/17/2003
Analysis Date: initiated 12/15/03

Particle Size (μm)	Particle Size (mm)	phi	Incremental Percent	Cumulative Percent
>2000	>2	-1	0.25%	0.25%
1000	1	0	1.42%	1.67%
500	0.50	1	8.05%	9.72%
250	0.25	2	54.71%	64.42%
125	0.125	3	33.42%	97.85%
75	0.075	3.5	0.78%	98.62%
63	0.063	4	0.07%	98.70%
31	0.031	5	1.30%	100.00%
16	0.016	6	0.00%	100.00%
8	0.008	7	0.00%	100.00%
4	0.004	8	0.00%	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	0.2%	>2000 μm
% Sand	98.5%	>63 μm
% Silt	1.3%	>2 μm
% Clay	0.0%	<2 μm

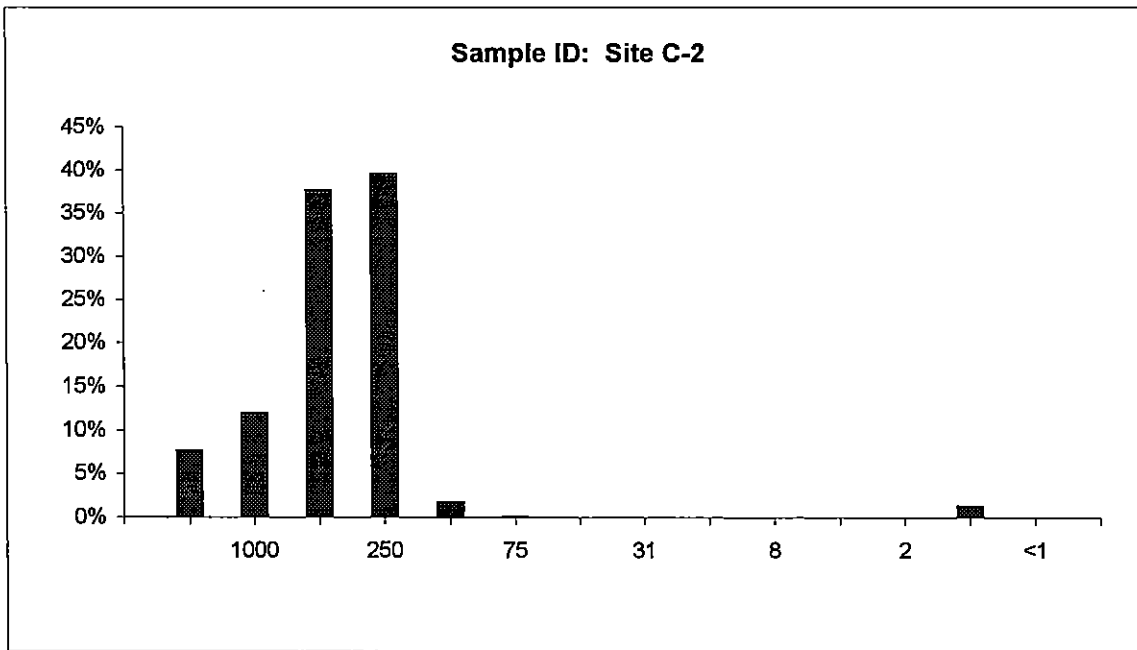


Grain Size Analysis Summary AMEC Bioassay Laboratory

Client ID: <u>City of Buenaventura</u>	Sample I.D.: <u>Site C-2</u>
Project ID: <u>Santa Clara River Estuary</u>	Sample Date: <u>10/17/2003</u>
	Analysis Date: <u>initiated 12/15/03</u>

Particle Size (µm)	Particle Size (mm)	phi	Incremental Percent	Cumulative Percent
>2000	>2	-1	7.60%	7.60%
1000	1	0	11.93%	19.53%
500	0.50	1	37.70%	57.22%
250	0.25	2	39.59%	96.82%
125	0.125	3	1.78%	98.59%
75	0.075	3.5	0.06%	98.66%
63	0.063	4	0.03%	98.68%
31	0.031	5	0.00%	98.68%
16	0.016	6	0.00%	98.68%
8	0.008	7	0.00%	98.68%
4	0.004	8	0.00%	98.68%
2	0.002	9	0.00%	98.68%
1	0.001	10	1.32%	100.00%
<1	>0.001	>10	0.00%	100.00%

% Gravel	7.6%	>2000 µm
% Sand	91.1%	>63 µm
% Silt	0.0%	>2 µm
% Clay	1.3%	<2 µm

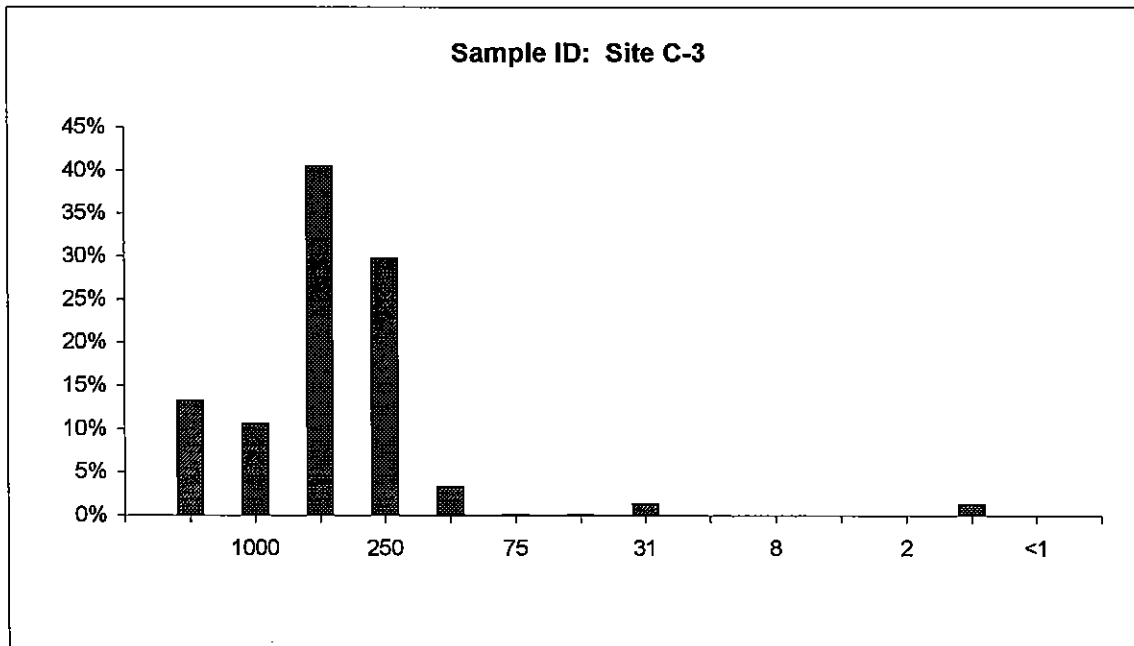


Grain Size Analysis Summary AMEC Bioassay Laboratory

Client ID: <u>City of Buenaventura</u>	Sample I.D.: <u>Site C-3</u>
Project ID: <u>Santa Clara River Estuary</u>	Sample Date: <u>10/17/2003</u>
	Analysis Date: <u>initiated 12/15/03</u>

Particle Size (μm)	Particle Size (mm)	phi	Incremental Percent	Cumulative Percent
>2000	>2	-1	13.20%	13.20%
1000	1	0	10.53%	23.73%
500	0.50	1	40.47%	64.21%
250	0.25	2	29.72%	93.92%
125	0.125	3	3.28%	97.21%
75	0.075	3.5	0.13%	97.33%
63	0.063	4	0.04%	97.37%
31	0.031	5	1.31%	98.69%
16	0.016	6	0.00%	98.69%
8	0.008	7	0.00%	98.69%
4	0.004	8	0.00%	98.69%
2	0.002	9	0.00%	98.69%
1	0.001	10	1.31%	100.00%
<1	>0.001	>10	0.00%	100.00%

% Gravel	13.2%	>2000 μm
% Sand	84.2%	>63 μm
% Silt	1.3%	>2 μm
% Clay	1.3%	<2 μm

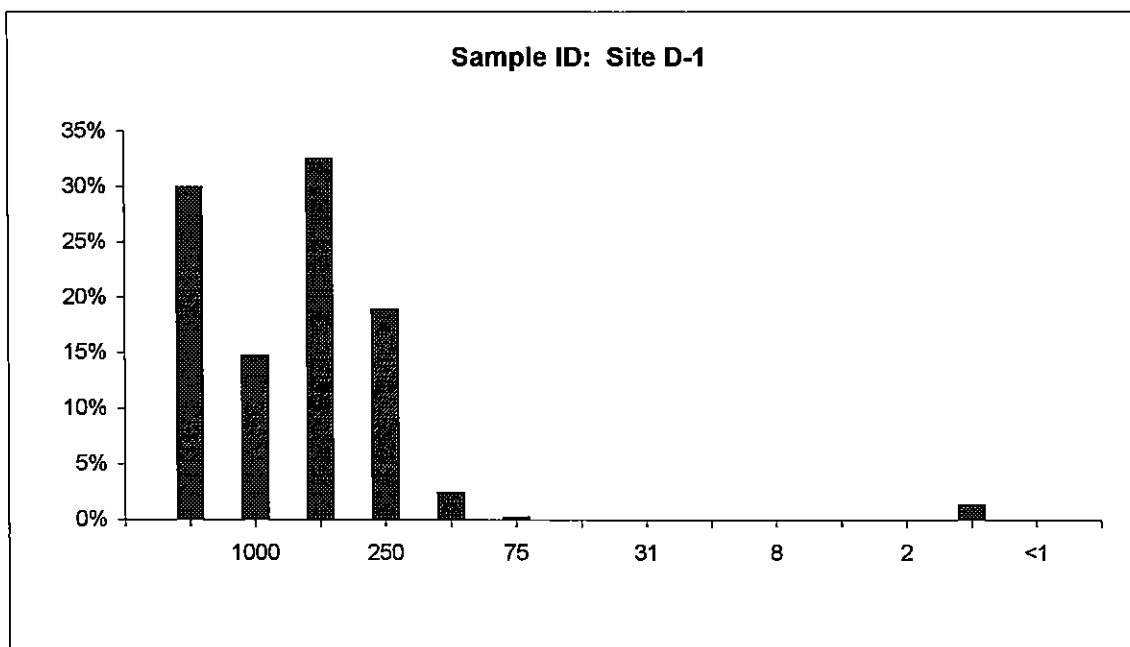


Grain Size Analysis Summary AMEC Bioassay Laboratory

Client ID: City of Buenaventura **Sample I.D.:** Site D-1
Project ID: Santa Clara River Estuary **Sample Date:** 10/17/2003
Analysis Date: initiated 12/15/03

Particle Size (μm)	Particle Size (mm)	phi	Incremental Percent	Cumulative Percent
>2000	>2	-1	29.95%	29.95%
1000	1	0	14.69%	44.65%
500	0.50	1	32.52%	77.17%
250	0.25	2	18.90%	96.07%
125	0.125	3	2.39%	98.45%
75	0.075	3.5	0.22%	98.68%
63	0.063	4	0.02%	98.70%
31	0.031	5	0.00%	98.70%
16	0.016	6	0.00%	98.70%
8	0.008	7	0.00%	98.70%
4	0.004	8	0.00%	98.70%
2	0.002	9	0.00%	98.70%
1	0.001	10	1.30%	100.00%
<1	>0.001	>10	0.00%	100.00%

% Gravel	30.0%	>2000 μm
% Sand	68.8%	>63 μm
% Silt	0.0%	>2 μm
% Clay	1.3%	<2 μm

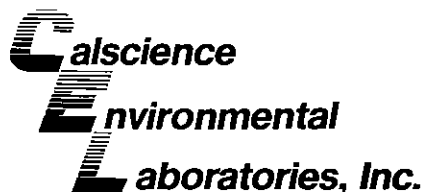


APPENDIX F
ANALYTICAL CHEMISTRY DATA

Appendix Table F-1. Sediment Trace Metals and TOC Measurements
City of Buenaventura - Santa Clara River Estuary Dry Weather Sampling Event
Collection Date: 17 October 2003

Sample ID	Copper (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Zinc (mg/kg)	TOC (mg/kg)
A-1	16.9	0.65	ND	ND	10918
A-2	3.42	3.06	ND	9.13	7072
A-3	2.29	20.2	0.94	63.1	2727
B-1	3.14	4.30	ND	12.1	4897
B-2	4.20	5.99	ND	18.1	4682
B-3	2.98	4.19	ND	9.50	3042
B-4	19.3	20.4	0.85	61.4	16949
C-1	3.84	3.26	ND	8.16	1591
C-2	2.69	3.42	ND	18.4	2750
C-3	2.83	3.77	ND	6.88	3362
D-1	2.94	4.19	ND	7.85	2014

All values reported on a dry weight basis.



November 06, 2003

Chris Stransky
AMEC Earth and Environmental
5510 Morehouse Drive, Suite 300
San Diego, CA 92121-3723

Subject: **Calscience Work Order No.: 03-10-1236**
Client Reference: **Santa Clara River Estuary**

Dear Client:

Enclosed is an analytical report for the above-referenced project. The samples included in this report were received 10/21/2003 and analyzed in accordance with the attached chain-of-custody.

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,

A handwritten signature in black ink, appearing to read "R. Stearns", written over a horizontal line.

Calscience Environmental
Laboratories, Inc.
Robert Stearns
Project Manager

A handwritten signature in black ink, appearing to read "Michael J. Crisostomo", written over a horizontal line.

Michael J. Crisostomo
Quality Assurance Manager



ANALYTICAL REPORT

AMEC Earth and Environmental
5510 Morehouse Drive, Suite 300
San Diego, CA 92121-3723

Date Received: 10/21/03
Work Order No: 03-10-1236
Preparation: EPA 3050B
Method: EPA 6010B

Project: Santa Clara River Estuary

Page 1 of 2

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
SCRE-A-4 A-3	03-10-1236-1	10/17/03	Solid	10/22/03	10/23/03	031022L06

Parameter	Result	RL	DF	Qual	Units
Copper	1.51	0.50	1		mg/kg <i>Wet wt</i>

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
SCRE-A-2	03-10-1236-2	10/17/03	Solid	10/22/03	10/23/03	031022L06

Parameter	Result	RL	DF	Qual	Units
Copper	2.76	0.50	1		mg/kg <i>Wet wt</i>

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
SCRE-A-3 A-1	03-10-1236-3	10/17/03	Solid	10/22/03	10/23/03	031022L06

Parameter	Result	RL	DF	Qual	Units
Copper	13.6	0.5	1		mg/kg <i>Wet wt</i>

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
SCRE-B-1	03-10-1236-4	10/17/03	Solid	10/22/03	10/23/03	031022L06

Parameter	Result	RL	DF	Qual	Units
Copper	2.44	0.50	1		mg/kg <i>Wet wt</i>

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
SCRE-B-2	03-10-1236-5	10/17/03	Solid	10/22/03	10/23/03	031022L06

Parameter	Result	RL	DF	Qual	Units
Copper	3.50	0.50	1		mg/kg <i>Wet wt</i>

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
SCRE-B-3	03-10-1236-6	10/17/03	Solid	10/22/03	10/23/03	031022L06

Parameter	Result	RL	DF	Qual	Units
Copper	2.35	0.50	1		mg/kg <i>Wet wt</i>

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
SCRE-B-4	03-10-1236-7	10/17/03	Solid	10/22/03	10/23/03	031022L06

Parameter	Result	RL	DF	Qual	Units
Copper	12.5	0.5	1		mg/kg <i>Wet wt</i>

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

7440 Lincoln Way, Garden Grove, CA 92841-1432 • TEL: (714) 895-5494 • FAX: (714) 894-7501

AMEC Earth and Environmental
 5510 Morehouse Drive, Suite 300
 San Diego, CA 92121-3723

Date Received: 10/21/03
 Work Order No: 03-10-1236
 Preparation: EPA 3050B
 Method: EPA 6010B

Project: Santa Clara River Estuary

Page 2 of 2

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
SCRE-C-1 C-3 86	03-10-1236-8	10/17/03	Solid	10/22/03	10/23/03	031022L06

Parameter	Result	RL	DF	Qual	Units
Copper	2.27	0.50	1		mg/kg wet wt

SCRE-C-2	03-10-1236-9	10/17/03	Solid	10/22/03	10/23/03	031022L06
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Parameter	Result	RL	DF	Qual	Units
Copper	2.15	0.50	1		mg/kg wet wt

SCRE-C-3 C-1 87	03-10-1236-10	10/17/03	Solid	10/22/03	10/23/03	031022L06
--------------------	---------------	----------	-------	----------	----------	-----------

Parameter	Result	RL	DF	Qual	Units
Copper	3.14	0.50	1		mg/kg wet wt

SCRE-D-1	03-10-1236-11	10/17/03	Solid	10/22/03	10/23/03	031022L06
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Parameter	Result	RL	DF	Qual	Units
Copper	2.48	0.50	1		mg/kg wet wt

Method Blank	097-01-002-4,839	N/A	Solid	10/22/03	10/22/03	031022L06
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Parameter	Result	RL	DF	Qual	Units
Copper	ND	0.500	1		mg/kg wet wt

AMEC Earth and Environmental
5510 Morehouse Drive, Suite 300
San Diego, CA 92121-3723

Date Sampled: 10/17/03
Date Received: 10/21/03
Date Analyzed: 11/03/03

Attn: Chris Stransky
RE: Santa Clara River Estuary

Work Order No.: 03-10-1236
Method: EPA 9060
Page 1 of 1

All concentrations are reported in mg/kg (ppm). *wet wt*

<u>Sample Number</u>	<u>Total Organic Carbon Concentration</u>	<u>Reporting Limit</u>
SCRE-A- 1 ⁸¹⁵ A-3	1800	500
SCRE-A-2	5700	500
SCRE-A- 3 ⁸¹⁹ A11	8800	500
SCRE-B-1	3800	500
SCRE-B-2	3900	500
SCRE-B-3	2400	500
SCRE-B-4	11000	500
SCRE-C- 1 ⁸¹⁴ C-3	2700	500
SCRE-C-2	2200	500
SCRE-C- 3 ⁸¹² C-1	1300	500
SCRE-D-1	1700	500
Method Blank	ND	500

ND denotes not detected at indicated reportable limit.

Each sample was received by CEL chilled, intact, and with chain-of-custody attached.



Quality Control - Spike/Spike Duplicate

AMEC Earth and Environmental
 5510 Morehouse Drive, Suite 300
 San Diego, CA 92121-3723

Date Received: 10/21/03
 Work Order No: 03-10-1236
 Preparation: EPA 3050B
 Method: EPA 6010B

Project: Santa Clara River Estuary

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
03-10-1186-1	Solid	ICP 3300	10/22/03	10/24/03	031022S06

Parameter	MS %REC	MSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Copper	109	109	75-125	0	0-20	



Quality Control - Laboratory Control Sample

AMEC Earth and Environmental
5510 Morehouse Drive, Suite 300
San Diego, CA 92121-3723

Date Received: 10/21/03
Work Order No: 03-10-1236
Preparation: EPA 3050B
Method: EPA 6010B

Project: Santa Clara River Estuary

Quality Control Sample ID	Matrix	Instrument	Date Analyzed	Lab File ID	LCS Batch Number
097-01-002-4,839	Solid	ICP 3300	10/22/03	031022-I-06	031022L06

Parameter	Conc Added	Conc Recovered	%Rec	%Rec CL	Qualifiers
Copper	50.0	50.6	101	80-120	



QUALITY ASSURANCE SUMMARY

Method EPA 9060

AMEC Earth and Environmental
Page 1 of 1

Work Order No.: 03-10-1236
Date Analyzed: 11/03/03

Matrix Spike/Matrix Spike Duplicate

Sample Spiked: 03-10-1745-7

<u>Analyte</u>	<u>MS%REC</u>	<u>MSD%REC</u>	<u>Control Limits (%)</u>	<u>%RPD</u>	<u>Control Limits (%)</u>
Total Organic Carbon	101	104	70 - 130	3	0 - 25

Laboratory Control Sample

<u>Analyte</u>	<u>Conc. Added</u>	<u>Conc. Rec.</u>	<u>%REC</u>	<u>Control Limits (%)</u>
Total Organic Carbon	6000	6400	107	80 - 120

Work Order Number: 03-10-1236

<u>Qualifier</u>	<u>Definition</u>
ND	Not detected at indicated reporting limit.

WORK ORDER #: **03** - 10 - 1236

Cooler 1 of 1

SAMPLE RECEIPT FORM

CLIENT: Ames

DATE: 10/21/3

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 °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):

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:

CALSCIENCE ENVIRONMENTAL LABORATORIES, INC.

7440 LINCOLN WAY
GARDEN GROVE, CA 92841-1432
TEL: (714) 895-5494 • FAX: (714) 894-7501

1236

CHAIN OF CUSTODY RECORD

Date 10/20/03

Page 1 of 2

LABORATORY CLIENT: <u>AMEC Earth & Environmental</u>				CLIENT PROJECT NAME / NUMBER: <u>Santa Clara River Estuary</u>				P.O. NO.:													
ADDRESS: <u>SS10 Morehouse Dr</u>				PROJECT CONTACT: <u>Chris Strandsky</u>				LAB USE ONLY <input checked="" type="checkbox"/> 0 - <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input checked="" type="checkbox"/> 6													
CITY: <u>San Diego</u>		STATE: <u>CA</u>		ZIP: <u>92121</u>		SAMPLER(S): (SIGNATURE) <u>[Signature]</u>		COELT LOG CODE <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		COOLER RECEIPT TEMP = _____ °C											
TEL: <u>858 458-9044</u>		FAX: <u>858 587-3961</u>		E-MAIL: <u>chris.strandsky@amec.com</u>		REQUESTED ANALYSES															
TURNAROUND TIME: <u>Standard</u> <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.	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)	PMAs (8310)	VOCs (T0-14A) or (T0-15)	TOC	Copper
			DATE	TIME																	
1		SCRE - A-1	10/17/03	1234	Soil	1														X	X
2		A-2		1313																	
3		A-3		1357																	
4		B-1		1445																	
5		B-2		1519																	
6		B-3		1542																	
7		B-4		1605																	
8		C-1		1709																	
9		C-2		1722																	
10		C-3		1737																	
Relinquished by: (Signature) <u>[Signature]</u>						Received by: (Signature) <u>[Signature]</u>						Date: <u>10/21/3</u>		Time: <u>1140</u>							
Relinquished by: (Signature)						Received by: (Signature)						Date:		Time:							
Relinquished by: (Signature) <u>[Signature]</u>						Received for Laboratory by: (Signature) <u>[Signature]</u>						Date: <u>10/21/3</u>		Time: <u>1615</u>							

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.

**CALSCIENCE ENVIRONMENTAL
LABORATORIES, INC.**

7440 LINCOLN WAY
GARDEN GROVE, CA 92841-1432
TEL: (714) 895-5494 • FAX: (714) 894-7501

1234

CHAIN OF CUSTODY RECORD

Date 10/20/03

Page 2 of 2

LABORATORY CLIENT: <u>AMEC Earth & Environmental</u>				CLIENT PROJECT NAME / NUMBER: <u>Santa Clara River Estuary</u>				P.O. NO.:																															
ADDRESS: <u>5510 Morehouse Dr</u>				PROJECT CONTACT: <u>Chris Strandy</u>				LAB USE ONLY <input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> 2 <input checked="" type="checkbox"/> 3 <input checked="" type="checkbox"/> 4																															
CITY: <u>San Diego</u>		STATE: <u>CA</u>		ZIP: <u>92121</u>		SAMPLER(S): (SIGNATURE) <u>[Signature]</u>		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.strandy@amec.com</u>		COOLER RECEIPT		TEMP = _____ °C																															
TURNAROUND TIME: <u>Standard</u>				REQUESTED ANALYSES																																			
<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:				<table border="1" style="width:100%; border-collapse: collapse; text-align: center;"> <tr> <td style="width: 5%;">TPH (G)</td> <td style="width: 5%;">TPH (D) or</td> <td style="width: 5%;">BTEX / MTBE (8021B)</td> <td style="width: 5%;">HALOCARBONS (8021B)</td> <td style="width: 5%;">VOCs (8260B)</td> <td style="width: 5%;">VOCs (5035 / 8260B) EnCore</td> <td style="width: 5%;">SVOCs (8270C)</td> <td style="width: 5%;">PEST (8081A)</td> <td style="width: 5%;">PCBs (8082)</td> <td style="width: 5%;">EDB / DBCP (504.1) or (8011)</td> <td style="width: 5%;">CAC, T22 METALS (5010B)</td> <td style="width: 5%;">PNAs (8310)</td> <td style="width: 5%;">VOCs (10-14A) or (10-15)</td> <td style="width: 5%;">TOC</td> <td style="width: 5%;">Copper</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 style="text-align: left;">X</td> <td style="text-align: left;">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 (5010B)	PNAs (8310)	VOCs (10-14A) or (10-15)	TOC	Copper														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 (5010B)	PNAs (8310)	VOCs (10-14A) or (10-15)	TOC	Copper																									
													X	X																									
LAB USE ONLY	GEIMS ID	SAMPLE ID	SAMPLING		MATRIX	NO. OF CONT.																																	
//		SCRE - D-1	DATE	TIME	Sed	1																																	

Relinquished by: (Signature) <u>[Signature]</u>	Received by: (Signature) <u>[Signature]</u>	Date: <u>10/21/3</u>	Time: <u>1140</u>
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received for Laboratory by: (Signature) <u>[Signature]</u>	Date: <u>10/21/3</u>	Time: <u>1615</u>

DISTRIBUTION: White with final report, Green to File, Yellow and Pink to Client.
Please note that pages 1 and 2 of 2 of our TCs are printed on the reverse side of the Yellow and Pink copies respectively.

09/10/01 Revision

C&G Graphic (714) 898-9702

Client City of Buenaventura

Client Code

Shipping Address: City of Buenaventura
Public Works Department
1400 Spinaker Dr. PO Box 99
Ventura, CA 93002-0099

Project # 3551000305 Task 0002, * Chris
to override labor to PL 611

Client Sector Code
Budget
Contract Info

Billing Address: same

Project Start Date:

Contacts
phone Karen Waln (Management Specialist), Florence
Jay (Laboratory Supervisor, Wastewater
Division), Dan Pfeiffer (Plant Superintendent),
Don Davis
(805) 677-4128 (Karen) -4134 (Florence)

Project End Date:
Cost Increase Date: New Project

Fax (805) 677-4101
e-mail kwaln, fjay@ci.ventura.ca.us

Additional Contacts AMEC SB: Joanne Lortie, Ricahrd Montijo
(805) 962-0992

KHE: Rachel Kamman
phone, fax ??
rachel@khe-inc.com

Testing	Unit Code	Test Procedure	Unit Cost	Frequency	Concentrations (tentative)
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Boat use ??

NA
NA

Comments:

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.: 04-04-0772**
 Client Reference: City of Buenaventura / SCRE

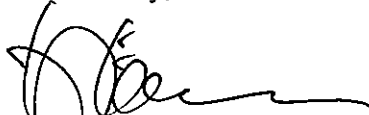
Dear Client:

Enclosed is an analytical report for the above-referenced project. The samples included in this report were received 04/14/04 and analyzed in accordance with the attached chain-of-custody. This report has been revised 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: 04/14/04
 Work Order No: 04-04-0772
 Preparation: N/A
 Method: EPA 160.3

Project: City of Buenaventura / SCRE

Page 1 of 2

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
SCR A-1	04-04-0772-1	10/17/04	Solid	N/A	05/04/04	40504TSD2

Parameter	Result	RL	DF	Qual	Units
Solids, Total	80.6	0.1	1		%

SCR A-2	04-04-0772-2	10/17/04	Solid	N/A	05/04/04	40504TSD2
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Parameter	Result	RL	DF	Qual	Units
Solids, Total	80.6	0.1	1		%

SCR A-3	04-04-0772-3	10/17/04	Solid	N/A	05/04/04	40504TSD2
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Parameter	Result	RL	DF	Qual	Units
Solids, Total	86.0	0.1	1		%

SCR B-1	04-04-0772-4	10/17/04	Solid	N/A	05/04/04	40504TSD2
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Parameter	Result	RL	DF	Qual	Units
Solids, Total	77.6	0.1	1		%

SCR B-2	04-04-0772-5	10/17/04	Solid	N/A	05/04/04	40504TSD2
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Parameter	Result	RL	DF	Qual	Units
Solids, Total	83.3	0.1	1		%

SCR B-3	04-04-0772-6	10/17/04	Solid	N/A	05/04/04	40504TSD2
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Parameter	Result	RL	DF	Qual	Units
Solids, Total	78.9	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: 04/14/04
 Work Order No: 04-04-0772
 Preparation: N/A
 Method: EPA 160.3

Project: City of Buenaventura / SCRE

Page 2 of 2

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
SCR B-4	04-04-0772-7	10/17/04	Solid	N/A	05/04/04	40504TSD2

Parameter	Result	RL	DF	Qual	Units
Solids, Total	64.9	0.1	1		%

SCR C-1	04-04-0772-8	10/17/04	Solid	N/A	05/04/04	40504TSD2
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Parameter	Result	RL	DF	Qual	Units
Solids, Total	81.7	0.1	1		%

SCR C-2	04-04-0772-9	10/17/04	Solid	N/A	05/04/04	40504TSD2
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Parameter	Result	RL	DF	Qual	Units
Solids, Total	80.0	0.1	1		%

SCR C-3	04-04-0772-10	10/17/04	Solid	N/A	05/04/04	40504TSD2
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Parameter	Result	RL	DF	Qual	Units
Solids, Total	80.3	0.1	1		%

SCR D-1	04-04-0772-11	10/17/04	Solid	N/A	05/04/04	40504TSD2
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Parameter	Result	RL	DF	Qual	Units
Solids, Total	84.4	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: 04/14/04
 Work Order No: 04-04-0772
 Preparation: EPA 3050B
 Method: EPA 6020
 Units: mg/kg

Project: City of Buenaventura / SCRE

Page 1 of 2

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
SCR A-1	04-04-0772-1	10/17/04	Solid	04/16/04	04/17/04	040416L02

Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Nickel	0.653	0.123	12.34		Zinc	ND	1.23	12.34	
Selenium	ND	0.617	12.34						

SCR A-2	04-04-0772-2	10/17/04	Solid	04/16/04	04/17/04	040416L02
---------	--------------	----------	-------	----------	----------	-----------

Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Nickel	3.06	0.12	12.34		Zinc	9.13	1.23	12.34	
Selenium	ND	0.617	12.34						

SCR A-3	04-04-0772-3	10/17/04	Solid	04/16/04	04/17/04	040416L02
---------	--------------	----------	-------	----------	----------	-----------

Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Nickel	20.2	0.1	15.16		Zinc	63.1	1.5	15.16	
Selenium	0.937	0.758	15.16						

SCR B-1	04-04-0772-4	10/17/04	Solid	04/16/04	04/17/04	040416L02
---------	--------------	----------	-------	----------	----------	-----------

Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Nickel	4.30	0.12	12.82		Zinc	12.1	1.2	12.82	
Selenium	ND	0.641	12.82						

SCR B-2	04-04-0772-5	10/17/04	Solid	04/16/04	04/17/04	040416L02
---------	--------------	----------	-------	----------	----------	-----------

Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Nickel	5.99	0.12	12.04		Zinc	18.1	1.2	12.04	
Selenium	ND	0.602	12.04						

SCR B-3	04-04-0772-6	10/17/04	Solid	04/16/04	04/17/04	040416L02
---------	--------------	----------	-------	----------	----------	-----------

Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Nickel	4.19	0.12	12.66		Zinc	9.50	1.27	12.66	
Selenium	ND	0.633	12.66						

SCR B-4	04-04-0772-7	10/17/04	Solid	04/16/04	04/17/04	040416L02
---------	--------------	----------	-------	----------	----------	-----------

Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Nickel	20.4	0.1	15.38		Zinc	61.4	1.5	15.38	
Selenium	0.853	0.769	15.38						

RL - Reporting Limit , DF - Dilution Factor , Qual - Qualifiers

AMEC Earth and Environmental
 5510 Morehouse Drive, Suite 300
 San Diego, CA 92121-3723

Date Received: 04/14/04
 Work Order No: 04-04-0772
 Preparation: EPA 3050B
 Method: EPA 6020
 Units: mg/kg

Project: City of Buenaventura / SCRE

Page 2 of 2

Client Sample Number	Lab Sample Number	Date Collected	Matrix	Date Prepared	Date Analyzed	QC Batch ID
SCR C-1	04-04-0772-8	10/17/04	Solid	04/16/04	04/17/04	040416L02

Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Nickel	3.26	0.12	12.2		Zinc	8.16	1.22	12.2	
Selenium	ND	0.610	12.2						

SCR C-2	04-04-0772-9	10/17/04	Solid	04/16/04	04/17/04	040416L02
---------	--------------	----------	-------	----------	----------	-----------

Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Nickel	3.42	0.12	12.5		Zinc	18.4	1.2	12.5	
Selenium	ND	0.625	12.5						

SCR C-3	04-04-0772-10	10/17/04	Solid	04/16/04	04/17/04	040416L02
---------	---------------	----------	-------	----------	----------	-----------

Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Nickel	3.77	0.12	12.5		Zinc	6.88	1.25	12.5	
Selenium	ND	0.625	12.5						

SCR D-1	04-04-0772-11	10/17/04	Solid	04/16/04	04/17/04	040416L02
---------	---------------	----------	-------	----------	----------	-----------

Comment(s): -Results are reported on a dry weight basis.

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Nickel	4.19	0.11	11.9		Zinc	7.85	1.19	11.9	
Selenium	ND	0.595	11.9						

Method Blank	096-10-002-296	N/A	Solid	04/16/04	04/16/04	040416L02
--------------	----------------	-----	-------	----------	----------	-----------

Parameter	Result	RL	DF	Qual	Parameter	Result	RL	DF	Qual
Nickel	ND	0.0100	1		Zinc	ND	0.100	1	
Selenium	ND	0.0500	1						

AMEC Earth and Environmental
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 San Diego, CA 92121-3723

Date Received: 04/14/04
 Work Order No: 04-04-0772
 Preparation: N/A
 Method: EPA 160.3

Project: City of Buenaventura / SCRE

Quality Control Sample ID	Matrix	Instrument	Date Prepared:	Date Analyzed:	Duplicate Batch Number
SCR D-1	Solid	N/A	N/A	05/04/04	40504TSD2

Parameter	Sample Conc	DUP Conc	RPD	RPD CL	Qualifiers
Solids, Total	84.4	83.1	2	0-25	

AMEC Earth and Environmental
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 San Diego, CA 92121-3723

Date Received: 04/14/04
 Work Order No: 04-04-0772
 Preparation: EPA 3050B
 Method: EPA 6020

Project: City of Buenaventura / SCRE

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	MS/MSD Batch Number
SCR B-4	Solid	ICP/MS A	04/16/04	04/17/04	040416S02

<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>
Nickel	99	98	80-120	0	0-20	
Selenium	103	103	80-120	0	0-20	
Zinc	109	107	80-120	1	0-20	

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 5510 Morehouse Drive, Suite 300
 San Diego, CA 92121-3723

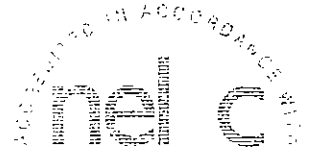
Date Received:
 Work Order No:
 Preparation:
 Method:

N/A
 04-04-0772
 EPA 3050B
 EPA 6020

Project: City of Buenaventura / SCRE

Quality Control Sample ID	Matrix	Instrument	Date Prepared	Date Analyzed	LCS/LCSD Batch Number
096-10-002-296	Solid	ICP/MS A	04/16/04	04/17/04	040416L02

Parameter	LCS %REC	LCSD %REC	%REC CL	RPD	RPD CL	Qualifiers
Nickel	98	98	80-120	0	0-20	
Selenium	102	102	80-120	0	0-20	
Zinc	101	99	80-120	1	0-20	



Work Order Number: 04-04-0772

<u>Qualifier</u>	<u>Definition</u>
ND	Not detected at indicated reporting limit.

A handwritten signature in black ink is located at the bottom left of the page.

WORK ORDER #:

04 - 04 - 0772

Cooler 1 of 1

SAMPLE RECEIPT FORM

CLIENT: Amec

DATE: 4/14/4

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.
- 4.7 °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): _____
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:

APPENDIX G
FIELD COLLECTION DATA

Appendix Table G-1. Field Sample Collection Summary
City of Buenaventura - Santa Clara River Estuary Dry Weather Sampling Event
Collected 17 October 2003

Site	Time of Collection	Latitude 34° ...	Longitude 119° ...	Mean Water Sample Depth (m)	Mean Sediment Penetration Depth (cm)
A-1	1357	13.985	15.888	1.5	2.0
A-2	1313	13.881	15.842	2.1	3.5
A-3	1234	13.758	15.820	1.4	3.0
B-1	1445	14.092	15.791	1.4	2.5
B-2	1519	13.968	15.705	0.9	3.0
B-3	1542	13.917	15.650	1.9	2.0
B-4	1605	13.891	15.571	1.8	4.0
C-1	1737	14.067	15.395	1.2	4.0
C-2	1722	14.057	15.393	1.2	4.0
C-3	1709	14.029	15.393	1.4	4.0
D-1	1749	14.065	15.332	1.2	4.0

^a Start of collection time at each site location

Appendix Table G-2. Field Water Quality Measurements

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

Sample Collection Date: 17 October 2003

Sample	Water Depth (m)	Temperature (°C)	Salinity (ppt)	Conductivity (umhos/cm)	pH (units)	DO (mg/L)
A-1	0.0	21.5	2.3	4360	8.74	16.7
	0.8	21.6	2.4	4440	nr	16.7
	1.5	21.7	4.3	7840	nr	nr
A-2	0.0	21.3	2.3	4400	8.72	16.5
	1.1	21.3	2.3	4400	nr	16.7
	2.1	22.0	11.9	19930	nr	nr
A-3	0.0	21.0	2.0	4220	8.90	15.2
	0.7	20.8	2.2	4210	nr	15.5
	1.4	20.7	2.2	4210	nr	nr
B-1	0.0	21.9	1.5	2780	7.10	7.5
	0.7	21.4	1.5	3110	nr	7.6
	1.4	21.8	2.9	5400	nr	nr
B-2	0.0	22.2	2.3	4350	8.83	>20.0
	0.5	22.2	2.3	4350	nr	>20.0
	0.9	22.2	2.3	4350	nr	nr
B-3	0.0	21.7	2.3	4340	8.65	18.9
	1.0	21.7	2.3	4340	nr	19.1
	1.9	22.1	10.6	18650	nr	nr
B-4	0.0	21.7	2.3	4420	8.55	19.1
	0.8	21.7	2.3	4430	nr	18.2
	1.6	21.7	2.3	4430	nr	nr
C-1	0.0	21.9	2.1	3930	8.77	>20.0
	0.5	21.9	2.1	3910	nr	>20.0
	0.9	21.9	2.1	4040	nr	nr
C-2	0.0	21.9	2.2	4200	8.92	>20.0
	0.5	21.9	2.2	4200	nr	>20.0
	0.9	21.9	2.2	4220	nr	nr
C-3	0.0	22.0	2.2	4200	8.92	>20.0
	0.7	22.0	2.2	4200	nr	>20.0
	1.4	22.0	2.2	4250	nr	nr
D-1	0.0	21.8	2.2	4230	9.15	>20.0
	0.5	21.8	2.2	4230	nr	>20.0
	1.0	21.8	2.2	4240	nr	nr

nr- not recorded

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City of Buenaventura
Oct 2003 - Oct 2004**

BENTHIC SAMPLE COLLECTION DATA SHEET

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Station: <u>BCS A-3 A-1</u>	Date: <u>10-17-03</u>
Vessel Name: _____	Arrival Time: <u>1357</u>
Grab Sampler Type: <u>Vanucci</u>	Depart Time: <u>1415</u>
Latitude: <u>32° 34' 13.985</u>	Longitude: <u>117° 19' 15.888</u>
Weather ¹ : <u>clear</u>	Wind (kts/dir) ² : <u>5 KTS/ WEST</u>
	Sampler Initials: <u>BCS, RG</u>

Grab Num.	Field Rep (A,B,C)	Sample Depth (ft)	Pen. Depth (cm)	% Intact/ Volume (L)	Sed. Comp ³	Sed. Color ⁴	Sed. Odor ⁵	Grab Sample Type ⁶	Comments: Sample Description, # of Macroinverts, Photo?
1	NA	5.0	20	NA	Fine Sand	<u>Black/brown Brown in Black</u>	<u>Organic</u>	<u>Vanucci</u>	<u>Worm tubes (Brown) 1cm-top Black 1cm-Bottom Brown</u>
2									<u>✓ SAME</u>
3									<u>✓</u>
4									<u>✓</u>
5									<u>✓</u>
6									<u>✓</u>
7									
8									
9									
10									

¹ Weather List: clear, partly cloudy, continuous cloud layer, fog, haze, drizzle, rain, showers, thunderstorms
² Direction in compass headings: N, S, E, W, NE, NW, SE, SW
³ Sediment Composition: coarse sand, fine sand, silt/clay, gravel, shell hash
⁴ Sediment Color: brown, tan, black, gray, olive green, red
⁵ Sediment Odor: none, petroleum, hydrogen sulfide, other
⁶ Grab Type: infauna (INF), sediment chemistry (Chem), toxicity (Tox)

Santa Clara River Estuary Evaluation
City of Buenaventura
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BENTHIC SAMPLE COLLECTION DATA SHEET

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Station: A-2	Date: 10-17-03
Vessel Name:	Arrival Time: 1313 Depart Time: 1339
Grab Sampler Type: Vanvee	Latitude: 32° 34' 13.881 Longitude: 117° 19' 15.842
Weather: Partly Cloudy	Wind (kts/dir): 4 kts / WEST Sampler Initials: BCS, RL

Grab Num.	Field Rep (A,B,C)	Sample Depth (ft)	Pen. Depth (cm)	% Intact/ Volume (L)	Sed. Comp ³	Sed. Color ⁴	Sed. Odor ⁵	Grab Sample Type ⁶	Comments: Sample Description, # of Macroinverts, Photo?
1	NA	7.0	3-4	NA	Coarse SAND	Black	sulfide	Vanvee	fine brown soft Taylor on top.
2									✓ Rocks in sample
3									✓ Rocks fouled sampler
4									✓ Rocks fouled sampler
5									✓
6	"	"	"	"	"	Drain Sand	"	"	✓
7						Brown Sand			✓ Rock fouled ^{sampler} sampler
8									
9									
10									

¹ Weather List: clear, partly cloudy, continuous cloud layer, fog, haze, drizzle, rain, showers, thunderstorms
² Direction in compass headings: N, S, E, W, NE, NW, SE, SW
³ Sediment Composition: coarse sand, fine sand, silt/clay, gravel, shell hash
⁴ Sediment Color: brown, tan, black, gray, olive green, red
⁵ Sediment Odor: none, petroleum, hydrogen sulfide, other
⁶ Grab Type: infauna (INF), sediment chemistry (Chem), toxicity (Tox)

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BENTHIC SAMPLE COLLECTION DATA SHEET

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Station: <u>315 A-T A-3</u>	Date: <u>10/17/03</u>
Vessel Name: _____	Arrival Time: <u>10:50 1234</u>
Grab Sampler Type: <u>Vanvreen</u>	Depart Time: <u>1303</u>
Latitude: <u>32° 34' 13.758</u>	Longitude: <u>117° 11' 15.820</u>
Weather ¹ : <u>Partly cloudy</u>	Wind (kts/dir) ² : <u>8 kts/West</u>
	Sampler Initials: <u>BCS, RG</u>

Grab Num.	Field Rep (A,B,C) <small>1,2,3</small>	Sample Depth (ft)	Pen. Depth (cm)	% Intact/Volume (L)	Sed. Comp ₃	Sed. Color ₄	Sed. Odor ₅	Grab Sample Type ₆	Comments: Sample Description, # of Macroinverts, Photo?
1	NA	4.6 4.5 24	3cm	NA	coarse SAND	tan	NONE	VANVREEN	Algae debris few rocks
2									✓
3									✓
4									✓
5									✓
6									
7									
8									4.2
9									
10									

¹ Weather List: clear, partly cloudy, continuous cloud layer, fog, haze, drizzle, rain, showers, thunderstorms

² Direction in compass headings: N, S, E, W, NE, NW, SE, SW

³ Sediment Composition: coarse sand, fine sand, silt/clay, gravel, shell hash

⁴ Sediment Color: brown, tan, black, gray, olive green, red

⁵ Sediment Odor: none, petroleum, hydrogen sulfide, other

⁶ 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: B-1	Date: 10-17-03
Vessel Name:	Arrival Time: 1445 Depart Time: 1502
Grab Sampler Type: Vanvee	Latitude: 32° 34' 14.092 Longitude: 117° 19' 15.791
Weather ¹ : Clear	Wind (kts/dir) ² : 4 kts / west Sampler Initials: BLS, RL

Grab Num.	Field Rep (A,B,C)	Sample Depth (ft)	Pen. Depth (cm)	% Intact/ Volume (L)	Sed. Comp ₃	Sed. Color ₄	Sed. Odor ₅	Grab Sample Type ₆	Comments: Sample Description, # of Macroinverts, Photo?
1	NA	4' 7"	2-3	NA	Coarse Sand	Brown surface gravel/sand	Sulfide	Vanvee	Brown surface 1-2 mm
2									✓ SAME
3									✓
4									✓
5									✓
6									
7									
8									
9									
10									

¹ Weather List: clear, partly cloudy, continuous cloud layer, fog, haze, drizzle, rain, showers, thunderstorms
² Direction in compass headings: N, S, E, W, NE, NW, SE, SW
³ Sediment Composition: coarse sand, fine sand, silt/clay, gravel, shell hash
⁴ Sediment Color: brown, tan, black, gray, olive green, red
⁵ Sediment Odor: none, petroleum, hydrogen sulfide, other
⁶ 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: B-2	Date: 10-17-03
Vessel Name:	Arrival Time: 1519 Depart Time: 1531
Grab Sampler Type: Vanvce	Latitude: 32° 34' 13.968 Longitude: 117° 11' 15.705
Weather ¹ : clear	Wind (kts/dir) ² : 5kts/WEST Sampler Initials: BLS, RG

Grab Num.	Field Rep (A,B,C)	Sample Depth (ft)	Pen. Depth (cm)	% Intact/ Volume (L)	Sed. Comp ³	Sed. Color ⁴	Sed. Odor ⁵	Grab Sample Type ⁶	Comments: Sample Description, # of Macroinverts, Photo?
1	NA	3.0	3-4	NA	med. sand	tan	NONE	VANVCE	woody debris (reed)
2									✓ SAME
3									✓ SAME
4									✓
5									
6									
7									
8									
9									
10									

¹ Weather List: clear, partly cloudy, continuous cloud layer, fog, haze, drizzle, rain, showers, thunderstorms
² Direction in compass headings: N, S, E, W, NE, NW, SE, SW
³ Sediment Composition: coarse sand, fine sand, silt/clay, gravel, shell hash
⁴ Sediment Color: brown, tan, black, gray, olive green, red
⁵ Sediment Odor: none, petroleum, hydrogen sulfide, other
⁶ 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: B-3	Date: 10-17-03
Vessel Name: _____	Arrival Time: 1542
Grab Sampler Type: Vance	Depart Time: 1600
Latitude: 32° 34' 13.917	Longitude: 117° 19' 15.650
Weather ¹ : Clear	Wind (kts/dir) ² : 5 kts / West
	Sampler Initials: RIS, RG

Grab Num.	Field Rep (A,B,C)	Sample Depth (ft)	Pen. Depth (cm)	% Intact/ Volume (L)	Sed. Comp ³	Sed. Color ⁴	Sed. Odor ⁵	Grab Sample Type ⁶	Comments: Sample Description, # of Macroinverts, Photo?
1		6.3"	2		Uniform coarse sand	Black gray sulfide		Vance	
2									✓ No. sed. No sample
3									✓
4									✓
5									✓
6									✓
7									
8									
9									
10									

¹ Weather List: clear, partly cloudy, continuous cloud layer, fog, haze, drizzle, rain, showers, thunderstorms
² Direction in compass headings: N, S, E, W, NE, NW, SE, SW
³ Sediment Composition: coarse sand, fine sand, silt/clay, gravel, shell hash
⁴ Sediment Color: brown, tan, black, gray, olive green, red
⁵ Sediment Odor: none, petroleum, hydrogen sulfide, other
⁶ Grab Type: infauna (INF), sediment chemistry (Chem), toxicity (Tox)

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City of Buenaventura
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BENTHIC SAMPLE COLLECTION DATA SHEET

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Station: R4 B-4	Date: 10-17-03
Vessel Name:	Arrival Time: 1605
Grab Sampler Type: Vanbec	Depart Time: 1634
Latitude: 32° 34' 13.891	Longitude: 117° 15' 19.571
Weather ¹ : clear	Wind (kts/dir) ² : 7 kts / west
	Sampler Initials: BCS, RL

Grab Num.	Field Rep (A,B,C)	Sample Depth (ft)	Pen. Depth (cm)	% Intact/Volume (L)	Sed. Comp ₃	Sed. Color ₄	Sed. Odor ₅	Grab Sample Type ₆	Comments: Sample Description, # of Macroinverts, Photo?
1		5.10"	3 4		fine clay fine sand sand	Brown tan	None	Vanbec	
2									
3									
4									
5									
6									
7									
8									
9									
10									

¹ Weather List: clear, partly cloudy, continuous cloud layer, fog, haze, drizzle, rain, showers, thunderstorms
² Direction in compass headings: N, S, E, W, NE, NW, SE, SW
³ Sediment Composition: coarse sand, fine sand, silt/clay, gravel, shell hash
⁴ Sediment Color: brown, tan, black, gray, olive green, red
⁵ Sediment Odor: none, petroleum, hydrogen sulfide, other
⁶ Grab Type: infauna (INF), sediment chemistry (Chem), toxicity (Tox)

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BENTHIC SAMPLE COLLECTION DATA SHEET

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Station: <u>385 C-1</u>	Date: <u>10-17-03</u>
Vessel Name: _____	Arrival Time: <u>1737</u>
Grab Sampler Type: <u>VAN VEE</u>	Depart Time: <u>1744</u>
Latitude: <u>32° 34' 14.067</u>	Longitude: <u>117° 19' 15.395</u>
Weather ¹ : <u>clear</u>	Wind (kts/dir) ² : <u>3 kts</u>
	Sampler Initials: <u>RLS, RG</u>

Grab Num.	Field Rep (A,B,C)	Sample Depth (ft)	Pen. Depth (cm)	%. Intact/ Volume (L)	Sed. Comp ³	Sed. Color ⁴	Sed. Odor ⁵	Grab Sample Type ⁶	Comments: Sample Description, # of Macroinverts, Photo?
1	NA	3'10"	1/2	NA	Coarse SAND	tan	NON	Vanvee	
2									
3									
4									
5									
6									
7									
8									
9									
10									

¹ Weather List: clear, partly cloudy, continuous cloud layer, fog, haze, drizzle, rain, showers, thunderstorms

² Direction in compass headings: N, S, E, W, NE, NW, SE, SW

³ Sediment Composition: coarse sand, fine sand, silt/clay, gravel, shell hash

⁴ Sediment Color: brown, tan, black, gray, olive green, red

⁵ Sediment Odor: none, petroleum, hydrogen sulfide, other

⁶ 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>C-32</u>	Date:
Vessel Name:	Arrival Time: <u>1722</u> Depart Time: <u>181735</u>
Grab Sampler Type: <u>Vanvee</u>	Latitude: <u>32° 34' 14.05</u> ²⁴ Longitude: <u>117° 11' 15.393</u>
Weather ¹ : <u>clear</u>	Wind (kts/dir) ² : <u>5 kts / west</u> Sampler Initials: <u>BCS, RQ</u>

Grab Num.	Field Rep (A,B,C)	Sample Depth (ft)	Pen. Depth (cm)	% Intact/ Volume (L)	Sed. Comp ³	Sed. Color ⁴	Sed. Odor ⁵	Grab Sample Type ⁶	Comments: Sample Description, # of Macroinverts, Photo?
1	Na	3' 10"	9	Na	COARSE SAND	tan	NO	Vanvee	Surface layer fine algae
2									✓ same
3									✓ same
4									
5									
6									
7									
8									
9									
10									

¹ Weather List: clear, partly cloudy, continuous cloud layer, fog, haze, drizzle, rain, showers, thunderstorms
² Direction in compass headings: N, S, E, W, NE, NW, SE, SW
³ Sediment Composition: coarse sand, fine sand, silt/clay, gravel, shell hash
⁴ Sediment Color: brown, tan, black, gray, olive green, red
⁵ Sediment Odor: none, petroleum, hydrogen sulfide, other
⁶ Grab Type: infauna (INF), sediment chemistry (Chem), toxicity (Tox)

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BENTHIC SAMPLE COLLECTION DATA SHEET

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Station: <u>RL C-3</u>	Date: <u>10-17-03</u>
Vessel Name: _____	Arrival Time: <u>1709</u>
Grab Sampler Type: <u>Vanvee</u>	Depart Time: <u>1719</u>
Latitude: <u>34° 14.029</u>	Longitude: <u>117° 15.393</u>
Weather ¹ : <u>clear</u>	Wind (kts/dir) ² : <u>4 kts / West</u>
	Sampler Initials: <u>BCS, RL</u>

Grab Num.	Field Rep (A,B,C)	Sample Depth (ft)	Pen. Depth (cm)	% Intact/ Volume (L)	Sed. Comp ³	Sed. Color ⁴	Sed. Odor ⁵	Grab Sample Type ⁶	Comments: Sample Description, # of Macroinverts, Photo?
1		4.6	4		Coarse sand	Black TAN	Slight Sulfid	Vanvee	
2									✓ SAME
3									✓ SAME
4									
5									
6									
7									
8									
9									
10									

¹ Weather List: clear, partly cloudy, continuous cloud layer, fog, haze, drizzle, rain, showers, thunderstorms
² Direction in compass headings: N, S, E, W, NE, NW, SE, SW
³ Sediment Composition: coarse sand, fine sand, silt/clay, gravel, shell hash
⁴ Sediment Color: brown, tan, black, gray, olive green, red
⁵ Sediment Odor: none, petroleum, hydrogen sulfide, other
⁶ 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

Page ___ of ___

Station: <u>D-1</u>	Date: <u>10-17-03</u>
Vessel Name: _____	Arrival Time: <u>1749</u>
Grab Sampler Type: <u>Van Vee</u>	Depart Time: <u>1800</u>
Latitude: <u>32° 34' 14.065</u>	Longitude: <u>117° 15' 33.2</u>
Weather ¹ : <u>clear</u>	Wind (kts/dir) ² : <u>6 kts / west</u>
	Sampler Initials: <u>BCS P</u>

Grab Num.	Field Rep (A,B,C)	Sample Depth (ft)	Pen. Depth (cm)	% Intact/ Volume (L)	Sed. Comp ³	Sed. Color ⁴	Sed. Odor ⁵	Grab Sample Type ⁶	Comments: Sample Description, # of Macroinverts, Photo?
1		3'4"							
2									
3									
4									
5									
6									
7									
8									
9									
10									

¹ Weather List: clear, partly cloudy, continuous cloud layer, fog, haze, drizzle, rain, showers, thunderstorms
² Direction in compass headings: N, S, E, W, NE, NW, SE, SW
³ Sediment Composition: coarse sand, fine sand, silt/clay, gravel, shell hash
⁴ Sediment Color: brown, tan, black, gray, olive green, red
⁵ Sediment Odor: none, petroleum, hydrogen sulfide, other
⁶ Grab Type: infauna (INF), sediment chemistry (Chem), toxicity (Tox)

Santa Clara River Estuary Evaluation City of Buenaventura

Field Water Quality Measurement Log

2003 - 2004

Sample Collection Date: 10/17/03

Sampler: BS, RG

Sample ID	Depth (ft)	Temp °C	Salinity (ppt)	Cond. (umhos-cm)	pH	DO (mg/L)	Comments/Observations
A-1 A-3 <small>349</small> (ex) 46	4.50 ^{4.50}	21.0	2.0	4220	8.73 ^{8.90}	15.2	
	2.25	20.8	2.2	4210		15.5	
	4.50 ^{4.50}	20.7	2.2	4210			
A-2		21.3	2.3	4400	8.72	16.5	
	3.5	21.3	2.3	4400	8.55 ^{8.25}	16.7	
	7.0	22.0	11.9	19930			
A-3 A-1 <small>65</small>		21.5	2.3	4360	8.74	16.7	
	2.5	21.6	2.4	4440		16.7	
	5.0	21.7	4.3	7840			
B-1		21.9	1.5	2780	7.10	7.5	→ in reed forest - outfall location
	2.35	21.4	1.5	3110	7.24 ^{7.14}	7.6 ^{7.4}	
	4.7"	21.8	2.9	5400			
B-2		22.2	2.0 ^{2.3}	4350	8.83	720.0	→ on edge of reeds
		22.2	2.3	4350	9.07 ^{8.25}	720.0	
	3.0	22.2	2.3	4350			
B3		21.7	2.3	4340	8.65	18.9	
	3.15	21.7	2.3	4340		19.1	
	6.3"	22.1	10.6	18650			

Santa Clara River Estuary Evaluation City of Buenaventura

Field Water Quality Measurement Log

2003 - 2004

Sample Collection Date: 10/17/03

Sampler: Bcs, RG

Sample ID	Depth (ft)	Temp °C	Salinity (ppt)	Cond. (umhos-cm)	pH	DO (mg/L)	Comments/Observations
B-4		21.7	2.3	4420	8.55	19.1	
		21.7	2.3	4430	8.67	18.2	
	5'10"	21.7	2.3	4430			
C-3 Bcs		22.0	2.2	4200	8.92	720.0	
		22.0	2.2	4200		720.0	
	4'6"	22.0	2.2	4250			
C-2		21.9	2.2	4200	8.92	720.0	
		21.9	2.2	4200		720.0	
	3'10"	21.9	2.2	4220			
C-3 C-1 Bcs		21.9	2.1	3930	8.77	720.0	
		21.9	2.1	3910		720.0	
	3'10"	21.9	2.1	4040			
D-1		21.8	2.2	4230	9.15	720.0	
		21.8	2.2	4230		720.0	
	3'4"	21.8	2.2	4240			

APPENDIX H
CHAIN-OF-CUSTODY FORMS

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 10/20/03
Page 1 of 2

LABORATORY CLIENT: <u>AMEC Earth & Environmental</u>			CLIENT PROJECT NAME / NUMBER: <u>San Joaquin River Estuary</u>		P.O. NO.:
ADDRESS: <u>5510 Morehouse Dr</u>			PROJECT CONTACT: <u>Chris Strandy</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) <u>[Signature]</u>		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.strandy@amec.com</u>	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)	TOC	Copper	
			DATE	TIME																	
		SCRE - A-1	10/17/03	1234	Sed	1														X	X
		A-2		1313																	
		A-3		1357																	
		B-1		1445																	
		B-2		1519																	
		B-3		1542																	
		B-4		1605																	
		C-1		1709																	
		C-2		1722																	
		C-3		1737																	

Relinquished by: (Signature) <u>[Signature]</u>	Received by: (Signature) <u>[Signature]</u>	Date: <u>10/21/03</u>	Time: <u>1140</u>
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received for Laboratory by: (Signature)	Date:	Time:

Q&O Graphic (714) 898-9702

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 10/20/03
Page 2 of 2

LABORATORY CLIENT: <u>AMEC Earth & Environmental</u>				CLIENT PROJECT NAME / NUMBER: <u>Santa Clara River Estuary</u>				P.O. NO.:																																	
ADDRESS: <u>5510 Morehouse Dr</u>				PROJECT CONTACT: <u>Chris Strandby</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) <u>[Signature]</u>		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.strandby@amec.com</u>		COOLER RECEIPT		TEMP = _____ °C																																	
TURNAROUND TIME: <u>Standard</u> <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				REQUESTED ANALYSES																																					
SPECIAL REQUIREMENTS (ADDITIONAL COSTS MAY APPLY) <input type="checkbox"/> RWQCB REPORTING <input type="checkbox"/> COELT REPORTING				<table border="1" style="width:100%; border-collapse: collapse; text-align: center;"> <tr> <td style="width: 5%;">TPH (G)</td> <td style="width: 5%;">TPH (D) or</td> <td style="width: 5%;">BTEX / MTBE (8021B)</td> <td style="width: 5%;">HALOCARBONS (8021B)</td> <td style="width: 5%;">VOCs (8260B)</td> <td style="width: 5%;">VOCs (5035 / 8260B) EnCore</td> <td style="width: 5%;">SVOCs (8270C)</td> <td style="width: 5%;">PEST (8081A)</td> <td style="width: 5%;">PCBs (8082)</td> <td style="width: 5%;">EDB / DBCP (504.1) or (8011)</td> <td style="width: 5%;">CAC, T22 METALS (6010B)</td> <td style="width: 5%;">PNAs (8310)</td> <td style="width: 5%;">VOCs (T0-14A) or (T0-15)</td> <td style="width: 5%;">TOC</td> <td style="width: 5%;">Copper</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 style="text-align: left;">X</td> <td style="text-align: left;">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 (T0-14A) or (T0-15)	TOC	Copper														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 (T0-14A) or (T0-15)	TOC	Copper																											
													X	X																											
SPECIAL INSTRUCTIONS:																																									
LAB. USE ONLY	GEIMS ID	SAMPLE ID	SAMPLING		MATRIX	NO. OF CONT.																																			
			DATE	TIME																																					
		SCRE - D-1	10/17/03	1749	Soil	1																																			

Relinquished by: (Signature) <u>[Signature]</u>	Received by: (Signature) <u>[Signature]</u>	Date: <u>10/21/03</u>	Time: <u>1140</u>
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received for Laboratory by: (Signature)	Date:	Time:

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TEL: (714) 895-5494 • FAX: (714) 894-7501

CHAIN OF CUSTODY RECORD

Date 4/13/04

Page 1 of 1

LABORATORY CLIENT: <u>AMEC Earth & Environmental</u>			CLIENT PROJECT NAME / NUMBER: <u>City of Buena Ventura / SCRE</u>			P.O. NO.:		
ADDRESS: <u>5510 Marchessa Dr</u>			PROJECT CONTACT: <u>Chris Stransky / Howard Bailey</u>			QUOTE NO.:		
CITY: <u>San Diego</u>		STATE: <u>CA</u>		ZIP: <u>92121</u>		LAB USE ONLY		
TEL: <u>858 458-9044</u>		FAX: <u>858 587-3961</u>		E-MAIL: <u>chris.stransky@amec.com</u>		<u>04-0772</u>		
TURNAROUND TIME <u>Standard</u>			REQUESTED ANALYSES					
<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"/> ARCHIVE SAMPLES UNTIL ___/___/___								
SPECIAL INSTRUCTIONS								

TURNAROUND TIME
 SAME DAY 24 HR 48 HR 72 HR 5 DAYS 10 DAYS

SPECIAL REQUIREMENTS (ADDITIONAL COSTS MAY APPLY)
 RWQCB REPORTING ARCHIVE SAMPLES UNTIL ___/___/___

SPECIAL INSTRUCTIONS

LAB USE ONLY	SAMPLE ID	LOCATION/DESCRIPTION	SAMPLING		MATRIX	NO. OF CONT.	TPH (G)	TPH (D) (O)	BTEX / MTBE (8021B)	HALOCARBONS (8021B)	VOCs (8260B)	SVOCs (8270C)	PEST (8081A)	PCBs (8082)	EDB / DBCP (504.1) or (8011)	CAC, T22 METALS (6010B)	ICP/MS METALS (6020)	PNAs (8310)	VOCs (T0-14A) or (T0-15)	CH ₄ / TGNM0 (25.1)	FIXED GASES (25.1) or (D1946)	Se, Ni, Zn	
			DATE	TIME																			
	SCR A-1	Santa Clara River Estuary	10/17/03	1357	Sed	1																	X
	SCR A-2			1313																			
	SCR A-3			1234																			
	SCR B-1			1445																			
	SCR B-2			1519																			
	SCR B-3			1542																			
	SCR B-4			1605																			
	SCR C-1			1737																			
	SCR C-2			1722																			
	SCR C-3			1709																			
	SCR D-1			1749																			

Relinquished by: (Signature) 	Received by: (Signature) 	Date: <u>4/14/04</u>	Time: <u>1307</u>
Relinquished by: (Signature) 	Received by: (Signature) 	Date:	Time:
Relinquished by: (Signature) 	Received for Laboratory by: (Signature) 	Date: <u>4/14/04</u>	Time: <u>1755</u>

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