CHEMICAL ANALYSIS, TOXICITY EVALUATION AND BIOACCUMULATION TESTING OF SEDIMENTS FROM **HUMBOLDT BAY:**

BASELINE SURVEY I

Fiscal Year 1993

FINAL REPORT

Prepared for:

U.S. ARMY ENGINEERING DISTRICT
SAN FRANCISCO CORPS OF ENGINEERS
San Francisco, California

Prepared by:

TOXSCAN INC. and KINNETIC LABORATORIES, INC.
Watsonville, California

SEPTEMBER 1993
Final Revision 9/94

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BASELINE SURVEY I

1.0 Introduction

Under Contract No. DACW07-92-D-002 from San Francisco District, Army Corps of Engineers (SFACOE), ToxScan, Inc. collected and analyzed sediment samples from Humboldt Bay for FY1993 maintenance dredging. Sediments were sampled by Kinnetic Laboratories, Inc., and returned to the ToxScan, Inc. laboratory at Watsonville, CA where they were assigned laboratory number **T-9209** for physical, chemical and bioassay analyses. Bioaccumulation analyses on four composites were analyzed under laboratory number **T-9284**. Samples collected, composites and analyses are summarized in Table 1.

2.0 Methods

2.1 Sediment Collection

Sediment sampling was conducted between 29 October 1992 and 2 November 1992 from the M/V Celtic. Target sampling locations (California state plane coordinates) are listed in Table 1 of the Scope of Services provided by the San Francisco District, Army Corps of Engineers (SFACOE). Prior to initiating the field program, each station location was converted to latitude × longitude to allow use of a differential Global Positioning System (GPS). Station locations were plotted on "blue line" pre-dredge survey charts provided by the SFACOE to determine the location and approximate depth of each core. Final sampling locations are plotted on Figures 1 through 4. Details of each core and grab sample (time collected, depth, location) are summarized in Table 2 and documented in field log sheets (Appendix B).

Horizontal positioning was established with a Trimble series 4000 Differential GPS navigation system. Mudline elevations were determined at each core location at the time of sampling with a JFV 90 dual frequency color sounder with an accuracy of 0.1 feet. Mean lower low water (MLLW) mudline elevations were extrapolated using Micronautics, Inc. Tide 1 software. Elevations were determined at each core location at the time of sampling.

Where cores were necessary (due to depth of depositional sediment) samples were collected by Vibracore; in areas where sedimentation appeared to be minimal samples were collected by Smith-Macintyre grab . The vibracore cutting tip and core sample catcher were #306 grade stainless steel; the Vibracore barrel was aluminum. The Smith-Macintyre grab was constructed of galvanized steel. Prior to sampling at each station, the vibracore cutting tip, core catcher, compositing equipment, and (steps 1 and 2 only) Smith-Macintyre grab were all cleaned by the following EPA approved clean-up protocol:

1. Wash with 2% Micro Laboratory Soap
2. Rinse three times with clean water
3. Rinse with 2N nitric acid
4. Final rinse 3x with Milli-Q type I reagent grade deionized (DI) water
5. Store in cleaned containers until use.

Samples were taken as close to the target locations as possible. Sampling at many of the targeted sites were relocated because they were at or below proposed dredge depth. When a targeted site was not substantially shallower than dredge depth, a grab sample was taken to characterize the sediment present. If the grab sample was field-determined primarily to be sand, an aliquot was obtained for PSD only. If the grab sample was field-determined primarily to be fine sediment (silt or clay) an aliquot was taken for compositing with samples from the same area.

Composite Samples. Composite samples for toxicity testing were to exclude individual samples composed predominantly of sand (80% $\Phi \leq 4$). The composites were formulated based on field assessment of grain size. In two instances (SAM6 and the Reference Site station) the composite could be accumulated only by taking replicate cores or grabs from the same location.

Four composite samples (three harbor composites and one reference site composite) were collected for toxicity and chemistry evaluation after consultation in the field with SFACOE representatives: 1) Eureka Upper Channel (EKUP); 2) Samoa Turning Basin (SAMTB); 3) Fields Landing Lower Channel and Turning Basin (FLTB); and 4) the disposal site reference (REF). Individual samples comprising each composite are indicated in Table 2. The original study design projected four sampling harbor stations to be composited; however, the samples projected for composite 3 did not meet grain size criteria (by field inspection) for bioassay and bioaccumulation testing. Comp 3 was therefore never produced. To avoid possible confusion, the harbor composites have been renamed in this report. The original composite labels (which appear in the chains of custody and in Appendix C-1) and their counterparts are as follows:

Comp 1 = EKUP
Comp 2 = SAMTB
Comp 4 = FLTB

2.1.1 Sample Handling. Vibracore and Smith Macintyre grab samples were taken during this project. Handling procedures for each sample type are summarized below:

Vibracore Samples. Each core sample was measured for total core length. If the core was acceptable (i.e., penetration to dredge depth) the desired sample was extruded into the compositing container. Only the sediment from project dredge depth to the surficial sediment was extruded into the compositing container.

Grab Samples. Each grab sample was evaluated for grain size, composition, and depth of penetration. Grabs which had "washed out", or which were determined to have insufficient penetration, were rejected. Grab samples which consisted primarily of sand, gravel, shell hash or a combination of these materials (field-estimated 80% $\Phi \leq 4$) were collected as discrete samples for PSD only, and were not included in area composite samples. Grab samples were used in the Bar and Entrance Channel because of the extreme wave environment, and were collected in the inner channels where less than 1.5 feet of shoaling existed between the existing bottom and the project depth.

Each area composite was homogenized by thorough mixing in Teflon lined compositing containers. These containers and all sediment handling tools were cleaned to the same protocols as the sampling device. The homogenized sample was then aliquoted into the chemistry sample containers utilizing cleaned Teflon lined tools, and placed in precleaned coolers, on ice, to reduce the temperature to the prescribed 4°C. The balance of each homogenized composite (for bioassay and bioaccumulation analyses) was placed in a precleaned plastic bag, and put into precleaned plastic coolers, on ice, to reduce the temperature to the prescribed 4 degrees centigrade. All samples were transported to ToxScan's chemistry and bioassay facilities in Watsonville under chain of custody at the prescribed temperature. Subsamples of the four composites were subsequently shipped at temperature under chain of custody to Alta Analytical Laboratory Inc., El Dorado Hills, CA for 2,3,7,8-TCDD and 2,3,7,8-TCDF (Dioxins) analysis.

2.2 Water Collection

Reference site water was not collected for this project. Instead, seawater for suspended particulate phase bioassays, solid phase static and flow-through bioassays, and for the bioaccumulation assessments was pumped directly from the ocean immediately offshore of ToxScan's Davenport facility. For flowthrough tests and bioaccumulation exposures, the seawater was first pumped into a 55,000 gallon indoor cistern, then pumped into the flow-through system. Seawater for the elutriate (suspended particulate phase) preparations and for the solid phase static testing was transported from Davenport to ToxScan's Watsonville facilities by truck.

2.3 Chemical and Physical Sediment Analysis

Sediment samples for analysis were collected in glass containers. Prior to analysis, samples were stored in the laboratory at 4°C. Analyses are summarized in Table 3, and were conducted according to the following methods:

Sediment Grain Size was determined using the methods described in Plumb (1981).

Interstitial Water Salinity, pH and Total Ammonia values are determined for centrifuge-extracted sediment pore waters by salinometer-calibrated refractometer (YSI Model 33 Conductivity/Salinity Meter and Atago S-10 or S-28 Hand Held Refractometer), and by pH meter / ammonia probe (Fisher Accumet Model 925 with Orion Ammonia Electrode Model 95-12). One hundred to two hundred grams of sediment are centrifuged at 7,000 to 8,000 rpm until supernatant is clear (15 - 30 minutes).

Total and Water Soluble Sulfides. This method was adapted from EPA Method 376.1 (EPA 1983) and Standard Method 4500-S^{-2}-E (APHA 1992). Sediment samples were mixed with O_2-free DIW, and treated in a manner similar to aqueous samples. Hydrogen sulfide present in aqueous samples was purged into a zinc acetate trap using nitrogen gas. The sample Ph was adjusted to about 4 if total sulfide was to be determined, or left unadjusted for free sulfide determinations. The zinc sulfide precipitate in the trap was oxidized with a known and excess amount of iodine, and the unreacted iodine was back-titrated with thiosulfate.

Oil and Grease, Total Petroleum Hydrocarbon. Samples are acidified to a low Ph and extracted with fluorocarbon-113 in a separatory funnel. The fluorocarbon layer is separated from each sample, passed over sodium sulfate and collected for analysis of Oil and Grease using an Infrared spectrophotometer scanning the wavelengths from 3200 to 2700 cm^{-1}. To determine Total Petroleum Hydrocarbons, this above extract is passed through silica gel which extracts the vegetable oil fractions leaving the petroleum fraction which is then analyzed by Infrared spectrophotometric techniques as described below.

Total Organic Carbon (TOC). Analysis for total organic carbon followed the method of Gaudette, et al. (1974). One-to-two grams of sediment were placed in a 500 ml flask to which 10 ml of potassium dichromate ($K_2CR_2O_7$) had been added. Twenty ml of concentrated sulfuric acid (H_2SO_4) was then added while the flask was swirled. After 30 minutes, the sample was diluted to a volume of 200 ml with de-ionized water (DIW), and 10 ml of phosphoric acid (H_3PO_4) and 0.2 g of sodium fluoride (NaF) were added. After more swirling, 15 drops of diphenylamine indicator was added and the sample was titrated with 0.5N ferrous ammonium sulfate.

Metals. Analyses for metals utilized combinations of the following Varian spectrophotometers: SpectrAA 400P or 400Z with GTA 96 a Graphite Furnace and autosampler; or a SpectrAA 10 with VOA 76 hydride—cold vapor generator and flame autosamplers. Sample preparation prior to analysis by atomic absorption was accomplished by guidelines specified by Chapter 3, Sections 3.2 and 3.3, 7000 series (EPA 1986).

Organotins. Organotin species analysis was by the method of Uhler and Durrel (1989). Speciation was done by a n-pentyl derivatization using a Gas Chromatograph with a Flame Photometric Detector. A sediment sample was mixed with 5 ml of hydrobromic acid (HBr), converting cationic butyltins to the bromide complexes, which were then extracted with a toluene-tropolone mixture. Following this extraction a n-pentylmagnesium bromide was used to convert the butyltins to the n-pentyl derivatives. This extract was cleaned by passing it through a Florisil/Silica chromatograph column and then injected into the Gas Chromatograph with a FPD detector where butyltins were quantified.

Chlorinated Pesticides and PCB's. Analyses for these constituents were determined by Method 8080 (EPA 1986). A solid sample is mixed with anhydrous sodium sulfate, placed in an extraction thimble and extracted using acetone and hexane in a Soxhlet extractor. The extract is then dried, concentrated, and, as necessary, undergoes a Florisil clean-up. After extraction, a 2 microliter sample is injected into a gas chromatograph and the effluent is detected by an electron capture detector.

Polynuclear Aromatic Hydrocarbons and Phthalates. Analyses for semivolatile compounds were by GC-MS techniques, following Method 8270 (EPA 1986). A solid sample is mixed with anhydrous sodium sulfate, placed in an extraction thimble and extracted using acetone and hexane in a Soxhlet extractor. The extract is then dried, concentrated and cleaned up by gel permeation chromatography. After extraction, a 2 microliter sample is injected into a gas chromatograph and the effluent is detected by mass spectroscopy.

Sediment Analyses for TCDD and TCDF (Dioxins). Sediment samples were analyzed for 2,3,7,8-TCDD and 2,3,7,8-TCDF using NCASI Method 551. These analyses were performed by Alta Analytical Laboratory, Inc., El Dorado Hills, CA.

2.4 Bioassay and Bioaccumulation Test Procedures

Six acute bioassay toxicity tests and two bioaccumulation assessments were made with each of the the Humboldt Harbor sediment composites (Eureka Upper Channel, Samoa Turning Basin and Field's Landing Lower Channel amd Turning Basin), the disposal site reference composite, and the control sediment. Methods and procedures for these are summarized below and outlined in Table 3.

2.4.1 Suspended Particulate Phase Bioassays:

Suspended particulate phase elutriates were prepared by procedures outlined in the EPA/Corps of Engineers Testing Manual (EPA/USACE 1991), using laboratory seawater and test sediments. The test protocol was as specified by ASTM (1990). Three concentrations (100%, 50%, 10%) of suspended particulate phase were tested. The lower concentrations were evaluated only if the 100% concentrations produced >50% inhibition of development. Three species were tested in suspended particulate phase bioassays: The larvae of a marine bivalve (the bay mussel, *Mytilus edulis*), a mysid (*Holmesimysis costata*), and a marine teleost fish (the speckled sandab, *Citharichthys stigmaeous*).

Elutriate sanddab bioassays were performed at the Davenport laboratory, and elutriate bioassays with mysids and bivalve larvae were performed at the Watsonville laboratory. The positioning of test containers and other conditions in the laboratories were designed for uniform exposure to the controlled laboratory environment. Five replicates of test treatments were randomly assigned (complete random design) to the test containers by use of a random numbers generating program.

The sediment samples were placed in cleaned 5-gallon polyethylene buckets with laboratory seawater for elutriate preparation. The sediment to water ratio was 1:4 as specified in the Implementation Manual. The mixtures were agitated by vigorous aeration for 30 minutes. After a one-hour settling period, the elutriates were siphoned off and used as suspended particulate phase media.

2.4.1.1 Bivalve Larvae (*Mytilus edulis*)

Adult *Mytilus edulis* were purchased from Sea Farms West in Carlsbad, CA. Adult mussels were induced to spawn by high-temperature stimulation. Eggs and sperm were collected in separate basins filled with aerated seawater at 20°C. Egg density was determined by microscopically counting several 1-ml aliquots taken from the well-mixed egg basin. Fertilization was accomplished by addition of an appropriate amount of sperm suspension, and confirmed by microscopic examination.

Larvae were tested in 250 ml polyethylene beakers containing approximately 200 ml of appropriate test solution. After fertilization was confirmed an aliquot containing approximately 6000 fertilized eggs was pipetted into each test beaker. Gentle aeration was provided throughout the 48-hour duration of the test. Five extra beakers were prepared in addition to those required for test and control replicates. These "extra" test containers were not incubated for 48 hours, but rather they were evaluated immediately after inoculation to provide the "initial recovery" data used to establish the mean number of embryos added to each experimental beaker.

At the end of the 48-hour exposure period the contents of each dish were poured through a 45μ nytex screen. Surviving larvae were retained on the screen. The test beaker was rinsed three times with seawater and each successive rinse was poured through the screen to ensure complete transfer of larvae. Larvae were quantitatively transferred from the screen into a graduated cylinder and the volume was

adjusted with a seawater-formalin mixture. Contents of the cylinder were mixed by inversion to ensure uniform distribution of larvae, and a 1 ml aliquot was transferred to a Sedgwick-Rafter counting slide for microscopic evaluation. Larvae were scored for evidence of internal tissue inside a complete larval shell. Larvae which had a complete larval shell containing tissue were counted as normal, whereas empty shells and larvae with incomplete shells were scored as abnormal. Data were reported as percent of initial embryos which survived and percent of survivors which showed normal development, as calculated below.

The control exposure, performed for quality assurance purposes, used seawater from our laboratory system. Five replicate dishes were used for each test exposure. Temperature, dissolved oxygen, pH and salinity were monitored in each test concentration and in controls at the beginning and end of the test.

The raw data resulting from these bioassays included the following:

- Counts of embryos added to five replicate test containers which had not been incubated for 48 hours (=initial recovery).

- Counts of normal and abnormal embryos from each test container that was incubated for 48 hours.

The results were calculated from these data as follows:

$$\%\ Survival = \frac{No.\ normal\ larvae\ recovered}{N} \times 100$$

$$\%\ Normal = \frac{No.\ normal\ larvae}{No.\ normal\ larvae + No.\ abnormal\ larvae} \times 100$$

where N = the mean initial number of embryos added (from initial recovery data).

For each test chamber other than controls, % survival data were adjusted to correct for mortality observed in the control exposures by use of **Abbott's correction**:

$$Corrected\ Sample\ \%\ Survival = 100 - \left(\frac{mean\ \%\ control\ survival - \%\ sample\ survival}{mean\ \%\ control\ survival} \times 100\right)$$

Percent normal development data were similarly adjusted.

For the bioassay to be considered a valid test, an average of at least 70% of the exposed embyros must survive in the controls; abnormals were counted as mortalities as per the Testing Guidelines contained in SFACOE Public Notice No. 93-2: Response to Comments on Public Notice 92-5.

Following the Scope of Services, the 100% elutriate concentrations were evaluated initially. If mean % survival and/or % normal values were ≥50%, no further evaluations were performed. If survival and/or normal development values were ≤50%, the 10% and 50% elutriate exposures were evaluated and EC_{50} and/or LC_{50} values were calculated using the Trimmed Spearman-Karber method. For LC_{50} calculations, abnormal larvae and calculated mortalities were added; whereas for EC_{50} calculations, separate abnormality counts were used, as per Public Notice 93-2 (see above).

A reference toxicant bioassay was also performed for quality assurance purposes, to verify the health and sensitivity of the test organism population. The reference toxicant used was cupric sulfate ($CuSO_4 \cdot 5H_2O$) dissolved in laboratory seawater.

2.4.1.2 Teleost Fish (*Citharichthys stigmaeus*)

Speckled sanddabs (*Citharichthys stigmaeus*) were collected from Tomales Bay by John Brezina & Associates. Fish were allowed to acclimate to laboratory conditions prior to testing. Fish were fed a high protein pellet food during the holding period until 48 hours before test initiation. Fish were neither fed nor medicated during the bioassay and the preceding 48 hours.

Fish were tested in 10-liter aquaria and were individually transferred from holding tanks to aquaria to start the test. During the bioassays, the number of survivors of the original 10 animals per tank were recorded as experimental data at 4, 8, 24, 48, 72, and 96 hours after test initiation. At each of these checkpoints, dead animals (i.e., those nonresponsive to mechanical stimulus) were removed from the test containers.

A reference toxicant bioassay was also performed on the sanddabs for quality assurance purposes, to verify the health and sensitivity of the test organism population. The reference toxicant used was Sodium Dodecyl Sulfate (SDS) dissolved in laboratory seawater.

2.4.1.3 Mysid (*Holmesmysis costata*)

Mysids (*Holmesimysis costata*) were collected from kelp beds near Monterey, California. The animals were gently concentrated with a dip net, corralled into a submerged bucket without removing them from the water and transported directly to the bioassay lab. In transit, holding tank temperatures were maintained within 2°C of the ambient temperature at sampling. Gentle aeration was supplied from a bottle of compressed oxygen. Upon arrival at the laboratory, holding tank temperature was adjusted to within 2°C of the collection water temperature. Acclimation to test temperature was accomplished at

a maximum rate of 2°C per day. Mysids were held for laboratory acclimation five or more days prior to testing. During this time and throughout testing, the mysids were fed about 50 brine shrimp (*Artemia salina*) nauplii per mysid per day to prevent mortality from starvation and cannibalism.

Mysids were tested in one-liter polycarbonate tanks containing one liter of test solution. To initiate testing, mysids were sorted into groups of 10 in small containers with very small volumes of seawater. Mysids were transferred to the test containers by submerging the containers and slowly tipping the animals into the test medium. During the bioassays, the number of survivors of the original 10 animals per tank were recorded as experimental data at 4, 8, 24, 48, 72, and 96 hours after test initiation. At each of these checkpoints, dead animals (i.e., those nonresponsive to mechanical stimulus) were removed from the test containers.

A reference toxicant bioassay was also performed on the mysids for quality assurance purposes, to verify the health and sensitivity of the test organism population. The reference toxicant used was Sodium Dodecyl Sulfate (SDS) dissolved in laboratory seawater.

2.4.1.4 Initial Mixing Calculations

In cases where an EC_{50} or LC_{50} was obtained, calculations of initial mixing were made using standardized formulae developed by the USACOE and USEPA (EPA/USACE 1977).

2.4.2 Solid Phase Static Bioassays (Amphipod):

Solid Phase materials from the site were bioassayed simultaneously with control and reference sediments. Adult *Rhepoxynius* were obtained from Northwest Aquatics, Inc., and bioassay-tested following procedures outlined by ASTM (1990) for amphipods. Five replicates of each station and reference treatment were randomly assigned to test jars. A 2-cm deep layer of appropriate sediment was added to each jar on the day prior to test initiation, and each test jar was provided with aeration via pasteur pipet. The test was started on the following day by randomly assigning 20 amphipods to each jar. The test continued for 10 days under static conditions, with constant illumination and aeration. Daily observations were made of each container, and the number of animals which had appeared on the sediment surface was noted. At this time, environmental test conditions (temperature, salinity, pH, dissolved oxygen) were measured in each test container.

At the end of the ten day exposure period, the contents of each jar were poured through a 0.5mm sieve and the number of surviving amphipods counted. Survivors from each replicate were transferred into bowls containing control sediment and monitored for their ability to rebury within one hour. Test data for each replicate therefore include number of survivors and number of survivors able to rebury.

A reference toxicant bioassay was also performed for quality assurance purposes, to verify the health and sensitivity of the test organism population. The reference toxicant used was cadmium chloride ($CdCl_2$) dissolved in laboratory seawater.

2.4.3 Solid Phase Flow-through Bioassays (Mysid Shrimp and Polychaete Worm)

Solid Phase materials from the site were bioassayed simultaneously with control and reference sediments. Control sediments were collected from Tomales Bay. Testing was performed at the Davenport facility where continuously flowing seawater is available, using testing procedures in EPA/USACE (1991). All sediments were sieved through a 1.0 mm screen to remove indigenous fauna, and a 3.0 cm layer of appropriate sediment was added to each test container. Tanks were then filled with lab seawater, and either twenty polychaete worms (*Nephtys caecoides*) or twenty mysids (*Holmesimysis costata*) were added to each container. Worms were tested in 31 L glass aquaria; mysids were tested in 1.5 L polycarbonate tanks fitted with small, screened drain holes. The small mysid containers were suspended above the larger worm containers such that when the flow-through seawater system was activated, seawater passed through the mysid tanks, overflowed through the screened drain holes into the worm tanks, then drained to sea.

Solid Phase flow-through bioassays continued for 10 days. At least twice each day, environmental systems were checked for proper functioning. Once each day, the salinity and temperature of the system were measured. Dissolved oxygen and pH values of each tank were measured twice daily.

After the 10-day bioassay period, the contents of each tank were gently washed with seawater through a 0.5-mm nylon screen. The animals were retrieved from the screen and counted. Test data were the number of survivors of each species.

A reference toxicant bioassay was also performed on the mysids for quality assurance purposes, to verify the health and sensitivity of the test organism population. The reference toxicant used was Sodium Dodecyl Sulfate (SDS) dissolved in laboratory seawater.

2.4.4 Bioaccumulation Assessment: Clam and Polychaete Worm

Bioaccumulation assessments were performed using the clam *Macoma nasuta* and the polychaete worm *Nephtys caecoides*. Animals were exposed to test and control sediments in an array of 31-liter flow-through glass aquaria. Five replicates of each harbor composite, reference composite and control sediments were randomly assigned to the test tanks. The control sediment was collected from Tomales Bay, CA. Sediments were screened through a 1.0 mm screen to remove indigenous fauna, and a 3.0 cm layer was added to each tank. Tanks were filled with water and 30 clams and 40 worms were added to each. After a one-hour settling time, the flow-through seawater system was activated and adjusted to a flow rate equivalent to 5 tank/volume changes per 24 hours (6.5 liters/hour).

Bioaccumulation assessment exposure continued for 28 days. At least twice each day, environmental systems were checked for possible malfunction. Daily monitoring of each tank for temperature and D.O. was performed. The seawater system was monitored daily for salinity and pH.

After exposure the contents of each tank were gently washed with seawater through a 0.5-mm nylon screen from which the animals were retrieved. Surviving clams were transferred to filtered flowing seawater for gut evacuation: Two days were required for evacuation as indicated by the absence of fecal pellet formation. Surviving worms were transferred to 30-liter flow-through aquaria containing a 3-cm layer of fine, clean sand. Visual inspection of individuals confirmed how much time (typically 24 hours) was necessary for complete gut evacuation in worms. Directly following these treatments, the soft tissues of clams and worms were homogenized for chemical analyses.

Based on EPA and SFACOE review of the sediment chemistry results for the three harbor composites (EKUP, SAMTB and FLTB) metals were determined to be the only contaminants of concern (those to be analyzed in the bioaccumulation assessment). The sediment data revealed no detectable Dioxins, PAHs, phenols, chlorinated pesticides or PCBs, while total organotins were detected at 1 to 2 ppb, close to detection limits. Metals analyses of the exposed tissues subsequently were performed at ToxScan's analytical facility in Watsonville, California. Analytical methods are summarized in Section 2.3; detection limits are detailed in Section 3.2 (Table 4).

3.0 Results

Sediment physical, chemical, and bioassay analyses are summarized in Table 1. Fourteen samples (including one replicate) were analyzed for particle size distribution (PSD) only (North Bay, Entrance and Bar samples). Twenty six samples were analyzed for PSD and sediment chemistry. These comprised twenty-one discrete samples plus the three harbor composites (Eureka Upper Channel, Samoa Turning Basin and Field's Landing Lower Channel and Turning Basin) plus one reference site composite, and one control sediment. Bioassay and bioaccumulation testing was performed on the four composites and the control sediment; subsamples of these were subcontracted for dioxin (2,3,7,8-TCDD and 2,3,7,8-TCDF) analysis.

3.1 Sediment Physical Analysis

The particle size distributions of the sediment samples and composites are summarized in Table 5 and detailed in Appendix C. The North Bay, Entrance and Bar samples each contained at least 95% coarse sediments by weight ($\Phi \leq 4$). Coarse sediment composition of the three harbor composites were as follows: Eureka Upper Channel (EKUP) = 76.3%; Samoa Turning Basin (SAMTB) = 81.2%; and Field's Landing Lower Channel and Turning Basin (FLTB) = 58.5%. The disposal site reference (REF) composite contained 77% coarse sediments, and the control sediment (from Tomales Bay) contained 94.6% coarse particles.

3.2 Bulk Sediment Chemistry

Results of bulk sediment chemical analyses of the Humboldt Harbor sediment samples and composites are summarized in Table 4. The laboratory reports are presented in Appendix C, and QA/QC reports are presented in Appendix D. Chains of Custody are Presented in Appendix E. The discussion below is generally limited to analyses of the harbor and reference composites and the Tomales Bay control sediment; please refer to the Appendix C for results of analyses of the individual samples.

Metals. The Humboldt Harbor sediment composites were analyzed for ten metals. Except for cadmium and selenium, metals concentrations in the Harbor composites were similar to or less than those found in the Reference composite. Metals concentrations in the harbor composites were generally higher than those of the Tomales Bay control sediment. Within the Harbor composites, Comp FLTB tended to have the highest metals concentrations, with cadmium levels twice that of the reference composite, and selenium levels 1.7x the reference. Relative to the Tomales Bay control sediment, FLTB contained nearly seven times the copper and 3.4 to 3.8 times the selenium, nickel and chromium. SAMTB and EKUP also had elevated levels of these four metals (Cu, Se, Ni and Cr) relative to the Tomales Bay sediments.

Individual accounts of the ten metals analyzed in these sediments are as follows:

Arsenic (Ag). Concentrations of arsenic ranged from 5.2 ppm to 6.0 ppm in the harbor composites. Of the harbor samples, only FLTB exceeded (by 1.1x) the 5.5 ppm of arsenic found in the reference composite. Arsenic concentrations in each of the harbor composites exceeded (by 1.5x to 1.7x) the levels found in the Tomales Bay control sediment.

Cadmium (Cd). Concentrations of cadmium ranged from 0.05 ppm to 0.11 ppm in the harbor composites. Of the harbor samples, only FLTB exceeded (by 2.2x) the 0.05 ppm of cadmium found in the reference composite and in the Tomales Bay control sediment.

Chromium (Cr). Concentrations of chromium ranged from 120 ppm to 160 ppm in the harbor composites. Of the harbor samples, only FLTB exceeded (by 1.1x) the 150 ppm of chromium found in the reference composite. Chromium concentrations in each of the harbor composites exceeded (by 2.6x to 3.5x) the levels found in the Tomales Bay control sediment.

Copper (Cu). Concentrations of copper ranged from 13 ppm to 20 ppm in the harbor composites. Of the harbor samples, FLTB (1.3x) and EKUP (1.1x) exceeded the 15 ppm of copper found in the reference composite. Copper concentrations in each of the harbor composites exceeded (by 4.3x to 6.7x) the levels found in the Tomales Bay control sediment.

Lead (Pb). Concentrations of lead ranged from 4.4 ppm to 5.6 ppm in the harbor composites. Of the harbor samples, FLTB (1.1x) and EKUP (1.1x) exceeded the 4.9 ppm of lead found in the reference composite. Lead concentrations in each of the harbor composites exceeded (by 2.0x to 2.6x) the levels found in the Tomales Bay control sediment.

Mercury (Hg). Concentrations of mercury ranged from 0.02 ppm to 0.03 ppm in the harbor composites. None of the harbor samples exceeded the 0.03 ppm of mercury found in the reference composite. Mercury concentrations in harbor composites SAMTB and FLTB exceeded (by 1.5x) the levels found in the Tomales Bay control sediment.

Nickel (Ni). Concentrations of nickel ranged from 60 ppm to 76 ppm in the harbor composites. Of the harbor samples, none of the harbor composites exceeded the 78 ppm of nickel found in the reference composite. Nickel concentrations in each of the harbor composites exceeded (by 3.0x to 3.8x) the levels found in the Tomales Bay control sediment.

Selenium (Se). Concentrations of selenium ranged from 0.12 ppm to 0.17 ppm in the harbor composites. Each of the harbor samples, exceeded (by 1.2x to 1.7x) the 0.10 ppm of selenium found in the reference composite, and (by 2.4x to 3.4x) the levels found in the Tomales Bay control sediment.

Silver (Ag). Concentrations of silver were 0.05 ppm in each of the harbor composites, and also in the reference and Tomales Bay control samples.

Zinc (Zn). Concentrations of zinc ranged from 43 ppm to 54 ppm in the harbor composites. None of the harbor samples exceeded the 50 ppm of zinc found in the reference composite. Zinc concentrations in each of the harbor composites exceeded (by 2.4x to 3.0x) the levels found in the Tomales Bay control sediment.

Butyltins. Three organotins (tri-, di-, and mono-butyltin) were measured in the Oakland Harbor sediment composites. A small amount (1 ppb) of dibutyltin was detected in the SAMTB composite. Similarly, 1 ppb of tributyltin was found in all three harbor channel composites. No mono- or tetrabutyltins were detected from the harbor composites, and the reference and control sediments contained no detectable butyltins.

Semivolatiles. Phthalate esters, phenols and seventeen polynuclear aromatic hydrocarbons (PAHs) were measured in the Humboldt Harbor sediment composites. None of the harbor composites, reference or Tomales Bay control sediments contained detectable phthalates, phenols or PAHs.

Chlorinated Pesticides and PCBs. The Humboldt Harbor sediment composites were analyzed for the eighteen chlorinated pesticides and four polychlorinated biphenyls (PCBs as Aroclors). None of the harbor composites, reference or Tomales Bay control sediments contained detectable amounts of these substances.

Dioxins. The Humboldt Harbor composites were analylzed for 3,7,8-TCDD and 3,7,8-TCDF by Alta Analytical Laboratories, (El Dorado Hills, CA). None were found in any of the sediments tested.

Sediment Conventionals. Total sulfides ranged from 11 ppm to 160 ppm in the harbor sediment composites; individual sample EK4 contained 420 ppm, and sample FL2 contained 290 ppm. Except for a trace amount (0.1 ppm) in the EKUP composite, no water soluble sulfides were found in the harbor composites, the reference composite, or the Tomales Bay control sediment.

Oil and Grease (22 ppm) was detected only in the SAMTB composite; total petroleum hydrocarbon were not detected in the harbor and reference composites, nor in the Tomales Bay control sediment.

Percent solids in the harbor composites ranged from 68% to 77% compared to 77% in both the reference composite and the Tomales Bay control sediment; total organic carbon ranged from 0.1% to 0.3% in the harbor composites. TOC was not detectable in the reference composite, nor in the Tomales Bay control sediment.

Sediment Chemistry Summary. Except for slightly elevated levels of cadmium (2x) and selenium (1.7x) Humboldt Harbor sediments appear to contain no unusually high concentrations of any of the tested substances or compounds when compared to the reference site sediments. Compared to the home control sediment from Tomales Bay, the Humboldt sediments appeared only to contain elevated concentrations of metals except silver and mercury (see above). Organics (except traces of two butyltin species) were not detectable in the harbor sediments. Sediment conventional levels were also low.

3.3 Bioassay Test Results

3.3.1 Suspended Particulate Phase Bioassays

Suspended Particulate Phase bioassay testing of the Humboldt Harbor sediments comprised three species: a bivalve larva, a teleost fish and a mysid shrimp. Results of these bioassays are summarized below, and in Tables 6 through 8.

3.3.1.1 Bivalve Larvae

Results of bivalve larvae (*M. edulis*) tests are presented in Table 6; reference toxicant data and environmental monitoring data are presented in Appendix D.

Survival. Mean survival in the laboratory seawater control was 98.4%, well within the ASTM (1989) protocol requirements of ≥70 percent. The reference site sediment 100% elutriate produced 71.4% survival, Abbott's-corrected to 72.6%. Abbott's corrected mean survival in the 100% elutriates of the Humboldt Harbor composites ranged from 82.6% in Eureka Upper Channel to 91.0% in Fields Landing Lower Channel and Turning Basin. None of the harbor sediment bivalve tests demonstrated enough toxicity to generate an LC_{50}.

Development. Mean normal development values (adjusted with Abbott's correction) for bivalve larvae exposed to 100% elutriates of the test sediment ranged from 96.3% in Field's Landing Channel to 98.3% in Eureka Upper Channel. Normal development in the disposal site reference elutriate was 77.6%, Abbott's-corrected to 80.6%. Normal development the laboratory seawater control was 96.3%. None of the Humboldt Harbor sediment bivalve tests demonstrated enough toxicity to generate an EC_{50}.

Reference Toxicant. The bivalve reference toxicant LC_{50} was 6.54 ppb Cu (95% CL: 5.87 - 7.28), and the EC_{50} for development was 8.50 ppb (95% CL: 7.89 - 9.15). These values are within ±2 SD of the mean of EC_{50}s calculated from previous *Mytilus*:copper reference toxicant tests.

3.3.1.2 Mysid Shrimp

Mean survival of the mysid *Holesimysis costata* in the Humboldt Harbor sediment elutriates ranged from 98% to 100% (Table 7). Home sediment control survival was 100% and the reference site composite survival was 98%. Mysid survival in the harbor composites was not significantly different than reference site survival (Steel's Many-One Rank Test: p=0.05, n=3).

Reference Toxicant. The mysid reference toxicant 96 hour LC_{50} was 3.49 ppt SDS (95% CL: 3.02 - 4.02). This value is within ±2 SD of the mean of LC_{50}s calculated from previous *Holmesimysis* : SDS reference toxicant tests.

3.3.1.3 Teleost Fish

Mean survival of the sandab *Citharichthys stigmaeus* in the Humboldt Harbor sediment elutriates ranged from 98% to 100% (Table 8). The home sediment control and the reference site composite each recorded 100% survival. Sandab survival in the harbor composites was not significantly different than reference site survival (Steel's Many-One Rank Test: p=0.05, n=3).

Reference Toxicant. The sanddab reference toxicant 96 hour LC_{50} was 2.19 ppt SDS (95% CL: 1.94 - 2.48). This value is within ±2 SD of the mean of LC_{50}s calculated from previous *Citharichthys* SDS reference toxicant tests.

3.3.1.4 Initial Mixing Calculations

Initial mixing calculations were not necessary for these sediments because none of the suspended particulate phase bioassays produced EC_{50}'s or LC_{50}'s.

3.3.2 Solid Phase Static Bioassay (Amphipod)

Solid phase static bioassay results are summarized below and in Table 9. Reference toxicant data and environmental monitoring data are presented in Appendix D.

Survival. Mean survival of the amphipod *Rhepoxynius abronius* in the Humboldt Harbor sediment composites ranged from 87.0% to 93.0% (versus 93.0% in the home sediment control and 94.0% in the reference site composite. Survival in the harbor composites did not differ significantly from reference site survival (Dunnett's Test: p=0.05, df=16,3).

Reference Toxicant. The amphipod reference toxicant 96 hour LC_{50} was 0.85 ppb Cd (95% CL: 0.69 - 1.06). This value is within ±2 SD of the mean of LC_{50}s calculated from previous *Holmesimysis* : SDS reference toxicant tests.

3.3.3 Solid Phase Flow-Through Bioassays: Mysid Shrimp and Polychaete Worm

Solid phase flow-through bioassay results are summarized below and in Tables 10 and 11. Reference toxicant data and environmental monitoring data are presented in Appendix D.

Mysid Shrimp Survival. Mean survival of *Holmesimysis costata* in the Humboldt Harbor sediment composites ranged from 95% to 96% (versus 97% in the home sediment control and 95% in the reference composite. Mysid survival did not differ significantly from survival in the reference site composite (Dunnet's Test: p=0.05, df=16,3).

Reference Toxicant. The mysid reference toxicant 96 hour LC_{50} was 3.49 ppt SDS (95% CL: 3.02 - 4.02). This value is within ± 2 SD of the mean of LC_{50}s calculated from previous *Rhepoxynius:*c-admium reference toxicant tests.

Polychaete Worm Survival. Mean survival of *Nephtys caecoides* in the Humboldt Harbor sediment composites ranged from 90% to 97% (versus 100% in the home sediment control and 99% in the reference composite. Polychaete survival in samples Comp EKUP (Eureka Upper Channel) and Comp FLTB (Field's Landing Lower Channel and Turning Basin) were significantly diminished compared to survival in the reference site composite Dunnett's Test (p=0.05, df=16,3).

Reference Toxicant. A reference toxicant test was not run with this species.

3.3.4 Bioaccumulation Analyses (Clam and Worm)

Exposed tissue burdens of metals for clams (*Macoma nasuta*) and worms (*Nephtys caecoides*) are presented in Table 12. Results of statistical analyses of clam tissue data are summarized in Table 13, and tissue analytical data are presented in Appendix C-2. Statistical analyses of worm (*Nephtys caecoides*) tissue data are summarized in Table 14, and the data are also presented in Appendix C-2.

Twenty-eight day exposure of clams to Eureka Upper Channel (EKUP) and Fields Landing Lower Channel and Turning Basin (FLTB) sediments resulted in statistically significant elevations of tissue chromium, copper, lead and nickel when compared with clams exposed to reference sediments for 28 days. Clams exposed to Samoa Turning Basin (SAMTB) sediments showed elevated levels of tissue chromium, lead and nickel. Among the four significantly bioaccumulating metals, nickel concentrations averaged 4.4x that of the reference tissue accumulation, whereas chromium, copper and lead averaged 1.4x to 1.9x the reference values.

Worms exposed for twenty-eight days to EKUP sediments showed significantly elevated tissue burdens of arsenic and lead when compared to the reference sediment. In SAMTB sediments, worms

showed significantly elevated tissue lead levels, while in FLTB sediments worms demonstrated significantly elevated tissue arsenic concentrations. Although statistically significant, the differences between the harbor sediment-exposed tissues and the reference sediment-exposed tissues were rather small: EKUP and FLTB tissue arsenic concentrations each were 1.1x the reference; EKUP and SAMTB tissue lead concentrations were 1.4x and 1.3x the reference tissue levels. Although each of the harbor sediment-exposed tissue burdens of these two metals exceeded their respective Tomales Bay control treatments, the baseline tissue levels of lead (1.2 ppm) were higher than concentrations found in the harbor sediment-exposed tissues (however, baseline values result from a single, non-replicated sample).

Sediment concentrations of the bioaccumulated metals were relatively similar in reference and test sediments; in fact, concentrations of cadmium, nickel and zinc in *Nephtys* was slightly higher in the reference composite than in any of the test composites. Similarly, for *Macoma*, reference-exposed tissue accumulation of arsenic and selenium exceeded the values found in the harbor-exposed tissues. However, in general, the harbor-exposed tissues tended to accumulate more metals than did the reference-exposed tissues. The increased biological availability of these metals in the test sediments may be related to slight organic enrichment and/or slightly smaller particle size in the test composites as compared with the reference composite.

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TABLES

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Table 1. Analyses performed, Humboldt Bay Baseline Survey I (FY 1993). Shaded samples composited; SPP = Suspended Particulate Phase.

SAMPLE	ANALYSES: Initial Grain Size	Sediment Chemistry	Solid Phase Bioassay	SPP Bioassay
North Bay Channel:				
NB1	YES	NO	NO	NO
NB2	YES	NO	NO	NO
NB3	YES	NO	NO	NO
NB4	YES	NO	NO	NO
NB5	YES	NO	NO	NO
NB6	YES	NO	NO	NO
NB7	YES	NO	NO	NO
NB8	YES	NO	NO	NO
NB9	YES	NO	NO	NO
NB10	YES	NO	NO	NO
Samoa Turning Basin:				
SAM1	YES	YES	NO	NO
SAM2	YES	YES	NO	NO
SAM3	YES	YES	NO	NO
SAM4	YES	YES	NO	NO
SAM5	YES	YES	NO	NO
Comp SAMTB:	YES	YES	YES	YES
SAM6-A	YES	YES	NO	NO
SAM6-B	YES	YES	NO	NO
SAM6-C	YES	YES	NO	NO
SAM7	YES	YES	NO	NO
Eureka Upper Channel:				
EK1	YES	YES	NO	NO
Comp EKUP:	YES	YES	YES	YES
EK2	YES	YES	NO	NO
EK3	YES	YES	NO	NO
EK4	YES	YES	NO	NO
Fields Landing Lower Channel and Turning Basin:				
Comp FLTB:	YES	YES	YES	YES
FL1	YES	YES	NO	NO
FL2	YES	YES	NO	NO
FL3	YES	YES	NO	NO
FL4	YES	YES	NO	NO
FL5	YES	YES	NO	NO
FL6	YES	YES	NO	NO
FL7	YES	YES	NO	NO
FL8	YES	YES	NO	NO
Entrance Channel, Bar, Reference Site and Control:				
ENT1	YES	NO	NO	NO
ENT2	YES	NO	NO	NO
BAR1	YES	NO	NO	NO
REF	YES	YES	YES	YES
CONTROL	YES	YES	YES	YES

Table 2. Sediment samples collected, Humboldt Bay Baseline Survey I (FY 1993). Samples collected by vibracore or Smith-Macintyre grab; shaded samples composited.

SAMPLE		DATE	TIME	Core Penetration (Feet) ACHIEVED	SAMPLED	California State Plane Coordinates[1] NORTH	EAST
North Bay Channel:							
NB1		10/30/92	10:05	GRAB[2]		525031	1384394
NB2		10/30/92	09:59	GRAB		526030	1384057
NB3		10/30/92	09:44	GRAB		528797	1386523
NB4		10/30/92	09:35	GRAB		530599	1387800
NB5		10/30/92	09:14	GRAB		531749	1389435
NB6		10/29/92	15:54	GRAB		533758	1391370
NB7a		10/29/92	16:22	GRAB		535830	1392466
NB7b		10/29/92	16:35	GRAB		535752	1392243
NB8		10/29/92	08:38	GRAB		537273	1393224
NB9		10/31/92	08:00	GRAB		538721	1393809
NB10		10/31/92	08:12	GRAB		540443	1394440
Samoa Turning Basin (SAMTB):							
SAM1		10/31/92	08:22	GRAB		541705	1394795
SAM2		10/31/92	08:30	GRAB		542592	1395004
SAM3		10/31/92	08:42	GRAB		544002	1395528
SAM4		10/31/92	08:52	GRAB		545288	1395694
SAM5		10/31/92	09:01	GRAB		547195	1397435
SAM6	A	10/31/92	10:05	GRAB		547717	1397065
SAM6	B	10/31/92	11:15	2.8	2.8	547415	1397729
SAM6	C	10/31/92	12:10	3.5	3.5	548045	1397400
SAM7		10/31/92	09:22	GRAB		548062	1399100
Eureka Upper Channel (EKUP):							
EK1		10/31/92	14:50	1.6	1.6	541616	1394926
EK2		11/01/92	09:00	1.5	1.5	543229	1396864
EK3		11/01/92	10:30	5.2	5.2	543538	1397512
EK4		11/01/92	11:45	GRAB		543931	1394440
Fields Landing Lower Channel and Turning Basin (FLTB):							
FL1		10/30/92	13:50	GRAB		513761	1383887
FL2		10/30/92	14:51	GRAB		514038	1384234
FL3		10/30/92	15:16	GRAB		514435	1383990
FL4		10/30/92	12:08	GRAB		515405	1384560
FL5		10/30/92	10:56	GRAB		517266	1385306
FL6		10/30/92	10:45	GRAB		519218	1384729
FL7		10/30/92	10:32	GRAB		521153	1383800
FL8		10/30/92	10:19	GRAB		523119	1384683
Entrance Channel, Bar and Reference Site:							
ENT1		11/02/92	11:45	GRAB		526029	1382439
ENT2		11/02/92	12:00	GRAB		529168	1380331
BAR1		11/02/92	12:10	GRAB		530790	1377603
REF1		11/02/92	13:15	GRAB		524696	1351329

[1] Field measurements of station locations were made in latitude × longitude (see Field Logs, Appendix A), and converted here to California State Plane Coordinates.

[2] Grab samples (except Entrance and Bar) were taken only where depth from bottom to project depth was less than 1.5 ft; Entrance and Bar stations were grab sampled due to wind and sea conditions.

Table 3. Biological assessments, Humboldt Bay Baseline Survey I (FY 1993).

Test Species:	SP	SPP	BA
R. abronius	X	-	-
M. edulis	-	X	-
H. costata	X	X	-
C. stigmaeus	-	X	-
N. caecoides	X	-	X
M. nasuta	-	-	X

X = test performed

SP = Solid Phase Bioassay; SPP = Suspended Particulate Phase Bioassay; BA = Bioaccumulation

Table 4. Sediment chemistry summary, Humboldt Bay Baseline Survey I (FY 1993).

Analyte	Sampling Sections					Detection Limit
	EKUP	SAMTB	FLTB	REF	Control	
METALS (ppm, dry wt)						
Arsenic	5.3	5.2	6.0	5.5	3.5	0.1
Cadmium	ND	ND	0.11	ND	ND	0.1
Chromium	120	140	160	150	46	0.1
Copper	16	13	20	15	3	0.1
Lead	5.6	4.4	5.3	4.9	2.2	0.1
Mercury	0.02	0.03	0.03	0.03	0.02	0.02
Nickel	65	60	76	78	20	0.1
Selenium	0.13	0.12	0.17	0.10	ND	0.1
Silver	ND	ND	ND	ND	ND	0.1
Zinc	49	43	54	50	18	1.0
ORGANOTINS (ppb, dry weight)						
Monobutyltin	ND	ND	ND	ND	ND	1.0
Dibutyltin	ND	1	ND	ND	ND	1.0
Tributyltin	1	1	1	ND	ND	1.0
Tetrabutyltin	ND	ND	ND	ND	ND	1.0
PAHs (ppb, dry wt)						
2-Methyl naphthalene	ND	ND	ND	ND	ND	8
Naphthalene	ND	ND	ND	ND	ND	20
Acenaphthylene	ND	ND	ND	ND	ND	6
Acenaphthene	ND	ND	ND	ND	ND	8
Fluorene	ND	ND	ND	ND	ND	20
Phenanthrene	ND	ND	ND	ND	ND	20
Anthracene	ND	ND	ND	ND	ND	20
Fluoranthene	ND	ND	ND	ND	ND	20
Pyrene	ND	ND	ND	ND	ND	40
Chrysene	ND	ND	ND	ND	ND	30
Benzo(a)anthracene	ND	ND	ND	ND	ND	20
Benzo(b)fluoranthene	ND	ND	ND	ND	ND	20
Benzo(k)fluoranthene	ND	ND	ND	ND	ND	20
Benzo(a)pyrene	ND	ND	ND	ND	ND	20
Indeno[1,2,3-CD]pyrene	ND	ND	ND	ND	ND	20
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND	20
Benzo[ghi]perylene	ND	ND	ND	ND	ND	40
total PAHs	ND	ND	ND	ND	ND	
PHENOLS (ppb, dry wt)						
Phenol	ND	ND	ND	ND	ND	10
2,4-Dimethylphenol	ND	ND	ND	ND	ND	10
2,4-Dichlorophenol	ND	ND	ND	ND	ND	40
Pentachlorophenol	ND	ND	ND	ND	ND	40
Total Chlorinated phenol	ND	ND	ND	ND	ND	4-60
total phenols	ND	ND	ND	ND	ND	
DIOXINS (pptr, dry wt)						
2,3,7,8-TCDD	ND	ND	ND	ND	ND	0.24
2,3,7,8-TCDF	ND	ND	ND	ND	ND	0.39

Table 4, continued. Sediment chemistry summary, Humboldt Bay Baseline Survey I (FY 1993).

Analyte	Sampling Sections					Detection Limit
	EKUP	SAMTB	FLTB	Ref Comp	Control	
MISCELLANEOUS CHEMISTRIES						
Total sulfides (ppm, dry)	160	48	11	ND	53	0.1
Water soluble sulfides (ppm, dry)	0.1	ND	ND	ND	ND	0.1
Oil & Grease (ppm, dry)	ND	22	ND	ND	ND	20
Petroleum Hydrocarbons (ppm, dry)	ND	ND	ND	ND	ND	20
% Solids (%)	75	77	68	77	77	0.1
TOC (%)	0.1	0.1	0.3	ND	ND	0.1
CHLORINATED PESTICIDES (ppb, dry weight)						
Aldrin	ND	ND	ND	ND	ND	0.5
alpha-BHC	ND	ND	ND	ND	ND	0.5-1.0
beta-BHC	ND	ND	ND	ND	ND	0.5-1.0
delta-BHC	ND	ND	ND	ND	ND	0.5-1.0
gamma-BHC (lindane)	ND	ND	ND	ND	ND	0.5-1.0
alpha-Chlordane	ND	ND	ND	ND	ND	5.0
gamma-Chlordane	ND	ND	ND	ND	ND	5.0
2,4'-DDD	ND	ND	ND	ND	ND	1.0
4,4'-DDD	ND	ND	ND	ND	ND	1.0
2,4'-DDE	ND	ND	ND	ND	ND	0.5
4,4'-DDE	ND	ND	ND	ND	ND	0.5
2,4'-DDT	ND	ND	ND	ND	ND	1.0
4,4'-DDT	ND	ND	ND	ND	ND	1.0
Dieldrin	ND	ND	ND	ND	ND	0.5
Endosulfan I	ND	ND	ND	ND	ND	2.0
Endosulfan II	ND	ND	ND	ND	ND	0.5
Endosulfan sulfate	ND	ND	ND	ND	ND	10
Endrin	ND	ND	ND	ND	ND	0.5
Endrin aldehyde	ND	ND	ND	ND	ND	0.5
Heptachlor	ND	ND	ND	ND	ND	0.5
Heptachlor epoxide	ND	ND	ND	ND	ND	10
Methoxychlor	ND	ND	ND	ND	ND	10
Toxaphene	ND	ND	ND	ND	ND	30
PCBs (ppb, dry weight)						
PCB 1242	ND	ND	ND	ND	ND	20
PCB 1248	ND	ND	ND	ND	ND	20
PCB 1254	ND	ND	ND	ND	ND	20
PCB 1260	ND	ND	ND	ND	ND	20
total PCBs	ND	ND	ND	ND	ND	

Table 4, continued. Sediment chemistry summary, Humboldt Bay Baseline Survey I (FY 1993).

Analyte	Sampling Sections EK1	EK2	EK3	EK4	Detection Limit
METALS (ppm, dry wt)					
Arsenic	5.7	5.2	5.1	6.2	0.1
Cadmium	ND	ND	ND	0.11	0.1
Chromium	86	110	130	160	0.1
Copper	8	11	15	25	0.1
Lead	3.2	4.4	5.2	7.3	0.1
Mercury	0.02	0.02	0.02	0.03	0.02
Nickel	39	56	62	85	0.1
Selenium	ND	ND	0.10	0.18	0.1
Silver	ND	ND	ND	ND	0.1
Zinc	32	40	ND	67	1.0
ORGANOTINS (ppb, dry weight)					
Monobutyltin	ND	ND	ND	ND	1.0
Dibutyltin	ND	ND	ND	ND	1.0
Tributyltin	ND	ND	ND	2	1.0
Tetrabutyltin	ND	ND	ND	ND	1.0
PAHs (ppb, dry wt)					
2-Methyl naphthalene	ND	ND	ND	ND	8
Naphthalene	ND	ND	ND	ND	20
Acenaphthylene	ND	ND	ND	ND	6
Acenaphthene	ND	ND	ND	ND	8
Fluorene	ND	ND	ND	ND	20
Phenanthrene	ND	ND	ND	ND	20
Anthracene	ND	ND	ND	ND	20
Fluoranthene	ND	ND	ND	ND	20
Pyrene	ND	ND	ND	ND	40
Chrysene	ND	ND	ND	ND	30
Benzo(a)anthracene	ND	ND	ND	ND	20
Benzo(b)fluoranthene	ND	ND	ND	ND	20
Benzo(k)fluoranthene	ND	ND	ND	ND	20
Benzo(a)pyrene	ND	ND	ND	ND	20
Indeno[1,2,3-CD]pyrene	ND	ND	ND	ND	20
Dibenzo(a,h)anthracene	ND	ND	ND	ND	20
Benzo[ghi]perylene	ND	ND	ND	ND	40
total PAHs	ND	ND	ND	ND	
PHENOLS (ppb, dry wt)					
Phenol	ND	ND	ND	ND	10
2,4-Dimethylphenol	ND	ND	ND	ND	10
2,4-Dichlorophenol	ND	ND	ND	ND	40
Pentachlorophenol	ND	ND	ND	ND	40
Total Chlorinated phenol	ND	ND	ND	ND	4-60
total phenols	ND	ND	ND	ND	

Table 4, continued. Sediment chemistry summary, Humboldt Bay Baseline Survey I (FY 1993).

Analyte	Sampling Sections				Detection Limit
	EK1	EK2	EK3	EK4	
MISCELLANEOUS CHEMISTRIES					
Total sulfides (ppm, dry)	ND	16	15	420	0.1
Water soluble sulfides (ppm, dry)	ND	ND	ND	ND	0.1
Oil & Grease (ppm, dry)	160	ND	ND	36	20
Petroleum Hydrocarbons (ppm, dry)	ND	ND	ND	21	20
% Solids (%)	85	82	79	62	0.1
TOC (%)	0.1	0.1	0.3	0.5	0.1
CHLORINATED PESTICIDES (ppb, dry weight)					
Aldrin	ND	ND	ND	ND	0.5
alpha-BHC	ND	ND	ND	ND	0.5-1.0
beta-BHC	ND	ND	ND	ND	0.5-1.0
delta-BHC	ND	ND	ND	ND	0.5-1.0
gamma-BHC (lindane)	ND	ND	ND	ND	0.5-1.0
alpha-Chlordane	ND	ND	ND	ND	5.0
gamma-Chlordane	ND	ND	ND	ND	5.0
2,4'-DDD	ND	ND	ND	ND	1.0
4,4'-DDD	ND	ND	ND	ND	1.0
2,4'-DDE	ND	ND	ND	ND	0.5
4,4'-DDE	ND	ND	ND	ND	0.5
2,4'-DDT	ND	ND	ND	ND	1.0
4,4'-DDT	ND	ND	ND	ND	1.0
Dieldrin	ND	ND	ND	ND	0.5
Endosulfan I	ND	ND	ND	ND	2.0
Endosulfan II	ND	ND	ND	ND	0.5
Endosulfan sulfate	ND	ND	ND	ND	10
Endrin	ND	ND	ND	ND	0.5
Endrin aldehyde	ND	ND	ND	ND	0.5
Heptachlor	ND	ND	ND	ND	0.5
Heptachlor epoxide	ND	ND	ND	ND	10
Methoxychlor	ND	ND	ND	ND	10
Toxaphene	ND	ND	ND	ND	30
PCBs (ppb, dry weight)					
PCB 1242	ND	ND	ND	ND	20
PCB 1248	ND	ND	ND	ND	20
PCB 1254	ND	ND	ND	ND	20
PCB 1260	ND	ND	ND	ND	20
total PCBs	ND	ND	ND	ND	

Table 4, continued. Sediment chemistry summary, Humboldt Bay Baseline Survey I (FY 1993).

Analyte	Sampling Sections				Detection Limit
	SAM1	SAM2	SAM3	SAM4	
METALS (ppm, dry wt)					
Arsenic	4.9	4.9	4.7	6.0	0.1
Cadmium	ND	ND	ND	ND	0.1
Chromium	100	110	88	110	0.1
Copper	8	6	6	7	0.1
Lead	3.8	4.0	3.4	4.1	0.1
Mercury	0.05	0.02	0.03	0.03	0.02
Nickel	41	44	42	42	0.1
Selenium	ND	ND	ND	ND	0.1
Silver	ND	ND	ND	ND	0.1
Zinc	29	31	29	32	1.0
ORGANOTINS (ppb, dry weight)					
Monobutyltin	ND	ND	ND	ND	1.0
Dibutyltin	ND	ND	ND	ND	1.0
Tributyltin	ND	1	ND	ND	1.0
Tetrabutyltin	ND	ND	ND	ND	1.0
PAHs (ppb, dry wt)					
2-Methyl naphthalene	ND	ND	ND	ND	8
Naphthalene	ND	ND	ND	ND	20
Acenaphthylene	ND	ND	ND	ND	6
Acenaphthene	ND	ND	ND	ND	8
Fluorene	ND	ND	ND	ND	20
Phenanthrene	ND	ND	ND	ND	20
Anthracene	ND	ND	ND	ND	20
Fluoranthene	ND	ND	ND	ND	20
Pyrene	ND	ND	ND	ND	40
Chrysene	ND	ND	ND	ND	30
Benzo(a)anthracene	ND	ND	ND	ND	20
Benzo(b)fluoranthene	ND	ND	ND	ND	20
Benzo(k)fluoranthene	ND	ND	ND	ND	20
Benzo(a)pyrene	ND	ND	ND	ND	20
Indeno[1,2,3-CD]pyrene	ND	ND	ND	ND	20
Dibenzo(a,h)anthracene	ND	ND	ND	ND	20
Benzo[ghi]perylene	ND	ND	ND	ND	40
total PAHs	ND	ND	ND	ND	
PHENOLS (ppb, dry wt)					
Phenol	ND	ND	ND	ND	10
2,4-Dimethylphenol	ND	ND	ND	ND	10
2,4-Dichlorophenol	ND	ND	ND	ND	40
Pentachlorophenol	ND	ND	ND	ND	40
Total Chlorinated phenol	ND	ND	ND	ND	4-60
total phenols	ND	ND	ND	ND	

Table 4, continued. Sediment chemistry summary, Humboldt Bay Baseline Survey I (FY 1993).

Analyte	Sampling Sections				Detection Limit
	SAM1	SAM2	SAM3	SAM4	
MISCELLANEOUS CHEMISTRIES					
Total sulfides (ppm, dry)	ND	ND	ND	2.4	0.1
Water soluble sulfides (ppm, dry)	ND	ND	ND	ND	0.1
Oil & Grease (ppm, dry)	ND	56	ND	ND	20
Petroleum Hydrocarbons (ppm, dry)	ND	ND	ND	ND	20
% Solids (%)	80	80	78	79	0.1
TOC (%)	ND	ND	ND	0.1	0.1
CHLORINATED PESTICIDES (ppb, dry weight)					
Aldrin	ND	ND	ND	ND	0.5
alpha-BHC	ND	ND	ND	ND	0.5-1.0
beta-BHC	ND	ND	ND	ND	0.5-1.0
delta-BHC	ND	ND	ND	ND	0.5-1.0
gamma-BHC (lindane)	ND	ND	ND	ND	0.5-1.0
alpha-Chlordane	ND	ND	ND	ND	5.0
gamma-Chlordane	ND	ND	ND	ND	5.0
2,4'-DDD	ND	ND	ND	ND	1.0
4,4'-DDD	ND	ND	ND	ND	1.0
2,4'-DDE	ND	ND	ND	ND	0.5
4,4'-DDE	ND	ND	3.3	ND	0.5
2,4'-DDT	ND	ND	ND	ND	1.0
4,4'-DDT	ND	ND	ND	ND	1.0
Dieldrin	ND	ND	ND	ND	0.5
Endosulfan I	ND	ND	ND	ND	2.0
Endosulfan II	ND	ND	ND	ND	0.5
Endosulfan sulfate	ND	ND	ND	ND	10
Endrin	ND	ND	ND	ND	0.5
Endrin aldehyde	ND	ND	ND	ND	0.5
Heptachlor	ND	ND	ND	ND	0.5
Heptachlor epoxide	ND	ND	ND	ND	10
Methoxychlor	ND	ND	ND	ND	10
Toxaphene	ND	ND	ND	ND	30
PCBs (ppb, dry weight)					
PCB 1242	ND	ND	ND	ND	20
PCB 1248	ND	ND	ND	ND	20
PCB 1254	ND	ND	ND	ND	20
PCB 1260	ND	ND	ND	ND	20
total PCBs	ND	ND	ND	ND	

Table 4, continued. Sediment chemistry summary, Humboldt Bay Baseline Survey I (FY 1993).

Analyte	Sampling Sections					Detection Limit
	SAM5	SAM6-A	SAM6-B	SAM6-C	SAM7	
METALS (ppm, dry wt)						
Arsenic	6.0	5.3	5.7	5.9	5.4	0.1
Cadmium	ND	ND	ND	ND	ND	0.1
Chromium	120	150	160	160	120	0.1
Copper	7	15	18	14	7	0.1
Lead	4.5	4.9	5.7	5.4	4.6	0.1
Mercury	0.06	0.03	0.05	0.05	0.04	0.02
Nickel	48	66	73	68	46	0.1
Selenium	ND	0.11	0.12	0.10	ND	0.1
Silver	ND	ND	ND	ND	ND	0.1
Zinc	34	48	54	49	35	1.0
ORGANOTINS (ppb, dry weight)						
Monobutyltin	ND	ND	ND	ND	ND	1.0
Dibutyltin	ND	ND	ND	ND	ND	1.0
Tributyltin	1	1	1	1	ND	1.0
Tetrabutyltin	ND	ND	ND	ND	ND	1.0
PAHs (ppb, dry wt)						
2-Methyl naphthalene	ND	ND	ND	ND	ND	8
Naphthalene	ND	ND	ND	ND	ND	20
Acenaphthylene	ND	ND	ND	ND	ND	6
Acenaphthene	ND	ND	ND	ND	ND	8
Fluorene	ND	ND	ND	ND	ND	20
Phenanthrene	ND	ND	ND	ND	ND	20
Anthracene	ND	ND	ND	ND	ND	20
Fluoranthene	ND	ND	ND	ND	ND	20
Pyrene	ND	ND	ND	ND	ND	40
Chrysene	ND	ND	ND	ND	ND	30
Benzo(a)anthracene	ND	ND	ND	ND	ND	20
Benzo(b)fluoranthene	ND	ND	ND	ND	ND	20
Benzo(k)fluoranthene	ND	ND	ND	ND	ND	20
Benzo(a)pyrene	ND	ND	ND	ND	ND	20
Indeno[1,2,3-CD]pyrene	ND	ND	ND	ND	ND	20
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND	20
Benzo[ghi]perylene	ND	ND	ND	ND	ND	40
total PAHs	ND	ND	ND	ND	ND	
PHENOLS (ppb, dry wt)						
Phenol	ND	ND	ND	ND	ND	10
2,4-Dimethylphenol	ND	ND	ND	ND	ND	10
2,4-Dichlorophenol	ND	ND	ND	ND	ND	40
Pentachlorophenol	ND	ND	ND	ND	ND	40
Total Chlorinated phenol	ND	ND	ND	ND	ND	4-60
total phenols	ND	ND	ND	ND	ND	

Table 4, continued. Sediment chemistry summary, Humboldt Bay Baseline Survey I (FY 1993).

Analyte	Sampling Sections					Detection Limit
	SAM5	SAM6-A	SAM6-B	SAM6-C	SAM7	
MISCELLANEOUS CHEMISTRIES						
Total sulfides (ppm, dry)	2.5	41	42	49	ND	0.1
Water soluble sulfides (ppm, dry)	ND	ND	ND	0.2	ND	0.1
Oil & Grease (ppm, dry)	ND	ND	ND	ND	ND	20
Petroleum Hydrocarbons (ppm, dry)	ND	ND	ND	ND	ND	20
% Solids (%)	76	71	69	75	78	0.1
TOC (%)	0.1	0.3	0.3	0.3	0.1	0.1
CHLORINATED PESTICIDES (ppb, dry weight)						
Aldrin	ND	ND	ND	ND	ND	0.5
alpha-BHC	ND	ND	ND	ND	ND	0.5-1.0
beta-BHC	ND	ND	ND	ND	ND	0.5-1.0
delta-BHC	ND	ND	ND	ND	ND	0.5-1.0
gamma-BHC (lindane)	ND	ND	ND	ND	ND	0.5-1.0
alpha-Chlordane	ND	ND	ND	ND	ND	5.0
gamma-Chlordane	ND	ND	ND	ND	ND	5.0
2,4'-DDD	ND	ND	ND	ND	ND	1.0
4,4'-DDD	ND	ND	ND	ND	ND	1.0
2,4'-DDE	ND	ND	ND	ND	ND	0.5
4,4'-DDE	ND	ND	ND	ND	ND	0.5
2,4'-DDT	ND	ND	ND	ND	ND	1.0
4,4'-DDT	ND	ND	ND	ND	ND	1.0
Dieldrin	ND	ND	ND	ND	ND	0.5
Endosulfan I	ND	ND	ND	ND	ND	2.0
Endosulfan II	ND	ND	ND	ND	ND	0.5
Endosulfan sulfate	ND	ND	ND	ND	ND	10
Endrin	ND	ND	ND	ND	ND	0.5
Endrin aldehyde	ND	ND	ND	ND	ND	0.5
Heptachlor	ND	ND	ND	ND	ND	0.5
Heptachlor epoxide	ND	ND	ND	ND	ND	10
Methoxychlor	ND	ND	ND	ND	ND	10
Toxaphene	ND	ND	ND	ND	ND	30
PCBs (ppb, dry weight)						
PCB 1242	ND	ND	ND	ND	ND	20
PCB 1248	ND	ND	ND	ND	ND	20
PCB 1254	ND	ND	ND	ND	ND	20
PCB 1260	ND	ND	ND	ND	ND	20
total PCBs	ND	ND	ND	ND	ND	

Table 4, continued. Sediment chemistry summary, Humboldt Bay Baseline Survey I (FY 1993).

Analyte	Sampling Sections				Detection Limit
	FL1	FL2	FL3	FL4	
METALS (ppm, dry wt)					
Arsenic	5.1	6.6	5.3	4.9	0.1
Cadmium	ND	0.16	ND	ND	0.1
Chromium	140	150	150	150	0.1
Copper	9	35	18	15	0.1
Lead	3.3	7.1	5.0	4.1	0.1
Mercury	0.04	0.07	0.04	0.02	0.02
Nickel	55	85	77	69	0.1
Selenium	ND	0.22	0.15	0.11	0.1
Silver	ND	ND	ND	ND	0.1
Zinc	39	73	51	46	1.0
ORGANOTINS (ppb, dry weight)					
Monobutyltin	ND	ND	ND	ND	1.0
Dibutyltin	ND	1	ND	ND	1.0
Tributyltin	1	4	ND	ND	1.0
Tetrabutyltin	ND	ND	ND	ND	1.0
PAHs (ppb, dry wt)					
2-Methyl naphthalene	ND	23	ND	ND	8
Naphthalene	ND	ND	ND	ND	20
Acenaphthylene	ND	ND	ND	ND	6
Acenaphthene	ND	ND	ND	ND	8
Fluorene	ND	ND	ND	ND	20
Phenanthrene	ND	ND	ND	ND	20
Anthracene	ND	ND	ND	ND	20
Fluoranthene	ND	ND	ND	ND	20
Pyrene	ND	13	ND	ND	40
Chrysene	ND	ND	ND	ND	30
Benzo(a)anthracene	ND	ND	ND	ND	20
Benzo(b)fluoranthene	ND	ND	ND	ND	20
Benzo(k)fluoranthene	ND	ND	ND	ND	20
Benzo(a)pyrene	ND	ND	ND	ND	20
Indeno[1,2,3-CD]pyrene	ND	ND	ND	ND	20
Dibenzo(a,h)anthracene	ND	ND	ND	ND	20
Benzo[ghi]perylene	ND	ND	ND	ND	40
total PAHs	ND	37	ND	ND	
PHENOLS (ppb, dry wt)					
Phenol	ND	ND	ND	ND	10
2,4-Dimethylphenol	ND	ND	ND	ND	10
2,4-Dichlorophenol	ND	ND	ND	ND	40
Pentachlorophenol	ND	ND	ND	ND	40
Total Chlorinated phenol	ND	ND	ND	ND	4-60
total phenols	ND	ND	ND	ND	

Table 4, continued. Sediment chemistry summary, Humboldt Bay Baseline Survey I (FY 1993).

Analyte	Sampling Sections				Detection Limit
	FL1	FL2	FL3	FL4	
MISCELLANEOUS CHEMISTRIES					
Total sulfides (ppm, dry)	21	290	49	7.1	0.1
Water soluble sulfides (ppm, dry)	ND	ND	ND	ND	0.1
Oil & Grease (ppm, dry)	ND	31	ND	ND	20
Petroleum Hydrocarbons (ppm, dry)	ND	ND	ND	ND	20
% Solids (%)	78	57	71	78	0.1
TOC (%)	0.3	0.7	0.4	0.4	0.1
CHLORINATED PESTICIDES (ppb, dry weight)					
Aldrin	ND	ND	ND	ND	0.5
alpha-BHC	ND	ND	ND	ND	0.5-1.0
beta-BHC	ND	ND	ND	ND	0.5-1.0
delta-BHC	ND	ND	ND	ND	0.5-1.0
gamma-BHC (lindane)	ND	ND	ND	ND	0.5-1.0
alpha-Chlordane	ND	ND	ND	ND	5.0
gamma-Chlordane	ND	ND	ND	ND	5.0
2,4'-DDD	ND	ND	ND	ND	1.0
4,4'-DDD	ND	ND	ND	ND	1.0
2,4'-DDE	ND	ND	ND	ND	0.5
4,4'-DDE	ND	ND	ND	ND	0.5
2,4'-DDT	ND	ND	ND	ND	1.0
4,4'-DDT	ND	ND	ND	42	1.0
Dieldrin	ND	ND	ND	ND	0.5
Endosulfan I	ND	ND	ND	ND	2.0
Endosulfan II	ND	ND	ND	ND	0.5
Endosulfan sulfate	ND	ND	ND	ND	10
Endrin	ND	ND	ND	ND	0.5
Endrin aldehyde	ND	ND	ND	ND	0.5
Heptachlor	ND	ND	ND	ND	0.5
Heptachlor epoxide	ND	ND	ND	ND	10
Methoxychlor	ND	ND	ND	ND	10
Toxaphene	ND	ND	ND	ND	30
PCBs (ppb, dry weight)					
PCB 1242	ND	ND	ND	ND	20
PCB 1248	ND	ND	ND	ND	20
PCB 1254	ND	ND	ND	ND	20
PCB 1260	ND	ND	ND	ND	20
total PCBs	ND	ND	ND	ND	

Table 4, continued. Sediment chemistry summary, Humboldt Bay Baseline Survey I (FY 1993).

Analyte	Sampling Sections FL5	FL6	FL7	FL8	Detection Limit
METALS (ppm, dry wt)					
Arsenic	5.0	3.1	5.2	4.9	0.1
Cadmium	ND	ND	ND	ND	0.1
Chromium	130	140	140	120	0.1
Copper	7	7	6	8	0.1
Lead	3.0	3.3	3.6	3.9	0.1
Mercury	0.05	0.03	0.05	0.04	0.02
Nickel	49	45	47	59	0.1
Selenium	ND	ND	ND	ND	0.1
Silver	ND	ND	ND	ND	0.1
Zinc	34	34	34	39	1.0
ORGANOTINS (ppb, dry weight)					
Monobutyltin	ND	ND	ND	ND	1.0
Dibutyltin	ND	ND	ND	ND	1.0
Tributyltin	ND	ND	ND	ND	1.0
Tetrabutyltin	ND	ND	ND	ND	1.0
PAHs (ppb, dry wt)					
2-Methyl naphthalene	ND	4.0	ND	ND	8
Naphthalene	ND	ND	ND	ND	20
Acenaphthylene	ND	ND	ND	ND	6
Acenaphthene	ND	ND	ND	ND	8
Fluorene	ND	ND	ND	ND	20
Phenanthrene	ND	ND	ND	ND	20
Anthracene	ND	ND	ND	ND	20
Fluoranthene	ND	ND	ND	ND	20
Pyrene	ND	ND	ND	ND	40
Chrysene	ND	ND	ND	ND	30
Benzo(a)anthracene	ND	ND	ND	ND	20
Benzo(b)fluoranthene	ND	ND	ND	ND	20
Benzo(k)fluoranthene	ND	ND	ND	ND	20
Benzo(a)pyrene	ND	ND	ND	ND	20
Indeno[1,2,3-CD]pyrene	ND	ND	ND	ND	20
Dibenzo(a,h)anthracene	ND	ND	ND	ND	20
Benzo[ghi]perylene	ND	ND	ND	ND	40
total PAHs	ND	4.0	ND	ND	
PHENOLS (ppb, dry wt)					
Phenol	ND	ND	ND	ND	10
2,4-Dimethylphenol	ND	ND	ND	ND	10
2,4-Dichlorophenol	ND	ND	ND	ND	40
Pentachlorophenol	ND	ND	ND	ND	40
Total Chlorinated phenol	ND	ND	ND	ND	4-60
total phenols	ND	ND	ND	ND	

Table 4, continued. Sediment chemistry summary, Humboldt Bay Baseline Survey I (FY 1993).

Analyte	Sampling Sections				Detection Limit
	FL5	FL6	FL7	FL8	
MISCELLANEOUS CHEMISTRIES					
Total sulfides (ppm, dry)	12	2.3	ND	0.3	0.1
Water soluble sulfides (ppm, dry)	ND	ND	ND	ND	0.1
Oil & Grease (ppm, dry)	ND	ND	81	ND	20
Petroleum Hydrocarbons (ppm, dry)	ND	ND	73	ND	20
% Solids (%)	76	80	78	75	0.1
TOC (%)	0.1	ND	ND	0.1	0.1
CHLORINATED PESTICIDES (ppb, dry weight)					
Aldrin	ND	ND	ND	ND	0.5
alpha-BHC	ND	ND	ND	ND	0.5-1.0
beta-BHC	ND	ND	ND	ND	0.5-1.0
delta-BHC	ND	ND	ND	ND	0.5-1.0
gamma-BHC (lindane)	ND	ND	ND	ND	0.5-1.0
alpha-Chlordane	ND	ND	ND	ND	5.0
gamma-Chlordane	ND	ND	ND	ND	5.0
2,4'-DDD	ND	ND	ND	ND	1.0
4,4'-DDD	ND	ND	ND	ND	1.0
2,4'-DDE	ND	ND	ND	ND	0.5
4,4'-DDE	ND	ND	ND	ND	0.5
2,4'-DDT	ND	ND	ND	ND	1.0
4,4'-DDT	ND	ND	ND	44	1.0
Dieldrin	ND	ND	ND	ND	0.5
Endosulfan I	ND	ND	ND	ND	2.0
Endosulfan II	ND	ND	ND	ND	0.5
Endosulfan sulfate	ND	ND	ND	ND	10
Endrin	ND	ND	ND	ND	0.5
Endrin aldehyde	ND	ND	ND	ND	0.5
Heptachlor	ND	ND	ND	ND	0.5
Heptachlor epoxide	ND	ND	ND	ND	10
Methoxychlor	ND	ND	ND	ND	10
Toxaphene	ND	ND	ND	ND	30
PCBs (ppb, dry weight)					
PCB 1242	ND	ND	ND	ND	20
PCB 1248	ND	ND	ND	ND	20
PCB 1254	ND	ND	ND	ND	20
PCB 1260	ND	ND	ND	ND	20
total PCBs	ND	ND	ND	ND	

Table 5. Particle Size Distributions (PSD), Humboldt Bay Baseline Survey I (FY 1993). Cumulative percent particle size intervals; weight (g): Coarse $\leq 4\phi$; Fine $\geq 5\phi$.

Size Interval (Phi)	Sampling Stations: Cumulative Percent				
	EK1	EK2	EK3	EK4	Comp EKUP
<-5	0.0	0.0	0.0	0.0	0.0
-4	0.0	0.0	0.0	0.0	0.0
-3	0.0	0.0	0.0	0.0	0.0
-2	7.6	0.0	0.0	0.0	0.0
-1	19.0	0.0	0.0	0.0	0.0
0	28.6	0.5	0.7	0.0	0.1
1	40.3	1.5	1.7	0.7	0.9
2	64.0	27.0	17.5	4.6	19.2
3	94.9	84.8	80.6	20.7	68.6
4	96.8	88.3	84.6	41.3	76.3
5	97.5	90.5	87.5	56.3	81.8
6	98.0	92.6	90.3	68.7	87.5
7	98.5	94.5	92.9	78.2	90.8
8	98.8	95.8	94.2	83.2	93.2
9	99.0	97.0	96.0	87.5	95.0
>9	100.0	100.0	100.0	100.0	100.0
Total weight:	34.7	33.0	32.0	22.8	30.7
Coarse weight:	33.6	29.1	27.0	9.4	23.4
Fine weight:	1.1	3.9	4.9	13.4	7.3

Table 5, continued.
Particle Size Distributions (PSD), Humboldt Bay Baseline Survey I (FY 1993). Cumulative percent particle size intervals; weight (g): Coarse $\leq 4\phi$; Fine $\geq 5\phi$.

Size Interval (Phi)	Sampling Stations: Cumulative Percent					
	SAM1	SAM2	SAM3	SAM4	SAM5	SAM7
<-5	0.0	0.0	0.0	0.0	0.0	0.0
-4	0.0	0.0	0.0	0.0	0.0	0.0
-3	0.0	0.0	0.0	0.0	0.0	0.0
-2	0.0	6.7	0.0	0.0	0.0	0.0
-1	5.0	13.0	1.5	0.0	0.0	0.7
0	11.0	15.5	4.8	2.8	0.8	0.7
1	25.0	20.0	14.1	15.1	4.9	3.4
2	88.7	70.8	71.7	69.4	50.1	65.0
3	99.3	98.8	98.8	97.9	97.8	98.4
4	99.4	99.2	99.0	98.4	98.2	98.7
5	99.5	99.3	99.2	98.8	98.3	98.7
6	99.5	99.3	99.3	98.9	98.7	98.7
7	99.6	99.4	99.4	99.2	99.0	99.1
8	99.6	99.5	99.5	99.3	99.1	99.2
9	100.0	100.0	99.5	99.4	99.1	99.3
>9	100.0	100.0	100.0	100.0	100.0	100.0
Total weight:	51.6	41.0	35.7	42.4	40.4	31.1
Coarse weight:	51.3	40.7	35.4	41.7	39.6	30.7
Fine weight:	0.3	0.3	0.3	0.7	0.7	0.4

Table 5, continued.
Particle Size Distributions (PSD), Humboldt Bay Baseline Survey I (FY 1993). Cumulative percent particle size intervals; weight (g): Coarse $\leq 4\phi$; Fine $\geq 5\phi$.

Size Interval (Phi)	Sampling Stations: Cumulative Percent			
	SAM6-A	SAM6-B	SAM6-C	Comp SAMTB
<-5	0.0	0.0	0.0	0.0
-4	0.0	0.0	0.0	0.0
-3	0.0	0.0	0.0	0.0
-2	0.0	0.0	0.0	0.0
-1	0.0	0.0	0.4	0.2
0	0.3	0.3	1.1	0.6
1	1.1	0.9	2.9	1.5
2	6.1	6.2	6.9	5.5
3	65.9	72.0	75.3	73.9
4	76.4	77.3	82.1	81.2
5	81.8	83.3	86.9	85.6
6	86.6	86.5	90.0	89.1
7	89.8	89.9	92.2	92.0
8	92.2	92.3	94.0	93.7
9	94.0	94.3	95.7	95.2
>9	100.0	100.0	100.0	100.0
Total weight:	29.7	31.6	30.4	31.8
Coarse weight:	22.7	24.4	25.0	25.8
Fine weight:	7.0	7.2	5.5	6.0

Table 5, continued.
Particle Size Distributions (PSD), Humboldt Bay Baseline Survey I (FY 1993). Cumulative percent particle size intervals; weight (g): Coarse $\leq 4\phi$; Fine $\geq 5\phi$.

Size Interval (Phi)	Sampling Stations: Cumulative Percent				
	FL1	FL2	FL3	FL4	Comp FLTB
<-5	0.0	0.0	0.0	0.0	0.0
-4	0.0	0.0	0.0	0.0	0.0
-3	0.0	0.0	0.0	0.0	0.0
-2	0.0	0.0	0.0	0.0	0.0
-1	0.0	0.0	0.0	0.0	0.0
0	0.3	0.2	0.1	0.4	0.1
1	1.2	0.4	0.4	1.3	0.6
2	16.3	1.6	2.1	12.9	6.6
3	83.4	7.1	36.2	43.5	37.1
4	87.7	34.2	62.8	63.9	58.5
5	91.2	51.5	76.4	79.0	69.9
6	93.4	63.9	84.1	86.4	79.4
7	94.9	74.0	88.3	90.4	85.5
8	96.1	81.8	91.4	92.7	88.8
9	97.2	87.1	93.5	94.7	91.4
>9	100.0	100.0	100.0	100.0	100.0
Total weight:	32.9	28.1	28.7	32.1	28.6
Coarse weight:	28.9	9.6	18.0	20.5	16.7
Fine weight:	4.1	18.5	10.7	11.6	11.9

Table 5, continued.
Particle Size Distributions (PSD), Humboldt Bay Baseline Survey I (FY 1993). Cumulative percent particle size intervals; weight (g): Coarse $\leq 4\phi$; Fine $\geq 5\phi$.

Size Interval (Phi)	Sampling Stations: Cumulative Percent					
	FL5	FL6	FL7	FL8	Ref Comp	Control
<-5	0.0	0.0	0.0	0.0	0.0	0.0
-4	0.0	0.0	0.0	0.0	0.0	0.0
-3	0.0	0.0	0.0	0.0	0.0	0.0
-2	0.0	6.6	0.0	0.0	0.0	0.0
-1	0.0	10.7	0.4	0.0	0.0	0.0
0	0.1	12.8	1.1	0.2	0.2	0.0
1	0.5	17.0	4.9	1.0	0.3	0.7
2	13.2	54.8	60.8	28.9	0.6	37.7
3	96.7	96.0	97.8	97.6	9.0	93.5
4	98.8	97.4	98.6	99.1	77.0	96.4
5	99.2	98.1	98.8	99.2	93.7	97.4
6	99.3	98.4	99.0	99.3	95.8	97.9
7	99.4	99.0	99.3	99.5	97.2	98.3
8	99.4	99.2	99.4	99.5	97.8	98.5
9	99.5	99.3	99.4	100.0	97.8	98.5
>9	100.0	100.0	100.0	100.0	100.0	100.0
Total weight:	34.5	37.5	33.6	38.3	30.2	31.7
Coarse weight:	34.1	36.5	33.1	38.0	23.3	30.5
Fine weight:	0.4	1.0	0.5	0.3	7.0	1.1

Table 5, continued.
Particle Size Distributions (PSD), Humboldt Bay Baseline Survey I (FY 1993). Cumulative percent particle size intervals; weight (g): Coarse $\leq 4\phi$; Fine $\geq 5\phi$.

Size Interval (Phi)	Sampling Stations: Cumulative Percent				
	NB1	NB2	NB3	NB4	NB5
<-5	0.0	0.0	0.0	0.0	0.0
-4	0.0	0.0	0.0	0.0	0.0
-3	0.0	0.0	0.0	0.0	0.0
-2	0.2	0.0	0.3	0.0	0.0
-1	0.3	0.0	0.9	2.0	0.8
0	0.8	0.1	2.4	7.0	2.1
1	5.3	0.3	19.0	20.5	9.8
2	60.9	46.0	85.0	80.4	73.9
3	98.9	99.3	99.4	99.2	99.2
4	99.5	99.5	99.6	99.5	99.5
5	99.6	99.5	99.7	99.5	99.5
6	99.6	99.5	99.7	99.5	99.5
7	99.6	99.5	99.7	99.5	99.5
8	99.7	99.6	99.7	99.5	99.5
9	99.7	99.6	99.7	99.5	99.5
>9	100.0	100.0	100.0	100.0	100.0
Total weight:	46.1	42.6	44.5	41.5	42.2
Coarse weight:	45.9	42.4	44.3	41.3	42.0
Fine weight:	0.2	0.2	0.2	0.2	0.2

Table 5, continued.
Particle Size Distributions (PSD), Humboldt Bay Baseline Survey I (FY 1993). Cumulative percent particle size intervals; weight (g): Coarse $\leq 4\phi$; Fine $\geq 5\phi$.

Size Interval (Phi)	Sampling Stations: Cumulative Percent				
	NB6	NB7	NB8	NB9	NB10
<-5	0.0	0.0	0.0	0.0	0.0
-4	0.0	0.0	0.0	0.0	0.0
-3	0.0	0.0	0.0	0.0	0.0
-2	14.7	12.0	9.5	6.7	14.2
-1	30.7	25.8	23.9	24.9	34.4
0	37.6	33.6	32.8	39.2	46.1
1	44.6	45.5	43.0	57.4	59.0
2	75.9	85.3	79.2	90.5	87.7
3	98.4	99.1	94.1	98.2	96.8
4	99.1	99.3	95.0	98.6	97.4
5	99.1	99.4	96.1	99.0	98.5
6	99.4	99.5	96.9	99.2	98.6
7	99.4	99.5	97.8	99.3	98.8
8	99.4	99.5	98.3	99.5	99.1
9	99.5	99.6	98.9	99.6	99.5
>9	100.0	100.0	100.0	100.0	100.0
Total weight:	43.9	41.5	37.0	51.5	45.0
Coarse weight:	43.5	41.2	35.2	50.7	43.9
Fine weight:	0.4	0.3	1.9	0.7	1.2

Table 5, continued.
Particle Size Distributions (PSD), Humboldt Bay Baseline Survey I (FY 1993). Cumulative percent particle size intervals; weight (g): Coarse $\leq 4\phi$; Fine $\geq 5\phi$.

Size Interval (Phi)	Sampling Stations: Cumulative Percent		
	ENT1	ENT2	BAR1
<-5	0.0	0.0	0.0
-4	0.0	0.0	0.0
-3	0.0	0.0	0.0
-2	0.0	0.0	0.0
-1	0.0	0.0	0.0
0	0.3	0.2	0.0
1	1.9	0.8	0.2
2	41.9	69.9	47.4
3	96.3	99.0	99.0
4	99.0	99.4	99.4
5	99.6	99.4	99.4
6	99.6	99.4	99.4
7	99.6	99.4	99.5
8	99.6	99.5	99.5
9	99.7	99.5	99.5
>9	100.0	100.0	100.0
Total weight:	41.5	39.5	42.3
Coarse weight:	41.0	39.2	42.1
Fine weight:	0.4	0.2	0.2

Table 6. Bivalve larvae (*M. edulis*) suspended particulate phase bioassays, Humboldt Harbor Baseline Survey I (FY 1993). See text for explanation of calculations (Mean initial recovery = 4354).

Sample ID	Rep	Number Normal	Number Abnormal	Total Recovered per 1 mL	Resuspended Volume	Total # Normal Larvae Recovered	% Survival	Mean % Survival + S.D.	% Normal Develop-ment	Mean % Normal Development + S.D.	Survival		Normal Development	
											Abbotts Corrected Value	Mean Corrected Value	Abbotts Corrected Value	Mean Corrected Value
	1	118	2	120	38	4484	103.0		98.3					
	2	98	5	103	43	4214	96.8	98.4	95.1	96.3				
Control	3	127	4	131	32	4064	93.3	+	96.9	+				
	4	131	6	137	35	4585	105.3	4.88	95.6	1.21				
	5	122	6	128	35	4270	98.1		95.3					
	6	136	5	141	30	4080	93.7		96.5					
	1	63	31	94	36	2268	52.1		67.0		53.0		69.6	
Humboldt	2	97	34	131	37	3589	82.4	71.4	74.0	77.6	83.8	72.6	76.9	80.6
Reference	3	78	17	95	43	3354	77.0	+	82.1	+	78.3	+	85.3	+
Sediment	4	111	22	133	31	3441	79.0	12.36	83.5	6.94	80.3	12.56	86.7	7.20
100%	5	78	18	96	37	2886	66.3		81.3		67.4		84.4	
	1	85	1	86	45	3825	87.9		98.8		89.3		102.6	
EKUP	2	106	7	113	31	3286	75.5	81.2	93.8	94.6	76.7	82.6	97.4	98.3
100%	3	102	9	111	41	4182	96.0	+	91.9	+	97.6	+	95.4	+
	4	84	5	89	36	3024	69.5	10.61	94.4	2.55	70.6	10.79	98.0	2.65
	5	99	6	105	34	3366	77.3		94.3		78.6		97.9	
	1	122	5	127	34	4148	95.3		96.1		96.9		99.8	
SAMTB	2	96	9	105	37	3552	81.6	87.2	91.4	93.2	82.9	88.6	94.9	96.7
100%	3	87	7	94	41	3567	81.9	+	92.6	+	83.3	+	96.1	+
	4	115	7	122	35	4025	92.4	6.29	94.3	1.98	94.0	6.40	97.9	2.06
	5	97	9	106	38	3686	84.7		91.5		86.1		95.0	
	1	143	9	152	29	4147	95.2		94.1		96.8		97.7	
FLTB	2	99	13	112	40	3960	91.0	89.5	88.4	92.7	92.5	91.0	91.8	96.3
100%	3	86	7	93	45	3870	88.9	+	92.5	+	90.4	+	96.0	+
	4	107	4	111	36	3852	88.5	4.11	96.4	2.93	89.9	4.17	100.1	3.04
	5	85	7	92	43	3655	83.9		92.4		85.3		95.9	

Point Estimates:

EKUP: LC_{50} >100%; EC_{50} >100%
SAMTB: LC_{50} >100%; EC_{50} >100%
FLTB: LC_{50} >100%; EC_{50} >100%

Table 7. Mysid (*H. costata*) suspended particulate phase bioassays, Humboldt Bay Baseline Survey I (FY 1993).

Holmesimysis costata
Suspended Particulate Phase Bioassay Results
Humboldt Harbor Sediments

	NUMBER OF SURVIVORS (Start n = 10)				
Replicate No.	Home Sediment	Disposal Reference	EKUP	SAMTB	FLTB
1	10	10	10	9	10
2	10	9	10	10	10
3	10	10	10	10	10
4	10	10	10	10	10
5	10	10	10	10	10
Mean	10.0	9.8	10.0	9.8	10.0
SD	0.0	0.45	0.0	0.45	0.0

1. Data **fail** SHAPIRO-WILKS TEST for normality at P=0.01:

   W=0.603 D = 1.600 Critical $W_{(20, 0.01)}$ = 0.868

2. Data **fail** BARTLETT'S TEST for homogeneity of variance at α=0.01: At least one group has zero variance.

3. Steel's Many-One Rank test shows **no significant difference** among sample data and disposal site reference:

   Critical F value = 17 (0.05, k=3)

	EKUP	SAMTB	FLTB
Rank Sum:	30	27.5	30

Table 8. Fish (*C. stigmaeus*) suspended particulate phase bioassays, Humboldt Bay Baseline Survey I (FY 1993).

Citharichthys stigmaeus
Suspended Particulate Phase Bioassay Results
Humboldt Harbor Sediments

NUMBER OF SURVIVORS (Start n = 10)					
Replicate No.	Home Sediment	Disposal Reference	EKUP	SAMTB	FLTB
1	10	10	10	9	10
2	10	10	10	10	10
3	10	10	10	10	10
4	10	10	9	10	10
5	10	10	10	10	10
Mean	10.0	10.0	9.8	9.8	10.0
SD	0.0	0.0	0.45	0.45	0.0

1. Data **fail** SHAPIRO-WILKS TEST for normality at P=0.01:

   W=0.588 D = 2.400 Critical $W_{(20,\ 0.01)}$ = 0.868

2. Data **fail** BARTLETT'S TEST for homogeneity of variance at α=0.01: At least one group has zero variance.

3. Steel's Many-One Rank test shows **no significant difference** among sample data and disposal site reference:

   Critical value = 17 (0.05, k=3)

	EKUP	SAMTB	FLTB
Rank Sum:	27.5	27.5	30

Table 9. Amphipod (*R. abronius*) solid phase static bioassays, Humboldt Bay Baseline Survey I (FY 1993).

Rhepoxynius abronius
Solid Phase Static Bioassay Results
Humboldt Harbor Sediments

	NUMBER OF SURVIVORS (Start n = 20)				
Replicate No.	Home Sediment	Disposal Reference	EKUP	SAMTB	FLTB
1	19	19	19	17	20
2	19	17	18	20	20
3	20	18	20	17	17
4	18	19	16	15	18
5	17	19	20	18	17
Mean	18.6	18.8	18.6	17.4	18.4
SD	1.14	0.45	1.67	1.81	1.52
Mean % Reburial	98.9	98.8	93.3	90.2	92.6
SD	2.37	2.64	6.20	7.43	8.56

1. Data **pass** SHAPIRO-WILKS TEST for normality at P=0.01:

   W=0.964 D = 36.800 Critical $W_{(20, 0.01)}$ = 0.868

2. Data **pass** BARTLETT'S TEST for homogeneity of variance at α=0.01:

   Calculated B statistic = 1.81 Table Chi-square value = 11.34

3. ANOVA test shows **no significant difference** among sample means and disposal site reference:

   Critical F value = 3.24 (0.05, 3, 16) Calculated F value = 0.638
   Calculated F > Critical F; ∴ **Fail to Reject** H_0: all groups equal

4. DUNNETT'S TEST (Mean Comparison Test) shows **no Humboldt Harbor sample composite with lower survival** than the Humboldt reference composite at P = 0.05:

	EKUP	SAMTB	FLTB
Dunnett's t: (1-tailed, P=0.05, d.f.=16,3)	-0.209	1.043	0.000

Dunnett table value = 2.23

Table 10. Mysid (*H. costata*) solid phase flow-through bioassays, Humboldt Bay Baseline Survey I (FY 1993).

Holmesimysis costata
Solid Phase Flow-Through Bioassay Results
Humboldt Harbor Sediments

	NUMBER OF SURVIVORS (Start n = 20)				
Replicate No.	Home Sediment	Disposal Reference	EKUP	SAMTB	FLTB
1	19	18	19	20	20
2	19	20	20	19	19
3	20	19	18	20	19
4	19	18	19	18	19
5	20	20	19	19	19
Mean	19.4	19.0	19.0	19.2	19.2
SD	0.55	1.0	0.71	0.71	0.45

1. Data **pass** SHAPIRO-WILKS TEST for normality at P=0.01:

   W=0.888 D = 9.600 Critical $W_{(20,\ 0.01)}$ = 0.868

2. Data **pass** BARTLETT'S TEST for homogeneity of variance at α=0.01:

   Calculated B statistic = 2.23 Table Chi-square value = 11.34

3. ANOVA test shows **no significant difference** among sample means and disposal site reference:

   Critical F value = 3.24 (0.05, 3, 16) Calculated F value = 0.111
   Calculated F > Critical F; ∴ **Fail to Reject** H_0: all groups equal

4. DUNNETT'S TEST (Mean Comparison Test) shows **no Humboldt Harbor sample composite with lower survival** than the Humboldt reference composite at P = 0.05:

	EKUP	SAMTB	FLTB
Dunnett's t: (1-tailed, P=0.05, d.f.=16,3)	0.000	-0.200	-0.2000

Dunnett table value = 2.23

Table 11. Polychaete worm (*N. caecoides*) solid phase flow-through bioassays, Humboldt Bay Baseline Survey I (FY 1993).

Nephtys caecoides
Solid Phase Flow-Through Bioassay Results
Humboldt Harbor Sediments

	NUMBER OF SURVIVORS (Start n = 20)				
Replicate No.	Home Sediment	Disposal Reference	EKUP	SAMTB	FLTB
1	20	19	18	20	18
2	20	20	19	18	18
3	20	20	18	19	19
4	20	120	20	20	17
5	20	20	18	20	18
Mean	20.0	19.8	18.6	19.4	18.0
SD	0.0	0.45	0.89	0.89	0.71

1. Data **pass** SHAPIRO-WILKS TEST for normality at P=0.01:

   W=0.978 D = 9.200 Critical $W_{(20,\ 0.01)}$ = 0.868

2. Data **pass** BARTLETT'S TEST for homogeneity of variance at α=0.01:

   Calculated B statistic = 1.94 Table Chi-square value = 11.34

3. ANOVA test shows **significant difference** among sample means and disposal site reference:

   Critical F value = 3.24 (0.05, 3, 16) Calculated F value = 5.652
   Calculated F > Critical F; ∴ **Reject** H_0: all groups equal

4. DUNNETT'S TEST (Mean Comparison Test) shows **sample composites Comp EKUP and Comp FLTB produce lower survival** than the Humboldt reference composite at P = 0.05:

	EKUP	SAMTB	FLTB
Dunnett's t: (1-tailed, P=0.05, d.f.=16,3)	2.502	0.834	3.753

Dunnett table value = 2.23

Table 12. Mean metals concentrations (mg/kg) in tissues of *M. nasuta* and *N. caecoides* exposed to Humboldt Bay sediments, Baseline Survey I (FY 1993). Non-detected analytes calculated at 0.5 x D.L.; n = 5 for all means; Baseline values are from a single tissue composite.

Macoma nasuta

Sediment Treatment	As	Cd	Cr	Cu	Pb	Hg	Ni	Se	Ag	Zn
Baseline	34	0.70	19	81	3.1	0.53	9.5	2.4	0.70	200
Control	43.4	0.50	6.48	64.0	2.72	0.30	6.08	2.38	0.55	192
EKUP	37.8	0.49	22.2	69.4	5.00	0.18	20.8	2.04	0.60	198
SAMTB	41.8	0.87	20.8	60.4	3.94	0.16	22.2	1.96	0.43	180
FLTB	41.2	0.54	25.8	78.2	5.24	0.19	24.8	2.04	0.55	210
Reference	42.8	0.59	12.3	48.4	2.86	0.24	5.18	2.46	0.40	174

Nephtys caecoides

Sediment Treatment	As	Cd	Cr	Cu	Pb	Hg	Ni	Se	Ag[1]	Zn
Baseline	27	1.5	7.0	22	1.2	0.19	9.7	3.9	0.05	300
Control	24.4	0.77	1.62	26.8	0.62	0.13	4.82	3.16	0.05	182
EKUP	28.0	0.77	1.40	23.8	0.94	0.14	5.56	3.18	0.06	170
SAMTB	26.0	0.73	1.62	24.4	0.88	0.14	5.40	3.20	0.05	168
FLTB	28.0	0.70	3.04	25.8	0.80	0.14	5.68	2.94	0.05	172
Reference	25.0	0.89	1.68	25.0	0.68	0.14	5.70	3.18	0.05	180

[1] Ag means calculations contain ND values (calculated as 0.05 mg/kg).

Detection Limits: Hg = 0.02 mg/kg (parts per million)
All others = 0.1 mg/kg.

Shaded values are statistically elevated compared to reference treatments (see Table 13 and Table 14 for statistical summaries).

Table 13. Statistical analyses: *Macoma nasuta* bioaccumulation, Humboldt Bay Baseline Survey I (FY 1993).

	PARAMETRIC TESTS			NON-PARAMETRIC TESTS	
CONSTITUENT	Bartlett's B-Value	ANOVA F-Value	Significant Stations by Dunnett's Test	Kruskal-Wallace H-Value	Significant Stations by Dunn's Test
Arsenic	2.109	0.630	none	---	---
Cadmium	37.437	---	---	3.789	none
Chromium	4.216	9.628	EKUP+SAMTB+FLTB	---	---
Copper	6.459	5.203	EKUP+FLTB	---	---
Lead	3.363	11.037	EKUP+SAMTB+FLTB	---	---
Mercury	6.458	4.080	none	---	---
Nickel	6.550	7.006	EKUP+SAMTB+FLTB	---	---
Selenium	10.727	---	---	4.771	none
Silver	4.866	2.115	none	---	---
Zinc	2.838	1.538	none	---	---

--- not determined

Table 14. Statistical analyses: *Nephtys caecoides* bioaccumulation, Humboldt Bay Baseline Survey I (FY 1993).

	PARAMETRIC TESTS			NON-PARAMETRIC TESTS	
CONSTITUENT	Bartlett's B-Value	ANOVA F-Value	Significant Stations by Dunnett's Test	Kruskal-Wallace H-Value	Significant Stations by Dunn's Test
Arsenic	4.362	2.647	EKUP+FLTB	---	---
Cadmium	4.772	3.280	none	---	---
Chromium	13.724	---	---	4.079	none
Copper	8.221	---	---	4.377	none
Lead	5.311	3.771	EKUP+SAMTB	---	---
Mercury	1.160	0.043	none	---	---
Nickel	7.839	---	---	2.293	none
Selenium	6.938	0.646	none	---	---
Silver	3.087	1.083	none	---	---
Zinc	2.258	0.622	none	---	---

--- not determined

FIGURES

FIGURES

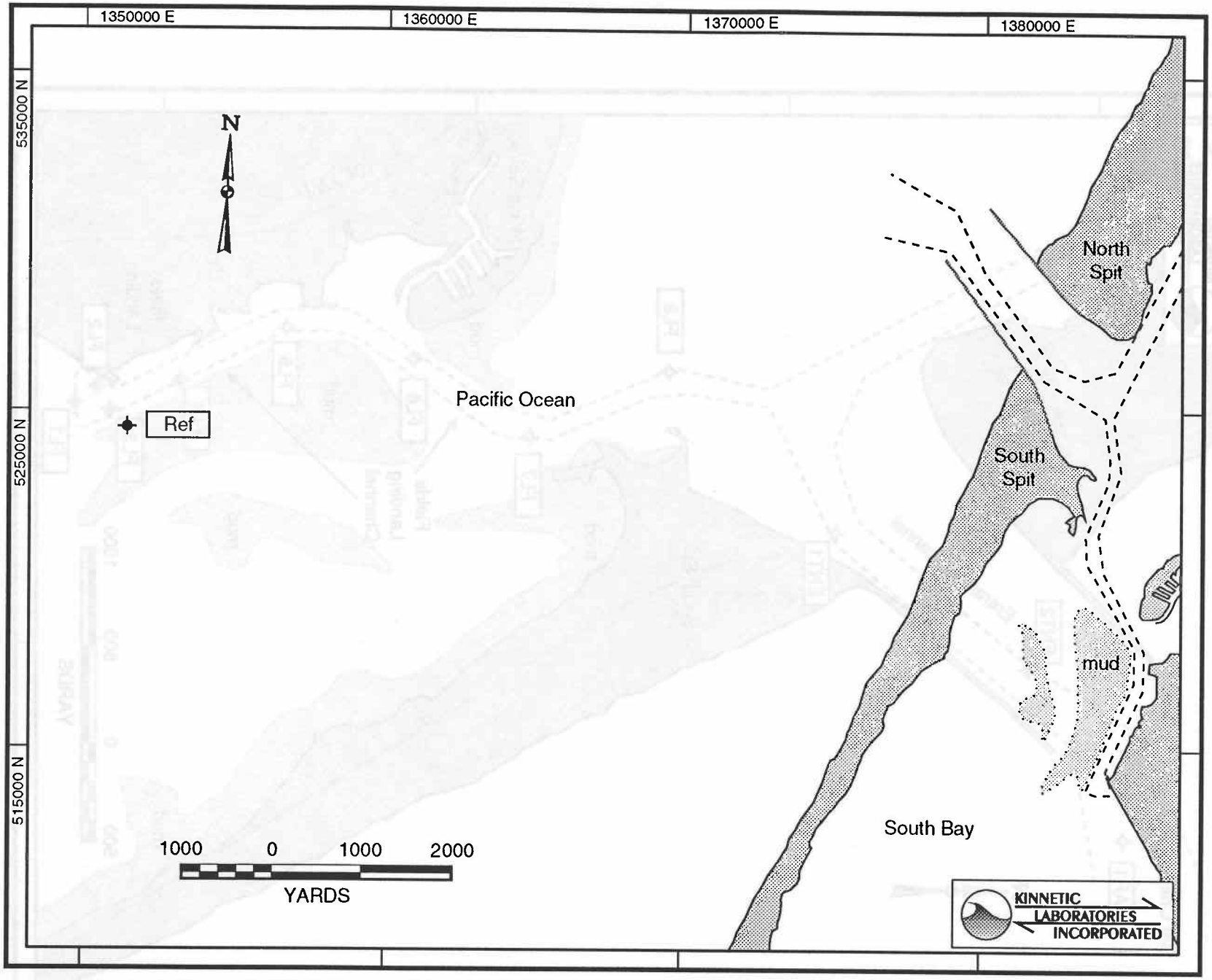

Figure 1. Humboldt Bay FY 1993 sampling locations. Reference station (solid) composite of six grab samples.

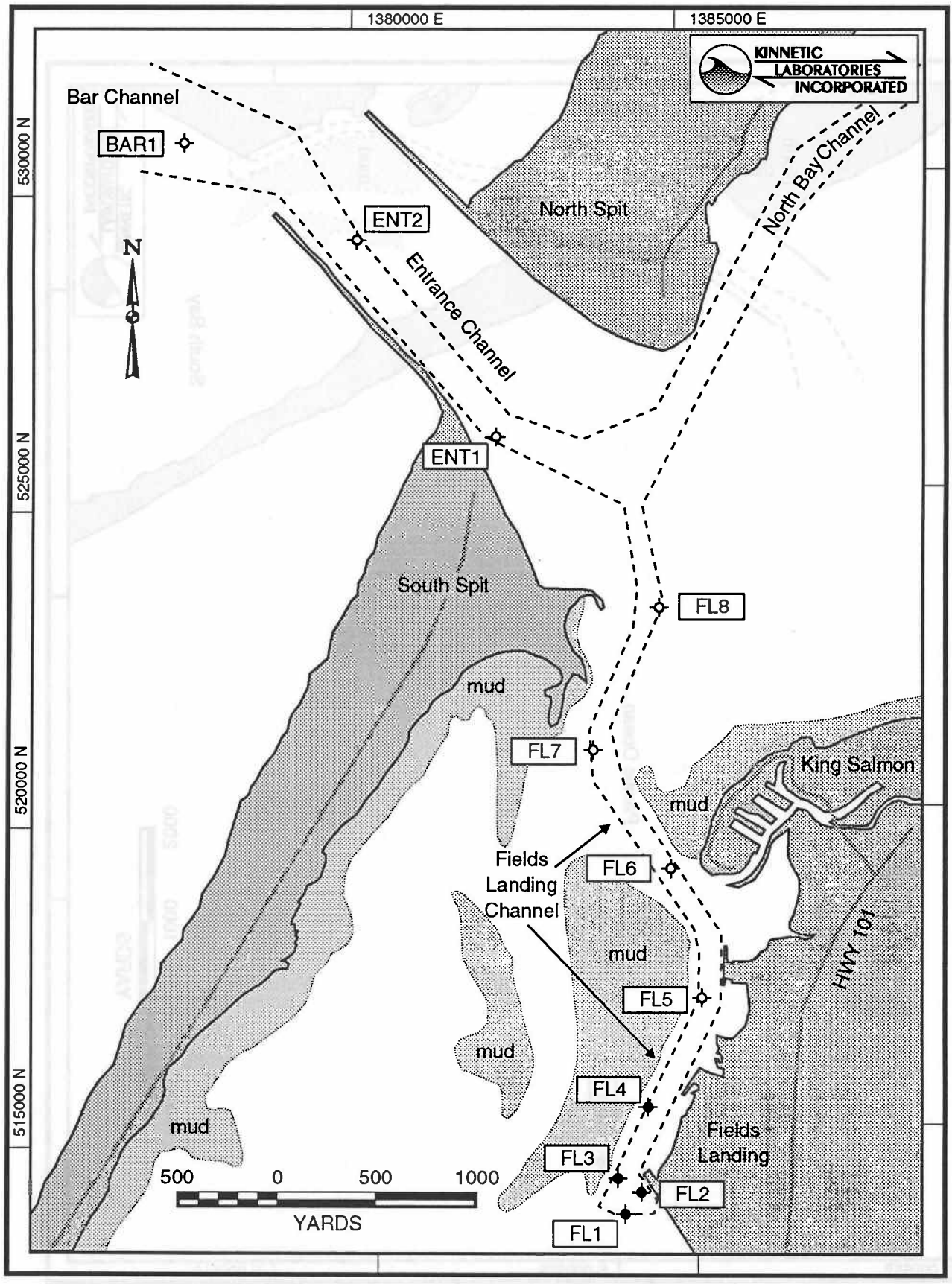

Figure 2. Humboldt Bay FY1993 sampling locations. Stations FL1 through FL8, ENT1, ENT2, and BAR1. Solid stations indicate those used in Fields Landing Lower Channel and Turning Basin (FLTB) composite.

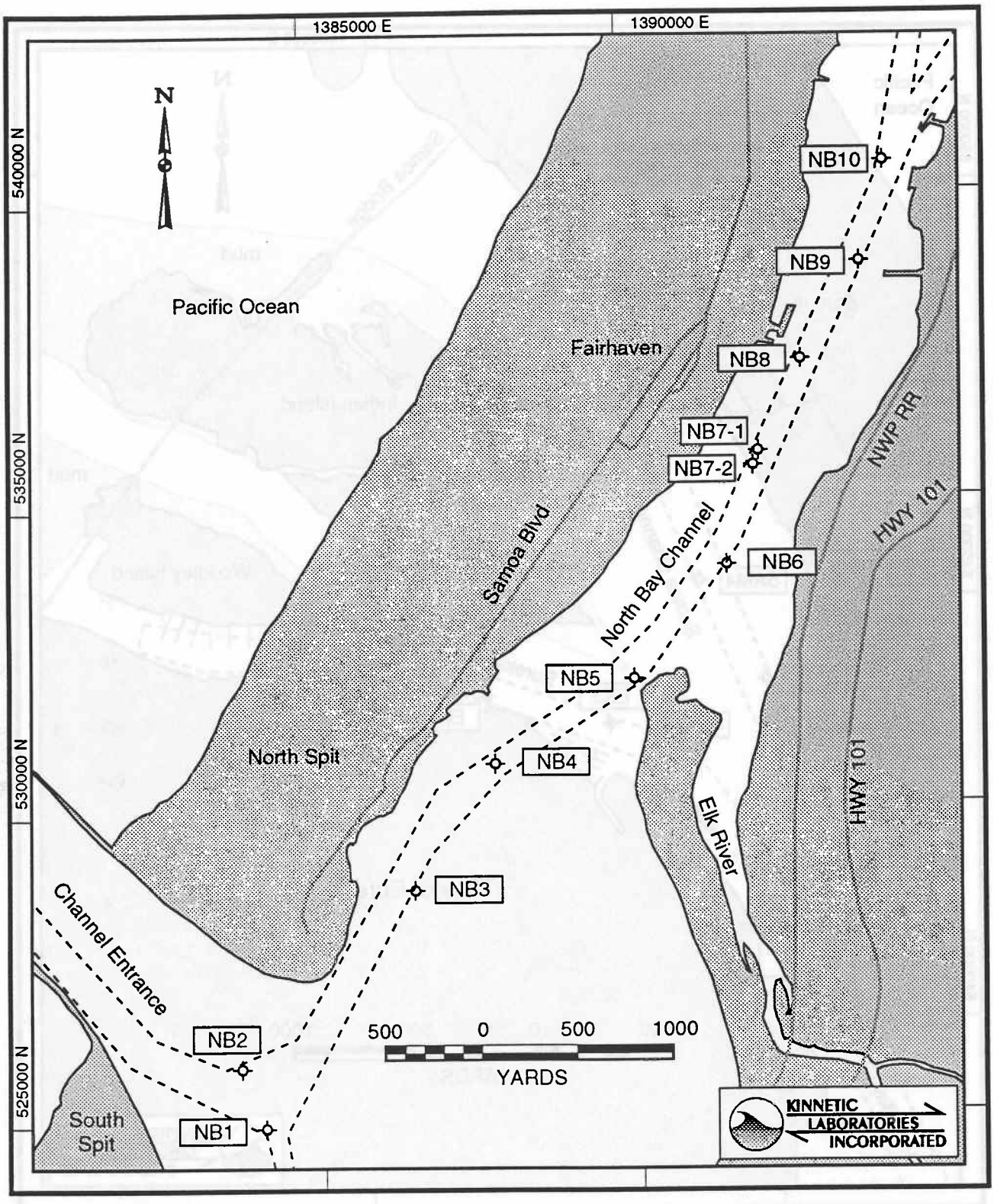

Figure 3. Humboldt Bay FY1993 sampling locations. Stations NB1 through NB10.

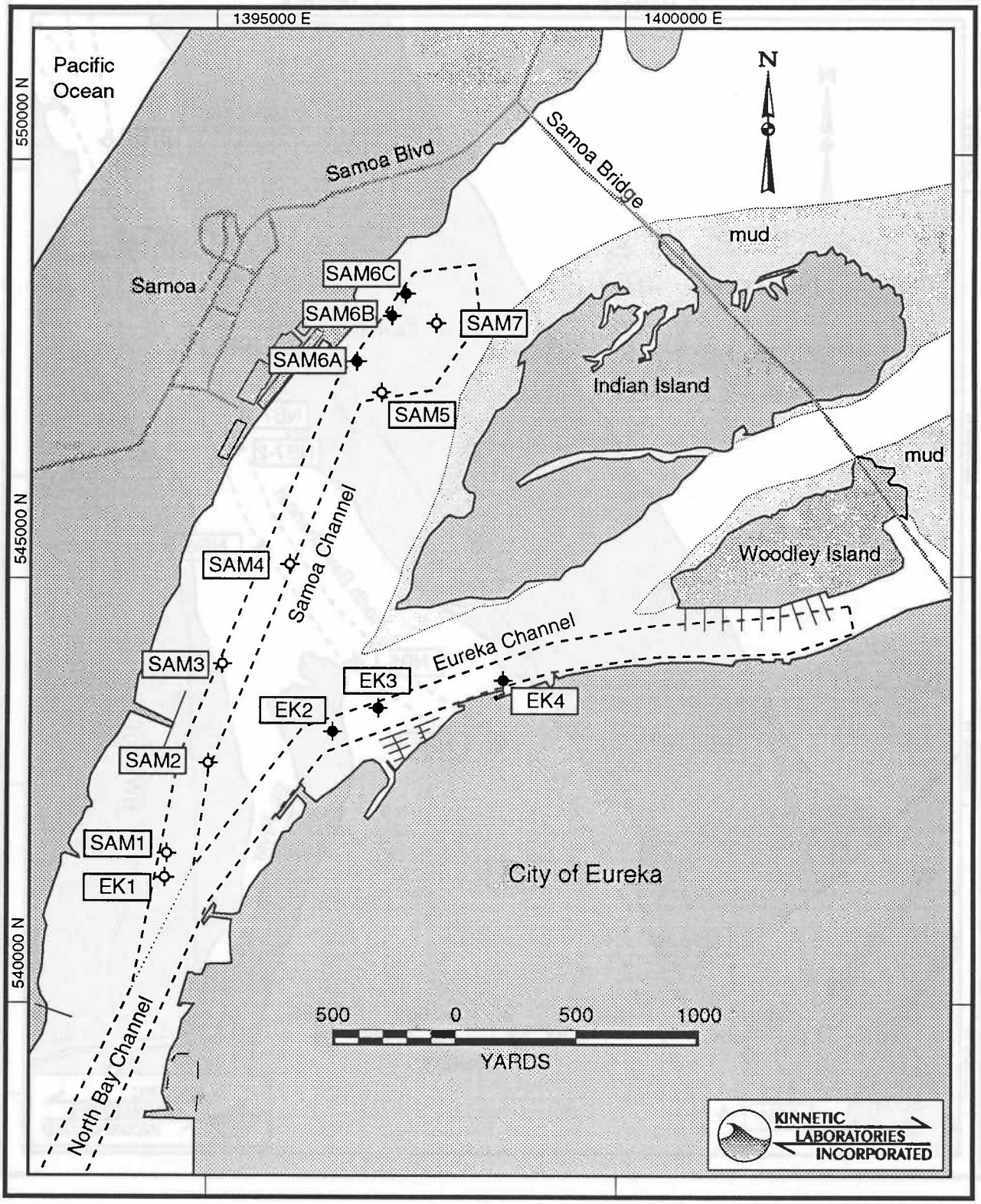

Figure 4. Humboldt Bay FY1993 sampling locations. Stations EK1 through EK4 and SAM1 through SAM7. Solid stations indicate those used in Eureka Upper Channel (EKUP) and Samoa Turning Basin (SAMTB) composites.

APPENDICES

Appendix A

Scope of Services

Scope of Services
Bioassays and Bioaccumulation Testing
Humboldt Harbor FY 93 Maintenance Dredging

1. PURPOSE. The purpose of this contract is to perform bulk sediment analyses, suspended particulate bioassays, solid phase bioassays, and bioaccumulation testing of sediments collected from Humboldt Harbor and Bay. The testing will assist in determining whether the material from Humboldt Harbor and Bay is suitable for aquatic disposal in compliance with Section 103 of the Marine Protection Research and Sanctuaries Act.

2. THE CONTRACTOR'S RESPONSIBILITY. The Contractor shall furnish all necessary labor, facilities, equipment, and materials to perform the work described under this contract. The Contractor's representative shall be available to meet with Government personnel as requested by the USACE San Francisco District. The Contractor shall perform the services in accordance with this statement of work and the general provisions. Any modifications in equipment and/or methodology from those outlined in this Scope of Services must be approved by the San Francisco District (SFD). In order to adhere to the project schedule, all requests for modification or variations in equipment or procedures shall be forwarded to the SFD at the earliest date/time to ensure a timely review. The Contractor shall comply with all pertinent provisions of the U.S. Army Corps of Engineers Safety and Health Requirements Manual EM-385-1-1, date October 1984. The Contractor shall provide transportation and access from shore to the sampling vessel to a representative of the U.S. Army Corps of Engineers who may be present during sampling.

SEDIMENT SAMPLING LOCATIONS

a. Samoa, Eureka, Fields Landing, North Bay, Bar and Entrance Channels. Sediment samples shall be taken at those sites listed in Table 1 (shown in Figure 1). A total of four composites shall be made according to the compositing scheme shown in Figure 2 and listed in Table 2.

b. A sufficient amount of sediment shall be collected from each location specified in Table 1, so that a representative amount of sediment is included from each sampling location in each composite, and that there is sufficient composited sediment to run the full suite of sediment chemistry, bioassays and bioaccumulation tests. In addition, sufficient individual sediment from each sediment location within a composite area shall be taken to conduct individual sediment chemistry analyses.

c. All of the samples shall have their containers physically marked as to area, sample location, and purpose of sampling. The Contractor

shall furnish SFD an inventory of all samples taken and delivered, and their respective labels.

d. Sediment samples shall be placed in appropriate containers and stored following methodologies described in the manual. Care shall be taken to ensure that the containers are completely filled by the samples and that air bubbles are not trapped in the containers. All samples shall be stored immediately at 4°C and not frozen or dried. The Contractor shall provide the ice and ice chests or chest freezers to be used in the field to maintain samples at 4 C. These samples shall be stored at 4 C until testing initiated.

e. That portion of each individual sediment sample remaining after analyses shall be archived at 4°C. for possible additional chemical analyses until completion of the work and acceptance of the final report. Disposal of all sediments remaining at the end of testing shall be the Contractor's responsibility.

f. The Contractor shall provide the mudline elevations at each sample gathering location in reference to mean lower low water.

g. The Contractor shall maintain a daily field activity log listing the beginning and ending time for every and all phases of operation.

h. Formal chain-of-custody procedures shall be followed and documented.

4. SEDIMENT SAMPLING EQUIPMENT

a. Sediments in the Samoa, Eureka, Fields Landing, and North Bay channels shall be sampled with vibracore equipment. Each of the sampling locations within Humboldt Bay and Harbor sampled by vibracore shall be sampled from mudline to project depths (MLLW) listed on Table 1. Material below the required depths listed on Table 1 shall not be used for testing. Where there is less than a foot of sediment at the sampling location or attempts to sample with the Vibracore equipment has failed, sediment samples at that location shall be obtained with either a Van Veen Grab sampler or a pipe dredge sampler. Samples from the Bar and Entrance channels, reference site, and control site shall be sampled using either a Van Veen Grab Sampler or equivalent, or a pipe dredge.

b. A fathometer shall be used to ensure vertical control of sampling. Horizontal positioning equipment with an accuracy of ten (10) feet is required to locate sampling points within the harbor. An accuracy of fifty (50) feet is required to locate the sampling site of the reference area.

c. Each individual sediment core sample taken in the Humboldt channels shall be taken within an area bounded by a 50-foot radius having its center located at the coordinates provided above or as approved by the government representative. In the event that there

is insufficient sediment to sample between mudline elevation and the sampling depth listed above, with either the vibracore or grab sampler, the contractor shall locate as close as possible to the original sampling site, a new sampling location (inside the channel lines) which will provide sufficient sediment for sampling.

d. Care shall be taken during sampling to avoid contamination of sediment. All coring devices, if possible, shall be composed of or lined with a noncontaminating material such as cellulose buterate or lexan. If this is not possible, the Contractor must document what steps will be taken to prevent contamination of sediments during sampling as well as during storage prior to initiation of testing. Any samples indicating external contamination due to handling shall require resampling at no additional cost to the SFD.

5. SEDIMENT CHEMICAL, PHYSICAL AND GEOLOGICAL CHARACTERIZATION.

a. Grain size analyses shall be completed for all individual sediment samples taken in each of the Humboldt Harbor and Bay channels. Individual sediment samples taken in the Bar, Entrance, and North Bay channels, which are found to not be predominantly sand (if <80% retained on #200 sieve), and are not included in a compositing area, shall be analyzed for the parameters specified in Table 3. All composited sediments from Humboldt Harbor channels, the reference site, and the control, and all individual sediments sampled within the compositing areas, shall be analyzed for the parameters specified in Table 1. In addition, for each composited sediment, Dioxin/Furan analyses shall be conducted. The required detection limits are also given in Table 3. The results shall be reported in dry weight.

b. All analyses must be conducted using EPA approved methodologies that are suitable for marine sediments and which yield the required detection limits with good precision and accuracy. Appropriate clean-up procedures shall be employed that remove as much of the interfering material as possible from the sample without compromising the integrity of the sample or increasing the detection limits.

c. The presence of major "unknown" analytes on gas chromatograms or reconstructed ion chromatography (GC/MS) should be noted.

d. Grain size analysis and hydrometer readings shall be performed in accordance with the grain size procedure found in Procedures for Handling and Chemical Analysis of Sediment and Water Samples, U.S. Army Corps of Engineers Technical Committee on Criteria for Dredged and Fill Material (Plumb 1981).

CHANNEL	SAMPLE	NORTHING	EASTING	Estimated depth to mudline (MLLW)	Sample to maximum Depth of (MLLW)
North Bay					
	NB1	525,070	1,384,200	GRAB	37
	NB2	525,920	1,383,850	GRAB	37
	NB3	528,610	1,386,270	GRAB	37
	NB4	530,600	1,387,800	GRAB	37
	NB5	531,750	1,389,435	GRAB	37
	NB6	533,710	1,391,365	GRAB	37
	NB7	535,691	1,392,300	36	37
	NB8	537,165	1,392,987	36	37
	NB9	538,680	1,393,630	35	37
	NB10	540,530	1,394,465	36	37
SAMOA					
	SAM1	541,698	1,394,581	36.5	37
	SAM2	542,620	1,34,962	35.5	37
	SAM3	544,057	1,395,362	35-36	37
	SAM4	545,480	1,396,110	35-36	37
	SAM5	547,270	1,397,500	34-35	37
	SAM6	547,620	1,397,079	36	37
	SAM7	548,480	1,398,061	36	37
EUREKA					
	EK1	541,498	1,395,132	36.5	37
	EK2	543,115	1,396,720	26.5	28
	EK3	543,600	1,397,863	27	28
	EK4	543,792	1,398,985	26.5	28
FIELDS LANDING					
	FL1	513,800	1,383,820	27.5-28	28
	FL2	514,070	1,384,130	27.5-28	28
	FL3	514,250	1,383,790	28-30	28

CHANNEL	SAMPLE	NORTHING	EASTING	Estimated depth to mudline (MLLW)	Sample to maximum Depth of (MLLW)
	FL4	515,660	1,384,580	28	28
	FL5	517,305	1,385,100	27	28
	FL6	519,220	1,384,600	27	28
	FL7	521,140	1,383,510	25	28
	FL8	523,300	1,384,500	27	28
ENTRANCE	ENT1	526,110	1,382,040	Grab	45
	ENT2	529,240	1,379,860	Grab	45
BAR	BAR1	531,010	1,377,490	GRAB	45
Reference site	RF	40°49'41" North	124°18'34" West	GRAB OR PIPE DREDGE	165-165' or 26.5-27.0 fathoms
Control Site	Tomales Bay	38°13'50" North	172o57'40" West		

TABLE 1. Humboldt Sampling Locations

Composite	SAMPLE	COMPOSITE	SAMPLE
1	EK1	4	FL1
1	EK2	4	FL2
1	EK3	4	FL3
1	EK4	4	FL4
		4	FL5
2	SAM4	4	FL6
2	SAM5	4	FL7
2	SAM6	4	FL8
2	SAM7		
		5	RF
3**	NB8	6	Tomales Bay
3**	NB9		
3**	NB10		
3	SAM1		
3	SAM2		
3	SAM3		

Table 2. Compositing Plan

** Only placed in composte if >80% passes through #200 sieve

Table 3 Designation of Parameters for Analysis

Parameters	Detection Limit (mg/kg dry wt)[a]
Sediment Conventionals	
TOC	0.1%
Oil and Grease	20
TPH	20
Grain Size	NA
Total Solids	0.1%
Total and Water Soluble Sulfides	0.1
Metals	
Ag	0.1
As	0.1
Cd	0.1
Cr	0.1
Cu	0.1
Hg	0.02
Ni	0.1
Pb	0.1
Se	0.1
Zn	1.0
Organic Compounds	
Butyltins[b]	0.001
PCBs[c]	0.02
PAHs[d]/ Phenol	0.02
Pesticides-[e]	
Aldrin	.0005
Alpha-BHC	.001
Beta-BHC	.001
Delta-BHC	.001
Gamma-BHC	.001
Alpha-Chlordane	.001
Gamma-Chlordane	.001
4.4'-DDD	.001
4.4'-DDE	.001
4.4'-DDT	.001
Dieldrin	.0005
Endosulfan I	.002
Endosulfan II	.0005
Endosulfan Sulfate	.01
Endrine	.0005
Heptochlor	.0005
Heptochlor Epoxide	.01
Toxaphene	.03

TCDD/TCDF (f)	1 pptrillion

(a) Report as mg/kg dry wt., unless otherwise noted.
(b) Mono-, Di-, and Tributyltin.
(c) Reported as Aroclor equivalents 1242, 1248, 1254, and 1260 and total PCB.
(d) All compounds on EPA Method 610 list.
(e) All compounds on EPA Method 608 list.
(f) Only on composited sediments

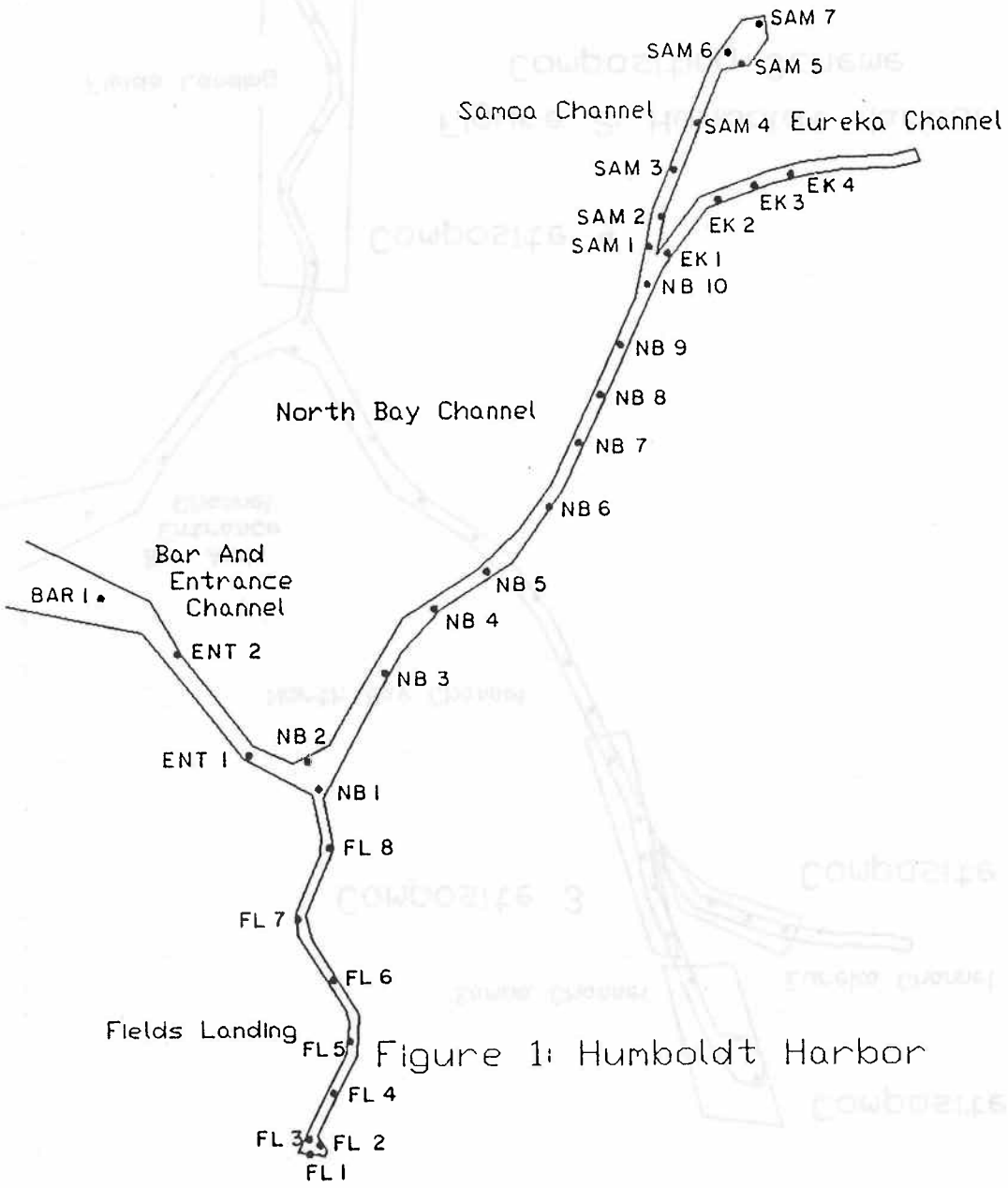

Figure 1: Humboldt Harbor

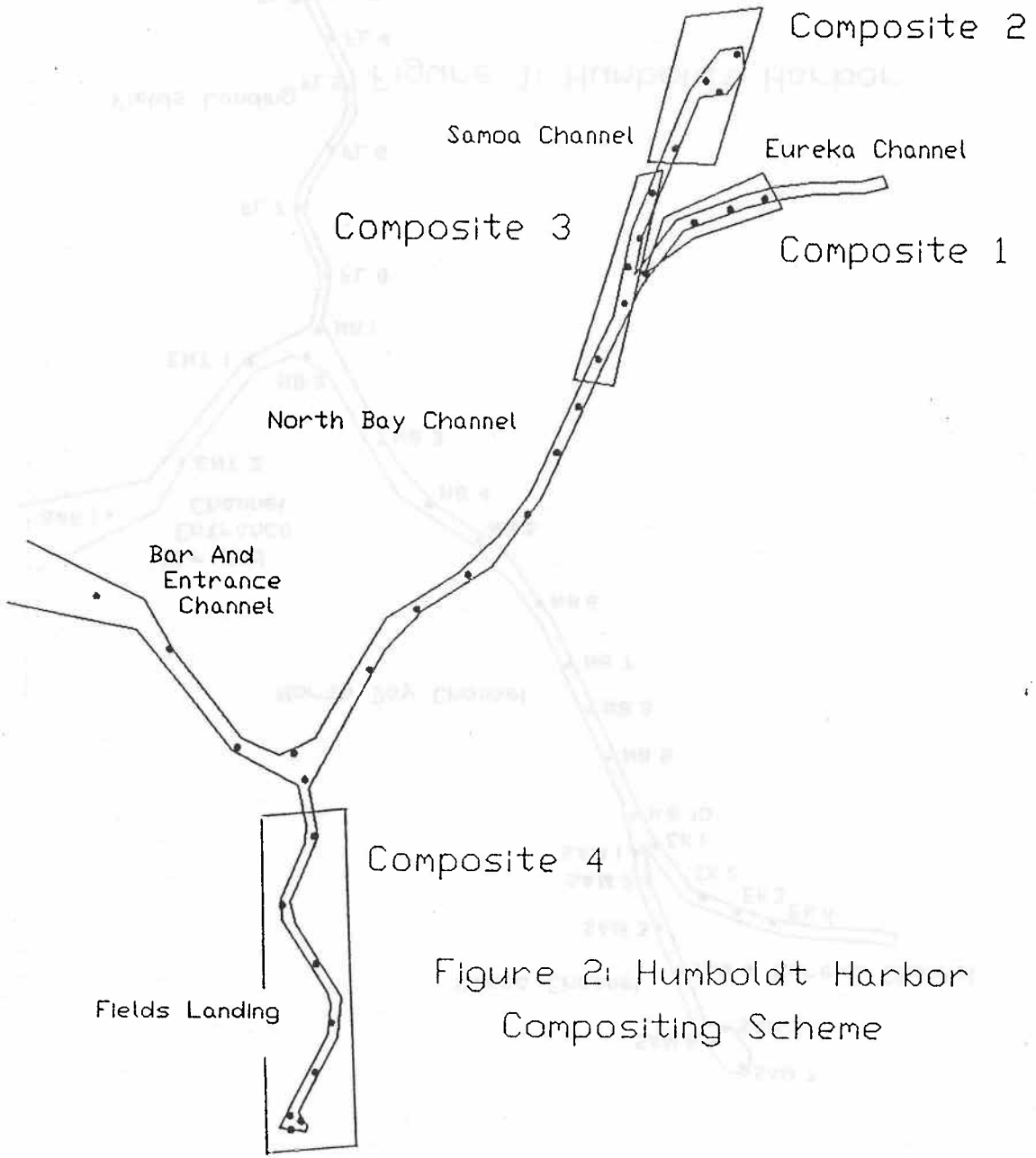

Figure 2: Humboldt Harbor
Compositing Scheme

Note: Throughout the following discussions on bioassays the term Manual refers to the Evaluation of Dredged Material for Ocean Disposal, Testing Manual (EPA-503/8-91/001, February 1991) developed by the EPA Office of Marine and Estuarine Protection and U. S. Army Corps of Engineers, available through the Corps of Engineers' Waterways Experiment Station, Telephone (601)634-2571.

6. SUSPENDED PARTICULATE PHASE BIOASSAYS.

a. Sediment and Water Collection. The Contractor shall collect and preserve all sediment samples as described in sections 3 and 4 above and in the Manual. Water shall be clean, uncontaminated seawater of appropriate salinity, pH and temperature. Sufficient water shall be collected to perform the required tests. Seawater from any suitable location may be used provided it does not exceed applicable EPA quality criteria for marine waters and is of constant quality. Contractors shall be able to provide evidence that water meets these criteria, if necessary. Testing shall be conducted on the composited samples as specified in sections 3 and 4 above.

b. Preparation of the Bioassay Phase.

(1) Suspended Particulate Phase Bioassay. Phase preparation shall follow the procedure in the Manual for the suspended phase.

(2) Water Samples. Preparation of water samples shall follow the Manual.

(3) Sediment Sample. Composited sediment samples from Humboldt Bay and Harbor shall be prepared according to the manual. In addition to the treatment composites, there shall be the control water, reference water, and reference sediments. The control and reference water may be the same if the animals are being held before testing in the same water to be used for the bioassays.

c. Collection and Maintenance of Test Species.

(1) Species Selection. Three species shall be used: (1) Larvae of (pacific oyster) Crassostraea gigas or (bay mussel) Mytilus edulis (% normal development to D stage) (2) (mysid shrimp) Holmesimysis sculpta, and (3) (juvenile sanddab) Citharicthys stigmaeus.

(2) Organism Handling and Holding. Organisms shall be held no longer than two weeks. The SFD must approve additional holding time. Experiments shall be designed and performed so that organisms are handled as minimally as possible. Procedures for handling are found in the Manual. The physiological and biological needs of the test organisms must be met at all times.

d. Bioassay Testing of the Suspended Phase. Five replications of each treatment (including control) shall be performed. If greater than 10% of the control dies during any test, that test must be repeated at no additional expense to the SFD. However, control mortalities of 30% are acceptable in zooplankton

bioassays. Conditions and procedures shall follow those found in the Manual, unless otherwise noted.

e. Deviations From the Manual. If there is an odor of hydrogen sulfide, the water shall be aerated until the odor of hydrogen sulfide is no longer detected. The Contractor shall measure NH_3 in the test containers. If the NH_3 concentration is elevated, the water shall be aerated until the concentration is adequately reduced before introducing the test organisms.

f. Experimental Design. The design is a completely randomized design with three dilutions per dredging area per species, three reference sediments, and a control.

Suspended Particulate Treatments	As a Reference	As a Control
For each dredge area:	(1) 100% marine water	(1) 100% culture water
(1) 100% Suspended Particulate Phase	(The following use reference sediment)	Note: May be the same as reference water
(2) 50% suspended particulate phase	(2) 100% suspended particulate phase	
(3) 10% suspended particulate phase	(3) 50% suspended particulate phase	
	(4) 10% suspended particulate phase	

The test organisms and treatment shall be randomly assigned to test containers. The variable measured shall be percent survival except for the bivalve larvae test for which both survival and percent normal development are measured. The EC50 and LC50 shall both be calculated according to ASTM E724-89. Each species shall be considered a separate test. The 100% suspended particulate phase may be run first. If mortalities (or abnormal development) of 50% or less occur by 48-96 hours, the 50% and 10% dilutions need not be run. If greater than 50% mortality (or abnormal development) occurs by 48-96 hours, the test must be rerun at the Contractor's expense using the full series of dilutions (100%, 50%, 10% and control).

g. Data Analysis for Suspended Particulate Bioassays.

(1) If total survival or percent normal development in the test medium is equal to or higher than survival in the reference or control, visual inspection of the data is adequate and no statistical analyses are needed.

(2) A table or tables shall be provided for each species tested, giving the number of organisms tested, the total number of

surviving organisms for each time period and each treatment, the mean, and the standard deviation.

(3) If mean percent survival or normal development in the control is greater than any of the other treatments, for the bioassays, than additional statistical analyses shall be performed. The statistical analyses shall be as described in the Manual. Any deviations from the Manual must be approved by the Government. The results of all statistical analyses shall be presented in tabular form.

(4) If 50 percent or greater mortality or abnormal development occurs in the highest concentration of test medium, than a LC50 or EC50 must be calculated as described in the Manual.

7. SOLID PHASE BIOASSAY

a. Sediment and Water Collection. The Contractor shall collect and preserve all sediment and water samples as described in sections 3 and 4 above and in the Manual. Composited sediment samples shall be prepared and handled according to the Manual. For control sediment, the Contractor shall procure unpolluted sediment that is compatible with the test organisms and preferably from where they were collected. The control sediment must meet the needs of the organisms. The bioassays shall be conducted with a flow-through seawater system except for the test using the amphipod. Seawater of approximately 15°C, 30-32 ppt salinity should be passed through a sand filter and flow into each aquarium at a rate that will replace the aquarium volume at least once every 12 hours. The flow should be directed to achieve good mixing without disturbing the layer of sediment on the aquarium bottom. Water for all bioassays will be clean, uncontaminated seawater of appropriate salinity, pH and temperature. Seawater from any suitable location may be used provided it does not exceed applicable EPA quality criteria for marine waters and is of constant quality.

b. Collection and Maintenance of Test Species.

(1) Species Collection. It is recommended that collection of species should include at least 20% more than the minimum requirement.

(2) Species Selection. Two species shall be used: (1)(Amphipod) Rhepoxynius abronius; (2) (burrowing polychaete) Nepthys caecoides, and (mysid shrimp) Holmesimysis costata.

(3) Organism Handling and Holding. Organisms shall be held no longer than two weeks. The SFD must approve additional holding time. Experiments shall be designed and performed so that organisms are handled as minimally as possible. Procedures for handling are found in the Manual. The physiological and biological needs of the organisms must be met at all times.

c. Solid Phase Preparation and Experimental Design. The test treatments shall consist of the dredged material samples, a reference,

and a control. Five replications of each treatment shall be performed. Each replicate shall consist of at least 20 organisms of each of these species. The dredged material treatments, references, and control shall be prepared as described in the Manual. However, only whole sediments shall be used in the solid phase tests. Layering of test sediments or control sediments over reference sediments is no longer acceptable. The purpose of the control is to verify the health of test organisms and the acceptability of test conditions. It also provides for quality assurance. If the mean survival in the control is less than 90 percent, the test must be repeated at no additional cost to the SFD. The variable measured shall be percent survival. Each species shall be considered a separate test.

d. Solid Phase Testing. Conditions and procedures shall follow those found in the Manual for the 10-day solid phase bioassay. Observations and water quality measurements (temperature, pH salinity, dissolve oxygen shall be made daily. Ammonia shall be measured daily in static tests.

(1) If the test sediment has an odor of hydrogen sulfide or has elevated ammonia levels, prior to introducing the organisms let the sediment settle in tank and then aerate until the ammonia concentration is sufficiently reduced and there is sufficient oxygen (approximately 4ppm) at the sediment-water interface being careful not to oxidize the sediment. One hour after the addition of the organism, the water in the tank shall be analyzed for hydrogen sulfide, ammonia, and dissolved oxygen. This information shall be included in the final report.

(2) The amphipod bioassay shall be conducted following the procedures of Swartz, R. C., J.K. Phillips, J.O. Lamberson and F.A. Cole. 1985. Phoxocephalid amphipod bioassay for marine sediment toxicity. pp. 284-307. In: R.D. Cardwell, R. Purdy and R.C. Bahner (eds.), Aquatic Toxicology and Hazard Assessment: Seventh Symposium. ASTM STP 854. The reburial portion of the test is not required.

e. Data Analysis For Solid Phase Bioassay.

(1) If total survival in the test medium is equal to or higher than in the reference, visual inspection of the data is adequate and no statistical analyses are needed for that test.

(2) A table or tables shall be provided for each species tested, giving the number of organisms tested, the total number of surviving organisms for each treatment, the means, and the standard deviation.

(3) If mean percent survival in the reference is greater than any of the other treatments, for the bioassays, then additional statistical analyses shall be performed. The statistical analyses shall be as described in the Manual except that multiple t-test shall not be used. Alternative statistical methods must be approved by the SFD. The results of all statistical

analyses shall be presented in tabular form.

8. BIOACCUMULATION.

a. Sediment and Water Collection. The Contractor shall collect and preserve all sediment and water samples as described in sections 3 and 4 above and in the Manual. Composited sediment samples shall be prepared and handled according to the Manual. For control sediment, the Contractor shall procure unpolluted sediment that is compatible with the test organisms and preferably from where they were collected. The control sediment must meet the needs of the organisms. The bioassays shall be conducted with a flow-through seawater system except for the test using the amphipod. Seawater of approximately 15°C, 30-32 ppt salinity should be passed through a sand filter and flow into each aquarium at a rate that will replace the aquarium volume at least once every 12 hours. The flow should be directed to achieve good mixing without disturbing the layer of sediment on the aquarium bottom. Water for all bioassays will be clean, uncontaminated seawater of appropriate salinity, pH and temperature. Seawater from any suitable location may be used provided it does not exceed applicable EPA quality criteria for marine waters and is of constant quality.

b. Collection and Maintenance of Test Species.

(1) Species Collection. It is recommended that collection of species should include at least 20% more than the minimum requirement.

(2) Species Selection. Two species shall be used: (1) Macuma nasuta and (2) Nephtys caecoides

(3) Organism Handling and Holding. Organisms shall be held no longer than two weeks. The SFD must approve additional holding time. Experiments shall be designed and performed so that organisms are handled as minimally as possible. Procedures for handling are found in the Manual. The physiological and biological needs of the organisms must be met at all times.

c. Solid Phase Preparation and Experimental Design. The test treatments shall consist of the dredged material samples, a reference, and a control. Five replications of each treatment shall be performed. Each replicate shall consist of at least 20 organisms of each of these species. The dredged material treatments, references, and control shall be prepared as described in the Manual. However, only whole sediments shall be used in the solid phase tests. Layering of test sediments or control sediments over reference sediments is no longer acceptable. The purpose of the control is to verify the health of test organisms and the acceptability of test conditions. It also provides for quality assurance. If the mean survival in the control is less than 90 percent, the test must be repeated at no additional cost to the SFD. This data must be reported to the SFD The variable measured shall be percent survival. Each species shall be considered a separate test.

(1) Tissue Analyses. At the end of the bioassay, surviving individuals of the bivalve are placed in separate aquaria in clean, flowing sediment-free water for sufficient time to void the digestive tracts. If the test animal requires that material be ingested to void its digestive tract, they should be purged in aquaria with clean sand. The Contractor shall provide rationale for the voiding times selected. The tissue shall be analyzed for the parameters specified in Table 3. A pre-exposure sample of tissue shall be analyzed for parameters specified in Table 3. Required detection limits are specified in Table 3. The Contractor is responsible for having sufficient tissue of the organisms to be used for bioaccumulation testing.

(2) Number of Samples. Five replicates from each of the treatments shall be tested for the parameters listed in Table 3. Survivors within each replicate shall be pooled as necessary to provide sufficient tissue for testing. The treatments shall consist of the dredged material samples, the references, and the control.

a. The results shall be reported in dry weight. Percent moisture shall also be reported.

b. Procedure. Suggested procedures for specific constituents are given in the Manual. The method selected must yield the required detection limits with good precision and accuracy.

c. Solid Phase Testing. Conditions and procedures shall follow those found in the Manual for the 28-day solid phase bioassay. Observations and water quality measurements (temperature, pH salinity, dissolve oxygen shall be made daily.

(1) If the test sediment has an odor of hydrogen sulfide or has elevated ammonia levels, prior to introducing the organisms let the sediment settle in tank and then aerate until the ammonia concentration is sufficiently reduced and there is sufficient oxygen (approximately 4ppm) at the sediment-water interface being careful not to oxidize the sediment. One hour after the addition of the organism, the water in the tank shall be analyzed for hydrogen sulfide, ammonia, and dissolved oxygen. This information shall be included in the final report.

d. Data Analysis and Presentation.

(1) If the mean tissue concentration of a parameter in one or more of the dredged material samples is less than or equal to that in the reference, visual inspection of the data is adequate and no statistical analyses are required, for that parameter.

(2) A table or tables shall be provided for each species and each contaminant giving the tissue concentration for each treatment and each replicate, the mean, and the

standard deviation.

(3) If mean tissue concentration of any parameter in any of the dredged material samples is higher than that in the reference, then additional statistical analyses comparing the test tissue concentration to the reference tissue concentration shall be performed. The statistical analyses shall be as described in the Manual except that multiple t-tests shall not be used. Alternative statistical procedures shall be approved by the SFD. The results of all statistical analyses shall be presented in tabular form.

9. QUALITY ASSURANCE AND QUALITY CONTROL.

a. The Contractor and subcontractors shall have an established quality control plan which is based on Environmental Protection Agency's quality control program as outlined in Handbook for Analytical Quality Control in Water and Wastewater Laboratories, USEPA 600/4-79-019, March 1979, EPA Office of Research and Development, Cincinatti, Ohio (Handbook). This plan shall also comply with the manual.

b. Quality control charts will be used for precision and accuracy (see section 6.1-6.3 of the Handbook). Percent recovery will be the control chart statistic for controlling accuracy. The industrial statistic "I" will be the control chart statistic for controlling precision. When it is discovered that any analysis is out of control from the standpoint of either precision or accuracy, all analyses since the last in control point will be repeated.

c. Upon completion of the analyses, the laboratory shall prepare a quality control report which includes the precision and accuracy of data generated on the analyzed samples.

d. As an absolute minimum, the following quality control measures shall be taken with each group of samples analyzed:

(1) A reagent blank per batch of samples shall be analyzed.

(2) One duplicate analyses per 10-20 samples shall be made, and precision data shall be reported in the quality control report.

(3) At least one audit or reference sample (EPA, NBS or other EPA- acceptable sources) for each constituent (if available) shall be analyzed (per batch or one per 10-20 samples whichever is less) and reported in the quality control report. This audit sample (marine or estuarine sediment and tissue) shall be within the same concentration range as the samples that are being analyzed.

(4) Spiked samples shall be analyzed in order to address analytical accuracy. At least one per 10-20 samples must be spiked with an appropriate standard in order to address accuracy. The concentration of the spike shall be within 200% of the detection

limit.

(5) Printouts from all AA and GC analyses shall be kept on file in the event that any concerns arise with the data.

e. All laboratory analyses shall be completed within the recommended holding time for each analytical method.

f. In addition to following quality control procedures described in the Handbook, quality control procedures described for specific analytical methods shall also be followed.

g. All GC analyses require confirmation using a second column which is different from the one used in the initial GC analysis.

h. Standard reference toxicant tests shall be conducted on all species. The results shall be reported in the report.

10. RELEASE OF DATA.

All data, reports, and materials obtained as a result of this contract shall become the property of the U.S. Government and shall be turned over to the SFD upon completion of this work. No data shall be released by the Contractor to any other party other than the SFD without expressed written permission from the SFD.

11. RESPONSIBILITY FOR FIELD WORK.

The Contractor shall be responsible for all damages to persons and property that occur as a result of actions by the Contractor's employees in connection with execution of the work.

12. REPORT PREPARATION.

a. The contractor shall prepare a project report according to the following format.

(1) Introduction. This section shall include a discussion of the purpose and a description of the project.

(2) Materials and Methods. This section shall include:

a. Narrative description of the material, methods and equipment used to perform the project tasks.

b. Daily field activity log which includes tidal stage and weather conditions.

c. Inventory of all samples taken and explanation of how used in the tests.

d. Diagrams and figures as appropriate including location map of the sampling areas and sample

locations within each area.

(3) Results. The Contractor shall include a narrative of the chemical characterization test results as well as the tables and graphs as described earlier. Any unusual laboratory or field observations shall also be described.

(4) References.

(5) Include appendixes

Appendix A -Scope of Work
Appendix B- Field Sampling Log Sheets/Field Notes
Appendix C- Grain Size data/graphs
Appendix D- QA/QC Data Plan and Report

(6) Text material shall be typed on good quality 8 1/2 by 11 inch bond paper with a 1 1/2-inch margin on the right, and 1-inch at the top and bottom.

(7) Drawings or plates shall be no larger than 20 inches by 11 inches with sufficient margin for binding on the left side and shall include a geographical scale.

(8) Each draft report shall be reviewed by the Corps of Engineers and comments returned to the Contractor. The Contractor shall address comments, correct typographical errors, and otherwise revise the document in accordance to the Contracting Officer's or his Authorized Representative's comments and questions.

Period of Service

Check Point One:
Pre-sampling Conference
Within 2 days of receiving the notice to proceed the contractor shall contact the Corps contract representative and provide the proposed dates for sampling.

Check Point Two:
Within 15 workdays of receiving the notice to proceed the contractor shall complete the sampling.

Check Point Three:
Within 60 workdays following the sampling the contractor shall submit 3 copies of the draft report.

Check Point Four:
Within 10 workdays of receiving the Corps comments on the draft report, the contractor shall submit 10 copies of the final report.

locations within each area.

(3) Results. The Contractor shall include a narrative of the chemical characterization test results as well as the tables and graphs as described earlier. Any unusual laboratory or field observations shall also be described.

(4) References.

(5) Include appendixes

Appendix A -Scope of Work
Appendix B- Field Sampling Log Sheets/Field Notes
Appendix C- Grain Size data/graphs
Appendix D- QA/QC Data Plan and Report

(6) Text material shall be typed on good quality 8 1/2 by 11 inch bond paper with a 1 1/2-inch margin on the right, and 1-inch at the top and bottom.

(7) Drawings or plates shall be no larger than 30 inches by 11 inches with sufficient margin for binding on the left side and shall include a geographical scale.

(8) Each draft report shall be reviewed by the Corps of Engineers and comments returned to the Contractor. The Contractor shall address comments, correct typographical errors, and otherwise revise the document in accordance to the Contracting Officer's or his Authorized Representative's comments and questions.

Period of Service

Check Point One:
Pre-sampling Conference
within 7 days of receiving the notice to proceed the contractor shall contact the Corps contract representative and provide the proposed dates for sampling.

Check Point Two:
Within 15 workdays of receiving the notice to proceed the contractor shall complete the sampling.

Check Point Three:
Within 60 workdays following the sampling the contractor shall submit 3 copies of the draft report.

Check Point Four:
Within 10 workdays of receiving the Corps comments on the draft report, the contractor shall submit 10 copies of the final report.

Appendix B

Field Sampling Log Sheets

SFCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

Date: 10-30-92 Vessel: C. Hale

Captain: Phil Glow Crew: KLI

GENERAL OBSERVATIONS:

Location I.D.: NR-1 (Time: 10:05) 10.82"

Coordinates: 40° 45' 24.60"

124° 13'

Core#: Core Length Obtained: Core Length Sampled GRAB

Sample: Composite/Discrete Core subsampled: Yes/No Sub Sample Interval:

Water Depth (+/-) Tide M.L.L.W. Sampling Depth = 37

38.5 (+/-) 5.02 = M.L.L.W. Mudline Depth = 35.25

+ 1.75

40.25 Core Length = 1.75

6 x 6 Only

COMMENTS:

SFCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

Date: 10-30-92 Vessel: Celtic

Captain: Phil Gloss Crew: KLI

GENERAL OBSERVATIONS: Great Surf in Entrance channel

Location I.D.: NR 2 Time: 0959

Coordinates: 40 45 19.46 20.60"

124 13 31.96 29.30"

Core#: _____ Core Length Obtained: _____ Core Length Sampled GRAB

Sample: Composite/(Discrete) Core subsampled: Yes/(No) Sub Sample Interval: _____

Water Depth (+/-) Tide M.L.L.W. Sampling Depth = 37.0

39 (+/-) 4.88 = M.L.L.W. Mudline Depth = 35.87

correction + 1.75 Core Length = 1.13

40.75

Grab Only

COMMENTS: Sand

COE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

: 11-30-92 Vessel: Celtic

n: L. Glow Crew: Crew

NERAL OBSERVATIONS: Sand

cation I.D.: NR 3 Time: 0944

ordinates: Desired 40 45 46.64 Actual 40 45 48.62"
124 13 01.41 124 12 55.05"

l #: Core Length Obtained: Core Length Sampled GRAB

mple: Composite (Discrete) Core subsampled: Yes (No) Sub Sample Interval:

Water Depth (+/-) Tide

37.8 (+) 4.65 = M.L.L.W. Sampling Depth = 37'

+1.35 M.L.L.W. Mudline Depth = 34.9

39.55 Core Length = 2.1'

Grab Only

MMENTS: Grab Only for PSD

COE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

: 10-30 Vessel: Celtic

tain: P Glow Crew: KLE

NERAL OBSERVATIONS: Sand -

cation I.D.: NB4 Time: 0935

ordinates: 40° 46 6.52" 40 46 6.59"

124° 12 42.18" 124 12 36.14"

ore#: Core Length Obtained: Core Length Sampled GRAB

ample: Composite/Discrete Core subsampled: Yes/No Sub Sample Interval:

Water Depth (+/-) Tide = M.L.L.W. Sampling Depth = _____

_____ (+/-) _____ = M.L.L.W. Mudline Depth = _____

Core Length = _____

COMMENTS: Moved towards East toward of channel to find area we could sample

COE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

e: 10-30 Vessel: Celtic

ain: P Glad Crew: KLI

ENERAL OBSERVATIONS: 1st Grab misfire

ocation I.D.: NB-5 Time: 0914

ordinates: Desired 40° 46' 18.45 Actual 22.63"

124° 12' 21.31 10.73"

e#: Core Length Obtained: Core Length Sampled GRAB

nple: Composite/Discrete Core subsampled: Yes/No Sub Sample Interval:

Water Depth (+/-) Tide

40.15 (+/-) 4.2 =

M.L.L.W. Sampling Depth = 32.0

M.L.L.W. Mudline Depth = 35.95

Core Length = 1.05

Grab Only

OMMENTS: Smith Mac Grab

Pure clean sand

SFCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

ate: October 29 1992 Vessel: Celtic

aptain: Phil Glenn Crew: Brown, Mattison, Emerson, Mertz
Guy, known as KLI

ENERAL OBSERVATIONS: EBB Tide - 20 Knot South Wind, ourcast
Area of core (desired) was at project depth. Moved site
towards Eastern side of channel to get representative
ample. Sediment is sand, gravel, shell hash. Tube worms

Location I.D.: NB 6 Time: 1554

oordinates: 40° 46' 38.87"
124° 11' 51.88"

Core#: Core Length Obtained: Core Length Sampled GRAB

Sample: Composite/Discrete Core subsampled: Yes/No Sub Sample Interval:

Water Depth (+/-) Tide

40.4 (+/-) -3.61 =

M.L.L.W. Sampling Depth =

M.L.L.W. Mudline Depth = 36.79

Core Length = .35"
Smith-Mac. Grab

COMMENTS:

TCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

te: Oct. 29, 1992 Vessel: Celtic

ain: Phil Cleveland Crew: KLI

ENERAL OBSERVATIONS: Location at or below project depth. Took representative sample at or near channel center. Shell hash, Sand, Gravel.

A

ocation I.D.: NB7 - Rep 1 Time: 1622

oordinates: 40° 46' 59.52" N
124° 11' 43.25" W

e#: Core Length Obtained: Surface Core Length Sampled GRAB

nple: Composite/Discrete Core subsampled: Yes/No Sub Sample Interval:

Water Depth (+/-) Tide

42' (+/-) 2.35 =

M.L.L.W. Sampling Depth = 37

M.L.L.W. Mudline Depth = 39.25

Core Length = Surface

OMMENTS:

Fatho + 1.9

SFCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

ate: Oct. 29, 1992 Vessel: Celtic

aptain: Phil Glass Crew: KLI

ENERAL OBSERVATIONS:
Took sample at toe of channel (near western limit)
to characterize nature of sediment.
Sediment near identical to Rep 1.

B

ocation I.D.: NB 7 - Rep 2 Time: 1635

oordinates: 40° 46' 58.69"
124° 11' 46.13"

Core#: Core Length Obtained: Core Length Sampled GRAB

Sample: Composite/(Discrete) Core subsampled: Yes/(No) Sub Sample Interval:

Water Depth	(+/-)	Tide		
32.5	- (+)	3.15	=	M.L.L.W. Sampling Depth = 37'
				M.L.L.W. Mudline Depth = 35.35'
				Core Length = Surface

COMMENTS:

COE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

Date: 10-30-92 Vessel: Celtic

Captain: P Glass Crew: KLI

GENERAL OBSERVATIONS:
No area < Project Depth - Made 2 smac. drops. Sand, Gravel lots of shell hash. Kept 2nd 6ma6 for PSD only, even though depth is greater than project depth.

Location I.D.: NR 8 - 26-6S Time: 0838

Coordinates: 40° 47' 13.96"
124° 11' 33.87"

Core#: _____ Core Length Obtained: 6ma6 Core Length Sampled PSD only

Sample: Composite/(Discrete) Core subsampled: Yes/(No) Sub Sample Interval: _____

Water Depth	(+/-)	Tide		
52.15	(+/-)	3.36	=	M.L.L.W. Sampling Depth = 37'
				M.L.L.W. Mudline Depth = 48.49'
				Core Length = 6ma6 for PSD only

COMMENTS:

SFCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

Date: 31 Oct 92 Vessel: M/V Celtic

Captain: Phil Crew: KLI

GENERAL OBSERVATIONS:
In center channel near ft of Del Norte St
Access from Simpson paper mill
Sample: med. COARSE Green/Brn SAND large shell debris
filamentous Algae, shell hash. some organic debris

Location I.D.: NB #9D Time: 0800 hrs PST

Coordinates: LAT: 40° 47' 28.5" _____

Long. 124° 11' 21.65" _____

Core#: Smith/MAC Grab sample Core Length Obtained: _____ Core Length Sampled GRAB

Sample: Composite/(Discrete) Core subsampled: Yes/No Sub Sample Interval: _____

Water Depth (+/-) Tide

39.75 (+/-) 3.5 =

M.L.L.W. Sampling Depth = 27'

M.L.L.W. Mudline Depth = 38.25

Core Length = _____

COMMENTS:

GRAB SAMPLE

Todays weather is overcast 55-60°F Winds S. occasional rain showers.

SFCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

Date: 31 Oct 92 Vessel: Celtic

Captain: P Glenn Crew: KLI

GENERAL OBSERVATIONS:

Central Channel ~1000 m ~~South~~ North of pulp mill

Sample: Brown/Grn SAND. Large shell debris + small trash

No tubes, (1) seastar, no odors

Location I.D.: NB 10 D Time: 0812 hrs ~~PST~~

Coordinates: 40° 47' 45.65" _____

124° 11' 15.20" _____

Core#: _____ Core Length Obtained: _____ Core Length Sampled GRAB

Sample: Composite/(Discrete) Core subsampled: Yes/No Sub Sample Interval: _____

Water Depth	(+/-)	Tide		
39.75	(+/-)	3.48	=	M.L.L.W. Sampling Depth = 37'
				M.L.L.W. Mudline Depth = 36.27
				Core Length = _____

COMMENTS:

GRAB Sample

SFCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

Date: 31 Oct 92 Vessel: Celtic

Captain: P. Glenn Crew: KLI

GENERAL OBSERVATIONS:

Toward west of center channel near pulp/wood piles

Sample: Green/Brn. sand med/coarse shell, hash w/ large shell frags nor organic debris. (much cleaner looking)

Location I.D.: SAM 1 D Time: 0822 hrs PST

Coordinates: LAT 40° 47' 58.13"

Long 124° 11' 14.89"

Core#: Core Length Obtained: Core Length Sampled GRAB

Sample: Composite/(Discrete) Core subsampled: Yes/No Sub Sample Interval:

Water Depth	(+/-) Tide		
38.75	(+/-) 3.49	=	M.L.L.W. Sampling Depth = 37'
			M.L.L.W. Mudline Depth = 36.27
			Core Length =

COMMENTS:

GRAB Sample

SPCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

ate: 31 Oct 92 Vessel: Celtic

tain: P Glenn Crew: K L I

ENERAL OBSERVATIONS:
W. of center of channel off of Louisiana pacific plant loading dock

Sample: Grn/Brn Medium/fine SAND, little bit of shell hash. no organic debris. Clean uniform sample no odor.

ocation I.D.: SAM 2 D Time: 0830 PST

ordinates: 40° 48'07 "
124° 11' 09.47"

e#: Core Length Obtained: Core Length Sampled GRAB

mple: Composite/Discrete Core subsampled: Yes/No Sub Sample Interval:

Water Depth (+/-) Tide M.L.L.W. Sampling Depth = 37'

39.75 (+/-) 3.5 = M.L.L.W. Mudline Depth = 36.25

Core Length =

OMMENTS:

GRAB Sample

FCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

ıte: 31 Oct 92 Vessel: Celtic

ıptain: P. Glenn Crew: KLI

ENERAL OBSERVATIONS: W side of channel just North of end of LP Loading Pier
Weather remains overcast
sample: Med/fine Grn/Brn SAND, organic debris. no odor shell hash
no large shells

ocation I.D.: SAM 3 D Time: 0842 h PST

Coordinates: LAT: 40 48 21.0 "

Long: 124 11 08.11 "

ore#: Core Length Obtained: Core Length Sampled GRAB

Sample: Composite/Discrete Core subsampled: Yes/No Sub Sample Interval:

Water Depth	(+/-)	Tide		
39.55	(+/-)	3.54	=	M.L.L.W. Sampling Depth = 37'
				M.L.L.W. Mudline Depth = 36.01
				Core Length =

COMMENTS: CRAB sample

COE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

e. 31 Oct 92 Vessel: Celtic

in: P Glenn Crew: K L I

NERAL OBSERVATIONS:
W. side of channel off lumber piles near L.P. plant

ample: Med/fine Grn/Brn SAND, shell hash. no organic debris, no odor
no large shell debris

ocation I.D.: SAM 4D Time: 0852 hrs PST

rdinates: LAT: 40° 48' 33.9"

Long. 124° 10' 56.28"

e#: Core Length Obtained: Core Length Sampled GRAB

ample: Composite/(Discrete) Core subsampled: Yes/No Sub Sample Interval:

Water Depth (+/-) Tide

39.75 (+/-) 3.58 =

M.L.L.W. Sampling Depth = 37'

M.L.L.W. Mudline Depth = 36.17

Core Length =

OMMENTS:

Grab sample

COE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

:: 31 Oct 92 Vessel: Celtic

tain: P Glenn Crew: KLI

NERAL OBSERVATIONS:
W side of channel off L.P. WA Refinery
sample: med/fine Grn/Brn. SAND, shell hash, no odor no G. shell

ocation I.D.: SAM 5 D Time: 0901 PST

oordinates: LAT: 40° 48' 53.02"
Long: 124° 10' 42.35"

Core#: Core Length Obtained: Core Length Sampled GRAB

Sample: Composite/Discrete Core subsampled: Yes/No Sub Sample Interval:

Water Depth (+/-) Tide

39.75 (+/-) 3.63 =

M.L.L.W. Sampling Depth = 37'

M.L.L.W. Mudline Depth = 36.12

Core Length =

COMMENTS:
GRAB SAMPLE

COE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

e: 31 Oct 92 Vessel: Celtic

in: P Glenn Crew: KLI

NERAL OBSERVATIONS:
sample taken ~ 100' ft off S. End of LP Lumber dock
sample. fine SAND w/silt ANOXIC layer, slight odor, some worms
more SAND at bottom of grab 3 Reps

ocation I.D.: SAM 6A (~~Z-6A~~) Time: 1005 PST

ordinates: LAT: 40° 48' 58.08"
Long: 124° 10' 47.32"

e#: Core Length Obtained: Core Length Sampled GRAB

ample: Composite/Discrete Core subsampled: Yes/No Sub Sample Interval:

Water Depth (+/-) Tide

40.45 (+/-) 4.18' =

M.L.L.W. Sampling Depth = 37'

M.L.L.W. Mudline Depth = 36.27

Core Length =

OMMENTS: Grab Samples

SFCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

Date: 31 Oct 92 Vessel: Celtic

Captain: P Glenn Crew: K L I

GENERAL OBSERVATIONS:

Sample:

Location I.D.: SAM 6 (B) Time: 11:15

ordinates: LAT: 40 49 01 41

Long: 124 10 43.0

Core#: _____ Core Length Obtained: 2.5 - 2.8 Core Length Sampled _____

Sample: (Composite)/Discrete Core subsampled: Yes/No Sub Sample Interval: _____

Water Depth (+/-) Tide M.L.L.W. Sampling Depth = 37

38.75 (+/-) 4.56 = M.L.L.W. Mudline Depth = 34.19

Core Length = 2.81

COMMENTS:

GRAB SAMPLES TOTAL OF 4 CORES TAKEN TO PROJECT DEPTH

H_2S SMELL

SFCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

Date: 31 OCT 92 Vessel: CELTIC

Captain: P Glenn Crew: KLI

GENERAL OBSERVATIONS:

1-1½ - - medium Sand

1½-3.5 becomes more clay, Fine Sand

3.2-3.5 anoxic layer with odor

Location I.D.: SAM 6 C Time: 1210

Coordinates: LAT 40 49 05.14

LONG 124 10 38.91

Core#: 6C/3 FOR 3 Core Length Obtained: 3.5, 3.5, 3.2 Core Length Sampled ALL

Sample: (Composite)/Discrete Core subsampled: Yes/No Sub Sample Interval:

Water Depth	(+/-) Tide		
39.0	(+/-) 5.6	=	M.L.L.W. Sampling Depth = 37
			M.L.L.W. Mudline Depth = 33.4
			Core Length = 3.6

COMMENTS: Took A TOTAL OF 3 CORES, WITH LENGTHS OF 3.5, 3.5 AND 3.2

SFCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

Date: 31 Oct 92 Vessel: Celtic

Captain: P. Glenn Crew: KLI

GENERAL OBSERVATIONS: Center of channel.

sample: Med/fine Grn/Brn SAND, shell hash, no odor some eelgrass
no organic debris otherwise

Location I.D.: SAM 7D Time: 0922 PST

Coordinates: LAT: 40° 49' 01.73"
Long: 124° 10' 34.83"

Core#: ____ Core Length Obtained: ____ Core Length Sampled GRAB

Sample: Composite/Discrete (circled: Discrete) Core subsampled: Yes/No Sub Sample Interval: ____

Water Depth	(+/-)	Tide			
38.75	(+/-)	3.76	=	M.L.L.W. Sampling Depth	= 37'
				M.L.L.W. Mudline Depth	= 35.99
				Core Length	= ____

COMMENTS: GRAB Sample

~~[illegible] but similar~~
~~[illegible]~~
~~channel material~~

SFCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

Date: 31 OCT 92 Vessel: CELTIC

Captain: P GLENN Crew: KLI

GENERAL OBSERVATIONS:

medium Brown sand to ~6 inches
Shell layer at 7 inches
Black sand from 7.5 inches and deeper
1 drink

Location I.D.: EK-1 Time: 1450

Coordinates: LAT 40 47 57.28

LONG 124 13.16

Core#: EK-1 Core Length Obtained: 1.6 Core Length Sampled 1.6

Sample: Composite/Discrete Core subsampled: Yes/No Sub Sample Interval:

Water Depth	(+/-) Tide		
41.15	(+/-) 6.45	=	M.L.L.W. Sampling Depth = 37
		=	M.L.L.W. Mudline Depth = 35.3
			Core Length = 1.7'

COMMENTS:

SFCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

Date: 1 NOV 1992 Vessel: CELTIC

Captain: P GLENN Crew: KLI

GENERAL OBSERVATIONS:

Top 6-12" medium Brown Sand
12-24" becomes darker with some fines
24-36" fine with increasing clay with depth

Location I.D.: EK-2-3 Time: 900-945

ordinates: LAT 40° 48' 13.70"

LONG 124° 10' 43.49"

Core#: Core Length Obtained: Core Length Sampled

Sample: Composite/Discrete Core subsampled: Yes/No Sub Sample Interval:

Water Depth	(+/-)	Tide			
30	(+/-)	3.54	=	M.L.L.W. Sampling Depth	= 28
				M.L.L.W. Mudline Depth	= 26.46
				Core Length	= 1.54

COMMENTS:

6 cores taken to obtain sufficient material

Discrete Sample Taken From EK-2

SFCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

Date: 1 NOV 1992 Vessel: CELTIC

Captain: P. GLENN Crew: KLI

GENERAL OBSERVATIONS:

TOP 6-12" Medium Brown Sand
12" - 36 Dark fine Sand
36-60 Sandy and interstitial Clay

Location I.D.: EK-3 #4 Time: 1030 - 1130

Coordinates: LAT 40 48 16.91

LONG 124 10 40.16

Core #: _____ Core Length Obtained: 5' 2" Core Length Sampled _____

Sample: Composite/Discrete Core subsampled: Yes/No Sub Sample Interval: _____

Water Depth (+/-) Tide

26.5 (+/-) 4.1 =

M.L.L.W. Sampling Depth = 28

M.L.L.W. Mudline Depth = 22.9

Core Length = 5.6

COMMENTS:

DISCRETE SAMPLE TAKEN EK 3-D
TOTAL OF 3 Cores ranging From 4.9 - 5.5 TAKEN

SFCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

Date: 1 NOV 1992 Vessel: CELTIC

Captain: P GLENN Crew: KLI

GENERAL OBSERVATIONS:

VERY smooth, Fine | Diatom mat on surface
Below diatom layer (>1cm) sediment Black, medium to strong
Sulfide smell
Consistent Texture Top To Bottom

Location I.D.: EK-4 Time: 1145

Coordinates: LAT 40 48 20.19

LONG 124 10 19.61

Core#: _____ Core Length Obtained: _____ Core Length Sampled GRAB

Sample: (Composite)/Discrete Core subsampled: Yes/No Sub Sample Interval: _____

Water Depth (+/-) Tide M.L.L.W. Sampling Depth = _____

_____ (+/-) _____ = M.L.L.W. Mudline Depth = _____

Core Length = _____

COMMENTS: TOOK 4 GRAB SAMPLES AT THIS STATION

DISCARDED SAMPLE TAKEN EK-4-D

SFCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

ate: 10-30-92 Vessel: Celtic

aptain: R. Glow Crew: KLI

ENERAL OBSERVATIONS: Some clam shells + shell hash but appears to be mostly River deposited sediment.

ocation I.D.: FL-1 Time: 1350 — 1420

oordinates: 40° 43' 17.38"

124° 13' 32.40"

ore#: Core Length Obtained: Core Length Sampled GRAB

Sample: (Composite)/Discrete Core subsampled: Yes/No Sub Sample Interval:

Water Depth (+/-) Tide = M.L.L.W. Sampling Depth = 2.20

30.5 (+/-) 6.37 = M.L.L.W. Mudline Depth = 26.13

+1.75

32.25

Core Length = 1.87

COMMENTS: Decided to take multiple Smith Mac Grabs at site to characterize area.

SFCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

Date: 10-30-92 Vessel: Celtic

Captain: P. Glenn Crew: KLI

GENERAL OBSERVATIONS:

Location I.D.: FL 2 Time: 1451 - 1503

Coordinates: 22.46 40° 43' 22.26"

24.41 124° 13' 18.89"

Core#: _____ Core Length Obtained: _____ Core Length Sampled GRAB

Sample: (Composite)/Discrete Core subsampled: Yes/No Sub Sample Interval: _____

Water Depth (+/-) Tide

31' (+/-) 5.6 =

M.L.L.W. Sampling Depth = 28

M.L.L.W. Mudline Depth = 25.4

Core Length = _____

COMMENTS: Moved desired stations to get into shallower water. Still in channel alongside dock. Smith Mac grabs to get surficial sediment

SFCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

ate: 10-30-92 Vessel: Celtic

aptain: P. Glow Crew: KLI

ENERAL OBSERVATIONS:

Location I.D.: FL-3 Time: 1516 - 1545

ordinates: 40° 43' 26.04"

124° 13' 26.35

Core#: Core Length Obtained: Core Length Sampled GRAB

Sample: (Composite)/Discrete Core subsampled: Yes/No Sub Sample Interval:

Water Depth	(+/-)	Tide			
				M.L.L.W. Sampling Depth	= 29'
32.5	(+/-)	5.14	=	M.L.L.W. Mudline Depth	= 27.36'
				Core Length	= 0.64'

COMMENTS: moved station to find depositional sediments
Took multiple Smith Mac grabs

SFCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

Date: 10-30-92 Vessel: Celtic

Captain: P. Glow Crew: KLT

GENERAL OBSERVATIONS: Fine grain sand + silt in Smith Mac. Bar. Ck
To take composite samples

Location I.D.: FL-4 Time: 1105

Coordinates: 40° 43' 36.64"
124° 13' 19.30"

Core#: _____ Core Length Obtained: _____ Core Length Sampled GRAB

Sample: Composite/Discrete Core subsampled: Yes/No Sub Sample Interval: _____

Water Depth (+/-) Tide

30.0
+ 1.35
31.35

(+) 5.29 =

M.L.L.W. Sampling Depth = 28.0'

M.L.L.W. Mudline Depth = 25.86

Core Length = 2.14'

COMMENTS:

SFCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

Date: 10-30-92 Vessel: Celtic

Captain: D Glow Crew: KLI

GENERAL OBSERVATIONS: Wind SSW @ 30 Knots
Choppy w/ white caps

Location I.D.: Ft - 4' - Vibra core Time: 1208 - 1235

Coordinates: 38.28 Actual 40° 43' 35.75

19.09 124° 13' 20.27

Core#: 1, 2 + 3 Core Length Obtained: 2' → 4' Core Length Sampled 4'

Sample: (Composite) Discrete Core subsampled: Yes (No) Sub Sample Interval:

Water Depth	(+/-)	Tide	M.L.L.W. Sampling Depth	= 28.00
28.40	(+/-)	6.75	M.L.L.W. Mudline Depth	= 23.66
+ 1.25				
30.15			Core Length	= 4.34

COMMENTS: Core #1 = 26" Total yield of 4.5 gallons this site
#2 = 3'10"
#3 = 4'

SFCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

Date: 10-30-92 Vessel: Celtic

Captain: Phil Glenn Crew: KLI

GENERAL OBSERVATIONS: Small Razor Clams in sample Grab

PSD only

Location I.D.: EL 5 Time: 1056

Coordinates: 40° 43' 54.36

124° 13' 08.89

Core#: Core Length Obtained: Core Length Sampled GRAB

Sample: Composite/(Discrete) Core subsampled: Yes/(No) Sub Sample Interval:

Water Depth	(+/-)	Tide		
30.0	(+/-)	5.76	=	M.L.L.W. Sampling Depth = 28
+0.75				M.L.L.W. Mudline Depth = 25.99
30.75				Core Length = 2.01

COMMENTS:

Sand - Seems to be getting finer grain size

SFCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

Date: 10-30-92 Vessel: Celtic

Captain: R. Glenn Crew: KLI

GENERAL OBSERVATIONS:

Location I.D.: FL 6 Time: 1045

Coordinates: 40° 44" 13.57"

124° 13" 13.65"

Core#: Core Length Obtained: Core Length Sampled GRAB

Sample: Composite/(Discrete) Core subsampled: Yes/(No) Sub Sample Interval:

PSD only

Water Depth (+/-) Tide

30 (+/-) 5.5 =

1.25

31.25

M.L.L.W. Sampling Depth = 28'

M.L.L.W. Mudline Depth = 26.16

Core Length =

COMMENTS:

Sand w/some rock + shell hash

SFCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

Date: 10-30-92 Vessel: Celtic

Captain: P. Glenn Crew: KLI

GENERAL OBSERVATIONS:

Location I.D.: FL-7 Time: 1032

Coordinates: 40° 44' 32.36" (

124° 13' 31.03"

Core#: _____ Core Length Obtained: _____ Core Length Sampled GRAB

Sample: Composite/Discrete Core subsampled: Yes/No Sub Sample Interval: _____

Water Depth (+/-) Tide

24'
1.75
25.75

(+) 5.38 =

M.L.L.W. Sampling Depth = 28'

M.L.L.W. Mudline Depth = 20.37

Core Length = 7.63'

Grab only Based on grain size

COMMENTS:

-Sand — Made field assessment to take discrete grab + not include in composite.

SFCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

Date: 10-30-92 Vessel: Celtic

Captain: R. Glover Crew: KLI

GENERAL OBSERVATIONS:

Location I.D.: FL-8 Time: 1019

Coordinates: 40° 44' 52.06"
124° 13' 17.07"

Core#: Core Length Obtained: Core Length Sampled GRAB

Sample: Composite/(Discrete) Core subsampled: Yes/(No) Sub Sample Interval:

Water Depth (+/-) Tide

30.0 (+/-) 5.1 =
+ 1.75
31.75

M.L.L.W. Sampling Depth = 28

M.L.L.W. Mudline Depth = 26.57

Core Length = 1.43

Grab for PSD only

COMMENTS: This was to be included in composite, but was deleted from composite due to grain size.

Sand

SFCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

Date: 2 NOV 1992 Vessel: CELTIC

Captain: P. GLEASON Crew: KLI

GENERAL OBSERVATIONS:

Medium Grey-Brown Sand
Small pieces of organic material such as wood

Location I.D.: ENE 1 Time: 11:45

Ordinates: LAT 40 45 20.19

LONG 124 13 50.32

Core#: _____ Core Length Obtained: _____ Core Length Sampled GRAB

Sample: Composite/(Discrete) Core subsampled: Yes/No Sub Sample Interval: _____

Water Depth	(+/-)	Tide			
				M.L.L.W. Sampling Depth	= 45
47.75	(+/-)	3.52	=	M.L.L.W. Mudline Depth	= 44.23
				Core Length	= _____

COMMENTS:

1 DISCRETE SAMPLE TAKEN

SFCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

Date: 2 NOV Vessel: Celtic

Captain: Phil Glenn Crew: KLI

GENERAL OBSERVATIONS:

medium Grey - Brown Sand
Contains small pieces of wood

Location I.D.: ENT 2 Time: 1200

Coordinates: LAT 40 45 50.67

LONG 124 14 18.75

Core#: Core Length Obtained: Core Length Sampled GRAB

Sample: Composite/Discrete Core subsampled: Yes/No Sub Sample Interval:

Water Depth	(+/-)	Tide		M.L.L.W. Sampling Depth	= 45
43.75	(+/-)	3.59	=	M.L.L.W. Mudline Depth	= 40.16
				Core Length	=

COMMENTS:

1 DISCRETE SAMPLE TAKEN

SFCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

Date: 2 Nov 1992 Vessel: CELTIC

Captain: P. GLENN Crew: KLI

GENERAL OBSERVATIONS:

medium to Fine Sand - Very Uniform
no wood or organic material

Location I.D.: BAR 1 Time: 12:10

Coordinates: LAT 40 46 06

LONG 124 14 54.73

Core#: _____ Core Length Obtained: _____ Core Length Sampled GRAB

Sample: Composite/(Discrete) Core subsampled: Yes/No Sub Sample Interval: _____

Water Depth	(+/-)	Tide			
				M.L.L.W. Sampling Depth	= 45
43.75	(+/-)	3.63	=	M.L.L.W. Mudline Depth	= 40.12
				Core Length	= —

COMMENTS:

1 DISCRETE SAMPLE TAKEN

SFCOE FY 1992 MAINTENANCE DREDGING
HUMBOLDT HARBOR
CORE SAMPLING DATA SHEET

KINNETIC LABORATORIES INCORPORATED

Date: 2 NOV 1992 Vessel: CLEMY

Captain: P GLENN Crew: KLI

GENERAL OBSERVATIONS:
Very Fine Sand - some silt
uniform

Location I.D.: Ref site Time: 1:45 - 2:15 pm

Coordinates: LAT 40 44 59

LONG 124 20 34

Core#: _____ Core Length Obtained: _____ Core Length Sampled GRAB

Sample: Composite/Discrete Core subsampled: Yes/No Sub Sample Interval: _____

Water Depth	(+/-)	Tide		
163	(+/-)	—	=	M.L.L.W. Mudline Depth = 163 FT

M.L.L.W. Sampling Depth = 167 FT

Core Length = _____

COMMENTS:

#			
GRAB	1	1 gallon	GRAB 6 4 gallons
GRAB	2	1 gallon	
GRAB	3	4 gallons	
GRAB	4	½ gallon	
GRAB	5	1 gallon	

San Francisco Army Corps of Engineers
Humboldt Harbor Sediments

FY '93

Table 1. Summary of Core Samples Collected

Sample	Core #	Date	Time	Core Penetration Achieved (ft.)	Core Penetration Sampled(ft.) (n/s = no sample)	California Grid Zone Coordinates N	California Grid Zone Coordinates E
NB1	GRAB	10/30/92	10:05	-	-	525031	1384394
NB2	GRAB	10/30/92	09:59	-	-	526030	1384057
NB3	GRAB	10/30/92	09:44	-	-	528797	1386523
NB4	GRAB	10/30/92	09:35	-	-	530599	1387800
NB5	GRAB	10/30/92	09:14	-	-	531749	1389435
NB6	GRAB	10/29/92	15:54	-	-	533758	1391370
NB7	GRAB 1	10/29/92	16:22	-	-	535830	1392466
NB7	GRAB 2	10/29/92	16:35	-	-	535752	1392243
NB8	GRAB	10/29/92	08:38	-	-	537273	1393224
NB9	GRAB	10/31/92	08:00	-	-	538721	1393809
NB10	GRAB	10/31/92	08:12	-	-	540443	1394440
SAM1	GRAB	10/31/92	08:22	-	-	541705	1394795
SAM2	GRAB	10/31/92	08:30	-	-	542592	1395004
SAM3	GRAB	10/31/92	08:42	-	-	544002	1395528
SAM4	GRAB	10/31/92	08:52	-	-	545288	1395694
SAM5	GRAB	10/31/92	09:01	-	-	547195	1397435
SAM6	A	10/31/92	10:05	-	-	547717	1397065
SAM6	B	10/31/92	11:15	2.8	2.8	548415	1397729
SAM6	C	10/31/92	12:10	3.5	3.5	548045	1397400
SAM7	GRAB	10/31/92	09:22	-	-	548062	1399100

San Francisco Army Corps of Engineers
Humboldt Harbor Sediments
FY 93

Table 1. Summary of Core Samples Collected

Sample	Core #	Date	Time	Core Penetration Achieved (ft.)	Core Penetration Sampled(ft.) (n/s = no sample)	California Grid Zone Coordinates N	California Grid Zone Coordinates E
EK1	A	10/31/92	14:50	1.6	1.6	541616	1394926
EK2	A	11/01/92	09:00	1.5	1.5	543229	1396864
EK3	A	11/01/92	10:30	5.2	5.2	543538	1397512
EK4	GRAB	11/01/92	11:45	-	-	543931	1394440
FL1	GRAB	10/30/92	13:50	-	-	513761	1383887
FL2	GRAB	10/30/92	14:51	-	-	514038	1384234
FL3	GRAB	10/30/92	15:16	-	-	514435	1383990
FL4	A	10/30/92	12:08	-	-	515405	1384560
FL5	GRAB	10/30/92	10:56	-	-	517266	1385306
FL6	GRAB	10/30/92	10:45	-	-	519218	1384729
FL7	GRAB	10/30/92	10:32	-	-	521153	1383800
FL8	GRAB	10/30/92	10:19	-	-	523119	1384683
ENT1	GRAB	11/02/92	11:45	-	-	526029	1382439
ENT2	GRAB	11/02/92	12:00	-	-	529168	1380331
BAR1	GRAB	11/02/92	12:10	-	-	530790	1377603
REF1	GRAB	11/02/92	13:15	-	-	524696	1351329

Appendix C

Chemistry Results

Appendix C

Chemistry Results

Percent Solids
(%)

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: November 18, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as percent:

Sample Identification	% Solids
EKUP	75
SAMTB	77
FLTB	68
Ref Comp	77
Control	77
EK1	85
EK2	82
EK3-D	79
EK4-D	62
SAM1-D	80
SAM2-D	80
SAM3-D	78
SAM4-D	79
Detection limit	0.1

Philip D. Carpenter
Laboratory Director

Percent Solids
(%)

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: November 18, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as percent:

Sample Identification	% Solids
SAM5-D	76
SAM6-A	71
SAM6-B	69
SAM6-C	75
SAM7-D	78
FL1-D	78
FL2-D	57
FL3-D	71
FL4-D	78
FL5	76
FL6	80
FL7	78
FL8	75
Detection limit	0.1

Philip L. Carpenter
Laboratory Director

Sulfides
mg/Kg (ppm)

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: November 24, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per kilogram (parts per million) as indicated:

Sample Identification	Total Sulfides as received	Total Sulfides dry weight	Water Soluble Sulfides as received	Water Soluble Sulfides dry weight
EKUP	120	160	0.1	0.1
SAMTB	37	48	ND	ND
FLTB	7.3	11	ND	ND
Ref Comp	ND	ND	ND	ND
Control	41	53	ND	ND
EK1	ND	ND	ND	ND
EK2	13	16	ND	ND
EK3-D	12	15	ND	ND
EK4-D	260	420	ND	ND
SAM1-D	ND	ND	ND	ND
SAM2-D	ND	ND	ND	ND
SAM3-D	ND	ND	ND	ND
SAM4-D	1.9	2.4	ND	ND
Detection Limit		0.1		0.1

ND = None detected

Philip D. Carpenter
Laboratory Director

Sulfides
mg/Kg (ppm)

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: November 24, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per kilogram (parts per million) as indicated:

Sample Identification	Total Sulfides as received	Total Sulfides dry weight	Water Soluble Sulfides as received	Water Soluble Sulfides dry weight
SAM5-D	1.9	2.5	ND	ND
SAM6-A	29	41	ND	ND
SAM6-B	29	42	ND	ND
SAM6-C	37	49	0.1	0.2
SAM7-D	ND	ND	ND	ND
FL1-D	16	21	ND	ND
FL2-D	160	290	ND	ND
FL3-D	35	49	ND	ND
FL4-D	5.5	7.1	ND	ND
FL5	9.5	12	ND	ND
FL6	1.8	2.3	ND	ND
FL7	ND	ND	ND	ND
FL8	0.2	0.3	ND	ND
Detection Limit		0.1		0.1

ND = None detected

Philip D. Carpenter
Laboratory Director

Total Organic Carbon (TOC)
(%)

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: November 24-December 1, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as percent:

Sample Identification	TOC (%) as received	TOC (%) dry weight
EKUP	0.1	0.1
SAMTB	0.1	0.1
FLTB	0.2	0.3
Ref Comp	ND	ND
Control	ND	ND
EK1	0.1	0.1
EK2	0.1	0.1
EK3-D	0.2	0.3
EK4-D	0.3	0.5
SAM1-D	ND	ND
SAM2-D	ND	ND
SAM3-D	ND	ND
SAM4-D	0.1	0.1
Detection Limit		0.1

ND = None Detected

Philip D. Carpenter
Laboratory Director

Total Organic Carbon (TOC)
(%)

MATERIAL:	Sediment samples received November 4, 1992
IDENTIFICATION:	Humboldt
DATE COMPLETED:	November 24-December 1, 1992
TOXSCAN NUMBER:	T-9209
REPORT:	Quantitative chemical analysis is as follows, expressed as percent:

Sample Identification	TOC (%) as received	TOC (%) dry weight
SAM5-D	0.1	0.1
SAM6-A	0.2	0.3
SAM6-B	0.2	0.3
SAM6-C	0.2	0.3
SAM7-D	0.1	0.1
FL1-D	0.2	0.3
FL2-D	0.4	0.7
FL3-D	0.3	0.4
FL4-D	0.3	0.4
FL5	0.1	0.1
FL6	ND	ND
FL7	ND	ND
FL8	0.1	0.1
Detection Limit		0.1

ND = None Detected

Philip D. Carpenter
Laboratory Director

Metals
mg/Kg (ppm)
Dry Weight

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: November 20-25, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per kilogram (parts per million) on a dry weight basis:

Analyte	EKUP	SAMTB	FLTB	Reference Composite	Control
Arsenic	5.3	5.2	6.0	5.5	3.5
Cadmium	ND	ND	0.11	ND	ND
Chromium	120	140	160	150	46
Copper	16	13	20	15	3.0
Lead	5.6	4.4	5.3	4.9	2.2
Mercury	0.02	0.03	0.03	0.03	0.02
Nickel	65	60	76	78	20
Selenium	0.1	0.1	0.2	0.1	ND
Silver	ND	ND	ND	ND	ND
Zinc	49	43	54	50	18

ND = None Detected

Mercury Detection Limit = 0.02

All other Detection limits = 0.1

Philip D. Carpenter
Laboratory Director

Metals
mg/Kg (ppm)
Dry Weight

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: November 20-25, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per kilogram (parts per million) on a dry weight basis:

Analyte	EK1	EK2	EK3-D	EK4-D
Arsenic	5.7	5.2	5.1	6.2
Cadmium	ND	ND	ND	0.1
Chromium	86	110	130	160
Copper	8	11	15	25
Lead	3.2	4.4	5.2	7.3
Mercury	0.02	0.02	0.02	0.03
Nickel	39	56	62	85
Selenium	ND	ND	0.1	0.2
Silver	ND	ND	ND	ND
Zinc	32	40	38	67

ND = None Detected

Mercury Detection Limit = 0.02

All other Detection limits = 0.1

Philip R. Carpenter
Laboratory Director

Metals
mg/Kg (ppm)
Dry Weight

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: November 20-25, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per kilogram (parts per million) on a dry weight basis:

Analyte	SAM1-D	SAM2-D	SAM3-D	SAM4-D	SAM5-D
Arsenic	4.9	4.9	4.7	6.0	6.0
Cadmium	ND	ND	ND	ND	ND
Chromium	100	110	88	110	120
Copper	8.0	6.0	6.0	7.0	7.0
Lead	3.8	4.0	3.4	4.1	4.5
Mercury	0.05	0.02	0.03	0.03	0.06
Nickel	41	44	42	42	48
Selenium	ND	ND	ND	ND	ND
Silver	ND	ND	ND	ND	ND
Zinc	29	31	29	32	34

ND = None Detected

Mercury Detection Limit = 0.02

All other Detection limits = 0.1

Philip D. Carpenter
Laboratory Director

Metals
mg/Kg (ppm)
Dry Weight

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: November 20-25, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per kilogram (parts per million) on a dry weight basis:

Analyte	SAM6-A	SAM6-B	SAM6-C	SAM7-D
Arsenic	5.3	5.7	5.9	5.4
Cadmium	ND	ND	ND	ND
Chromium	150	160	160	120
Copper	15	18	14	7.0
Lead	4.9	5.7	5.4	4.6
Mercury	0.03	0.05	0.05	0.04
Nickel	66	73	68	46
Selenium	0.1	0.1	0.1	ND
Silver	ND	ND	ND	ND
Zinc	48	54	49	35

ND = None Detected

Mercury Detection Limit = 0.02

All other Detection limits = 0.1

Philip R. Carpenter
Laboratory Director

Metals
mg/Kg (ppm)
Dry Weight

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: November 20-25, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per kilogram (parts per million) on a dry weight basis:

Analyte	FL1-D	FL2-D	FL3-D	FL4-D
Arsenic	5.1	6.6	5.3	4.9
Cadmium	ND	0.2	ND	ND
Chromium	140	150	150	150
Copper	9	35	18	15
Lead	3.3	7.1	5.0	4.1
Mercury	0.04	0.07	0.04	0.02
Nickel	55	85	77	69
Selenium	ND	0.2	0.2	0.1
Silver	ND	ND	ND	ND
Zinc	39	73	51	46

ND = None Detected

Mercury Detection Limit = 0.02

All other Detection limits = 0.1

Philip D. Carpenter
Laboratory Director

Metals
mg/Kg (ppm)
Dry Weight

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: November 20-25, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per kilogram (parts per million) on a dry weight basis:

Analyte	FL5	FL6	FL7	FL8
Arsenic	5.0	3.1	5.2	4.9
Cadmium	ND	ND	ND	ND
Chromium	130	140	140	120
Copper	7.0	7.0	6.0	8.0
Lead	3.0	3.3	3.6	3.9
Mercury	0.05	0.03	0.05	0.04
Nickel	49	45	47	59
Selenium	ND	ND	ND	ND
Silver	ND	ND	ND	ND
Zinc	34	34	34	39

ND = None Detected

Mercury Detection Limit = 0.02

All other Detection limits = 0.1

Philip D. Carpenter
Laboratory Director

Metals
mg/Kg (ppm)
As Received

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: November 20-25, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per kilogram (parts per million) as received:

Analyte	EKUP	SAMTB	FLTB	Reference Composite	Control
Arsenic	4.0	4.0	4.1	3.7	3.1
Cadmium	ND	ND	0.1	ND	0.1
Chromium	91	110	110	100	40
Copper	12	10	13	10	2.7
Lead	4.2	3.4	3.6	3.3	2.0
Mercury	0.02	0.02	0.02	0.01	0.02
Nickel	49	46	51	53	18
Selenium	0.1	0.1	0.1	0.1	ND
Silver	ND	ND	ND	ND	ND
Zinc	37	33	37	34	16

ND = None Detected

Mercury Detection Limit = 0.02

All other Detection limits = 0.1

Philip D. Carpenter
Laboratory Director

Metals
mg/Kg (ppm)
As Received

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: November 20-25, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per kilogram (parts per million) as received:

Analyte	EK1	EK2	EK3-D	EK4-D
Arsenic	4.7	4.1	3.8	3.6
Cadmium	ND	ND	ND	0.1
Chromium	71	87	98	93
Copper	6.3	8.8	11	14
Lead	2.6	3.5	3.9	4.2
Mercury	0.02	0.02	0.02	0.02
Nickel	32	44	46	49
Selenium	ND	0.1	0.1	0.1
Silver	ND	ND	ND	ND
Zinc	26	31	28	38

ND = None Detected

Mercury Detection Limit = 0.02

All other Detection limits = 0.1

Philip D. Carpenter
Laboratory Director

Metals
mg/Kg (ppm)
As Received

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: November 20-25, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per kilogram (parts per million) as received:

Analyte	SAM1-D	SAM2-D	SAM3-D	SAM4-D	SAM5-D
Arsenic	3.9	3.9	3.7	4.7	4.6
Cadmium	ND	ND	ND	ND	ND
Chromium	80	87	69	86	91
Copper	6.0	5.0	4.6	5.2	5.1
Lead	3.0	3.2	2.7	3.2	3.4
Mercury	0.04	0.02	0.03	0.03	0.04
Nickel	33	35	33	33	36
Selenium	ND	ND	ND	ND	ND
Silver	ND	ND	ND	ND	ND
Zinc	24	25	23	25	26

ND = None Detected

Mercury Detection Limit = 0.02

All other Detection limits = 0.1

Philip D. Carpenter
Laboratory Director

Metals
mg/Kg (ppm)
As Received

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: November 20-25, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per kilogram (parts per million) as received:

Analyte	SAM6-A	SAM6-B	SAM6-C	SAM7-D
Arsenic	3.7	3.9	4.4	4.2
Cadmium	0.06	ND	ND	ND
Chromium	100	110	120	94
Copper	11	13	10	5.3
Lead	3.5	3.9	4.1	3.6
Mercury	0.02	0.04	0.04	0.03
Nickel	47	50	51	36
Selenium	0.1	0.1	0.1	ND
Silver	ND	ND	ND	ND
Zinc	34	37	37	27

ND = None Detected

Mercury Detection Limit = 0.02

All other Detection limits = 0.1

Philip D. Carpenter
Laboratory Director

Metals
mg/Kg (ppm)
As Received

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: November 20-25, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per kilogram (parts per million) as received:

Analyte	FL1-D	FL2-D	FL3-D	FL4-D
Arsenic	4.3	4.5	3.5	3.3
Cadmium	ND	0.1	0.1	ND
Chromium	120	100	98	100
Copper	7.5	24	12	10
Lead	2.8	4.9	3.2	2.8
Mercury	0.03	0.04	0.03	0.02
Nickel	47	58	50	47
Selenium	0.1	0.2	0.1	0.1
Silver	ND	ND	ND	ND
Zinc	33	50	33	31

ND = None Detected

Mercury Detection Limit = 0.02

All other Detection limits = 0.1

Philip D. Carpenter
Laboratory Director

Metals
mg/Kg (ppm)
As Received

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: November 20-25, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per kilogram (parts per million) as received:

Analyte	FL5	FL6	FL7	FL8
Arsenic	3.9	2.4	4.1	3.7
Cadmium	ND	ND	ND	ND
Chromium	100	110	100	89
Copper	5.1	5.9	4.9	6.4
Lead	2.4	2.7	2.8	2.9
Mercury	0.04	0.02	0.04	0.03
Nickel	39	36	37	44
Selenium	ND	ND	ND	ND
Silver	ND	ND	ND	ND
Zinc	27	27	26	29

ND = None Detected

Mercury Detection Limit = 0.02

All other Detection limits = 0.1

Philip D. Carpenter
Laboratory Director

Oil & Grease
Standard Method 5520C
mg/Kg (ppm)

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: December 3, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per Kilogram (parts per million) as indicated:

Sample Identification	Oil & Grease as received	Oil & Grease dry weight
EKUP	ND	ND
SAMTB	17	22
FLTB	ND	ND
Ref Comp	ND	ND
Control	ND	ND
EK1	140	160
EK2	ND	ND
EK3-D	ND	ND
EK4-D	22	36
SAM1-D	ND	ND
SAM2-D	45	56
SAM3-D	ND	ND
SAM4-D	ND	ND
Detection Limit	10	20

ND = None Detected

Philip D. Carpenter
Laboratory Director

Oil & Grease
Standard Method 5520C
mg/Kg (ppm)

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: December 3, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per Kilogram (parts per million) as indicated:

Sample Identification	Oil & Grease as received	Oil & Grease dry weight
SAM5-D	ND	ND
SAM6-A	ND	ND
SAM6-B	ND	ND
SAM6-C	ND	ND
SAM7-D	ND	ND
FL1-D	ND	ND
FL2-D	18	31
FL3-D	ND	ND
FL4-D	ND	ND
FL5	ND	ND
FL6	ND	ND
FL7	64	81
FL8	ND	ND
Detection Limit	10	20

ND = None Detected

Philip D. Carpenter
Laboratory Director

Total Petroleum Hydrocarbons
Standard Method 5520F
mg/Kg (ppm)

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: December 3, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per Kilogram (parts per million) as indicated:

Sample Identification	Total Petroleum Hydrocarbons as received	dry weight
EKUP	ND	ND
SAMTB	ND	ND
FLTB	ND	ND
Ref Comp	ND	ND
Control	ND	ND
EK1	ND	ND
EK2	ND	ND
EK3-D	ND	ND
EK4-D	13	21
SAM1-D	ND	ND
SAM2-D	ND	ND
SAM3-D	ND	ND
SAM4-D	ND	ND
Detection limit	10	20

ND = None Detected

Philip R. Carpenter
Laboratory Director

Total Petroleum Hydrocarbons
Standard Method 5520F
mg/Kg (ppm)

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: December 3, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per Kilogram (parts per million) as indicated:

Sample Identification	Total Petroleum Hydrocarbons as received	dry weight
SAM5-D	ND	ND
SAM6-A	ND	ND
SAM6-B	ND	ND
SAM6-C	ND	ND
SAM7-D	ND	ND
FL1-D	ND	ND
FL2-D	ND	ND
FL3-D	ND	ND
FL4-D	ND	ND
FL5	ND	ND
FL6	ND	ND
FL7	57	73
FL8	ND	ND
Detection limit	10	20

ND = None Detected

Philip D. Carpenter
Laboratory Director

Organotin Speciation
µg/Kg (ppb)
As Received

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: November 20-24, 1992
DATE EXTRACTED: November 16-23, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) as received:

Sample ID	Monobutyltin	Dibutyltin	Tributyltin	Tetrabutyltin	% TPT SUR
EKUP	ND	ND	1	ND	88
SAMTB	ND	1	1	ND	84
FLTB	ND	ND	1	ND	80
Ref Comp	ND	ND	ND	ND	86
Control	ND	ND	ND	ND	76
EK1	ND	ND	ND	ND	73
EK2	ND	ND	ND	ND	96
EK3-D	ND	ND	ND	ND	88
EK4-D	ND	ND	1	ND	85
SAM1-D	ND	ND	ND	ND	102
SAM2-D	ND	ND	1	ND	100
SAM3-D	ND	ND	ND	ND	97
SAM4-D	ND	ND	ND	ND	101

TPT Sur = Tripropyltin surrogate recovery

ND = None Detected

Detection limit = 1 ppb

Philip D. Carpenter
Laboratory Director

Organotin Speciation
µg/Kg (ppb)
As Received

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: November 20-24, 1992
DATE EXTRACTED: November 16-23, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) as received:

Sample ID	Monobutyltin	Dibutyltin	Tributyltin	Tetrabutyltin	% TPT SUR
SAM5-D	ND	ND	1	ND	97
SAM6-A	ND	ND	1	ND	98
SAM6-B	ND	ND	1	ND	104
SAM6-C	ND	ND	1	ND	95
SAM7-D	ND	ND	ND	ND	91
FL1-D	ND	ND	1	ND	75
FL2-D	ND	1	2	ND	91
FL3-D	ND	ND	ND	ND	84
FL4-D	ND	ND	ND	ND	72
FL5	ND	ND	ND	ND	98
FL6	ND	ND	ND	ND	103
FL7	ND	ND	ND	ND	93
FL8	ND	ND	ND	ND	98

TPT Sur = Tripropyltin surrogate recovery

ND = None Detected

Detection limit = 1 ppb

Philip D. Carpenter
Laboratory Director

Organotin Speciation
µg/Kg (ppb)
Dry Weight

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: November 20-24, 1992
DATE EXTRACTED: November 16-23, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) on a dry weight basis:

Sample ID	Monobutyltin	Dibutyltin	Tributyltin	Tetrabutyltin	% TPT SUR
EKUP	ND	ND	1	ND	88
SAMTB	ND	1	1	ND	84
FLTB	ND	ND	1	ND	80
Ref Comp	ND	ND	ND	ND	86
Control	ND	ND	ND	ND	76
EK1	ND	ND	ND	ND	73
EK2	ND	ND	ND	ND	96
EK3-D	ND	ND	ND	ND	88
EK4-D	ND	ND	1	ND	85
SAM1-D	ND	ND	ND	ND	102
SAM2-D	ND	ND	1	ND	100
SAM3-D	ND	ND	ND	ND	97
SAM4-D	ND	ND	ND	ND	101

TPT Sur = Tripropyltin surrogate recovery

ND = None Detected

Detection limit = 1 ppb

Philip D. Carpenter
Laboratory Director

Organotin Speciation
µg/Kg (ppb)
Dry Weight

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: November 20-24, 1992
DATE EXTRACTED: November 16-23, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) on a dry weight basis:

Sample ID	Monobutyltin	Dibutyltin	Tributyltin	Tetrabutyltin	% TPT SUR
SAM5-D	ND	ND	1	ND	97
SAM6-A	ND	ND	1	ND	98
SAM6-B	ND	ND	1	ND	104
SAM6-C	ND	ND	1	ND	95
SAM7-D	ND	ND	ND	ND	91
FL1-D	ND	ND	1	ND	75
FL2-D	ND	1	2	ND	91
FL3-D	ND	ND	ND	ND	84
FL4-D	ND	ND	ND	ND	72
FL5	ND	ND	ND	ND	98
FL6	ND	ND	ND	ND	103
FL7	ND	ND	ND	ND	93
FL8	ND	ND	ND	ND	98

TPT Sur = Tripropyltin surrogate recovery

ND = None Detected

Detection limit = 1 ppb

Philip R. Carpenter
Laboratory Director

Polynuclear Aromatic Hydrocarbons (PAHs) and Phthalate Esters
EPA Method 8270
µg/Kg (ppb)
As Received

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: December 5-7, 1992
DATE EXTRACTED: November 11-12, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) as received:

Analyte	EKUP	SAMTB	FLTB	Reference Composite	Control	Detection Limit
2-methylnaphthalene	ND	ND	ND	ND	ND	3.5
Naphthalene	ND	ND	ND	ND	ND	0.6
Acenaphthylene	ND	ND	ND	ND	ND	1.3
Acenaphthene	ND	ND	ND	ND	ND	1.0
Fluorene	ND	ND	ND	ND	ND	2.0
Phenanthrene	ND	ND	ND	ND	ND	2.0
Anthracene	ND	ND	ND	ND	ND	2.3
Fluoranthene	ND	ND	ND	ND	ND	2.3
Pyrene	ND	ND	ND	ND	ND	2.1
Chrysene	ND	ND	ND	ND	ND	1.0
Benzo(a)anthracene	ND	ND	ND	ND	ND	3.0
Benzo(b)fluoranthene	ND	ND	ND	ND	ND	2.0
Benzo(k)fluoranthene	ND	ND	ND	ND	ND	2.1
Benzo(a)pyrene	ND	ND	ND	ND	ND	8.5
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	ND	3.4
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND	5.0
Benzo(ghi)perylene	ND	ND	ND	ND	ND	5.0
Total PAHs:	ND	ND	ND	ND	ND	0.6
Total phthalates:	ND	ND	ND	ND	ND	5.0

ND = None detected

Philip D. Carpenter
Laboratory Director

Polynuclear Aromatic Hydrocarbons (PAHs) and Phthalate Esters
EPA Method 8270
µg/Kg (ppb)
As Received

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: December 5-7, 1992
DATE EXTRACTED: November 11-12, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) as received:

Analyte	EK1	EK2	EK3-D	EK4-D	Detection Limit
2-methylnaphthalene	ND	ND	ND	ND	3.5
Naphthalene	ND	ND	ND	ND	0.6
Acenaphthylene	ND	ND	ND	ND	1.3
Acenaphthene	ND	ND	ND	ND	1.0
Fluorene	ND	ND	ND	ND	2.0
Phenanthrene	ND	ND	ND	ND	2.0
Anthracene	ND	ND	ND	ND	2.3
Fluoranthene	ND	ND	ND	ND	2.3
Pyrene	ND	ND	ND	ND	2.1
Chrysene	ND	ND	ND	ND	1.0
Benzo(a)anthracene	ND	ND	ND	ND	3.0
Benzo(b)fluoranthene	ND	ND	ND	ND	2.0
Benzo(k)fluoranthene	ND	ND	ND	ND	2.1
Benzo(a)pyrene	ND	ND	ND	ND	8.5
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	3.4
Dibenzo(a,h)anthracene	ND	ND	ND	ND	5.0
Benzo(ghi)perylene	ND	ND	ND	ND	5.0
Total PAHs:	ND	ND	ND	ND	0.6
Total phthalates:	ND	ND	ND	ND	5.0

ND = None detected

Philip D. Carpenter
Laboratory Director

Polynuclear Aromatic Hydrocarbons (PAHs) and Phthalate Esters
EPA Method 8270
µg/Kg (ppb)
As Received

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: December 5-7, 1992
DATE EXTRACTED: November 11-12, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) as received:

Analyte	SAM1-D	SAM2-D	SAM3-D	SAM4-D	SAM5-D	Detection Limit
2-methylnaphthalene	ND	ND	ND	ND	ND	3.5
Naphthalene	ND	ND	ND	ND	ND	0.6
Acenaphthylene	ND	ND	ND	ND	ND	1.3
Acenaphthene	ND	ND	ND	ND	ND	1.0
Fluorene	ND	ND	ND	ND	ND	2.0
Phenanthrene	ND	ND	ND	ND	ND	2.0
Anthracene	ND	ND	ND	ND	ND	2.3
Fluoranthene	ND	ND	ND	ND	ND	2.3
Pyrene	ND	ND	ND	ND	ND	2.1
Chrysene	ND	ND	ND	ND	ND	1.0
Benzo(a)anthracene	ND	ND	ND	ND	ND	3.0
Benzo(b)fluoranthene	ND	ND	ND	ND	ND	2.0
Benzo(k)fluoranthene	ND	ND	ND	ND	ND	2.1
Benzo(a)pyrene	ND	ND	ND	ND	ND	8.5
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	ND	3.4
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND	5.0
Benzo(ghi)perylene	ND	ND	ND	ND	ND	5.0
Total PAHs:	ND	ND	ND	ND	ND	0.6
Total phthalates:	ND	ND	ND	ND	ND	5.0

ND = None detected

Philip D. Carpenter
Laboratory Director

Polynuclear Aromatic Hydrocarbons (PAHs) and Phthalate Esters
EPA Method 8270
µg/Kg (ppb)
As Received

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: December 5-7, 1992
DATE EXTRACTED: November 11-12, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) as received:

Analyte	SAM6-A	SAM6-B	SAM6-C	SAM7-D	Detection Limit
2-methylnaphthalene	ND	ND	ND	ND	3.5
Naphthalene	ND	ND	ND	ND	0.6
Acenaphthylene	ND	ND	ND	ND	1.3
Acenaphthene	ND	ND	ND	ND	1.0
Fluorene	ND	ND	ND	ND	2.0
Phenanthrene	ND	ND	ND	ND	2.0
Anthracene	ND	ND	ND	ND	2.3
Fluoranthene	ND	ND	ND	ND	2.3
Pyrene	ND	ND	ND	ND	2.1
Chrysene	ND	ND	ND	ND	1.0
Benzo(a)anthracene	ND	ND	ND	ND	3.0
Benzo(b)fluoranthene	ND	ND	ND	ND	2.0
Benzo(k)fluoranthene	ND	ND	ND	ND	2.1
Benzo(a)pyrene	ND	ND	ND	ND	8.5
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	3.4
Dibenzo(a,h)anthracene	ND	ND	ND	ND	5.0
Benzo(ghi)perylene	ND	ND	ND	ND	5.0
Total PAHs:	ND	ND	ND	ND	0.6
Total phthalates:	ND	ND	ND	ND	5.0

ND = None detected

Philip D. Carpenter
Laboratory Director

Polynuclear Aromatic Hydrocarbons (PAHs) and Phthalate Esters
EPA Method 8270
µg/Kg (ppb)
As Received

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: December 5-7, 1992
DATE EXTRACTED: November 11-12, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) as received:

Analyte	FL1-D	FL2-D	FL3-D	FL4-D	Detection Limit
2-methylnaphthalene	ND	13	ND	ND	3.5
Naphthalene	ND	ND	ND	ND	0.6
Acenaphthylene	ND	ND	ND	ND	1.3
Acenaphthene	ND	ND	ND	ND	1.0
Fluorene	ND	ND	ND	ND	2.0
Phenanthrene	ND	ND	ND	ND	2.0
Anthracene	ND	ND	ND	ND	2.3
Fluoranthene	ND	ND	ND	ND	2.3
Pyrene	ND	7.6	ND	ND	2.1
Chrysene	ND	ND	ND	ND	1.0
Benzo(a)anthracene	ND	ND	ND	ND	3.0
Benzo(b)fluoranthene	ND	ND	ND	ND	2.0
Benzo(k)fluoranthene	ND	ND	ND	ND	2.1
Benzo(a)pyrene	ND	ND	ND	ND	8.5
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	3.4
Dibenzo(a,h)anthracene	ND	ND	ND	ND	5.0
Benzo(ghi)perylene	ND	ND	ND	ND	5.0
Total PAHs	ND	21	ND	ND	0.6
Total phthalates:	ND	ND	ND	ND	5.0

ND = None detected

Philip D. Carpenter
Laboratory Director

Polynuclear Aromatic Hydrocarbons (PAHs) and Phthalate Esters
EPA Method 8270
µg/Kg (ppb)
As Received

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: December 5-7, 1992
DATE EXTRACTED: November 11-12, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) as received:

Analyte	FL5	FL6	FL7	FL8	Detection Limit
2-methylnaphthalene	ND	3.2	ND	ND	3.5
Naphthalene	ND	ND	ND	ND	0.6
Acenaphthylene	ND	ND	ND	ND	1.3
Acenaphthene	ND	ND	ND	ND	1.0
Fluorene	ND	ND	ND	ND	2.0
Phenanthrene	ND	ND	ND	ND	2.0
Anthracene	ND	ND	ND	ND	2.3
Fluoranthene	ND	ND	ND	ND	2.3
Pyrene	ND	ND	ND	ND	2.1
Chrysene	ND	ND	ND	ND	1.0
Benzo(a)anthracene	ND	ND	ND	ND	3.0
Benzo(b)fluoranthene	ND	ND	ND	ND	2.0
Benzo(k)fluoranthene	ND	ND	ND	ND	2.1
Benzo(a)pyrene	ND	ND	ND	ND	8.5
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	3.4
Dibenzo(a,h)anthracene	ND	ND	ND	ND	5.0
Benzo(ghi)perylene	ND	ND	ND	ND	5.0
Total PAHs:	ND	3.2	ND	ND	0.6
Total phthalates:	ND	ND	ND	ND	5.0

ND = None detected

Philip D. Carpenter
Laboratory Director

Polynuclear Aromatic Hydrocarbons (PAHs) and Phthalate Esters
EPA Method 8270
µg/Kg (ppb)
Dry Weight

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: December 5-7, 1992
DATE EXTRACTED: November 11-12, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) on a dry weight basis:

Analyte	EKUP	SAMTB	FLTB	Reference Composite	Control	Detection Limit
2-methylnaphthalene	ND	ND	ND	ND	ND	7.0
Naphthalene	ND	ND	ND	ND	ND	1.2
Acenaphthylene	ND	ND	ND	ND	ND	2.6
Acenaphthene	ND	ND	ND	ND	ND	2.0
Fluorene	ND	ND	ND	ND	ND	4.0
Phenanthrene	ND	ND	ND	ND	ND	4.0
Anthracene	ND	ND	ND	ND	ND	4.5
Fluoranthene	ND	ND	ND	ND	ND	4.5
Pyrene	ND	ND	ND	ND	ND	4.2
Chrysene	ND	ND	ND	ND	ND	12
Benzo(a)anthracene	ND	ND	ND	ND	ND	6.0
Benzo(b)fluoranthene	ND	ND	ND	ND	ND	4.0
Benzo(k)fluoranthene	ND	ND	ND	ND	ND	4.2
Benzo(a)pyrene	ND	ND	ND	ND	ND	17
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	ND	6.8
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND	10
Benzo(ghi)perylene	ND	ND	ND	ND	ND	10
Total PAHs:	ND	ND	ND	ND	ND	1.2
Total phthalates:	ND	ND	ND	ND	ND	10

ND = None detected

Philip R. Carpenter
Laboratory Director

Polynuclear Aromatic Hydrocarbons (PAHs) and Phthalate Esters
EPA Method 8270
µg/Kg (ppb)
Dry Weight

MATERIAL:	Sediment samples received November 4, 1992
IDENTIFICATION:	Humboldt
DATE COMPLETED:	December 5-7, 1992
DATE EXTRACTED:	November 11-12, 1992
TOXSCAN NUMBER:	T-9209
REPORT:	Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) on a dry weight basis:

Analyte	EK1	EK2	EK3-D	EK4-D	Detection Limit
2-methylnaphthalene	ND	ND	ND	ND	7.0
Naphthalene	ND	ND	ND	ND	1.2
Acenaphthylene	ND	ND	ND	ND	2.6
Acenaphthene	ND	ND	ND	ND	2.0
Fluorene	ND	ND	ND	ND	4.0
Phenanthrene	ND	ND	ND	ND	4.0
Anthracene	ND	ND	ND	ND	4.5
Fluoranthene	ND	ND	ND	ND	4.5
Pyrene	ND	ND	ND	ND	4.2
Chrysene	ND	ND	ND	ND	12
Benzo(a)anthracene	ND	ND	ND	ND	6.0
Benzo(b)fluoranthene	ND	ND	ND	ND	4.0
Benzo(k)fluoranthene	ND	ND	ND	ND	4.2
Benzo(a)pyrene	ND	ND	ND	ND	17
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	6.8
Dibenzo(a,h)anthracene	ND	ND	ND	ND	10
Benzo(ghi)perylene	ND	ND	ND	ND	10
Total PAHs:	ND	ND	ND	ND	1.2
Total phthalates:	ND	ND	ND	ND	10

ND = None detected

Philip D. Carpenter
Laboratory Director

Polynuclear Aromatic Hydrocarbons (PAHs) and Phthalate Esters
EPA Method 8270
µg/Kg (ppb)
Dry Weight

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: December 5-7, 1992
DATE EXTRACTED: November 11-12, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) on a dry weight basis:

Analyte	SAM1-D	SAM2-D	SAM3-D	SAM4-D	SAM5-D	Detection Limit
2-methylnaphthalene	ND	ND	ND	ND	ND	7.0
Naphthalene	ND	ND	ND	ND	ND	1.2
Acenaphthylene	ND	ND	ND	ND	ND	2.6
Acenaphthene	ND	ND	ND	ND	ND	2.0
Fluorene	ND	ND	ND	ND	ND	4.0
Phenanthrene	ND	ND	ND	ND	ND	4.0
Anthracene	ND	ND	ND	ND	ND	4.5
Fluoranthene	ND	ND	ND	ND	ND	4.5
Pyrene	ND	ND	ND	ND	ND	4.2
Chrysene	ND	ND	ND	ND	ND	12
Benzo(a)anthracene	ND	ND	ND	ND	ND	6.0
Benzo(b)fluoranthene	ND	ND	ND	ND	ND	4.0
Benzo(k)fluoranthene	ND	ND	ND	ND	ND	4.2
Benzo(a)pyrene	ND	ND	ND	ND	ND	17
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	ND	6.8
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND	10
Benzo(ghi)perylene	ND	ND	ND	ND	ND	10
Total PAHs:	ND	ND	ND	ND	ND	1.2
Total phthalates:	ND	ND	ND	ND	ND	10

ND = None detected

Philip D. Cargente
Laboratory Director

Polynuclear Aromatic Hydrocarbons (PAHs) and Phthalate Esters
EPA Method 8270
µg/Kg (ppb)
Dry Weight

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: December 5-7, 1992
DATE EXTRACTED: November 11-12, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) on a dry weight basis:

Analyte	SAM6-A	SAM6-B	SAM6-C	SAM7-D	Detection Limit
2-methylnaphthalene	ND	ND	ND	ND	7.0
Naphthalene	ND	ND	ND	ND	1.2
Acenaphthylene	ND	ND	ND	ND	2.6
Acenaphthene	ND	ND	ND	ND	2.0
Fluorene	ND	ND	ND	ND	4.0
Phenanthrene	ND	ND	ND	ND	4.0
Anthracene	ND	ND	ND	ND	4.5
Fluoranthene	ND	ND	ND	ND	4.5
Pyrene	ND	ND	ND	ND	4.2
Chrysene	ND	ND	ND	ND	12
Benzo(a)anthracene	ND	ND	ND	ND	6.0
Benzo(b)fluoranthene	ND	ND	ND	ND	4.0
Benzo(k)fluoranthene	ND	ND	ND	ND	4.2
Benzo(a)pyrene	ND	ND	ND	ND	17
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	6.8
Dibenzo(a,h)anthracene	ND	ND	ND	ND	10
Benzo(ghi)perylene	ND	ND	ND	ND	10
Total PAHs:	ND	ND	ND	ND	1.2
Total phthalates:	ND	ND	ND	ND	10

ND = None detected

Philip D. Cargenta
Laboratory Director

Polynuclear Aromatic Hydrocarbons (PAHs) and Phthalate Esters
EPA Method 8270
µg/Kg (ppb)
Dry Weight

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: December 5-7, 1992
DATE EXTRACTED: November 11-12, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) on a dry weight basis:

Analyte	FL1-D	FL2-D	FL3-D	FL4-D	Detection Limit
2-methylnaphthalene	ND	23	ND	ND	7.0
Naphthalene	ND	ND	ND	ND	1.2
Acenaphthylene	ND	ND	ND	ND	2.6
Acenaphthene	ND	ND	ND	ND	2.0
Fluorene	ND	ND	ND	ND	4.0
Phenanthrene	ND	ND	ND	ND	4.0
Anthracene	ND	ND	ND	ND	4.5
Fluoranthene	ND	ND	ND	ND	4.5
Pyrene	ND	13	ND	ND	4.2
Chrysene	ND	ND	ND	ND	12
Benzo(a)anthracene	ND	ND	ND	ND	6.0
Benzo(b)fluoranthene	ND	ND	ND	ND	4.0
Benzo(k)fluoranthene	ND	ND	ND	ND	4.2
Benzo(a)pyrene	ND	ND	ND	ND	17
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	6.8
Dibenzo(a,h)anthracene	ND	ND	ND	ND	10
Benzo(ghi)perylene	ND	ND	ND	ND	10
Total PAHs:	ND	37	ND	ND	1.2
Total phthalates:	ND	ND	ND	ND	10

ND = None detected

Philip R. Carpenter
Laboratory Director

Polynuclear Aromatic Hydrocarbons (PAHs) and Phthalate Esters
EPA Method 8270
µg/Kg (ppb)
Dry Weight

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: December 5-7, 1992
DATE EXTRACTED: November 11-12, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) on a dry weight basis:

Analyte	FL5	FL6	FL7	FL8	Detection Limit
2-methylnaphthalene	ND	4.0	ND	ND	7.0
Naphthalene	ND	ND	ND	ND	1.2
Acenaphthylene	ND	ND	ND	ND	2.6
Acenaphthene	ND	ND	ND	ND	2.0
Fluorene	ND	ND	ND	ND	4.0
Phenanthrene	ND	ND	ND	ND	4.0
Anthracene	ND	ND	ND	ND	4.5
Fluoranthene	ND	ND	ND	ND	4.5
Pyrene	ND	ND	ND	ND	4.2
Chrysene	ND	ND	ND	ND	12
Benzo(a)anthracene	ND	ND	ND	ND	6.0
Benzo(b)fluoranthene	ND	ND	ND	ND	4.0
Benzo(k)fluoranthene	ND	ND	ND	ND	4.2
Benzo(a)pyrene	ND	ND	ND	ND	17
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	6.8
Dibenzo(a,h)anthracene	ND	ND	ND	ND	10
Benzo(ghi)perylene	ND	ND	ND	ND	10
Total PAHs:	ND	4.0	ND	ND	1.2
Total phthalates:	ND	ND	ND	ND	10

ND = None detected

Philip D. Carpenter
Laboratory Director

Chlorinated Pesticides
EPA Method 8080
µg/Kg (ppb)
As Received

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: December 3, 1992
DATE EXTRACTED: November 10, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) as received:

Analyte	EKUP	SAMTB	FLTB	Reference Composite	Control	Detection Limit
Aldrin	ND	ND	ND	ND	ND	0.25
alpha-BHC	ND	ND	ND	ND	ND	0.5
beta-BHC	ND	ND	ND	ND	ND	0.5
delta-BHC	ND	ND	ND	ND	ND	0.5
gamma-BHC (lindane)	ND	ND	ND	ND	ND	0.5
alpha-Chlordane	ND	ND	ND	ND	ND	0.5
gamma-Chlordane	ND	ND	ND	ND	ND	0.5
4,4'-DDD	ND	ND	ND	ND	ND	0.5
4,4'-DDE	ND	ND	ND	ND	ND	0.5
4,4'-DDT	ND	ND	ND	ND	ND	0.5
Dieldrin	ND	ND	ND	ND	ND	0.25
Endosulfan I	ND	ND	ND	ND	ND	1.0
Endosulfan II	ND	ND	ND	ND	ND	0.25
Endosulfan sulfate	ND	ND	ND	ND	ND	5.0
Endrin	ND	ND	ND	ND	ND	0.25
Heptachlor	ND	ND	ND	ND	ND	0.25
Heptachlor epoxide	ND	ND	ND	ND	ND	5.0
Toxaphene	ND	ND	ND	ND	ND	15
PCBs:						
PCB 1242	ND	ND	ND	ND	ND	10
PCB 1248	ND	ND	ND	ND	ND	10
PCB 1254	ND	ND	ND	ND	ND	10
PCB 1260	ND	ND	ND	ND	ND	10
TOTAL PCBs	ND	ND	ND	ND	ND	10

ND = None detected

Philip D. Carpenter
Laboratory Director

Chlorinated Pesticides
EPA Method 8080
µg/Kg (ppb)
As Received

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: December 3, 1992
DATE EXTRACTED: November 10, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) as received:

Analyte	EK1	EK2	EK3-D	EK4-D	Detection Limit
Aldrin	ND	ND	ND	ND	0.25
alpha-BHC	ND	ND	ND	ND	0.5
beta-BHC	ND	ND	ND	ND	0.5
delta-BHC	ND	ND	ND	ND	0.5
gamma-BHC (lindane)	ND	ND	ND	ND	0.5
alpha-Chlordane	ND	ND	ND	ND	0.5
gamma-Chlordane	ND	ND	ND	ND	0.5
4,4'-DDD	ND	ND	ND	ND	0.5
4,4'-DDE	ND	ND	ND	ND	0.5
4,4'-DDT	ND	ND	ND	ND	0.5
Dieldrin	ND	ND	ND	ND	0.25
Endosulfan I	ND	ND	ND	ND	1.0
Endosulfan II	ND	ND	ND	ND	0.25
Endosulfan sulfate	ND	ND	ND	ND	5.0
Endrin	ND	ND	ND	ND	0.25
Heptachlor	ND	ND	ND	ND	0.25
Heptachlor epoxide	ND	ND	ND	ND	5.0
Toxaphene	ND	ND	ND	ND	15
PCBs:					
PCB 1242	ND	ND	ND	ND	10
PCB 1248	ND	ND	ND	ND	10
PCB 1254	ND	ND	ND	ND	10
PCB 1260	ND	ND	ND	ND	10
TOTAL PCBs	ND	ND	ND	ND	10

ND = None detected

Philip D. Carpenter
Laboratory Director

Chlorinated Pesticides
EPA Method 8080
µg/Kg (ppb)
As Received

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: December 3, 1992
DATE EXTRACTED: November 10, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) as received:

Analyte	SAM1-D	SAM2-D	SAM3-D	SAM4-D	SAM5-D	Detection Limit
Aldrin	ND	ND	ND	ND	ND	0.25
alpha-BHC	ND	ND	ND	ND	ND	0.5
beta-BHC	ND	ND	ND	ND	ND	0.5
delta-BHC	ND	ND	ND	ND	ND	0.5
gamma-BHC (lindane)	ND	ND	ND	ND	ND	0.5
alpha-Chlordane	ND	ND	ND	ND	ND	0.5
gamma-Chlordane	ND	ND	ND	ND	ND	0.5
4,4'-DDD	ND	ND	ND	ND	ND	0.5
4,4'-DDE	ND	ND	ND	ND	ND	0.5
4,4'-DDT	ND	ND	ND	ND	ND	0.5
Dieldrin	ND	ND	ND	ND	ND	0.25
Endosulfan I	ND	ND	ND	ND	ND	1.0
Endosulfan II	ND	ND	ND	ND	ND	0.25
Endosulfan sulfate	ND	ND	ND	ND	ND	5.0
Endrin	ND	ND	ND	ND	ND	0.25
Heptachlor	ND	ND	ND	ND	ND	0.25
Heptachlor epoxide	ND	ND	ND	ND	ND	5.0
Toxaphene	ND	ND	ND	ND	ND	15
PCBs:						
PCB 1242	ND	ND	ND	ND	ND	10
PCB 1248	ND	ND	ND	ND	ND	10
PCB 1254	ND	ND	ND	ND	ND	10
PCB 1260	ND	ND	ND	ND	ND	10
TOTAL PCBs	ND	ND	ND	ND	ND	10

ND = None detected

Philip D. Carpenter
Laboratory Director

Chlorinated Pesticides
EPA Method 8080
µg/Kg (ppb)
As Received

MATERIAL:	Sediment samples received November 4, 1992
IDENTIFICATION:	Humboldt
DATE COMPLETED:	December 3, 1992
DATE EXTRACTED:	November 10, 1992
TOXSCAN NUMBER:	T-9209
REPORT:	Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) as received:

Analyte	SAM6-A	SAM6-B	SAM6-C	SAM7-D	Detection Limit
Aldrin	ND	ND	ND	ND	0.25
alpha-BHC	ND	ND	ND	ND	0.5
beta-BHC	ND	ND	ND	ND	0.5
delta-BHC	ND	ND	ND	ND	0.5
gamma-BHC (lindane)	ND	ND	ND	ND	0.5
alpha-Chlordane	ND	ND	ND	ND	0.5
gamma-Chlordane	ND	ND	ND	ND	0.5
4,4'-DDD	ND	ND	ND	ND	0.5
4,4'-DDE	ND	ND	ND	ND	0.5
4,4'-DDT	ND	ND	ND	ND	0.5
Dieldrin	ND	ND	ND	ND	0.25
Endosulfan I	ND	ND	ND	ND	1.0
Endosulfan II	ND	ND	ND	ND	0.25
Endosulfan sulfate	ND	ND	ND	ND	5.0
Endrin	ND	ND	ND	ND	0.25
Heptachlor	ND	ND	ND	ND	0.25
Heptachlor epoxide	ND	ND	ND	ND	5.0
Toxaphene	ND	ND	ND	ND	15
PCBs:					
PCB 1242	ND	ND	ND	ND	10
PCB 1248	ND	ND	ND	ND	10
PCB 1254	ND	ND	ND	ND	10
PCB 1260	ND	ND	ND	ND	10
TOTAL PCBs	ND	ND	ND	ND	10

ND = None detected

Philip D. Carpenter
Laboratory Director

Chlorinated Pesticides
EPA Method 8080
µg/Kg (ppb)
As Received

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: December 3, 1992
DATE EXTRACTED: November 10, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) as received:

Analyte	FL1-D	FL2-D	FL3-D	FL4-D	Detection Limit
Aldrin	ND	ND	ND	ND	0.25
alpha-BHC	ND	ND	ND	ND	0.5
beta-BHC	ND	ND	ND	ND	0.5
delta-BHC	ND	ND	ND	ND	0.5
gamma-BHC (lindane)	ND	ND	ND	ND	0.5
alpha-Chlordane	ND	ND	ND	ND	0.5
gamma-Chlordane	ND	ND	ND	ND	0.5
4,4'-DDD	ND	ND	ND	ND	0.5
4,4'-DDE	ND	ND	ND	ND	0.5
4,4'-DDT	ND	ND	ND	ND	0.5
Dieldrin	ND	ND	ND	ND	0.25
Endosulfan I	ND	ND	ND	ND	1.0
Endosulfan II	ND	ND	ND	ND	0.25
Endosulfan sulfate	ND	ND	ND	ND	5.0
Endrin	ND	ND	ND	ND	0.25
Heptachlor	ND	ND	ND	ND	0.25
Heptachlor epoxide	ND	ND	ND	ND	5.0
Toxaphene	ND	ND	ND	ND	15
PCBs:					
PCB 1242	ND	ND	ND	ND	10
PCB 1248	ND	ND	ND	ND	10
PCB 1254	ND	ND	ND	ND	10
PCB 1260	ND	ND	ND	ND	10
TOTAL PCBs	ND	ND	ND	ND	10

ND = None detected

Philip R. Carpenter
Laboratory Director

Chlorinated Pesticides
EPA Method 8080
µg/Kg (ppb)
As Received

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: December 3, 1992
DATE EXTRACTED: November 10, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) as received:

Analyte	FL5	FL6	FL7	FL8	Detection Limit
Aldrin	ND	ND	ND	ND	0.25
alpha-BHC	ND	ND	ND	ND	0.5
beta-BHC	ND	ND	ND	ND	0.5
delta-BHC	ND	ND	ND	ND	0.5
gamma-BHC (lindane)	ND	ND	ND	ND	0.5
alpha-Chlordane	ND	ND	ND	ND	0.5
gamma-Chlordane	ND	ND	ND	ND	0.5
4,4'-DDD	ND	ND	ND	ND	0.5
4,4'-DDE	ND	ND	ND	ND	0.5
4,4'-DDT	ND	ND	ND	ND	0.5
Dieldrin	ND	ND	ND	ND	0.25
Endosulfan I	ND	ND	ND	ND	1.0
Endosulfan II	ND	ND	ND	ND	0.25
Endosulfan sulfate	ND	ND	ND	ND	5.0
Endrin	ND	ND	ND	ND	0.25
Heptachlor	ND	ND	ND	ND	0.25
Heptachlor epoxide	ND	ND	ND	ND	5.0
Toxaphene	ND	ND	ND	ND	15
PCBs:					
PCB 1242	ND	ND	ND	ND	10
PCB 1248	ND	ND	ND	ND	10
PCB 1254	ND	ND	ND	ND	10
PCB 1260	ND	ND	ND	ND	10
TOTAL PCBs	ND	ND	ND	ND	10

ND = None detected

Philip D. Carpenter
Laboratory Director

Chlorinated Pesticides
EPA Method 8080
µg/Kg (ppb)
Dry Weight

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: December 3, 1992
DATE EXTRACTED: November 10, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) on a dry weight basis:

Analyte	EKUP	SAMTB	FLTB	Reference Composite	Control	Detection Limit
Aldrin	ND	ND	ND	ND	ND	0.5
alpha-BHC	ND	ND	ND	ND	ND	1.0
beta-BHC	ND	ND	ND	ND	ND	1.0
delta-BHC	ND	ND	ND	ND	ND	1.0
gamma-BHC (lindane)	ND	ND	ND	ND	ND	1.0
alpha-Chlordane	ND	ND	ND	ND	ND	1.0
gamma-Chlordane	ND	ND	ND	ND	ND	1.0
4,4'-DDD	ND	ND	ND	ND	ND	1.0
4,4'-DDE	ND	ND	ND	ND	ND	1.0
4,4'-DDT	ND	ND	ND	ND	ND	1.0
Dieldrin	ND	ND	ND	ND	ND	0.5
Endosulfan I	ND	ND	ND	ND	ND	2.0
Endosulfan II	ND	ND	ND	ND	ND	0.5
Endosulfan sulfate	ND	ND	ND	ND	ND	10
Endrin	ND	ND	ND	ND	ND	0.5
Heptachlor	ND	ND	ND	ND	ND	0.5
Heptachlor epoxide	ND	ND	ND	ND	ND	10
Toxaphene	ND	ND	ND	ND	ND	30
PCBs:						
PCB 1242	ND	ND	ND	ND	ND	20
PCB 1248	ND	ND	ND	ND	ND	20
PCB 1254	ND	ND	ND	ND	ND	20
PCB 1260	ND	ND	ND	ND	ND	20
TOTAL PCBs	ND	ND	ND	ND	ND	20

ND = None detected

Philip D. Carpenter
Laboratory Director

Chlorinated Pesticides
EPA Method 8080
µg/Kg (ppb)
Dry Weight

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: December 3, 1992
DATE EXTRACTED: November 10, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) on a dry weight basis:

Analyte	EK1	EK2	EK3-D	EK4-D	Detection Limit
Aldrin	ND	ND	ND	ND	0.5
alpha-BHC	ND	ND	ND	ND	1.0
beta-BHC	ND	ND	ND	ND	1.0
delta-BHC	ND	ND	ND	ND	1.0
gamma-BHC (lindane)	ND	ND	ND	ND	1.0
alpha-Chlordane	ND	ND	ND	ND	1.0
gamma-Chlordane	ND	ND	ND	ND	1.0
4,4'-DDD	ND	ND	ND	ND	1.0
4,4'-DDE	ND	ND	ND	ND	1.0
4,4'-DDT	ND	ND	ND	ND	1.0
Dieldrin	ND	ND	ND	ND	0.5
Endosulfan I	ND	ND	ND	ND	2.0
Endosulfan II	ND	ND	ND	ND	0.5
Endosulfan sulfate	ND	ND	ND	ND	10
Endrin	ND	ND	ND	ND	0.5
Heptachlor	ND	ND	ND	ND	0.5
Heptachlor epoxide	ND	ND	ND	ND	10
Toxaphene	ND	ND	ND	ND	30
PCBs:					
PCB 1242	ND	ND	ND	ND	20
PCB 1248	ND	ND	ND	ND	20
PCB 1254	ND	ND	ND	ND	20
PCB 1260	ND	ND	ND	ND	20
TOTAL PCBs	ND	ND	ND	ND	20

ND = None detected

Philip D. Carpenter
Laboratory Director

Chlorinated Pesticides
EPA Method 8080
µg/Kg (ppb)
Dry Weight

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: December 3, 1992
DATE EXTRACTED: November 10, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) on a dry weight basis:

Analyte	SAM1-D	SAM2-D	SAM3-D	SAM4-D	SAM5-D	Detection Limit
Aldrin	ND	ND	ND	ND	ND	0.5
alpha-BHC	ND	ND	ND	ND	ND	1.0
beta-BHC	ND	ND	ND	ND	ND	1.0
delta-BHC	ND	ND	ND	ND	ND	1.0
gamma-BHC (lindane)	ND	ND	ND	ND	ND	1.0
alpha-Chlordane	ND	ND	ND	ND	ND	1.0
gamma-Chlordane	ND	ND	ND	ND	ND	1.0
4,4'-DDD	ND	ND	ND	ND	ND	1.0
4,4'-DDE	ND	ND	ND	ND	ND	1.0
4,4'-DDT	ND	ND	ND	ND	ND	1.0
Dieldrin	ND	ND	ND	ND	ND	0.5
Endosulfan I	ND	ND	ND	ND	ND	2.0
Endosulfan II	ND	ND	ND	ND	ND	0.5
Endosulfan sulfate	ND	ND	ND	ND	ND	10
Endrin	ND	ND	ND	ND	ND	0.5
Heptachlor	ND	ND	ND	ND	ND	0.5
Heptachlor epoxide	ND	ND	ND	ND	ND	10
Toxaphene	ND	ND	ND	ND	ND	30
PCBs:						
PCB 1242	ND	ND	ND	ND	ND	20
PCB 1248	ND	ND	ND	ND	ND	20
PCB 1254	ND	ND	ND	ND	ND	20
PCB 1260	ND	ND	ND	ND	ND	20
TOTAL PCBs	ND	ND	ND	ND	ND	20

ND = None detected

Philip R. Carpenter
Laboratory Director

Chlorinated Pesticides
EPA Method 8080
µg/Kg (ppb)
Dry Weight

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: December 3, 1992
DATE EXTRACTED: November 10, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) on a dry weight basis:

Analyte	SAM6-A	SAM6-B	SAM6-C	SAM7-D	Detection Limit
Aldrin	ND	ND	ND	ND	0.5
alpha-BHC	ND	ND	ND	ND	1.0
beta-BHC	ND	ND	ND	ND	1.0
delta-BHC	ND	ND	ND	ND	1.0
gamma-BHC (lindane)	ND	ND	ND	ND	1.0
alpha-Chlordane	ND	ND	ND	ND	1.0
gamma-Chlordane	ND	ND	ND	ND	1.0
4,4'-DDD	ND	ND	ND	ND	1.0
4,4'-DDE	ND	ND	ND	ND	1.0
4,4'-DDT	ND	ND	ND	ND	1.0
Dieldrin	ND	ND	ND	ND	0.5
Endosulfan I	ND	ND	ND	ND	2.0
Endosulfan II	ND	ND	ND	ND	0.5
Endosulfan sulfate	ND	ND	ND	ND	10
Endrin	ND	ND	ND	ND	0.5
Heptachlor	ND	ND	ND	ND	0.5
Heptachlor epoxide	ND	ND	ND	ND	10
Toxaphene	ND	ND	ND	ND	30
PCBs:					
PCB 1242	ND	ND	ND	ND	20
PCB 1248	ND	ND	ND	ND	20
PCB 1254	ND	ND	ND	ND	20
PCB 1260	ND	ND	ND	ND	20
TOTAL PCBs	ND	ND	ND	ND	20

ND = None detected

Philip D. Carpenter
Laboratory Director

Chlorinated Pesticides
EPA Method 8080
µg/Kg (ppb)
Dry Weight

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: December 3, 1992
DATE EXTRACTED: November 10, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) on a dry weight basis:

Analyte	FL1-D	FL2-D	FL3-D	FL4-D	Detection Limit
Aldrin	ND	ND	ND	ND	0.5
alpha-BHC	ND	ND	ND	ND	1.0
beta-BHC	ND	ND	ND	ND	1.0
delta-BHC	ND	ND	ND	ND	1.0
gamma-BHC (lindane)	ND	ND	ND	ND	1.0
alpha-Chlordane	ND	ND	ND	ND	1.0
gamma-Chlordane	ND	ND	ND	ND	1.0
4,4'-DDD	ND	ND	ND	ND	1.0
4,4'-DDE	ND	ND	ND	ND	1.0
4,4'-DDT	ND	ND	ND	ND	1.0
Dieldrin	ND	ND	ND	ND	0.5
Endosulfan I	ND	ND	ND	ND	2.0
Endosulfan II	ND	ND	ND	ND	0.5
Endosulfan sulfate	ND	ND	ND	ND	10
Endrin	ND	ND	ND	ND	0.5
Heptachlor	ND	ND	ND	ND	0.5
Heptachlor epoxide	ND	ND	ND	ND	10
Toxaphene	ND	ND	ND	ND	30
PCBs:					
PCB 1242	ND	ND	ND	ND	20
PCB 1248	ND	ND	ND	ND	20
PCB 1254	ND	ND	ND	ND	20
PCB 1260	ND	ND	ND	ND	20
TOTAL PCBs	ND	ND	ND	ND	20

ND = None detected

Philip D. Carpenter
Laboratory Director

Chlorinated Pesticides
EPA Method 8080
µg/Kg (ppb)
Dry Weight

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: December 3, 1992
DATE EXTRACTED: November 10, 1992
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows, expressed as micrograms per kilogram (parts per billion) on a dry weight basis:

Analyte	FL5	FL6	FL7	FL8	Detection Limit
Aldrin	ND	ND	ND	ND	0.5
alpha-BHC	ND	ND	ND	ND	1.0
beta-BHC	ND	ND	ND	ND	1.0
delta-BHC	ND	ND	ND	ND	1.0
gamma-BHC (lindane)	ND	ND	ND	ND	1.0
alpha-Chlordane	ND	ND	ND	ND	1.0
gamma-Chlordane	ND	ND	ND	ND	1.0
4,4'-DDD	ND	ND	ND	ND	1.0
4,4'-DDE	ND	ND	ND	ND	1.0
4,4'-DDT	ND	ND	ND	ND	1.0
Dieldrin	ND	ND	ND	ND	0.5
Endosulfan I	ND	ND	ND	ND	2.0
Endosulfan II	ND	ND	ND	ND	0.5
Endosulfan sulfate	ND	ND	ND	ND	10
Endrin	ND	ND	ND	ND	0.5
Heptachlor	ND	ND	ND	ND	0.5
Heptachlor epoxide	ND	ND	ND	ND	10
Toxaphene	ND	ND	ND	ND	30
PCBs:					
PCB 1242	ND	ND	ND	ND	20
PCB 1248	ND	ND	ND	ND	20
PCB 1254	ND	ND	ND	ND	20
PCB 1260	ND	ND	ND	ND	20
TOTAL PCBs	ND	ND	ND	ND	20

ND = None detected

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
EKUP

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.00	0.0	0.0
0	2-1	0.04	0.1	0.1
1	1-0.5	0.25	0.8	0.9
2	0.5-0.25	5.60	18.3	19.2
3	0.25-0.125	15.15	49.4	68.6
4	0.125-0.062	2.36	7.7	76.3
5	0.062-0.031	1.67	5.5	81.8
6	0.031-0.016	1.75	5.7	87.5
7	0.016-0.008	1.00	3.3	90.8
8	0.008-0.004	0.76	2.5	93.2
9	0.004-0.002	0.54	1.8	95.0
>9	<0.002	1.53	5.0	100.0

TOTAL WT	COARSE WT	FINE WT
30.7	23.4	7.3

Philip A. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
SAMTB

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.06	0.2	0.2
0	2-1	0.13	0.4	0.6
1	1-0.5	0.28	0.9	1.5
2	0.5-0.25	1.27	4.0	5.5
3	0.25-0.125	21.74	68.4	73.9
4	0.125-0.062	2.32	7.3	81.2
5	0.062-0.031	1.41	4.5	85.6
6	0.031-0.016	1.12	3.5	89.1
7	0.016-0.008	0.92	2.9	92.0
8	0.008-0.004	0.53	1.7	93.7
9	0.004-0.002	0.48	1.5	95.2
>9	<0.002	1.53	4.8	100.0

TOTAL WT	COARSE WT	FINE WT
31.8	25.8	6.0

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
FLTB

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.00	0.0	0.0
0	2-1	0.02	0.1	0.1
1	1-0.5	0.15	0.5	0.6
2	0.5-0.25	1.71	6.0	6.6
3	0.25-0.125	8.72	30.5	37.1
4	0.125-0.062	6.12	21.4	58.5
5	0.062-0.031	3.16	11.4	69.9
6	0.031-0.016	2.72	9.5	79.4
7	0.016-0.008	1.74	6.1	85.5
8	0.008-0.004	0.93	3.3	88.8
9	0.004-0.002	0.74	2.6	91.4
>9	<0.002	2.46	8.6	100.0

TOTAL WT	COARSE WT	FINE WT
28.6	16.7	11.9

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
Ref Comp

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.00	0.0	0.0
0	2-1	0.06	0.2	0.2
1	1-0.5	0.04	0.1	0.3
2	0.5-0.25	0.08	0.3	0.6
3	0.25-0.125	2.53	8.4	9.0
4	0.125-0.062	20.55	68.0	77.0
5	0.062-0.031	5.05	16.7	93.7
6	0.031-0.016	0.65	2.2	95.8
7	0.016-0.008	0.40	1.3	97.2
8	0.008-0.004	0.18	0.6	97.8
9	0.004-0.002	0.00	0.0	97.8
>9	<0.002	0.67	2.2	100.0

TOTAL WT	COARSE WT	FINE WT
30.2	23.3	7.0

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
Control

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.00	0.0	0.0
0	2-1	0.01	0.0	0.0
1	1-0.5	0.22	0.7	0.7
2	0.5-0.25	11.69	36.9	37.7
3	0.25-0.125	17.68	55.8	93.5
4	0.125-0.062	0.93	2.9	96.4
5	0.062-0.031	0.32	1.0	97.4
6	0.031-0.016	0.14	0.4	97.9
7	0.016-0.008	0.13	0.4	98.3
8	0.008-0.004	0.05	0.2	98.5
9	0.004-0.002	0.00	0.0	98.5
>9	<0.002	0.49	1.5	100.0

TOTAL WT	COARSE WT	FINE WT
31.7	30.5	1.1

Philip R. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
EK1

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	2.65	7.6	7.6
-1	4-2	3.95	11.4	19.0
0	2-1	3.32	9.6	28.6
1	1-0.5	4.05	11.7	40.3
2	0.5-0.25	8.23	23.7	64.0
3	0.25-0.125	10.73	30.9	94.9
4	0.125-0.062	0.67	1.9	96.8
5	0.062-0.031	0.22	0.6	97.5
6	0.031-0.016	0.19	0.5	98.0
7	0.016-0.008	0.17	0.5	98.5
8	0.008-0.004	0.09	0.2	98.8
9	0.004-0.002	0.07	0.2	99.0
>9	<0.002	0.36	1.0	100.0

TOTAL WT	COARSE WT	FINE WT
34.7	33.6	1.1

Philip K. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
EK2

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.00	0.0	0.0
0	2-1	0.16	0.5	0.5
1	1-0.5	0.35	1.1	1.5
2	0.5-0.25	8.41	25.5	27.0
3	0.25-0.125	19.06	57.8	84.8
4	0.125-0.062	1.16	3.5	88.3
5	0.062-0.031	0.71	2.1	90.5
6	0.031-0.016	0.70	2.1	92.6
7	0.016-0.008	0.61	1.8	94.5
8	0.008-0.004	0.45	1.4	95.8
9	0.004-0.002	0.38	1.2	97.0
>9	<0.002	1.00	3.0	100.0

TOTAL WT	COARSE WT	FINE WT
33.0	29.1	3.9

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
EK3-D

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.00	0.0	0.0
0	2-1	0.22	0.7	0.7
1	1-0.5	0.31	1.0	1.7
2	0.5-0.25	5.06	15.8	17.5
3	0.25-0.125	20.16	63.1	80.6
4	0.125-0.062	1.29	4.0	84.6
5	0.062-0.031	0.93	2.9	87.5
6	0.031-0.016	0.89	2.8	90.3
7	0.016-0.008	0.81	2.6	92.9
8	0.008-0.004	0.41	1.3	94.2
9	0.004-0.002	0.58	1.8	96.0
>9	<0.002	1.27	4.0	100.0

TOTAL WT	COARSE WT	FINE WT
32.0	27.0	4.9

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
EK4-D

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.00	0.0	0.0
0	2-1	0.00	0.0	0.0
1	1-0.5	0.15	0.7	0.7
2	0.5-0.25	0.89	3.9	4.6
3	0.25-0.125	3.69	16.2	20.7
4	0.125-0.062	4.70	20.6	41.3
5	0.062-0.031	3.41	14.9	56.3
6	0.031-0.016	2.83	12.4	68.7
7	0.016-0.008	2.18	9.6	78.2
8	0.008-0.004	1.12	4.9	83.2
9	0.004-0.002	0.99	4.3	87.5
>9	<0.002	2.86	12.5	100.0

TOTAL WT	COARSE WT	FINE WT
22.8	9.4	13.4

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
SAM1-D

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	2.60	5.0	5.0
0	2-1	3.10	6.0	11.0
1	1-0.5	7.21	14.0	25.0
2	0.5-0.25	32.90	63.7	88.7
3	0.25-0.125	5.46	10.6	99.3
4	0.125-0.062	0.07	0.1	99.4
5	0.062-0.031	0.03	0.0	99.5
6	0.031-0.016	0.00	0.0	99.5
7	0.016-0.008	0.03	0.1	99.6
8	0.008-0.004	0.01	0.0	99.6
9	0.004-0.002	0.22	0.4	100.0
>9	<0.002	0.00	0.0	100.0

TOTAL WT	COARSE WT	FINE WT
51.6	51.3	0.3

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
SAM2-D

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	2.74	6.7	6.7
-1	4-2	2.59	6.3	13.0
0	2-1	1.03	2.5	15.5
1	1-0.5	1.82	4.4	20.0
2	0.5-0.25	20.84	50.8	70.8
3	0.25-0.125	11.49	28.0	98.8
4	0.125-0.062	0.14	0.3	99.2
5	0.062-0.031	0.05	0.1	99.3
6	0.031-0.016	0.02	0.0	99.3
7	0.016-0.008	0.05	0.1	99.4
8	0.008-0.004	0.00	0.0	99.5
9	0.004-0.002	0.23	0.5	100.0
>9	<0.002	0.00	0.0	100.0

TOTAL WT	COARSE WT	FINE WT
41.0	40.7	0.3

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
SAM3-D

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.55	1.5	1.5
0	2-1	1.16	3.3	4.8
1	1-0.5	3.31	9.3	14.1
2	0.5-0.25	20.58	57.7	71.7
3	0.25-0.125	9.65	27.0	98.8
4	0.125-0.062	0.10	0.3	99.0
5	0.062-0.031	0.05	0.1	99.2
6	0.031-0.016	0.04	0.1	99.3
7	0.016-0.008	0.02	0.1	99.4
8	0.008-0.004	0.03	0.1	99.5
9	0.004-0.002	0.00	0.0	99.5
>9	<0.002	0.19	0.5	100.0

TOTAL WT	COARSE WT	FINE WT
35.7	35.4	0.3

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
SAM4-D

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.00	0.0	0.0
0	2-1	1.17	2.8	2.8
1	1-0.5	5.23	12.3	15.1
2	0.5-0.25	22.99	54.3	69.4
3	0.25-0.125	12.07	28.5	97.9
4	0.125-0.062	0.22	0.5	98.4
5	0.062-0.031	0.14	0.3	98.8
6	0.031-0.016	0.06	0.1	98.9
7	0.016-0.008	0.12	0.3	99.2
8	0.008-0.004	0.05	0.1	99.3
9	0.004-0.002	0.03	0.1	99.4
>9	<0.002	0.26	0.6	100.0

TOTAL WT	COARSE WT	FINE WT
42.4	41.7	0.7

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
SAM5-D

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.02	0.0	0.0
0	2-1	0.32	0.8	0.8
1	1-0.5	1.64	4.1	4.9
2	0.5-0.25	18.24	45.2	50.1
3	0.25-0.125	19.23	47.7	97.8
4	0.125-0.062	0.19	0.5	98.2
5	0.062-0.031	0.04	0.1	98.3
6	0.031-0.016	0.15	0.4	98.7
7	0.016-0.008	0.13	0.3	99.0
8	0.008-0.004	0.03	0.1	99.1
9	0.004-0.002	0.00	0.0	99.1
>9	<0.002	0.37	0.9	100.0

TOTAL WT	COARSE WT	FINE WT
40.4	39.6	0.7

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
SAM6-A

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.00	0.0	0.0
0	2-1	0.09	0.3	0.3
1	1-0.5	0.23	0.8	1.1
2	0.5-0.25	1.49	5.0	6.1
3	0.25-0.125	17.74	59.8	65.9
4	0.125-0.062	3.14	10.6	76.4
5	0.062-0.031	1.60	5.4	81.8
6	0.031-0.016	1.41	4.8	86.6
7	0.016-0.008	0.97	3.3	89.8
8	0.008-0.004	0.69	2.3	92.2
9	0.004-0.002	0.56	1.9	94.0
>9	<0.002	1.77	6.0	100.0

TOTAL WT	COARSE WT	FINE WT
29.7	22.7	7.0

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
SAM6-B

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.00	0.0	0.0
0	2-1	0.08	0.3	0.3
1	1-0.5	0.20	0.6	0.9
2	0.5-0.25	1.67	5.3	6.2
3	0.25-0.125	20.78	65.8	72.0
4	0.125-0.062	1.68	5.3	77.3
5	0.062-0.031	1.88	6.0	83.3
6	0.031-0.016	1.00	3.2	86.5
7	0.016-0.008	1.08	3.4	89.9
8	0.008-0.004	0.75	2.4	92.3
9	0.004-0.002	0.63	2.0	94.3
>9	<0.002	1.81	5.7	100.0

TOTAL WT	COARSE WT	FINE WT
31.6	24.4	7.2

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
SAM6-C

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.12	0.4	0.4
0	2-1	0.22	0.7	1.1
1	1-0.5	0.53	1.7	2.9
2	0.5-0.25	1.22	4.0	6.9
3	0.25-0.125	20.80	68.5	75.3
4	0.125-0.062	2.05	6.7	82.1
5	0.062-0.031	1.45	4.8	86.9
6	0.031-0.016	0.96	3.2	90.0
7	0.016-0.008	0.67	2.2	92.2
8	0.008-0.004	0.53	1.8	94.0
9	0.004-0.002	0.52	1.7	95.7
>9	<0.002	1.31	4.3	100.0

TOTAL WT	COARSE WT	FINE WT
30.4	24.9	5.5

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
SAM7-D

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.22	0.7	0.7
0	2-1	0.00	0.0	0.7
1	1-0.5	0.85	2.7	3.4
2	0.5-0.25	19.14	61.6	65.0
3	0.25-0.125	10.36	33.3	98.4
4	0.125-0.062	0.11	0.4	98.7
5	0.062-0.031	0.00	0.0	98.7
6	0.031-0.016	0.00	0.0	98.7
7	0.016-0.008	0.13	0.4	99.1
8	0.008-0.004	0.01	0.0	99.2
9	0.004-0.002	0.03	0.1	99.3
>9	<0.002	0.23	0.7	100.0

TOTAL WT	COARSE WT	FINE WT
31.1	30.7	0.4

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
FL1-D

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.00	0.0	0.0
0	2-1	0.10	0.3	0.3
1	1-0.5	0.30	0.9	1.2
2	0.5-0.25	4.96	15.1	16.3
3	0.25-0.125	22.06	67.1	83.4
4	0.125-0.062	1.39	4.2	87.7
5	0.062-0.031	1.15	3.5	91.2
6	0.031-0.016	0.74	2.3	93.4
7	0.016-0.008	0.48	1.5	94.9
8	0.008-0.004	0.40	1.2	96.1
9	0.004-0.002	0.37	1.1	97.2
>9	<0.002	0.91	2.8	100.0

TOTAL WT	COARSE WT	FINE WT
32.9	28.9	4.1

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
FL2-D

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.01	0.0	0.0
0	2-1	0.04	0.1	0.2
1	1-0.5	0.07	0.2	0.4
2	0.5-0.25	0.32	1.1	1.6
3	0.25-0.125	1.55	5.5	7.1
4	0.125-0.062	7.63	27.1	34.2
5	0.062-0.031	4.85	17.2	51.5
6	0.031-0.016	3.50	12.5	63.9
7	0.016-0.008	2.84	10.1	74.0
8	0.008-0.004	2.19	7.8	81.8
9	0.004-0.002	1.48	5.3	87.1
>9	<0.002	3.63	12.9	100.0

TOTAL WT	COARSE WT	FINE WT
28.1	9.6	18.5

Philip D. Carpente
Laboratory Director

Particle Size
Plumb, 1981
(%)
FL3-D

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.00	0.0	0.0
0	2-1	0.03	0.1	0.1
1	1-0.5	0.08	0.3	0.4
2	0.5-0.25	0.50	1.7	2.1
3	0.25-0.125	9.76	34.1	36.2
4	0.125-0.062	7.63	26.6	62.8
5	0.062-0.031	3.90	13.6	76.4
6	0.031-0.016	2.19	7.6	84.1
7	0.016-0.008	1.23	4.3	88.3
8	0.008-0.004	0.88	3.1	91.4
9	0.004-0.002	0.61	2.1	93.5
>9	<0.002	1.85	6.5	100.0

TOTAL WT	COARSE WT	FINE WT
28.7	18.0	10.7

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
FL4-D

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.00	0.0	0.0
0	2-1	0.12	0.4	0.4
1	1-0.5	0.30	0.9	1.3
2	0.5-0.25	3.73	11.6	12.9
3	0.25-0.125	9.82	30.6	43.5
4	0.125-0.062	6.55	20.4	63.9
5	0.062-0.031	4.87	15.2	79.0
6	0.031-0.016	2.39	7.4	86.4
7	0.016-0.008	1.27	4.0	90.4
8	0.008-0.004	0.73	2.3	92.7
9	0.004-0.002	0.66	2.0	94.7
>9	<0.002	1.69	5.3	100.0

TOTAL WT	COARSE WT	FINE WT
32.1	20.5	11.6

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
FL5

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.00	0.0	0.0
0	2-1	0.04	0.1	0.1
1	1-0.5	0.12	0.3	0.5
2	0.5-0.25	4.40	12.8	13.2
3	0.25-0.125	28.80	83.5	96.7
4	0.125-0.062	0.71	2.1	98.8
5	0.062-0.031	0.14	0.4	99.2
6	0.031-0.016	0.03	0.1	99.3
7	0.016-0.008	0.04	0.1	99.4
8	0.008-0.004	0.02	0.1	99.4
9	0.004-0.002	0.01	0.0	99.5
>9	<0.002	0.19	0.5	100.0

TOTAL WT	COARSE WT	FINE WT
34.5	34.1	0.4

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
FL6

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	2.47	6.6	6.6
-1	4-2	1.55	4.1	10.7
0	2-1	0.77	2.1	12.8
1	1-0.5	1.60	4.3	17.0
2	0.5-0.25	14.16	37.7	54.8
3	0.25-0.125	15.48	41.3	96.0
4	0.125-0.062	0.51	1.4	97.4
5	0.062-0.031	0.27	0.7	98.1
6	0.031-0.016	0.09	0.2	98.4
7	0.016-0.008	0.25	0.7	99.0
8	0.008-0.004	0.08	0.2	99.2
9	0.004-0.002	0.05	0.1	99.3
>9	<0.002	0.25	0.7	100.0

TOTAL WT	COARSE WT	FINE WT
37.5	36.5	1.0

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
FL7

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.12	0.4	0.4
0	2-1	0.24	0.7	1.1
1	1-0.5	1.30	3.9	4.9
2	0.5-0.25	18.79	55.9	60.8
3	0.25-0.125	12.43	37.0	97.8
4	0.125-0.062	0.25	0.7	98.6
5	0.062-0.031	0.08	0.2	98.8
6	0.031-0.016	0.09	0.3	99.0
7	0.016-0.008	0.08	0.2	99.3
8	0.008-0.004	0.05	0.1	99.4
9	0.004-0.002	0.01	0.0	99.4
>9	<0.002	0.19	0.6	100.0

TOTAL WT	COARSE WT	FINE WT
33.6	33.1	0.5

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
FL8

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.00	0.0	0.0
0	2-1	0.09	0.2	0.2
1	1-0.5	0.31	0.8	1.0
2	0.5-0.25	10.65	27.8	28.9
3	0.25-0.125	26.31	68.7	97.6
4	0.125-0.062	0.60	1.6	99.1
5	0.062-0.031	0.03	0.1	99.2
6	0.031-0.016	0.04	0.1	99.3
7	0.016-0.008	0.05	0.1	99.5
8	0.008-0.004	0.00	0.0	99.5
9	0.004-0.002	0.21	0.5	100.0
>9	<0.002	0.00	0.0	100.0

TOTAL WT	COARSE WT	FINE WT
38.3	38.0	0.3

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
NB1

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.11	0.2	0.2
-1	4-2	0.04	0.1	0.3
0	2-1	0.22	0.5	0.8
1	1-0.5	2.08	4.5	5.3
2	0.5-0.25	25.63	55.6	60.9
3	0.25-0.125	17.55	38.0	98.9
4	0.125-0.062	0.28	0.6	99.5
5	0.062-0.031	0.03	0.1	99.6
6	0.031-0.016	0.02	0.0	99.6
7	0.016-0.008	0.00	0.0	99.6
8	0.008-0.004	0.02	0.1	99.7
9	0.004-0.002	0.01	0.0	99.7
>9	<0.002	0.14	0.3	100.0

TOTAL WT	COARSE WT	FINE WT
46.1	45.9	0.2

Philip R. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
NB2

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.00	0.0	0.0
0	2-1	0.04	0.1	0.1
1	1-0.5	0.08	0.2	0.3
2	0.5-0.25	19.46	45.7	46.0
3	0.25-0.125	22.68	53.3	99.3
4	0.125-0.062	0.11	0.3	99.5
5	0.062-0.031	0.00	0.0	99.5
6	0.031-0.016	0.00	0.0	99.5
7	0.016-0.008	0.00	0.0	99.5
8	0.008-0.004	0.03	0.1	99.6
9	0.004-0.002	0.00	0.0	99.6
>9	<0.002	0.17	0.4	100.0

TOTAL WT	COARSE WT	FINE WT
42.6	42.4	0.2

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
NB3

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.13	0.3	0.3
-1	4-2	0.27	0.6	0.9
0	2-1	0.68	1.5	2.4
1	1-0.5	7.39	16.6	19.0
2	0.5-0.25	29.35	66.0	85.0
3	0.25-0.125	6.40	14.4	99.4
4	0.125-0.062	0.10	0.2	99.6
5	0.062-0.031	0.02	0.0	99.7
6	0.031-0.016	0.00	0.0	99.7
7	0.016-0.008	0.00	0.0	99.7
8	0.008-0.004	0.00	0.0	99.7
9	0.004-0.002	0.00	0.0	99.7
>9	<0.002	0.15	0.3	100.0

TOTAL WT	COARSE WT	FINE WT
44.5	44.3	0.17

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
NB4

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.81	2.0	2.0
0	2-1	2.08	5.0	7.0
1	1-0.5	5.63	13.6	20.5
2	0.5-0.25	24.86	59.9	80.4
3	0.25-0.125	7.78	18.7	99.2
4	0.125-0.062	0.12	0.3	99.5
5	0.062-0.031	0.00	0.0	99.5
6	0.031-0.016	0.00	0.0	99.5
7	0.016-0.008	0.00	0.0	99.5
8	0.008-0.004	0.00	0.0	99.5
9	0.004-0.002	0.01	0.0	99.5
>9	<0.002	0.20	0.5	100.0

TOTAL WT	COARSE WT	FINE WT
41.5	41.3	0.2

Philip A. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
NB5

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.34	0.8	0.8
0	2-1	0.55	1.3	2.1
1	1-0.5	3.26	7.7	9.8
2	0.5-0.25	27.04	64.1	73.9
3	0.25-0.125	10.69	25.3	99.2
4	0.125-0.062	0.10	0.2	99.5
5	0.062-0.031	0.00	0.0	99.5
6	0.031-0.016	0.01	0.0	99.5
7	0.016-0.008	0.00	0.0	99.5
8	0.008-0.004	0.00	0.0	99.5
9	0.004-0.002	0.00	0.0	99.5
>9	<0.002	0.20	0.5	100.0

TOTAL WT	COARSE WT	FINE WT
42.2	42.0	0.2

Philip D. Cargente
Laboratory Director

Particle Size
Plumb, 1981
(%)
NB6

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	6.46	14.7	14.7
-1	4-2	7.02	16.0	30.7
0	2-1	3.02	6.9	37.6
1	1-0.5	3.08	7.0	44.6
2	0.5-0.25	13.74	31.3	75.9
3	0.25-0.125	9.87	22.5	98.4
4	0.125-0.062	0.30	0.7	99.1
5	0.062-0.031	0.00	0.0	99.1
6	0.031-0.016	0.13	0.3	99.4
7	0.016-0.008	0.03	0.1	99.4
8	0.008-0.004	0.00	0.0	99.4
9	0.004-0.002	0.02	0.1	99.5
>9	<0.002	0.22	0.5	100.0

TOTAL WT	COARSE WT	FINE WT
43.9	43.5	0.4

Philip D. Carpenter
Laboratory Director

ToxScan, Inc.
T-9209 & T-9284
C-83

San Francisco Army Corps of Engineers
Humboldt Bay
Baseline Survey/ (FY 1993)

Particle Size
Plumb, 1981
(%)
NB7

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	4.97	12.0	12.0
-1	4-2	5.74	13.9	25.8
0	2-1	3.22	7.8	33.6
1	1-0.5	4.94	11.9	45.5
2	0.5-0.25	16.48	39.8	85.3
3	0.25-0.125	5.74	13.8	99.1
4	0.125-0.062	0.09	0.2	99.3
5	0.062-0.031	0.00	0.1	99.4
6	0.031-0.016	0.03	0.1	99.5
7	0.016-0.008	0.00	0.0	99.5
8	0.008-0.004	0.03	0.1	99.5
9	0.004-0.002	0.03	0.1	99.6
>9	<0.002	0.19	0.4	100.0

TOTAL WT	COARSE WT	FINE WT
41.5	41.2	0.3

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
NB8

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	3.50	9.5	9.5
-1	4-2	5.36	14.5	23.9
0	2-1	3.27	8.8	32.8
1	1-0.5	3.77	10.2	43.0
2	0.5-0.25	13.41	36.2	79.2
3	0.25-0.125	5.52	14.9	94.1
4	0.125-0.062	0.33	0.9	95.0
5	0.062-0.031	0.41	1.1	96.1
6	0.031-0.016	0.30	0.8	96.9
7	0.016-0.008	0.31	0.8	97.8
8	0.008-0.004	0.20	0.6	98.3
9	0.004-0.002	0.23	0.6	98.9
>9	<0.002	0.40	1.1	100.0

TOTAL WT	COARSE WT	FINE WT
37.01	35.16	1.85

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
NB9D

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	3.47	6.7	6.7
-1	4-2	9.32	18.1	24.9
0	2-1	7.39	14.4	39.2
1	1-0.5	9.35	18.2	57.4
2	0.5-0.25	17.03	33.1	90.5
3	0.25-0.125	3.95	7.7	98.2
4	0.125-0.062	0.21	0.4	98.6
5	0.062-0.031	0.20	0.4	99.0
6	0.031-0.016	0.10	0.2	99.2
7	0.016-0.008	0.08	0.1	99.3
8	0.008-0.004	0.08	0.1	99.5
9	0.004-0.002	0.08	0.2	99.6
>9	<0.002	0.20	0.4	100.0

TOTAL WT	COARSE WT	FINE WT
51.45	50.72	0.73

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
NB10D

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	6.40	14.2	14.2
-1	4-2	9.11	20.2	34.4
0	2-1	5.25	11.7	46.1
1	1-0.5	5.83	12.9	59.0
2	0.5-0.25	12.92	28.7	87.7
3	0.25-0.125	4.08	9.1	96.8
4	0.125-0.062	0.29	0.6	97.4
5	0.062-0.031	0.46	1.0	98.5
6	0.031-0.016	0.05	0.1	98.6
7	0.016-0.008	0.12	0.3	98.8
8	0.008-0.004	0.11	0.2	99.1
9	0.004-0.002	0.20	0.4	99.5
>9	<0.002	0.21	0.5	100.0

TOTAL WT	COARSE WT	FINE WT
45.03	43.88	1.15

Philip D. Cargente
Laboratory Director

Particle Size
Plumb, 1981
(%)
ENT1

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.00	0.0	0.0
0	2-1	0.14	0.3	0.3
1	1-0.5	0.65	1.6	1.9
2	0.5-0.25	16.59	40.0	41.9
3	0.25-0.125	22.52	54.3	96.3
4	0.125-0.062	1.12	2.7	99.0
5	0.062-0.031	0.25	0.6	99.6
6	0.031-0.016	0.02	0.0	99.6
7	0.016-0.008	0.00	0.0	99.6
8	0.008-0.004	0.01	0.0	99.6
9	0.004-0.002	0.01	0.0	99.7
>9	<0.002	0.14	0.3	100.0

TOTAL WT	COARSE WT	FINE WT
41.45	41.02	0.43

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
ENT2

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.00	0.0	0.0
0	2-1	0.06	0.2	0.2
1	1-0.5	0.26	0.7	0.8
2	0.5-0.25	27.25	69.1	69.9
3	0.25-0.125	11.50	29.1	99.0
4	0.125-0.062	0.15	0.4	99.4
5	0.062-0.031	0.00	0.0	99.4
6	0.031-0.016	0.00	0.0	99.4
7	0.016-0.008	0.00	0.0	99.4
8	0.008-0.004	0.03	0.1	99.5
9	0.004-0.002	0.00	0.0	99.5
>9	<0.002	0.20	0.5	100.0

TOTAL WT	COARSE WT	FINE WT
39.5	39.2	0.2

Philip D. Carpenter
Laboratory Director

Particle Size
Plumb, 1981
(%)
BAR1

MATERIAL: Sediment samples received November 4, 1992
IDENTIFICATION: Humboldt
TOXSCAN NUMBER: T-9209
REPORT: Quantitative chemical analysis is as follows:

SIZE INTERVAL Phi	mm	INTERVAL WT	INTERVAL %	CUMULATIVE %
<-5	>32	0.00	0.0	0.0
-4	32-16	0.00	0.0	0.0
-3	16-8	0.00	0.0	0.0
-2	8-4	0.00	0.0	0.0
-1	4-2	0.00	0.0	0.0
0	2-1	0.01	0.0	0.0
1	1-0.5	0.07	0.2	0.2
2	0.5-0.25	19.96	47.2	47.4
3	0.25-0.125	21.85	51.6	99.0
4	0.125-0.062	0.17	0.4	99.4
5	0.062-0.031	0.00	0.0	99.4
6	0.031-0.016	0.00	0.0	99.4
7	0.016-0.008	0.02	0.0	99.5
8	0.008-0.004	0.00	0.0	99.5
9	0.004-0.002	0.00	0.0	99.5
>9	<0.002	0.22	0.5	100.0

TOTAL WT	COARSE WT	FINE WT
42.3	42.1	0.2

Philip D. Carpenter
Laboratory Director

Appendix C-1

Dioxin Analyses Results
(Alta Analytical Laboratory, Inc.)

Please note: The composite sample labels in this appendix are equivalent to the composite sample labels referenced in other sections and appendices of this report, as follows:

Comp 1 = EKUP
Comp 2 = SAMTB
Comp 4 = FLTB

Appendix C-1

Dioxin Analyses Results
(Alta Analytical Laboratory, Inc.)

Please note: The composite sample labels in this appendix are equivalent to the composite sample labels referenced in other sections and appendices of this report, as follows:

Comp 1 = EXCUP
Comp 2 = SAMTB
Comp 4 = PLTB

ALTA

November 16, 1992

Alta Batch I.D.: 11751

Ms. Mary Lou Milazzo
ToxScan Inc.
42 Hanger Way
Watsonville, CA 95076

Dear Ms. Milazzo,

Enclosed are the results for the five soil samples received at Alta Analytical Laboratory on November 6, 1992. These samples were analyzed using NCASI Method 551 for 2,3,7,8-TCDD and 2,3,7,8-TCDF. This work was authorized under your Purchase Order #8700. Routine turnaround time was requested for this work.

The following report consists of a Sample Inventory (Section I), Analytical Results (Section II) and the Appendix. The Appendix contains a copy of the chain-of-custody, a list of data qualifiers and abbreviations and copies of the raw data (if requested).

If you have any questions regarding this report please feel free to contact me.

Sincerely,

Robert L. Mitzel for

William J. Luksemburg
Director of HRMS Services

Alta Analytical Laboratory Inc.
5070 Robert J. Mathews Pkwy., Suite 2
El Dorado Hills, CA 95762
FAX (916) 933-0940
(916) 933-1640

ALTA

Section I. Sample Inventory

Date Received: 6-Nov-92

Alta Lab ID.	Client ID.
11751-1-SA	T-9209-46 COMP 1 (2of2)
11751-2-SA	T-9209-48 COMP 2 (2of2)
11751-3-SA	T-9209-50 COMP 4
11751-4-SA	T-9209-40 REF. COMP (2of3)
11751-5-SA	T-9209-55 CONTROL

SECTION II.

ALTA

TCDD & TCDF
NCASI 551

METHOD BLANK
Lab ID: 11751-001-MB
Matrix: Soil

Date Received: NA
Date Extracted: 11/10/92
Sample Amount: 10.00 g

ICAL ID: I551
QC Lot: LC1106S
Units: pg/g

Compound	Conc.	D.L.	Ratio	S/N Ratio	Qualifier
2,3,7,8-TCDD	ND	0.20			
2,3,7,8-TCDF	ND	0.19			

Isotopic Recovery Results

Internal Standard:	% R	Ratio	Qualifier
^{13}C-2,3,7,8-TCDD	109	0.77	
^{13}C-2,3,7,8-TCDF	99	0.79	
Clean-up Recovery Standard:			
^{37}Cl-2,3,7,8-TCDD	103	NA	

Dates Analyzed:

DB-5: 11/12/92

DB-225: NA

Analyst: [signature]

Reviewer: [signature]

ALTA

TCDD & TCDF
NCASI 551

LCS RESULTS
Lab ID: 11751-LCS1/LCS2
Matrix: Soil

Date Received: NA
Date Extracted: 11/06/92
Sample Amount: 10.00 g

ICAL ID: I551
QC Lot: LC1106S
Units: NA

Compound	LCS1 % R	LCS2 % R	RPD %
2,3,7,8-TCDD	97	98	1.0
2,3,7,8-TCDF	103	99	4.0
1,2,7,8-TCDF	89	87	2.3

Isotopic Recovery Results

Internal Standard:	LCS1 % R	LCS2 % R
^{13}C-2,3,7,8-TCDD	90	105
^{13}C-2,3,7,8-TCDF	90	107
Clean-up Recovery Standard:		
^{37}Cl-2,3,7,8-TCDD	83	94

Dates Analyzed:

DB-5: 11/09/92

DB-225: NA

Analyst: _____

Reviewer: _____

ALTA

TCDD & TCDF
NCASI 551

Sample ID: T-9209-46 Comp 1 **Date Received:** 11/06/92 **ICAL ID:** I551
Lab ID: 11751-001-SA **Date Extracted:** 11/10/92 **QC Lot:** LC1106S
Matrix: Soil **Sample Amount:** 10.20 g **Units:** pg/g
% Solids: 74

Compound	Conc.	D.L.	Ratio	S/N Ratio	Qualifier
2,3,7,8-TCDD	ND	0.24			
2,3,7,8-TCDF	ND	0.39			

Isotopic Recovery Results

Internal Standard:	% R	Ratio	Qualifier
^{13}C-2,3,7,8-TCDD	109	0.79	
^{13}C-2,3,7,8-TCDF	99	0.80	
Clean-up Recovery Standard:			
^{37}Cl-2,3,7,8-TCDD	99	NA	

Dates Analyzed:

DB-5: 11/12/92 **DB-225:** NA

Analyst: [signature] Reviewer: [signature]

ALTA

TCDD & TCDF
NCASI 551

Sample ID: T-9209-48 Comp 2 **Date Received:** 11/06/92 **ICAL ID:** I551
Lab ID: 11751-002-SA **Date Extracted:** 11/10/92 **QC Lot:** LC1106S
Matrix: Soil **Sample Amount:** 10.20 g **Units:** pg/g
% Solids: 72

Compound	Conc.	D.L.	Ratio	S/N Ratio	Qualifier
2,3,7,8-TCDD	ND	0.19			
2,3,7,8-TCDF	ND	0.34			

Isotopic Recovery Results

Internal Standard:	% R	Ratio	Qualifier
^{13}C-2,3,7,8-TCDD	114	0.79	
^{13}C-2,3,7,8-TCDF	118	0.76	
Clean-up Recovery Standard:			
^{37}Cl-2,3,7,8-TCDD	101	NA	

Dates Analyzed:

DB-5: 11/12/92 **DB-225:** NA

Analyst: [signature] Reviewer: [signature]

ALTA

TCDD & TCDF
NCASI 551

Sample ID: T-9209-50 Comp 4 **Date Received:** 11/06/92 **ICAL ID:** I551
Lab ID: 11751-003-SA **Date Extracted:** 11/10/92 **QC Lot:** LC1106S
Matrix: Soil **Sample Amount:** 10.26 g **Units:** pg/g
% Solids: 63

Compound	Conc.	D.L.	Ratio	S/N Ratio	Qualifier
2,3,7,8-TCDD	ND	0.19			
2,3,7,8-TCDF	ND	0.28			

Isotopic Recovery Results

Internal Standard:	% R	Ratio	Qualifier
^{13}C-2,3,7,8-TCDD	111	0.80	
^{13}C-2,3,7,8-TCDF	121	0.79	

Clean-up Recovery Standard:			
^{37}Cl-2,3,7,8-TCDD	96	NA	

Dates Analyzed:

DB-5: 11/12/92 **DB-225:** NA

Analyst: [signature] Page 1 of 1 Reviewer: [signature]

ALTA

TCDD & TCDF
NCASI 551

Sample ID: T-9209-40 Ref Comp **Date Received:** 11/06/92 **ICAL ID:** I551
Lab ID: 11751-004-SA **Date Extracted:** 11/10/92 **QC Lot:** LC1106S
Matrix: Soil **Sample Amount:** 10.24 g **Units:** pg/g
% Solids: 78

Compound	Conc.	D.L.	Ratio	S/N Ratio	Qualifier
2,3,7,8-TCDD	ND	0.14			
2,3,7,8-TCDF	ND	0.089			

Isotopic Recovery Results

Internal Standard:	% R	Ratio	Qualifier
^{13}C-2,3,7,8-TCDD	110	0.80	
^{13}C-2,3,7,8-TCDF	118	0.80	

Clean-up Recovery Standard:

^{37}Cl-2,3,7,8-TCDD	99	NA	

Dates Analyzed:

DB-5: 11/12/92 **DB-225:** NA

Analyst: [signature] Reviewer: [signature]

ALTA

TCDD & TCDF
NCASI 551

Sample ID: T-9209-55 Control
Lab ID: 11751-005-SA
Matrix: Soil
% Solids: 79

Date Received: 11/06/92
Date Extracted: 11/10/92
Sample Amount: 10.13 g

ICAL ID: I551
QC Lot: LC1106S
Units: pg/g

Compound	Conc.	D.L.	Ratio	S/N Ratio	Qualifier
2,3,7,8-TCDD	ND	0.15			
2,3,7,8-TCDF	ND	0.13			

Isotopic Recovery Results

Internal Standard:	% R	Ratio	Qualifier
^{13}C-2,3,7,8-TCDD	99	0.78	
^{13}C-2,3,7,8-TCDF	103	0.81	
Clean-up Recovery Standard:			
^{37}Cl-2,3,7,8-TCDD	90	NA	

Dates Analyzed:

DB-5: 11/12/92

DB-225: NA

Analyst: BS

Reviewer: bh

APPENDIX

DATA QUALIFIERS & ABBREVIATIONS

ALTA

A	**The amount detected is below the Method Calibration Limit.**
B	**This compound was also detected in the blank.**
C	**The amount detected is less than five times the Method Quantitation Limit.**
D	**The amount reported is the maximum possible concentration.**
E	**The detection limit was raised above the Method Quantitation Limit due to chemical interferences.**
F	**This result has been confirmed on a DB-225 column.**
G	**This result has been confirmed on a SP-2331 column.**
H	**The signal-to-noise ratio is greater than 10:1.**
I	**Chemical Interference**

Conc.	**Concentration**
D.L.	**Detection Limit**
NA	**Not applicable**
S/N	**Signal-to-noise**
*****	**See Cover Letter**
ND	**Not Detected**
MPC	**Maximum Possible Concentration**

SAMPLING AND ANALYSIS CHAIN OF CUSTODY RECORD

ToxScan Inc.
42 Hangar Way
Watsonville, CA 95076
(408) 724-4522

CLIENT _____ LABORATORY NO. T-9209

CONTACT _____ PHONE _____ ACCOUNT NO. _____

REQUEST			LABORATORY REQUIREMENTS				CHAIN OF CUSTODY							
SAMPLE TYPE									ToxScan Inc.			CONTRACT LABORATORY		
Sediment												Alta Analytical		
SAMPLE ID	LAB ID	PARAMETERS	BOTTLES	PRES.	LABORATORY	PO#	SAMPLED BY	DATE	REC'D BY	DATE	COMMENTS	REC'D BY	DATE	COMMENTS
Comp 1 (2of2)	T-9209 -46	TCDD/TCDF	1-1 Liter Glass Jar	On Ice				11/01/92						
Comp 2 (2of2)	T-9209 -48	↓	↓					10/31/92						
Comp 4	T-9209 -50							10/30/92						
2of3 Ref. Comp	T-9209 -40							11/02/92						
Control	T-9209 -55							10/29/92						

SIGNATURES:

LABORATORY REPRESENTATIVE: _____

RELEASED TO COURIER BY FIELD PERSONEL: _____

RECEIVED BY COURIER: _____

RELEASED TO LABORATORY BY COURIER: _____

RECEIVED BY LABORATORY: _____

RELEASED TO LABORATORY BY COURIER: Via UPS Next Da
Michael Schlenz 11/04/9

RECEIVED BY LABORATORY: 11-6-92
Rec. Flatt Alta Analytical 1100

Please send Signed Copy of C.O.C Thanks

Sample #T-9209-40 Rec Broken M.F

THIS FORM MUST ACCOMPANY THE "ANALYSIS REQUEST FORM" AND SAMPLES TO INITIATE ANALYSIS.

ALTA Analytical Laboratory

Batch ID:_____

Sample Log-In Checklist	Yes	No
1. Samples Arrived by: UPS		
2. Airbill Present? Number_____		X
3. Shipping Container is Intact?	X	
4. Custody Seals Present? Number_____		X
If yes, are they intact? N/A		
* 5. Sample Containers Intact?	X	
6. Shipping Preservation: Ice/Blue Ice/None		
7. Temperature: 19 °C		
8. Chain of Custody Present?	X	
9. Discrepancies in Chain of Custody?		X
10. Packing Retained?	X	

Name: RH.F Date Rcv'd: 11-6-92

Comments: *5. Sample # T-9209-40 Rec Broken
RH.F

Appendix C-2

Bioaccumulation Results

Metals Bioaccumulation - *Nephtys caecoides*
mg/Kg (ppm) - dry weight
Baseline

MATERIAL:	Tissue samples received December 9, 1992
IDENTIFICATION:	Humboldt
DATE COMPLETED:	March 12-18, 1993
TOXSCAN NUMBER:	T-9284
REPORT:	Quantitative chemical analysis is as follows, expressed as milligrams per kilogram (parts per million) on a dry weight basis:

Analyte	Baseline Value
Arsenic	27
Cadmium	1.5
Chromium	7.0
Copper	22
Lead	1.2
Mercury	0.19
Nickel	9.7
Selenium	3.9
Silver	ND
Zinc	300

ND = None Detected

Mercury Detection Limit = 0.02

All other Detection limits = 0.1

Philip D. Carpenter
Laboratory Director

Metals Bioaccumulation - *Nephtys caecoides*
mg/Kg (ppm) - dry weight
EKUP

MATERIAL: Tissue samples received December 9, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: March 12-18, 1993
TOXSCAN NUMBER: T-9284
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per kilogram (parts per million) on a dry weight basis:

Analyte	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Arsenic	26	27	30	28	29
Cadmium	0.8	0.7	0.9	0.8	0.8
Chromium	0.7	1.9	1.2	1.6	1.6
Copper	24	23	24	24	24
Lead	0.7	0.8	0.9	1.2	1.1
Mercury	0.12	0.15	0.14	0.12	0.15
Nickel	4.5	6.1	5.7	5.6	5.9
Selenium	3.8	2.0	3.0	3.7	3.4
Silver	0.1	ND	ND	ND	ND
Zinc	180	160	180	170	160

ND = None Detected

Mercury Detection Limit = 0.02

All other Detection limits = 0.1

Philip D. Carpenter
Laboratory Director

Metals Bioaccumulation - *Nephtys caecoides*
mg/Kg (ppm) - dry weight
SAMTB

MATERIAL: Tissue samples received December 9, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: March 12-18, 1993
TOXSCAN NUMBER: T-9284
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per kilogram (parts per million) on a dry weight basis:

Analyte	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Arsenic	28	26	27	25	24
Cadmium	0.9	0.7	0.6	0.7	0.7
Chromium	2.1	2.0	1.3	1.3	1.4
Copper	24	21	28	24	25
Lead	1.0	0.9	0.8	0.8	0.9
Mercury	0.15	0.12	0.17	0.12	0.14
Nickel	5.6	5.5	5.2	5.4	5.3
Selenium	4.0	2.7	3.5	3.3	2.5
Silver	ND	ND	ND	ND	ND
Zinc	180	180	140	170	170

ND = None Detected

Mercury Detection Limit = 0.02

All other Detection limits = 0.1

Philip D. Carpenter
Laboratory Director

Metals Bioaccumulation - *Nephtys caecoides*
mg/Kg (ppm) - dry weight
FLTB

MATERIAL: Tissue samples received December 9, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: March 12-18, 1993
TOXSCAN NUMBER: T-9284
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per kilogram (parts per million) on a dry weight basis:

Analyte	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Arsenic	28	30	28	27	27
Cadmium	0.7	0.7	0.7	0.7	0.7
Chromium	2.1	0.9	2.2	6.1	3.9
Copper	27	26	27	24	25
Lead	0.9	0.7	0.7	0.9	0.8
Mercury	0.10	0.16	0.14	0.19	0.12
Nickel	5.4	4.5	5.9	6.3	6.3
Selenium	3.2	3.3	2.8	2.3	3.1
Silver	ND	ND	ND	ND	ND
Zinc	180	180	180	160	160

ND = None Detected

Mercury Detection Limit = 0.02

All other Detection limits = 0.1

Philip D. Carpenter
Laboratory Director

Metals Bioaccumulation - *Nephtys caecoides*
mg/Kg (ppm) - dry weight
Reference

MATERIAL: Tissue samples received December 9, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: March 12-18, 1993
TOXSCAN NUMBER: T-9284
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per kilogram (parts per million) on a dry weight basis:

Analyte	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Arsenic	21	27	28	22	27
Cadmium	0.7	0.8	0.9	0.9	1.1
Chromium	1.7	1.9	1.3	2.5	1.0
Copper	24	23	27	27	24
Lead	0.7	0.6	0.7	0.6	0.8
Mercury	0.10	0.13	0.12	0.19	0.15
Nickel	6.1	5.8	4.4	6.9	5.4
Selenium	2.8	3.1	3.9	2.9	3.2
Silver	ND	ND	ND	ND	ND
Zinc	170	160	190	170	210

ND = None Detected

Mercury Detection Limit = 0.02

All other Detection limits = 0.1

Philip D. Carpenter
Laboratory Director

Metals Bioaccumulation - *Nephtys caecoides*
mg/Kg (ppm) - dry weight
Control

MATERIAL: Tissue samples received December 9, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: March 12-18, 1993
TOXSCAN NUMBER: T-9284
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per kilogram (parts per million) on a dry weight basis:

Analyte	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Arsenic	25	24	27	22	24
Cadmium	0.6	0.7	0.8	0.8	0.9
Chromium	2.5	1.2	1.1	1.2	2.1
Copper	29	27	27	25	26
Lead	0.6	0.7	0.6	0.6	0.6
Mercury	0.10	0.14	0.15	0.14	0.11
Nickel	4.4	4.6	5.5	4.9	4.7
Selenium	3.7	3.1	3.2	2.9	2.9
Silver	ND	ND	ND	ND	ND
Zinc	190	190	180	150	200

ND = None Detected

Mercury Detection Limit = 0.02

All other Detection limits = 0.1

Philip D. Cargente
Laboratory Director

Metals Bioaccumulation - *Macoma nasuta*
mg/Kg (ppm) - dry weight
Baseline

MATERIAL: Tissue samples received December 9, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: 12-19 March 1993
TOXSCAN NUMBER: T-9284
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per kilogram (parts per million) on a dry weight basis:

Analyte	Baseline Value
Arsenic	34
Cadmium	0.7
Chromium	19
Copper	81
Lead	3.1
Mercury	0.53
Nickel	9.5
Selenium	2.4
Silver	0.7
Zinc	200

Mercury Detection Limit = 0.02

All other Detection limits = 0.1

Philip D. Carpenter
Laboratory Director

Metals Bioaccumulation - *Macoma nasuta*
mg/Kg (ppm) - dry weight
EKUP

MATERIAL: Tissue samples received December 9, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: 12-19 March 1993
TOXSCAN NUMBER: T-9284
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per kilogram (parts per million) on a dry weight basis:

Analyte	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Arsenic	36	34	44	39	36
Cadmium	0.5	0.4	0.6	0.4	0.5
Chromium	25	20	20	18	28
Copper	65	53	80	53	96
Lead	5.8	4.2	5.6	5.5	5.3
Mercury	0.16	0.17	0.19	0.22	0.18
Nickel	20	20	22	20	22
Selenium	2.5	2.0	1.7	2.0	2.0
Silver	0.6	0.4	0.7	0.4	0.9
Zinc	200	180	220	150	240

Mercury Detection Limit = 0.02

All other Detection limits = 0.1

Philip D. Carpenter
Laboratory Director

Metals Bioaccumulation - *Macoma nasuta*
mg/Kg (ppm) - dry weight
SAMTB

MATERIAL: Tissue samples received December 9, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: 12-19 March 1993
TOXSCAN NUMBER: T-9284
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per kilogram (parts per million) on a dry weight basis:

Analyte	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Arsenic	54	42	38	43	32
Cadmium	0.4	0.7	2.3	0.4	0.5
Chromium	19	16	25	18	26
Copper	57	54	64	64	63
Lead	2.5	4.1	4.2	4.7	4.2
Mercury	0.17	0.15	0.17	0.16	0.13
Nickel	22	17	26	20	26
Selenium	2.4	2.2	1.6	1.8	1.8
Silver	0.3	0.4	0.5	0.5	0.5
Zinc	160	170	180	190	200

Mercury Detection Limit = 0.02

All other Detection limits = 0.1

Philip D. Carpenter
Laboratory Director

Metals Bioaccumulation - *Macoma nasuta*
mg/Kg (ppm) - dry weight
FLTB

MATERIAL: Tissue samples received December 9, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: 12-19 March 1993
TOXSCAN NUMBER: T-9284
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per kilogram (parts per million) on a dry weight basis:

Analyte	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Arsenic	42	36	46	46	36
Cadmium	0.7	0.6	0.5	0.5	0.5
Chromium	28	27	25	25	24
Copper	97	66	88	72	68
Lead	5.6	5.0	5.6	5.2	4.8
Mercury	0.24	0.16	0.18	0.21	0.17
Nickel	31	20	25	23	25
Selenium	2.0	2.0	2.1	2.0	2.1
Silver	0.8	0.5	0.6	0.5	0.5
Zinc	250	200	220	190	190

Mercury Detection Limit = 0.02

All other Detection limits = 0.1

Philip D. Carpenter
Laboratory Director

Metals Bioaccumulation - *Macoma nasuta*
mg/Kg (ppm) - dry weight
Reference

MATERIAL: Tissue samples received December 9, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: 12-19 March 1993
TOXSCAN NUMBER: T-9284
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per kilogram (parts per million) on a dry weight basis:

Analyte	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Arsenic	53	42	40	35	44
Cadmium	0.6	0.6	0.5	0.6	0.7
Chromium	20	10	14	5.6	12
Copper	56	46	36	47	57
Lead	3.0	3.4	3.9	1.3	2.7
Mercury	0.33	0.23	0.25	0.15	0.24
Nickel	22	14	14	7.5	13
Selenium	2.6	2.4	1.8	2.5	3.0
Silver	0.5	0.4	0.3	0.3	0.5
Zinc	210	180	130	140	210

Mercury Detection Limit = 0.02

All other Detection limits = 0.1

Philip D. Carpenter
Laboratory Director

Metals Bioaccumulation - *Macoma nasuta*
mg/Kg (ppm) - dry weight
Control

MATERIAL: Tissue samples received December 9, 1992
IDENTIFICATION: Humboldt
DATE COMPLETED: 12-19 March 1993
TOXSCAN NUMBER: T-9284
REPORT: Quantitative chemical analysis is as follows, expressed as milligrams per kilogram (parts per million) on a dry weight basis:

Analyte	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
Arsenic	33	35	51	53	45
Cadmium	0.5	0.5	0.5	0.5	0.5
Chromium	6.5	5.2	6.9	6.3	7.5
Copper	84	64	61	54	57
Lead	3.2	2.8	1.9	3.0	2.7
Mercury	0.25	0.38	0.18	0.21	0.46
Nickel	6.0	5.2	6.6	6.7	5.9
Selenium	2.2	2.0	2.5	2.7	2.5
Silver	0.7	0.6	0.5	0.5	0.5
Zinc	200	190	190	190	190

Mercury Detection Limit = 0.02

All other Detection limits = 0.1

Philip D. Carpenter
Laboratory Director

Appendix D

QA/QC Data Plan and Report

QA/QC PLAN AND REPORT

1.0 Field Survey Procedures

Sediment samples were collected from 36 prescribed locations in Humboldt Harbor by use of a vibra-core and Smith-Macintyre grab. The vibra-core consists of a vibrating aluminum head and a ten foot long aluminum core tube. The core tube is capped with a stainless steel cutting tip and a stainless steel core catcher. The vibra-core is lowered slowly into the sediment; the vibration allows entry into the sediment from the mudline to the sample depth. If a sample was not obtained on the first attempt, core attempts were repeated until a sample was secured. The Smith-Macintyre grab consists of a set of spring-loaded galvanized steel jaws, triggered by impact with the sediment surface.

The water sample used to prepare elutriates for bioassays was collected from the disposal site using a peristaltic pump with silicon and teflon hoses which had been precleaned with soap and nitric acid, and thoroughly rinsed with deionized (DI) water.

Horizontal positioning was accomplished by use of a Trimble Global Positioning System (GPS). Water depth was measured by use of a precision Fathometer, calibrated daily according to manufacture specification. Tidal height was extrapolated from tide tables.

Sediment samples were composited in a precleaned teflon-lined container. Samples for chemical analysis were placed into pre-cleaned glass jars and sealed with teflon-lined lids. Bioassay samples were placed into one-gallon, pre-cleaned polyethylene jars with poly screw closures. Immediately after collection and compositing, samples were stored in insulated coolers with ice. Upon arrival at the ToxScan laboratory in Watsonville, CA, sediments were stored in the 4°C room until analyzed. Holding times for chemical analysis are detailed below. None were exceeded during this study.

All sampling data are documented in the field log sheets included in this report.

2.0 Laboratory

Laboratory QA/QC procedures for this testing program were implemented as described in the ToxScan QA/QC program. Generic QA measures are described below in an excerpt from our written program. Table 5 presents a summary of instruments used in this study for bulk sediment analyses, along with methods and schedules for calibration, maintenance, precision/accuracy monitoring and record keeping.

All sediment samples were preserved by storage at 4°C in the dark. While EPA/COE protocol allows a 6-week holding period for dredged material sampled, certain of the methods require extraction and/or analysis within a shorter time period. These restricted holding times are listed below, and were adhered to in this program.

Analyte	Maximum Holding Time
Mercury	28 days
PAH's	extraction within 14 days
Chlorinated Hydrocarbons	extraction within 14 days
Sulfides	7 days
Petroleum Hydrocarbons	28 days
Organotins	28 days

As required by the Scope of Services for this program, the frequency of duplicate analyses and spiked sample analyses has been increased over our standard practice. For this study, 10% of the analyses have been duplicated and 20% of samples have been spiked.

Following is an excerpt from our QA/QC program which details the routine QA/QC measures followed in this program.

Procedures for Sample Receiving

The samples, accompanied by a chain of custody form are received by the sample control officer who follows the listed procedures for receiving a sample.

All sample containers are inspected to determine if any breakage or mishandling occurred and to determine that the proper container and preservatives have been used. The sample control officer will verify that sample labels match those on the chain of custody and that all samples listed are present. If a chain of custody does not exist and one is to be generated. See section below on Chain of Custody and Documentation.

The "log-in" process is initiated by giving each sample a discrete laboratory number which is entered on the chain of custody, in the log book and on the project sheet.

The proper paperwork (Sample Analysis Request Form or SARF) indicating analyses needed, detection limits, due dates, sample description and location, and necessary QA/QC is prepared and given to the appropriate analyst. The project manager receives the project sheet, which indicates analyses to be performed and due dates, along with a copy of the original SARF.

Sample Identification Procedure

In order to maintain sample identity, the following scheme is used:
T-0001-01, where T = ToxScan
0001 is the group number assigned to the set of samples
01 is the individual container number received.

Chain of Custody and Documentation

A chain of custody is initiated prior to sampling or at the time of sample delivery is submitted by a walk-in client. This chain of custody accompanies all samples and is given to the sample control officer along with the samples. Samples are logged in and the chain of custody is kept with the original SARF. If samples are to be subcontracted to another laboratory, a photocopy of the original chain of custody is made and will accompany those samples.

Source and Preparation of Standards

All primary standards are purchased in concentrated solutions or as pure substances and purchased in the highest purity available from reputable manufacturers or suppliers. Liquid stock solutions of concentrated standards are accompanied by a certification as to purity and concentration. All batch numbers, catalogue numbers, supplier and date of purchase are kept in the standards log book and updated as necessary.

Stock and working standards are prepared taking into account the stability and concentration of the analyte. Thus, some standards are prepared daily, others at less frequent intervals. Those standards that are light sensitive are stored in amber or like containers. If refrigeration will maximize the lifetime of the standards, they are stored at 4°C. Included on the standards container are date of preparation, concentration of solution analyte, and weight or volume used to prepare the standard if applicable. All standards are prepared with a high quality deionized or distilled water or with known purity solvents. A blank of all dilutants is checked to determine if any contamination has been introduced.

Calibration Procedures and Methods of Analysis

All instrument calibration methods are related to known analyte concentrations. This requires a calibration curve be prepared for each analyte. Some instruments can be calibrated directly from known concentrations of a standard; others furnish data for construction of a three-point curve.

The analyst follows the procedures specified in the operational manual for each instrument as well as those guidelines set forth by operational standard methods: Standard Methods for the

Evaluation of Waters and Wastewaters, EPA Protocol SW-846, AOAC Manual of Methodologies, etc. Calibration of instrumental parameters is further checked against standard reference materials provided by the EPA or NBS with listings of certified values. The worksheets given to the analyst have pertinent areas for calibration data to be recorded from which calibration or standard curves can be obtained.

Once the instrument has been standardized, analyte concentrations are checked against the standard curve every 10 analyses to assure continued calibration.

Samples are prepared, analyzed and reported according to those standardized procedures specified by EPA, Standard Methods, AOAC, or other recognized, documented methodologies. Sample weights, preparation, aliquots taken, and calculations are recorded on the analysis sheet furnished for each parameter to be determined and recorded in ink.

Method Blanks and Duplicate and Spiked Samples

A method blank is the analysis of pure organic-free water, high purity solvent or clean sample matrix after being subjected to treatment specified by the method used. Method blanks are used on all analyses to verify, qualitatively, that no false positives will occur and quantitatively, that concentrations are accurate and do not reflect contamination. A method blank is analyzed at a minimum of once for each batch of samples or after every twentieth sample, whichever is more frequent.

Spiking concentrations are dependent upon the background levels in the original sample. When spiking for a scan analysis, nominal spiking levels are used as described by the method. If a small number of specified chemicals are being measured, the sample is ideally spiked at one-half to one-and-one-half times the concentration found in the sample.

The recovery of the spiked samples is calculated and summarized in the quality control record as accuracy and gives the control chart limits.

Establishment of Acceptance Limits of Precision and Accuracy

Each set of samples analyzed per analyte has a blank, duplicate, spike and a standard reference material from which the precision and accuracy data are obtained.

The precision of RPD is obtained by the manipulation of duplicate sample data as follows:

$$RPD = \frac{(D1 - D2)}{(D1 + D2)/2} \times 100$$

where D1 = sample
D2 = sample replicate

The accuracy is a measurement of the percentage of a spike recovery, %R, calculated by the formula:

$$\%R = [(SSR - SR)/SA] \times 100$$

where SSR = spiked sample
SR = sample
SA = spike added

Control charts are maintained to show the limits within which measurements should fall. The upper and lower control limits are calculated as follows and are based on 25 sample sets:

$$Upper\ control\ limits = M + 3\ Sm \quad (UCL)$$
$$Lower\ control\ limits = M - 3\ Sm \quad (LCL)$$

M = the average of the RPD
Sm = standard deviation of the RPD

Procedures for Corrective Action

If values fall outside the ULC or LCL, the following guidelines are taken for corrective action:

1. Define the problem.
2. QA/QC officer and laboratory section leader assign the investigation responsibility to an analyst.
3. Document the action needed to correct the problem.
4. Implement and verify that corrective action is taken and the problem corrected.

In general, when QA techniques or procedures identify errors, deficiencies or an "out of control" situation, and two types of action need to be considered. The first, immediate action is generally to correct instrumentation error or malfunction, poor technique, or sample variability. Long-term action is to correct out-of-control conditions that may stem from contamination, old standards, improper spiking, or improperly calibrated equipment.

The above guidelines would be followed to correct the problem and maintain acceptable levels of confidence. No laboratory results will be reported or released until the "out of control" situation is rectified.

All worksheets given to the analyst for analyte determination are dated and initialed after major analytical procedures are completed, i.e. on date weighed, after extraction, upon completion of digestion, and on the date the sample is given to the laboratory supervisor for review. This is signed by the supervisor after review for reliability in terms of accuracy, precision, detection limits, and quantitative limits, and forwarded to data processing.

Reports submitted to clients routinely include method numbers and detection limits as well as identifying information, date received, data analyzed, etc.

Maintenance and Repair of Instrumentation

Instruments are maintained according to the operation manuals supplied by the manufacturer. Repairs are conducted as needed, either by manufacturer representatives or by in-house personnel (for simple problems). Routine maintenance, such as lamp replacement, is conducted as indicated by the collected QC data.

3.0 Bioassay

Sediment elutriates for this testing program were prepared following methods outlined in the EPA/COE Testing Manual (1991). The bivalve larval bioassays were performed according to protocol described in ASTM (1989). Standard operating procedures (SOPs) have been written and approved for these procedures, and are accessible to all bioassay staff. Dilution water for the bioassays, collected from the ToxScan Davenport laboratory, meets all requirements outlined in ASTM (1989).

Data resulting from the bioassays were recorded in ink on laboratory data sheets, evaluated by the project manager to insure that all test conditions were within protocol limits, and incorporated into the permanent project record file.

SOPs have been developed for instrument calibration, which detail standards to be used, units for reporting data and expected performance standards for accuracy and precision. Water quality monitoring instruments (D.O. meter, pH meter, salinometer, thermometer) are calibrated at least once daily according to these SOPs, and data are recorded in logbooks at the laboratory. Backup instrumentation is available in the event of equipment failure.

Bioassay test protocols generally specify acceptable limits of water quality (pH, D.O., temperature, salinity) in test containers during test performance. They also specify certain minimum levels of organism response (survival, normal development, growth) which must be achieved in test

controls in order to validate the bioassay. A reference toxicant bioassay has been requested for this program as an additional quality assurance measure. Reference toxicant tests serve to "calibrate" the sensitivity of organisms to a known toxic compound, and control charts are maintained in the laboratory for each organism:toxicant combination.

For bivalve larvae, ToxScan uses copper sulfate as the reference toxicant. For amphipods, the reference toxicant used was cadmium hcloride. Our control charts are continuously updated as each new reference toxicant bioassay data set is incorporated. In order to be within control limits, the reftox EC50 or LC50 must fall within the range of ± 2 standard deviations of the mean of all previous reference toxicant bioassays.

Statistical analyses of bioassay data are performed using computer programs which provide not only the EC50 or LC50 calculation but also provide estimates of the precision of the data in the form of 95% confidence limits around the EC/LC50 point.

QA/QC data for chemical analyses and reference toxicant data for this test program are presented in Appendix D. Environmental monitoring data for these bioassays are also summarized in Appendix D. Chains of Custody are presented in Appendix E.

Table 5. Summary of instruments, calibration methods, precision/accuracy monitoring, maintenance and record-keeping for analytical equipment utilized in this test program.

Analyte	Instruments	Calibration Method	Precision & Accuracy Standards	Maintenance Schedule	Record-keeping Methods
Metals	Varian AA5; Models 400P, 4002, 10	3-4 point standard curve	SRMs* and replicate analyses	as needed	instrument print-out, electronic meter hard copy
Oil & Grease	Perkin-Elmer IR Spectrophotometer Model 710B	4-point standard curve	spikes and replicate analyses	as needed	chromatogram charts, hard copy
Sulfides	Titration	standardized titrant	replicate analyses	clean burettes	notebook hard copy
Organotins	Hewlett-Packard GC; model 5890, series II	3-point standard curve and surro-gate injection	SRMs and replicate analyses	as needed	instrument print-out, hard copy
Chlorinated pesticides and PCBs	Hewlett-Packard GC; model 5890 dual columns; ECD detectors	3-point standard curve	SRMs, matrix spikes, matrix spike duplicates, duplicate samples, surrogates	as needed	instrument printout and work sheet
PAHs, phenols, phthalates	Varian GC/MS Saturn II	5-point standard curve	SRMs, matrix spikes, matrix spike duplicates, duplicate samples, surrogates	as needed	instrument printout and work sheet

* SRM = standard reference materials, obtained from NIST (National Institute of Standards and Technology).

Chlorinated Pesticides
EPA METHOD 8080
QA/QC Report
SAM 1-D

Compound	% REC MS	% REC MSD	% RPD	QC LIMITS %REC	QC LIMITS %RPD
Lindane	67	47	35	46-127	50
Heptachlor	67	49	31	35-130	31
Aldrin	61	43	35	34-132	43
Dieldrin	70	50	33	31-134	38
Endrin	69	48	36	42-139	43
DDT	70	52	30	23-134	50

MS = matrix spike

MSD = matrix spike duplicate

RPD = relative percent difference

Chlorinated Pesticides
EPA METHOD 8080
QA/QC Report
Control

Compound	% REC MS	% REC MSD	% RPD	QC LIMITS %REC	QC LIMITS %RPD
Lindane	*	*	*	46-127	50
Heptachlor	70	79	12	35-130	31
Aldrin	68	59	12	34-132	43
Dieldrin	71	65	8.8	31-134	38
Endrin	77	70	9.5	42-139	43
DDT	81	74	9.0	23-134	50

* matrix interference

MS = matrix spike

MSD = matrix spike duplicate

RPD = relative percent difference

Chlorinated Pesticides
EPA METHOD 8080
µg/Kg (ppb) dry weight
QA/QC Report

Analyte	SAM1-D	SAM1-D Duplicate	Control	Control Duplicate	Detection Limit
Aldrin	ND	ND	ND	ND	0.5
alpha-BHC	ND	ND	ND	ND	1.0
beta-BHC	ND	ND	ND	ND	1.0
delta-BHC	ND	ND	ND	ND	1.0
gamma-BHC (lindane)	ND	ND	ND	ND	1.0
alpha-Chlordane	ND	ND	ND	ND	1.0
gamma-Chlordane	ND	ND	ND	ND	1.0
4,4'-DDD	ND	ND	ND	ND	1.0
4,4'-DDE	ND	ND	ND	ND	1.0
4,4'-DDT	ND	ND	ND	ND	1.0
Dieldrin	ND	ND	ND	ND	0.5
Endosulfan I	ND	ND	ND	ND	2.0
Endosulfan II	ND	ND	ND	ND	0.5
Endosulfan sulfate	ND	ND	ND	ND	10
Endrin	ND	ND	ND	ND	0.5
Heptachlor	ND	ND	ND	ND	0.5
Heptachlor epoxide	ND	ND	ND	ND	10
Toxaphene	ND	ND	ND	ND	30
PCB's	ND	ND	ND	ND	20

ND = None Detected

Polynuclear Aromatic Hydrocarbons (PAHs)
EPA METHOD 8270
QA/QC Report
SAM6-B

Compound	% REC MS	% REC MSD	% RPD	QC LIMITS %REC	QC LIMITS %RPD
Acenaphthene	81	107*	19*	55-103	14
Pyrene	85	70	13	49-132	36

* Outside QC limits. No corrective action required.

MS = matrix spike

MSD = matrix spike duplicate

RPD = relative percent difference

Polynuclear Aromatic Hydrocarbons (PAHs)
EPA METHOD 8270
QA/QC Report
SAM4-D

Compound	% REC MS	% REC MSD	% RPD	QC LIMITS %REC	QC LIMITS %RPD
Acenaphthene	59	84	22*	55-103	14
Pyrene	96	73	18	49-132	36

* Outside QC limits. No corrective action required.

MS = matrix spike

MSD = matrix spike duplicate

RPD = relative percent difference

Polynuclear Aromatic Hydrocarbons (PAHs)
EPA Method 8270
µg/Kg (ppb) dry weight
QA/QC Report

Analyte	FL2-D	FL2-D Duplicate	SAM6-A	SAM6-A Duplicate	Detection Limit
2-methylnaphthalene	23	12	ND	ND	7.0
Naphthalene	ND	ND	ND	ND	1.2
Acenaphthylene	ND	ND	ND	ND	2.6
Acenaphthene	ND	ND	ND	ND	2.0
Fluorene	ND	ND	ND	ND	4.0
Phenanthrene	ND	ND	ND	ND	4.0
Anthracene	ND	ND	ND	ND	4.5
Fluoranthene	ND	ND	ND	ND	4.5
Pyrene	13	860*	ND	ND	4.2
Chrysene	ND	ND	ND	ND	12
Benzo(a)anthracene	ND	ND	ND	ND	6.0
Benzo(b)fluoranthene	ND	ND	ND	ND	4.0
Benzo(k)fluoranthene	ND	ND	ND	ND	4.2
Benzo(a)pyrene	ND	ND	ND	ND	17
Indeno(1,2,3-CD)pyrene	ND	ND	ND	ND	6.8
Dibenzo(a,h)anthracene	ND	ND	ND	ND	10
Benzo(ghi)perylene	ND	ND	ND	ND	10
Total PAHs	36	870	ND	ND	1.2
Total phthalates	ND	ND	ND	ND	5.0

* Matrix interference

ND = None Detected

Organotin Speciation
µg/Kg (ppb) dry weight
QA/QC Report

Sample ID	Monobutyltin	Dibutyltin	Tributyltin	Tetrabutyltin	% TPT SUR
SPIKE 1 (%)	4	59	61	18	87
Amount of Spike (µg/Kg) = 100					
SRM (%)	96	61	52	--	95
Blank	ND	ND	ND	ND	96

TPT Sur = Tripropyltin surrogate recovery

ND = None detected

Detection limit = 1 ppb

NOTE: As stated in TBT methodology protocol[1], the analytical method has been optimized to tributyltin at the decreased efficiency of monobutyltin extraction and recovery of analyte

	SRM Value Found	SRM Certified Value	% Recovery
Dibutyltin	0.71	1.16	61
Tributyltin	0.66	1.27	52

SRM = National Research Council Canada PACS-1, marine sediment

[1]Battelle Project No. N-0519-6100, Measurement of Butyltin Species in Sediment by n-Pentyl Derivatization with Gas Chromatography/Flame Photometric Detection.

Metals
µg/g (ppm)
QA/QC Report
(QA/QC on EKUP)

Analyte/ Sample ID	% Recovery of Spike	Amount of Spike µg/mL	Rep 1	Rep 2	% Error	Method Blank
Arsenic	97	0.28	5.5	5.3	4	ND
Cadmium	118	0.028	ND	ND	NA	ND
Chromium	86	2.86	124	121	2	ND
Copper	76	2.86	16	15	6	ND
Lead	83	1.43	5.6	5.1	9	ND
Mercury	104	0.028	0.02	0.02	0	ND
Nickel	91	1.43	65	64	2	ND
Selenium	91	0.14	0.13	0.11	17	ND
Silver	92	0.14	ND	ND	NA	ND
Zinc	86	2.86	49	46	6	ND

ND = None Detected
NA = Not Applicable

Element	Value Found µg/g	Certified Value µg/g	+/-	Percent Recovery
Arsenic	8.8	11.6	1.3	76
Cadmium	0.30	0.36	0.07	83
Chromium	78.0	76.0	3.0	103
Copper	15.0	18.0	3.0	83
Lead	29.6	28.0	1.8	106
Mercury	0.066	0.063	0.012	105
Nickel	23.0	32.0	3.0	72
Zinc	108	138	6	78

SRM = National Institute of Standards and Technology Estuarine Sediment, # 1646

Metals
µg/g (ppm)
QA/QC Report
(QA/QC on FL5)

Analyte/ Sample ID	% Recovery of Spike	Amount of Spike µg/mL	Rep 1	Rep 2	% Error	Method Blank
Arsenic	98	0.28	5.6	5.0	11	ND
Cadmium	117	0.028	ND	ND	NA	ND
Chromium	109	2.86	132	130	2	ND
Copper	80	2.86	7	7	5	ND
Lead	84	1.43	3.2	3.0	6	ND
Mercury	94	0.028	0.047	0.041	14	ND
Nickel	101	1.43	51	49	4	ND
Selenium	86	0.14	ND	ND	NA	ND
Silver	98	0.14	ND	ND	NA	ND
Zinc	81	2.86	34	34	0	ND

ND = None Detected
NA = Not Applicable

Element	Value Found µg/g	Certified Value µg/g	+/-	Percent Recovery
Arsenic	8.8	11.6	1.3	76
Cadmium	0.30	0.36	0.07	83
Chromium	78.0	76.0	3.0	103
Copper	15.0	18.0	3.0	83
Lead	29.6	28.0	1.8	106
Mercury	0.066	0.063	0.012	105
Nickel	23.0	32.0	3.0	72
Zinc	108	138	6	78

SRM = National Institute of Standards and Technology Estuarine Sediment, # 1646

Organic Compounds
SRM QA/QC Report
µg/Kg (ppb)

Element	Value Found	Certified Value	Advisory Range
Pesticides			
Aldrin	325	461	190-560
beta-BHC	203	301	51-440
delta-BHC	245	255	48-360
gamma-Chlordane	357	436	130-570
4,4'-DDD	300	301	93-420
4,4'-DDE	77	101	30-150
4,4'-DDT	73	76.2	19-120
Dieldrin	101	203	73-300
Endrin	319	367	110-540
Heptachlor	219	265	90-290
Semi-volatiles			
Base/Neutrals			
Acenaphthene	3579	5070	2400-7400
Anthracene	5087	6040	1600-8000
Benzo(a)pyrene	534	2010	340-3300
2-Chloronaphthalene	1024	1010	610-1200
Chrysene	3906	3020	510-5100
Dibenzofuran	4400	4070	2300-4600
1,2-Dichlorobenzene	2956	8870	2800-11000
Dimethylphthalate	1965	5140	770-5800
2,4-Dinitrotoluene	1486	1580	610-2200
bis(2-Ethylhexyl)phthalate	950	3010	480-4800
2-Methylnaphthalene	435	812	410-910
Naphthalene	821	1480	560-2000
Phenanthrene	4968	4530	2400-5400
Pyrene	1485	2010	1000-2300
1,2,4-Trichlorobenzene	8327	8000	3500-11000
Acids			
4-Chloro-3-methylphenol	5058	5970	2600-8800
2-Methylphenol	6581	7030	2500-8100
4-Methylphenol	9882	9770	4300-11000
Pentachlorophenol	2435	7480	1100-13000
Phenol	1856	4900	740-5500
2,4,6-Trichlorophenol	1674	3330	1200-4800

SRM = Environmental Resource Associates Lot # 320

Summary of Bivalve Larvae Bioassay Environmental Monitoring Data

Sample ID	Parameter	Initial	Final
Seawater Control	pH value (units)	8.1	8.1
	Temperature (°C)	15.3	14.8
	D.O. (mg/L)	6.9	6.8
	Salinity (‰)	33	33
Humboldt Reference Sediment	pH value (units)	7.9	8.1
	Temperature (°C)	15.3	14.7
	D.O. (mg/L)	6.0	7.1
	Salinity (‰)	33	33
EKUP	pH value (units)	8.0	8.1
	Temperature (°C)	15.3	14.8
	D.O. (mg/L)	4.1	7.1
	Salinity (‰)	33	33
SAMTB	pH value (units)	8.1	8.2
	Temperature (°C)	15.3	14.8
	D.O. (mg/L)	4.3	7.1
	Salinity (‰)	33	33
FLTB	pH value (units)	8.1	8.2
	Temperature (°C)	15.3	14.8
	D.O. (mg/L)	4.2	7.1
	Salinity (‰)	33	33

Summary of *Rhepoxynius abronius* Solid Phase Static Bioassay Environmental Monitoring Data

Sample ID	Parameter	Mean	Std.Dev.	Maximum	Minimum
Control	D.O. (mg/L)	7.74	0.14	8.1	7.5
	Temperature (°C)	14.94	0.15	15.3	14.6
	pH value (units)	8.11	0.06	8.2	7.9
Humboldt Reference Sediment	D.O. (mg/L)	7.71	0.13	7.9	7.5
	Temperature (°C)	14.97	0.13	15.2	14.7
	pH value (units)	8.14	0.07	8.2	8.0
EKUP	D.O. (mg/L)	7.70	0.16	7.9	7.0
	Temperature (°C)	14.97	0.15	15.2	14.6
	pH value (units)	8.12	0.08	8.2	7.9
SAMTB	D.O. (mg/L)	7.71	0.20	8.0	6.6
	Temperature (°C)	14.97	0.16	15.2	14.7
	pH value (units)	8.13	0.08	8.2	8.0
FLTB	D.O. (mg/L)	7.65	0.26	7.9	6.5
	Temperature (°C)	14.93	0.17	15.2	14.6
	pH value (units)	8.12	0.07	8.2	7.9

Summary of *Holmesimysis costata* Solid Phase Flow Through Bioassay Environmental Monitoring Data

Sample ID	Parameter	Mean	Std.Dev.	Maximum	Minimum
Control	D.O. (mg/L)	7.97	0.26	8.5	7.5
	Temperature (°C)	13.46	1.41	16.1	11.9
	pH value (units)	7.97	0.05	8.0	7.9
Humboldt Reference Sediment	D.O. (mg/L)	7.93	0.28	8.6	7.4
	Temperature (°C)	13.50	1.38	16.0	12.0
	pH value (units)	7.99	0.03	8.0	7.9
EKUP	D.O. (mg/L)	7.97	0.29	8.6	7.4
	Temperature (°C)	13.53	1.36	16.1	12.0
	pH value (units)	7.99	0.03	8.0	7.9
SAMTB	D.O. (mg/L)	7.99	0.28	8.6	7.5
	Temperature (°C)	13.64	1.42	16.1	12.0
	pH value (units)	7.98	0.04	8.0	7.9
FLTB	D.O. (mg/L)	7.94	0.30	8.6	7.5
	Temperature (°C)	13.78	1.46	16.1	12.0
	pH value (units)	7.99	0.03	8.0	7.9

Summary of *Nephtys caecoides* Solid Phase Flow Through Bioassay Environmental Monitoring Data

Sample ID	Parameter	Mean	Std.Dev.	Maximum	Minimum
Control	D.O. (mg/L)	8.05	0.19	8.5	7.7
	Temperature (°C)	13.54	0.98	15.5	12.0
	pH value (units)	7.97	0.05	8.0	7.9
Humboldt Reference Sediment	D.O. (mg/L)	8.02	0.20	8.5	7.7
	Temperature (°C)	13.60	0.99	15.4	12.0
	pH value (units)	8.01	0.03	8.1	8.0
EKUP	D.O. (mg/L)	7.98	0.19	8.4	7.6
	Temperature (°C)	13.71	1.04	15.6	12.0
	pH value (units)	8.00	0.00	8.0	8.0
SAMTB	D.O. (mg/L)	7.99	0.21	8.4	7.6
	Temperature (°C)	13.73	1.07	15.6	12.0
	pH value (units)	8.00	0.01	8.1	8.0
FLTB	D.O. (mg/L)	7.92	0.23	8.4	7.6
	Temperature (°C)	13.92	1.25	15.9	12.0
	pH value (units)	8.00	0.00	8.0	8.0

Summary of *Citharichthys stigmaeus* Suspended Phase Bioassay Environmental Monitoring Data

Sample ID	Parameter	Mean	Std.Dev.	Maximum	Minimum
Control	D.O. (mg/L)	7.61	0.40	8.2	6.3
	Temperature (°C)	14.61	0.49	15.2	14.0
	pH value (units)	7.89	0.08	8.0	7.7
Humboldt Reference Sediment	D.O. (mg/L)	7.37	0.69	8.1	6.0
	Temperature (°C)	14.73	0.44	15.2	14.0
	pH value (units)	7.89	0.14	8.0	7.6
EKUP	D.O. (mg/L)	7.08	1.24	8.1	4.6
	Temperature (°C)	14.72	0.42	15.2	14.0
	pH value (units)	7.92	0.13	8.0	7.6
SAMTB	D.O. (mg/L)	7.30	0.78	8.1	5.8
	Temperature (°C)	14.76	0.42	15.6	14.0
	pH value (units)	7.92	0.08	8.0	7.8
FLTB	D.O. (mg/L)	7.23	0.92	8.1	5.4
	Temperature (°C)	14.78	0.33	15.1	14.0
	pH value (units)	7.91	0.14	8.1	7.6

Summary of *Holmesimysis costata* Suspended Phase Bioassay Environmental Monitoring Data

Sample ID	Parameter	Mean	Std.Dev.	Maximum	Minimum
Control	D.O. (mg/L)	7.07	0.52	8.0	6.6
	Temperature (°C)	14.76	0.50	15.5	14.0
	pH value (units)	7.86	0.08	8.0	7.8
Humboldt Reference Sediment	D.O. (mg/L)	6.76	0.27	7.5	6.4
	Temperature (°C)	14.69	0.36	15.1	14.0
	pH value (units)	7.82	0.05	7.9	7.7
EKUP	D.O. (mg/L)	6.97	0.74	8.4	6.4
	Temperature (°C)	14.68	0.41	15.4	14.0
	pH value (units)	7.77	0.07	7.9	7.7
SAMTB	D.O. (mg/L)	6.95	0.59	8.5	6.5
	Temperature (°C)	14.69	0.41	15.4	14.0
	pH value (units)	7.79	0.06	7.9	7.7
FLTB	D.O. (mg/L)	7.08	0.55	8.2	6.6
	Temperature (°C)	14.66	0.37	15.0	14.0
	pH value (units)	7.82	0.04	7.9	7.8

REFERENCE TOXICANT (COPPER)
Bivalve Larvae Bioassay

Sample ID	Rep	Number Normal	Number Abnormal	Total Recovered per 1 mL	Resuspended Volume	Total # Normal Larvae Recovered	% Survival	Mean % Survival ± S.D.	% Normal Develop-ment	Mean % Normal Development ± S.D.	Survival		Normal Development	
											Abbotts Corrected Value	Mean Corrected Value	Abbotts Corrected Value	Mean Corrected Value
Control	1	118	2	120	38	4484	103.0		98.3					
	2	98	5	103	43	4214	96.8	98.4	95.1	96.3				
	3	127	4	131	32	4064	93.3	±	96.9	±				
	4	131	6	137	35	4585	105.3	4.88	95.6	1.21				
	5	122	6	128	35	4270	98.1		95.3					
	6	136	5	141	30	4080	93.7		96.5					
2 ppb	1	114	5	119	33	3762	86.4	92.8	95.8	95.7	87.8	94.4	99.5	99.3
	2	121	4	125	34	4114	94.5	±	96.8	±	96.1	±	100.5	±
	3	118	7	125	36	4248	97.6	5.77	94.4	1.21	99.2	5.86	98.0	1.25
4 ppb	1	83	5	88	40	3320	76.3	69.7	94.3	92.1	77.5	70.8	97.9	95.6
	2	82	7	89	38	3116	71.6	±	92.1	±	72.8	±	95.7	±
	3	62	7	69	43	2666	61.2	7.69	89.9	2.23	62.2	7.81	93.3	2.32
8 ppb	1	78	39	117	34	2652	60.9	49.3	66.7	60.1	61.9	50.1	69.2	62.4
	2	50	33	83	39	1950	44.8	±	60.2	±	45.5	±	62.6	±
	3	47	41	88	39	1833	42.1	10.17	53.4	6.63	42.8	10.34	55.5	6.88
16 ppb	1	0	91	91	38	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	0	97	97	36	0	0.0	±	0.0	±	0.0	±	0.0	±
	3	0	94	94	35	0	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00
32 ppb	1	0	0	0	34	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	0	0	0	36	0	0.0	±	0.0	±	0.0	±	0.0	±
	3	0	0	0	34	0	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00

LC_{50} = 6.54 ppb (5.87, 7.28 ppb); EC_{50} = 8.50 ppb (7.89, 9.15 ppb)

Reference Toxicant Bioassay

Species: *Rhepoxynius abronius*
Toxicant: Cadmium chloride

Date: 16 November 1992
T-9209

Concentration (mg/L)	Replicate	Number Surviving: Observation Time (hours) 0	Number Surviving: Observation Time (hours) 96	Mean % Survival
Control	1	10	10	100
	2	10	10	
	3	10	10	
0.25	1	10	8	87
	2	10	9	
	3	10	9	
0.50	1	10	8	83
	2	10	9	
	3	10	8	
1.00	1	10	5	40
	2	10	4	
	3	10	3	
2.00	1	10	1	3
	2	10	0	
	3	10	0	
4.00	1	10	0	0
	2	10	0	
	3	10	0	

96-hour LC_{50} (Spearman) = 0.85 ppm

95% confidence limits = 0.69 ppm - 1.06 ppm

Reference Toxicant Bioassay

Species: *Holmesimysis costata*
Toxicant: Sodium Dodecyl Sulfate

Date: 25 November 1992
T-9209

Concentration (mg/L)	Replicate	Number Surviving: Observation Time (hours) 0	96	Mean % Survival
Control	1	10	10	100
	2	10	10	
	3	10	10	
0.5	1	10	10	97
	2	10	10	
	3	10	9	
1.0	1	10	10	100
	2	10	10	
	3	10	10	
2.0	1	10	9	93
	2	10	9	
	3	10	10	
4.0	1	10	1	37
	2	10	5	
	3	10	5	
8.0	1	10	0	0
	2	10	0	
	3	10	0	

96-hour LC_{50} (Spearman) = 3.49 ppm

95% confidence limits = 3.02 ppm - 4.02 ppm

Reference Toxicant Bioassay

Species: *Citharichthys stigmaeus*
Toxicant: Sodium Dodecyl Sulfate

Date: 9 December 1992
T-9209

Concentration (mg/L)	Replicate	Number Surviving: Observation Time (hours) 0	Number Surviving: Observation Time (hours) 96	Mean % Survival
Control	1	10	10	100
	2	10	10	
	3	10	10	
	4	10	10	
	5	10	10	
	6	10	10	
0.25	1	10	10	100
	2	10	10	
	3	10	10	
0.5	1	10	10	100
	2	10	10	
	3	10	10	
1.0	1	10	10	100
	2	10	10	
	3	10	10	
2.0	1	10	8	63
	2	10	6	
	3	10	5	
4.0	1	10	0	0
	2	10	0	
	3	10	0	

96-hour LC_{50} (Spearman) = 2.19 ppm

95% confidence limits = 1.94 ppm - 2.48 ppm

Appendix E

Chain of Custody

Appendix E

Chain of Custody

SAMPLING AND ANALYSIS CHAIN OF CUSTODY RECORD

ToxScan Inc.
42 Hangar Way
Watsonville, CA 95076
(408) 724-4522

CLIENT KLI - SF COE Humboldt LABORATORY NO. T-9209

CONTACT _____ PHONE _____ ACCOUNT NO. 84/AR1

REQUEST			LABORATORY REQUIREMENTS				CHAIN OF CUSTODY							
SAMPLE TYPE									ToxScan Inc.			CONTRACT LABORATORY		
SAMPLE ID	LAB ID	PARAMETERS	BOTTLES	PRES.	LABORATORY	PO#	SAMPLED BY	DATE	REC'D BY	DATE	COMMENTS	REC'D BY	DATE	COMMENTS
COMPOSITE 4 1 of 2	-01	Biossay	ICE CHEST	NONE	TOXSCAN		KLI	30 Oct 92	CE	11/4/92	INTACT			
COMPOSITE 4 2 of 2	-02	↓	↓	↓	↓		↓	↓	CE	11/4/92	INTACT			
COMPOSITE 2 1 of 2	-03	↓	↓	↓	↓		↓	1 NOV 92	CE	11/4/92	INTACT			
COMPOSITE 1 2 of 2	-04	↓	↓	↓	↓		↓	↓	CE	11/4/92	INTACT			
COMPOSITE 2 1 of 2	-05	↓	↓	↓	↓		↓	31 Oct 92	CE	11/4/92	INTACT			
COMPOSITE 2 2 of 2	-06	↓	↓	↓	↓		↓	↓	CE	11/4/92	INTACT			
REF COMP 1 of 2	-07	↓	↓	↓	↓		↓	2 Nov 92	CE	11/4/92	INTACT			
REF COMP 2 of 2	-08	↓	↓	↓	↓		↓	↓	CE	11/4/92	INTACT			

SIGNATURES:

LABORATORY REPRESENTATIVE: _____

RELEASED TO COURIER BY FIELD PERSONEL: _____

RECEIVED BY COURIER: _____

RELEASED TO LABORATORY BY COURIER: _____

RECEIVED BY LABORATORY: _____

RELEASED TO LABORATORY BY COURIER: _____

RECEIVED BY LABORATORY: _____

THIS FORM MUST ACCOMPANY THE "ANALYSIS REQUEST FORM" AND SAMPLES TO INITIATE ANALYSIS.

+503

SAMPLING AND ANALYSIS CHAIN OF CUSTODY RECORD

ToxScan Inc.
42 Hangar Way
Watsonville, CA 95076
(408) 724-4522

CLIENT KLI - SF COE Humboldt LABORATORY NO. T-9209

CONTACT _____ PHONE _____ ACCOUNT NO. _____

REQUEST			LABORATORY REQUIREMENTS				CHAIN OF CUSTODY							
SAMPLE TYPE									ToxScan Inc.			CONTRACT LABORATORY		
SAMPLE ID	LAB ID	PARAMETERS	BOTTLES	PRES.	LABORATORY	PO#	SAMPLED BY	DATE	REC'D BY	DATE	COMMENTS	REC'D BY	DATE	COMMENTS
NB 1	-09	Grain Size	1 LITER glass	NONE	TOXSCAN		KLI	10/30	CE	11/4/92	INTACT			
NB 2	-10							30 Oct 92	CE					
NB 3	-11								CE					
NB 4	-12								CE					
NB 5	-13								CE					
NB 8	-14							V	CE					
NB 6	-15							29 Oct. 92	CE					
NB 7 Rep 1	-16								CE		1/2 full			
NB 7 Rep 2	-17							V	CE					
NB 9 D	-18							31 Oct 92	CE					
NB 10 D	-19								CE					

SIGNATURES:

LABORATORY REPRESENTATIVE: _____

RELEASED TO COURIER BY FIELD PERSONEL: _____

RECEIVED BY COURIER: _____

RELEASED TO LABORATORY BY COURIER: _____

RECEIVED BY LABORATORY: _____

RELEASED TO LABORATORY BY COURIER: _____

RECEIVED BY LABORATORY: _____

THIS FORM MUST ACCOMPANY THE "ANALYSIS REQUEST FORM" AND SAMPLES TO INITIATE ANALYSIS.

SAMPLING AND ANALYSIS CHAIN OF CUSTODY RECORD

~~SLO~~

ToxScan Inc.
42 Hangar Way
Watsonville, CA 95076
(408) 724-4522

CLIENT KLI SF COE Humboldt LABORATORY NO. T-9209

CONTACT _____ PHONE _____ ACCOUNT NO. _____

REQUEST			LABORATORY REQUIREMENTS				CHAIN OF CUSTODY							
SAMPLE TYPE									ToxScan Inc.			CONTRACT LABORATORY		
SAMPLE ID	LAB ID	PARAMETERS	BOTTLES	PRES.	LABORATORY	PO#	SAMPLED BY	DATE	REC'D BY	DATE	COMMENTS	REC'D BY	DATE	COMMENTS
FL2 D	-20	Tier II Chem.	1 Liter glass	NONE	TOXSCAN		KLI	30 Oct. 92	CR	11/4/92	INTACT			
FL3 D	-21	↓	↓	↓	↓		↓		CR	↓	↓			
FL4D	-22								CR					
FL5	-23								CR					
FL6	-24								CR					
FL7	-25								CR					
FL8	-26							↓	CR					
SAM1 D	-27							31 Oct. 92	CR					
SAM2 D	-28							↓	CR					
SAM3 D	-29								CR					
SAM4D	-30	↓							CR	↓	↓			

SIGNATURES:

LABORATORY REPRESENTATIVE: _____

RELEASED TO COURIER BY FIELD PERSONEL: _____

RECEIVED BY COURIER: _____

RELEASED TO LABORATORY BY COURIER: _____

RECEIVED BY LABORATORY: _____

RELEASED TO LABORATORY BY COURIER: _____

RECEIVED BY LABORATORY: _____

THIS FORM MUST ACCOMPANY THE "ANALYSIS REQUEST FORM" AND SAMPLES TO INITIATE ANALYSIS.

T 9216 ~~Stat~~

SAMPLING AND ANALYSIS CHAIN OF CUSTODY RECORD

ToxScan Inc.
42 Hangar Way
Watsonville, CA 95076
(408) 724-4522

CLIENT KLI - SF Corr Humboldt LABORATORY NO. T-9209

CONTACT _____ PHONE _____ ACCOUNT NO. _____

REQUEST			LABORATORY REQUIREMENTS				CHAIN OF CUSTODY							
SAMPLE TYPE									ToxScan Inc.			CONTRACT LABORATORY		
SAMPLE ID	LAB ID	PARAMETERS	BOTTLES	PRES.	LABORATORY	PO#	SAMPLED BY	DATE	REC'D BY	DATE	COMMENTS	REC'D BY	DATE	COMMENTS
SAM5 D	-31	Tier II Chem.	1 Liter glass	NONE	TOXSCAN		KLI	31 Oct 92	CE	11/4/92	INTACT			
SAM6 A	-32	↓	↓	↓	↓		↓	↓	CE	↓	↓			
SAM6 B	-33								CE					
SAM6 C	-34								CE					
SAM7 D	-35	↓							CE					
ENT. 1	-36	Grain Size						2 Nov 92	CE					
ENT. 2	-37	↓						↓	CE					
BAR 1	-38	↓							CE					
REF COMP 1 of 2	-39	Tier II							CE					
REF COMP 2 of 2	-40	TCDD/ TCDF							CE	↓	↓			

SIGNATURES:

LABORATORY REPRESENTATIVE: _____

RELEASED TO COURIER BY FIELD PERSONEL: _____

RECEIVED BY COURIER: _____

RELEASED TO LABORATORY BY COURIER: _____

RECEIVED BY LABORATORY: _____

RELEASED TO LABORATORY BY COURIER: _____

RECEIVED BY LABORATORY: _____

THIS FORM MUST ACCOMPANY THE "ANALYSIS REQUEST FORM" AND SAMPLES TO INITIATE ANALYSIS.

SAMPLING AND ANALYSIS CHAIN OF CUSTODY RECORD

ToxScan Inc.
42 Hangar Way
Watsonville, CA 95076
(408) 724-4522

CLIENT KLI - SF COE Humboldt

LABORATORY NO. T-9209

CONTACT _____ PHONE _____

ACCOUNT NO. _____

REQUEST			LABORATORY REQUIREMENTS				CHAIN OF CUSTODY							
SAMPLE TYPE									ToxScan Inc.			CONTRACT LABORATORY		
SAMPLE ID	LAB ID	PARAMETERS	BOTTLES	PRES.	LABORATORY	PO#	SAMPLED BY	DATE	REC'D BY	DATE	COMMENTS	REC'D BY	DATE	COMMENTS
EK 1	-41	~~Dioxin~~ Tier II Chem	1 Liter glass		Toxscan		KLI	31 Oct. 92	CC	11/4/92	INTACT			
EK 2	-42	Tier II Chem						1 Nov 92	CC					
EK 3-D	-43								CC					
EK 4-D	-44								CC					
COMP 1 1 of 2	-45							1 Nov 92	CC					
COMP 1 2 of 2	-46	TCDD/CDF							CC					
COMP 2 1 of 2	-47	Tier II Chem.						31 Oct. 92	CC					
COMP 2 2 of 2	-48	TCDD/TCDF							CC					
COMP 4	-49	Tier II Chem.						30 Oct. 92	CC		NOT SPECIFIED 1 of 2 or 2 of 2			
COMP 4	-50	TCDD/TCDF							CC		INTACT			
FLD	-51	Tier II Chem.							CC					

SIGNATURES:

LABORATORY REPRESENTATIVE: _____

RELEASED TO COURIER BY FIELD PERSONEL: _____

RECEIVED BY COURIER: _____

RELEASED TO LABORATORY BY COURIER: _____

RECEIVED BY LABORATORY: _____

RELEASED TO LABORATORY BY COURIER: _____

RECEIVED BY LABORATORY: _____

THIS FORM MUST ACCOMPANY THE "ANALYSIS REQUEST FORM" AND SAMPLES TO INITIATE ANALYSIS.

P. 6 of 6

T-9209

SAMPLING AND ANALYSIS CHAIN OF CUSTODY RECORD

ToxScan Inc.
42 Hangar Way
Watsonville, CA 95076
(408) 724-4522

CLIENT SFCOE / [illegible] LABORATORY NO. ~~T-9184~~

CONTACT ______ PHONE ______ ACCOUNT NO. ______

REQUEST			LABORATORY REQUIREMENTS				CHAIN OF CUSTODY							
SAMPLE TYPE									ToxScan Inc.			CONTRACT LABORATORY		
SAMPLE ID	LAB ID	PARAMETERS	BOTTLES	PRES.	LABORATORY	PO#	SAMPLED BY	DATE	REC'D BY	DATE	COMMENTS	REC'D BY	DATE	COMMENTS
CONTROL SEDIMENT	-52 ~~-01~~	Bioassay	5gal Bucket	w/ ice			[illegible]	10/26/93	[illegible]	10/27/93	Intact			
↓	-53 ~~-02~~	↓	↓	↓			↓	↓	↓	↓	↓			
Control Sediment Sub-Sample 1 of 3	-54 ~~-03~~	Tier II Chem.	1-1 Liter Glass Jar				Sub Sampled by [illegible]	10/[illegible]						
									Sampled Sub sampled from T-9174-01 [illegible]					
Control Sediment Sub-Sample 2 of 3	-55 ~~-04~~	TCDD/TCDF	1-1 Liter Glass Jar				Sub Sampled by [illegible]	10/[illegible]						
Control Sediment Sub-Sample 3 of 3	-56 ~~-05~~	(extra sample)	1-1 Liter Glass Jar				Sub sampled by [illegible]	10/[illegible]						

SIGNATURES:

LABORATORY REPRESENTATIVE: Tim [illegible]

RELEASED TO COURIER BY FIELD PERSONEL: ______

RELEASED TO LABORATORY BY COURIER: [signature]

RELEASED TO LABORATORY BY COURIER: ______

RECEIVED BY COURIER: [signature]

RECEIVED BY LABORATORY: [signature]

RECEIVED BY LABORATORY: ______

THIS FORM MUST ACCOMPANY THE "ANALYSIS REQUEST FORM" AND SAMPLES TO INITIATE ANALYSIS.