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Ecological Evaluation of Proposed Discharge of Dredged Material From Oakland Harbor into Ocean Waters (Phase II of -42-Foot Project)

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Battelle/Marine Sciences Laboratory
Sequim, Washington

September 1990

Prepared for the
U.S. Army Corps of Engineers
under a Related Services Agreement
with the U.S. Department of Energy
Contract DE-AC06-76RLO 1830

Pacific Northwest Laboratory
Richland, Washington 99352

Battelle

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In your copy of the subject report, please replace the final sentence of the Summary (p. iv) and the first sentence of Section 4.6, Conclusions (p. 4.13), with the following sentence:

> Sediments that may be unacceptable for ocean disposal, based on toxicity information and current Implementation Manual guidelines are OI-CH-4A, OI-CH-6A, OI-SS-4L, OI-TS-5U, OO-CH-3, OO-CH-4, OO-CH-8, OI-CH-2A, OO-W-1, OO-W-2, OI-MA-1L, OI-MA-2U, OI-TS-5L, OO-CH-2, OO-W-3, and OO-W-4.

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SUMMARY

The U.S. Army Corps of Engineers (USACE), San Francisco District, was authorized by the Water Resources Development Act of 1986 (Public Law 99-662) to deepen and widen the navigation channels of Inner and Outer Oakland Harbor, California, to accommodate modern deep-draft vessels. The recommended plan consists of deepening the harbor channels from the presently authorized water depth of -35 ft mean lower low water (MLLW) to -42 ft MLLW and supplying the harbor with adequate turning basins and berthing areas. Offshore ocean disposal of the dredged sediment is being considered, provided there is no evidence of harmful ecological effects. If harmful ecological effects are not evident then the appropriate certifications from state environmental quality agencies and concurrence from the Environmental Protection Agency can be obtained to allow disposal of sediment.

To help provide the scientific basis for determining whether Oakland Harbor sediments are suitable for offshore disposal, the Battelle/Marine Sciences Laboratory (MSL), operating under contract to the USACE, San Francisco District, collected sediment cores from 23 stations in Inner and Outer Oakland Harbor, evaluated these sediment cores geologically, performed chemical analyses for selected contaminants in sediments, conducted a series of solid phase toxicity tests with four sensitive marine invertebrates (*Macoma nasuta*, *Nephtys caecoides*, *Ampelisca abdita*, and *Rhepoxynius abronius*), and assessed the bioaccumulation potential of sediment-associated contaminants in the tissues of *M. Nasuta*.

Toxicity tests using standard protocols with the bivalve *M. nasuta* and the amphipod *A. abdita* at all stations showed no significant increases in mortality relative to reference sediments. The standardized toxicity tests using the polycheate *N. caecoides* and the amphipod *R. abronius* revealed significant effects at stations predominantly consisting of sediment from the Older Bay Mud formation known as Merritt Sands (OI-CH-4A, OI-CH-6A, and OI-SS-4L). The mortality at these stations is not related to chemical contaminants. The only other station with significant polychaete mortality

(OI-TS-5U) had the highest concentrations of metals and organic contaminant of any station sampled. It is likely that the chemical contaminants at this station contributed to the observed polychaete mortality.

Significant contaminant-related toxicity to amphipods occurred at station OI-TS-5AU, at the maneuvering area station OI-MA-2U, at four channel stations (OO-CH-3, OO-CH-4, OO-CH-8, and OI-CH-2A) and at two outer harbor stations (OO-W-1 and OO-W-2). The amphipod mortality at the other maneuvering area station (OI-MA-1L), although significant, does not appear to be related to contaminants, grain size, or organic carbon. The other 16 test sediments (OI-CH-0, OI-CH-4A, OI-CH-6A, OI-SS-4L, OO-CH-1, OO-CH-2, OO-CH-5, OO-CH-6, OO-CH-7, OO-W-3, OO-W-4, OO-W-5, MA-2L, PRC, PRF, and Tomales Bay) showed no significantly increased acute mortality in the amphipod tests or in any other tests that are related to sediment contaminants. All of these sediments are suitable for open-ocean disposal based on current guidelines in the Implementation Manual.

None of the metals produced significant levels of bioaccumulation relative to the two reference sediments. PAH bioaccumulation was significantly greater at stations OI-MA-1L, OI-MA-2U, OI-TS-5AL, and OI-TS-5AU. When PCBs were evaluated, only station OO-CH-2 was added to the list of stations showing significant bioaccumulation. Significant pesticide bioaccumulation occurred at stations OO-W-3 and OO-W-4, Tributyltin bioaccumulation occurred at only OI-TS-5AU. Therefore, the additional stations showing unacceptable bioaccumulation based on present Implementation Manual criteria would be OI-MA-1L, OO-CH-2, OO-W-3, and OO-W-4.

Sediments that may be unacceptable for ocean disposal, based on toxicity information and current Implementation Manual guidelines are OI-CH-4A, OI-CH-6A, OI-SS-4L, OI-TS-5U, OO-CH-3, OO-CH-4, OO-CH-8, OI-CH-2A, OO-W-1, OO-W-2, OI-MA-1L, OI-MA-2U, OI-TS-5L, OO-CH-2, OO-W-3, and OO-W-4.

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1.0 INTRODUCTION

The U.S. Army Corps of Engineers (USACE), San Francisco District, was authorized by the Water Resources Development Act of 1986 (Public Law 99-662) to deepen and widen the navigation channels of Inner and Outer Oakland Harbor, California, to accommodate modern deep-draft vessels. The recommended plan consists of deepening the harbor channels from the presently authorized water depth of -35 ft mean lower low water (MLLW) to -42 ft MLLW and expanding turning basins and berthing areas in the harbor. Offshore ocean disposal of the dredged sediment is being considered, provided that there is no evidence of harmful ecological effects and that appropriate certifications from state environmental quality agencies and concurrence from the Environmental Protection Agency can be obtained. Ecological effects must be determined by toxicity tests, chemical analyses, and other empirical measurements performed in compliance with the Implementation Manual for Section 103 of Public Law 92-532.

To help provide the scientific basis for determining whether Oakland Inner Harbor sediments are suitable for offshore disposal, the Battelle/ Marine Sciences Laboratory (MSL), operating under contract to the USACE, San Francisco District, recently conducted an ecological evaluation of sediments collected to project depths of -38 ft MLLW (Word et al. 1988). The -38 ft evaluation supplemented related preliminary studies conducted by MBL (1987), Word et al. (1990a) and USACE (1988). This previous work was extended to include additional toxicological and chemical evaluations of sediment from Oakland Inner and Outer Harbor to the -44-ft depth project depth of -42 ft plus 2 ft of overdepth. The follow-on study was performed in two phases. Phase I evaluated sediments from 20 stations in Oakland Inner Harbor to full project depth and was completed between July 22 and August 23, 1988. The results of Phase I are presented in Ecological Evaluation of Proposed Discharge of Dredged Material from Oakland Harbor into Ocean Waters (Phase I of -42 Foot Project), (Word et al. 1990b). Phase II of the Oakland Harbor studies is described in this report. During Phase II, sediments from 6 stations in Oakland Inner Harbor and 15 stations in Oakland Outer Harbor were evaluated to the full project depth of -42 ft (plus 2 ft of overdepth).

The six stations in Oakland Inner Harbor and one station in Oakland Outer Harbor were added to Phase II after it was discovered that coring equipment could not penetrate to the -44-ft project depth at these stations during Phase I.

Phase II of the follow-on study for the -42-ft project consisted of chemical analyses of selected contaminants in sediments, a series of solid phase toxicity tests conducted with four sensitive marine invertebrates (Macoma nasuta, Nephtys caecoides, Ampelisca abdita, and Rhepoxynius abronius), and an assessment of the bioaccumulation potential of sediment-associated contaminants in tissues of M. nasuta. To ensure that results of the current study comply with 40 CFR 227 requirements, the technical design and procedures were based on guidelines and recommendations provided in the Implementation Manual for Ecological Evaluation of Proposed Discharge of Dredged Material Into Ocean Waters (EPA/USACE 1977). Other relevant testing protocols were also developed or used as appropriate.

Section 2.0 of this report describes field and laboratory methodologies, including quality assurance and quality control procedures. Results of physical and chemical analyses, toxicity tests, and bioaccumulation measurements are provided in Section 3.0. Conclusions on the potential ecological impact of the proposed dredging operations are included in Section 4.0. Appendixes A through G contain supporting data and other relevant information.

2.0 MATERIALS AND METHODS

2.1 STUDY AREA DESCRIPTION

The Port of Oakland is located on the eastern shore of central San Francisco Bay, east of the city of San Francisco. Oakland Inner Harbor is a 4.5-mile-long shipping channel located between the cities of Oakland and Alameda, California (Figure 2.1). Oakland Outer Harbor, also shown in Figure 2.1, is a larger waterway south of the Oakland Bay Bridge. Core samples representing dredged material were collected from Oakland Inner and Outer Harbors.

The area offshore to the south of Point Reyes, California (Figure 2.2), was another source of sediment samples for this study. One site south of Point Reyes provided uncontaminated sediment that is of approximately the same grain size, organic carbon level, and water depth as the sediment that would be found at the disposal site. This relatively coarse-grained material was layered into all toxicity test containers (see Section 2.7) and is called PR-coarse in this report. A second site off Point Reyes provided uncontaminated fine-grained material that would simulate the physical conditions of fine-grained (silt and clay) dredged material for disposal. This material is called PR-fine in this report.

2.2 GENERAL QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

Quality Assurance/Quality Control (QA/QC) procedures followed by MSL and subcontractors were consistent with the Implementation Manual (EPA/USACE 1977) and other related EPA protocols (PSEP 1986). These procedures are documented in a Quality Assurance Plan (Number EES-20, Revision 3) produced by the Quality Engineering Division at Pacific Northwest Laboratory (PNL). A PNL quality assurance engineer was present at the MSL during most of the Phase II program to ensure that accepted procedures were followed. A PNL Laboratory Record Book (LRB) was assigned to each portion of the study to serve as a permanent record of daily activity. All entries in the LRBs were signed and dated by the researcher and reviewed by both the project manager and the quality assurance engineer. Specific QA/QC procedures for each activity are included in Section 2.7.2.

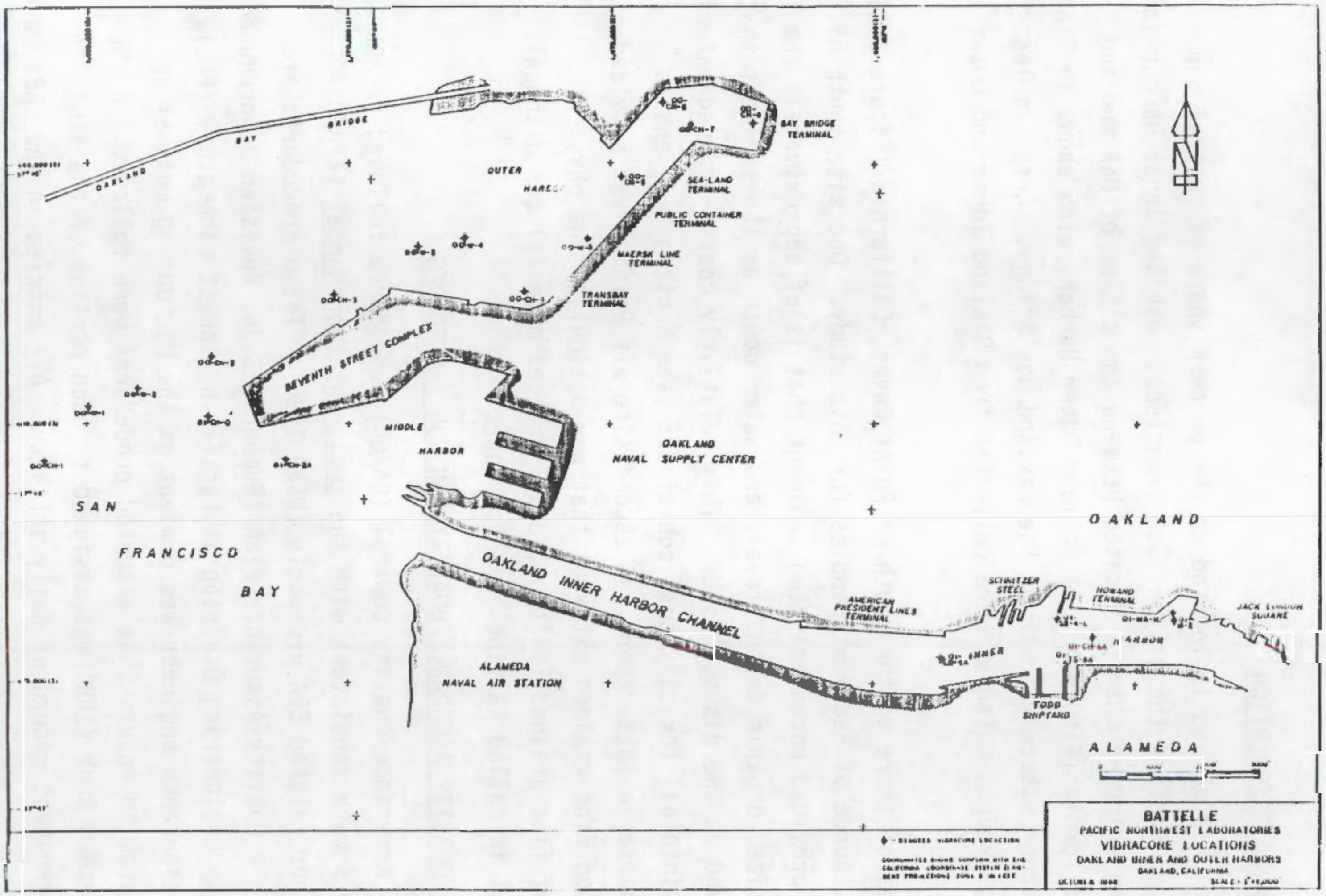


FIGURE 2.1. Sampling Sites in Oakland Inner and Outer Harbors

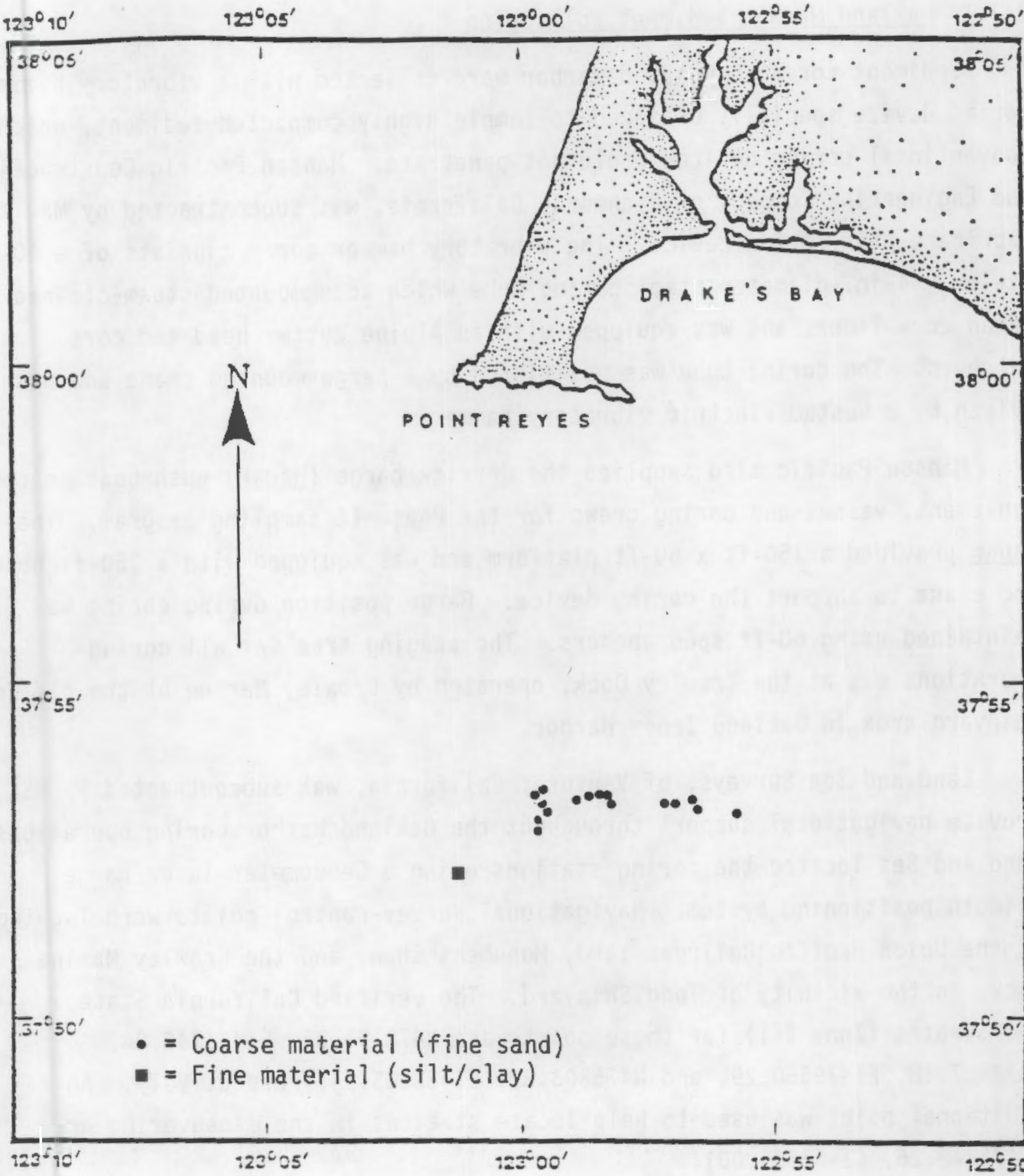


FIGURE 2.2. Locations of Point Reyes Sampling Sites

2.3 SEDIMENT COLLECTION

2.3.1 Oakland Harbor Sediment Collection

Sediment cores in Oakland Harbor were collected with a vibratory hammer coring device specially designed to sample highly compacted sediment, which conventional coring devices would not penetrate. Manson Pacific Construction and Engineering Company of Richmond, California, was subcontracted by MSL to fabricate this coring device. The vibratory hammer corer consists of a 50-ft-long, 4-in.-diameter steel coring tube which accommodated steam-cleaned lexan core liners and was equipped with an Alpine cutter head and core catchers. The coring tube was positioned by a barge-mounted crane and was driven by a Westam electric vibratory hammer.

Manson Pacific also supplied the derrick barge (Hagar) push boat, support equipment, vessel and coring crews for the Phase II sampling program. The Hagar provided a 150-ft x 60-ft platform and was equipped with a 150-ft boom and crane to support the coring device. Barge position during coring was maintained using 60-ft spud anchors. The staging area for all coring operations was at the Crowley Dock, operated by Crowley Marine at the old Todd Shipyard area in Oakland Inner Harbor.

Land and Sea Surveys, of Ventura, California, was subcontracted by MSL to provide navigational support throughout the Oakland Harbor coring operations. Land and Sea located the coring stations using a Geodometer laser/range azimuth positioning system. Navigational survey-control points were located at the Union Pacific Railroad Yard, Monument Chan, and the Crowley Marine Dock, in the vicinity of Todd Shipyard. The verified California State Coordinates (Zone III) for these points are N478193.85, E1471745.84, N474967.18, E1479560.29, and N475303.82, E1483103.14, respectively. An additional point was used to help locate stations in the maneuvering area (N475348.26, E1483606.00).

Before coring commenced, the navigators surveyed the station reference coordinates, deployed station buoys, and determined station depths with a lead-line deployed from a runabout. The uncorrected depth determined in this manner was recorded in the station logs kept by Land and Sea Surveys. Depth corrections were made during actual coring by measuring water level with respect to a known tidal benchmark (Monument Chan, for instance, is 10.39 ft above MLLW) and applying the appropriate correction factor to the depth recorded on the coring barge at that time. This method eliminates the use of a tide table, thereby reducing the probability of error when applying tide table calculations to MLLW depth. Tide tables were consulted during the coring operation, however, and compared with MLLW water depths in the coring area as a second check of the corrected MLLW depths radioed to the derrick barge by Land and Sea personnel. Verified MLLW depths were recorded in MSL field logs, as were uncorrected depths and the total core length needed to penetrate to -44 ft MLLW (-42 ft plus 2 ft overdepth).

Once Hagar was in position and MLLW depths were verified, the station buoy offset was determined and radioed to the crane operator, so that the vibratory hammer corer could be positioned correctly. The core barrel was lowered to the bottom and the penetration depth was measured using calibrated marks on the outside of the barrel. The vibratory hammer was used if the corer did not penetrate to project depth under its own weight and momentum. When the coring device had penetrated the required distance, the core barrel was lifted from the water and placed on the barge deck. The lexan liner holding the sediment sample was pulled from the core barrel and measured for appropriate length. If the sample was of acceptable length, the core was capped, labeled, and cut into 5-ft sections for storage in a refrigerated container aboard the Hagar. At the end of each day, the cores were transferred to a refrigerated truck located at the Manson/Crowley staging area and maintained at 4°C until used for sediment chemistry or bioassay testing.

2.3.2 Point Reyes Sediment Collection

Three types of samplers--a pipe dredge, a Battelle-designed Yeloc sampler, and a modified van Veen grab sampler--were used to collect sediment from the sites offshore of Point Reyes (Figure 2.2). The pipe dredge proved most successful for collecting large sediment volumes in rough seas, though the other samplers were used to collect some of the samples. The pipe dredge is a cylindrical apparatus, 5 ft long with a diameter of 12 in., designed to collect surficial sediment as it is dragged along the bottom. The pipe dredge and other samplers were deployed from an articulating boom aboard the

72-ft F/V White Lightning. Upon recovery, sediment was released from the sampler onto a clean plastic tarp on deck. Sediment was then placed into numbered, clean, seawater-cured coolers, kept cool with blue ice, and transported to the refrigerated truck at the Crowley/Manson staging area. Point Reyes sediment samples were maintained at 4°C until being delivered to MSL in Sequim, Washington.

2.3.3 Tomales Bay Sediment

A sediment sample from the tideflats of Tomales Bay, California, was collected by shovel and bucket. This sediment is the native habitat for the test organism N. caecoides (polychaete) and was collected and shipped with the organisms in clean coolers. After the Nephtys were shipped to MSL, it was decided to make Tomales Bay a test sediment. Consequently, holding conditions were appropriate for the test organisms rather than sediment samples. This meant that sediment was held under aerated seawater at approximately 14°C until used for testing.

2.4 SAMPLE PREPARATION FOR CHEMICAL, PHYSICAL, AND BIOLOGICAL TESTING

2.4.1 Labware Cleaning

All laboratory utensils and glassware were washed by hand with commercial detergent or by a Forma laboratory dishwasher with Forma Soap Solution 2, were rinsed five times with deionized water after washing, and were allowed to air-dry. Glass, Pyrex, plastic, titanium, and PVC containers and equipment were then soaked in a 5% nitric acid solution (HNO_3, Baker Instra-analyzed grade) for at least 4 h. After acid-cleaning, labware was rinsed five times with deionized water and again allowed to air-dry. Stainless-steel bowls, spoons, and spatulas were rinsed three times with methylene chloride ($MeCl_2$) and allowed to dry. All labware was either stored in clean containers or used immediately.

Large aquaria were washed by hand with soap and water, rinsed five times with deionized water, and filled with 5% nitric acid. The acid remained in the aquaria for a minimum of 4 h. The acid was then removed and the aquaria were rinsed five times with deionized water and placed upside-down atop water tables until used.

2.4.2 Test Sediment Preparation

Sediment treatments for chemical, physical, and biological testing were prepared from Oakland Harbor core samples, Point Reyes grab and dredge samples, and Tomales Bay grab samples. Oakland Harbor core samples were cut in half longitudinally and examined by an MSL geologist and a USACE representative. Geological descriptions were performed according to the American Society for Testing and Materials (ASTM) Procedure D2488-84: "Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)" (1984). This procedure is detailed in Appendix B, and results and interpretation of the geological analysis are presented in Section 3.2. The USACE representative would then determine the appropriate vertical section(s) of core to be composited into each sediment treatment. The compositing strategy was usually to separate the material between -38 and -44 ft MLLW from the material shallower than -38 ft MLLW.

Sediments from Point Reyes (PR-coarse and PR-fine) were used as uncontaminated sediment treatments to provide information on a range of variables arising from dredged-material texture (grain size) and to establish a basis for comparison of physical differences. The Tomales Bay sediments provided a third uncontaminated control to verify the health of the sensitive test organism N. Caecoides during the toxicity tests. All three control sediment treatments were sieved through a 0.5-mm Nytex screen to remove organisms before being composited.

To composite, or mix, samples for chemical analysis, sediment from the appropriate segment of each core was removed from the core liner with a stainless-steel spatula and placed in a labeled, stainless-steel bowl. Care was taken to avoid removing sediment that had been in direct contact with the core liner or sediment containing flakes of liner resulting from the cutting process. Point Reyes and Tomales Bay control sediments were sieved directly into stainless-steel bowls. Sediment was mixed with stainless-steel spoons until the color and texture were homogenous. Subsamples were immediately transferred to appropriately labeled jars for the various chemical and physical analyses. The remaining sediment was covered with sheet Teflon, labeled, and stored at 4°C until needed for biological testing.

2.4.3 Preparation of Point Reyes Coarse (Reference) Sediment

Medium-to-fine sand collected south of Point Reyes, California (Section 2.3.2), was used as a coarse-grained, uncontaminated sediment on which all test treatments were layered in the Phase II toxicity tests. This material was also used as a negative control treatment during testing, because it closely approximates actual conditions at the disposal site and is similar to the Point Reyes material used in the Oakland -38-ft and Phase I toxicity tests. The coarse material was prepared first by screening the sediment through a 0.5-mm Nytex screen to remove all organisms present. This screen was integrated with a sieving tray designed by MSL and constructed of stainless-steel and wood. All surfaces of this tray were painted with several coats of a nontoxic epoxy paint to minimize sediment contamination from contact with wood and metal. The sieving tray was designed to discharge sieved sediment directly into a 55-gal aquarium. A submersible pump installed in the aquarium created a closed circulation system that recycled the seawater used for sieving. This reduced the amount of water needed for sieving and minimized loss of fine-grained material. After an aquarium was full of sieved sediment, it was removed from the sieving area, covered with a polyethylene sheet that did not touch the sediment or seawater, and allowed to settle for 6 h undisturbed.

At the end of the settling period, the overlying water was removed with a siphon hose. The sediment was placed in a large epoxy-coated cement mixer using an epoxy-coated shovel. This mixer was used to thoroughly homogenize the sediment, a process that took about 6 min. Mixed sediment was returned to the aquarium, and aliquots for chemical analysis were immediately removed to clean, labeled jars. The aquarium was again covered with polyethylene and stored at ambient temperature (approximately 15°C) until used for biological testing (within 24 h).

2.5 CHEMICAL AND PHYSICAL ANALYTICAL PROCEDURES

2.5.1 Polynuclear Aromatic Hydrocarbons (PAHs), Chlorinated Pesticides, and Polychlorinated Biphenyls (PCBs)

Sixteen priority-pollutant PAH compounds (EPA Method 610 list), 15 organochlorine pesticides (EPA Method 608 list), and four PCBs (Aroclors 1242, 1248, 1254, and 1260) were measured in sediments and tissue samples by Battelle Ocean Sciences, Duxbury, Massachusetts, and Battelle Columbus Laboratories, Columbus, Ohio, using standard laboratory techniques based on EPA SW846 and EPA CLP methods. Quality control procedures included analysis of National Oceanic and Atmospheric Administration (NOAA) reference materials SQ-1 (sediment) and Oyster-1 (tissue), procedural blanks, matrix spikes, surrogate compounds, and duplicate samples.

One aliquot of sediment was taken for dry-weight determination, and another 50-g aliquot (wet weight) was subsampled for analysis. Each sample was spiked with surrogate recovery materials (10 μg/sample each of naphthalene-d_8, acenaphthene-d_{10}, phenanthrene-d_{10}, chrysene-d_{12}, and perylene-d_{12}) and subsequently extracted with 1:1 methylene chloride:acetone. PAH analytes were not used in the matrix-spike assessment of analytical accuracy because of the extensive use of surrogate materials in the PAH analytical protocol. The extraction method was analogous to Contract Lab Protocol methods except that a 50-g (wet weight) sample was used, to lower detection limits, and the ambient temperature extraction was used instead of sonication (NAF Method, MacLeod et al. 1985).

M. Nasuta tissue was homogenized in the laboratory and, where possible, a 15-g aliquot was removed for organics analysis. The tissue sample was macerated using a Tissuemizer and sodium sulfate and extracted repeatedly with methylene chloride (NAF Method, MacLeod et al. 1985). All extracts were processed through a gel permeation chromatography (GPC) cleanup step using a Phenogel 100A-size exclusion column prior to analysis. Performance criteria used to assure the quality of GPC data were analogous to those recommended in EPA Method 3640. Approximately one-third to one-half of each sample extract was processed through GPC. The remainder was archived for possible future analyses.

Samples were analyzed for PAH by gas chromatography/mass spectrometry (GC/MS) following MSL standard operating procedures, modeled after EPA Method 8270 but specific for PAH analysis only. The mass spectrometer was operated in the electron impact mode, using selected ion monitoring (SIM) to acquire individual PAH quantification and confirmation ions. SIM was required to meet project detection limits for tissue analyses and was also used for sediment analysis, so that data acquisition methods for both analyses would be identical.

Samples were analyzed for pesticides and PCBs by gas chromatography using electron capture detection (GC/ECD). Analysis and quality assurance methods for GC/ECD analyses followed EPA Methods 8000 and 8080, except that high-resolution fused silica capillary chromatography columns were substituted for the packed chromatography columns specified in the method. GC/ECD analytes were confirmed by reanalysis of samples using a chromatography column of different polarity, as specified in EPA Method 8000. For pesticides and PCBs, the surrogate compounds added to each sample to assess extraction efficiency were dibutylchlorendate (600 ng/sample) and/or dibromooctafluorobiphenyl (200 ng/sample). Analytical accuracy was assessed by matrix spikes of a subset of pesticide analytes, for which percent recovery was reported.

2.5.2 Metals and Metalloids

Metal and metalloid concentrations in sediment and tissue samples were determined using several procedures. Lead and zinc were measured by energy diffusive x-ray fluorescence (XRF). Mercury was analyzed by cold-vapor atomic absorption spectrophotometry (CVAA). Antimony, arsenic, cadmium, chromium, copper, nickel, selenium, silver, and thallium were analyzed by Zeeman graphite-furnace atomic absorption spectrophotometry (GFAA).

XRF Analysis

Energy-diffusive XRF analysis was performed by PNL following the method of Nielson and Sanders (1983). Approximately 0.5 g of freeze-dried, ground sample was pressed into 2-cm-diameter pellets for the analysis. Lead and zinc were analyzed by this technique. The XRF technique is recognized by the National Bureau of Standards (NBS) for analyzing metals in geological and biological matrices. For quality control of XRF measurements, duplicate samples and standard reference materials were analyzed. Reference materials included PACS-1, MESS, and NBS 1646 sediments. Blank samples are not appropriate for XRF. The detection limit in sediment is approximately 1 μg/g, based on a twofold standard deviation of mean counts for a sample that contains low concentrations of an element (Nielson and Sanders 1983). Spike recoveries were not conducted for the metals analyzed by XRF, because it is not possible to mix solutions of metal homogeneously with dry sediment.

Atomic Absorption Spectroscopy (AA)

Atomic absorption spectroscopy was performed on sediment and tissue digestate to determine the concentrations of antimony, arsenic, cadmium, chromium, copper, mercury, nickel, selenium, silver, and thallium. Samples were freeze-dried and blended in a mixer-mill. Approximately 4 g of sample were then ground in a ceramic ball mill. Then, 0.2-g aliquots of this dried homogenate were digested with 4:1 nitric acid:perchloric acid in Teflon digestion bombs. After these samples were allowed to cool, hydrofluoric acid was added and the digestion bombs were placed in a 130°C oven for 8 to 12 h. After cooling, solution volumes were determined and the solutions were stored in polyethylene bottles until the analysis was performed.

Mercury concentrations were determined through cold-vapor atomic absorption using a Laboratory Data Control (LDC) mercury monitor with a 30-cm cell as a detector, as indicated in EPA Protocol 7481 and modified by Bloom and Crecelius (1983). The remaining metals (antimony, arsenic, cadmium, chromium, copper, nickel, selenium, silver, and thallium) were analyzed on a Zeeman graphite-furnace atomic absorption spectrometer using Methods 7041, 7060, 7131, 7191, 7210, 7520, 7740, 7760, 7841 (EPA 1986). Duplicate samples, matrix spikes, procedural blanks, and the reference materials PACS-1, MESS, and NBS 1646 were analyzed for quality control of CVAA and GFAA analyses.

2.5.3 Organotins

Extraction of sediments and tissues for organotin analysis followed the methods of Unger et al. (1986). Approximately 10 g (wet weight) of sample was weighed into a 125-mL solvent-cleaned glass jar and mixed thoroughly with approximately 100 g of anhydrous sodium sulfate to remove the water in the sample. Methylene chloride (110 mL) and tropolone (0.25 g) were then added to the container. This mixture was homogenized for 12 h and the liquid portion decanted through silanized glass wool to remove particles. The container was then rinsed three times with additional methylene chloride and the resulting fluid decanted, filtered through glass wool, and added to the original extract.

The mono-, di-, and tri-butyltin compounds extracted from the sediment were derivatized with n-hexyl magnesium bromide to a less-volatile and more thermally stable form than the organotin hydrides (Unger et al. 1986). This derivative was in the tetra-alkyltin form and was quantified by GC/MS. The n-hexyl derivatives of butyltin species were separated, and the method was evaluated using tri-propyltin as a surrogate standard; recoveries were reported.

2.5.4 Total Organic Carbon

Total organic carbon (TOC) was measured in sediment samples only. TOC was determined by AMTest, Redmond, Washington, using a non-dispersive infrared measurement of carbon dioxide released from the organic carbon during combustion of the sediment. Inorganic carbonates were released from the sediment sample before combustion by using hydrochloride. A Dohrmann DC-180 analyzer was used to measure carbon dioxide. Duplicate samples were analyzed for quality control. This TOC method is consistent with PSEP (1986) and Standard Method 505 (Standard Methods 1975).

2.5.5 Oil and Grease

Total oil and grease was measured in sediment samples only. Approximately 20 g of sediment (wet weight) was weighed into a solvent-rinsed, 250-mL jar, and approximately 40 to 50 g of anhydrous sodium sulfate was added and homogenized with the sediment to absorb any water. Then, 50 mL of freon was stirred into this mixture and the jar was capped and immediately placed on a rolling sample homogenizer for 16 h. After the sample was removed from the homogenizer, the freon was poured into a solvent-rinsed conical vial. An additional 50 mL of freon then was added to the sediment, and the sample was rolled an additional 6 h. This second extraction has been shown to ensure 90% extraction efficiency for various sediment matrices (Word et al. 1987). These two extracts were combined and measured to the nearest milliliter. Two separate scintillation vials were filled for analysis on a Beckman Acculab 4 Infrared Spectrophotometer (IR).

The sample was scanned from 4000 to 600 cm^{-1}, and the peak height was measured at 2930 cm^{-1}. This wavelength, which represents the $-CH_2$ configurations of hydrocarbons, is the standard used to determine oil and grease. Oil and grease may include hydrocarbons, fats, fatty acids, soaps, waxes, oils, and any other carbon-hydrogen material that is extracted by the freon solvent. The relationship of peak height to the oil concentration was determined by regressing the peak height versus a known concentration of fuel oil (EPA-API Reference Oil WP 681). This method is consistent with Method 502 B (Standard Methods 1975).

2.5.6 Petroleum Hydrocarbons

Petroleum hydrocarbons represent the mineral fraction of total oil and grease. The petroleum hydrocarbon analysis was performed on a portion of the oil and grease extract. A 50-mL aliquot of this extract was mixed with freon in a solvent-rinsed glass jar to provide 100 mL of sample . This mixture represents a 50% dilution, which is accounted for in the calculations of the concentrations of the petroleum fraction of the oil-and-grease measurement. This solution was then mixed on a homogenizer for 5 min with 3 g of 200-mesh silica gel, Grade 922, to remove the polar materials (fatty acids) from the solution. The compounds not removed by the silica gel were considered hydrocarbons for this test and were quantified using the Beckman Acculab 4 Infrared Spectrophotometer. As with the oil and grease measurement, the sample was scanned from 4000 to 600 cm^{-1}, and the peak height was measured at 2930 cm^{-1}.

To ensure that the silica-gel extraction of fatty acids was effective, this extraction was performed on a sample of American Petroleum Institute (API) crude petroleum and on a sample of corn oil. For the latter test, 1 mL of corn oil was dissolved in 100 mL of freon. This solution was diluted tenfold to obtain an appropriate reading on the infrared spectrophotometer. Thirty microliters of the API standard oil were dissolved in 100 mL of freon. Both of these samples were analyzed on the infrared spectrophotometer, as indicated in the above procedure. The samples were then exposed to the silica-gel extraction procedure and re-analyzed on the infrared spectrophotometer. The procedure was effective. The corn oil was completely removed from the extract while the petroleum hydrocarbon sample remained essentially unaffected.

2.5.7 Grain Size

Sediment samples were passed through a 62-μm sieve to separate the sand and mud fractions. Grain size distribution of the sand fractions were determined by weighing material collected on seven sieves (See Table 2.1). The fine fractions (<62 μm) settled to 20, 10, or 7 cm in a 1-L graduated cylinder at specific time periods. The size of the material either was larger than the specified sieve size opening or was determined for the pipette-collected material, based on Stokes Law (Table 2.1). Dried samples were weighed to the nearest 0.1 μg on an electronic balance. Salt content was then accounted for. This method is consistent with PSEP methodology (PSEP 1986).

2.6 TEST ORGANISM COLLECTION

Selection of appropriate sensitive benthic marine organisms was consistent with Table F.1 in Appendix F of the Implementation Manual (EPA/USACE 1977). Selected were a detrital-feeding, infaunal bivalve (*Macoma nasuta*); a burrowing, deposit-feeding polychaete (*Nephtys caecoides*); a tube-building, detrital-feeding, amphipod (*Ampelisca abdita*); and a burrowing, detrital-feeding amphipod (*Rhepoxynius abronius*). Test organism collection was concurrent with sediment collection operations. Test organisms were obtained from uncontaminated sites, and all precautions were taken to minimize stress during collection and shipping. Upon arrival at MSL, organisms were kept in their native sediment whenever possible and were

TABLE 2.1. Sieve and Pipette Data for Analysis of Sediment Grain Size

Grain Size, mm	Phi	Screen Number	Pipette Depth, cm	Time of Pipette Sampling h	min	sec
3.35	-2.0	6	NA	NA		
2.0	-1.0	10	NA	NA		
1.0	0	18	NA	NA		
0.25	2.0	35	NA	NA		
0.125	3.0	120	NA	NA		
0.0625	4.0	230	20	0	0	20
0.0480	4.5	NA	10	0	0	55
0.0312	5.0	NA	10	0	1	55
0.0230	5.5	NA	10	0	3	40
0.0156	6.0	NA	10	0	7	41
0.0078	7.0	NA	10	0	31	0
0.0039	8.0	NA	10	2	3	0
0.0019	9.0	NA	7	5	43	0
0.000976	10.0	NA	7	22	53	0
0.0004883	11.0	NA	5	65	25	0

NA = Not applicable

gradually acclimated to laboratory holding conditions. Animals were fed, if required, before and during toxicity testing. Following is a summary of collection and handling procedures for each test species.

2.6.1 Collection of *Macoma nasuta*

The bent-nose clam, *M. nasuta*, was collected from Sequim Bay, Washington (40°03.80'N latitude, 123°00.25'W longitude), and Discovery Bay, Washington (48°02.80'N latitude, 123°50.00'W longitude). These embayments are near the MSL facility and are considered uncontaminated habitats for these clams (EPA 1986). Clams were also collected in these areas for the previous -38-ft Oakland Inner Harbor sediment evaluation (Word et al. 1988) and Phase I of the follow-on study. Approximately 5000 individuals were collected for testing. The clams were collected using bucket, shovel, and sieve. Care was taken to minimize shell breakage. The clams were stored in large tubs with sediment from the collection site and seawater and were kept cool throughout the collection period. The clams were transported to MSL on the collection day and placed in flow-through storage tanks at ambient salinity and 15°C until testing began. Salinity, temperature, dissolved oxygen (DO), and pH were monitored daily during the holding period, which did not exceed 2 weeks.

2.6.2 Collection of *Nephtys caecoides*

The polychaete *N. caecoides* was collected from mud flats in Tomales Bay, California (38°13.83'N latitude, 122°57.67'W longitude). John Brezina of Brezina & Associates, Dillon Beach, California, performed the polychaete collections. The worms were collected using bucket, shovel, and sieve. Approximately 5000 polychaetes were collected for testing purposes. Animals were placed in clean coolers containing sediment from the collection site and seawater. Care was taken to avoid damage to the polychaetes during collection and transferral. The seawater in each cooler was supersaturated with oxygen (22 ppm) prior to shipment to MSL. The animals were shipped via commercial overnight delivery.

Upon arrival at MSL, the shipping bags were placed in the holding water and were aerated to drive off excess oxygen. Holding water was gradually added to each bag until salinity, temperature, and pH were approximately equal to the holding-water conditions. The required acclimation period was about 6 h. Worms and sediment were then released into the holding tank by slitting the bottom of the bag and gently removing the plastic. Holding-water quality was monitored daily until all toxicity tests were initiated (within 2 weeks).

2.6.3 Collection of *Ampelisca abdita*

The amphipod *A. abdita* was collected from fine sediments in the shallow subtidal zone in the southern end of the Pettaquamscutt (Narrow) River, Rhode Island. These animals were collected by personnel from Science Applications International Corporation (SAIC) under the supervision of Dr. John Scott. Approximately 10,000 amphipods were transported by air from Rhode Island to

MSL. Two separate deliveries were required to supply this large number of test animals.

To obtain these animals, surface sediments (8 to 10 cm) containing amphipods were scooped with a shovel into buckets and taken to the SAIC laboratory in Newport, Rhode Island, where they were sieved on a 0.5-mm mesh screen with flowing seawater maintained at the collection-site temperature and salinity. Animals retained on the screen were transferred to 8-oz microwave containers. Each container held about 200 organisms in native sediment covered with a small amount of water. The organisms were transported on ice to MSL, where they were gradually acclimated to MSL holding-water salinity, temperature, DO, and pH. The dishes were placed undisturbed in the bottom of the holding container. Water quality was monitored daily until test initiation. *A. abdita* were fed *Phaeodactylum tricornutum* twice before testing. Total holding time did not exceed 2 weeks.

2.6.4 Collection of *Rhepoxynius abronius*

The amphipod *R. abronius* was collected at water depths of -15 ft near West Beach, Whidbey Island, Washington (48°50.83'N latitude, 122°40.00'W longitude). An MSL-designed sediment dredge was deployed from the MSL research vessel to collect the amphipods at this site. Approximately 10,000 amphipods were collected for testing. The amphipods were transferred from the dredge into large tubs filled with seawater and sediment from the collection site. The animals were kept cool in the field and transported to MSL on the collection day. Acclimation to holding conditions required 2 h. Animals were held in native sediment with flow-through seawater for less than 2 weeks. Water quality was monitored daily until test initiation. Feeding of *R. abronius* was not required.

2.7 SOLIO-PHASE TOXICOLOGICAL TESTING PROCEDURES

2.7.1 Test Objectives and Experimental Design

The "solid phase" of dredged material is the portion of the material that is expected to settle to the bottom after disposal. The objectives of the solid phase toxicity tests were 1) to approximate exposure conditions that might be experienced by benthic organisms living in sediments near the boundary of a disposal site, and 2) to evaluate effects caused by the physical presence of dredged material and the toxicity of contaminants associated with it. These tests were not intended to evaluate the impact of dredged materials that might exist within a disposal site or directly beneath a disposal vessel. The toxicity tests described below were designed and performed to meet the objectives and to comply with the solid-phase testing requirements of the 40 CFR 227 as presented in the Implementation Manual prepared by the EPA/USACE Technical Committee on Criteria for Dredged and Fill Material (EPA/USACE 1977). Supplementary procedures developed for the amphipod toxicity tests were based on guidelines provided in the protocols of Scott and Redmond (personal communication) and Swartz et al. (1985). The following toxicity tests were conducted:

- 10-day solid-phase flow-through tests for mortality of *M. nasuta* and *N. caecoides* as described in the Implementation Manual (EPA/USACE 1977).
- 10-day solid-phase flow-through tests for mortality of *A. abdita* in accordance with manuscript method of Scott and Redmond (personal communication).
- 10-day solid-phase static tests for mortality of *A. abdita* in accordance with bioassay procedures for *R. abronius* of Swartz et al. (1985).
- 10-day solid-phase flow-through tests for mortality of *R. abronius* in accordance with bioassay procedures of Scott and Redmond (personal communication).
- 10-day solid-phase static test for mortality of *R. abronius* in accordance with bioassay procedures of Swartz et al. (1985).
- Measurement of contaminant concentrations in the tissues of surviving *M. nasuta* that were exposed to the sediment treatments, for bioaccumulation. Specific contaminants are organotins, metals, PCBs, pesticides, and selected PAHs.

Specific effects, or endpoints, included both mortality of test organisms and accumulation of contaminants in tissues after 10 days of exposure to proposed dredge material. The selected test organisms allowed examination of observed effects in relation to differences in feeding and in life habits. Comparative data from tests performed on the two amphipods also will be useful in evaluating the relative sensitivities of these species under different testing scenarios. Table 2.2 summarizes the experimental design and test requirements for the Oakland Phase II solid-phase toxicity tests.

In each test, 5 replicates of each sediment treatment were evaluated. Each replicate contained 20 individuals of the test organism, so that 100 organisms were exposed to each sediment treatment. The clams and polychaete worms were tested together in the flow-through M. nasuta/N. caecoides toxicity test. The two amphipod species were tested together in both the flow-through and the static A. abdita/ R. abronius toxicity tests.

The containers used for the flow-through M. nasuta/N. caecoides test were 38-L (10-gal) glass aquaria, randomly placed on five water tables. An exception to the random design was the placement of the 5 replicate Tomales Bay aquaria. The addition of Tomales Bay sediment as a test treatment was requested after placement of the planned number of aquaria had been completed. Water delivery was regulated by a dripper-arm system designed to deliver a constant flow of 125 mL/min ± 10 mL/min (Figure 2.3). Aeration was provided by air stones in the seawater reservoir and to each test container through a glass pipette connected to the overhead air manifold. One-liter glass Mason jars, randomly placed on two water tables, were used for the A. abdita/R. abronius toxicity tests. Again, the late addition of Tomales Bay replicates made them exceptions from the random design. Aeration was provided to the static test jars by pipettes connected to an overhead air manifold (Figure 2.4). Jars for the flow-through test were modified to provide a subsurface water discharge and a screened overflow port (Figure 2.4). This design regulated the water level in the container while minimizing impingement of floating amphipods on discharge screens. Aerated flow-through water was regulated by a dripper-arm system designed to deliver a constant flow of 40 ± 5 mL/min.

TABLE 2.2. Experimental Design and Test Requirements (ST=sediment treatment; PR = Point Reyes)

Species	Test Duration	Test Conditions	Number Sediment Treatments	Number Replicates per Treatment	Number Animals per Replicate
M. nasuta, *N. caecoides* (Tested simultaneously in same containers)	10-day	Flow-through; ST layered on PR-coarse.	23 Oakland Harbor ST 1 PR-fine control 1 PR-coarse control 1 Tomales Bay conrol	5	20 of each species
R. abronius *A. abdita* (Tested simultaneously in same containers)	10-day	Flow-through; ST layered on PR-coarse	23 Oakland Harbor ST 1 PR-fine control 1 PR-coarse control 1 Tomales Bay control	5	20 of each species
R. abronius, *A. abdita* (Tested simultaneously in same containers)	10-day	Static; ST layered on PR-coarse; Containers aerated.	23 Oakland Harbor ST 1 PR-fine control 1 PR-coarse control 1 Tomales Bay control	5	20 of each species

Species	Type Test Container	Water Quality Requirements	Frequency of Biological Counts and Water-Quality Monitoring	Appropriate Protocol
M. nasuta, *N. caecoides* (Tested simultaneously in same containers)	10-gal aquarium	Temp. = 15±1°C; Sal. = Ambient ±1°/∘∘; D.O. ≥ 4.0 mg/L; pH = Ambient ±0.4; Flow rate = 125±10 mL/min	1/day	EPA/USACE (1977)
R. abronius *A. abdita* (Tested simultaneously in same containers)	1-qt Mason jar	Temp. = 15±1°C; Sal. = Ambient ±1°/∘∘; D.O ≥ Ambient ±0.4 Flow rate = 40±5 mL/min	1/day	Scott and Redmond (personal communication); EPA/USACE (1977) Word et al. 1989a
R. abronius, *A. abdita* (Tested simultaneously in same containers)	1-qt Mason jar	Temp. = 15±°C; Sal. = Ambient ±1°/∘∘; D.O. ≥ 4.0 mg/L; pH = Ambient ±0.4	1/day	Swartz et al. (1985) EPA/USACE (1977)

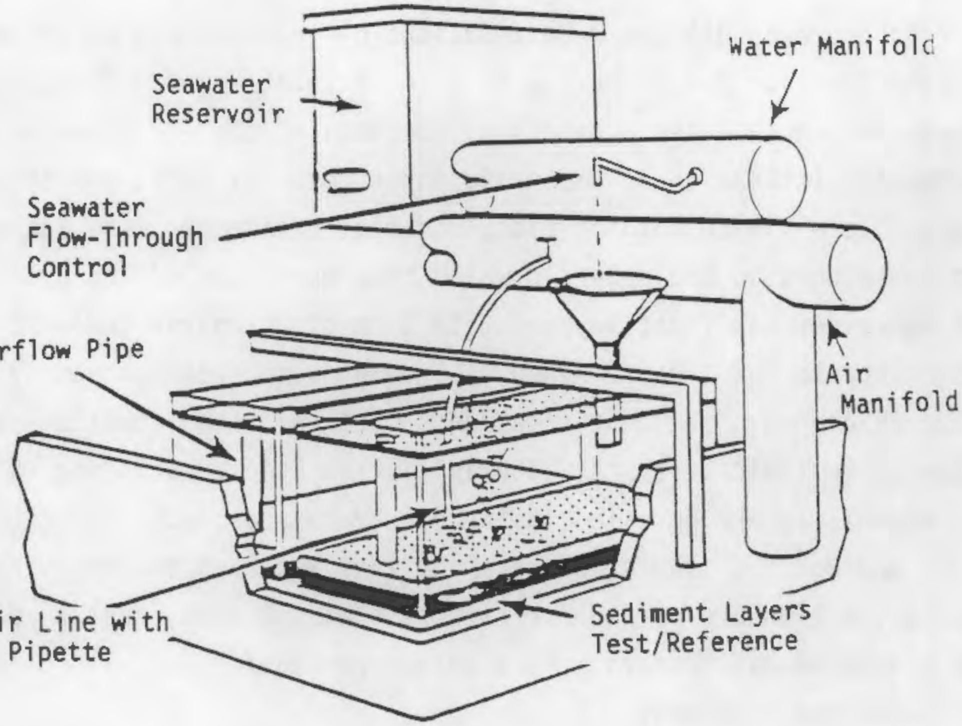


FIGURE 2.3. Experimental Set-up for M. nasuta/N. caecoides Test

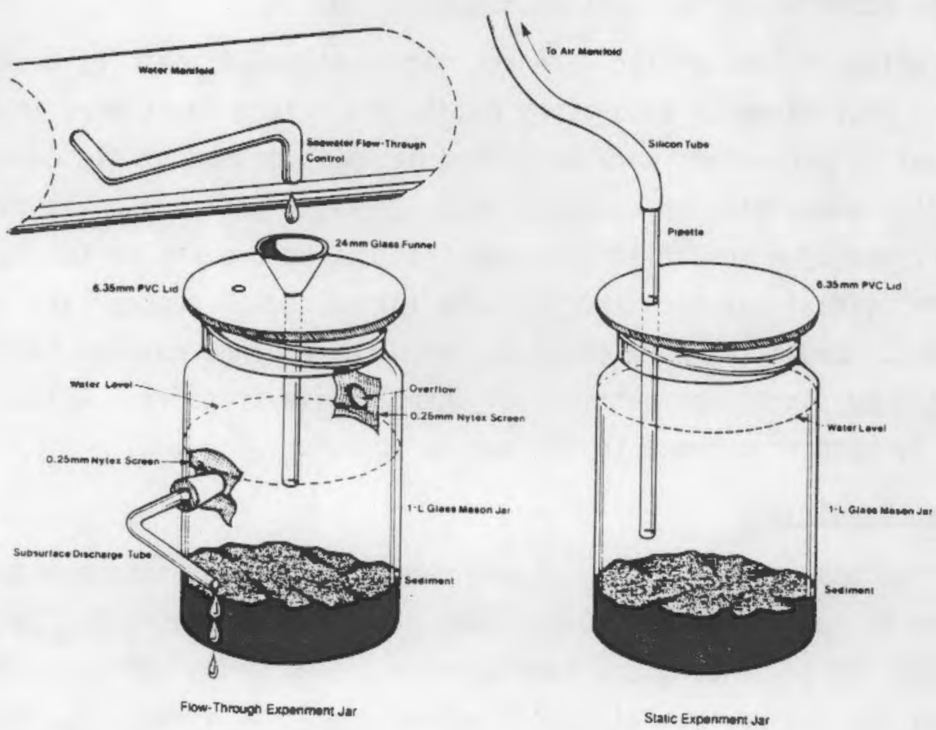


FIGURE 2.4. Experimental Set-up for A. abdita/R. abronius Tests

Exposure conditions were simulated by layering 1.5 cm of test treatment sediment (Section 2.4.3) on top of 3 cm of Point Reyes (PR-coarse) sediment in seawater in each test container. Because of the large number of sediment treatments, initiation of the solid phase toxicity tests was staggered over 3 days. To minimize holding time, sediment treatments were introduced to test containers in the order in which they were sampled and prepared. Each test container was first layered with 3 cm of PR-coarse sediment and allowed to equilibrate for 2 days. Then, 1.5 cm of test sediment was layered on top of the PR-coarse. Sediment treatments were initiated simultaneously in each of the three toxicity tests. The initiation steps, including the addition of test organisms, are detailed in the procedures for each test (Sections 2.7.3, 2.7.4, and 2.7.5). The steps were the same for each treatment each day. Because the exposure period for each test was 10 days, test termination was also staggered over 3 days. Termination procedures are also detailed in the procedures for each test.

2.7.2 Quality Assurance/Quality Control

Test Organism Identification and Handling

Organisms collected for exposure during sediment toxicity tests (Section 2.6) were acclimated to laboratory conditions before tests were initiated. Water quality parameters were monitored daily to assure stable conditions, and holding times did not exceed 2 weeks. Test organism species identity was confirmed by a qualified taxonomist at MSL before use in toxicity tests. Twenty individuals of each species were introduced to appropriate test containers. Organisms were carefully transferred from holding tanks to test containers by pipetting, netting, or quantitative transfer. Animals were not touched by hand or exposed to air during transfer.

Test Conditions

During all toxicity tests, experimental conditions were monitored daily to ensure acceptability and consistency with the Implementation Manual (EPA/USACE 1977). Biological conditions included daily observations of test organisms for obvious mortalities, burrowing or tube formation, and unusual behavior patterns. Physical conditions included a stable temperature ($\pm$ 2.0°C), minimum dissolved-oxygen concentration of 4.0 ppm, stable salinity (± 2.0 $^{o}/oo$), and 14 h of light per day. Water quality instruments were calibrated according to manufacturers' specifications or more-stringent PNL protocols. Instrument calibration information and schedules are presented in Appendix H.

2.7.3 Procedures for Flow-Through Test with M. nasuta and N. caecoides

Test containers (Figure 2.3) for the flow-through M. nasuta/N. caecoides toxicity test were labeled and placed in random order on water tables, then filled with 8 L of sand-filtered seawater. Eight treatments were initiated one day, 8 the next day, and 10 the third day. The following steps apply to initiation of each sediment treatment: A 3-cm layer of prepared PR-coarse sediment (Section 2.4.3) was added to each aquarium and allowed to settle for 1 h. After settling, the flow-through seawater system was turned on to deliver 125 mL/min. Two hours were allowed for the sediment and water to equilibrate before addition of 20 M. nasuta to the aquaria. Equilibration continued for 2 days, during which time dead or nonburrowing clams were removed and replaced. At the end of the 2-day period, 75% of the water was drained from the aquaria by removing the standpipes. A 1.5-cm layer of test sediment (Section 2.4.3) was placed on top of the PR-coarse, and the standpipes were replaced so the aquaria could fill with water. Two hours after test sediment addition, 20 N. caecoides were added to each aquarium and the initiation time recorded.

Throughout the 10-day exposure period, animal behavior (siphon exposure, burrowing, sediment avoidance) was monitored daily, as were water quality parameters (salinity, temperature, DO, pH, and flow rate). M. nasuta and N. caecoides were not fed during the test. Dead organisms were removed and preserved in individual containers with 10% buffered formalin. Each container was labeled with the sediment treatment, replicate, date, and time removed.

Ten days (240 h) after the recorded test initiation, the contents of each aquarium were carefully passed through 0.5-mm Nytex sieves, and the remaining animals were counted and classified as alive or dead. Missing N. caecoides that were not removed during the test were assumed to have died and decomposed. Mortality in N. caecoides was determined by observing movement and was confirmed by gentle probing of motionless worms. N. caecoides were then preserved in 10% buffered formalin. Mortality in M. nasuta was determined by applying pressure to the bivalve shell. The clam was alive if it resisted opening its shell. If the clam's adductor muscle would no longer hold the valves together and the shell would open easily, the clam was considered dead. The surviving M. nasuta were placed in clean, labeled aquaria under flow-through conditions to depurate for 2 days in preparation for bioaccumulation studies. The complete procedure for obtaining M. nasuta tissues for bioaccumulation is given in Section 2.7.6.

2.7.4 Procedures for Flow-Through Test with A. abdita and R. abronius

Flow-through Mason jars (Figure 2.4) were placed in random order on water tables and 200 mL of sand-filtered seawater were added. Again, treatments were initiated over a 3-day period. PR-coarse sediment was layered to a depth of 3 cm and allowed to settle for 1 h. The flow-through seawater system was started and adjusted to deliver 40 mL/min. Sediment and water were allowed to equilibrate for 2 days, then the flow-through delivery was stopped and the water level in each jar carefully reduced by 75% with a suction pump. A 1.5-cm layer of test sediment was added on top of the PR-coarse and allowed to settle for 1 h before the flow-through water system was turned back on. After water had circulated for 2 h, 20 A. abdita and 20 R. abronius were added to each test container and the test initiation time recorded.

Throughout the 10-day exposure period, amphipod behavior (A. abdita tube formation, R. abronius reburrowing) was observed daily before water quality parameters (salinity, temperature, DO, pH, and flow rate) were monitored. Test organisms were not fed during the test. To avoid disturbing the test container, organisms that appeared to be dead were not removed.

Ten days (240 h) after the test initiation, the contents of each jar were carefully passed through 0.5-mm Nytex sieves and placed in a glass culture dish. R. abronius recovered from a test jar were counted into a shallow petri dish containing seawater and scored for mortality based on the presence or absence of pleopod movement when probed (Swartz et al. 1985). Unrecovered R. abronius were assumed to have died and decomposed during testing. The A. abdita organisms and tubes remaining in the culture dish were placed in a labeled 50-mL centrifuge tube containing 5% buffered formalin and rose-bengal dye. After 1 day of preservation, A. abdita were gently rescreened through a 0.25-mm Nytex sieve and transeferred to a shallow sorting dish for enumeration under a microscope. Tubes were gently probed open to ensure that all A. abdita remaining were counted. A. abdita mortality was determined by 1) absence of individuals and 2) poor condition of preserved organisms. Due to their small size, A. abdita that die during testing usually decompose in 1 to 2 days, so lost organisms were assumed dead. Recently dead organisms are usually in poor condition after preservation, indicating a test-related mortality. After scoring, both R. abronius and A. abdita were preserved in 40% ethanol.

2.7.5 Procedures for Static Test with A. abdita and R. abronius

Labeled Mason jars (Figure 2.4) were placed in random order on water tables and 200 mL of sand-filtered seawater were added to each. Over a 3-day period, in the order that sediment treatments were initiated, PR-coarse sediment was layered to a depth of 3 cm and allowed to settle for 1 h. Sand-filtered seawater was added to fill each jar to the 800-mL mark, and the sediment and water were allowed to equilibrate for 2 days. After 1 day, 75% of the water was removed with a vacuum pump and replaced. At the end of the equilibration period, 75% of the water was again removed and a 1.5-cm layer of test sediment added on top of the PR-coarse. The jars were filled to the 800-mL mark and the sediment allowed to settle for 1 h before 75% of the water was removed and replaced. Twenty A. abdita and 20 R. abronius were added to each jar and the initiation time recorded. Aeration was provided to each jar by a glass pipette connected to the overhead air manifold.

Daily observations of behavior and measurement of water quality parameters (salinity, temperature, DO, and pH) were recorded over the 10-day exposure period. Organisms were not fed during the test, and those that appeared to be dead were not removed. The overlying water in the static jars was replaced if 1) a comparison of static and flow-through water quality conditions in replicate jars indicated that water quality differences between tests exceeded one-half of the allowable range indicated in the

Implementation Manual (EPA/USACE 1977) or 2) if a pattern of difference was detected between the flow-through and static set-ups or within each of the static jars.

At the end of the 10-day exposure period, the contents of each jar were carefully passed through a 0.5-mm Nytex sieve and placed in a glass culture dish. *R. abronius* and *A. abdita* were enumerated and scored for mortality as described in the previous section. After scoring, all organisms were preserved in 40% ethanol.

2.7.6 Procedures for Obtaining M. nasuta Tissue Samples for Bioaccumulation Tests

Following termination of the 10-day flow-through toxicity test with *M. nasuta* and *N. caecoides*, the surviving *M. nasuta* from each replicate were placed in clean, labeled flow-through aquaria (see Section 2.7.4). Clams were allowed to depurate in clean flowing seawater for 2 days. Each day all fecal material was siphoned out of the aquaria. It is expected that contaminants bound to food or contained in the gut are excreted over the 2-day period; consequently, the remaining contaminants are assumed to be those contained within and bioaccumulated by the clam tissues. The 2-day depuration period is consistent with the requirements of the Implementation Manual (EPA/USACE 1977).

At the end of this period, individuals within a replicate were randomly allocated for trace metal, organotin, PCB, PAH, and pesticide analysis. Clams were carefully dissected with clean titanium scalpels. The entire clam tissue was separated from the shell and placed into the appropriate labeled container. Metal and organotin analyses were performed immediately at MSL. Samples for organics analysis were placed in solvent-rinsed glass jars and shipped on ice to the analytical laboratory the day of dissection. The analytical procedures for tissue bioaccumulation analysis are covered in Section 2.5.

2.8 STATISTICAL DESIGN AND DATA ANALYSIS

Solid phase toxicity tests were designed to be completely random designs. Random water table positions were assigned to each test container using a separate random number tables. The discrete random number generator in LOTUS 123 was used for this purpose. Test organisms were randomly allocated to treatments at the initiation of each test.

The purpose of statistical analysis was to determine the significance and magnitude of sediment treatment toxicity relative to PR-coarse. Statistical analysis was performed after a QA/QC review assured that the data were valid and that 10% mortality was not exceeded in the PR-coarse treatments. Toxicity was ranked based on test organism survival after a 10-day exposure to sediment.

After ascertaining that mortality in PR-coarse treatments did not exceed 10%, survival data from each of the flow-through and static toxicity tests were evaluated by analysis of variance (ANOVA) as recommended by the Implementation Manual (EPA/USACE 1977). The arcsine square root transformation was used to assure homogeneity of variances within the data on mean proportion surviving for each test. If no significant difference in survival was detected by ANOVA, no further statistical analysis was performed.

If survival was significantly different in at least one treatment in a test, all treatments in that test were compared using Tukey's Honestly Significant Difference (HSD) test (Steel and Torrie 1980). Tukey's HSD is a conservative test that uses an experiment-wide error rate and allows comparison between all possible treatment combinations. Information about a treatment significantly different from a reference is preserved, and additional information about significant differences from other treatments is provided. Comparison of treatments by Student's t-test was also done if significantly different survival was detected by ANOVA. However, when applied to comparisons between multiple test sediments and a reference, the t-test tends to propagate both type I and type II errors. Type I error declares significance when differences may not really be significant (when one of the means has very low variance). Type II error declares non-significance when differences are actually significant (when variances about the compared means are large). The multiple range comparison tests of Student Newman-Keuls and Dunnett allow comparison of treatments to only one other treatment (reference) and give no information about other between-treatment comparisons that may be of interest. In addition, the possible causes of the toxicity were examined by jointly analyzing the contaminant levels in each treatment and the resultant toxicity ranking.

The bioaccumulation of metals, organotins, pesticides, PCBs, and PAHs into the tissues of M. nasuta from each of the sediment treatments was also compared with ANOVA. Analysis was conducted on the natural logarithm of the concentration of each chemical component in order to stabilize the within-class variability. To determine whether or not significant differences existed between sediment concentration and bioaccumulation, the cross-product correlation between the concentration of each chemical component in the sediment and the average tissue concentration from the five replicate analyses was calculated. The correlation coefficient was also calculated using the sediment concentration normalized by the amount of total organic carbon.

3.0 RESULTS

Results are presented in five sections of this chapter. The results of sediment collection and sample preparation are presented in Section 3.1; interpretation of geological descriptions of Oakland Harbor sediment cores is presented in Section 3.2; the results of chemical and physical analysis of sediment samples are presented in Section 3.3; the results of the solid-phase toxicity tests are summarized in Section 3.4; and the potential for bioaccumulation of contaminants into tissues of test organisms is summarized in Section 3.5.

3.1 SEDIMENT COLLECTION AND SAMPLE PREPARATION

3.1.1 Sediment Sample Collection

Sediment sampling and storage procedures followed during Phase II were consistent with Appendices B and F in the Implementation Manual (EPA/USACE 1977). Approved samplers were used to collect sediments, and all sediments were stored in non-contaminating cellulose acetate butyrate (CAB) core liners with sealed end caps, or in clean, seawater-cured coolers. Sediment was maintained at 4°C from time of collection until time of use and was never frozen or dried. Sediment shipping and storage was kept as short as possible; most sediments were processed within 8 days of collection. A unique label was attached to each sample at the time of its collection. Chain-of-custody forms were developed and used to track samples through all steps from field collection through chemistry and toxicity test results.

Oakland Inner and Outer Harbors

Core sampling in Oakland Inner and Outer Harbors was conducted between September 27 and 29, 1988, using the equipment and procedures described in Section 2.3. Included in this sampling were stations that were not sampled to project depth during Phase I of the Oakland Harbor Program. All stations were successfully cored to ≥-44 ft MLLW depth during Phase II sampling. A total of 29 cores were collected from 21 locations in Oakland Harbor (Figure 2.1). Core station positions, dates of sampling, water depths, and other sampling information for Oakland Inner and Outer Harbors is summarized in Table 3.1.

Point Reyes Sediment Collection

Sampling at the two sediment sites south of Point Reyes (Figure 2.2) was successfully conducted October 2, 1988. At one site, approximately 1000 L of medium-to-fine sand, similar to sediment at the proposed disposal site, was collected as a reference material to layer in all test containers and also to serve as a coarse-grained, uncontaminated control sediment treatment (PR-coarse). At the other site, approximately 20 L of material, composed primarily of silt, was collected to serve as a fine-grained, uncontaminated control sediment treatment (PR-fine). A summary of the Point Reyes offshore sampling is presented in Table A.2 of Appendix A.

Tomales Bay Sediment

Sediment native to the test organism N. caecoides was collected on September 30, 1988, from the mudflats of Tomales Bay, California. Approximately 15 L of this sediment was collected, shipped, and held with the organisms. On October 7, 1988, USACE requested that this sediment be included as a test treatment to verify the health of N. caecoides during the toxicity test.

3.1.2 Sediment Sample Preparation

A total of 27 sediment treatments were prepared from sediments from Oakland Harbor, from offshore of Point Reyes, and from Tomales Bay, California. Table 3.2 lists the treatments and the compositing strategy for each, including stations where multiple core samples were used to obtain enough sediment for biological testing. One Oakland Harbor treatment (OI-TS-5 Merritt) was prepared as a special chemistry sample and was not tested biologically during Phase II. The 26 remaining treatments were prepared for both chemical and biological testing as described in Section 2.4.2. Point Reyes coarse material for layering in all test containers and for use as a clean control treatment (PR-coarse) was sieved and composited as described in Section 2.4.3. All Phase II sediments for biological testing were used within 10 days from date of collection, well within the holding time of 14 days recommended in the Implementation Manual (EPA/USACE 1977).

TABLE 3.1. Summary of Sediment Collection in Oakland Harbor

Station	Core Number	Sample Date MM-DD-YY	California State Zone III Coordinates (X) East	California State Zone III Coordinates (Y) North	Water Depth (ft MLLW)	Required Core Length (ft)	Collected Core Length (ft)	Comments
OI-CH-0	1	09-29-88	1467300	480135	37.2	6.8	8.6	
OO-CH-1	1	09-28-88	1464193	479275	38.7	5.3	7.3	
OO-CH-1	2	09-28-88	1464193	479275	38.7	5.3	NA	Rejected - insufficient penetration
OO-CH-1	3	09-28-88	1464193	479275	38.7	5.3	8.6	
OO-CH-2	1	09-27-88	1467350	481285	33.8	10.2	11.5	
OI-CH-2A	1	09-27-88	1468800	479310	37.8	6.2	6.3	No vibrating action required
OI-CH-2A	2	09-27-88	1468800	479310	37.6	6.2	6.0	No vibrating action required
OO-CH-3	1	09-28-88	1469705	482475	38.3	5.7	8.8	
OO-CH-3	2	09-28-88	1464193	479275	38.3	5.7	8.3	
OO-CH-4	1	09-28-88	1473378	482533	34.5	9.5	NA	Rejected - insufficient penetration
OO-CH-4	2	09-28-88	1473378	482533	34.5	9.5	NA	Rejected - insufficient penetration
OO-CH-4	1	09-29-88	1473378	482533	34.1	9.9	NA	Rejected - insufficient penetration
OO-CH-4	2	09-29-88	1473378	482533	34.1	9.9	10.0	
OI-CH-4A	1	09-27-88	1481315	475480	38.8	7.2	9.7	Golden sand present
OO-CH-5	1	09-28-88	1475190	484725	38.0	6.0	9.4	
OO-CH-5	2	09-28-88	1475190	484725	38.0	6.0	10.0	Hard sand, gray in color
OO-CH-6	1	09-28-88	1475970	486135	36.0	8.0	8.0	Fine sand silt clay
OI-CH-6A	1	09-27-88	1484255	475923	38.5	7.5	7.0	
OO-CH-7	1	09-29-88	1476500	485730	39.1	4.9	6.6	
OO-CH-7	2	09-29-88	1476500	485730	39.1	4.9	6.7	
OO-CH-8	1	09-29-88	1477685	485745	35.2	8.8	NA	Rejected - insufficient penetration
OO-CH-8	2	09-29-88	1477685	485745	35.2	8.8	NA	Rejected - insufficient penetration
OO-CH-8	3	09-29-88	1477685	485745	35.2	8.8	8.8	
OI-SS-4L	1	09-27-88	1483520	476245	24.2	19.8	21.2	
OI-SS-4L	2	09-27-88	1483520	476245	24.2	19.8	22.0	Dark mud, then 15 feet of sand

(NA = not applicable)

TABLE 3.1. (contd)

Station	Core Number	Sample Date MM-DD-YY	California State Zone III Coordinates (X) East	(Y) North	Water Depth (ft MLLW)	Required Core Length (ft)	Collected Core Length (ft)	Comments
OI-TS-5A	1	09-27-88	1483745	475425	28.3	15.7	12.0	Rejected - insufficient penetration
OI-TS-5A	2	09-27-88	1483745	475425	28.3	15.7	13.8	Rejected - insufficient penetration
OI-TS-5A	3	09-27-88	1483745	475425	28.3	15.7	16.4	
OI-TS-5A	4	09-27-88	1483745	475425	28.3	15.7	17.0	
OI-MA-1L	1	09-27-88	1485740	476380	20.8	23.2	23.0	Asphalt material at bottom of core
OI-MA-1L	2	09-27-88	1485740	476380	20.8	23.2	23.3	
OI-MA-2	1	09-27-88	1485755	476210	31.5	12.5	12.6	
OO-W-1	1	09-28-88	1465028	480325	26.1	17.9	NA	Rejected - material too soft
OO-W-1	2	09-29-88	1465028	480325	29.9	14.1	15.4	
OO-W-2	1	09-27-88	1465950	480678	32.9	11.1	13.9	
OO-W-3	1	09-28-88	1471336	483385	33.3	10.7	NA	Rejected - insufficient penetration
OO-W-3	2	09-28-88	1471336	483385	33.3	10.7	NA	Rejected - insufficient penetration
OO-W-3	3	09-28-88	1471336	483385	32.8	11.2	10.9	
OO-W-4	1	09-28-88	1472230	483550	28.6	15.4	NA	Rejected - insufficient penetration
OO-W-4	2	09-28-88	1472230	483550	28.6	15.4	NA	Rejected - insufficient penetration
OO-W-4	3	09-28-88	1472230	483550	28.6	15.4	NA	Rejected - insufficient penetration
OO-W-4	4	09-29-88	1472230	483550	28.9	15.1	15.6	
OO-W-4	5	09-28-88	1472230	483550	28.4	5.0	5.0	Needed to collect only upper 5.0 ft of core.
OO-W-5	1	09-28-88	1474585	483543	41.0	3.0	NA	Rejected - insufficient penetration
OO-W-5	2	09-28-88	1474585	483543	41.0	3.0	3.8	Vibrating from point of contact
OO-W-5	3	09-28-88	1474585	483543	41.0	3.0	3.0	Vibrating from point of contact

(NA = not applicable)

TABLE 3.2. Compositing Strategy and Sample Preparation Information for Phase II Sediment Treatments

Sediment Treatment	Water Depth (ft MLLW)	Origin of Sediment: Vertical Core Segment (ft MLLW)	Origin of Sediment: Number of Cores
OI-CH-0	37.2	37.2 to 44	1
OO-CH-1	38.7	38.7 to 44	2
OO-CH-2	33.8	38.0 to 44	1
OI-CH-2A	37.8	37.8 to 44	2
OO-CH-3	38.3	38.3 to 44	2
OO-CH-4	34.1	38.0 to 44	1
OI-CH-4A	36.8	36.8 to 44	1
OO-CH-5	38.0	38.0 to 44	2
OO-CH-6	36.0	38.0 to 44	1
OI-CH-6A	36.5	36.5 to 44	1
OO-CH-7	39.1	39.1 to 44	2
OO-CH-8	35.2	38.D to 44	1
OI-SS-4L	24.2	38.0 to 44	1
OI-TS-5AU	28.3	28.3 to 38	2
OI-TS-5AL	28.3	38.0 to 44(a)	2
OI-TS-5A Merritt(b)	28.3	≈43 to 44	1
OI-MA-1L	20.8	38.0 to 44	1
OI-MA-2U	31.5	31.5 to 38	1
OI-MA-2L	31.5	38.0 to 44	1
OO-W-1	29.9	38.0 to 44	1
OO-W-2	32.9	38.0 to 44	1
OO-W-3	32.8	38.0 to 44	1
OO-W-4	28.9	38.0 to 44	1
OO-W-5	41.0	41.0 to 44	3
PR-Coarse	Medium-to-fine sand, composited from multiple grab samples		
PR-Fine	Silty material, composited from multiple grab samples		
Tomales Bay	Sand from Tomales Bay, California, in which _N. caecoides_ were shipped and held		

(a) Merritt Sand sample removed from TS-5A, core 3 (Table 3.1)
(b) Merritt Sand sample for chemistry only (no biological testing)

3.2 GEOLOGIC ANALYSIS OF SEDIMENT SAMPLES

The sediments within the Oakland Harbor are divided into two geologic units. These two units, the Older Bay Mud and Younger Bay Mud (USACE 1975a), are differentiated principally on the basis of color and consistency (i.e., firmness). Bedrock, consisting of consolidated deposits of the Franciscan Formation, lies at a depth of about 430 ft below the MLLW surface and may be deeper under the Outer Harbor (USACE 1988). USACE (1988) divided the Older Bay Mud unit into three formations: the San Antonio, Alameda, and Posey formations. The characteristics used to differentiate these formations are unclear; therefore, for the purposes of this discussion, stratigraphic units are subdivided on the basis of the interpreted sedimentary environment (i.e., terrestrial [fluvial] or marine [estuarine]) (Figure 3.1). Terrestrial deposits display features indicative of subaerial weathering (e.g., root traces that extend and bifurcate downward, bleached and/or oxidized color). Marine deposits, on the other hand, usually are dark-colored (because of reducing conditions) and contain mollusk shells. In general, because of the fluvial transport mechanisms involved, terrestrial sediments are coarser textured than marine deposits. Deposits, locally referred to as Merritt Sands, appear to be equivalent to coarse-grained terrestrial facies of the Older Bay Mud unit.

Most cores drilled during Phase II were collected from the Outer Harbor channel (Figure 3.2). Relationships between the Outer Oakland Harbor sediments are shown graphically in a geologic cross section (Figure 3.3) and in a fence diagram (Figure 3.4). For ease of display the sediments in Figure 3.3 are divided into four groups: 1) silty clay (CL), 2) poorly graded sand to well-graded sand or pebbly sand (SP/SW), 3) silty sand to sandy silt (SM/ML), and (4) a stiff, cohesive silt (ML). Essentially, the uppermost silty clay unit on these figures conforms to the Younger Bay Mud unit; deposits below this belong to the Older Bay Mud unit. The next two sections describe the Older and Younger Bay Mud units, respectively. This is followed by a closer look at the geology in the vicinity of the Outer Harbor.

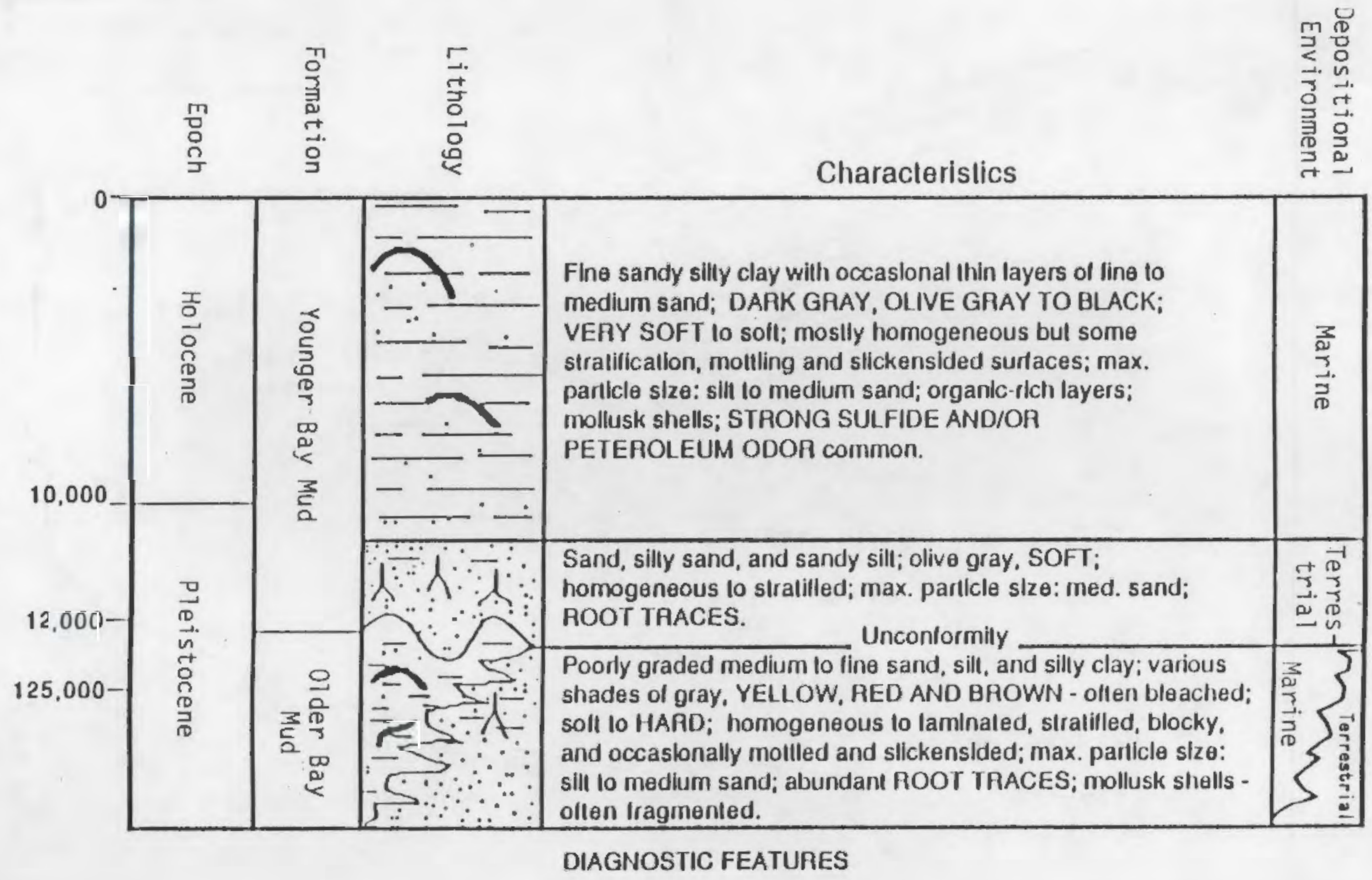


FIGURE 3.1. Stratigraphic Chart of Oakland Harbor Sediments

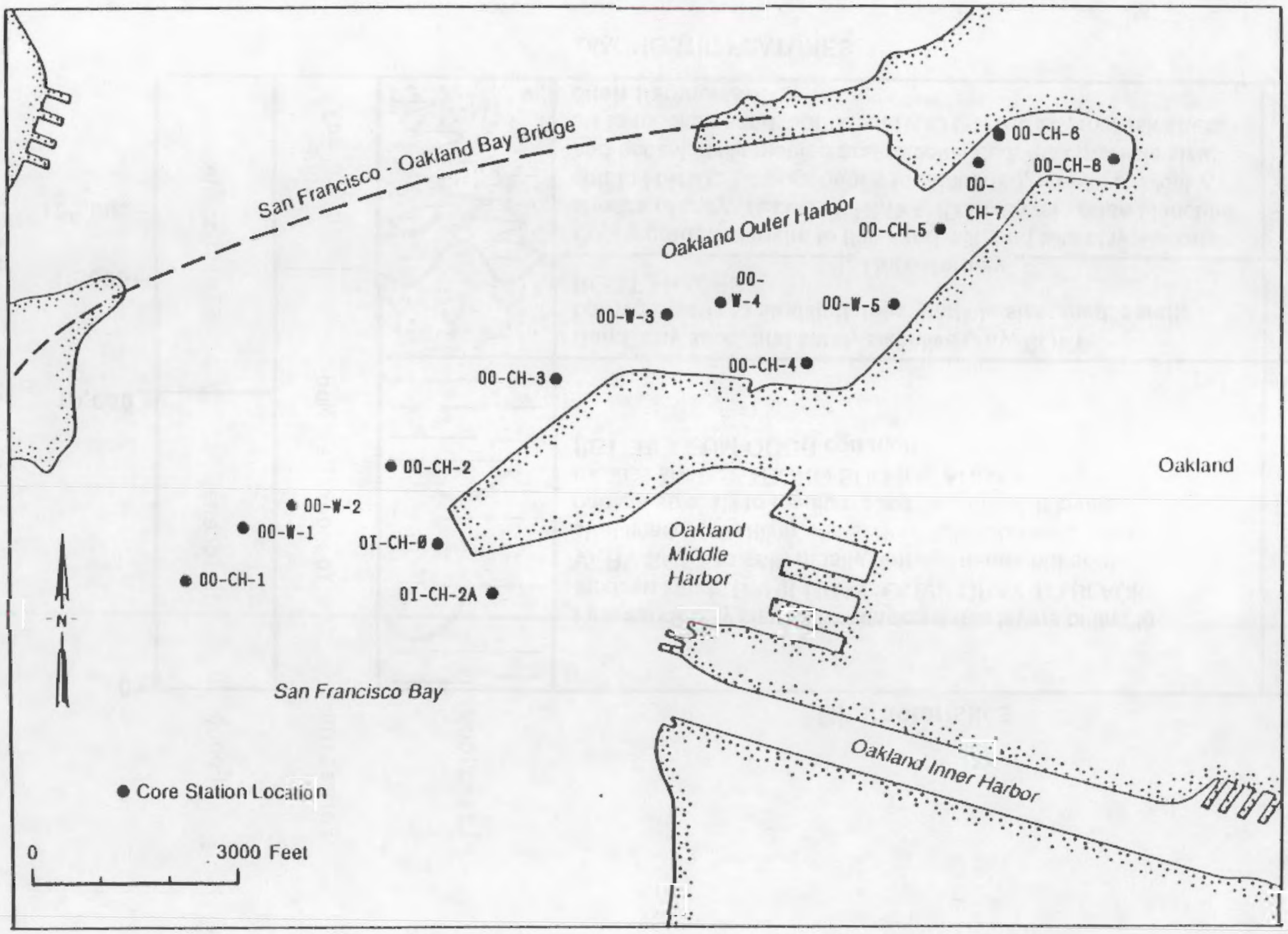


FIGURE 3.2. Station Locations for Oakland Outer Harbor

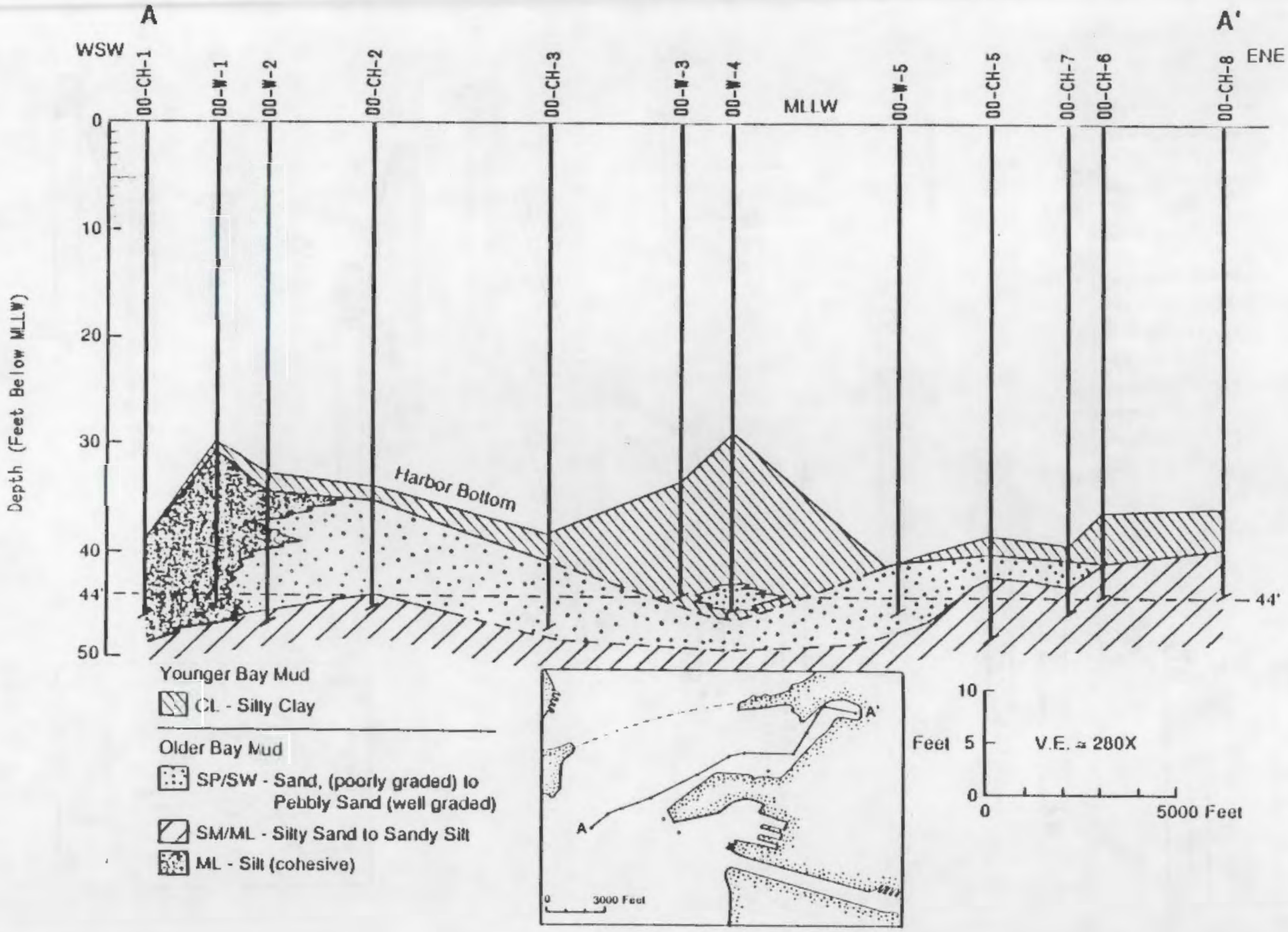


FIGURE 3.3. Geological Cross-Section Along Oakland Outer Harbor from Point A to A'

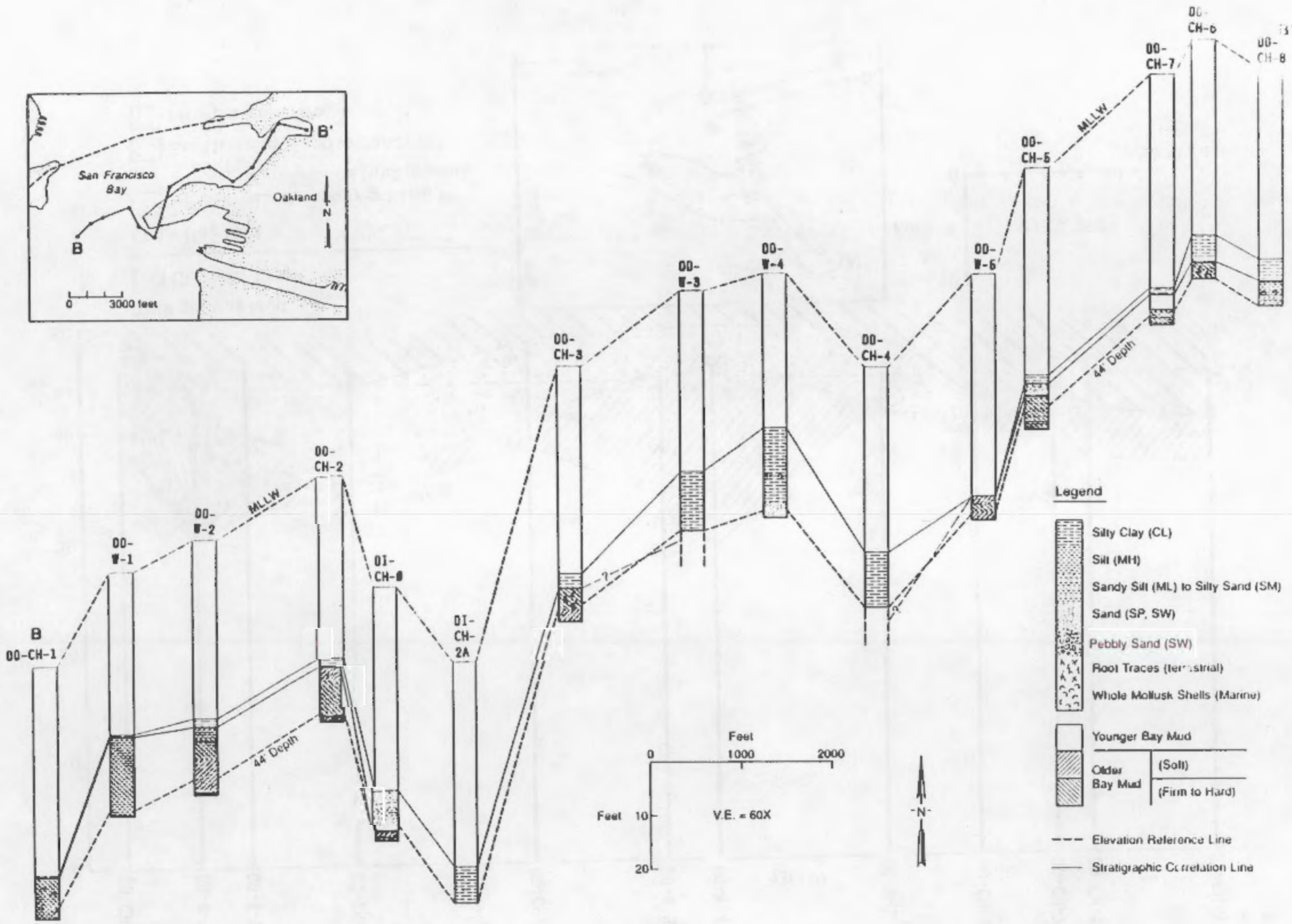


FIGURE 3.4. Fence Diagram from Oakland Outer Harbor from Point B to B'

3.2.1 Older Bay Mud

The Older Bay Mud unit consists of a wide range of deposits, from loose pebbly sands to stiff, cohesive silts and clays. The Older Bay Mud unit was deposited during the last interglacial period (USACE 1975b, 1979). Interglacial periods have occurred at approximately 100,000-year intervals over the last one million years or so (Stottlemyre et al. 1981); the most recent interglacial period ended about 125,000 years ago (CLIMAP 1984). Most of the Older Bay Mud unit was probably deposited during this time; however, some of the unit may have formed during previous interglacial periods. The top of the Older Bay Mud unit appears to represent an erosional surface but also may have been modified by past dredging activities; the uneven nature of this surface is apparent in Figure 3.3.

The Older Bay Mud unit is distinguished by its firm to hard consistency and by its color. Color is particularly useful for the identification of terrestrial sediments, which consist of various shades of red, yellow, and brown. These colors are consistent with an oxidizing environment, associated with deposition by rivers and streams. The presence of deeply penetrating root traces is another indication of terrestrial conditions. The marine portions of the Older Bay Mud unit, on the other hand, consist of drab-colored shades of olive and gray. These colors, and the presence of whole mollusk shells, are indicative of a low-energy, reducing, estuarine environment.

The high degree of consolidation, in combination with the weathered and often bleached appearance of the Older Bay Mud, suggests that this unit is much older than the overlying estuarine sediments belonging to the Younger Bay Mud unit. The highly oxidized and weathered appearance of the Older Bay Mud, in combination with the presence of root traces and calcium-carbonate nodules, suggests the Older Bay Mud unit underwent alteration during a period of subaerial soil development. Unlike the Younger Bay Mud unit, no distinctive odors were detected in the Older Bay Mud unit. This may be due to the compacted nature of the Older Bay Mud unit, which acts as a barrier preventing contaminants associated with the overlying Younger Bay Mud unit from penetrating downward.

3.2.2 Younger Bay Mud

The Younger Bay Mud unit consists of mostly soft, dark-colored sediments deposited in an estuarine environment. These deposits were laid down as sea level rose following the last ice age, which ended approximately 12,000 years ago (Barry 1983). The Younger Bay Mud unit forms a continuous blanket across the harbor bottom, except in a few areas where erosion or dredging have prevented them from being deposited. USACE (1975a) subdivided the Younger Bay Mud unit into a Semi-Consolidated Bay Mud member and an overlying Soft Bay Mud member. However, a sudden, characteristic change in consistency, reported by the USACE (1979), was not observed within the Younger Bay Mud unit in this study; therefore, it is assumed that the Semi-Consolidated Bay Mud member is not present.

The Younger Bay Mud unit is mostly a very soft, silty clay. However, in places a soft sand to muddy sand is also present (Figure 3.4). All the Younger Bay Mud sediments are characteristically dark-colored, ranging from gray to dark gray and olive gray. The Younger Bay Mud unit is not restricted to the present bay area, but also lies, above sea level, a considerable distance inland (USACE 1975a). This suggests that sea level has been higher at times in the past.

The physical and chemical characteristics of the uppermost 2 ft of the Younger Bay Mud unit were analyzed previously in a study by the USACE (1975b); some of the results of this study are presented in Figure 3.1. Accordingly, the Younger Bay Mud unit is classified as ranging from silty clay to clay, though it can contain as much as 30% fine sand ($\leq$ phi of 3). Thin sand lenses were sometimes observed within the soft clayey muds; these probably represent deposition within tidal channels. The firmness of the Younger Bay Mud unit increases slightly with depth, probably as a result of compaction beneath the younger sediments.

The dark color of the Younger Bay Mud unit and the frequent odor of rotten eggs (i.e., hydrogen sulfide) are indications of chemically reduced conditions. High-sulfide contents are corroborated in Table 1 by the presence of as much as 2760 ppm sulfide. Another test called for in the procedure for describing the sediments (Appendix B) was a test for calcium carbonate via reaction with hydrochloric acid. Results of this test almost always indicated very low concentrations of calcium carbonate. This is also corroborated by the USACE (1975b) study, which reported carbonate contents of less than 1% (Table 3.1).

3.2.3 Geology of the Outer Harbor

A cross section of the Oakland Outer Harbor (Figure 3.3) reveals a relatively complex geologic history for the area, including periods of terrestrial sedimentation, marine sedimentation, and erosion. The Younger Bay Mud unit varies in thickness from about 20 ft in the vicinity of Station OO-W-4 to being absent at Station OO-W-5 (Figure 3.3). The Younger Bay Mud unit thins to the west, near the entrance to the outer harbor (Figures 3.3 and 3.4). The Younger Bay Mud unit in the outer harbor consists mostly of a soft, dark-colored, silty clay. An exception is the sediment at Station OO-W-4 (Figures 3.3 and 3.4), where a sand lens lies near the base of the Younger Bay Mud unit. This probably represents deposition within a submarine paleochannel soon after marine transgression began at the end of the last ice age. Soft, dark-colored sands of the Younger Bay Mud unit are also present at Station OI-CH-0 (Figure 3.4). The position of this station with respect to the shoreline and entrance to the harbors may result in stronger currents or wave activity, thus leading to deposition of the coarser material at this locality.

The eroded, Older Bay Mud unit can be divided into three sediment types. One sediment type, a soft to firm, very homogeneous, gray, stiff and cohesive silt to clayey silt is present beneath a thin veneer of Younger Bay Mud along the west end of the outer harbor channel (Figures 3.3 and 3.4); this unit is thickest near Station OO-W-1. A second sediment type consists of an oxidized, soft to firm sand to pebbly sand, probably equivalent to the "Merritt Sands" mentioned previously. These sands overlie a third sediment type, a firm sandy silt to silty sand of probable terrestrial origin. This sediment type is thickest above the 44-ft level along the eastern end of the outer harbor at Stations OO-CH-6 and OO-CH-8 (Figures 3.3 and 3.4).

3.3 CHEMICAL AND PHYSICAL ANALYSIS OF SEDIMENT SAMPLES

This section presents data for metals, organotins, conventional measurements, and priority-pollutant organic compounds analyzed in Oakland Harbor sediments. Included are data for 10 metals, total organic carbon, oil and grease, petroleum hydrocarbons, grain size, and 16 PAHs, 16 pesticides, 4 PCBs (Aroclor formulations), and mono-, di-, and tributyltins. Quality assurance data are summarized in Appendix C. Metals and other inorganic analytes are present in all sedimentary material, but most PAHs and all butyltins, pesticides, and PCBs in Oakland Harbor sediments arise from human activities in or around the harbor. Although certain PAHs in harbor sediments may derive from natural sources (i.e., from natural petrogenic sources such as natural seepage of petroleum or the weathering of coal or from combustion sources such as forest fires or grass fires), the majority of PAHs and all of the synthetic organic contaminants in harbor sediments arise from other sources, including stormwater runoff and urban fallout, seepage from landfills, municipal wastewater discharge, and inputs from port and harbor activities. Without specific information regarding point sources of these contaminants, it can be assumed that most of the organic contamination in the harbor originates from these multiple uses of the coastal zone and nearshore environment.

3.3.1 Polynuclear Aromatic Hydrocarbons

The quality assurance review of sediment PAH data included the target versus achieved detection limits, an evaluation of analytical precision through duplicate analysis and of analytical accuracy through the analysis of Standard Reference Materials (SRMs), a review of surrogate-standard recovery, and a review of the presence of organic compounds in procedural blanks. These data are summarized in Appendix C, Tables C.1 and C.2.

The achieved detection limits for PAH analysis was 0.3 ng/g (dry wt) or less, which is below our target of 20 ng/g. Three samples were analyzed in duplicate for the 16 PAH compounds, resulting in 48 observations. The relative percent difference (RPD) ranged from 6 to 95% in these comparisons, with 19 observations above 25% (our QA limit). An SRM was measured twice for the 16 compounds to determine accuracy. Of the 32 total observations, the percent recovery of the standard ranged from 0 to 182%, with 11 observations greater than 120% recovery and 4 observations less than 40% recovery (our QA limits were 40 to 120%). The remainder were within range. The recovery of five surrogates was monitored in all 34 samples in place of spikes, resulting in 170 observations for the 16 compounds. Recovery of these compounds was very good, with all but two in our acceptable range of 40 to 120%. Procedural blanks were run twice, resulting in 16 observations. Blanks showed nondetectable levels of most compounds. Although Fluoranthene, Phenanthrene, and Pyrene were present in levels above detection, they were present in concentrations below our original detection limit of 20 ng/g (dry wt). Our quality assurance review notes high RPDs associated with duplicate analysis, some samples outside of our acceptable range for SRMs, and good surrogate recovery. We believe these data are acceptable for analysis, based on detection limit and surrogate standard recovery, with poor duplicate and SRM performance requiring a qualification.

PAH were found in all sediments in the study area and ranged from a high total concentration of 10,482 ng/g (dry wt) at Station OI-TS-5AU near Todd Shipyard to a low total concentration of <1 ng/g at Station OO-W-5 in Oakland Outer Harbor (Table 3.3). Sediment from the proposed maneuvering area was relatively high in PAHs in the upper part of the core at Station OI-MA-2U (9816 ng/g) but relatively low in the lower part of the core at Station OI-MA-1L (26 ng/g). Similarly, Oakland Inner Harbor Channel provided mixed results. Relatively low values, <3 and 15 ng/g, were found in sediment consisting of Merritt sands at Stations OI-CH-4A and OI-CH-6A respectively; relatively high values--897, 448, and 540 ng/g--were found at Stations OO-CH-4, OO-CH-5, and OO-CH-6, respectively. Similarly, mixed results were associated with Oakland Outer Harbor stations. Highest sediment PAH concentrations (2030 and 1471 ng/g) occurred at Stations OI-CH-2A and OO-CH-3 respectively in the Oakland Outer Harbor Channel.

Sources of PAH compounds in the sediments generally can be determined from the following criteria: petrogenic sources (coal, petroleum) are indicated by a high amount of alkylated naphthalenes, phenanthrenes, fluorenes, and dibenzothiophenes relative to the parent (unsubstituted) compounds; combustion sources are indicated by an equal or larger concentration of unsubstituted compounds relative to the alkyl-substituted

TABLE 3.3. Concentrations of PAHs in Oakland Outer Harbor Sediments

Sediment Treatment	PAH Concentrations (ng/g dry wt) Acenaph-thene	Acenaph-thylene	Anthra-cene	Benzo(a) Anthra-cene	Benzo(a) pyrene	Benzo(b) flouran-thene	Benzo (g,h,i) perylene	Benzo(k) fluoran-thene
OI-CH-0	-	-	0.12	-	0.31	0.47	0.50	-
OO-CH-1	-	-	5.00	10.86	18.92	15.79	17.06	10.60
OO-CH-2	-	-	5.20	8.46	18.84	13.14	16.19	9.92
OI-CH-2A	13.18	-	49.19	109.75	206.45	151.11	160.41	116.98
OO-CH-3	8.51	-	25.45	70.62	178.57	120.03	164.24	103.73
OO-CH-4	12.57	-	34.79	41.43	75.68	56.10	63.76	54.15
OI-CH-4A	-	-	-	0.13	0.19	-	-	-
OO-CH-5	3.00	-	10.71	20.51	47.69	37.32	43.78	34.41
OO-CH-6	-	-	14.83	27.09	51.96	40.35	44.06	38.00
OI-CH-6A	-	-	0.24	0.28	-	0.63	0.52	-
OO-CH-7	-	-	3.30	7.59	15.10	12.08	12.93	12.68
OO-CH-8	-	-	20.69	36.10	56.57	52.27	42.22	43.69
OI-SS-4L	-	-	0.44	1.08	2.99	1.95	2.99	1.63
OI-TS-5AU	104.89	-	220.43	571.80	1262.93	1317.74	730.79	672.87
OI-TS-5AL	18.96	-	30.13	48.90	100.08	74.95	75.69	56.34
OI-TS-5 Merritt	-	-	0.35	0.67	2.11	1.78	1.40	1.77
OI-MA-1L	0.49	-	0.67	1.13	2.43	1.40	2.06	1.40
OI-MA-2U	60.73	-	170.09	392.14	1399.70	995.07	1089.62	-
OI-MA-2L	1.77	-	3.61	10.59	32.70	20.40	28.97	16.38
OO-W-1	-	-	0.87	1.12	-	3.95	1.14	3.95
OO-W-2	0.52	-	1.88	7.94	25.70	17.73	22.21	12.65
OO-W-3	1.86	-	6.11	20.56	42.36	29.82	38.89	27.21
OO-W-4	-	-	23.97	42.45	102.07	69.61	85.46	64.11
OO-W-5	-	-	0.08	-	-	-	-	-
PR-coarse	-	-	0.74	2.27	3.57	3.98	4.08	1.98
PR-fine	-	-	0.57	1.94	3.39	3.79	4.47	2.27
Tomales Bay	-	-	0.31	0.79	0.63	1.84	0.78	0.53

- = Undetected

TABLE 3.3 (contd)

PAH Concentrations (ng/g dry wt)

Sediment Treatment	Chrysene	Dibenzo (a,h) anthracene	Fluoranthene	Fluorene	Indeno-(1,2,3-c,d) pyrene	Naphthalene	Phenanthrene	Pyrene	Total
OI-CH-0	0.35	-	0.21	0.14	0.27	-	-	0.37	2.73
OO-CH-1	14.56	1.68	28.11	2.78	14.02	4.57	20.02	36.83	200.80
OO-CH-2	10.91	0.97	27.37	1.99	12.54	3.09	13.00	36.92	178.54
OI-CH-2A	132.67	9.82	288.98	15.76	128.41	18.10	142.30	487.36	2030.47
OO-CH-3	96.16	10.62	174.32	8.56	133.71	12.92	69.67	293.68	1470.79
OO-CH-4	56.97	4.33	140.19	13.00	52.96	6.19	61.77	222.86	896.76
OI-CH-4A	0.20	-	0.10	-	-	1.88	0.21	0.17	2.88
OO-CH-5	28.39	3.51	50.32	4.06	33.78	-	27.02	103.59	448.08
OO-CH-6	40.05	3.49	69.48	4.25	32.00	3.41	27.27	144.15	540.38
OI-CH-6A	0.48	-	0.59	0.48	-	9.09	2.20	0.57	15.08
OO-CH-7	10.06	1.03	15.02	1.24	10.44	-	5.99	40.71	148.18
OO-CH-8	53.81	3.49	77.22	4.93	32.42	2.76	33.53	180.41	640.11
OI-SS-4L	1.25	-	2.65	0.26	2.44	2.94	1.02	5.91	27.54
OI-TS-5AU	867.51	187.93	1077.09	93.85	762.90	50.07	515.10	2046.57	10482.47
OI-TS-5AL	67.40	6.35	125.38	25.43	67.28	9.29	130.75	235.60	1072.53
OI-TS-5 Merritt	1.22	-	1.32	0.41	1.24	2.49	1.09	2.82	18.68
OI-MA-1L	1.74	-	5.07	-	1.40	-	2.12	6.00	25.91
OI-MA-2U	605.66	70.98	1189.66	36.01	957.32	92.14	453.41	2303.53	9816.06
OI-MA-2L	13.76	1.80	31.92	0.65	23.05	8.45	13.10	73.77	280.93
OO-W-1	2.58	-	2.82	1.60	-	-	4.06	3.54	25.63
OO-W-2	11.32	1.50	20.08	0.79	18.59	-	6.60	28.96	176.47
OO-W-3	28.39	2.86	44.63	2.23	34.96	1.43	16.59	64.11	362.02
OO-W-4	61.11	4.89	141.84	7.13	67.70	0.83	55.95	226.66	953.76
OO-W-5	-	-	-	-	-	-	-	-	0.08
PR-coarse	3.97	-	6.42	1.63	2.67	-	9.49	7.52	48.31
PR-fine	3.05	-	4.84	0.94	3.02	-	4.92	6.23	39.43
Tomales Bay	3.60	-	1.78	2.32	0.39	4.40	17.63	2.66	37.65

- = Undetected

compounds. Larger relative quantities of 4-, 5-, and 6-ring rather than 2- and 3-ring PAHs can mean greater quantities of combusted materials, but they can also indicate weathered petroleum. Because concentrations of alkyl-substituted PAH were not determined in this study, it is difficult to estimate the relative amounts of petroleum-source PAHs compared with those resulting from combustion sources. However, most of the stations displayed relatively higher concentrations of 4-, 5-, and 6-ring PAHs (fluoranthene through benzo(g,h,i)perylene) relative to the 2- and 3-ring PAHs (naphthalene through anthracene). Thus, a significant amount of the sediment PAHs may have been either of combustion origin or a result of weathered petroleum.

By comparison, five sediment sites in San Francisco Bay included in the Mussel Watch study showed mean total PAH concentrations ranging from 1000 ng/g (near the San Mateo Bridge) to 5300 ng/g in the Oakland estuary (Battelle 1988). In comparison with two other coastal areas, the sediment PAH concentrations in the inner harbor sediments were similar to those found in the New York Bight, where concentrations range from 9,500 to 31,000 ng/g (NOAA 1983) and were less than those found in Boston Harbor, where concentrations range from 2,400 to 880,000 ng/g, with a geometric mean of 180,000 ng/g, n=33 (Boehm 1984).

3.3.2 Pesticides

Quality assurance review of sediment pesticide data was conducted in a similar fashion to that of the PAHs. These quality assurance data are presented in Appendix C, Tables C.2 and C.4. The detection limit for pesticide analysis was 0.02 to 0.04 ng/g (dry wt), well below our target of 2.5 ng/g. Duplicate analyses were conducted on three samples for the 16 compounds, resulting in 48 observations. In most cases, the RPD could not be calculated as both values were below detection. RPDs ranged from 5 to 40% where they could be calculated, with high RPOs being associated with duplicate analysis of p',p'-DDT. An interim reference material (IRM) was measured twice to assess analytical accuracy. The concentrations in this IRM (SQ1) are known to be different from the stated concentrations. This may be due either to uncertainty concerning the actual concentrations of the reference material or to its age. Therefore, the actual values were not used as accuracy measures but as a precision measurement. The RPD for two measurements of this reference material ranged from not calculable because one or more values were less than detectable to 114, except for dBHC, which was detected in one sample at approximately 3 μg/kg and was undetected in the other sample.

Surrogate recovery was monitored in all 34 samples, resulting in a percent recovery ranging from 39 to 118%. This was very good, as only 1 of 34 surrogate recovery observation was outside our acceptable range of 40 to 120%. Two procedural blanks were run, and these showed no contamination except for the presence of Aldrin in one blank at 2.3 ng/g (dry wt). Two samples were spiked for six pesticide compounds, including g-BHC, Heptachlor, Aldrin, Dieldrin, Endrin, and p',p'-DDT. Spike recoveries ranged from 62 to 150% for these compounds, with high recoveries for DDT and Endrin. The recoveries in 9 of 12 observations, however, were within our quality assurance range of 40 to 120%. Our quality assurance assessment of the pesticide data is that these data are acceptable for use in analysis based on detection limit and surrogate-recovery data, though care must be taken when evaluating the DDT and Endrin concentrations, because high spike recoveries were observed.

The concentrations of measured pesticides were generally low compared other organics (Table 3.4). DDD, a metabolite of DDT, was found in sediments from 13 of 23 stations, with the highest value (9.55 ng/g dry weight) occurring at Station OO-CH-4. DDE, another metabolite of DDT, was detected in the same 13 stations as DDD, though at slightly lower levels. The highest level of DDE found (5.24 ng/g) was also found at Station OO-CH-4. The only other pesticide quantitated was BHC, which was detected at relatively low levels (<2.80 ng/g) at two stations (OI-TS-5AU/L, OO-W-4).

The levels of DDD and DDE are lower than, but comparable to, levels found in sediments from San Francisco Bay analyzed by the Mussel Watch Project (NOAA 1987, 1989). Mussel Watch found 60 ng/g to <u>not detected</u> for DDD, and 12 ng/g to <u>not detected</u> for DDE. Because all pesticide concentrations quantitated in Phase II were low, and no "hot spots" were found, it can be assumed that sediment pesticide concentrations in the study area result from a general, nonpoint source rather than specific contaminant inputs.

TABLE 3.4. Concentrations of Pesticides in Oakland Outer Harbor Sediments

Sediment Treatment	Pesticide Concentrations (ng/g dry wt) a BHC	Aldrin	b BHC	d BHC	p,p DDD	p,p DDE	p,p DDT	Dieldrin
OI-CH-0	-	-	-	-	-	-	-	-
OO-CH-1	-	-	-	-	-	-	-	-
OO-CH-2	-	-	-	-	1.85	2.20	-	1.03
OO-CH-2A	-	-	-	-	4.81	3.91	-	-
OO-CH-3	-	-	-	-	5.77	5.24	-	-
OO-CH-4	-	-	-	-	9.55	4.33	-	-
OI-CH-4A	-	-	-	-	-	-	-	-
OO-CH-5	-	-	-	-	2.18	1.03	-	-
OO-CH-6	-	-	-	-	2.96	2.27	-	-
OI-CH-6A	-	-	-	-	-	-	-	-
OO-CH-7	-	-	-	-	0.85	0.96	-	-
OO-CH-8	-	-	-	-	2.70	1.87	-	-
OI-SS-4L	-	-	-	-	-	-	-	-
OI-TS-5AU	-	-	-	-	6.76	5.00	-	-
OI-TS-5AL	-	-	-	-	1.08	0.88	-	-
OI-TS-5 Merritt	-	-	-	-	-	-	-	-
OI-MA-1L	-	-	-	-	-	-	-	-
OI-MA-2U	-	-	-	-	3.93	3.57	-	-
OI-MA-2L	-	-	-	-	-	-	-	-
OO-W-1	-	-	-	-	-	-	-	-
OO-W-2	-	-	-	-	-	-	-	-
OO-W-3	-	-	-	-	0.92	0.76	-	-
OO-W-4	-	-	-	-	8.72	4.00	-	-
OO-W-5	-	-	-	-	-	-	-	-
PR-coarse	-	-	-	-	-	2.15	-	-
PR-fine	-	-	-	-	-	2.36	-	-
Tomales Bay	-	-	-	-	-	-	-	-

- = Undetected

TABLE 3.4 (contd)

Sediment Treatment	Pesticide Concentrations (ng/g dry wt) Endo-sulfan I	Endo-sulfan II	Endo-sulfan sulfate	Endrin	Endrin Aldehyde	g BHC	Hepta-chlor	Hepta-chlor-Epoxide
OI-CH-0	-	-	-	-	-	-	-	-
OO-CH-1	-	-	-	-	-	-	-	-
OO-CH-2	-	-	-	-	-	-	-	-
OO-CH-2A	-	-	-	-	-	-	-	-
OO-CH-3	-	-	-	-	-	-	-	-
OO-CH-4	-	-	-	-	-	-	-	-
OI-CH-4A	-	-	-	-	-	-	-	-
OO-CH-5	-	-	-	-	-	-	-	-
OO-CH-6	-	-	-	-	-	-	-	-
OI-CH-6A	-	-	-	-	-	-	-	-
OO-CH-7	-	-	-	-	-	-	-	-
OO-CH-8	-	-	-	-	-	-	-	-
OI-SS-4L	-	-	-	-	-	-	-	-
OI-TS-5AU	-	-	-	-	-	2.28	-	-
OI-TS-5AL	-	-	-	-	-	1.84	-	-
OI-TS-5 Merritt	-	-	-	-	-	-	-	-
OI-MA-1L	-	-	-	-	-	-	-	-
OI-MA-2U	-	-	-	-	-	-	-	-
OI-MA-2L	-	-	-	-	-	-	-	-
OO-W-1	-	-	-	-	-	-	-	-
OO-W-2	-	-	-	-	-	-	-	-
OO-W-3	-	-	-	-	-	-	-	-
OO-W-4	-	-	-	-	-	2.80	-	-
OO-W-5	-	-	-	-	-	-	-	-
PR-coarse	-	-	-	-	-	-	-	-
PR-fine	-	-	-	-	-	-	-	-
Tomales Bay	-	-	-	-	-	-	-	-

- = Undetected

3.3.3 Polychlorinated Biphenyls

The quality assurance summary for sediment PCBs, shown in Table C.6, produced an achieved analytical detection limit of 4.0 ng/g (dry wt). This is well below our target limit of 20.0 ng/g. Three samples were analyzed in duplicate to determine analytical precision for the four measured compounds. All but 2 of the 12 observations produced values below detection, thus most RPDs could not be calculated. In two samples for which RPDs could be calculated, the range was 4 to 17%. This is within our quality assurance range of ≤25%. SRMs were analyzed twice, producing percent recoveries of 80 to 85% for the four compounds. These were within our acceptable range of 40 to 120%. (Surrogate recoveries were monitored with pesticides and are presented in that section.) Two procedural blanks were run. These resulted in nondetected levels of all compounds. Based on these evaluations, these data are considered acceptable for use in analysis.

The PCB concentrations were highest at Station OI-TS-5AU (525.46 ng/g dry wt) and generally were lower in the channel stations, ranging from not detected to 101.26 ng/g (Table 3.5). Total PCBs in the maneuvering area station OI-MA-2 ranged from 211.73 ng/g dry wt in the upper portion of the core (OI-MA-2U) to 5.99 ng/g dry wt in the lower portion (IO-MA-2L). At another maneuvering area station, OI-MA-1L, no total PCBs were detected. At 9 of 23 Oakland Harbor stations, no PCBs were detected.

PCB concentrations in the Inner Harbor sediments can be put in perspective by comparing them with other recent sediment data from Oakland Harbor and other coastal areas. The NOAA Mussel Watch project found PCB levels ranging from <u>not detected</u> to 429 ng/g (PCB as level of chlorination) in the Oakland Estuary (Battelle 1988). PCB concentrations in New York Upper and Lower Bay were reported from 130 to 700 ng/g, whereas concentrations in Arthur Kill and Raritan Bay, New Jersey, ranged from 320 to 3000 ng/g (NOAA 1983). PCB concentrations in Boston Harbor were similar, ranging from 2 to 880 ng/g, mean concentration 180 ng/g, with n=33 (Boehm 1984).

Although all the sediment samples were collected from within a relatively narrow geographical area in Oakland Harbor, PCB concentrations can be assumed to vary simply from variations in sedimentation rate. The fine-grained sediments found near Todd Shipyard and the maneuvering area can be expected to contain higher PCB levels than those collected in the channels, which have a relatively higher sand content.

There also appears to be a relationship to total organic carbon, as the highest levels of TOC (>1.00%) are generally associated with sediments containing the highest PCB levels. This is true for Stations OI-TS-5AU, OI-MA-2U, OI-CH-2A, OO-CH-4, and OO-W-4.

TABLE 3.5. Concentrations of PCBs in Oakland Outer Harbor Sediments

Sediment Treatment	PCB Concentrations (ng/g dry wt) Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total
OI-CH-0	-	-	-	-	-
OO-CH-1	-	-	-	-	-
OO-CH-2	12.05	-	42.78	28.12	82.95
OI-CH-2A	-	-	54.15	15.78	69.93
OO-CH-3	-	17.16	71.08	13.02	101.26
OO-CH-4	-	-	48.53	16.05	64.58
OI-CH-4A	-	-	-	-	-
OO-CH-5	-	-	14.22	8.87	23.08
OO-CH-6	-	-	11.29	9.67	20.97
OI-CH-6A	-	-	-	-	-
OO-CH-7	-	-	1.51	3.87	5.38
OO-CH-8	-	-	13.72	6.61	20.34
OI-SS-4L	-	-	-	-	-
OI-TS-5AU	162.52	-	362.94	-	525.46
OI-TS-5AL	-	12.18	41.91	-	54.08
OI-TS-5 Merritt(a)	-	-	-	-	-
OI-MA-1L	-	-	-	-	-
OI-MA-2U	-	67.99	143.74	-	211.73
OI-MA-2L	-	-	5.99	-	5.99
OO-W-1	-	-	-	-	-
OO-W-2	-	-	-	-	-
OO-W-3	-	-	-	6.57	6.57
OO-W-4	-	-	40.86	14.89	55.75
OO-W-5	-	-	-	-	-
PR-coarse	-	-	-	-	-
PR-fine	-	-	-	-	-
Tomales Bay	-	-	-	-	-

- = Undetected

3.3.4 Metals and Metalloids

Quality assurance review of the metals/metalloid data, presented in Tables C.7 and C.8, show that target detection limits were met for all 10 compounds. Duplicate analysis was performed on six samples, resulting in 60 observations. The range of RPDs for these observations was 0 to 24%, within our acceptable range of $\leq$25%. A SRM was analyzed twice to determine analytical accuracy for eight metals. Most of the results fell within the SRM range, though there was one low value for Cr, one high value for Hg, and one high value for Ni. Metals outside the SRM range were within 10% of the limit. Two procedural blanks were run. These showed only the presence of Hg in both blanks, at levels of 0.036 to 0.045 μg/g (dry wt). Two samples were spiked for four metals, producing recoveries of 83 to 112%, within our acceptable range of 40 to 120%. The quality assurance evaluation of sediment metals shows that these data are acceptable for analysis.

Analysis of metal concentrations in Oakland Harbor, Point Reyes, and Tomales Bay sediments revealed a sizeable range of values for most metals (Table 3.6). Examination of the data reveals that the highest concentrations of Ag, Cd, Cu, Hg, Pb, and As were found in sediment treatments OI-TS-5AU and OI-MA-2U from Oakland Inner Harbor. The highest concentrations of As, as well as the next highest concentrations of Ag, Cu, Hg, Pb, and Zn, were found at stations OO-W-3, OO-W-4, and OO-CH-4, a cluster of three stations north of the Seventh Street Complex in Oakland Outer Harbor. Although these concentrations appear high relative to those at other sites, this does not mean that the concentrations have been enhanced to levels of environmental concern. To assess the influence of Oakland Harbor sediments after disposal at the offshore site, the concentrations of Oakland sediment metals were compared with the coarse-sediment Point Reyes site and with typical shales (Krauskopf 1967). The ratios of sediment metal concentrations to shale soil metal concentrations are presented in Table 3.7. Oakland Harbor metal concentrations were also compared with disposal site concentrations (PR-coarse) to examine the relative difference between proposed dredged material and disposal-site sediments. The ratios of sediment metal concentrations to PR-coarse metal concentrations are presented in Table 3.8.

TABLE 3.6. Concentrations of Metals in Each Sediment Treatment and Average Crustal Abundance of Metals in Shale

Sediment Treatment	Metal Concentrations (µg/g dry wt)									
	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
Estuarine SRM	NA	10.3/ 11.9	0.29/ 0.43	73/ 79	15/ 21	0.051/ 0.075	29/ 35	26.4/ 30.0	NA	132/ 144
OI-CH-0	0.05	4.98	0.04	777.0	8.9	0.028	38.7	5.3	0.21	39.7
OO-CH-1	0.13	12.60	0.20	214.0	43.8	0.088	117.1	10.4	0.42	100.5
OO-CH-2	0.09	2.31	0.07	510.0	13.7	0.117	61.2	12.2	0.21	45.0
OI-CH-2A	0.48	11.00	0.27	247.0	58.1	0.310	118.9	33.0	0.50	142.7
OO-CH-3	0.09	4.80	0.03	368.0	14.9	0.065	59.5	10.2	0.26	47.8
OO-CH-4	0.66	15.50	0.47	253.0	56.5	0.082	118.8	48.8	0.43	170.3
OI-CH-4A	0.05	3.31	0.02	164.0	10.8	0.023	41.7	7.6	0.18	33.7
OO-CH-5	0.22	10.20	0.22	284.0	27.6	0.126	86.1	10.2	0.43	79.4
OO-CH-6	0.27	8.83	0.19	388.0	30.7	0.155	88.6	20.2	0.32	90.1
OI-CH-6A	0.04	6.08	0.05	689.0	14.4	0.018	65.7	3.5	0.18	50.5
OO-CH-7	0.09	3.87	0.13	501.0	15.9	0.051	75.8	10.6	0.28	59.4
OO-CH-8	0.26	9.90	0.27	273.0	38.9	0.169	117.3	19.3	0.39	102.9
OI-SS-4L	0.04	3.66	0.02	578.0	11.0	0.030	57.3	7.1	0.11	43.2
OI-TS-5AU	0.77	9.70	1.04	444.0	261.0	15.070	111.5	147.1	0.46	326.0
OI-TS-5AL	0.14	4.84	0.17	439.0	21.7	0.426	58.9	24.6	0.18	68.9
OI-TS-5 Merritt	0.04	3.22	0.02	552.0	10.7	0.045	57.3	7.0	0.14	43.9
OI-MA-1L	0.09	3.42	0.68	220.0	21.2	0.075	75.9	11.7	0.29	52.7
OI-MA-2U	0.81	11.00	0.71	301.0	94.0	0.810	122.8	89.9	0.47	230.0
OI-MA-2L	0.14	6.03	0.12	196.0	26.9	0.080	73.6	9.8	0.32	58.1
OO-W-1	0.12	12.90	0.12	283.0	45.8	0.070	115.8	12.0	0.39	105.8
OO-W-2	0.11	10.61	0.17	315.0	30.3	0.093	75.4	8.9	0.32	70.4
OO-W-3	0.65	17.60	0.42	229.0	59.1	0.490	116.5	44.4	0.53	186.1
OO-W-4	0.60	49.10	0.45	281.0	58.6	0.458	115.8	49.1	0.57	159.7
OO-W-5	0.04	3.55	0.02	408.0	8.9	0.070	57.9	7.4	0.22	36.6
Tomales Bay	0.03	4.72	0.16	43.3	6.6	0.110	28.8	4.4	0.21	24.7
PR-fine	0.03	7.96	0.23	456.0	9.5	0.056	45.6	6.0	0.28	48.4
PR-coarse	0.05	5.87	2.00	323.0	9.6	0.059	43.2	7.2	0.25	48.1
Shale soil(a)	0.10	6.60	0.30	100.0	57.0	0.4	95.0	20.0	0.60	80.0

(a) Krauskopf (1967)
NA = Not applicable

TABLE 3.7. Ratios of Metal Concentrations for Each Sediment Treatment to the Average Crustal Abundance of Metals and Metalloids Found in Shale Soils

Sediment Treatment	Metal Concentrations (µg/g dry wt)									
	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
OI-CH-0	0.50	0.75	0.13	7.77	0.16	0.07	0.41	0.27	0.35	0.50
OO-CH-1	1.30	1.91	0.67	2.14	0.77	0.22	1.23	0.52	0.70	1.26
OO-CH-2	0.90	0.35	0.23	5.10	0.24	0.29	0.64	0.61	0.35	0.56
OI-CH-2A	4.80	1.67	0.90	2.47	1.02	0.78	1.25	1.65	0.83	1.78
OO-CH-3	0.90	0.73	0.10	3.68	0.26	0.16	0.63	0.51	0.42	0.60
OO-CH-4	6.60	2.35	1.57	2.53	0.99	0.21	1.25	2.34	0.72	2.13
OI-CH-4A	0.50	0.50	0.07	1.64	0.19	0.06	0.44	0.38	0.30	0.42
OO-CH-5	2.20	1.55	0.73	2.84	0.48	0.32	0.91	0.51	0.72	0.99
OO-CH-6	2.70	1.34	0.63	3.88	0.54	0.39	0.93	1.01	0.53	1.13
OI-CH-6A	0.40	0.92	0.17	6.69	0.25	0.05	0.69	0.18	0.30	0.63
OO-CH-7	0.90	0.56	0.43	5.01	0.28	0.13	0.80	0.53	0.47	0.74
OO-CH-8	2.60	1.50	0.90	2.73	0.68	0.42	1.23	0.97	0.65	1.29
OI-SS-4L	0.40	0.54	0.07	5.78	0.19	0.08	0.60	0.36	0.18	0.54
OI-TS-5AU	7.70	1.47	3.47	4.44	4.58	37.68	1.17	7.36	0.77	4.08
OI-TS-5AL	1.40	0.73	0.57	4.39	0.38	1.07	0.62	1.23	0.30	0.86
OI-TS-5 Merritt	0.40	0.49	0.07	5.52	0.19	0.11	0.60	0.35	0.23	0.55
OI-MA-1L	0.90	0.52	2.20	2.20	0.37	0.19	0.80	0.59	0.48	0.66
OI-MA-2U	8.10	1.67	2.37	3.01	1.65	1.53	1.29	4.50	0.78	2.88
OI-MA-2L	1.40	0.91	0.40	1.95	0.47	0.20	0.77	0.49	0.53	0.73
OO-W-1	1.20	1.95	0.40	2.83	0.80	0.18	1.22	0.60	0.65	1.32
OO-W-2	1.10	1.61	0.57	3.15	0.53	0.23	0.79	0.45	0.53	0.88
OO-W-3	6.50	2.67	1.40	2.29	1.04	1.23	1.23	2.22	0.88	2.08
OO-W-4	6.00	7.44	1.50	2.81	0.99	1.14	1.22	2.46	0.95	2.00
OO-W-5	0.40	0.54	0.07	4.08	0.16	0.18	0.61	0.37	0.37	0.46
Tomales Bay	0.30	0.72	0.53	0.43	0.12	0.28	0.30	0.22	0.35	0.31
PR-fine	0.30	1.21	0.77	4.56	0.17	0.14	0.48	0.30	0.47	0.61
PR-coarse	0.50	0.89	6.67	3.23	0.17	0.15	0.45	0.36	0.42	0.60
Shale soil[a]	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

(a) Krauskopf (1967)

TABLE 3.8. Ratios of Metal Concentrations for Each Sediment Treatment to Metal Concentrations for Point Reyes (coarse) Sediment Treatment

Sediment Treatment	Metal Concentrations (μg/g dry wt)									
	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
OI-CH-0	1.00	0.65	0.02	2.41	0.93	0.47	0.90	0.74	0.84	0.83
OO-CH-1	2.60	2.15	0.10	0.66	4.56	1.49	2.71	1.44	1.68	2.09
OO-CH-2	1.80	0.39	0.04	1.58	1.43	1.98	1.42	1.69	0.84	0.94
OI-CH-2A	9.60	1.87	0.14	0.76	6.05	5.25	2.75	4.58	2.00	2.97
OO-CH-3	1.80	0.82	0.02	1.14	1.55	1.10	1.38	1.42	1.00	0.99
OO-CH-4	13.20	2.64	0.24	0.78	5.89	1.39	2.75	6.50	1.72	3.54
OI-CH-4A	1.00	0.56	0.01	0.51	1.13	0.39	0.97	1.06	0.72	0.70
OO-CH-5	4.40	1.74	0.11	0.68	2.89	2.14	1.99	1.42	1.72	1.65
OO-CH-6	5.40	1.50	0.10	1.20	3.20	2.63	2.05	2.81	1.28	1.87
OI-CH-6A	0.60	1.04	0.03	2.07	1.50	0.31	1.52	0.49	0.72	1.05
OO-CH-7	1.60	0.63	0.07	1.55	1.66	0.66	1.75	1.47	1.12	1.23
OO-CH-8	5.20	1.69	0.14	0.65	4.05	2.66	2.72	2.68	1.56	2.14
OI-SS-4L	0.80	0.60	0.01	1.79	1.15	0.51	1.33	0.99	0.44	0.90
OI-TS-5AU	15.40	1.65	0.52	1.37	27.19	255.42	2.58	20.43	1.64	6.78
OI-TS-5AL	2.80	0.82	0.09	1.36	2.26	7.22	1.36	3.42	0.72	1.43
OI-TS-5 Merritt	0.80	0.55	0.01	1.71	1.11	0.78	1.33	0.97	0.56	0.91
OI-MA-1L	1.60	0.58	0.33	0.68	2.21	1.27	1.76	1.63	1.16	1.10
OI-MA-2U	16.20	1.67	0.36	0.93	9.79	10.34	2.84	12.49	1.88	4.78
OI-MA-2L	2.60	1.03	0.06	0.60	2.80	1.36	1.70	1.36	1.28	1.21
OO-W-1	2.40	2.20	0.06	0.88	4.77	1.19	2.68	1.67	1.56	2.20
OO-W-2	2.20	1.61	0.09	0.98	3.16	1.58	1.75	1.24	1.28	1.46
OO-W-3	13.00	3.00	0.21	0.71	6.16	8.31	2.70	6.17	2.12	3.45
OO-W-4	12.00	8.36	0.23	0.87	5.90	7.73	2.68	6.82	2.28	3.32
OO-W-5	0.80	0.60	0.01	1.26	0.93	1.19	1.34	1.03	0.88	0.76
Tomales Bay	0.60	0.80	0.08	0.13	0.69	1.86	0.67	0.61	0.84	0.51
PR-fine	0.60	1.38	0.12	1.41	0.99	0.95	1.06	0.83	1.12	1.01
PR-coarse	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Silver concentrations ranged from 0.03 to 0.81 μg/g, or from 0.5 to 8.1 times the average Ag concentration in shale. Nine treatments (OI-MA-2U, OI-TS-5AU, OO-CH-4, OO-W-3, OO-W-4, OO-CH-2A, OO-CH-6, OO-CH-8, and OO-CH-5) had Ag concentrations greater than twice those in shale; most of these nine had 5 to 8 times the shale soil Ag concentration. The Ag concentration in PR-coarse was half the concentration found in shale. Therefore, relative to PR-coarse, Ag concentrations in several Oakland Harbor stations are higher by a factor of 10 or more.

Arsenic concentrations do not appear to be greatly enhanced relative to shale except at OO-W-4 in Oakland Outer Harbor, where As is 7.4 times more concentrated in the sediment. Nearby Stations OO-W-3 and OO-CH-4 have the next highest As levels, but these levels are approximately 2.5 times the As concentration in shale. The As concentration in PR-coarse sediment is only slightly lower than in shale soils, and concentrations at most stations are higher by less than a factor of 2. In addition to the three stations named above, Stations OO-W-1 and OO-CH-1, west of the Seventh Street Complex, had slightly more than twice the As of PR-coarse.

The highest cadmium concentration was found in the PR-coarse sediment; therefore, all Oakland Harbor sediment Cd levels have comparable PR-coarse. Only three treatments had more than twice the Cd of shale; Oakland Harbor sediments did not show highly elevated levels of Cd.

Chromium concentrations were also higher in PR-coarse than in shale soils, so that although Cr appears elevated relative to shale soils, only three stations have more than twice the Cd found in PR-coarse, and most stations have similar or lower levels.

Copper levels in Oakland Harbor sediments were near or below the average Cu level in shale, except for OI-TS-5AU, where Cu was enhanced by a factor of 4.6. However, the average Cu level in shale is 6 times higher than the Cu concentration found in PR-coarse, so a much greater difference between Oakland Harbor and PR-coarse Cu levels is apparent. Most treatments are enhanced 5 to 10 times relative to PR-coarse, and the highest (OI-TS-5AU) is enhanced by a factor of 27. These concentrations alone reveal little about the bioavailability of a metal to marine organisms or the possibility of a toxic effect and may or may not point to significant differences between dredged material and disposal-area sediments.

Mercury levels appear to be enhanced in very few sediment treatments relative to average shale Hg content, except for the extraordinary concentration of 15.070 μg/g found at OI-TS-5AU. This is nearly 40 times the Hg concentration found in shale and is 250 times the Hg in PR-coarse. The next-highest level, found at OI-MA-2U, was 0.610 μg/g, or about 1.5 times the Hg in shale and 10 times the Hg in PR-coarse. In previous sampling and analysis of nearby sites (-38-ft, Word et al. 1988; Oakland Phase I, Word et al. 1990), Hg levels were relatively high (1 to 6 μg/g), but still not half as high as at OI-TS-5AU. Since this measurement was duplicated, it appears to be a valid concentration. These values therefore indicate a patchy distribution of high mercury contamination in an area of somewhat-elevated sediment mercury levels.

Nickel concentrations in Oakland Harbor sediments are all very close to or lower than the average concentration of Ni in shale soils. The average Ni in shale is about twice the Ni concentration in PR-coarse sediment; therefore, though some Oakland sediments have up to 3 times the Ni of PR-coarse, these are probably not enhanced levels.

Most lead concentrations were similar to or below the average for lead in shale. Exceptions were the cluster of three stations (OO-W-3, OO-W-4, OO-CH-4) north of the Seventh Street Complex in Oakland Outer Harbor with Pb concentrations more than twice the Pb in shale soils, and Inner Harbor Stations OI-TS-5AU and OI-MA-2U, where Pb was elevated by factors of 7.4 and 4.5, respectively. Because the average Pb level in shale soils is nearly 3 times what was found in PR-coarse, these stations are enhanced in Pb by factors of >4.5 to >20.

A similar pattern was observed for zinc in Oakland Harbor sediments. However, the highest Zn concentration (OI-TS-5AU) was slightly more than 4 times the average Zn in shale and was 6.78 times the PR-coarse Zn concentration. The other stations (OI-MA-2U, OO-CH-4, OO-W-3, and OO-W-4) with relatively high Zn concentrations were enhanced by factors of 2 or 3. Again, most stations had concentrations near or below the average found in shale and do not appear significantly enhanced in Zn relative to PR-coarse.

3.3.5 Organotins

The quality assurance summary for sediment organotins is presented in Appendix C, Tables C.8 and C.10. The achieved detection limit for these analyses ranged from 0.32 to 0.46 ng/g (dry wt), well below the target detection limit of 10 ng/g. Duplicate analyses were run on three samples for the three compounds, resulting in nine observations. In six observations (two samples), values were below detection and RPDs could not be calculated. In the third sample, RPDs of 12%, 14%, and 101% were calculated for tri-, di-, and monobutyltin, respectively. SRMs were not available to evaluate analytical accuracy, but a surrogate (propyltin) was monitored for all 30 samples. Surrogate recovery ranged from 48 to 129%, with only one observation beyond our acceptable range of 40 to 120%. Two samples were spiked with tri-, di-, and monobutyltin, producing recoveries of 99% for tributyltin, 111 to 126% for dibutyltin, and 7 to 11% for monobutyltin.

Our assessment of the sediment organotin data is that tri- and dibutyltin data are acceptable for use in analysis. Because RPDs were high and recoveries in spikes were low, care should be used when evaluating the monobutyltin data. These low levels of recovery for manobutyltin are normal for this analyses (Unger et al. 1986).

Total organotin (mono-, di-, and tributyltin) concentrations in Oakland Harbor sediments are presented in Table 3.9. As determined in Phase I, highest concentrations were near Todd Shipyard and in the maneuvering area. Sediments from Station OI-TS-5AU contained a high of 211 ng/g (dry wt), while sediment from Station OI-MA-2U contained the next-highest level, 76 ng/g. Organotins were not detected in sediments from 11 other stations or in the reference sediments. Tri-butyltin was the predominant organotin species, ranging from 50 to 100% of the total concentration. At Station OI-TS-5AU, tributyltin accounted for 75% of the total; at Station OI-MA-2U, tributyltin accounted for only 50% of the total.

By comparison, nine sediment sites in Puget Sound and two sediment sites in Lake Washington (Varanasi 1988) were found to contain tributyltin ranging from 6 to 3000 ng/g (dry wt). All sites were located in or near a boat

TABLE 3.9. Concentrations of Organotins in Sediment Treatments

Sediment Treatment	Dry Weight (%)	Dry Weight Used	Organotin Concentrations (ng/g dry wt)				
			Propyltin % Recovery	Butyltin Concentrations			
				Tri	Di	Mono	Total[a]
OI-CH-0	84	18.46	53	< 0.57	< 0.32	< 0.85	NA[b]
OO-CH-1	57	12.92	61	0.84	< 0.46	< 1.20	0.84
OO-CH-2	81	18.22	73	< 0.58	< 0.32	< 0.87	NA
OI-CH-2A	47	11.05	64	6.60	1.30	< 1.42	7.90
OO-CH-3	73	9.17	129	2.94	< 0.64	< 1.70	2.94
OO-CH-4	47	11.50	79	6.40	0.97	< 1.40	7.37
OI-CH-4A	83	21.85	60	< 0.48	< 0.27	< 0.72	NA
OO-CH-5	68	19.16	49	1.10	< 0.31	< 0.82	1.10
OO-CH-6	63	13.09	48	3.00	0.73	< 1.20	3.73
OI-CH-6A	83	9.50	59	< 1.11	< 0.62	< 1.70	NA
OO-CH-7	77	18.05	56	0.94	< 0.75	< 0.35	0.94
OO-CH-8	67	16.65	49	3.40	< 0.35	< 0.95	3.40
OI-SS-4L	84	18.65	52	< 0.57	< 0.32	< 0.85	NA
OI-TS-5AU	51	7.18	88	211.00	57.00	11.00	279.00
OI-TS-5AL	78	18.28	103	2.30	< 0.32	< 0.86	2.30
OI-TS-5 Merritt	84	18.18	53	< 0.58	< 0.32	< 0.87	NA
OI-MA-1L	83	8.99	51	< 1.20	< 0.66	< 1.80	NA
OI-MA-2U	42	5.16	67	76.00	65.00	9.00	150.00
OI-MA-2L	82	8.25	35	< 1.28	1.59	< 1.90	1.59
OO-W-1	58	10.71	51	< 0.63	< 1.00	< 0.46	NA
OO-W-2	67	9.27	62	< 1.14	< 0.64	< 1.70	NA
OO-W-3	46	9.93	58	4.00	< 0.59	3.90	7.90
OO-W-4	48	11.22	81	1.80	0.58	< 1.40	2.38
OO-W-5	83	9.99	51	< 1.10	< 0.59	< 1.58	NA
PR-coarse	67	16.90	84	< 0.63	< 0.35	< 0.93	NA
PR-fine	74	19.74	63	< 0.46	< 0.73	< 0.34	NA
Tomales Bay	85	18.83	102	< 0.56	< 0.31	< 0.84	NA

(a) Totals include only values above detection.

(b) NA = not applicable; all values are below detection.

marina. Previous work in the Oakland Inner Harbor area found concentrations of tributyltin ranging from nondetectable to 2600 ng/g (dry wt) (Word et al. 1988; Word et al. 1990b). The highest concentrations were associated with sediment collected from the vicinity of Todd Shipyard, in Inner Oakland Harbor.

3.3.6 Total Organic Carbon

Quality assurances associated with measurements of TOC are presented in Appendix C, Table C.12. Inspection of these data shows that detection limit targets were met. Duplicate analyses were performed on eight samples, producing RPDs of 0 to 29%. Since there are no criteria for evaluation of this parameter, all data are considered acceptable for use in analysis.

Total organic carbon values ranged from a low of 0.02% in the Merrit sand sediments at Station OI-CH-4A to a high of 1.39% in the silty, Younger Bay Muds at Station OI-MA-2U. Other stations with nearly as high TOC values included OO-W-3 (1.18%), OI-CH-4 (1.09%), OI-TS-5AU (1.06%), OI-CH-2A (1.05%), and OO-W-4 (1.01%). By comparison, the reference sediments all contained between 0.28 and 0.35% TOC, and 12 of 23 other stations contained <0.35% TOC (Table 3.10).

3.3.7 Oil and Grease

Quality assurance associated with measurements of total oil and grease are presented in Appendix C, Table C.12. Inspection of these data show that detection limit targets were met. Duplicate analysis was performed on eight samples and produced and RPD of 10% in the only pair of observations above detection. Since there are no criteria for evaluation of this parameter, all data are considered acceptable for use in analysis.

Total oil and grease ranged from <20 to 1208 µg/g (dry weight), (Table 3.10). The reference sediments contained relatively low concentrations, generally <20 µg/g. The highest concentration of total oil and grease (1208 µg/g) was associated with Station OI-TS-5AU. Six other stations had concentrations of oil and grease >100 µg/g. These were OI-MA-2U (361 µg/g), OO-CH-4 (187 µg/g), OO-W-3 (171 µg/g), OI-TS-5AL (147 µg/g), OO-W-4 (124 µg/g), and OI-CH-2A (113 µg/g). As shown in Phase I studies

TABLE 3.10. Total Organic Carbon, Oil and Grease, and Petroleum Hydrocarbon Concentrations in Sediment Samples

Sediment Treatment	Rep	Total Organic Carbon (%)	Total Oil and Grease (μg/g dry wt)	Petroleum Hydrocarbons (μg/g dry wt)
OI-CH-0	1	0.05	< 20	< 20
OI-CH-0	2	0.06	ND[(a)]	ND
OO-CH-1	1	0.68	< 20	< 20
OO-CH-2	1	0.06	69	73
OO-CH-2	2	0.08	ND	ND
OI-CH-2A	1	1.05	113	95
OI-CH-2A	2	1.05	ND	ND
OO-CH-3	1	0.17	< 20	< 20
OO-CH-4	1	1.09	187	144
OI-CH-4A	1	0.02	< 20	< 20
OO-CH-5	1	0.34	95	85
OO-CH-6	1	0.44	53	48
OI-CH-6A	1	0.03	< 20	< 20
OO-CH-7	1	0.13	24	41
OO-CH-8	1	0.41	34	< 20
OI-SS-4L	1	0.01	< 20	< 20
OI-TS-5AU	1	1.06	1096	951
OI-TS-5AU	2	1.06	1208	ND
OI-TS-5AL	1	0.13	147	110
OI-TS-5 Merrit	1	0.01	< 20	< 20
OI-MA-1L	1	0.07	< 20	< 20
OI-MA-1L	2	ND	< 20	ND
OI-MA-2U	1	1.39	361	271
OI-MA-2L	1	0.11	< 20	< 20
OI-MA-2L	2	ND	< 20	ND
OO-W-1	1	0.62	28	25
OO-W-2	1	0.41	34	30
OO-W-3	1	1.18	171	152
OO-W-4	1	1.01	124	125
OO-W-5	1	0.04	< 20	< 20
PR-coarse	1	0.35	< 20	< 20
PR-coarse	2	0.34	ND	ND
PR-fine	1	0.30	< 20	< 20
PR-fine	2	0.31	ND	ND
Tomales Bay	1	0.28	< 20	< 20

(a) ND = Data not available.

(Word et al. 1990b), highest concentrations were associated with sediments in the vicinity of Todd Shipyard and the maneuvering area.

3.3.8 Petroleum Hydrocarbons

Quality assurance information associated with measurements of total organic carbon is presented in Appendix C, Table C.12. Inspection of these data shows that detection limit targets were met. Duplicate analyses were not performed, since these had been evaluated for total oil and grease. Because no criteria for evaluation of this parameter exist, all data are considered acceptable for use in analysis.

The distributions of total oil and grease and petroleum hydrocarbons were similar. Also, at stations with the six highest concentrations of total oil and grease, the concentration of petroleum hydrocarbons is 74% of the total oil and grease concentration or higher (Table 3.10). This indicates that the higher concentrations of 4- and 5-ring PAHs relative to 2- and 3-rings PAHs (see Section 3.3.1) are likely a result of the weathering of the petroleum hydrocarbon fractions, not combustion products.

3.3.9 Grain Size

Quality assurance information for grain size analyses is presented in Appendix C, Tables C.13 and C.14. Duplicate analyses were performed on three samples, resulting in RPDs ranging from 0 to 100%. Most RPDs were below 30%, though high RPDs were associated with the gravel portion of the samples. Because criteria for evaluation of this parameter do not exist, all data are considered acceptable for use in analysis.

Detailed grain size information on each sediment sample for each of 16 phi-size classes is contained in Appendix C, Table C.13. The percentages of sediment contained in major size fractions (gravel, sand, silt, and clay) are summarized in Table 3.11. Ten stations inclusive of the reference sediments have a unimodal distribution of grain size, with greater than 80% of the sediment mass being sand or gravel. Another 10 stations have a unimodal distribution of grain size, where silt and clay represent 70% of the sediment mass.

TABLE 3.11. Percent Sediment Weight Used in Each Sediment Treatment by Major Size Category

Sediment Treatment	Rep	% Total Solids	Estimated Recovery	Sediment (Percent dry wt) Gravel	Sand	Silt	Clay	Total Recovered
OI-CH-0	1	84.44%	93.80%	0.44	85.61	9.22	4.74	100.01
OO-CH-1	1	58.17%	95.78%	0.64	5.14	53.49	40.73	100.00
OO-CH-2	1	80.09%	93.17%	0.00	86.55	8.77	4.69	100.01
OI-CH-2A	1	46.49%	91.04%	0.00	24.17	39.33	49.90	113.40
OO-CH-3	1	74.23%	94.65%	0.13	69.72	17.50	12.65	100.00
OO-CH-4	1	51.08%	91.13%	0.00	11.20	38.28	50.51	99.99
OI-CH-4A	1	83.63%	94.37%	0.00	90.19	6.83	2.97	99.99
OO-CH-5	1	72.03%	95.16%	5.98	57.39	17.28	19.34	99.99
OO-CH-6	1	63.89%	91.38%	0.16	32.80	32.27	34.76	99.99
OI-CH-6A	1	83.85%	95.53%	0.28	85.39	8.57	5.75	99.99
OO-CH-7	1	78.43%	95.34%	0.00	73.91	13.19	12.90	100.00
OO-CH-8	1	67.61%	92.67%	0.20	24.82	41.92	33.08	100.02
OI-SS-4L	1	84.25%	93.81%	0.00	88.64	7.66	3.70	100.00
OI-SS-4L	2	84.36%	92.81%	0.04	87.46	9.45	3.04	99.99
OI-TS-5AU	1	55.88%	93.71%	0.85	28.66	39.23	31.28	100.02
OI-TS-5AU	2	55.94%	97.21%	0.68	30.11	29.95	39.25	99.99
OI-TS-5AL	1	80.33%	93.96%	0.62	83.03	8.85	7.51	100.01
OI-TS-5 Merritt	1	84.11%	92.74%	0.12	90.76	6.69	2.45	100.02
OI-MA-1L	1	84.25%	94.94%	0.29	41.12	37.07	21.52	100.00
OI-MA-1L	2	84.85%	92.33%	0.38	40.75	39.91	18.96	100.00
OI-MA-2U	1	45.74%	92.28%	0.00	6.15	36.96	56.87	99.98
OI-MA-2L	1	82.48%	96.53%	0.65	29.55	41.06	28.75	100.01
OO-W-1	1	60.15%	91.69%	0.09	6.17	53.27	40.47	100.00
OO-W-2	1	65.20%	91.25%	2.30	39.48	31.48	26.74	100.00
OO-W-3	1	46.87%	90.88%	0.00	5.11	40.27	54.61	99.99
OO-W-4	1	51.83%	93.73%	0.00	14.90	39.63	45.46	99.99
OO-W-5	1	84.26%	95.04%	0.00	88.50	7.87	3.63	100.00
PR-coarse	1	67.89%	91.70%	0.00	81.64	13.82	4.51	99.97
PR-fine	1	71.48%	91.85%	0.00	82.16	13.73	4.11	100.00
Tomales Bay	1	79.09%	94.07%	0.00	92.82	5.95	1.37	100.14

3.4 SOLID-PHASE TOXICITY TESTS

Three solid-phase toxicity tests were conducted to evaluate a total of 26 sediment treatments. The toxicity tests included a flow-through test of M. nasuta and N. caecoides (tested together); a flow-through test of R. abronius and A. abdita (tested together); and a static test of R. abronius and A. abdita (tested together). For the purpose of dredged-material analysis, the static R. abronius, flow-through A. abdita, and flow-through M. nasuta/N. caecoides are considered standard tests. The flow-through R. abronius and static A. abdita are considered nonstandard tests. The data resulting from each test first were evaluated to ensure that they met QA/QC guidelines, which include survival in uncontaminated sediments, and acceptable water quality parameters. After QA/QC review, the data were then evaluated by ANOVA, and also through the use of Student's T-test, as recommended by the Implementation Manual. ANOVA was used to determine whether differences between any of the sediment treatments can be detected. If significant differences were detected, Tukey's HSD was used to make all possible pair-wise comparisons between sediments to determine which treatments are significantly different from the PR-coarse treatment. We also examined the differences in proportion survival between the PR-coarse sediment treatment and the other 25 treatments. The Student's T-test was used as another check to determine statistically significant differences between the PR-coarse sediment and all other sediment treatments. The results of these analyses and comparisons enabled us to evaluate the toxicity of the sediments to the test organisms, as required by the Implementation Manual. What follows is a summary of QA/QC results, followed by the results of a discussion of each toxicological test.

3.4.1 Quality Assurance/Quality Control Results

According to the Implementation Manual, data from a toxicological test can be evaluated if control mortalities are less than 10%. Additionally, the QA/QC limits set forth in MSL's Technical Work Plan to USACE state acceptable water quality ranges of 15 ± 1.0°C, ambient salinity ± 1.0 $^{0}/oo$, dissolved oxygen levels of ≥ 4.0 mg/L, pH of ambient ± 0.4, and flow rate (if applicable) of 125 ± 10 mL/min for Macoma/Nephtys and 40 ± 5.0 mL/min for

Ampelisca/Rhepoxynius. The following presents QA/QC summary information for each test, based upon the above criteria.

Macoma/Nephtys Flow-Through Test

Three uncontaminated sediments were evaluated during this test: coarse-grained material collected off Point Reyes, California (PR-coarse), finer-grained material collected off Point Reyes (PR-fine), and sediment native to N. caecoides (Tomales Bay). The PR-coarse material was used to simulate the grain size conditions expected at the proposed disposal area; the PR-fine material provided an uncontaminated fine-grained sediment, and the Tomales Bay material served as sediment native to N. caecoides. Survivals of M. nasuta and N. caecoides were greater than 94% in these sediments (Table 3.12). Water quality data (summarized in Appendix D, Table D.5) show that dissolved oxygen, salinity, and flow parameters were within accepted limits during this test. Water temperature during the test exceeded acceptable ranges on one day, with recorded temperatures beyond the maximum of 16°C and pH values below our target limits in a few containers. This occurred near the end of the toxicological test and did not affect the test organisms, as evidenced by high survival in uncontaminated sediments. For this reason, these data are acceptable.

Ampelisca/Rhepoxynius Flow-Through Test

Amphipod survival in the three uncontaminated sediments ranged from 94 to 100% (Table 3.12) and was thus acceptable for analysis. Water quality conditions were within acceptable ranges for all measured parameters except temperature, which was out of range by 0.1°C on only one day, and one recorded flow rate, which exceeded our maximum by 3 mL/min. All data for these tests are summarized in Appendix E, Table E.5.

Ampelicsa/Rhepoxynius Static Test

Amphipod survival in the three uncontaminated sediments ranged from 97 to 100% (Table 3.12) and were thus acceptable for data analysis. Water quality conditions were within acceptable ranges for all parameters except pH (Appendix F, Table F.5). During the static test, it was necessary to remove and replace 75% of the overlying water to maintain acceptable pH ranges, and some values below our target limits were noted. This removal was performed on day 4 of the test and was not required thereafter. Since high survival was noted in uncontaminated sediment, these water quality parameters did not appear to affect the test. As a result, these data are acceptable.

TABLE 3.12. Quality Assurance/Quality Control Summary Information for Toxicity Tests

Parameter	Ranges of Acceptable QA/QC	Flow-Through Macoma/Nephtys	Flow-Through Ampelisca/Rhepoxynius	Static Ampelisca/Rhepoxynius
Survival in Uncontaminated Sediment	≥ 90%	94%	94 - 100%	97 - 100 %
Dissolved Oxygen	> 4.0 mg/L	Within Range	Within Range	> 4.0 mg/L
pH	ambient ± 0.4	7.20 - 7.95	Within Range	7.20 - 8.20
Salinity	ambient ± 1.0 o/oo	Within Range	Within Range	Within Range
Temperature	14.0 - 16.0 °C	14.5 - 16.8°C	14.2 - 16.1°C	Within Range
Flow (Aquaria)	115 - 135 mL/min	Within Range	5 - 48 mL/min	Not Applicable
Flow (Jars)	35 - 45 mL/min	Not Applicable	Within Range	Not Applicable

3.4.2 Macoma/Nephtys Flow-Through Test

The survivals of M. nasuta and N. caecoides are presented in Table 3.13. These data show that M. nasuta survival was high in all sediment treatments, ranging from 96 to 100%. ANOVA for these data indicates that there is no significant difference (α = 0.05) between the sediment treatments (Table 3.14). For this reason, no further analysis of these data are required. Survival of N. caecoides ranged from a low of 58% in sediment treatment OI-CH-4A to a high of 97% in sediment treatments Tomales Bay and OO-W-3 (Table 3.13). Three sediment treatments produced N. caecoides survivals of less than 80% (OI-CH-4A, OI-SS-4L, and OI-TS-5AL), and survivals of less than 90% were noted in 11 of the 26 sediments tested.

ANOVA of the N. caecoides data (Table 3.15) shows that there are significant differences between sediment treatments. Tukey's HSD test produced the statistical groups depicted in Table 3.16. This test shows that sediment treatments OI-CH-4A, OI-SS-4L, and OI-TS-5AL are significantly different from the PR-coarse sediment in that they belong to a different statistical group. This is illustrated by the 95% confidence intervals associated with the angular-transformed data (Figure 3.5). A comparison of N. caecoides percent survival shows that these three sediment treatments produced percent survivals ranging from 15 to 36% less than that recorded in the PR-coarse sediment (Table 3.16). In all, 5 of 25 sediment treatments produced percent survivals that were at least 10% less than that recorded in the PR-coarse sediment treatment.

One-tailed independent t-tests of the survival of N. caecoides in the sediment treatments versus their survival in the PR-coarse sediment showed that a total of nine sediment treatments were significantly different (α = 0.05) from the PR-coarse (Table 3.17). These treatments included the three mentioned above, as well as OI-CH-6A, OI-TS-5AU, OI-MA-2U, OI-CH-O, OI-MA-2L, and OO-W-1. All of these treatments produced percent survivals of less than 90% and survivals of at least 7% less than the PR-coarse treatment, whereas only the first two had survivals of at least 10% less than the PR-coarse sediment treatment.

TABLE 3.13. Mean and Percent Survival of *M. nasuta* and *N. caecoides* After 10-day Flow-Through Exposure Based on Five Replicate Measurments per Sediment Treatment and 20 Individuals per Species in Each Replicate

Sediment Treatment	*M. nasuta* Mean Survival	SD	Percent Survival	*N. caecoides* Mean Survival	SD	Percent Survival
OI-CH-0	19.8	0.45	99.0	17.2	1.64	86.0
OO-CH-1	19.8	0.45	99.0	19.2	1.10	96.0
OO-CH-2	20.0	0.00	100.0	17.4	1.67	87.0
OI-CH-2A	20.0	0.00	100.0	18.0	1.22	90.0
OO-CH-3	20.0	0.00	100.0	17.2	1.92	86.0
OO-CH-4	20.0	0.00	100.0	19.0	1.73	95.0
OI-CH-4A	20.0	0.00	100.0	11.6	4.77	58.0
OO-CH-5	20.0	0.00	100.0	19.0	1.00	95.0
OO-CH-6	19.8	0.45	99.0	18.6	1.34	93.0
OI-CH-6A	20.0	0.00	100.0	16.6	1.67	83.0
OO-CH-7	19.2	1.10	96.0	18.0	0.00	90.0
OO-CH-8	20.0	0.00	100.0	18.2	1.30	91.0
OI-SS-4L	19.8	0.45	99.0	15.2	1.64	76.0
OI-TS-5AU[a]	19.4	1.34	96.0	16.8	1.79	84.0
OI-TS-5AL[a]	20.0	0.71	99.0	15.8	1.30	79.0
OI-MA-1L	20.0	0.00	100.0	18.2	0.45	91.0
OI-MA-2U	20.0	0.00	100.0	17.0	1.58	85.0
OI-MA-2L	19.8	0.45	99.0	17.4	1.14	87.0
OO-W-1	20.0	0.00	100.0	17.4	1.34	87.0
OO-W-2	20.0	0.00	100.0	18.0	0.71	90.0
OO-W-3	20.0	0.00	100.0	19.4	1.34	97.0
OO-W-4	19.8	0.45	99.0	19.0	1.22	95.0
OO-W-5	20.0	0.00	100.0	18.2	0.84	91.0
PR-coarse	20.0	0.00	100.0	18.8	0.84	94.0
PR-fine	20.0	0.00	100.0	19.0	1.00	95.0
Tomales Bay	20.0	0.00	100.0	19.4	0.89	97.0

(a) One replicate contained 21 Macoma instead of 20
SD = Standard deviation

TABLE 3.14. Balanced One-Way ANOVA for 26 Sediment Treatments Using the Arcsine (expressed in radians) Square Root of the Proportion of *M. nasuta* Surviving a 10-Day Flow-Through Exposure

Source of Variation	Sum of Squares	d.f.	Mean Square	F-Ratio	Significance Level
Between Group	0.1737	25	0.0069	1.355	0.1461
Within Groups	0.5333	104	0.0051		
Total (corrected)	0.7070	129			

TABLE 3.15. Balanced One-Way ANOVA for 26 Sediment Treatments Using the Arcsine (expressed in radians) Square Root of the Proportion of *N. caecoides* Surviving a 10-Day Flow-Through Exposure

Source of Variation	Sum of Squares	d.f.	Mean Square	F-Ratio	Significance Level
Between Groups	2.3630	25	0.0945	4.661	0.0000
Within Groups	2.1089	104	0.0203		
Total (corrected)	4.4719	129			

TABLE 3.16. Comparison of *N. caecoides* Surviving for All Sediment Treatments

Sediment Treatment	Percent Survival	Statistical Group [a]	Change in Percent When Compared to PR-coarse [b]
00-CH-4A	58.0	A	36.0
0I-SS-4L	76.0	AB	18.0
0I-TS-5AL	79.0	ABC	15.0
0I-CH-6A	83.0	ABCD	11.0
0I-TS-5AU	84.0	ABCD	10.0
0I-MA-2U	85.0	ABCD	9.0
0I-CH-0	86.0	ABCD	8.0
0I-MA-2L	87.0	ABCD	7.0
00-W-1	87.0	ABCD	7.0
00-CH-2	87.0	ABCD	7.0
00-CH-3	86.0	BCD	8.0
00-CH-7	90.0	BCD	4.0
00-W-2	90.0	BCD	4.0
0I-CH-2A	90.0	BCD	4.0
0I-MA-1L	91.0	BCD	3.0
00-W-5	91.0	BCD	3.0
00-CH-8	91.0	BCD	3.0
00-CH-6	93.0	BCD	1.0
PR-coarse	94.0	BCD	0.0
00-CH-5	95.0	BCD	-1.0
PR-fine	95.0	BCD	-1.0
00-W-4	95.0	BCD	-1.0
00-CH-4	95.0	CD	-1.0
00-CH-1	96.0	D	-2.0
Tomales Bay	97.0	D	-3.0
00-W-3	97.0	D	-3.0

(a) Sediment treatments with the same statistical group are not significantly different from each other

(b) Percentage of survival in PR-course minus percent survival in that treatment

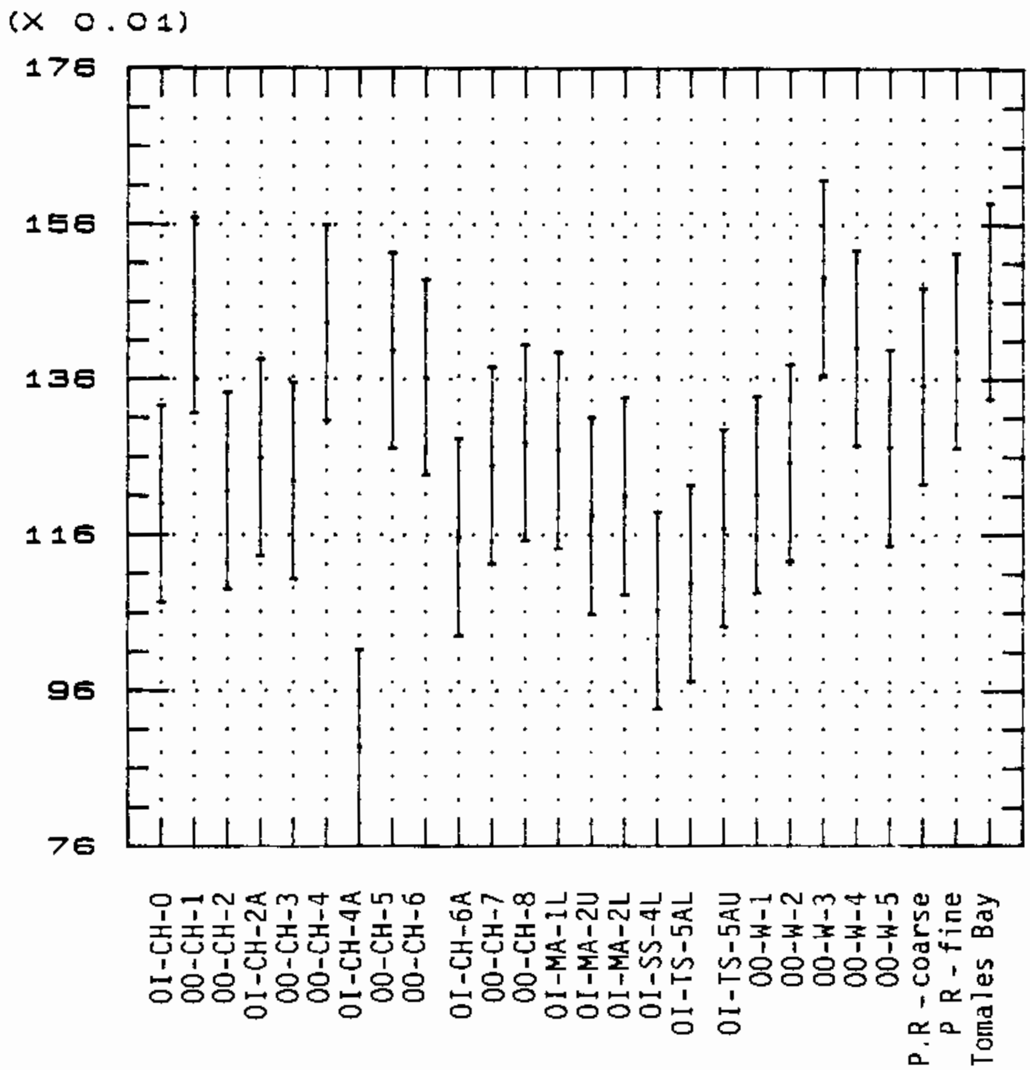


FIGURE 3.5. 95% Confidence Intervals of the Arcsine Square Root of the Proportion of *N. caecoides* Surviving a 10-day Flow-Through Exposure

TABLE 3.17. One-Tailed Independent T-Tests of the Survival of *N. caecoides* in Various Sediment Treatments Versus the Survival in PR-coarse Sediment Using the Arcsine Square Root of the Proportion Surviving a 10-day Flow Through Exposure

Sediment Treatment	Mean	SD	T-Value	d.f.	Probability	Two-Sided -95% CI About Mean Difference
PR-coarse	1.352	0.13	--	--	--	--
OI-CH-0	1.200	0.12	1.91	8.0	0.0462[a]	(-0.03, 0.34)
OO-CH-1	1.442	0.18	-0.92	7.4	0.8071	(-0.32, 0.14)
OO-CH-2	1.217	0.13	1.65	8.0	0.0692	(-0.05, 0.32)
OI-CH-2A	1.259	0.10	1.27	7.4	0.1206	(-0.08, 0.26)
OO-CH-3	1.229	0.21	1.12	6.8	0.1469	(-0.14, 0.38)
OO-CH-4	1.433	0.21	-0.74	6.8	0.7598	(-0.34, 0.18)
OI-CH-4A	0.887	0.28	3.33	5.6	0.0052[a]	(0.12, 0.81)
OO-CH-5	1.397	0.16	-0.48	7.6	0.6782	(-0.26, 0.17)
OO-CH-6	1.363	0.19	-0.10	7.1	0.5395	(-0.26, 0.24)
OI-CH-6A	1.157	0.12	2.42	8.0	0.0209[a]	(0.01, 0.38)
OO-CH-7	1.249	0.00	1.75	4.0	0.0592	(-0.06, 0.27)
OO-CH-8	1.278	0.10	0.98	7.6	0.1782	(-0.10, 0.25)
OI-SS-4L	1.063	0.10	3.96	7.3	0.0021[a]	(0.12, 0.46)
OI-TS-5AU	1.169	0.12	2.32	8.0	0.0243[a]	(0.00, 0.36)
OI-TS-5AL	1.098	0.08	3.69	6.6	0.0031[a]	(0.09, 0.42)
OI-MA-1L	1.268	0.04	1.35	4.8	0.1068	(-0.08, 0.24)
OI-MA-2U	1.184	0.12	2.13	8.0	0.0331[a]	(-0.01, 0.35)
OI-MA-2L	1.210	0.09	1.99	7.1	0.0409[a]	(-0.03, 0.31)
OO-W-1	1.212	0.10	1.88	7.6	0.0486[a]	(-0.03, 0.31)
OO-W-2	1.253	0.06	1.52	5.7	0.0831	(-0.06, 0.26)
OO-W-3	1.491	0.18	-1.41	7.4	0.9017	(-0.37, 0.09)
OO-W-4	1.401	0.17	-0.51	7.5	0.6885	(-0.27, 0.18)
OO-W-5	1.272	0.07	1.18	6.3	0.1358	(-0.08, 0.24)
P.R. fine	1.397	0.16	-0.48	7.6	0.6782	(-0.26, 0.17)
Tomales Bay	1.461	0.15	-1.21	7.8	0.8696	(-0.32, 0.10)

(a) SD = Significant at $P \leq 0.05$

3.4.3 Ampelisca/Rhepoxynius Flow-Through Test

The survivals of A. abdita and R. abronius under flow-through conditions are summarized in Table 3.18. These data show that survival of A. abdita was high in all sediment treatments, ranging from a low of 87% in sediment treatment OO-CH-3 to a high of 100% in the Tomales Bay sediment treatment. Since ANOVA of these data show that sediment treatments do not differ significantly (Table 3.19), these data do not provide significant effects for discussion.

The survival of R. abronius ranged from a low of 52% in sediment treatment OO-CH-8 to a high of 99% in sediment treatment PR-fine. A total of 12 of 26 treatments showed percent survival lower than 80, and a total of 17 of 26 treatments showed mean survival lower than 90% (Tables 3.18 and 3.20). ANOVA on these data showed that there were significant differences between sediment treatments (Table 3.21). Tukey's HSD test resulted in 15 of 26 treatments grouping away from the PR-coarse treatment (Table 3.20 and Figure 3.6). The treatments grouping away from the PR-coarse exhibited a percent survival of at least 10% less than that recorded in the PR-coarse, and in 10 cases, the percent survival in these treatments was at least 20% less than that recorded in the PR-coarse sediment treatment (Table 3.22). One-tailed independent t-tests of the survival of R. abronius in the sediment showed that 15 sediment treatments were significantly different ($\alpha = 0.05$) than the PR-coarse treatment (Table 3.22).

TABLE 3.18. Mean and Percent Survival of *A. abdita* and *R. abronius* After 10-day Flow-Through Exposure Based on 5 Replicate Measurements Per Sediment Treatment and 20 Individuals per Species in Each Replicate

Sediment Treatment	A. abdita Mean Survival	A. abdita SD	A. abdita Percent Survival	R. abronius Mean Survival	R. abronius SD	R. abronius Percent Survival
OI-CH-0	19.0	1.00	95.0	17.0	2.74	85.0
OO-CH-1	18.6	1.34	93.0	14.6	3.91	73.0
OO-CH-2	18.4	1.82	92.0	18.4	1.34	92.0
OI-CH-2A	18.2	1.30	91.0	13.0	1.00	65.0
OO-CH-3	17.4	1.67	87.0	16.6	3.51	83.0
OO-CH-4	19.2	0.45	96.0	16.2	2.17	81.0
OI-CH-4A	18.6	1.52	93.0	18.6	1.52	93.0
OO-CH-5	19.0	1.00	95.0	15.0	1.87	75.0
OO-CH-6	17.8	1.30	89.0	13.0	3.39	65.0
OI-CH-6A	19.6	0.55	98.0	18.8	0.84	94.0
OO-CH-7	18.6	0.89	93.0	12.4	2.88	62.0
OO-CH-8	18.0	1.22	90.0	10.4	1.14	52.0
OI-SS-4L	18.8	0.84	94.0	19.2	0.45	96.0
OI-TS-5AU	18.4	0.55	92.0	12.6	2.41	63.0
OI-TS-5AL	18.8	2.17	94.0	18.2	1.30	91.0
OI-MA-1L	18.8	0.84	94.0	13.0	0.71	65.0
OI-MA-2U	18.6	1.52	93.0	15.0	1.00	75.0
OI-MA-2L	19.0	1.00	95.0	16.4	1.14	82.0
OO-W-1	18.8	1.10	94.0	15.8	1.92	79.0
OO-W-2	18.2	1.92	91.0	14.8	1.64	74.0
OO-W-3	18.8	1.30	94.0	16.2	2.17	81.0
OO-W-4	17.8	1.48	89.0	15.8	0.84	79.0
OO-W-5	19.6	0.55	98.0	19.4	0.55	97.0
PR-coarse	18.8	1.30	94.0	19.0	1.41	95.0
PR-fine	19.2	1.30	96.0	19.8	0.45	99.0
Tomales Bay	20.0	0.00	100.0	19.4	0.89	97.0

TABLE 3.19. Balanced One-Way ANOVA for 26 Sediment Treatments Using the Arcsine (expressed in radians) Square Root of the Proportion of *A. abdita* Surviving a 10-Day Flow-Through Exposure

Source of Variation	Sum of Squares	d.f.	Mean Square	F-Ratio	Significance Level
Between Groups	0.7430	25	0.0297	1.204	0.254
Within Groups	2.5663	104	0.0247		
Total (Corrected)	3.3092	129			

TABLE 3.20. Comparison of All *R. abronius* Surviving for All Flow-Through Treatments

Sediment Treatment	Percent Survival	Statistical Group [a]	Change in Percent When Compared to PR-coarse [b]
OO-CH-8	52.0	A	43.0
OO-CH-7	62.0	AB	33.0
OI-TS-5AU	63.0	AB	32.0
OI-MA-IL	65.0	ABC	30.0
OI-CH-2A	65.0	ABC	30.0
OO-CH-6	65.0	ABC	30.0
OO-CH-1	73.0	ABCD	22.0
OO-W-2	74.0	ABCD	21.0
OI-MA-2U	75.0	ABCD	20.0
OO-CH-5	75.0	ABCD	20.0
OO-W-4	79.0	ABCDE	16.0
OO-W-1	79.0	ABCDE	16.0
OO-W-3	81.0	ABCDEF	14.0
OI-MA-2L	82.0	ABCDEF	13.0
OO-CH-4	81.0	BCDEF	14.0
OO-CH-3	83.0	BCDEFG	12.0
OI-CH-0	85.0	BCDEFG	10.0
OI-TS-5AL	91.0	CDEFG	4.0
OO-CH-2	92.0	DEFG	3.0
OI-CH-4A	93.0	DEFG	2.0
OI-CH-6A	94.0	DEFG	1.0
OI-SS-4L	96.0	DEFG	-1.0
PR-coarse	95.0	EFG	0.0
OO-W-5	97.0	EFG	-2.0
Tomales Bay	97.0	FG	-2.0
PR-fine	99.0	G	-4.0

(a) Sediment treatments with the same statistical group are not significantly different from each other

(b) Percentage of survival in PR-coarse minus percent survival in that treatment

TABLE 3.21. Balanced One-Way ANOVA for 26 Sediment Treatments Using the Arcsine (expressed in radians) Square Root of the Proportion of *R. abronius* Surviving a 10-Day Flow-Through Exposure

Source of Variation	Sum of Squares	d.f.	Mean Square	F-Ratio	Significance Level
Between Groups	5.0060	25	0.2002	9.054	0.000
Within Groups	2.3001	104	0.0221		
Total (Corrected)	7.306	129			

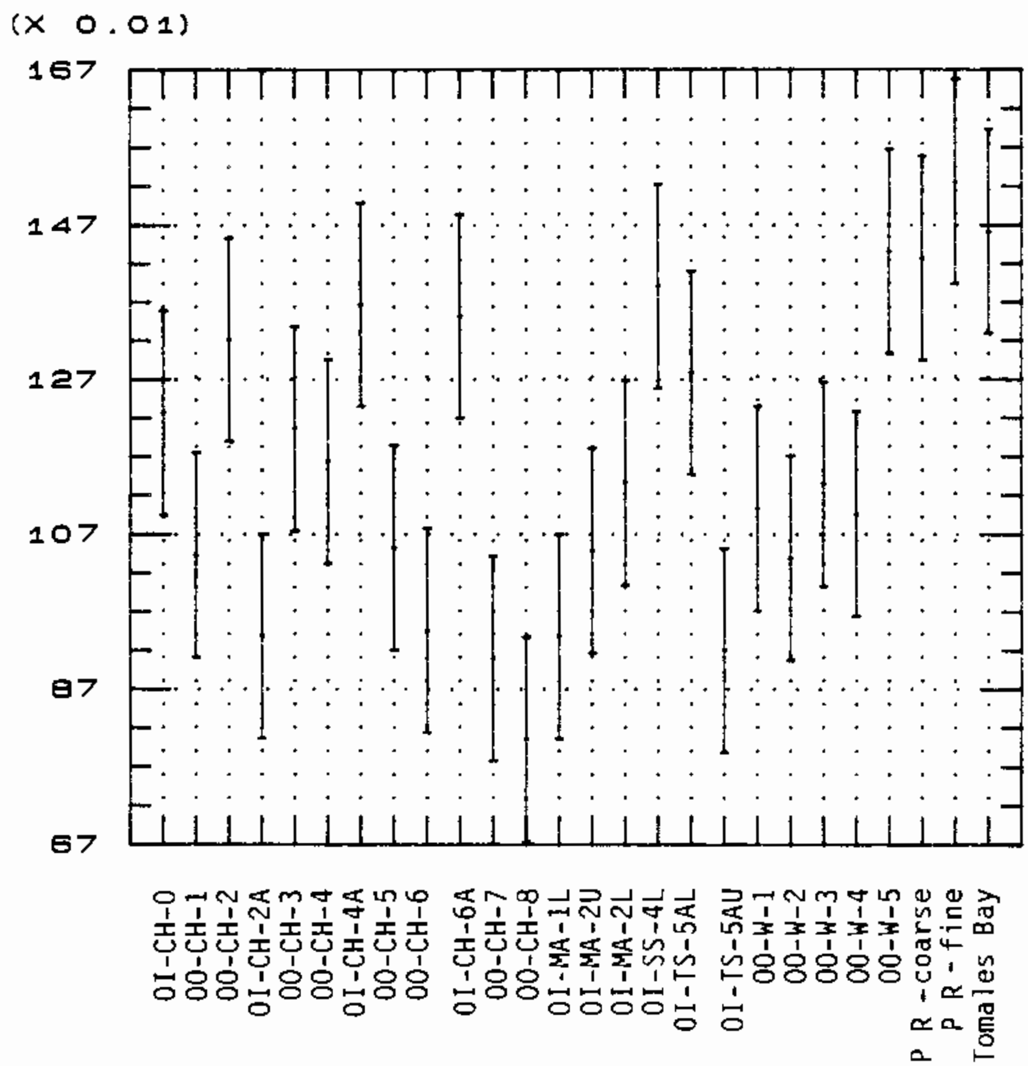


FIGURE 3.6. 95% Confidence Intervals of the Arcsine Square Root of the Proportion of *R. abronius* Surviving a 10-day Flow-Through Exposure

TABLE 3.22. One-Tailed Independent T-Tests of the Survival of *R. abronius* in Various Sediment Treatments Versus the Survival in PR-coarse Sediment Using the Arcsine Square Root of the Proportion Surviving a 10-day Flow Through Exposure

Sediment Treatment	Mean	SD	T-Value	d.f.	Probability	Two-Sided -95% CI About Mean Difference
PR-coarse	1.427	0.20	--	--	--	--
OI-CH-0	1.227	0.24	1.43	7.7	0.1904	(-0.12, 0.52)
OO-CH-1	1.043	0.22	2.88	8.0	0.0102(a)	(0.08, 0.69)
OO-CH-2	1.322	0.16	0.91	7.7	0.1935	(-0.16, 0.37)
OI-CH-2A	0.938	0.05	5.31	4.6	0.0004(a)	(0.24, 0.73)
OO-CH-3	1.206	0.27	1.46	7.3	0.0917	(-0.13, 0.58)
OO-CH-4	1.164	0.23	1.94	7.8	0.0442(a)	(-0.05, 0.58)
OI-CH-4A	1.367	0.20	0.48	8.0	0.3224	(-0.23, 0.35)
OO-CH-5	1.053	0.11	3.70	6.2	0.0030(a)	(0.13, 0.62)
OO-CH-6	0.946	0.18	3.98	8.0	0.0020(a)	(0.20, 0.76)
OI-CH-6A	1.352	0.13	0.70	6.9	0.2508	(-0.18, 0.33)
OO-CH-7	0.910	0.15	4.66	7.4	0.0008(a)	(0.26, 0.78)
OO-CH-8	0.806	0.06	6.71	4.7	0.0001(a)	(0.38, 0.86)
OI-SS-4L	1.390	0.10	0.37	5.9	0.3618	(-0.21, 0.28)
OI-TS-5AU	0.920	0.13	4.82	6.7	0.0007(a)	(0.26, 0.76)
OI-TS-5AL	1.278	0.10	1.48	6.0	0.0888	(-0.10, 0.39)
OI-MA-1L	0.938	0.04	5.40	4.3	0.0003(a)	(0.24, 0.73)
OI-MA-2U	1.049	0.06	4.08	4.7	0.0018(a)	(0.13, 0.62)
OI-MA-2L	1.137	0.08	3.04	5.2	0.0080(a)	(0.05, 0.53)
OO-W-1	1.103	0.12	3.13	6.5	0.0070(a)	(0.08, 0.57)
OO-W-2	1.039	0.09	3.97	5.6	0.0021(a)	(0.14, 0.63)
OO-W-3	1.135	0.15	2.63	7.4	0.0151(a)	(0.03, 0.55)
OO-W-4	1.096	0.05	3.59	4.6	0.0035(a)	(0.09, 0.57)
OO-W-5	1.435	0.12	-0.08	6.7	0.5317	(-0.26, 0.24)
PR-fine	1.526	0.10	-0.99	5.9	0.8246	(-0.34, 0.15)
Tomales Bay	1.461	0.15	-0.31	7.5	0.6164	(-0.30, 0.23)

(a) SD = Significant at $P \leq 0.05$

3.4.4 Ampelisca/Rhepoxynius Static Test

The results of the static test of A. abdita and R. abronius are presented in Table 3.23. The percent survival of A. abdita ranged from a low of 47 (OI-TS-5AL) to a high of 98 (OI-CH-6A and Tomales Bay). Five sediment treatments displayed percent survivals of less than 90, and ANOVA of all data show that there are significant differences between sediment treatments (Table 3.24). Tukey's HSD test indicates that two sediment treatments (OI-TS-5AL and OI-TS-5AU) are grouped away from the PR-coarse treatment and are thus significantly different (Table 3.25 and Figure 3.7). The 47% survival recorded in sediment treatment OI-TS-5AL is 50% less than that recorded in the PR-coarse treatment; sediment treatment OI-TS-5AU displayed 25% less survival than the PR-coarse (Table 3.25). The one-tailed independent t-tests of survival of A. abdita in treatments versus the survival in the PR-coarse showed that a total of nine sediment treatments are significantly different from the PR-coarse (Table 3.26). The eight significant sediment treatments include the OI-TS-5AL and OI-TS-5AU treatments, which were significant in the Tukey's analysis, and treatments OI-CH-0, OO-CH-3, OO-CH-5, OO-CH-6, OO-CH-7, OI-MA-1L, and OO-W-2.

The results of the static test of R. abronius shows that percent survival ranged from a low of 63 in the OI-MA-1L treatment to a high of 100 in the Tomales Bay and PR-coarse treatments (Table 3.27). A total of nine treatments displayed a percent survival less than 90. ANOVA of these data indicate that sediment treatments differ significantly (Table 3.28), and the Tukey's HSD test only groups one sediment treatment, OI-MA-1L, away from the PR-coarse (Table 3.29 and Figure 3.8). The OI-MA-1L sediment treatment displayed a percent survival 37% less than that recorded in the PR-coarse treatment. The one-tail independent t-test on the survival of R. abronius in sediment treatments versus survival in the PR-coarse shows that a total of 21 sediment treatments are significantly different from the PR-coarse (Table 3.29). Sediment treatments not significantly different were the Merritt sand stations at OI-CH-4A and OI-CH-6A, PR-fine and Tomales Bay. The t-test results indicate that any sediment treatment with less than 97%

TABLE 3.23. Mean and Percent Survival of *A. abdita* and *R. abronius* After 10-day Static Exposure Based on Five Replicate Measurements Per Sediment Treatment and 20 Individuals Per Species in Each Replicate

Sediment Treatment	A. abdita Mean Survival	A. abdita SD	A. abdita Percent Survival	R. abronius Mean Survival	R. abronius SD	R. abronius Percent Survival
OI-CH-0	18.2	0.84	91.0	18.4	1.14	92.0
OO-CH-1	18.4	1.14	92.0	18.6	1.52	93.0
OO-CH-2	19.2	0.84	96.0	18.4	1.14	92.0
OI-CH-2A	19.2	1.10	96.0	17.6	2.30	88.0
OO-CH-3	18.4	0.89	92.0	17.4	1.67	87.0
OO-CH-4	18.4	1.14	92.0	17.6	1.67	88.0
OI-CH-4A	19.4	0.89	97.0	19.6	0.55	98.0
OO-CH-5	18.4	0.89	92.0	18.4	1.52	92.0
OO-CH-6	17.4	1.52	87.0	18.4	1.14	92.0
OI-CH-6A	19.6	0.55	98.0	19.4	0.89	97.0
OO-CH-7	18.4	0.89	92.0	18.2	1.30	91.0
OO-CH-8	18.0	2.00	90.0	17.4	1.34	87.0
OI-SS-4L	18.4	1.52	92.0	19.0	0.71	95.0
OI-TS-5AU	14.4	1.52	72.0	16.0	3.61	80.0
OI-TS-5AL	9.4	2.07	47.0	17.6	2.07	88.0
OI-MA-1L	17.8	1.30	89.0	12.6	2.70	63.0
OI-MA-2U	19.4	0.89	97.0	17.2	0.84	86.0
OI-MA-2L	19.0	1.00	95.0	18.4	1.52	92.0
OO-W-1	18.6	1.67	93.0	17.8	1.10	89.0
OO-W-2	17.6	1.52	88.0	18.0	1.00	90.0
OO-W-3	18.4	1.14	92.0	18.6	1.14	93.0
OO-W-4	18.0	1.87	90.0	18.8	0.84	94.0
OO-W-5	19.0	1.41	95.0	19.0	1.22	95.0
PR-coarse	19.4	0.89	97.0	20.0	0.00	100.0
PR-fine	19.4	0.89	97.0	19.6	0.55	98.0
Tomales Bay	19.6	0.55	98.0	20.0	0.00	100.0

survival is significantly different from the PR-coarse treatment, thus indicating a highly precise measurement. Only 10 of these significantly different stations also have a greater than 10% increase in mortality over the Point Reyes coarse. These sediments are OI-MA-1L, OI-TS-5AU, OI-MA-2U, OO-CH-3, OO-CH-8, OO-CH-4, OO-CH-2A, OI-TS-5AL, OO-W-1, and OO-W-2.

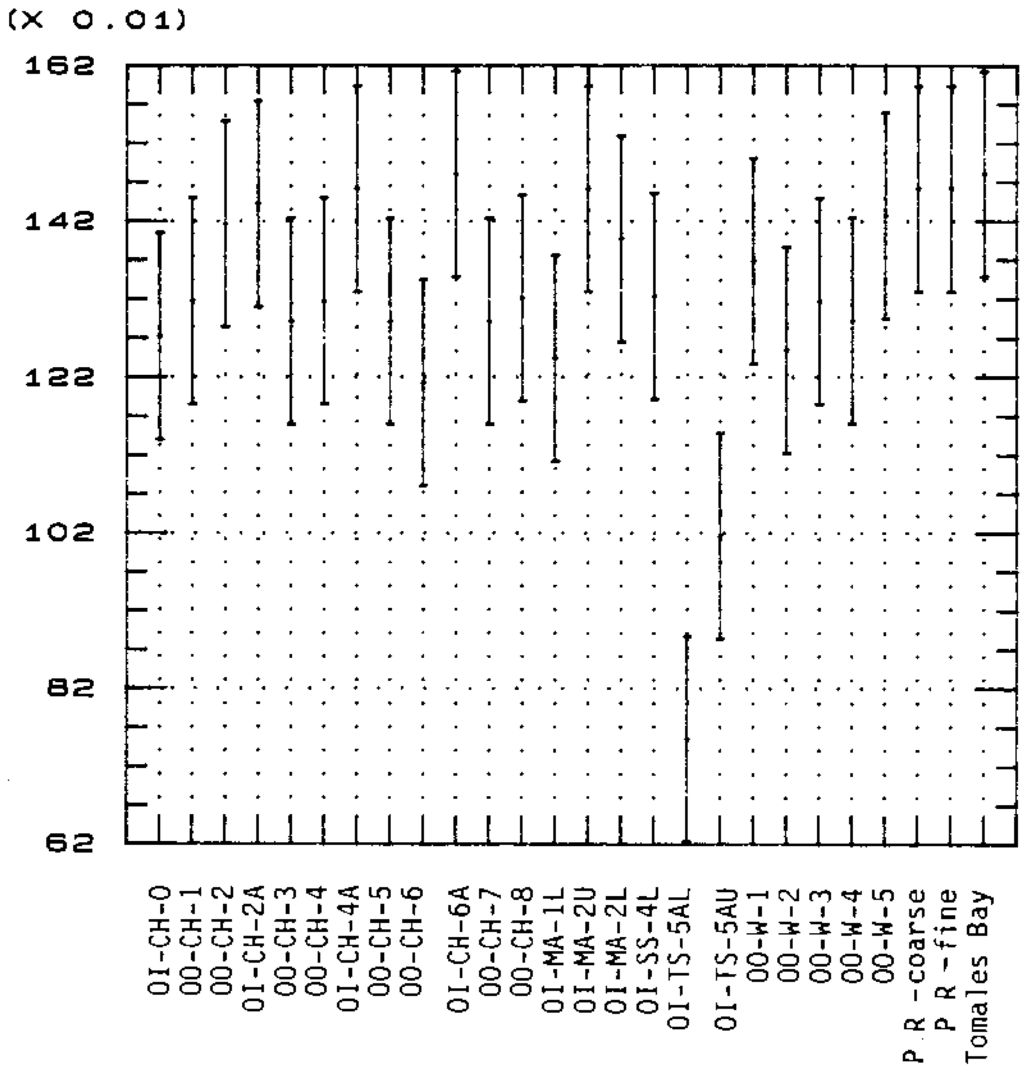
TABLE 3.24. Balanced One-Way ANOVA for 26 Sediment Treatments Using the Arcsine (expressed in radians) Square Root of the Proportion of *A. abdita* Surviving a 10-Day Static Exposure

Source of Variation	Sum of Squares	d.f.	Mean Square	F-Ratio	Significance Level
Between Groups	3.0660	25	0.1226	5.539	0.000
Within Groups	2.3027	104	0.0221		
Total (Corrected)	5.3687	129			

TABLE 3.25. Comparison of *A. abdita* Surviving the 10-day Static Test

Sediment Treatment	Percent Survival	Statistical Group [a]	Change in Percent When Compared with PR-coarse [b]
OI-TS-5AL	47.0	A	50.0
OI-TS-5AU	72.0	AB	25.0
OO-CH-6	87.0	BC	10.0
OI-MA-1L	89.0	BC	8.0
OO-W-2	88.0	BC	9.0
OO-W-4	90.0	BC	7.0
OO-CH-8	90.0	BC	7.0
OI-CH-0	91.0	BC	6.0
OO-CH-7	92.0	BC	5.0
OI-SS-4L	92.0	BC	5.0
OO-CH-5	92.0	BC	5.0
OO-W-3	92.0	BC	5.0
OO-CH-4	92.0	BC	5.0
OO-CH-3	92.0	BC	5.0
OO-CH-1	92.0	BC	5.0
OO-W-1	93.0	BC	4.0
OO-W-5	95.0	C	2.0
OI-MA-2L	95.0	C	2.0
OI-CH-2A	96.0	C	1.0
OO-CH-2	96.0	C	1.0
OI-MA-2U	97.0	C	0.0
PR-coarse	97.0	C	0.0
OI-CH-4A	97.0	C	0.0
PR-fine	97.0	C	0.0
OI-CH-6A	98.0	C	-1.0
Tomales Bay	98.0	C	-1.0

(a) Sediment treatments with the same statistical group are not significantly different from each other
(b) Percentage of survival in PR-coarse minus percent survival in that treatment



<u>FIGURE 3.7</u>. 95% Confidence Intervals of the Arcsine Square Root of the Proportion of <u>A</u>. <u>abdita</u> Surviving a 10-day Static Exposure

TABLE 3.26. One-Tailed Independent T-Tests of the Survival of _A. abdita_ in Various Sediment Treatments Versus the Survival in PR-coarse Sediment Using the Arcsine Square Root of the Proportion Surviving a 10-day Static Exposure

Sediment Treatment	Mean	SD	T-Value	d.f.	Probability	Two-Sided -95% CI About Mean Difference
PR-coarse	1.461	0.15	--	--	--	--
OI-CH-0	1.272	0.07	2.48	5.7	0.0190(a)	(0.00, 0.38)
OO-CH-1	1.317	0.15	1.48	8.0	0.0889	(-0.08, 0.37)
OO-CH-2	1.416	0.15	0.48	8.0	0.3237	(-0.17, 0.26)
OI-CH-2A	1.442	0.18	0.18	8.0	0.4293	(-0.22, 0.26)
OO-CH-3	1.292	0.08	2.20	5.9	0.0295(a)	(-0.02, 0.36)
OO-CH-4	1.317	0.15	1.48	8.0	0.0889	(-0.08, 0.37)
OI-CH-4A	1.461	0.15	0.00	8.0	0.5000	(-0.22, 0.22)
OO-CH-5	1.292	0.08	2.20	5.9	0.0295(a)	(-0.02, 0.36)
OO-CH-6	1.213	0.11	2.93	7.3	0.0094(a)	(0.05, 0.45)
OI-CH-6A	1.481	0.12	-0.22	7.6	0.5837	(-0.22, 0.19)
OO-CH-7	1.292	0.08	2.20	5.9	0.0295(a)	(-0.02, 0.36)
OO-CH-8	1.321	0.24	1.12	6.9	0.1483	(-0.16, 0.44)
OI-SS-4L	1.324	0.17	1.35	8.0	0.1072	(-0.10, 0.37)
OI-TS-5AU	1.016	0.09	5.65	6.3	0.0002(a)	(0.25, 0.64)
OI-TS-5AL	0.756	0.10	8.48	7.1	0.0000(a)	(0.51, 0.90)
OI-MA-1L	1.244	0.11	2.61	7.1	0.0156(a)	(0.02, 0.41)
OI-MA-2U	1.461	0.15	0.00	8.0	0.5000	(-0.22, 0.22)
OI-MA-2L	1.397	0.16	0.64	8.0	0.2696	(-0.17, 0.30)
OO-W-1	1.369	0.20	0.81	7.5	0.2196	(-0.17, 0.36)
OO-W-2	1.255	0.18	1.93	7.8	0.0449(a)	(-0.04, 0.46)
OO-W-3	1.317	0.15	1.48	8.0	0.0889	(-0.08, 0.37)
OO-W-4	1.292	0.19	1.55	7.7	0.0801	(-0.08, 0.42)
OO-W-5	1.427	0.20	0.31	7.5	0.3836	(-0.23, 0.30)
PR-fine	1.461	0.15	0.00	8.0	0.5000	(-0.22, 0.22)
Tomales Bay	1.481	0.12	-0.22	7.6	0.5837	(-0.22, 0.19)

(a) SD = Significant at $P \leq 0.05$

TABLE 3.27. Comparison of *R. abronius* Surviving the 10-day Static Test

Sediment Treatment	Percent Survival	Statistical Group [(a)]	Change in Percent When Compared with PR-coarse [(b)]
OI-MA-1L	63.0	A	37.0
OI-TS-5AU	80.0	AB	20.0
OI-MA-2U	86.0	AB	14.0
OO-CH-3	87.0	ABC	13.0
OO-CH-8	87.0	ABC	13.0
OO-CH-4	88.0	ABC	12.0
OI-CH-2A	88.0	ABC	12.0
OI-TS-5AL	88.0	ABC	12.0
OO-W-1	89.0	ABC	11.0
OO-W-2	90.0	ABC	10.0
OO-CH-7	91.0	BC	9.0
OI-CH-0	92.0	BC	8.0
OO-CH-5	92.0	BC	8.0
OO-CH-2	92.0	BC	8.0
OO-CH-6	92.0	BC	8.0
OI-MA-2L	92.0	BC	8.0
OO-W-3	93.0	BC	7.0
OO-CH-1	93.0	BC	7.0
OO-W-4	94.0	BC	6.0
OI-SS-4L	95.0	BC	5.0
OO-W-5	95.0	BC	5.0
OI-CH-6A	97.0	BC	3.0
PR-fine	98.0	BC	2.0
OI-CH-4A	98.0	BC	2.0
Tomales Bay	100.0	C	0.0
PR-coarse	100.0	C	0.0

(a) Sediment treatments with the same statistical group are not significantly different from each other
(b) Percentage of survival in PR-coarse minus percent survival in that treatment

TABLE 3.28. Balanced One-Way ANOVA for 26 Sediment Treatments Using the Arcsine (Expressed in Radians) Square Root of the Proportion of *R. abronius* Surviving a 10-Day Static Exposure

Source of Variation	Sum of Squares	d.f.	Mean Square	F-Ratio	Significance Level
Between Groups	2.2498	25	0.0900	3.750	0.000
Within Groups	2.4956	104	0.0240		
Total (Corrected)	4.7454	129			

TABLE 3.29. One-Tailed Independent T-Tests of the Survival of R. abronius in Various Sediment Treatments Versus the Survival in PR-coarse Sediment Using the Arcsine Square Root of the Proportion Surviving a 10-day Static Exposure

Sediment Treatment	Mean	SD	T-Value	d.f.	Probability	Two-Sided -95% CI About Mean Difference
PR-coarse	1.571	0.00	--	--	--	--
OI-CH-0	1.317	0.15	-3.67	4.0	0.0107(a)	(1.13, 1.51)
OO-CH-1	1.367	0.20	-2.29	4.0	0.0418(a)	(1.12, 1.61)
OO-CH-2	1.317	0.15	-3.67	4.0	0.0107(a)	(1.13, 1.51)
OI-CH-2A	1.266	0.21	-3.18	4.0	0.0167(a)	(1.00, 1.53)
OO-CH-3	1.241	0.19	-3.81	4.0	0.0095(a)	(1.00, 1.48)
OO-CH-4	1.232	0.13	-6.01	4.0	0.0019(a)	(1.08, 1.39)
OI-CH-4A	1.481	0.12	-1.63	4.0	0.0889	(1.33, 1.63)
OO-CH-5	1.347	0.21	-2.42	4.0	0.0363(a)	(1.09, 1.60)
OO-CH-6	1.317	0.15	-3.67	4.0	0.0107(a)	(1.13, 1.51)
OI-CH-6A	1.461	0.15	-1.59	4.0	0.0932	(1.27, 1.65)
OO-CH-7	1.302	0.17	-3.62	4.0	0.0112(a)	(1.10, 1.51)
OO-CH-8	1.212	0.10	-7.79	4.0	0.0007(a)	(1.08, 1.34)
OI-SS-4L	1.371	0.12	-3.75	4.0	0.0100(a)	(1.22, 1.52)
OI-TS-5AU	1.169	0.29	-3.11	4.0	0.0179(a)	(0.81, 1.53)
OI-TS-5AL	1.264	0.21	-3.30	4.0	0.0149(a)	(1.01, 1.52)
OI-MA-1L	0.924	0.15	-9.61	4.0	0.0003(a)	(0.74, 1.11)
OI-MA-2U	1.190	0.06	-14.18	4.0	0.0001(a)	(1.12, 1.27)
DI-MA-2L	1.324	0.17	-3.27	4.0	0.0154(a)	(1.11, 1.53)
OO-W-1	1.240	0.09	-8.69	4.0	0.0005(a)	(1.13, 1.35)
OO-W-2	1.257	0.09	-8.14	4.0	0.0006(a)	(1.15, 1.36)
OO-W-3	1.337	0.15	-3.50	4.0	0.0124(a)	(1.15, 1.52)
OO-W-4	1.352	0.13	-3.72	4.0	0.0102(a)	(1.19, 1.52)
OO-W-5	1.401	0.17	-2.23	4.0	0.0448(a)	(1.19, 1.61)
PR-fine	1.481	0.12	-1.63	4.0	0.0889	(1.33, 1.63)
Tomales Bay	1.571	0.00	--	--	--	--

(a) SD = Significant at $P \leq 0.05$

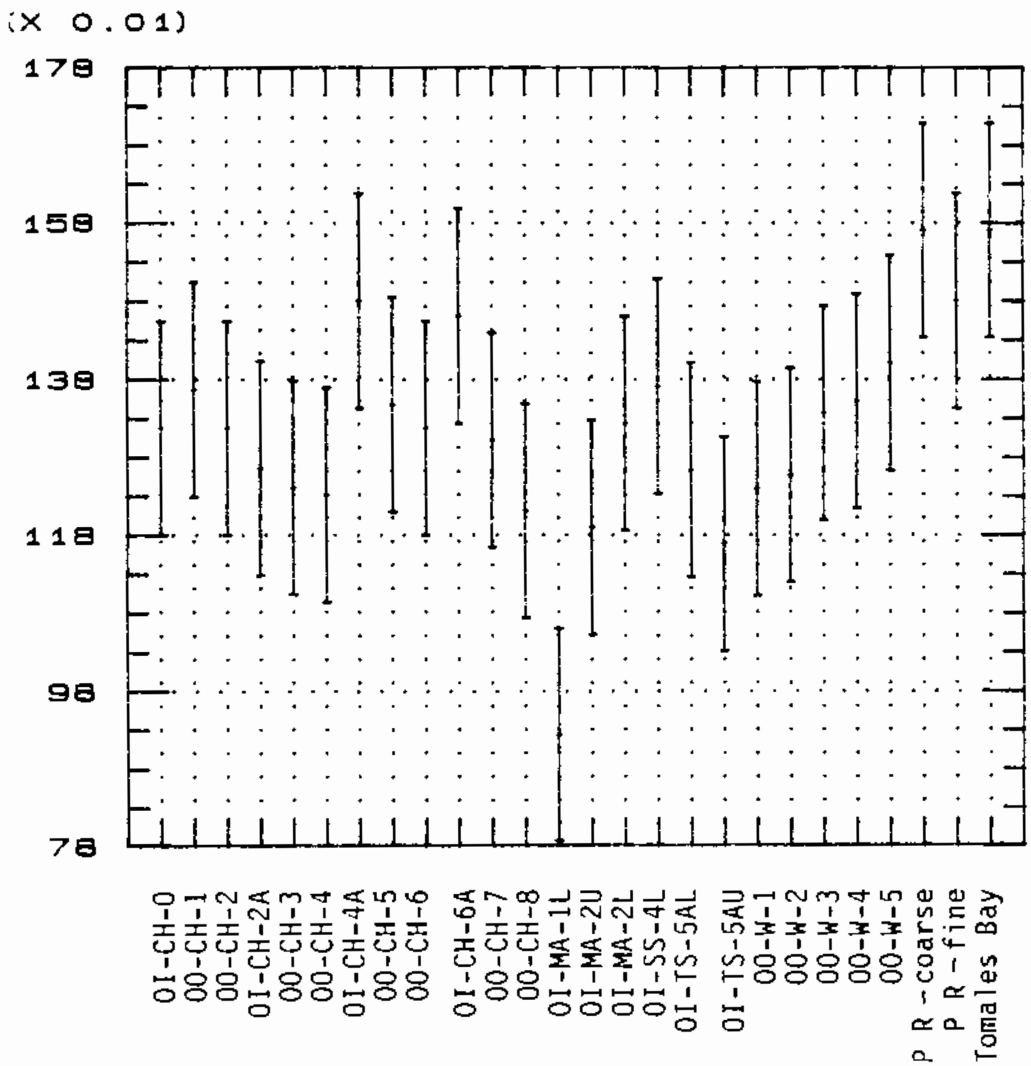


FIGURE 3.8. 95% Confidence Intervals of the Arcsine Square Root of the Proportion of *R. abronius* Surviving a 10-day Static Exposure

3.5 BIOACCUMULATION POTENTIAL

This section contains the results of chemical analyses (metals, PAHs, PCBs, pesticides, organotins) of organisms (M. nasuta) surviving the solid-phase bioassays. This section also contains the results of quality assurance and statistical analyses to determine data suitability and the potential for enhanced bioaccumulation associated with dredged-material disposal. Raw data and quality assurance data are presented in Appendix G.

3.5.1 Metals and Metalloids

Quality assurance information for tissue metals analysis is presented in Appendix G, Tables G.10 to G.12. These data show that our target detection limits were met for each metal. Duplicate analyses were performed on six samples for all 10 metals, resulting in 60 comparisons. The RPDs associated with these comparisons ranged from 0 to 35%, with only one comparison beyond our limits of ≤25% (for chromium).

A Standard Reference Material was analyzed 4 times for the 10 metals to determine analytical accuracy. In 9 of the 40 observations, the reported value was out of the certified SRM range. Three observations were above range for As, three were above range for Zn, one was below range for Cu, and two were below range for Se. All observations out of range were within 10% of the certified value. These values are quite close and do not constitute a quality assurance problem. Four procedural blanks were analyzed for the 10 metals, and in 3 of 4, Hg and Ni were detected. Hg was just above detection; Ni was approximately 20 to 40 times the detection limit. Four samples were spiked for 9 metals, resulting in 36 observations. The range of recoveries was 74 to 140%. Only the recovery of Ag in two samples (140 and 132%) was above our quality assurance range of 40 to 120%. The results of the quality assurance summary indicate that these data are acceptable for use in analysis. The results of the data analysis follow.

Silver

Mean concentrations of bioaccumulated silver ranged from a low of 0.32 µg/g (dry wt) in the PR-fine reference sediment to a high of 1.1 µg/g in sediment treatment OO-CH-3 (Table 3.30). The other reference sediment (PR-coarse) and the new control both resulted in tissue concentrations in the middle of this distribution (0.63 and 0.67 µg/g respectively). However, the ANOVA showed no statistically significant differences ($P = 0.05$) among the sediment treatment means (Table 3.31). Figure 3.9 presents the 95% confidence intervals of the natural logarithm of bioaccumulated Ag (µg/g dry wt) for these sediment treatments.

Arsenic

Mean concentrations of arsenic in clam tissues ranged from 24.40 to 37.80 µg/g (dry wt). Tissues exposed to reference sediments fell at the high end of this distribution (Table 3.32); the PR-fine and PR-coarse sediments respectively resulted in the fourth- and third-highest levels of bioaccumulated As (31.20 and 31.60 µg/g). While ANOVA results indicated a significant difference ($P = 0.0003$) among the sediment treatment means (Table 3.33), examination of the statistical groupings indicates that no test sediment resulted in bioaccumulation higher than either of the reference sediments. Figure 3.10 presents the 95% confidence intervals of the natural log of As concentrations (µg/g dry wt) for these data.

Lead

Mean lead concentrations ranged between 1.7 and 6.40 µg/g (dry wt) (Table 3.34). Point Reyes reference sediments fell at the low end of this distribution. Table 3.35 indicates that ANOVA failed to detect any differences among the 26 sediment treatments. Figure 3.11 presents the natural logarithm of Pb concentrations in clam (M. nasuta) tissue (µg/g dry wt) for each sediment treatment.

TABLE 3.30. Comparison of Concentrations of Silver Contained in Tissues of *M. nasuta* after 10-day Exposure to Sediment Treatments

Sediment Treatment	Sediment Concentration, µg/g dry wt[a]	Sediment Silver/ TOC[b]	Mean Tissue Concentration, µg/g dry wt	SD	Statistical Group[c]
PR-fine	0.0	0.1	0.3	0.3	A
00-W-2	0.1	0.3	0.8	0.6	A
OI-CH-2A	0.5	0.5	0.6	0.3	A
OI-TS-5AU	0.8	0.7	0.5	0.4	A
OI-MA-2L	0.1	1.3	0.5	0.3	A
00-CH-8	0.3	0.6	0.5	0.3	A
00-CH-5	0.2	0.6	0.5	0.3	A
OI-MA-2U	0.8	0.6	0.5	0.2	A
00-W-5	0.0	1.0	0.5	0.3	A
PR-coarse	0.1	0.1	0.6	0.4	A
OI-TS-5AL	0.1	1.1	0.6	0.1	A
00-W-4	0.6	0.6	0.8	0.5	A
OI-CH-4A	0.1	2.5	0.8	0.6	A
Tomales Bay	0.0	0.1	0.7	0.2	A
00-CH-6	0.3	0.6	1.0	0.6	A
OI-CH-0	0.1	1.0	0.7	0.2	A
OI-CH-6A	0.0	1.3	0.7	0.2	A
00-CH-7	0.1	0.7	0.9	0.5	A
OI-SS-4L	0.0	4.0	0.8	0.4	A
OI-MA-1L	0.1	1.3	0.9	0.5	A
00-W-1	0.1	0.2	0.8	0.3	A
00-W-3	0.7	0.6	1.0	0.4	A
00-CH-4	0.7	0.6	0.9	0.1	A
00-CH-2	0.1	1.5	1.0	0.4	A
00-CH-1	0.1	0.2	1.1	0.3	A
00-CH-3	0.1	1.9	1.1	0.5	A

(a) Not replicated
(b) Sediment concentration of silver as mg/kg dry wt divided by the sediment concentration of total organic carbon as percent dry wt
(c) Sediment treatments in the same statistical group are not significantly different from each other

TABLE 3.31. Balanced One-Way ANOVA of the Natural Logarithm of Silver Concentrations in Tissues of *M. nasuta* after 10-day Exposure to Sediment Treatments

Source of Variation	Sum of Squares	d.f.	Mean Square	F-Ratio	Significance Level
Between Groups	20.4514	25	0.8181	1.0960	0.3608
Within Groups	76.1186	102	0.7463		
Total (corrected)	96.5700	127			

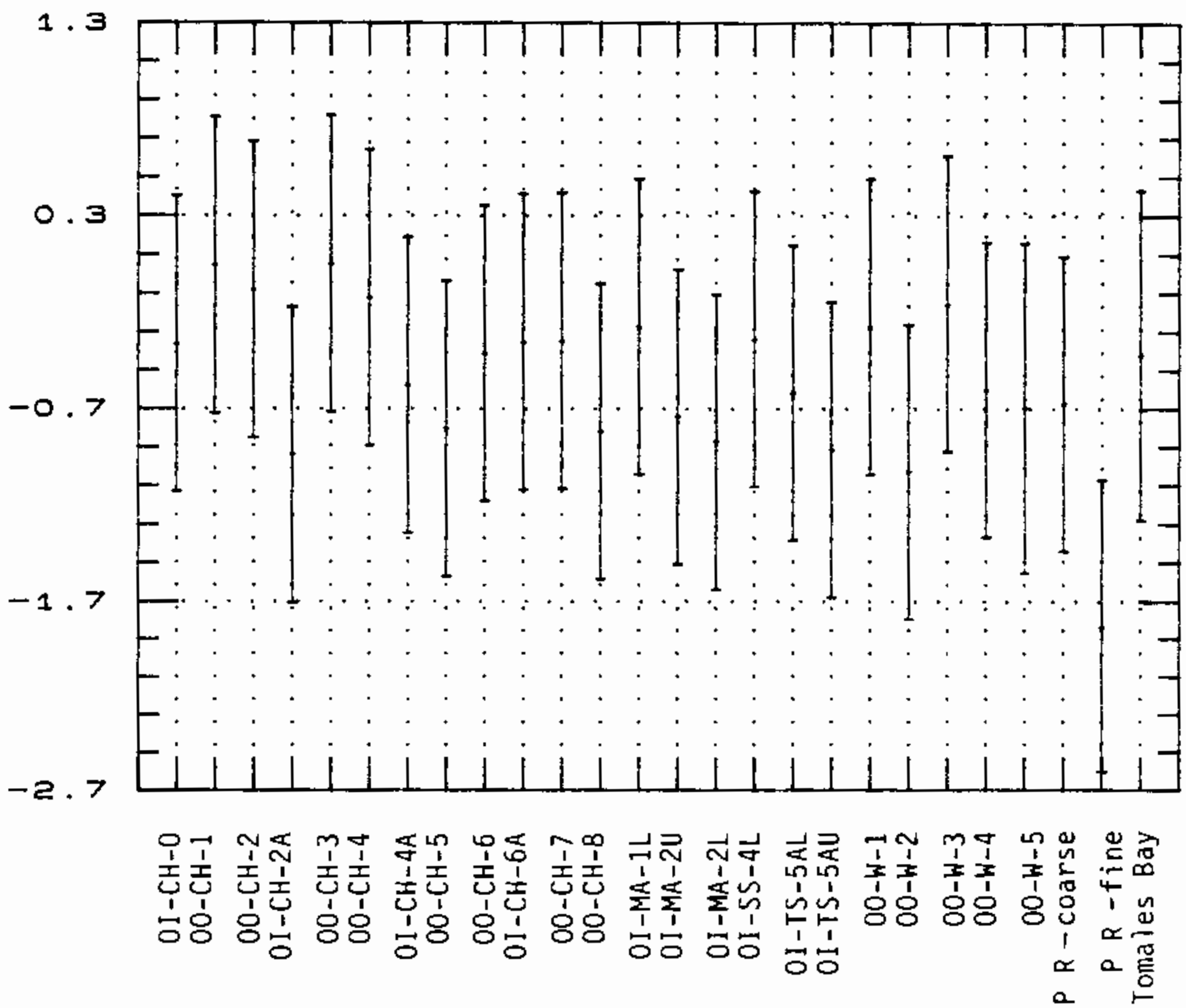


FIGURE 3.9. Natural Logarithm of Concentrations of Silver (mg/kg dry wt) in Tissues of *M. nasuta* After 10-day Exposure to Sediment Treatments

TABLE 3.32. Comparison of Concentrations of Arsenic Contained in Tissues of *M. nasuta* after 10-day Exposure to Sediment Treatments

Sediment Treatment	Sediment Concentration, µg/g dry wt[a]	Sediment Arsenic/TOC[b]	Mean Tissue Concentration, µg/g dry wt	SD	Statistical Group[c]
OI-CH-0	4.3	85.2	24.4	2.6	A
OI-CH-2A	11.0	7.7	25.2	4.0	A
OO-CH-5	10.2	30.0	25.4	3.0	AB
OO-CH-6	8.8	20.1	25.6	3.4	AB
OO-CH-4	15.5	14.2	26.2	1.8	AB
OI-TS-5AU	9.7	9.2	26.2	1.3	AB
OI-CH-6A	6.1	202.7	26.4	1.1	AB
OI-MA-2L	6.0	54.8	26.8	1.3	AB
OI-MA-1L	3.4	48.9	27.0	3.2	AB
OI-MA-2U	11.0	7.9	27.2	3.0	ABC
OO-W-1	12.9	20.8	27.2	2.8	ABC
OO-CH-1	12.6	18.5	27.4	1.7	ABC
OI-SS-4L	3.6	355.0	27.6	3.9	ABC
Tomales Bay	4.7	16.9	27.8	1.9	ABC
OI-TS-5AL	4.8	37.2	27.8	2.7	ABC
OO-CH-8	9.9	24.1	27.8	2.3	ABC
OO-CH-2	2.9	48.2	27.8	2.2	ABC
OO-W-5	3.6	88.8	28.5	5.2	ABC
OO-CH-3	4.8	28.2	28.8	2.3	ABC
OO-CH-7	3.7	28.2	29.0	2.5	ABC
OI-CH-4A	3.3	8.5	30.6	2.9	ABC
OO-W-4	49.1	48.6	32.6	11.3	ABC
PR-fine	8.0	26.5	31.2	4.0	ABC
PR-coarse	4.9	14.0	31.6	3.0	ABC
OO-W-2	10.6	25.9	35.8	9.3	BC
OO-W-3	17.6	14.9	37.8	5.0	C

(a) Not replicated
(b) Sediment concentration of arsenic as µg/g dry wt divided by the sediment concentration of total organic carbon as percent dry wt
(c) Sediment treatments in the same statistical group are not significantly different from each other

TABLE 3.33. Balanced One-Way ANOVA of the Natural Logarithm of Arsenic Concentrations in Tissues of *M. nasuta* after 10-day Exposure to Sediment Treatments

Source of Variation	Sum of Squares	d.f.	Mean Square	F-Ratio	Significance Level
Between Groups	1.2506	25	0.0500	2.6480	0.0003
Within Groups	1.9270	102	0.0189		
Total (Corrected)	3.1776	127			

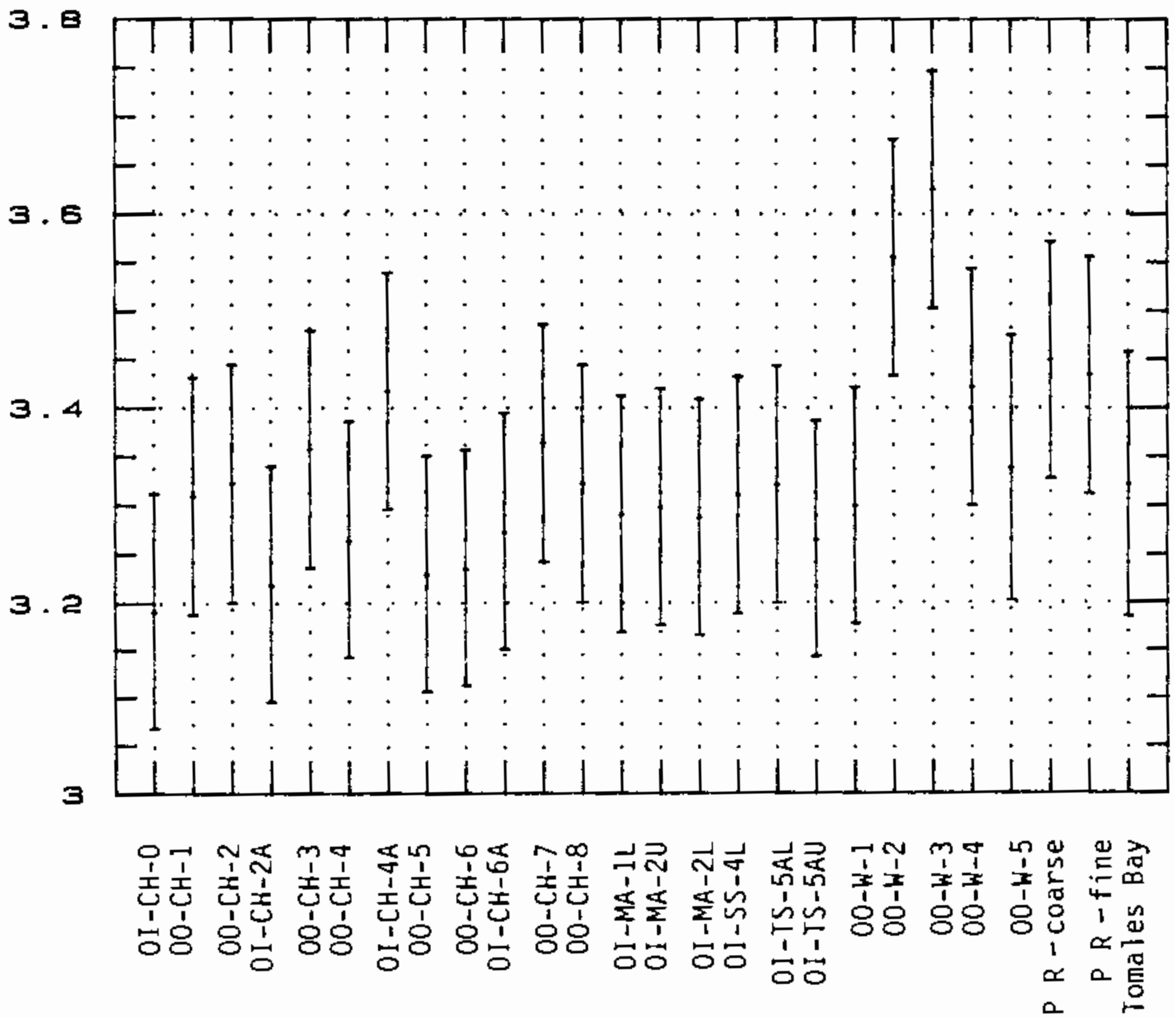


FIGURE 3.10. Natural Logarithm of Concentrations of Arsenic (μg/g dry wt) in Tissues of *M. nasuta* after 10-day Exposure to Sediment Treatments

TABLE 3.34. Comparison of Concentrations of Lead Contained in Tissues of *M. nasuta* after 10-day Exposure to Sediment Treatments

Sediment Treatment	Sediment Concentration, μg/g dry wt[a]	Sediment Lead/TOC[b]	Mean Tissue Concentration, μg/g dry wt	SD	Statistical Group[c]
OO-W-5	7.4	138.7	1.7	0.9	A
PR-fine	6.0	20.0	2.3	1.6	A
PR-coarse	6.7	19.1	2.3	1.1	A
OI-MA-2L	9.8	89.0	2.4	1.2	A
OI-TS-5AL	24.6	189.2	2.2	0.3	A
OI-CH-6A	3.5	116.6	2.5	1.2	A
OO-W-2	8.9	21.7	3.1	2.5	A
OI-TS-5AU	147.1	138.7	2.7	1.5	A
OO-CH-8	19.3	47.0	2.6	0.8	A
OI-CH-4A	7.6	380.0	3.0	1.6	A
OI-CH-2A	33.0	31.4	3.0	1.7	A
OO-W-4	49.1	48.6	3.2	2.3	A
OI-CH-0	6.5	130.0	2.9	1.1	A
OI-SS-4L	7.1	710.0	3.0	1.1	A
OI-MA-1L	11.7	167.1	3.3	2.2	A
OI-MA-2U	89.9	64.6	3.0	0.9	A
Tomales Bay	4.4	15.7	3.0	0.7	A
OO-CH-5	10.2	30.0	3.4	2.1	A
OO-CH-7	10.6	81.5	3.5	2.4	A
OO-W-3	44.4	37.6	3.4	0.9	A
OO-CH-4	46.4	42.5	3.5	0.9	A
OO-W-1	12.0	19.3	4.2	2.2	A
OO-CH-2	10.4	173.3	4.8	3.1	A
OO-CH-3	10.2	60.0	4.8	1.5	A
OO-CH-1	10.4	15.2	5.2	2.1	A
OO-CH-6	20.2	45.9	6.4	4.2	A

(a) Not replicated
(b) Sediment concentration of lead as μg/g dry wt divided by the sediment concentration of total organic carbon as percent dry wt
(c) Sediment treatments in the same statistical group are not significantly different from each other

TABLE 3.35. Balanced One-Way ANOVA of the Natural Logarithm of Lead Concentrations in Tissues of *M. nasuta* after 10-day Exposure to Sediment Treatments

Source of Variation	Sum of Squares	d.f.	Mean Square	F-Ratio	Significance Level
Between Groups	10.0035	25	0.4001	1.4140	0.1165
Within Groups	28.8737	102	0.2831		
Total (corrected)	38.8771	127			

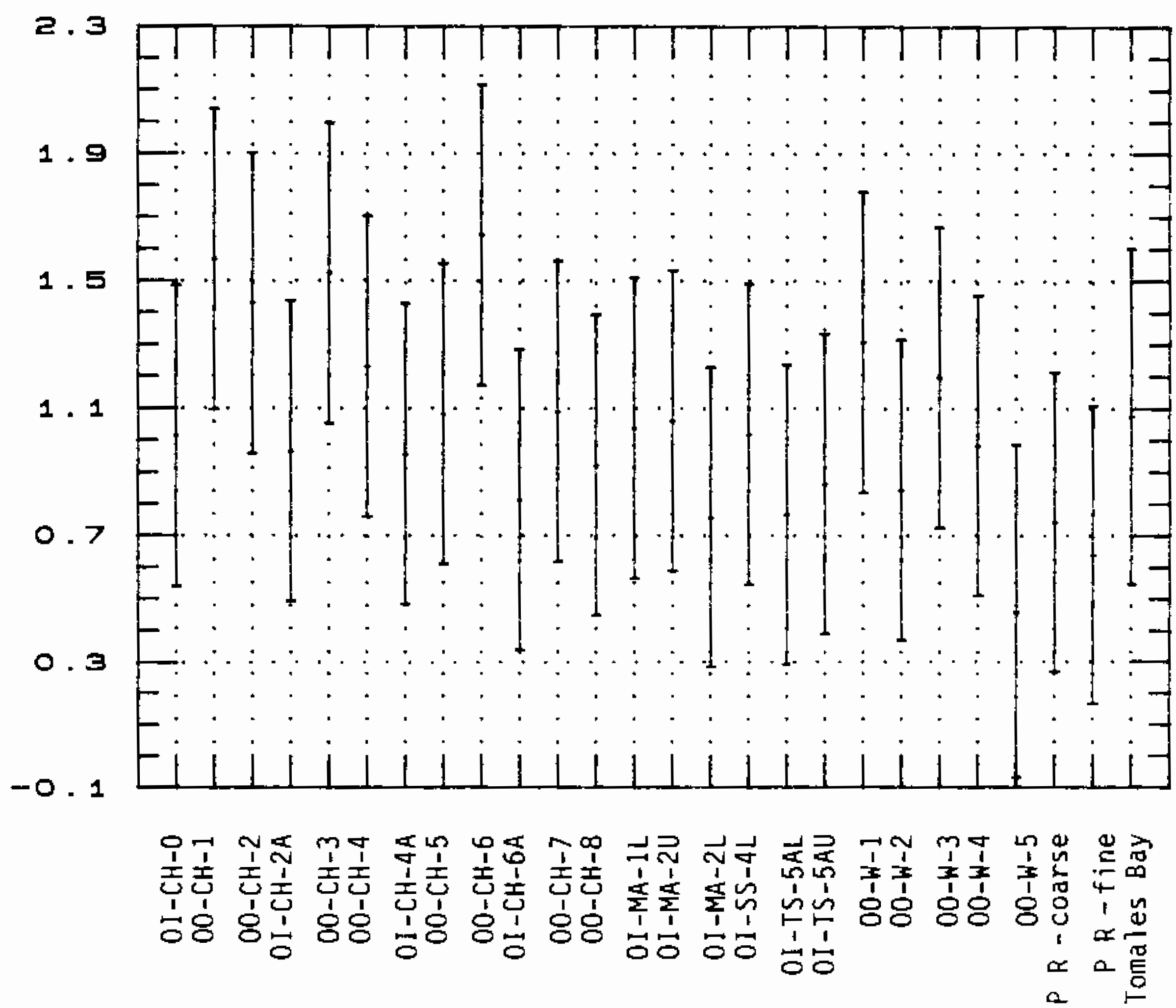


FIGURE 3.11. Natural Logarithm of Concentrations of Lead (μg/g dry wt) in Tissues of *M. nasuta* after 10-d Exposure to Sediment Treatments

Copper

Copper bioaccumulation was highest (82.00 μg/g dry wt) in sediments from station CH-1; it was lowest (24.40 μg/g) at station OI-TS-5AU (Table 3.36). Point Reyes reference sediments fell generally at the low end of this distribution. Because of the relatively wide range in concentrations of Cu bioaccumulated, a statistically significant difference ($P = 0.0327$) among the 26 sediment treatments was found when these data were subjected to ANOVA (Table 3.37). However, examination of the statistical groupings following analysis with Tukey's HSD Multiple Comparison Test revealed that no test sediment resulted in bioaccumulation higher than either of the reference sediments. Figure 3.12 presents the 95% confidence intervals of the natural log of Cu (μg/g dry wt) for these data.

Zinc

Mean concentrations of zinc found in clam tissues ranged from a low of 87.60 μg/g (dry wt) at station OI-TS-5AU to a high of 166.80 μg/g at station CH-3 (Table 3.38). The Point Reyes reference sediments fell generally at the low end of this distribution. Results of ANOVA indicated statistically significant differences ($P = 0.0005$) among the sediment treatment means (Table 3.39). Subsequently, Tukey's HSD multiple comparison test demonstrated that sediment from only one station (OO-CH-3) resulted in bioaccumulation higher than measured in either reference sediment. Figure 3.13 graphically presents these data.

Nickel

Mean concentrations of bioaccumulated nickel ranged from 2.60 μg/g (dry wt) at station OI-TS-5AU to a high 4.96 μg/g at station OO-CH-6 (Table 3.40). Reference sediments fell in the mid-region of this distribution. ANOVA demonstrated that statistically significant differences ($P \leq 0.00001$) occurred among the 26 sediment treatment means (Table 3.41). However, Tukey's HSD Multiple Comparison Test indicated that only one station (OO-CH-6) resulted in bioaccumulation higher than that measured in one of the reference sediments, in this case, PR-fine. Figure 3.14 presents the 95% confidence intervals of the natural log of Ni (μg/g dry wt) for these data.

TABLE 3.36. Comparison of Concentrations of Copper Contained in Tissues of *M. nasuta* after 10-day Exposure to Sediment Treatments

Sediment Treatment	Sediment Concentration, μg/g dry wt[a]	Sediemnt Copper/TOC[b]	Mean Tissue Concentration, μg/g dry wt	SD	Statistical Group[c]
OI-TS-5AU	261.0	246.2	24.4	10.3	A
OO-W-5	8.9	222.5	27.5	12.0	AB
PR-fine	9.5	31.6	31.2	18.9	AB
OI-TS-5AL	21.7	166.9	30.6	11.8	AB
OI-CH-4A	10.8	540.0	33.6	18.4	AB
OI-MA-2L	26.9	244.5	30.0	7.0	AB
OO-CH-8	38.9	94.8	31.6	10.5	AB
OI-CH-6A	14.4	480.0	31.4	9.8	AB
OI-MA-1L	21.2	302.8	37.2	30.8	AB
OO-CH-5	27.6	81.1	31.0	6.4	AB
OI-CH-2A	58.1	55.3	33.4	8.5	AB
PR-coarse	B.4	24.0	37.0	19.9	AB
OI-SS-4L	11.0	1,100.0	38.2	14.4	AB
Tomales Bay	6.6	23.5	37.0	6.1	AB
OO-W-2	30.3	73.9	42.2	17.0	AB
OO-W-4	56.6	56.0	49.8	29.6	AB
OO-CH-6	30.7	69.7	47.6	26.1	AB
OI-MA-2U	94.0	67.6	54.4	50.7	AB
OO-W-1	45.8	73.8	43.6	15.1	AB
OI-CH-0	9.3	186.0	44.8	9.7	AB
OO-CH-7	15.9	122.3	48.2	19.0	AB
OO-W-3	59.1	50.0	51.2	19.5	AB
OO-CH-4	56.5	51.8	49.6	11.0	AB
OO-CH-2	13.8	230.0	57.0	20.7	AB
OO-CH-3	14.9	87.6	60.2	19.0	AB
OO-CH-1	43.8	64.4	82.0	40.3	B

(a) Not replicated
(b) Sediment concentration of copper as μg/g dry wt divided by the sediment concentration of total organic carbon as percent dry wt
(c) Sediment treatments in the same statistical group are not significantly different from each other

TABLE 3.37. Balanced One-Way ANOVA of the Natural Logarithm of Copper Concentrations in Tissues of *M. nasuta* after 10-day Exposure to Sediment Treatments

Source of Variation	Sum of Squares	d.f.	Mean Square	F-Ratio	Significance Level
Between Groups	9.5615	25	0.3825	1.7090	0.0327
Within Groups	22.8228	102	0.2238		
Total (corrected)	32.3844	127			

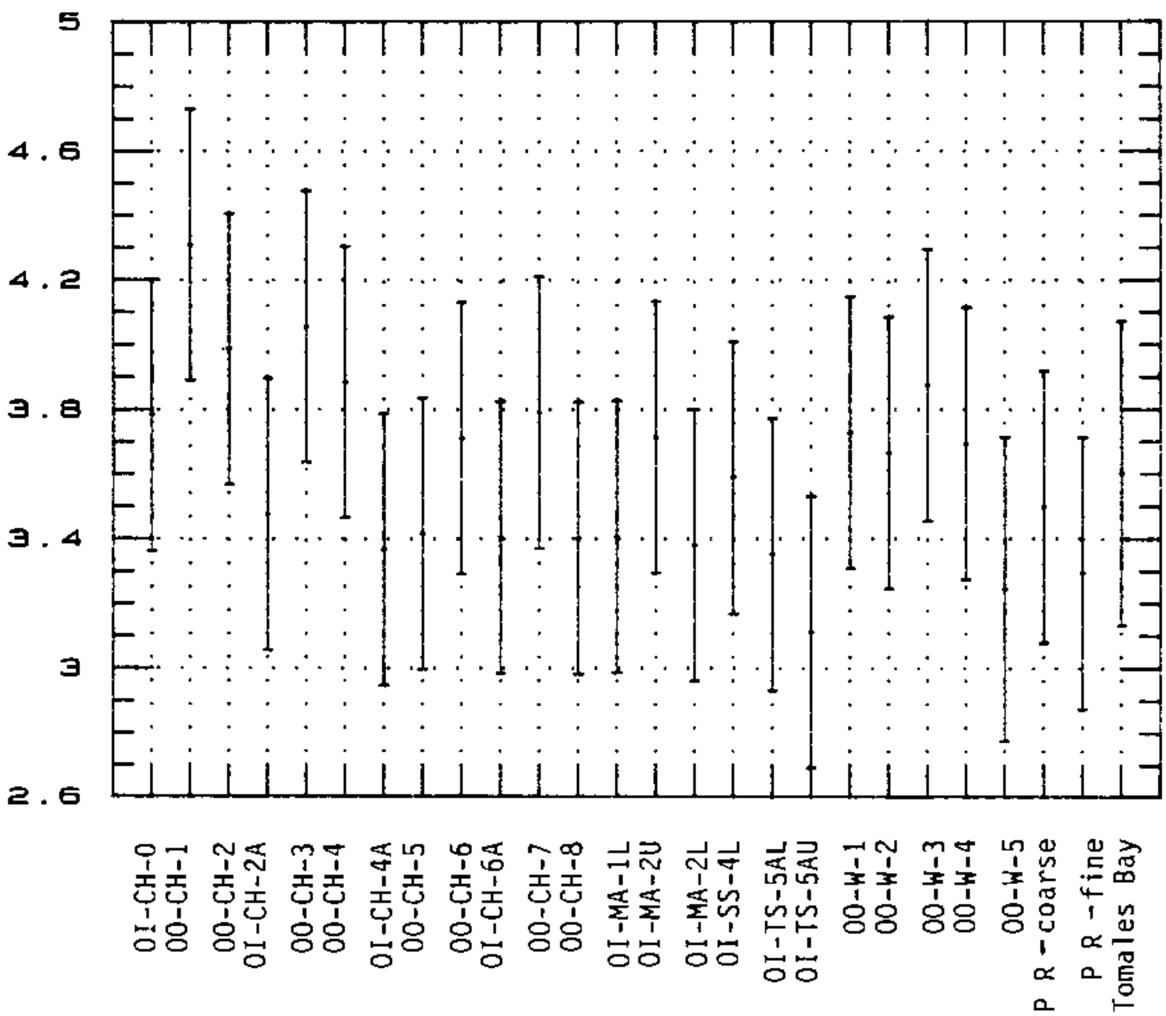


FIGURE 3.12. Natural Logarithm of Concentrations of Copper (μg/g dry wt) in Tissues of *M. nasuta* after 10-day Exposure to Sediment Treatments

TABLE 3.38. Comparison of Concentrations of Zinc Contained in Tissues of *M. nasuta* after 10-day Exposure to Sediment Treatments

Sediment Treatment	Sediment Concentration µg/g dry wt[(a)]	Sediment Zinc/TOC[(b)]	Mean Tissue Concentration µg/g dry wt	SD	Statistical Group[(c)]
OI-TS-5AU	326.0	307.5	87.6	16.2	A
OI-TS-5AL	68.9	530.0	90.4	32.8	A
OI-MA-2L	58.1	528.1	91.4	19.0	A
PR-coarse	48.1	137.4	93.2	23.1	A
OO-W-3	166.1	140.7	92.2	16.0	A
OI-MA-1L	52.7	752.8	93.2	15.6	A
PR-fine	48.4	161.3	92.8	4.5	A
OI-SS-4L	43.2	4,320.0	95.4	18.6	AB
OI-CH-0	39.7	794.0	100.0	15.9	AB
OI-CH-4A	33.7	1,685.0	104.0	36.0	AB
OO-W-2	70.4	171.7	105.0	30.5	AB
OO-CH-8	102.9	250.9	108.6	22.1	AB
OI-MA-2U	230.0	165.4	108.8	19.8	AB
OO-CH-4	170.3	1,562.0	110.8	22.5	AB
OO-CH-7	59.4	456.9	116.0	39.8	AB
OO-W-5	36.6	915.0	113.0	24.2	AB
Tomales Bay	24.7	88.2	115.0	31.1	AB
OO-CH-5	79.4	233.5	116.0	24.3	AB
OI-CH-6A	50.5	1,683.3	124.8	27.5	AB
OI-CH-2A	142.7	135.9	131.6	42.8	AB
OO-W-4	159.7	158.1	130.6	27.3	AB
OO-CH-1	100.5	147.7	142.6	73.1	AB
OO-W-1	105.8	170.6	136.0	28.7	AB
OO-CH-2	45.0	750.0	135.6	20.5	AB
OO-CH-6	90.1	204.7	138.4	22.3	AB
OO-CH-3	47.6	280.0	166.8	37.1	B

(a) Not replicated
(b) Sediment concentration of zinc as µg/g dry wt divided by the sediment concentration of total organic carbon as percent dry wt
(c) Sediment treatments in the same statistical group are not significantly different from each other

TABLE 3.39. Balanced One-Way ANOVA of the Natural Logarithm of Zinc Concentrations in Tissues of M. nasuta after 10-day Exposure to Sediment Treatments

Source of Variation	Sum of Squares	d.f.	Mean Square	F-Ratio	Significance Level
Between Groups	3.5377	25	0.1415	2.5430	0.0005
Within Groups	5.6749	102	0.0556		
Total (corrected)	9.2126	127			

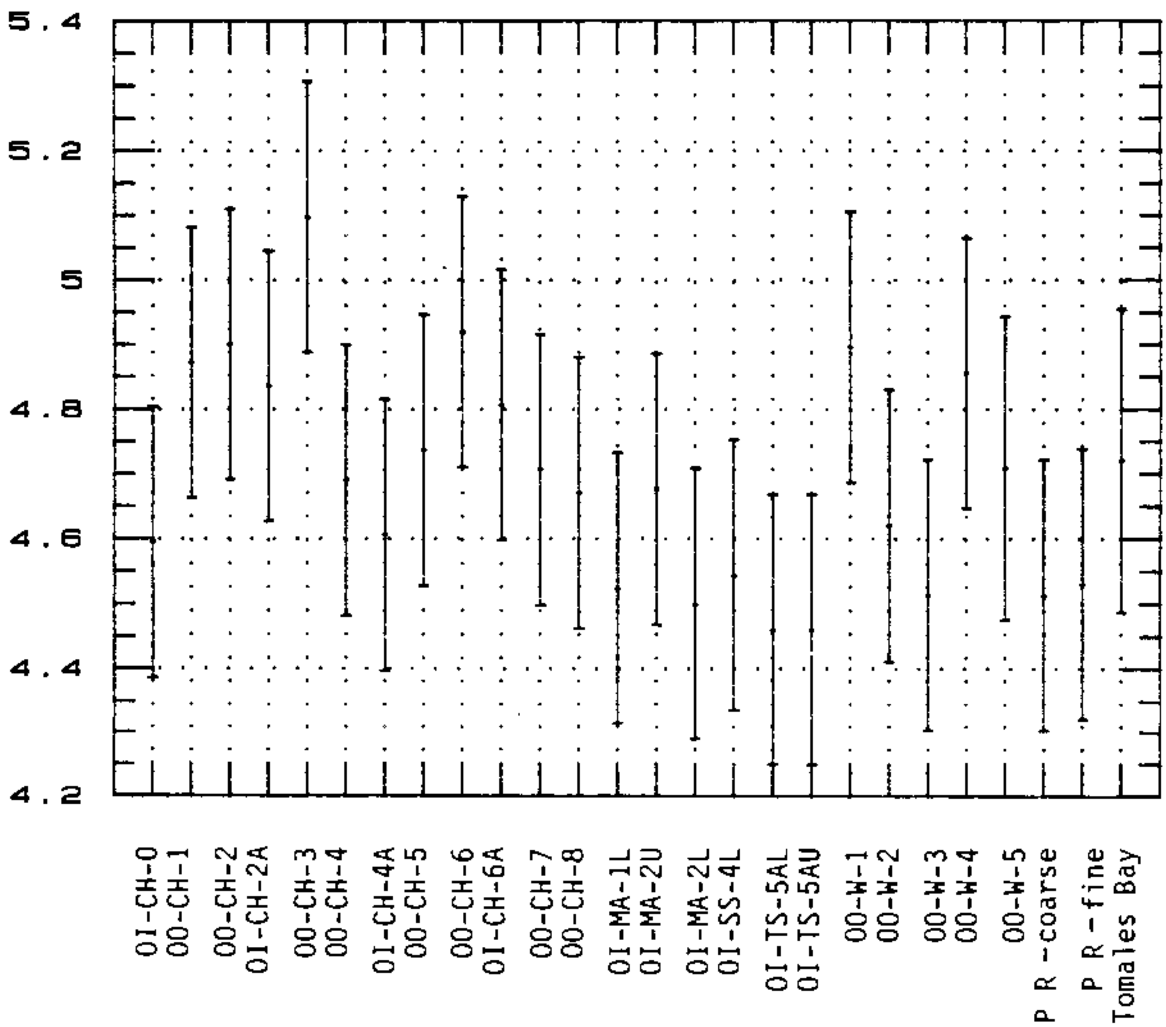


FIGURE 3.13. Natural Logarithm of Concentrations of Zinc (μg/g dry wt) in Tissues of M. nasuta after 10-day Exposure to Sediment Treatments

TABLE 3.40. Comparison of Concentrations of Nickel Contained in Tissues of *M. nasuta* after 10-day Exposure to Sediment Treatments

Sediment Treatment	Sediment Concentration, µg/g dry wt[a]	Sediment Nickel/ TOC[b]	Mean Tissue Concentration, µg/g dry wt	SD	Statistical Group[c]
OI-TS-5AU	111.5	108.9	2.6	0.4	A
OI-MA-2L	73.6	669.0	2.8	0.6	A8
OI-MA-1L	75.9	1,084.2	2.8	0.7	AB
OI-TS-5AL	58.9	453.0	2.8	0.3	AB
OI-SS-4L	57.3	5,730.0	2.9	0.6	AB
OI-MA-2U	122.8	88.3	2.9	0.7	ABC
00-W-3	116.5	98.7	3.0	0.7	ABC
00-W-4	115.8	98.1	3.1	0.6	ABC
PR-fine	45.6	152.0	3.1	0.6	ABC
OI-CH-4A	41.7	2,085.0	3.2	0.7	ABC
OI-CH-2A	118.9	113.2	3.1	0.5	ABC
00-CH-8	117.3	286.0	3.2	0.2	ABCD
00-W-5	57.9	1,447.5	3.4	0.6	A8CD
PR-coarse	39.7	113.4	3.4	0.5	ABCD
00-W-1	115.8	186.7	3.4	0.5	ABCD
00-CH-7	75.8	583.0	3.4	0.5	ABCD
00-CH-5	86.1	253.2	3.5	0.6	ABCD
Tomales Bay	28.8	102.8	3.6	0.8	ABCD
00-CH-4	118.6	108.8	3.6	0.3	ABCD
00-W-2	75.4	183.9	3.7	0.4	ABCD
OI-CH-6A	65.7	2,190.0	4.0	0.9	ABCD
OI-CH-0	40.5	810.0	4.1	0.1	BCD
00-CH-3	59.5	350.0	4.2	0.9	BCD
00-CH-2	66.5	1,108.3	4.2	0.9	BCD
00-CH-1	117.1	172.8	4.4	0.6	CD
00-CH-6	88.6	201.3	5.0	1.1	0

(a) Not replicated
(b) Sediment concentration of nickel as µg/g dry wt divided by the sediment concentration of total organic carbon as percent dry wt
(c) Sediment treatments in the same statistical group are not significantly different from each other

TABLE 3.41. Balanced One-Way ANOVA of the Natural Logarithm of Nickel Concentrations in Tissues of *M. nasuta* after 10-day Exposure to Sediment Treatments

Source of Variation	Sum of Squares	d.f.	Mean Square	F-Ratio	Significance Level
Between Groups	3.3899	25	0.1356	4.0380	<0.00001
Within Groups	3.4248	102	0.0336		
Total (corrected)	6.8147	127			

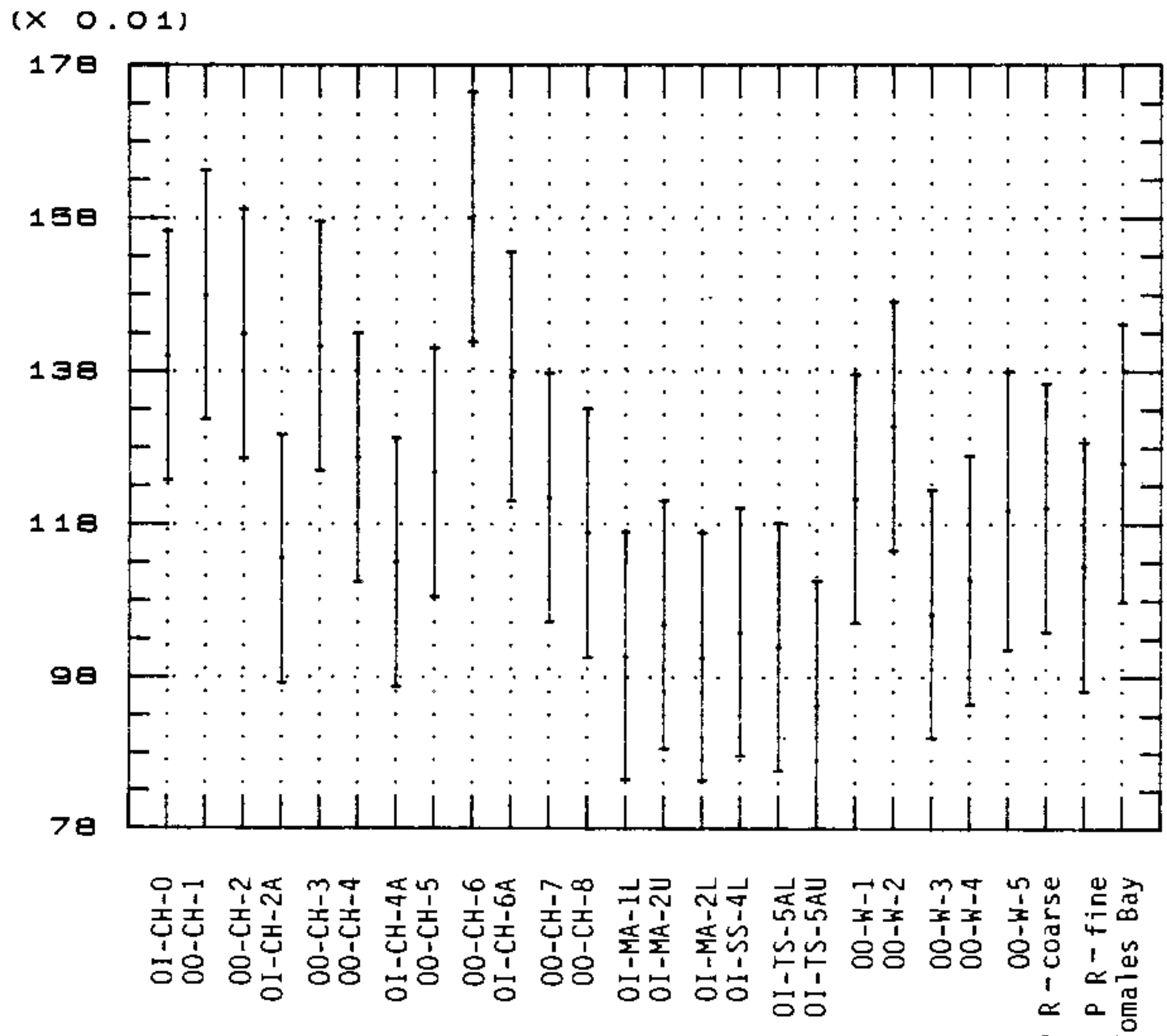


FIGURE 3.14. Natural Logarithm of Concentrations of Nickel (μg/g dry wt) in Tissues of *M. nasuta* after 10-day Exposure to Sediment Treatments

Chromium

Mean concentrations of chromium in clam tissues extend from 0.70 to 1.58 µg/g (dry wt) (Table 3.42). Lowest values resulted from exposure of clams to sediments from station OO-CH-7. Highest values were associated with station OO-CH-3. Both reference sediments (PR-coarse and PR-fine) resulted in tissue concentrations at the low end of this distribution (0.96 and 0.92 µg/g respectively). Although ANOVA demonstrated that statistically significant differences (P = 0.0003) occurred among the 26 treatment means (Table 3.43), the more conservative Tukey's HSD Multiple Comparison Test indicated that no test sediment resulted in enhanced bioaccumulation when compared with either reference sediment. These results are graphically presented in Figure 3.15.

Cadmium

Cadmium was bioaccumulated in clam tissue over a very narrow range, from 0.23 to 0.42 µg/g (dry wt) (Table 3.44). Predictably, ANOVA showed no statistically significant difference (P = 0.05) among the sediment treatment means (Table 3.45). Figure 3.16 presents the natural logarithm of cadmium concentrations in clam (M. nasuta) tissue, µg/g dry wt for each sediment treatment.

Mercury

Like cadmium, mercury was also bioaccumulated over a very narrow range, from 0.1 to 0.21 µg/g (dry wt) (Table 3.46). Consequently, the ANOVA showed no statistically significant differences (P = 0.05) among the 26 sediment treatment means (Table 3.47). Figure 3.17 presents the natural logarithm of mercury concentrations in clam (M. nasuta) tissue (µg/g dry wt) for each sediment treatment.

TABLE 3.42. Comparison of Concentrations of Chromium Contained in Tissues of *M. nasuta* after 10-day Exposure to Sediment Treatments

Sediment Treatment	Sediment Concentration, μg/g dry wt[a]	Sediment Chromium/ TOC[b]	Mean Tissue Concentration, μg/g dry wt	SD	Statistical Group[c]
00-CH-7	501.0	3,853.8	0.7	0.2	A
OI-CH-0	749.0	14,980.0	0.7	0.1	A
OI-MA-1L	220.0	3,142.8	0.7	0.1	AB
00-CH-8	273.0	665.8	0.8	0.2	ABC
00-W-3	229.0	194.0	0.8	0.1	ABC
OI-CH-4A	164.0	8,200.0	0.8	0.2	ABC
00-CH-5	284.0	835.2	0.8	0.3	ABC
OI-CH-2A	247.0	235.2	0.8	0.2	ABC
00-CH-1	214.0	314.7	0.9	0.2	ABC
00-W-4	281.0	278.2	0.9	0.1	ABC
Tomales Bay	43.3	154.6	0.9	0.2	ABC
00-CH-4	253.0	232.1	0.9	0.2	ABC
OI-MA-2L	195.0	1,772.7	0.9	0.1	ABC
PR-fine	456.0	1,520.0	0.9	0.2	ABC
PR-coarse	314.0	897.1	1.0	0.3	ABC
00-W-2	315.0	768.2	1.0	0.2	ABC
00-CH-2	484.0	8,066.6	1.0	0.3	ABC
OI-MA-2U	301.0	216.5	1.1	0.2	ABC
00-W-1	283.0	456.4	1.1	0.2	ABC
OI-CH-6A	669.0	22,300.0	1.2	0.4	ABC
00-W-5	408.0	10,200.0	1.2	0.4	ABC
OI-SS-4L	578.0	57,800.0	1.1	0.2	ABC
00-CH-6	388.0	881.8	1.2	0.3	ABC
OI-TS-5AL	439.0	3,376.9	1.4	0.8	ABC
OI-TS-5AU	444.0	418.0	1.4	0.5	BC
00-CH-3	368.0	2,164.7	1.6	0.8	C

(a) Not replicated
(b) Sediment concentration of chromium as μg/g dry wt divided by the sediment concentration of total organic carbon as percent dry wt
(c) Sediment treatments in the same statistical group are not significantly different from each other

TABLE 3.43. Balanced One-Way ANOVA of the Natural Logarithm of Chromium Concentrations in Tissues of M. nasuta after 10-day Exposure to Sediment Treatments

Source of Variation	Sum of Squares	d.f.	Mean Square	F-Ratio	Significance Level
Between Groups	4.9424	25	0.1977	2.6670	0.0003
Within Groups	7.5613	102	0.0741		
Total (corrected)	12.5037	127			

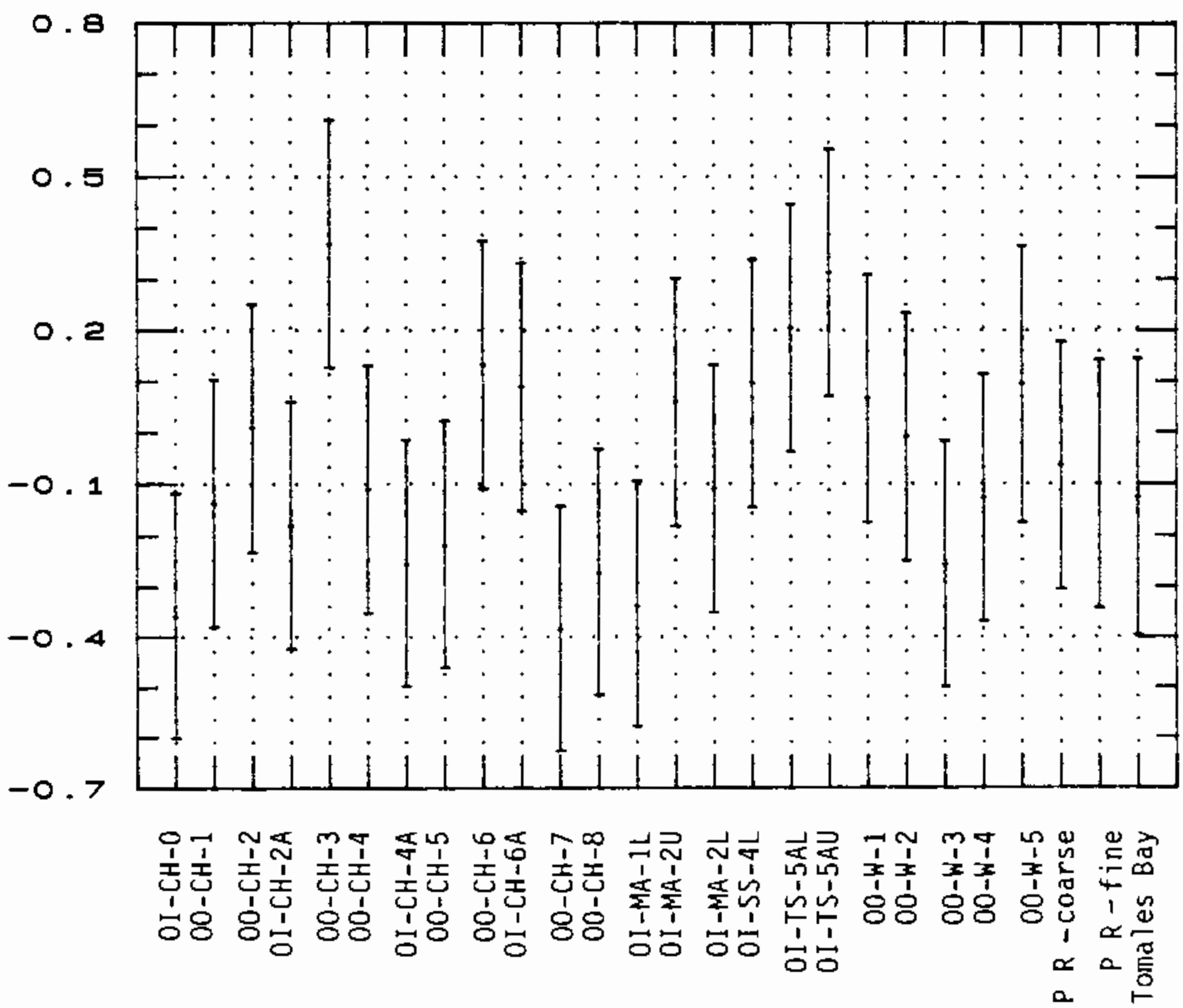


FIGURE 3.15. Natural Logarithm of Concentrations of Chromium (μg/g dry wt) in Tissues of M. nasuta after 10-day Exposure to Sediment Treatments

TABLE 3.44. Comparison of Concentrations of Cadmium Contained in Tissues of *M. nasuta* after 10-day Exposure to Sediment Treatments

Sediment Treatment	Sediment Concentration, µg/g dry wt[a]	Sediment Cadmium/TOC[b]	Mean Tissue Concentration, µg/g dry wt	SD	Statistical Group[c]
OI-TS-5AU	1.0	1.0	0.2	0.1	A
OO-W-2	0.2	0.4	0.2	0.1	A
OI-MA-2L	0.1	1.1	0.2	0.1	A
OI-MA-2U	0.7	0.5	0.3	0.0	A
OI-TS-5AL	0.2	1.3	0.3	0.4	A
OO-W-4	0.5	0.4	0.3	0.1	A
OO-W-5	0.0	0.5	0.3	0.0	A
OO-W-3	0.4	0.4	0.3	0.0	A
OO-CH-8	0.3	0.7	0.3	0.0	A
OI-MA-1L	0.7	9.4	0.3	0.1	A
PR-fine	0.2	0.8	0.3	0.0	A
OI-CH-0	0.0	0.8	0.3	0.0	A
OI-SS-4L	0.0	2.0	0.3	0.1	A
OO-CH-5	0.2	0.6	0.3	0.1	A
OO-CH-7	0.1	1.0	0.3	0.1	A
Tomales Bay	0.2	0.6	0.3	0.1	A
PR-coarse	2.0	5.7	0.3	0.1	A
OI-CH-4A	0.0	1.0	0.3	0.1	A
OI-CH-6A	0.1	0.8	0.3	0.1	A
OI-CH-2A	0.3	0.3	0.3	0.1	A
OO-CH-4	0.5	0.4	0.3	0.1	A
OO-CH-2	0.1	1.2	0.3	0.1	A
OO-CH-6	0.2	0.4	0.4	0.1	A
OI-CH-1	0.2	0.3	0.4	0.1	A
OO-W-1	0.1	0.2	0.4	0.1	A
OO-CH-3	0.0	0.2	0.4	0.1	A

(a) Not replicated
(b) Sediment concentration of cadmium as µg/g dry wt divided by the sediment concentration of total organic carbon as percent dry wt
(c) Sediment treatments in the same statistical group are not significantly different from each other

TABLE 3.45. Balanced One-Way ANOVA of the Natural Logarithm of Cadmium Concentrations in Tissues of M. nasuta after 10-day Exposure to Sediment Treatments

Source of Variation	Sum of Squares	d.f.	Mean Square	F-Ratio	Significance Level
Between Groups	3.2201	25	0.1288	1.2470	0.2194
Within Groups	10.5388	102	0.1033		
Total (corrected)	13.7589	127			

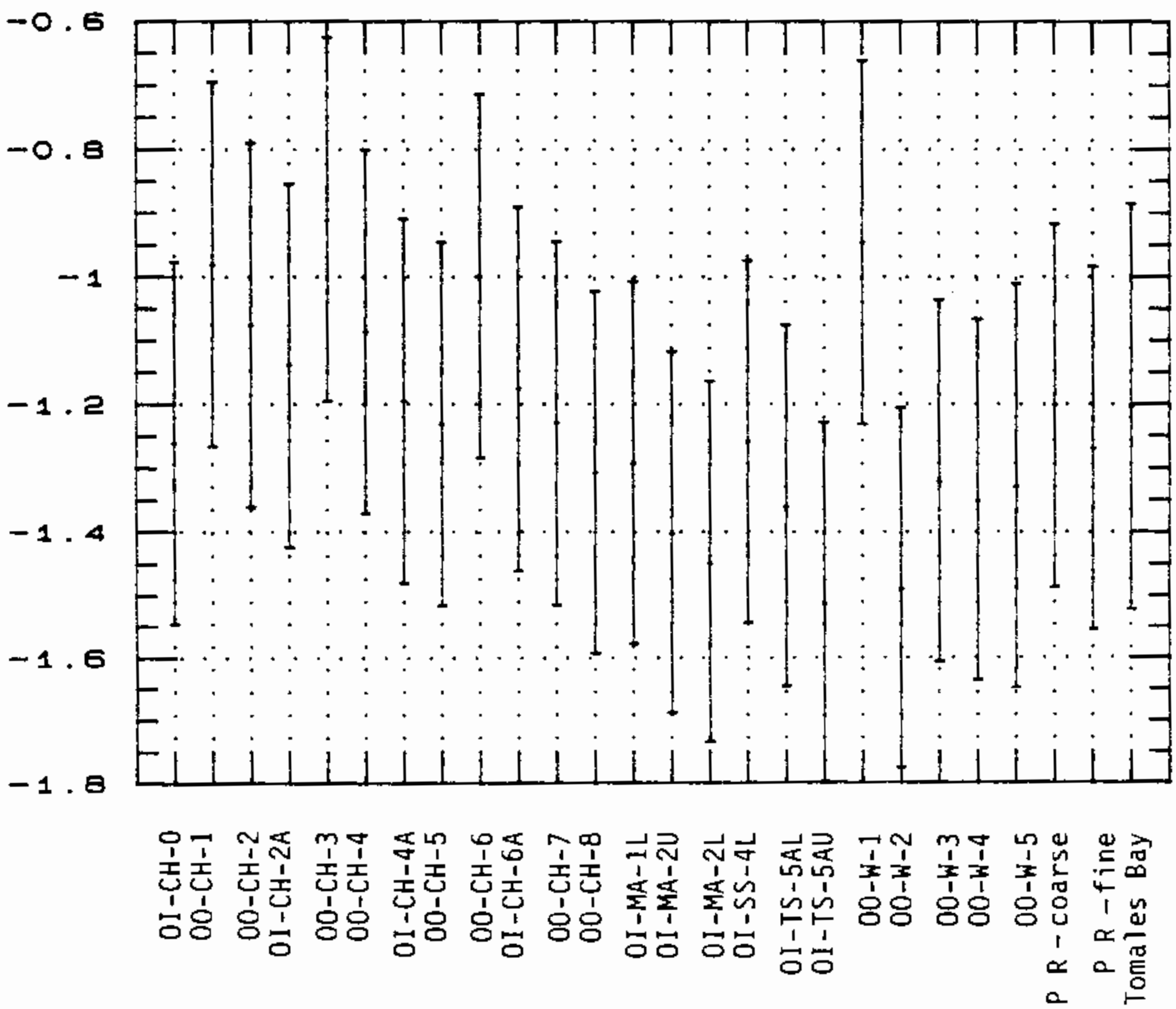


FIGURE 3.16. Natural Logarithm of Concentrations of Cadmium (µg/g dry wt) in Tissues of M. nasuta after 10-day Exposure to Sediment Treatments

TABLE 3.46. Comparison of Concentrations of Mercury Contained in Tissues of *M. nasuta* after 10-day Exposure to Sediment Treatments

Sediment Treatment	Sediment Concentration, µg/g dry wt[a]	Sediment Mercury/TOC[b]	Mean Tissue Concentration, µg/g dry wt	SD	Statistical Group[c]
OI-CH-2A	0.3	0.3	0.1	0.0	A
OI-CH-6A	0.0	0.3	0.1	0.0	A
OI-MA-2U	0.6	0.4	0.1	0.0	A
00-CH-8	0.2	0.4	0.1	0.0	A
OI-MA-1L	0.1	1.0	0.1	0.1	A
OI-CH-4A	0.0	1.0	0.1	0.0	A
OI-TS-5AU	15.1	14.2	0.1	0.0	A
PR-coarse	0.1	0.1	0.1	0.0	A
00-W-5	0.1	1.8	0.1	0.0	A
OI-MA-2L	0.1	0.7	0.1	0.0	A
00-CH-5	0.1	0.4	0.1	0.0	A
00-CH-7	0.1	0.4	0.1	0.0	A
OI-CH-0	0.0	0.4	0.1	0.0	A
OI-TS-5AL	0.4	3.2	0.1	0.0	A
OI-SS-4L	0.0	3.0	0.1	0.0	A
PR-fine	0.1	0.2	0.2	0.2	A
00-CH-4	0.1	0.1	0.1	0.0	A
00-CH-6	0.2	0.3	0.2	0.1	A
Tomales Bay	0.1	0.4	0.1	0.0	A
00-CH-3	0.1	0.4	0.2	0.0	A
00-CH-2	0.1	1.8	0.2	0.1	A
00-W-1	0.1	0.1	0.2	0.0	A
00-W-4	0.5	0.4	0.2	0.1	A
00-W-2	0.1	0.2	0.2	0.1	A
00-CH-1	0.1	0.1	0.2	0.1	A
00-W-3	0.5	0.4	0.2	0.1	A

(a) Not replicated
(b) Sediment concentration of mercury as µg/g dry wt divided by the sediment concentration of total organic carbon as percent dry wt
(c) Sediment treatments in the same statistical group are not significantly different from each other

TABLE 3.47. Balanced One-Way ANOVA of the Natural Logarithm of Mercury Concentrations in Tissues of *M. nasuta* after 10-day Exposure to Sediment Treatments

Source of Variation	Sum of Squares	d.f.	Mean Square	F-Ratio	Significance Level
Between Groups	5.1336	25	0.2053	1.6090	0.0512
Within Groups	13.0204	102	0.1277		
Total (corrected)	18.1540	127			

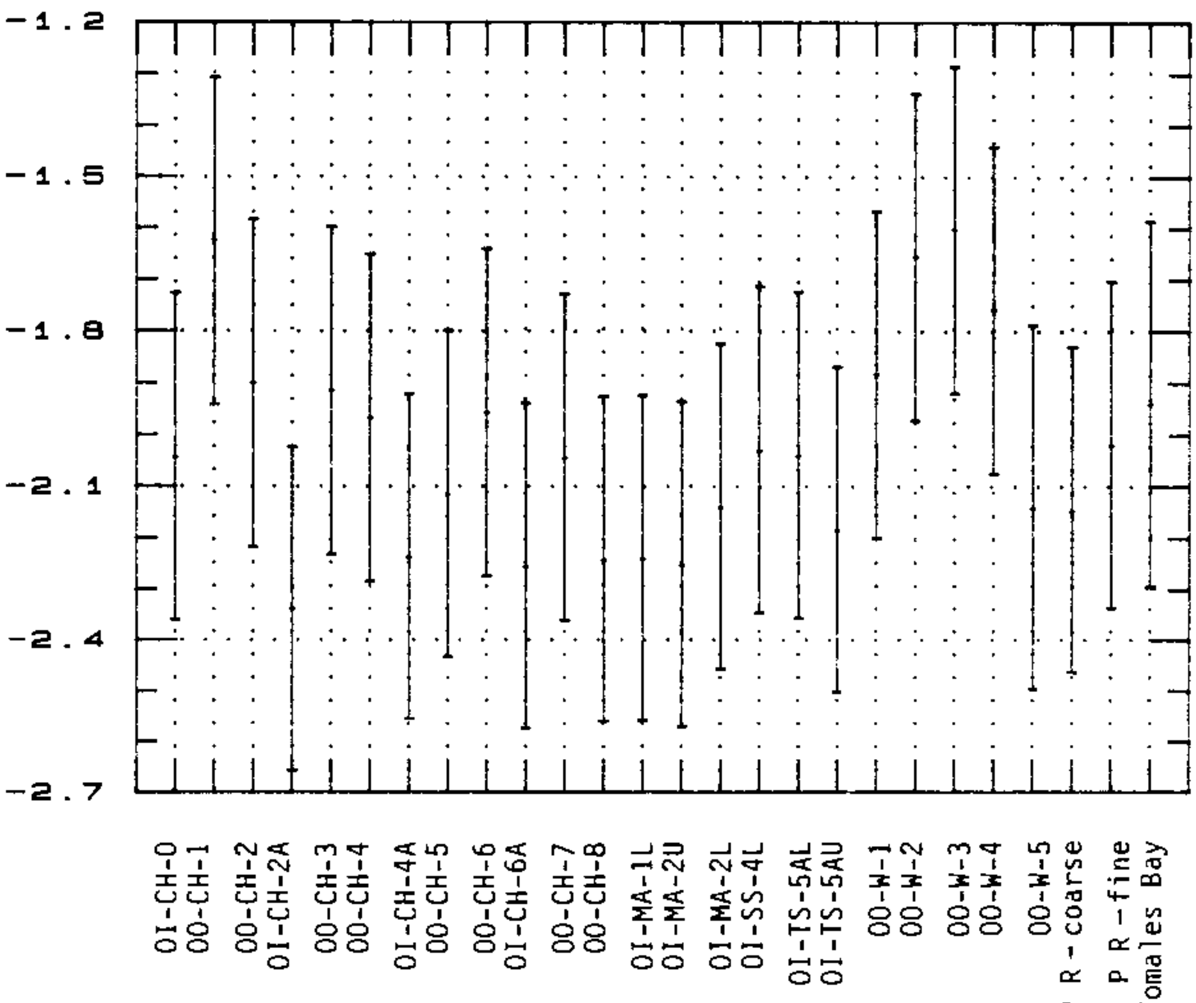


FIGURE 3.17. Natural Logarithm of Concentrations of Mercury (µg/g dry wt) in Tissues of *M. nasuta* after 10-day Exposure to Sediment Treatments

Selenium

The highest values of bioaccumulated selenium (5.28 µg/g dry wt) resulted from exposure to sediment from station OO-W-3 (Table 3.48); lowest values (2.52 µg/g) resulted from exposure to station OO-CH-5. Point Reyes-fine reference sediment fell at the low end of this distribution; PR-coarse fell at the high end. Although ANOVA (Table 3.49) results suggested statistically significant ($P = 0.0471$) differences among the sediment treatment means, the more conservative Tukey's HSD Multiple Comparison Test failed to detect any differences. The relatively narrow range of Se concentrations for the 26 sediment treatments are presented graphically in Figure 3.18.

Relation to Sediment Metals Concentration

As we determined in Phase I (Word et al. 1990), bioaccumulation of metals in clam tissue did not appear to be dependent upon sediment concentration. That is, sediment treatments with relatively high concentrations of metals (e.g., station OI-MA-2U for Ag, station OI-TS-5AU for Pb, station TS-5AU for Zn) did not always result in high bioaccumulation of metals in M. nasuta. In all regression analyses of sediment vs. tissue concentration, all correlation coefficients for the 10 metals studied in Phase II were statistically insignificant at the $\alpha = 0.05$ level (Table 3.50). Normalization of the sediment metals concentration to sediment TOC concentration did not improve the relationship.

Another way to show the lack of correlation between bioaccumulation and sediment concentration is to compare the variation in sediment concentration with the variation in tissue concentration. Table 3.50 shows sediment and mean tissue concentration variations as ratios of the highest sediment or mean tissue concentration to the lowest concentration. While sediment metals concentrations vary considerably (e.g., over 800-fold for mercury), the corresponding tissue concentrations vary only slightly. Overall, the variation in metals concentration to clam tissues averages 2.5-fold, which is comparable to the observations made during Phase I of the Oakland Harbor Program (Word et al. 1990).

TABLE 3.48. Comparison of Concentrations of Selenium Contained in Tissues of *M. nasuta* after 10-day Exposure to Sediment Treatments

Sediment Treatment	Sediment Concentration, μg/g dry wt[a]	Sediment Selenium/ TOC[b]	Mean Tissue Concentration, μg/g dry wt	SD	Statistical Group[c]
OO-CH-5	0.4	1.3	2.5	0.3	A
OI-MA-1L	0.3	4.1	2.5	0.2	A
PR-fine	0.3	0.9	2.6	0.5	A
OO-CH-8	0.4	1.0	2.7	0.4	A
OI-TS-5AU	0.5	0.4	2.8	0.3	A
OI-SS-4L	0.1	11.0	2.8	0.2	A
OO-W-5	0.2	5.5	2.8	0.4	A
OO-CH-7	0.3	2.2	2.8	0.2	A
OI-MA-2L	0.3	2.9	2.9	0.4	A
OI-CH-6A	0.2	6.0	2.9	0.1	A
OI-MA-2U	0.5	0.3	2.9	0.3	A
OI-CH-2A	0.5	0.5	3.0	0.3	A
OO-CH-4	0.4	0.4	3.0	0.3	A
OI-CH-4A	0.2	9.0	3.1	0.6	A
Tomales Bay	0.2	0.8	3.1	0.3	A
OO-W-4	0.6	0.6	3.1	0.5	A
OO-W-1	0.4	0.6	3.1	0.2	A
OO-CH-6	0.3	0.7	3.1	0.2	A
OI-CH-0	0.2	4.2	3.2	0.4	A
OO-W-2	0.3	0.8	3.3	0.4	A
OO-CH-1	0.4	0.6	3.4	0.3	A
OO-CH-2	0.2	3.5	3.4	0.2	A
OO-CH-3	0.3	1.5	3.7	0.3	A
OI-TS-5AL	0.2	1.4	4.8	4.0	A
PR-coarse	0.3	0.7	5.1	4.4	A
OO-W-3	0.5	0.4	5.3	4.9	A

(a) Not replicated
(b) Sediment concentration of selenium as μg/g dry wt divided by the sediment concentration of total organic carbon as percent dry wt
(c) Sediment treatments in the same statistical group are not significantly different from each other

TABLE 3.49. Balanced One-Way ANOVA of the Natural Logarithm of Selenium Concentrations in Tissues of *M. nasuta* after 10-day Exposure to Sediment Treatments

Source of Variation	Sum of Squares	d.f.	Mean Square	F-Ratio	Significance Level
Between Groups	2.5129	25	0.1005	1.6280	0.0471
Within Groups	6.2983	102	0.0617		
Total (corrected)	8.8112	127			

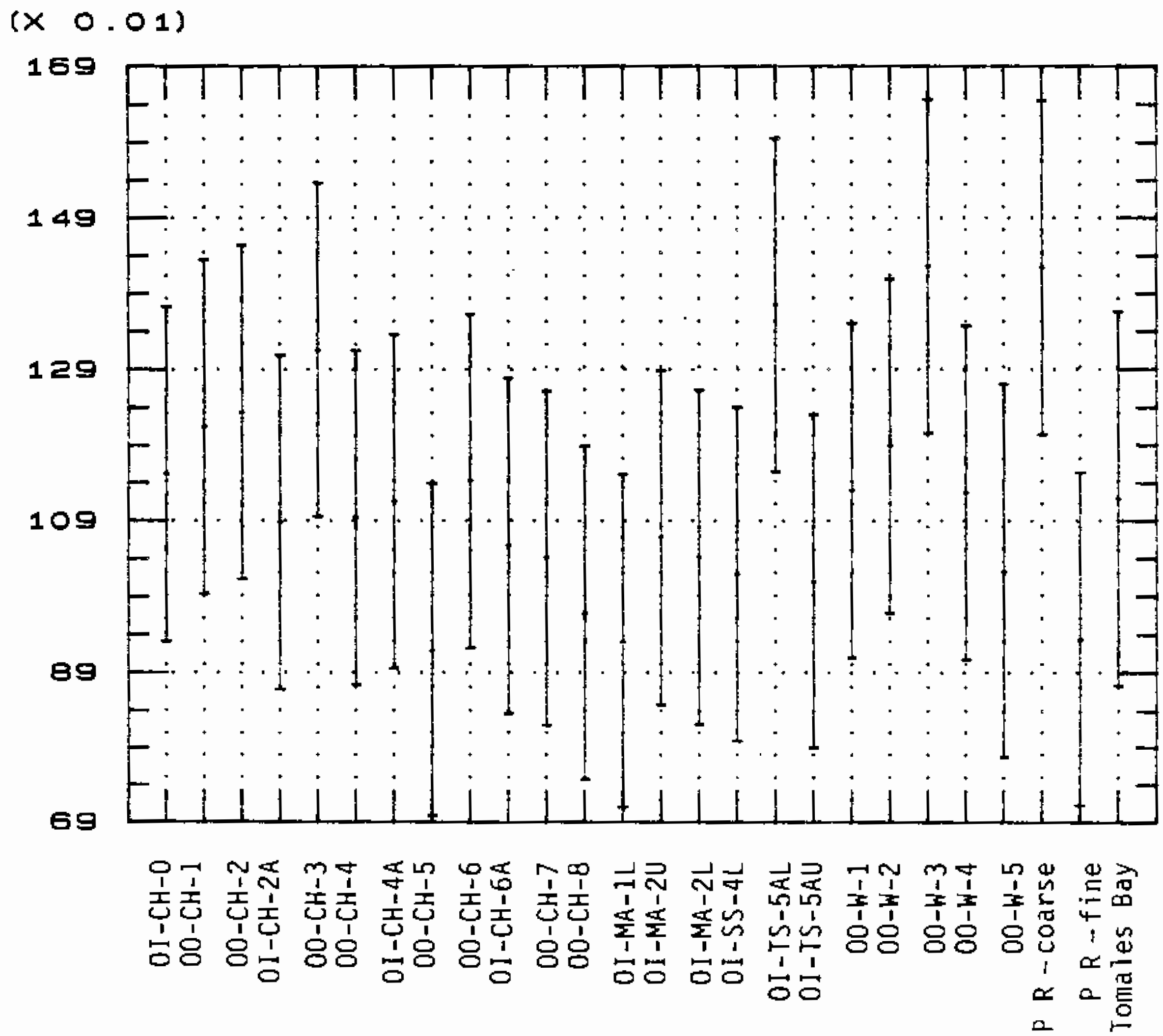


FIGURE 3.18. Natural Logarithm of Concentrations of Selenium (μg/g dry wt) in Tissues of *M. nasuta* after 10-day Exposure to Sediment Treatments

TABLE 3.50. Comparison of Sediment and Mean *M. nasuta* Tissue Metals Concentrations (correlation and difference)

Metal	Correlation Coefficient: Sediment vs. Tissue	Correlation Coefficient: TOC-Normalized Sediment vs. Tissue	Difference Factor[a]: Sediment	Difference Factor[a]: Tissue
Ag	-0.091	0.058	27.0	3.7
As	0.335	-0.092	21.0	1.6
Cd	-0.244	-0.160	100.0	2.0
Cr	0.247	-0.116	17.9	2.3
Cu	-0.100	-0.241	39.5	3.4
Hg	-0.144	-0.205	837.0	2.0
Ni	-0.22	-0.122	4.3	1.9
Pb	-0.086	-0.176	33.4	3.8
Se	-0.006	-0.236	5.2	2.1
Zn	-0.108	-0.199	13.2	1.9

(a) Maximum sediment concentration divided by minimum sediment concentration or maximum mean tissue concentration divided by minimum tissue concentration

3.5.2 Priority-Pollutant Polynuclear Aromatic Hydrocarbons, Pesticides, and Polychlorinated Biphenyls

Polynuclear Aromatic Hydrocarbons

The quality assurance summary for tissue PAHs is presented in Appendix G, Tables G.1 to G.3. These data show that the analytical detection limit for the 16 compounds ranged from 0.57 to 8.88 μg/kg (dry wt), well below our target of 20 μg/kg. Eight tissue samples were replicated for the 16 compounds to determine analytical precision, resulting in a RPD range of 1 to 93%. Of the 128 comparisons, 14 exceeded our quality assurance limit of ≤25% RPD. These included benzo(k)- and benzo(b)fluoranthene, chyrsene, benzo(k)anthracene, acenaphthene, fluroene, and naphthalene comparisons. Of the 128 comparisons, 114 were within acceptable RPD range.

A standard reference material was measured four times for eight compounds to determine analytical accuracy, producing a range of recovery of 27 to 159%. Three of 32 observations were below our target recovery minimum of 49%; nine were above our 120% maximum. High recoveries were assoicated with pyrene, chrysene, and fluoranthene compounds. Five surrogate compounds were measured for recovery in 141 samples, resulting in 705 observations. Five observations were below our 40% recovery minimum; nine were above our 120% recovery maximum. Low recoveries were associated with d8-Naphthalene; high recoveries were associated with d12-Chrysene.

Six procedural blanks were analyzed for the presence of the 16 compounds, and the following compounds were detected in at least one blank: benzo(a)pyrene, fluoranthene, fluorene, naphthalene, phenanthrene, and pyrene. All compounds except naphthalene were present at levels below our target detection limit of 20 μg/kg.

Our quality assurance evaluation indicates that these data are acceptable for use in analysis, given the low detection limit achieved, the results of duplicate analyses, and the good surrogate recovery.

The levels of total tissue PAHs were determined by summing all 16 PAH compounds. If a compound was not detected, one-half of the reported detection limit for the compound was used in the summation and analysis.

The comparison of mean concentrations of total PAHs accumulated in tissues of M. nasuta showed a low of 63.43 μg/kg (dry wt) from Station OO-W-1 and a high of 3533.61 μg/kg from Station OI-MA-2L. PR-coarse, PR-fine, and Tomales Bay sediments resulted in tissue concentrations generally at the low end of this distribution (Table 3.51). ANOVA results showed significant differences ($P \leq 0.0001$) among the tissues tested (Table 3.52), and examination of statistical groupings showed that four stations were statistically different and contained higher concentrations of PAHs than did PR-coarse. If the comparison was based on the cleanest reference sediment (PR-fine), then all stations were statistically different and contained elevated levels of PAHs. Figure 3.19 presents the 95% confidence intervals of the natural log of PAHs (μg/kg dry weight) for these data. The figure shows enhanced levels of PAHs in tissues exposed to sediments from Stations OI-MA-1L, OI-MA-2U, OI-TS-5AL, and OI-TS-5AU when compared with tissues exposed to reference sediments. Comparison of PAH sediment concentrations with tissue levels of PAH reveals no distinct pattern (Table 3.51).

TABLE 3.51. Comparison of Concentrations of Total PAHs Contained in Tissues of *M. nasuta* After 10-day Exposure to Sediment Treatments

Sediment Treatment	Sediment Concentration, μg/kg dry wt[a]	Sediment PAH/TOC[b]	Mean Tissue Concentration, μg/kg dry wt[c]	SD	Statistical Group[d]
00-W-1	25.6	41.3	63.4	9.9	A
PR-fine	39.4	131.4	70.0	11.9	AB
OI-CH-6A	15.1	502.7	86.2	42.2	ABC
OI-CH-4A	2.9	144.0	81.2	14.2	ABCD
00-W-5	0.1	2.0	85.5	18.1	ABCD
00-CH-5	448.1	1,435.5	102.3	18.4	ABCD
00-W-2	176.5	430.4	106.3	37.3	ABCD
OI-CH-0	2.7	54.6	113.6	50.3	ABCD
Tomales Bay	37.7	134.5	114.3	26.7	ABCDE
00-CH-1	200.8	295.3	113.6	20.6	ABCDE
00-CH-7	148.2	1,139.8	127.3	23.7	ABCDE
OI-MA-2L	1,072.5	8,250.2	140.4	48.6	ABCDEF
OI-SS-4L	25.9	370.1	139.8	22.1	ABCDEF
00-CH-3	1,470.8	8,651.7	171.9	151.6	BCOEF
00-CH-2	178.5	2,975.7	159.4	71.6	BCDEF
OI-CH-2A	2,030.5	1,933.8	157.0	38.9	CDEF
PR-coarse	48.3	123.7	175.7	92.6	CDEFG
00-W-3	362.0	306.8	178.8	60.7	DEFG
00-W-4	953.8	944.3	230.9	25.7	EFGH
00-CH-4	896.8	822.7	285.1	35.5	FGH
00-CH-6	540.4	1,228.1	289.8	29.0	FGH
00-CH-8	640.1	1,561.2	354.9	64.5	GH
OI-MA-1L	27.5	2,754.0	439.1	152.6	H
OI-MA-2U	10,482.5	9,889.1	2,246.2	528.4	I
OI-TS-5AL	9,816.1	7,061.9	2,798.4	278.0	I
OI-TS-5AU	280.9	2,553.9	3,533.6	851.9	I

(a) Not replicated
(b) Sediment concentration of PAHs as μg/kg dry wt divided by the sediment concentration of total organic carbon as percent dry wt
(c) One-half of the reported detection limit was used for undetected compounds
(d) Sediment treatments in the same statistical group are not significantly different from each other

TABLE 3.52. Balanced One-Way ANOVA of the Natural Logarithm of Total PAHs in Tissues of *M. nasuta* After 10-day Exposure to Sediment Treatments

Source of Variation	Sum of Squares	d.f.	Mean Square	F-Ratio	Significance Level
Between Groups	141.6456	25	5.6658	56.3100	<0.0001
Within Groups	10.0618	100	0.1006		
Total (corrected)	151.7074	125			

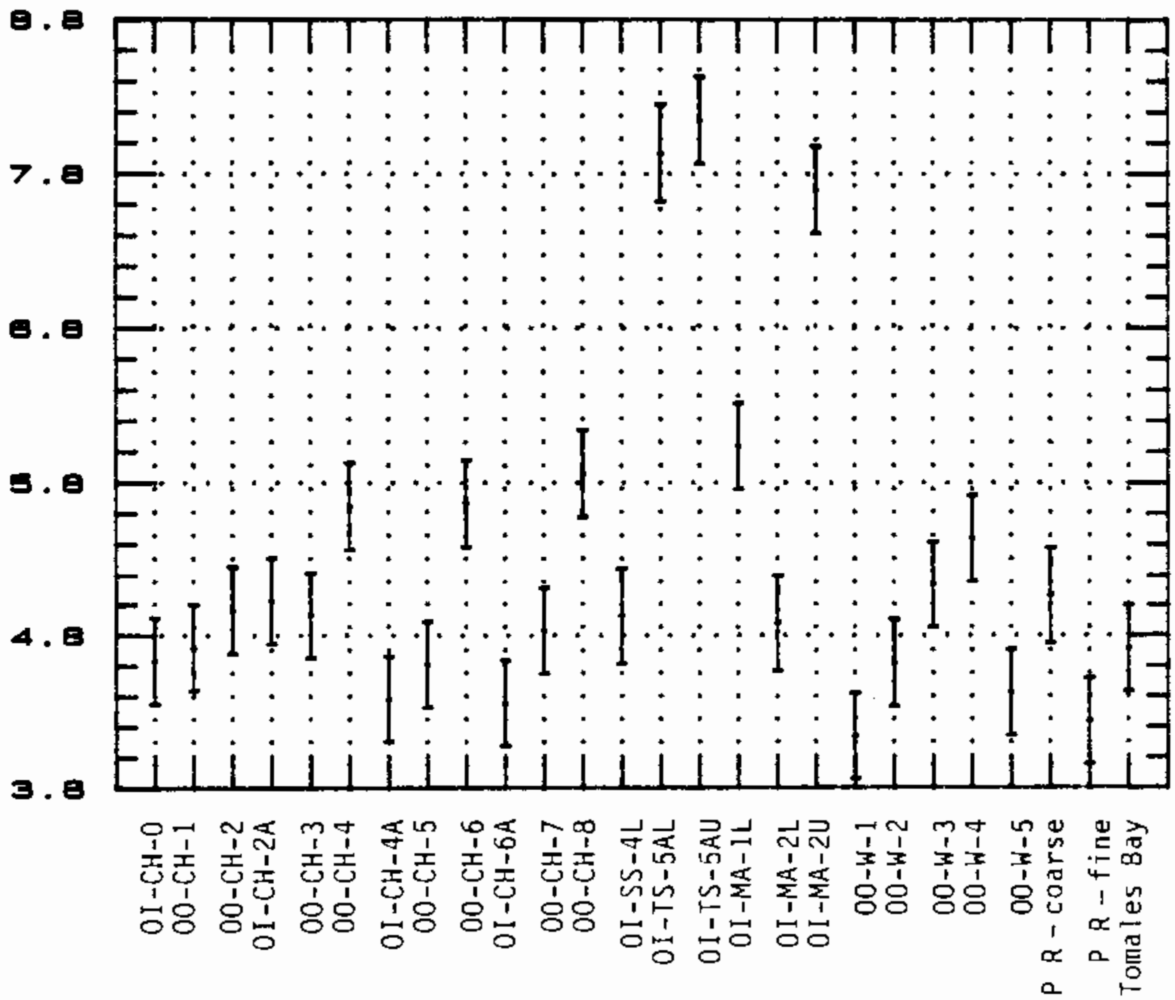


FIGURE 3.19. Natural Logarithm of Concentrations of PAHs (µg/kg dry wt) in Tissues of *M. nasuta* After 10-day Exposure to Sediment Treatments

Pesticides

Quality assurance information pertaining to tissue pesticides is presented in Appendix G, Tables G.4 to G.6. Detection limits for the 17 compounds exceeded our target limits by one to five times. This was primarily due to the tissue mass available. Duplicate analysis was run on six samples for the 17 compounds to determine analytical precision, resulting in a total of 102 observations. We were unable to calculate RPDs, because all compounds were below detection. An SRM was analyzed four times for the 17 compounds to determine analytical accuracy. The range of recovery of the compounds was 0 to 1245%, with the highest recoveries associated with 4',4'-DDE, 4',4'-DDT, and heptachlor. Low recoveries were associated with 4',4'-DDD, 4',4'-DDT, and dieldrin. There is some uncertainty concerning our measurements and the certified results of this SRM, so these quality assurance results are questionable.

Surrogate sample recovery was monitored for DBC in 67 samples and for DBOFB in 60 samples. DBC recoveries ranged from 2 to 62%, with 9 of 67 below our quality assurance limit of 40%. DBOFB surrogate recovery ranged from 54 to 105%, a range within our acceptable limits of 40 to 120%. Six procedural blanks were analyzed for the 17 compounds, and all were below detection.

Based on the results of this quality assurance review, we believe these data can be used for analysis, but with caution. Although the actual levels present in the SRM need additional verification. This data acceptance is based, at this time, on good DBOFB surrogate recovery, and clean procedural blanks. The higher detection limits should also be noted when examining the data.

The only pesticide detected in the clam tissues was DDE. For the purpose of data analysis and interpretation, mean DDE concentrations in each sediment treatment determined from either detected values or one-half of the reported detection limit in the tissue sample when DDE was not detected. Mean concentrations of detectable DDE pesticides in tissues of _M_. _nasuta_ ranged from a low of 2.6 μg/kg (dry wt) in the Tomales Bay reference sediment to a high of 9.4 μg/kg at Station OI-TS-5AU (Table 3.53), at an analytical detection limit for this compound of 3.8 ng/g (dry wt) for an individual sample. Although the levels of DDE were extremely low, ANOVA results showed

TABLE 3.53. Comparison of Concentrations of DDE Contained in Tissues of *M. nasuta* After 10-day Exposure to Test Sediments

Sediment Treatment	Sediment Concentration, µg/kg dry wt[(a)]	Sediment DDE/TOC[(b)]	Mean Tissue Concentration, µg/kg dry wt[(c)]	SD	Statistical Group[(d)]
OI-CH-0	ND	NA[(e)]	ND[(f)]	0.0	A
OO-CH-1	ND	NA	ND	0.0	A
OI-CH-2A	3.9	3.7	ND	0.0	A
OO-CH-3	5.2	30.8	ND	0.0	A
OO-CH-4	4.3	4.0	ND	0.0	A
OI-CH-4A	ND	NA	ND	0.0	A
OO-CH-5	1.0	3.0	ND	0.0	A
OO-CH-6	2.3	6.7	ND	0.0	A
OI-CH-6A	ND	NA	ND	0.0	A
OO-CH-7	1.0	7.4	ND	0.0	A
OO-CH-8	1.9	4.6	ND	0.0	A
OI-MA-2L	ND	NA	ND	0.0	AB
OO-W-1	ND	NA	ND	0.0	ABC
OO-W-2	ND	NA	ND	0.0	ABC
OO-W-5	ND	NA	ND	0.0	ABC
Tomales Bay	ND	NA	2.6	0.9	ABCD
OI-SS-4L	ND	NA	2.8	1.1	ABCDE
OO-CH-2	2.2	36.7	4.2	5.1	ABCDE
OI-MA-1L	ND	NA	4.3	5.5	ABCDEF
PR-coarse	2.2	6.1	4.0	0.5	B DEFG
PR-fine	2.4	7.9	4.8	0.6	EFGH
OO-W-3	0.8	0.7	5.1	1.2	EFGH
OO-W-4	4.0	4.0	5.6	0.7	FGH
OI-MA-2U	3.6	2.6	6.9	0.9	GH
OI-TS-5AL	0.9	6.8	7.0	0.9	GH
OI-TS-5AU	5.0	4.7	9.4	2.4	H

(a) Not replicated
(b) Sediment concentrations of DDE as µg/kg dry wt divided by the sediment concentration of total organic carbon as percent dry wt
(c) One-half of the reported detection limit was used for undetected compounds.
(d) Sediment treatments in the same statistical group are not significantly different from each other
(e) Not applicable
(f) Undetected in all five replicates; one-half the detection limit of 3.8 µg/kg was used in ANOVA

that significant differences (P = <0.0001) occurred among the means of the 26 sediment treatments (Table 3.54). Clams exposed to the reference sediments (PR-coarse, PR-fine) and to sediments from Stations OO-W-3, OO-W-4, OI-MA-2U, OI-TS-5AL, and OI-TS-5AU were statistically different and contained higher concentrations of DDE than clams exposed to the Tomales Bay reference sediment. Clams exposed to sediments from these same five stations, however, were indistinguishable from clams exposed to the two other reference sediments (PR-coarse, PR-fine). Figure 3.20 shows the 95% confidence intervals of the natural log of DDE (μg/kg dry weight) for these data. The figure indicates that higher levels of tissue DDE resulted from exposure to five sediment treatments and two reference sediments (PR-coarse, PR-fine) compared with the Tomales Bay reference sediment. Importantly, in Phase I of the -42-Foot Project (Word et al. 1990), chemical analyses of the PR-fine reference sediment also revealed a low but detectable (~2.00 μg/kg) signal for DDE. Comparison of pesticide sediment concentrations to tissue levels of pesticides reveals no distinct patterns (Table 3.53).

Polychlorinated Biphenyls

Quality assurance for PCBs is presented in Appendix G, Tables G.7 to G.9. Our target detection limit of 10 μg/kg (dry wt) was exceeded by six times in these analysis, primarily due to low tissue mass. Duplicate analyses were performed on six samples for the four compounds (24 comparisons), resulting in non-calculatable RPDs in all but one sample, due to nondetectable quantities. In the one comparison where RPD calculation was possible, it was 35%. A reference was analyzed four times, but certified values were not available to measure analytical accuracy. The four values for Aroclor 1254 averaged 1541 μg/kg (dry wt), with a standard deviation of 235). Six procedural-blank analyses produced nondetectable levels of the four PCBs. The results of this quality assurance analysis are that these data are acceptable for use in analysis, though the higher detection limits should be taken into account for undetected samples.

The only PCB detected in tissues was Aroclor 1254. This PCB was detected in at least one of five replicate samples only six sediment treatments. For the purpose of analysis, we used one-half of the detection limit (32 μg/kg) as a mean concentration when Aroclor 1254 was not detected in one or more

TABLE 3.54. Balanced One-Way ANOVA of the Natural Logarithm of DDE Concentrations in Tissues of *M. nasuta* After 10-day Exposure to Sediment Treatments

Source of Variation	Sum of Squares	d.f.	Mean Square	F-Ratio	Significance Level
Between groups	31.4523	25	1.2581	15.7890	<0.0001
Within groups	7.9681	100	0.0797		
Total (corrected)	39.4205	125			

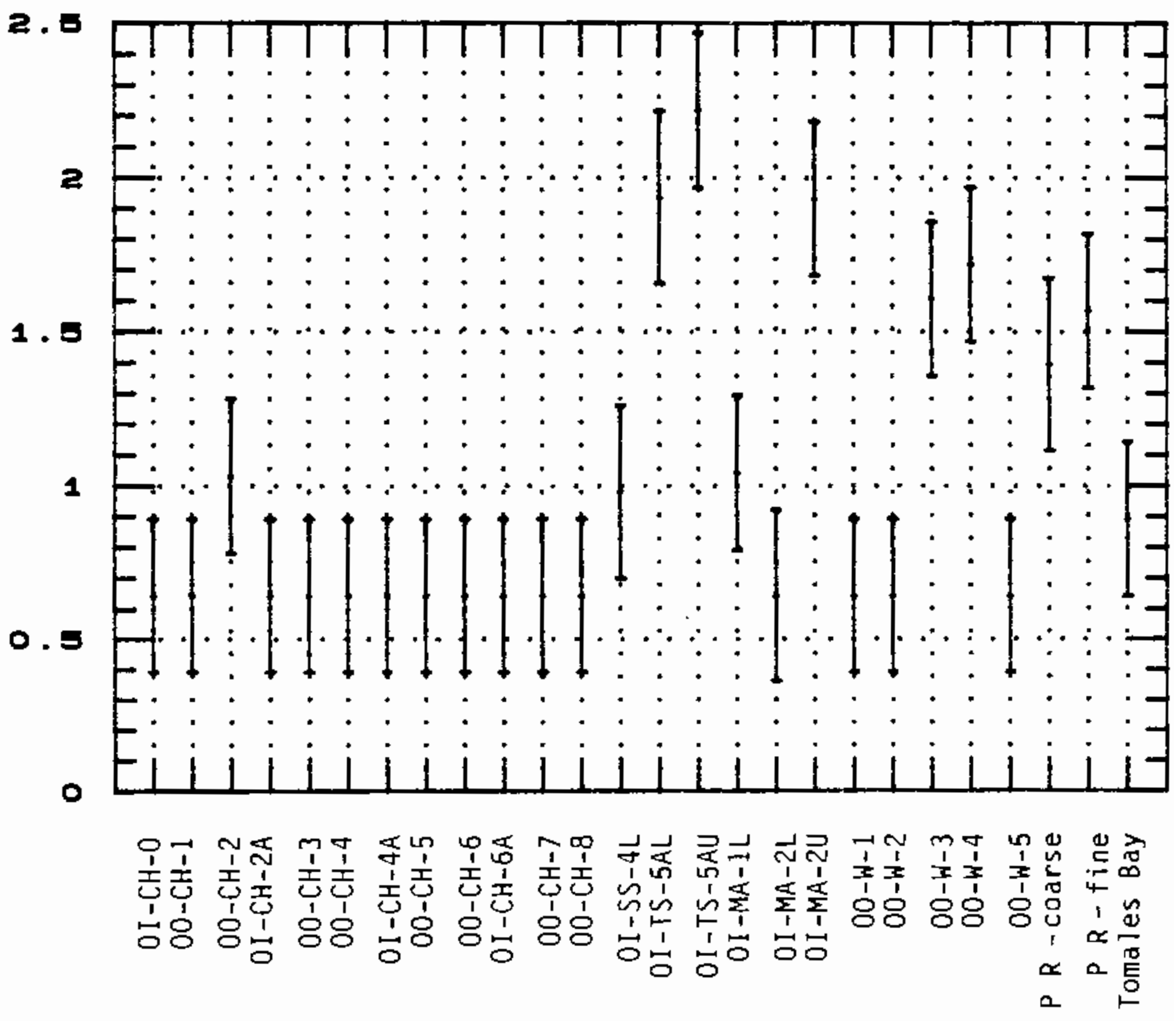


FIGURE 3.20. Natural Logarithm of Concentrations of DDE (μg/kg dry wt) in Tissues of *M. nasuta* After 10-day Exposure to Sediment Treatments

replicates, the mean concentration was calculated using detected values or one-half detection limit, for nondetected values.

Mean concentrations of detectable PCBs (only Arochlor 1254 was detected in tissues) ranged from undetected in 20 sediment treatments to a high of 195 μg/kg in tissues exposed to sediment from Station OI-TS-5AU. The achieved analytical detection limit for this compound (each individual sample) was 63 μg/kg (dry wt). ANOVA results showed significant differences ($P \leq 0.0001$) among sediment treatments (Table 3.55). Examination of statistical groups showed that four sediment treatments were statistically different and resulted in a higher concentration of PCBs in tissues than did the reference sediments. Figure 3.21 presents the 95% confidence intervals of the natural log of PCBs (μg/kg dry wt) for these data. This graph shows enhanced levels of PCBs in tissues under exposure to sediment treatments OO-CH-2, OI-TS-5AL, OI-MA-2U, and OI-TS-5AU compared with the reference sediment treatments. Comparison of sediment PCB levels to tissue concentrations reveals no clear patterns (Table 3.56).

TABLE 3.55. Balanced One-Way ANOVA of the Natural Logarithm of PCB (Aroclor 1254) Concentrations in Tissues of M. nasuta After 10-day Exposure to Sediment Treatments

Source of Variation	Sum of Squares	d.f.	Mean Square	F-Ratio	Significance Level
Between Groups	28.9916	25	1.1597	28.5310	<0.0001
Within Groups	4.0646	100	0.4065		
Total (corrected)	33.0563	125			

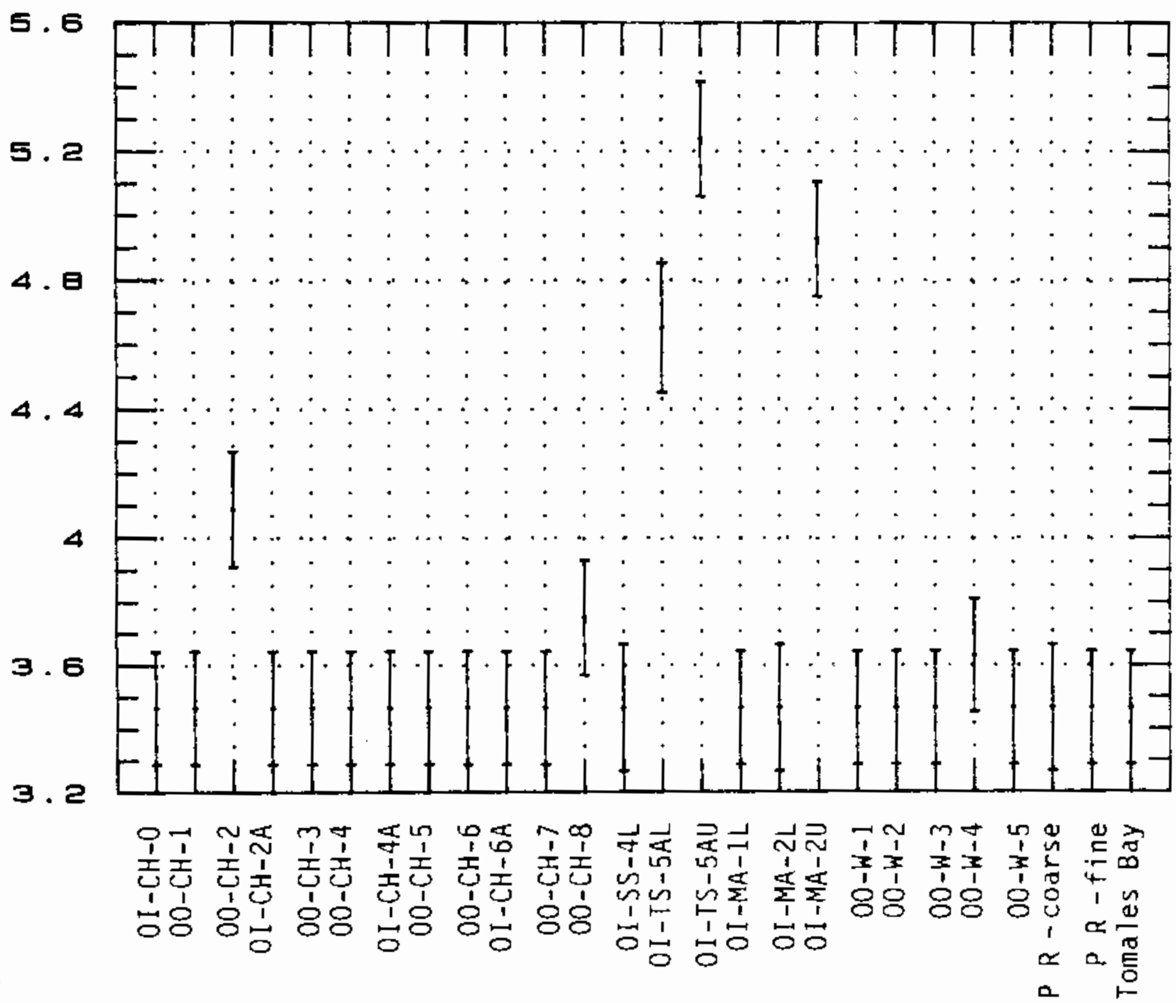


FIGURE 3.21. Natural Logarithm of Concentrations of PCBs (μg/kg dry wt) in Tissues of M. nasuta After 10-day Exposure to Sediment Treatments

TABLE 3.56. Comparison of Concentrations of PCBs (Aroclor 1254) Contained in in Tissues of *M. nasuta* After 10-day Exposure to Test Sediments

Sediment Treatment	Sediment Concentration, µg/kg dry wt[(a)]	Sediment 1254/ TOC[(b)]	Mean Tissue Concentration, µg/kg dry wt	SD	Statistical Group[(c)]
OI-CH-0	ND	NA[(e)]	ND[(d)]	0.0	A
OO-CH-1	ND	NA	ND	0.0	A
OI-CH-2A	54.2	51.6	ND	0.0	A
OO-CH-3	71.1	418.1	ND	0.0	A
OO-CH-4	48.5	44.5	ND	0.0	A
OI-CH-4A	ND	NA	ND	0.0	A
OO-CH-5	14.2	41.8	ND	0.0	A
OO-CH-6	11.3	25.7	ND	0.0	A
OI-CH-6A	ND	NA	ND	0.0	A
OO-CH-7	1.5	11.6	ND	0.0	A
OI-MA-1L	ND	NA	ND	0.0	A
OO-W-1	ND	NA	ND	0.0	A
OO-W-2	ND	NA	ND	0.0	A
OO-W-3	ND	NA	ND	0.0	A
OO-W-5	ND	NA	ND	0.0	A
PR-fine	ND	NA	ND	0.0	A
Tomales Bay	ND	NA	ND	0.0	A
OI-SS-4L	ND	NA	ND	0.0	A
OI-MA-2L	6.0	54.5	ND	0.0	A
PR-coarse	ND	NA	ND	0.0	A
OD-W-4	40.9	40.5	40.2	18.4	AB
OO-CH-8	13.7	33.5	52.2	45.2	AB
OO-CH-2	42.8	713.0	67.6	34.4	B
OI-TS-5AL	41.9	322.4	105.3	11.4	C
OI-MA-2U	143.7	103.4	139.5	23.8	CD
OI-TS-5AU	362.9	342.4	195.3	60.4	D

(a) Not replicated
(b) Sediment concentration of PCBs (Aroclor 1254) as µg/kg dry wt divided by sediment concentration of total organic carbon as percent dry wt
(c) Sediment treatments in the same statistical group are not significantly different from each other
(d) Undetected in all five replicates; one-half of the detection limit of 63 µg/kg was used in ANOVA
(e) Not applicable

3.5.3 Organotins

Quality assurance data for tissue organotins is presented in Appendix G, Tables G.13 to G.15. Target detection limits were met for all three measured compounds. Duplicate analyses were performed on seven samples, producing an RPD range of 8 to 42%, with only one observation above our 25% maximum RPD limit (tributyltin). Surrogate recovery of propyltin was monitored in all samples, and recoveries ranged from 57 to 113%. This is within our target recovery range of 40 to 120%. Five samples were spiked for tri-, di- and monobutyltin, and recoveries ranged from 16 to 98%, with good recoveries for tri- and di-butyltins and low recoveries for monobutyltins. Based on these results, these data are acceptable for use in analysis, though care should be taken when evaluating monobutyltin concentrations, since surrogate recoveries associated with these samples were low.

Mean organotin concentrations were calculated for each compound using detected concentrations. If a compound was not detected, the mean of all undetected values for a compound was used in the calculation. The reason for using this mean of undetected values rather than one-half of the detection limit was the observation of numerous concentrations near the analytical detection limit. Chemical analyses of organotin in tissues of M. nasuta after a 10-d exposure to sediment treatments showed that tributyltin concentrations ranged from 12.2 to 37.5 μg/kg (dry wt) (Table 3.57). Dibutyltin concentrations were slightly higher, ranging from 22.4 to 66.4 μg/kg (Table 3.57). Concentrations of monobutyltin were the lowest, ranging from 6.2 to 9.20 μg/kg (Table 3.57).

For tributyltins, ANOVA showed significant differences ($P \leq 0.00001$) among the sediments tested (Table 3.58). Examination of statistical groupings showed that only one station (OI-TS-5AU) resulted in bioaccumulation that was statistically different ($P \leq 0.00001$) than either of the Point Reyes reference sediments. Figure 3.22 shows the 95% confidence intervals of the natural log of tributyltin for these data. Although they are not shown in this report, ANOVA results showed no differences in dibutyltin and monobutyltin bioaccumulation among the 26 sediment treatments.

TABLE 3.57. Comparison of Concentrations of Butyltins Contained in Tissues of *M. nasuta* after 10-day Exposure to Sediment Treatments

Sediment Treatment	Monobutyltin Mean Tissue Concentration, µg/kg dry wt	Dibutyltin Mean Tissue Concentration, µg/kg dry wt	Tributyltin Mean Tissue Concentration, µg/kg dry wt	Tributyltin SD	Tributyltin Statistical Group[c]
OO-CH-2	ND[c]	35.1	12.2	0.2	A
OI-CH-0	ND	33.0	ND	0.0	A
OO-CH-1	ND	29.0	ND	0.0	A
OO-CH-3	ND	41.2	ND	0.0	A
OO-W-1	6.9	49.6	ND	0.0	A
OO-W-2	6.4	42.6	ND	0.0	A
OO-W-4	ND	29.2	ND	0.0	A
OO-W-5	6.5	49.6	ND	0.0	A
Tomales Bay	6.9	26.6	ND	0.0	A
OO-W-3	7.2	58.4	13.0	1.7	A
OI-TS-5AL	ND	30.2	13.4	2.6	A
OI-MA-2L	ND	44.0	13.5	1.6	A
OO-CH-5	9.2	48.3	13.6	2.0	A
OO-CH-4	ND	34.2	14.0	3.9	A
OI-SS-4L	ND	66.4	14.0	2.3	A
OI-CH-2A	ND	40.4	14.5	3.3	A
PR-fine	7.1	41.2	14.4	2.9	A
DI-CH-6A	ND	22.4	15.4	7.1	A
PR-coarse	7.4	59.0	15.6	5.9	A
OO-CH-8	6.4	37.2	15.1	2.7	A
OI-CH-4A	ND	39.2	15.8	6.4	A
OO-CH-7	6.2	39.6	17.5	8.2	A
OI-MA-1L	ND	43.0	17.8	3.1	A
OO-CH-6	ND	34.7	21.3	5.5	AB
OI-MA-2U	ND	60.6	22.9	11.2	AB
OI-TS-5AU	ND	41.2	37.5	15.0	B

(a) When compound was undetected, the mean value of all detection limits for that compound was used in calculating mean concentration
(b) Sediment treatments in same statistical group
(c) Not detected

TABLE 3.58. Balanced One-way ANOVA of the Natural Logarithm of Tributyltin Concentrations in Tissues of M. *nasuta* after 10-day Exposure to Sediment Treatments

Source of Variation	Sum of Squares	d.f.	Mean Square	F-Ratio	Significance Level
Between Groups	6.5736	25	0.2629	4.7480	≤0.00001
Within Groups	5.7593	104	0.0554		
Total (corrected)	12.3329	129			

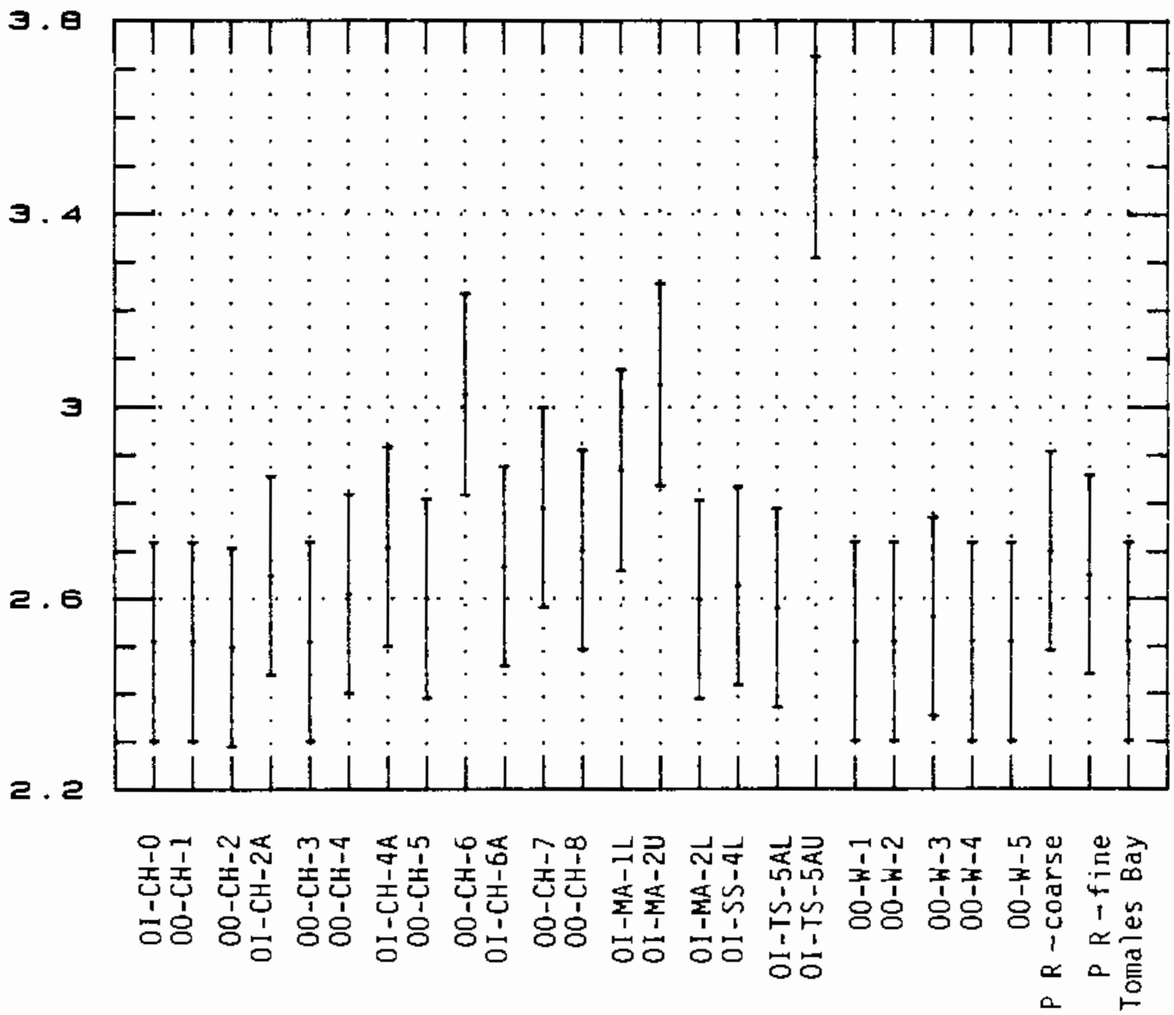


FIGURE 3.22. Natural Logarithm of Concentrations of Tributyltin (μg/kg dry wt) in Tissues of M. *nasuta* After 10-day Exposure to Sediment Treatments

4.0 DISCUSSION AND CONCLUSIONS

During the Oakland Harbor Phase II sediment evaluation program, the vibratory-hammer core was developed, tested, and used to collect sediment samples from Inner and Outer Oakland Harbors for the purposes of describing the geology and measuring physical and chemical sediment properties to maintenance (-38 ft MLLW) and new project (-42 ft MLLW) depths. The sediments from these cores were also tested for acute toxicity using four sensitive marine invertebrates (2 amphipods, 1 annelid, and 1 pelecypod) under standardized testing protocols. In addition, two nonstandard testing protocols were evaluated using the two amphipod species. Finally, the bioaccumulation potentials of sediment contaminants into tissues of the bivalve mollusk Macoma nasuta were measured.

4.1 VIBRATORY-HAMMER CORE

The vibratory-hammer core developed by the Battelle/Marine Sciences Laboratory and Manson Construction (Word et al. 1989b) effectively sampled to project depth at all locations within Outer and Inner Oakland Harbors. This sampler pushed 4-in.-dia cores into hard-packed sands and silts to a depth of at least 23 ft. During a companion program it pushed 12-in.-dia cores to a depth of at least 16 ft. The apparatus has proven highly successful during these and other programs in the San Francisco Bay area (Brown et al. 1990; Word and Kohn 1989). It has proven effective even in the highly compacted sediment, known locally as Merritt Sands.

4.2 GEOLOGY OF PROPOSED DREDGED SEDIMENTS

Most cores taken during Phase II were collected from the outer harbor channel. A cross section of the outer harbor is characterized by an upper soft and semi-consolidated Younger Bay Mud and a lower, more consolidated Older Bay Mud. The Younger Bay Mud was thickest (16 ft) near Station OO-W-4 but was absent in the vicinity of Station OO-W-5 and again in the west near the entrance to the outer harbor at station OI-CH-1. For the most part, the Younger Bay Mud of the outer harbor consisted of soft, dark-colored, silty clay. The Older Bay Mud unit consisted of three sediment types 1) a soft to firm, homogeneous, gray, stiff and cohesive silt to clayey silt, 2) an oxidized soft to firm sand to pebbly sand (equivalent to Merritt Sands), and 3) an underlying sandy silt to silty sand of probable terrestrial origin. The Older Bay Mud unit is thickest (~14 ft) in the vicinity of Station OO-W-1. The high degree of consolidation and the weathered and often bleached appearance of the Older Bay Mud suggested that this unit is much older than the overlying estuarine sediments of the Younger Bay unit.

4.3 TOXICITY OF PROPOSED DREDGED SEDIMENTS

A major portion of our evaluation was determining the potential toxicity of the solid phase of proposed dredged material. Evaluation, in this case, was based on survival of *Macoma nasuta*, *Nephtys caecoides*, *Rhepoxynius abronius*, and *Ampelisca abdita* in test sediments compared with their survival in reference sediments. A sediment was considered valid if survival was greater than 90% in the reference sediment.

In this analysis, sediments were grouped into the following five categories:

1. Stations showing no statistically significant decreases in survival (t-tests) and also showing no increases in mortality greater than 10% of the reference site values.

2. Stations showing no statistically significant decreases in survival (t-tests) but showing increases in mortality that exceed reference sediment values by 10% or more.

3. Stations showing statistically significant decreases in survival (t-tests) equal to or greater than 10% of reference sediments.

4. Stations showing statistically significant decreases in survival (t-tests) that are a minimum of 10% less than survival in reference sediments.

5. Stations showing statistically significant differences in survival based on group comparisons with reference statistics (ANOVA and HSD groupings) and including ≥ lower survival compared with reference survival.

Under guidelines of the *Implementation Manual* (EPA/USACE 1977), all category 1, 2, and 3 sediments would be acceptable for open-ocean disposal. In applying the guidelines for the species tested under the accepted protocols, we found one station (OO-CH-1) that fits the first category. No stations were found that fit the second category. Nine stations (OI-CH-O, OO-CH-2, OO-CH-5, OO-CH-6, OO-CH-7, OI-MA-2L, OO-W-3, OO-W-4, and OO-W-5) fit the third category . Sediments from the remaining 13 sediment treatments (OI-CH-2A, OO-CH-3, OO-CH-4, OI-CH-4A, OI-CH-6A, OO-CH-8, OI-SS-4L, OI-TS-5AU, OI-TS-5AL, OI-MA-1L, OI-MA-2U, OO-W-1, and OO-W-2) fit the fourth and fifth categories. Under current guidelines, sediment dredged from stations which tested in categories 4 and 5 would be considered unacceptable for ocean disposal.

Sediments were not all equally toxic to the four test species, nor were they equally toxic to a single species tested under different protocols (Table 4.1). None of the sediment treatments influenced survival of M. nasuta or A. abdita under the accepted flow-through protocols, and therefore these tests did not provide useful information for evaluating the appropriateness of ocean disposal. N. caecoides and R. abronius under accepted testing protocols did show significant decreases in survival that allowed evaluation of the appropriateness for ocean disposal. Although meeting the acceptance criteria for reference survival, the survival of R. abronius and A. abdita during use of the nonstandard testing protocols was less than their survival during testing under accepted protocols. Comparisons between the two species of amphipods show that tests using the nonstandard protocols resulted in greater mortality for each species than occurred under the standard protocols. The reasons for the decreased survival under nonstandard testing protocols are unknown. Therefore, these test should not be used to characterize the acceptability of sediments for ocean disposal.

TABLE 4.1. Summary of Geological, Physical, and Chemical Properties of Oakland Harbor Sediments

		Sediment Characteristics (a)								
		Geology Layer Thickness					Grain Size(b)			
Station	Core Depth (ft)	Younger Bay	Older Bay	Oil and Grease	Petroleum HC's	TOC	Gravel	Sand	Silt	Clay
OI-CH-D	37-46	8.0	1.0					*		
OO-CH-1	39-46	0.0	7.0						*	
OO-CH-2	34-46	2.0	10.0	x	x			*		
OI-CH-2A	38-44	6.0	0.0	x	x	x				*
OO-CH-3	38-47	3.0	6.0					*		
OO-CH-4	34-44	10.0	0.0	x	x					*
OI-CH-4A	37-47	0.0	10.0					*		
OO-CH-5	38-48	2.0	8.0	x	x			*		
OO-CH-6	36-44	4.5	3.5	x	x			*	*	*
OI-CH-6A	37-47	0.0	10.0					*		
OO-CH-7	39-46	2.0	5.0		x			*		
OO-CH-8	35-44	4.5	4.5						*	
OI-SS-4L	24-44(d)	11.0	9.0					*		
OI-TS-5AU	28-38	10.0	0.0	[xx]	[xx]	x			*	
OI-TS-5AL	38-44	2.0	4.0	x	x			*		
OI-MA-1L	21-44(d)	15.0	8.0					*	*	
OI-MA-2U	32-38	6.0	0.0	xx	xx	[x]				*
OI-MA-2L	38-44	1.5	4.5						*	
OO-W-1	30-45	1.0	14.0						*	
OO-W-2	33-47	2.0	12.0					*		
OO-W-3	33-44	11.0	0.0	x	x	x				*
OO-W-4	29-45	16.0	0.0	x	x					*
OO-W-5	41-46	0.0	5.0					*		
PRC	N/A(c)	N/A	N/A					*		
PRF	N/A	N/A	N/A					*		
TB	N/A	N/A	N/A					*		

(a) x = ≥ 2x PR Coarse; 2x = ≥ 10x PR Coarse; 3x = ≥ 100x PR Coarse; 4x = ≥ 1000x PR Coarse; [ ] = Highest Concentration

(b) * = Dominant Grain Size (5% greater than other fractions)

(c) N/A = Not Applicable

(d) -38 Ft to -44 Ft Evaluated

TABLE 4.1. Summary of Geological, Physical, and Chemical Properties of Oakland Harbor Sediments (Cont'd)

Sediment Chemistry Results(a)

Station	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn	PAH	PCB	DDT	TBT	Sum(b)
OI-CH-0				[x]											2
00-CH-1	x	x			x		x			x	x				6
00-CH-2						x					x	xx	x		5
OI-CH-2A	x				x	x	x	x	x	x	xxx	xx	x	xx	15
00-CH-3											xxx	xxx	x	x	8
00-CH-4	xx	x			x		x	x		x	xx	x	[x]	xx	14
OI-CH-4A															0
00-CH-5	x				x	x	x	x			xx	xx			9
00-CH-6	x				x	x	x				xx	xx	x	x	10
OI-CH-6A				x											1
00-CH-7											x	x			2
00-CH-8	x				x	x	x	x		x	xx	xx	x	x	12
OI-SS-4L(c)															0
OI-TS-5AU	[xx]				[xx]	[xxx]	x	[xx]		[xx]	[4x]	[xxx]	[x]	[xxx]	32
OI-TS-5AL	x				x	x		x			xxx	xx		x	10
OI-MA-1L(c)					x										1
OI-MA-2U	[xx]				x	xx	[x]	xx		x	4x	xxx	x	xx	21
OI-MA-2L	x				x						x	x			4
00-W-1	x	x			x		x			x					5
00-W-2	x				x						x				3
00-W-3	xx	x			x	x	x	x	x	x	x	x		x	12
00-W-4	xx	[x]			x	x	x	x	x	x	xxx	xx	[x]	x	18
00-W-5															0
PRC															0
PRF															0
TB															0

(a) x = ≥ 2x PR Coarse; 2x = ≥ 10x PR Coarse; 3x = ≥ 100x PR Coarse; 4x = ≥ 1000x PR Coarse; [ ] = Highest Concentration
(b) Sum is the number of x's. An additional 1 is added for each [ ].
(c) -38 Ft to -44 Ft Evaluated.

TABLE 4.1. Summary of Geological, Physical, and Chemical Properties of Oakland Harbor Sediments (Cont'd)

Station	M. nasuta	N. caecoides	R. abronius (Flow)	A. abdita (Flow)	R. abronius (Static)	A. abdita (Static)	Sum (b)
			Toxicological Response (a)				
OI-CH-D		**	*		**	**	7
00-CH-1			[***]			**	6
00-CH-2					**		2
OI-CH-2A			[***]		***		7
00-CH-3			*		***	**	6
00-CH-4			***		***		6
OI-CH-4A		[***]					4
00-CH-5			[***]		**	**	8
00-CH-6			[***]		**	***	9
OI-CH-6A		***					3
00-CH-7			[***]		**	**	8
00-CH-8			[***]		***		7
OI-SS-4L (c)		***			**		5
OI-TS-5AU		***	[***]		[***]	[***]	15
OI-TS-5AL		***			***	[***]	10
OI-MA-1L (c)			[***]		[***]	**	10
OI-MA-2U		**	[***]		[***]		10
OI-MA-2L		**	***		**		7
00-W-1		**	***		***		8
00-W-2			[***]		***	**	9
00-W-3			***		**		5
00-W-4			***		**		5
00-W-5					**		2
PRC							0
PRF							0
TB							0

(a) * = ≥ 10% Mortality; ** = Statistically Significant; *** = Statistical Significance + 10%; [***] = Different Statistical Group + 10%

(b) Sum is the number of *'s. An additional 1 is added for each [ ].

(c) -38 Ft to -44 Ft Evaluated.

TABLE 4.1. Summary of Geological, Physical, and Chemical Properties of Oakland Harbor Sediments (Cont'd)

Station	Bioaccumulation Potential(a)													
	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn	PAH	PCB	DDE	TBT
OI-CH-0														
OO-CH-1														
OO-CH-2														
OI-CH-2A												x(a)		
OO-CH-3										x				
OO-CH-4														
OI-CH-4A														
OO-CH-5														
OO-CH-6							x							
OI-CH-6A														
OO-CH-7														
OO-CH-8														
OI-SS-4L(b)														
OI-TS-5AU											x	x		x
OI-TS-5AL											x	x		
OI-MA-1L											x			
OI-MA-2U											x	x		
OI-MA-2L														
OO-W-1(b)														
OO-W-2														
OO-W-3														
OO-W-4														
OO-W-5														
PRC														
PRF														
TB														

(a) Statistically different from reference at $p \leq 0.05$.
(b) -38 Ft to -44 Ft Evaluated.

4.4 RELATIONSHIP OF SEDIMENT TOXICITY TO SEDIMENT CONTAMINANT CONCENTRATION

As determined in Phase I of the -42-ft project (Word et al. 1990b), elevated concentrations of contaminants in sediments did not always correspond to increases in mortality during the biological tests. Biological effects were also observed in sediments with relatively low levels of chemical contaminants. For these discussions we will refer only to the results of biological testing using the standard toxicity protocols. Additionally, these discussions will center only on those biological tests where significant increases showed at least 10% more mortality than reference sites. The tests showing no significant mortality differences included those for M. nasuta and A. abdita. The N. caecoides and R. abronius procedures revealed significant levels of toxicity at certain stations.

The bioassays conducted with the polychaete N. caecoides showed significant mortality in five sediment treatments (OI-CH-4A, OI-CH-6A, OI-SS-4L, OI-TS-5AL, and OI-TS-5AU). Although the upper portion of OI-TS-5A had the highest concentrations of metals and organic contaminants of all the sediment treatments, polychaete survival was actually better in this upper, more-contaminated section of the core than in any of the other sediment treatments showing significant mortality. In fact, stations OI-CH-4A, OI-CH-6A, and OI-SS-4L, which had the highest polychaete mortalities, also had the lowest contaminant concentrations, the lowest organic carbon contents, and the greatest percentages of Merritt Sands. These sediments are probably the least anthropogenically affected of all the stations. Whereas all other sediments of comparable grain size had normal survival, the stations with significant quantities of Merritt Sands showed decreased survival in N. caecoides for an unknown reason that was not related to chemical-contaminant concentrations or to grain size of the sediments.

The reasons for these apparently aberrant observations are unknown. However, anecdotal observations of polychaete behavior during the testing indicated an apparent sediment-avoidance reaction coupled with observations of bleeding from the proboscis (mouth) of some of the organisms exposed to Merritt Sands during the tests. These observations may indicate a physical avoidance response by polychaete, possibly because Merritt Sand may lacerate soft tissue.

A better cause-and-effect-relationship between contaminants and toxicity can be established using the R. abronius amphipod data, though some ambiguity still exists here. The toxicity resulting from exposure of R. abronius to sediment from Stations OI-MA-2U and OI-TS-5AU is probably attributable to the relatively high levels of metals and organics. Sediments from Stations OI-MA-2U and OI-TS-5AU contained the highest levels of metals and organics encountered during Phase II. PAH levels at these stations were also ≥1000 times the concentrations observed in the reference sediments. Relatively high metals and organics contents existed at stations OI-CH-2A, OO-CH-4, OO-CH-8, and OI-TS-5AL and at two other stations where only high metals (OO-W-1) or high organic contaminants (OO-CH-3) were found. These elevated levels are probably also associated with the cause of the observed toxicity.

The ambiguity is that Station MA-1-L, although consisting of sediments with few contaminant levels of significance, had the highest mortality among these test sediments. Swartz et al. (1985) indicate that R. abronius survives normally in sediments with volatile solids concentrations of up to 18.2%, which would be equivalent to about 9.6% total organic carbon. In the present study, the concentrations of organic carbon at stations resulting in toxicity of R. abronius were all less than 1.39 mg/kg, which is well below the concentration that could affect survival. It is not likely that total organic carbon was sufficiently large to cause any mortality in the sediments studied. Another factor shown to affect survival of amphipods is grain size. Swartz et al. (1985) found that survival in fine-grained sediment (9.7% sand, 36.8% silt, 53.5% clay) was significantly decreased ($P \leq 0.01$). Dewitt et al. (1988) stated that survival in uncontaminated sediment that is ≥80% fines (silt plus clay) was 15% lower than in the control. In the present study, seven stations (OO-CH-1, OO-CH-2A, OO-CH-4, OI-MA-2U, OO-W01, OO-W-3, and OO-W-4) consisted of sediments with ≥80% fines, but in only two stations (OI-MA-2U and OO-W-1) was survival decreased statistically plus more than 10% greater toxicity detected. The 41% sand, 37% silt, and 21% clay grain size is not sufficiently fine to explain the additional mortality seen at station MA-1-L. The reason for the mortality in this sediment, therefore, is still not clear.

4.5 BIOACCUMULATION POTENTIAL OF PROPOSED DREDGED MATERIALS

Relatively few data are available that relate bioaccumulation of metals and organic compounds to biological effects within a marine species. Also, human health standards based on tissue concentrations in edible fish and shellfish tissues are generally not available for all metals and organic compounds measured in dredged sediments. For these reasons, then, the Implementation Manual (EPA/USACE 1977) adopts the relatively conservative approach of assuming that any statistically significant ($P \leq 0.05$) difference in chemical concentration between reference and test sediment is potential cause for concern.

4.5.1 Polynuclear Aromatic Hydrocarbons

In contrast to the apparent metals regulation, total PAHs in Oakland Harbor Phase II sediments were bioaccumulated in tissues of *M. nasuta* over a range from 63 to 3533 µg/kg (dry wt). Clams exposed to the three reference sediments generally fell at the low end of this distribution. Analysis of variance and Tukey's HSD Multiple Comparison Test demonstrated that 11 stations resulted in significant bioaccumulation of total PAHs (Table 3.51 and 4.1) if the comparison is made on the basis of the cleanest reference sediment (PR-fine). If the comparison is based on the reference sediment containing the highest levels of PAHs (PR-coarse), then only four stations (OI-MA-1L, OI-MA-2U, OI-TS-5AL, and OI-TS-5AU) resulted in significant bioaccumulation of PAHs.

For comparison, bioaccumulation studies in Inner Oakland Harbor using the same species and experimental techniques resulted in a range of 255 to 43,495 µg/kg (dry wt) of PAH in tissues, with the concentrations of PAH in tissues of clams exposed to reference sediments averaging approximately 350 µg/kg (dry wt) (Word et al. 1990b). Only tissues of clams exposed to three sediments (OI-MA-2U, OI-TS-5AL, and OI-TS-5AU) had significant bio- accumulation of total PAHs that exceeded the values found in bivalves from the reference areas in the earlier Oakland study (Word et al. 1990b) and in Puget Sound (Malins et al. 1982). The PAHs contained in sediments from these three stations were available for uptake into the tissues of these clams.

4.5.2 Polychlorinated Biphenyls

Mean concentrations of PCBs (only Aroclor 1254 was detected) in tissues of M. nasuta exposed to Oakland Harbor Phase II sediments ranged from a low of undetected to a high of 195.3 µg/kg (dry wt). Aroclor 1254 was not detected in tissues exposed to 20 of the sediments, including the 3 reference sediments. As shown in Table 4.1, statistical analyses indicated that only four stations (OO-CH-2, OI-TS-5AL, OI-MA-2U, and OI-TS-5AU) resulted in significant bioaccumulation. The sediment and tissues from the Inner Oakland Harbor Study (Word et al. 1990b) showed similar distributions of PCBs in that only 1254 was detected and the levels of concentration only ranged slightly higher, to approximately 350 µg/kg (dry wt).

4.5.3 Pesticides

Mean concentrations of total pesticides (only DDE was detected) in M. nasuta exposed to the 26 sediments ranged from undetectable concentrations at 15 stations to 9.4 µg/kg (dry wt) at station OI-TS-5AU. Pesticide bioaccumulation from the Tomales Bay station was barely quantifiable. The other two reference sediments, as well as five other stations (OO-W-3, OO-W-4, OI-MA-2U, OI-TS-5AL, OI-TS-5AU), resulted in significantly greater bioaccumulation than occurred in the Tomales Bay reference sediment (Table 4.1). For comparison, Word et al. (1990b) reported that clams exposed to sediment from the Inner Oakland Harbor area had relatively comparable levels of DDE in tissues, with the maximum concentration being 13.6 µg/kg (dry wt).

4.5.4 Metals

Based on ANOVA and Tukey's HSD Multiple Comparison Test, only two metals (Zn, Ni) were bioaccumulated in tissues of M. nasuta to levels higher than were found in clams exposed to the cleanest of three reference sediments. Clams exposed to sediments from Station OO-CH-3 showed 1.8-fold enhancment in Zn (166.8 mg/kg dry wt), while clams exposed to sediments from Station OO-CH-6 showed 1.6-fold enhancement in Ni (4.9 mg/kg dry wt; Table 4.1). In each case, however, if the comparisons were made with other than the cleanest of three reference sediments, no test sediment resulted in enhanced metals bioaccumulation.

The lack of metals uptake into clams from sediments with elevated metals levels leads to one of two conclusions: 1) that the metals in these sediments are not bioavailable over the length of these tests or 2) that the clam regulates the levels of each metal within a relatively narrow band. The range of individual metal concentrations in sediment spans a factor ranging from 4.3 to nearly 837 (Hg), while the range in tissues spans a factor range of 1.9 to 3.7 with an average of 2.5, which is not substantially different from the factor of 1.9 that was determined during the Phase I studies of Inner Oakland Harbor. It appears that metals bioaccumulation from sediments with these ranges of concentrations are regulated within fairly narrow bounds.

4.5.5 Organotins

Tributyltin was bioaccumulated in M. nasuta over a range of values from less than detectable to 37 μg/kg (dry wt). Clams exposed to the three reference sediments bioaccumulated between less than detectable to 15 μg/kg (dry wt). Statistical analyses demonstrated that sediments from only one station (OI-TS-5AU) resulted in enhanced bioaccumulation compared with the reference sediments (Table 4.1). For comparison, clams exposed to sediment collected during the Inner Oakland Harbor program (Word et al. 1989) bioaccumulated higher concentrations of tributyltin (≤ 319 μg/kg, dry wt).

Dibutyltin was bioaccumulated in M. nasuta over a range of values from 22 to 66 μg/kg (dry wt). Clams exposed to the three reference sediments bioaccumulated between 27 and 59 μg/kg (dry wt). Statistical analyses demonstrated that none of the levels of bioaccumulated dibutyltin were statistically different when compared with any of the reference sediments (Table 4.1). Clams exposed to sediment collected during the Inner Oakland Harbor program (Word et al. 1989) bioaccumulated much lower levels of dibutyltin (6.7 to 23.4 μg/kg, dry wt).

This difference in levels of dibutyltin tissue concentrations between comparable testing programs is substantial. Because of this difference, a search of our methods was initiated to determine potential causes for contamination. The chemical-analytical testing procedures and methods were carefully examined and were not found to be a contributor to the contamination. Seawater collected near the intake of our water system was clean, but water collected after being heated and transported through our laboratory plumbing system had minor levels of dibutyltin, approximately 20 to 30 ng/L. Using the bioconcentration factor of 3,000 applied to butyltin results provides an estimate of 40 to 60 μg/kg in the tissues of exposed clams. These predicted tissue values based entirely on the levels of dibutyltin in the water from the flow-through system are very close to the concentration of the actual dibutyltin concentrations in the tissues of the clams. We believe that the concentrations of dibutyltin in the tissues of clams are essentially the result of contamination in our plumbing system.

Monobutyltin was bioaccumulated in M. nasuta over a range of values from less than detectable to 9 μg/kg (dry wt). Clams exposed to the three reference sediments bioaccumulated between less than detectable to 7 μg/kg (dry wt). Statistical analyses demonstrated no significant differences in bioaccumulation relative to the organisms exposed to reference sediments (Table 4.1). Clams exposed to sediment collected during the Inner Oakland Harbor program (Word et al. 1989) bioaccumulated essentially the same levels of monobutyltin (≤ 17 μg/kg, dry wt).

4.6 CONCLUSIONS

Sediments that may be unacceptable for ocean disposal, based on toxicity information and current Implementation Manual guidelines are OI-CH-4A, OI-CH-6A, OI-SS-4L, OI-TS-5U, OO-CH-3, OO-CH-4, OO-CH-8, OI-CH-2A, OO-W-1, OO-W-2, OI-MA-1L, OI-MA-2U, OI-TS-5L, OO-CH-2, OO-W-3, and OO-W-4. The toxicity at stations OI-CH-4A, OI-CH-6A, OI-SS-4L, OI-TS-5L, and OI-MA-L does not appear to be contaminant-related but is probably associated with the physical nature of Merritt Sands. Since the Implementation Manual guidelines are designed to protect the environment from damage by contaminants, it is possible that these sediments are acceptable for ocean disposal. The remaining stations (OI-CH-0, OI-CH-1, OO-CH-5, OO-CH-6, OO-CH-7, and OO-W-5) are acceptable for ocean disposal.

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APPENDIX A

FIELD SAMPLING DATA

TABLE A.1. Summary of Sediment Collection in Oakland Harbor (NA=not applicable)

Station	Core Number	Sample Date, MM-DD-YY	California State Zone III Coordinates (X) East	(Y) North	Water Depth, MLLW ft	Required Core Length, ft	Collected Core Length, ft	Comments
OI-TS-5A	1	09-27-88	1483745	475425	26.3	15.7	12.0	Rejected - insufficient penetration
OI-TS-5A	2	09-27-88	1483745	475425	26.3	15.7	13.8	Rejected - insufficient penetration
OI-TS-5A	3	09-27-88	1483745	475425	26.3	15.7	16.4	
OI-TS-5A	4	09-27-88	1483745	475425	26.3	15.7	17.0	
OI-SS-4L	1	09-27-88	1483520	476245	24.2	19.8	21.2	
OI-SS-4L	2	09-27-88	1483520	476245	24.2	19.8	22.0	Dark mud, then 15 feet of sand
OI-MA-1L	1	09-27-88	1485740	476380	20.8	23.2	23.0	Asphalt material at bottom of core
OI-MA-1L	2	09-27-88	1485740	476380	20.8	23.2	23.3	
OI-MA-2	1	09-27-88	1485755	476210	31.5	12.5	12.6	
OI-CH-6A	1	09-27-88	1484255	475923	36.5	7.5	7.0	
OI-CH-4A	1	09-27-88	1481315	475480	36.8	7.2	9.7	Golden sand present
OI-CH-2A	1	09-27-88	1468800	479310	37.8	6.2	6.3	No vibrating action required
OI-CH-2A	2	09-27-88	1468800	479310	37.8	6.2	6.0	No vibrating action required
OO-CH-2	1	09-27-88	1467350	481285	33.8	10.2	11.5	
OO-W-2	1	09-27-88	1465950	480678	32.9	11.1	13.9	
OO-W-1	1	09-28-88	1465020	480325	26.1	17.9	NA	Rejected material too soft
OO-CH-1	1	09-28-88	1464193	479275	38.7	5.3	7.3	
OO-CH-1	2	09-28-88	1464193	479275	38.7	5.3	NA	Rejected - insufficient penetration
OO-CH-1	3	09-28-88	1464193	479275	38.7	5.3	6.8	

TABLE A.1. (contd)

Station	Core Number	Sample Date, MM-DD-YY	California State Zone III Coordinates (X) East	(Y) North	Water Depth, MLLW ft	Required Core Length, ft	Collected Core Length, ft	Comments
00-CH-3	1	09-28-88	1469705	482475	38.3	5.7	8.8	
00-CH-3	2	09-28-88	1464193	479275	38.3	5.7	8.3	
00-W-3	1	09-28-88	1471336	483385	33.3	10.7	NA	Rejected - insufficient penetration
00-W-3	2	09-28-88	1471336	483385	33.3	10.7	NA	Rejected - insufficient penetration
00-W-3	3	09-28-88	1471336	483385	32.8	11.2	10.9	
00-W-4	1	09-28-88	1472230	483550	28.6	15.4	NA	Rejected - insufficient penetration
00-W-4	2	09-28-88	1472230	483550	28.6	15.4	NA	Rejected - insufficient penetration
00-W-4	3	09-28-88	1472230	483550	28.6	15.4	NA	Rejected - insufficient penetration
00-CH-4	1	09-28-88	1473378	482533	34.5	9.5	NA	Rejected - insufficient penetration
00-CH-4	2	09-28-88	1473378	482533	34.5	9.5	NA	Rejected - insufficient penetration
00-W-5	1	09-28-88	1474565	483543	41.0	3.0	NA	Rejected - insufficient penetration
00-W-5	2	09-28-88	1474565	483543	41.0	3.0	3.8	Vibrating from point of contact
00-W-5	3	09-28-88	1474565	483543	41.0	3.0	3.0	Vibrating from point of contact
00-CH-5	1	09-28-88	1475190	484725	38.0	6.0	9.4	
00-CH-5	2	09-28-88	1475190	484725	38.0	6.0	10.0	Hard sand, gray in color
00-CH-6	1	09-28-88	1475970	486135	36.0	8.0	8.0	Fine sand silt clay
00-CH-6	1	09-29-88	1477685	485745	35.2	8.8	NA	Rejected - insufficient penetration
00-CH-6	2	09-29-88	1477685	485745	35.2	8.8	NA	Rejected insufficient penetration
00-CH-6	3	09-29-88	1477685	485745	35.2	8.8	8.8	
00-CH-7	1	09-29-88	1478500	485730	39.1	4.9	6.6	

TABLE A.1. (contd)

Station	Core Number	Sample Date, MM-DD-YY	California State Zone III Coordinates (X) East	(Y) North	Water Depth, MLLW ft	Required Core Length, ft	Collected Core Length, ft	Comments
OO-CH-7	2	09-29-88	1476500	485730	39.1	4.9	6.7	
OO-CH-4	1	09-29-88	1473378	482533	34.1	9.9	NA	Rejected - insufficient penetration
OO-CH-4	2	09-29-88	1473378	482533	34.1	9.9	10.0	
OO-W-4	4	09-29-88	1472230	483550	28.9	16.1	15.6	
OO-W-1	2	09-29-88	1465028	480325	29.9	14.1	15.4	
OI-CH-0	1	09-29-88	1467300	480135	37.2	8.8	8.8	
OO-W-4	5	09-28-88	1472230	483550	28.4	5.0	5.0	Needed to collect only upper 5.0 ft of core

TABLE A.2. Summary of Samples and Positions for Offshore Point Reyes Sediment Collection

Station Number	Grab Number	Date and Time Sampled	Latitude/ Longitude	Water Depth, ft	Sampler	Cooler Number	Comments
2	1	09-28-88 1135	NA[(a)]	252	Yeloc[(b)]	27	Fine grained sand Not for use in tests
1	2	09-28-88 1200	NA	NA	VVG[(c)]	NA	No sample collected Cruise aborted
1	1	09-29-88 1335	37°51.02'N 123°01.65'W	276	Yeloc	NA	No sample collected
1	2	09-29-88 1400	37°50.88'N 123°01.26'W	276	Yeloc	NA	No sample collected
1	3	09-29-88 1520	37°50.62'N 123°00.79'W	278	VVG	NA	No sample collected Water grab
1	1	10-02-88 1010	37°52.24'N 123°01.47'W	288	PD[(d)]	12	Fine grained sediment for control
2	2	10-02-88 NA	37°53.11'N 123°01.01'W	294 Not	PD saved	NA	Sediment too fine
2	3	10-02-88 1107	37°55.84'N 123°03.52'W	264 Not	PD saved	NA	Sediment too fine
2	4	10-02-88 1155	37°52.60'N 122°59.96'W	264	PD	NA	Coarse sediment for coarse control Most washed out.
2	5	10-02-88 1205	37°52.75'N 122°59.87'W	264	PD	22,1	Coarse sediment Pipe 2/3 full
2	6	10-02-88 1220	37°52.96'N 122°59.71'W	264	PD	41,5	Coarse sediment
2	7	10-02-88 1234	37°53.18'N 122°59.89'W	264	PD	40,13	Coarse sediment Cooler 13 partially filled
2	8	10-02-88 1250	37°53.22'N 122°59.94'W	264	PD	13,16	Coarse sediment Cooler 16 partially filled

(a) NA = No Data Available

(b) Yeloc = MSL-Designed Yeloc Sand Dredge

(c) VVG = Van Veen Grab Sampler

(d) PD = Pipe Dredge

TABLE A.2. (contd)

Station Number	Grab Number	Date and Time Sampled	Latitude/ Longitude	Water Depth, ft	Sampler	Cooler Number	Comments
2	9	10-02-88 1300	37°53.30'N 122°59.83'W	264	PD	16,17,36	Coarse sediment
2	10	10-02-88 1323	37°53.51'N 122°59.31'W	264	PD	38,21	Coarse sediment
2	11	10-02-88 1340	37°53.34'N 122°58.95'W	264	PD	34,9	Coarse sediment
2	12	10-02-88 1403	37°53.39'N 122°58.90'W	264	PD	14,30	Coarse sediment Pipe 1/2 full
2	13	10-02-88 1420	37°53.38'N 122°58.71'W	264	PD	31	Very little coarse sediment collected
2	14	10-02-88 1438	37°53.46'N 122°58.57'W	252	PD	41,42	Coarse sediment Cooler 42 partially filled
2	15	10-02-88 1500	37°53.32'N 122°58.40'W	252	PD	42	Coarse sediment
2	16	10-02-88 1515	37°53.31'N 122°58.20'W	252	PD	20,24	Coarse sediment Cooler 24 paritally filled
2	17	10-02-88 1530	37°53.24'N 122°58.11'W	252	PD	24,16	Coarse sediment
2	18	10-02-88 1555	37°53.29'N 122°58.85'W	252	PD	22,15	Coarse sediment
2	19	10-02-88 1615	37°53.20'N 122°56.73'W	240	PD	4	Coarse sediment
2	20	10-02-88 1640	37°53.34'N 122°58.23'W	240	PD	2,18	Coarse sediment
2	21	10-02-88 1657	37°53.10'N 122°56.30'W	240	PD	39,18	Coarse sediment
2	22	10-02-88 1720	37°53.05'N 122°55.80'W	240	PD	35,26,5	Coarse sediment Cooler 5 is 1/2 full

(a) NA = No Data Available
(b) Yeloc = MSL-Designed Yeloc Sand Dredge
(c) VVG = Van Veen Grab Sampler
(d) PD = Pipe Dredge

Table A.3. Field Collection Personnel

Task	Participating Personnel
Oakland Inner Harbor Sample Collection	**Battelle** Jack Word James Coley James Young Steve Keisser Valerie Eikelman Elaine Byer Roy Kropp Christie Dolstra **U.S. Army Corps of Engineers, San Francisco District** Brian Walls Tom Chase **Manson Pacific Construction and Engineering Company** Randy Morgan Gary Bachal Gary Baker Ruben Virgel **Land and Sea Surveys** Robin Villa John Corona Robert Gilard **Crowley Marine** Captain Deckhand

Table A.3. (contd)

Task	Participating Personnel
Offshore Point Reyes Collection	Battelle
	Jack Word James Coley James Young Steve Keisser Valerie Eikelman Elaine Byers Roy Kropp
	FV White Lightning
	Leif Olson Bill Richards Ron Westman Anne Penberthy
Macoma nasuta and *Rhepoxynius abronius* Collection	Battelle
	Jeff Ward Pat Fallon Mike Barrows Jeff Anderson Rob Cuello
	R. Gunstone and Associates
	Field Crew
Nephtys caecoides Collection	Brezina & Associates John Brezina Assistants
Ampelisca abdita Collection	Science Applications International Corporation
	Dr. John Scott Michele Redmond

APPENDIX B

GEOLOGICAL ANALYSES DATA

APPENDIX B

MATERIALS AND METHODS USED FOR THE DESCRIPTION OF SEDIMENT CORE

B.1 MATERIALS

The following is a checklist of items and materials useful for the examination and description of sediment cores.

- ASTM Procedure D 2488-84
- Stainless-steel knife
- Hand lens (10X magnification)
- 10 N Hydrochloric acid (HCl)
- Ruler (scaled in 0.1-foot increments)
- Blank log forms (see Figure B.1)
- Clipboard
- AGI Data Sheets
- Munsell Color Charts

In addition, the charts and/or reference materials listed in Table B.1 are useful in the description of specific sediment characteristics.

B.2 METHODS

Descriptions of the physical, chemical, and biological features preserved in sediments aid in the interpretation of the types of geologic processes active both during and after the sediment was deposited. A total of 17 sediment characteristics, outlined in ASTM (1984), are commonly used to describe inorganic soils. These are listed in Table B.1.

Two features, moisture condition and dry strength was not routinely logged, because of the saturated nature of the sediments. Furthermore, since particles were rarely larger than coarse sand, characteristics of angularity, particle shape, range in particle size, and hardness also were not logged. For this reason, these sediment characteristics were not included in the log form for the description of Oakland Harbor sediments (Figure B.1). However, in the few instances where these characteristics did apply, they were described under the "COMMENTS" column.

Core #:
Date:
Page __ of __

Depth Below H_2O Surface	Depth Below Mudline	Lithology	Dilatancy	Toughness	Plasticity	Type	Color	Consistency	Cementation	Structure	HCl Reaction	Maximum Particle Size	Odor	Comments

FIGURE B.1. Form for Logging Oakland Harbor Sediment Data

TABLE B.1. Sediment Characteristics Identified in ASTM Procedure D2488-84.

1) angularity (1)
2) particle shape (1)
3) color
4) odor
5) moisture condition
6) HCl reaction
7) consistency (i.e., firmness)
8) cementation (1)
9) structure
10) sediment classification type (i.e., lithology)
11) range of particle sizes (1)
12) maximum particle size
13) hardness (1)
14) dry strength (2)
15) dilatancy (2)
16) toughness (2)
17) plasticity (2)

(1) Applies to coarse-grained sediment (sand and larger particles)

(2) Applies to fine-grained sediment of mostly silt and/or clay

The definition of "soil" from the engineer's standpoint (ASTM, 1984), includes any unconsolidated sediment. The geologic definition of soil is slightly different and restricts soils to those sedimentary deposits that have undergone alteration near the land's surface by either physical, chemical, and/or biological processes; therefore, in a strict sense, not all sediments are soils. For the purposes of this discussion, however, "soils" and "sediments" will be used synonymously.

It is sometimes helpful to provide an estimate of the relative proportions of different constituents in sediments (e.g. light- versus darkcolored minerals). This is made easier and more accurate by using a percentage estimate chart, which provides a graphic reference with varying concentrations of a particular constituent.

The criteria used to describe each of the 17 sediment characteristics identified in ASTM (1984) are discussed below.

B.2.1 Angularity

The angularity of sedimentary particles is a reflection of the sedimentary environment and of the amount of time that has elapsed before deposition and burial. A range of angularity may be stated, such as: subrounded to rounded. Because the description of angularity only applies to coarse-grained sediments, it was not normally noted in the logs for this project. The few pebbles that were present were classified as angular, indicating they were not transported far from their source before being deposited.

B.2.2 Shape

Shapes of sedimentary particles often reflect the internal characteristics of the material (e.g., preferential parting). Sometimes shapes reflects the type of sedimentary environment. For example gravel clasts deposited in high-energy environments, such as beaches and river bottoms, are often worn flat.

Gravel-sized clasts may be described in one of four ways. First, if the ratio of the clast's width to thickness is >3, it is classified as flat. Second, if the ratio of the clast's length to width is >3, the clast is elongate. Third, if both criteria apply the clast is both flat and elongate. Finally, if none of the criteria apply, then shape is not mentioned. The logs indicated the fraction of the clasts that have the sape, e.g., one-third of gravel clasts are flat. Particle shape did not apply to most of the sediments logged during this project, and the few pebbles that were observed were neither flat nor elongate.

B.2.3 Color

Color was often a useful criterion for differentiating Younger Bay Mud from Older Bay Mud. Sediment color was determined by comparing the wet sediment with standard sediment colors given in Munsell (1975). The advantage of using the Munsell soil color system is that it provides a consistent, standardized method for describing color and that subjectivity is minimized.

The Munsell color notation consists of three simple variables that combine to describe all colors known in the Munsell soil color system. The three variables are: hue, value, and chroma. The hue notation indicates the sediment color with respect to red, yellow, green, blue and purple; the value notation indicates its lightness; and the chroma notation indicates its strength (i.e., intensity).

Color can be described either by the Munsell notation (e.g., 5YR 5/3, hue=5YR, value=5, chroma=3) or by its equivalent color name (e.g., reddish brown). Both the color name and Munsell notation were recorded on core logs. Only rarely was there not a reasonable match between the true color of the core sediment and one of the colors on a Munsell color chart.

B.2.4 Odor

Odors may indicate the presence of contaminants or may be the result of the eochemical environment. Odors most frequently noted were the odors of petroleum hydrocarbons and the smell of rotten eggs (an indication of the presence of hydrogen sulfide). Both of these odors were restricted to the Younger Bay Mud unit. Petroleum odors may be the result of contamination of sediments by shipping spills or by industrial waste or maybe perhaps are derived from the abundant decaying organic matter present in these sediments. Hydrogen sulfide is a common natural by-product in chemically reducing environments such as the Oakland Harbor estuary.

B.2.5 Moisture Condition

Moisture condition is described as either dry, moist, or wet according to the following criteria:

DRY	Absence of moisture, dry to the touch
MOIST	Damp but no visible water
WET	Visible free water, usually soil is below water table (i.e.,saturated)

All the sediments logged for this project were taken from below sea level and did not lose any significant moisture between the time they were drilled and logged. Therefore, they are all classified as wet.

B.2.6 HCl Reaction

The reaction (i.e., effervescence) of sedimentary material as a result of adding dilute hydrochloric acid is an indication of the presence of calcium carbonate. Calcium carbonate in sediments may be derived from a variety of sources, including 1) physical disintegration of preexisting carbonate rocks (e.g., limestone, marble), 2) biogenic precipitation (e.g., shell, bone), and 3) soil development. In the last example, calcium carbonate concentrations, often referred to as caliche or calcrete, may accumulate over time near the land's surface in arid climates. Where calcium carbonate concentrations occur in combination with other evidence for soil development, such as root traces and oxidation, then a pedogenic (soil forming) origin is favored. Criteria for describing the reaction with 10 N HCl are as follows:

NONE	No visible reaction
WEAK	Some reaction, with bubbles forming slowly
STRONG	Violent reaction, with bubbles forming immediately

A solution of 10 N HCl is obtained by slowly adding one part of concentrated hydrochloric acid to three parts of distilled water.

B.2.7 Consistency

Consistency is a measure of the firmness or consolidation of sedimentary material. In general, there is a direct relationship between consistency and age of the deposit (i.e., older deposits are usually more firm because of compaction and/or cementation). Consistency is most applicable to fine-grained sediments and least applicable to sediments that contain significant amounts of gravel. The criteria used to determine consistency are as follows:

VERY SOFT	Thumb will penetrate soil more than 1 inch (25 mm)
SOFT	Thumb will penetrate soil about 1 inch (25 mm)
FIRM	Thumb will indent soil about 1/4 inch (6 mm)
HARD	Thumb will not indent soil but is readily indented with thumbnail
VERY HARD	Thumbnail will not indent soil

B.2.8 Cementation

Often sedimentary particles are held together with a binding cement. Three common natural cements are calcium carbonate (lime), silica, and ironoxide compounds. Particles cemented with calcium carbonate effervesce in the presence of hydrochloric acid (see Section B.2.6 above). Sediments cemented with iron oxide are usually some shade of red, yellow, or brown. Usually there is a relationship between consistency (Section B.2.7) and cementation, in that strongly cemented deposits are also hard to very hard. Criteria used to describe the degree of cementation are as follows:

WEAK	Crumbles or breaks with handling or light finger pressure
MODERATE	Crumbles or breaks with considerable finger pressure
STRONG	Will not crumble or break with finger pressure

B.2.9 Structure

Structures are features that originate within the layers of sediment or at the sediment/water interface in response to various physical, biological and/or chemical processes. Structures may be classified into two categories: primary and secondary. Primary structures form as the sediment is being deposited (e.g., lamination, stratification). Secondary structures form after deposition, often as a result of compaction or other stresses (e.g., fissured, slickensided), biological activity (e.g., root traces, mottling), and soil development (e.g., homogeneous, blocky, mottled). The following are some common structures observed in sedimentary deposits.

PRIMARY STRUCTURES

STRATIFIED	Alternating layers of varying material or color with layers at least 6 mm thick
LAMINATED	Alternating layers of varying material or color with the layers less than 6 mm thick
LENSED	Inclusion of small pockets of different sediment type, such as small lenses of sand scattered through a mass of clay. (This type of structure may also be secondary)

SECONDARY STRUCTURES

FISSURED	Breaks along definite planes of fracture with little resistance to fracturing
SLICKENSIDED	Fracture planes appear polished or glossy, sometimes striated

BLOCKY	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
MOTTLED	Variation in color of sediments as represented by localized spots or blotches of color or shades of color
HOMOGENEOUS	Same color and appearance throughout

B.2.10 Sediment Classification Type

The classification method used in this study is the Unified Soil Classification System (AGI 1982) which consists of a two-letter designation for most soils (i.e., unconsolidated sediments). According to this classification system, coarse-grained sediments are classified based on grain-size distribution and grading (i.e., sorting), while fine-grained sediments are classified on the basis of grain size and liquid limit vs. plasticity.

Particle-size distribution may be determined with precision using laboratory methods (e.g., sieving of sand and coarser particles; pipette or hydrometer analysis of silt and clay). Because these methods are expensive and time-consuming, it is more desirable to estimate grain size using rapid visual-manual techniques. For example, sand and coarser particles are most easily identified via comparison with standard charts of grain size. Fine-grained soils, consisting of mostly silt and/or clay, on the other hand, are identified based on manual tests of their dry strength, dilatancy, toughness, and plasticity (Figure B.2).

In the Unified Soil Classification System, the first letter of the sediment-type symbol represents the predominant grain-size interval, gravel (G), sand (S), silt (M), or clay (C). For coarsegrained sediments, the first letter (i.e., G or S) may be followed by a descriptor of grading, either W (well graded) or P (poorly graded), or a secondary grain-size descriptor (M or C). The definition of grading is opposite that of sorting, a common geologic term. For example, a clean, well-sorted sand, consisting of particles over a narrow range in grain size, is referred to as poorly graded in the Unified Soil Classification System and would receive the designation "SP". The second letter in the fine-grained soil designation consists of either L (low liquid limit) or H (high liquid limit).

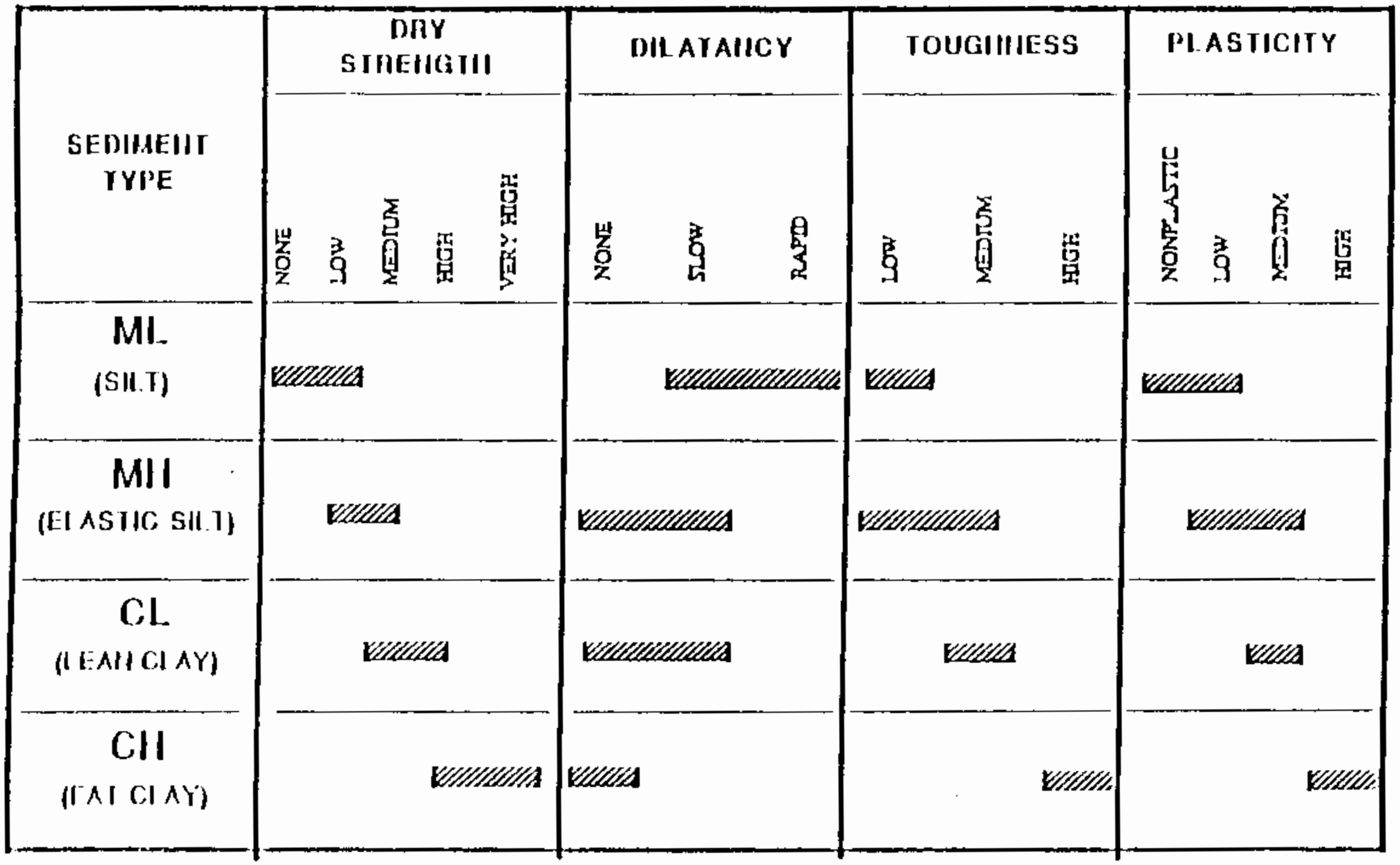


FIGURE B.2. Identification of Inorganic Fine-Grained Soils from Manual Tests

The lithology column on the geologic log (Fig. B.1) essentially represents a graphic display of sediment type. The graphic displays of lithology, utilized for quick, easy reference and comparison between different cores, thus make interpretations easier. Examples of other lithologic symbols in common use can be found in Last and Liikala (1987). Additional symbols may be used as long as they are graphically representative of the feature and are specifically defined and identified in a key that accompanies lithologic logs.

B.2.11 Range of Particle Sizes

For gravel- and sand-sized particles, the range of particle sizes within each component is defined (e.g., 20% fine to coarse gravel, 40% fine to coarse sand).

B.2.12 Maximum Particle Size

Maximum particle size is significant because it gives a general indication of the amount of turbulence or energy associated with deposition. If the maximum particle size is sand, it should be described as either fine, medium, or coarse sand. If the maximum particle size is in the gravel range, the largest particle is measured and its width along the narrowest axis is recorded.

The maximum grain size observed for the Younger Bay Muds ranged from silt to medium sand, while the Older Bay Mud usually ranged from fine sand to coarse sand. The largest particles observed anywhere were fine pebbles in the Older Bay Mud unit, the largest of which had a small diamter of about 5 mm.

B.2.13 Hardness

To determine harndess, the condition of the coarse sand and larger particles after being struck by a hard object, suach as a hammer, is described. Particles that do not fracture easily or resist a hammer blow are described as hard. Particles that crumble or break under the hammer blow are described accordingly.

Hardness was not applicable to this study because of the paucity of coarse sand and larger particles. The few pebbles that were present were composed exclusively of a very hard chert-like rock fragments.

B.2.14 Dry Strength

Dry strength, dilatancy, toughness, and plasticity are physical characteristics used to distinguish fine-grained inorganic soils, consisting of mostly silt and/or clay. The more clay present in a soil the greater its dry strength (Fig. B.2). To perform a manual test of dry strength, enough material must be selected in order to mold the material into a ball about 1 in. in diameter. The material is molded until it has the consistency of putty, adding water if necessary. From the molded material, at least three test specimens each about 1/2 in. in diameter are made. The specimens are allowed to dry in air, in sun, or by artificial means, as long as the temperature does not exceed 60C (ASTM 1984). The criteria for determining dry strength are as follows:

NONE	The dry specimen crumbles into powder with mere pressure of handling
LOW	The dry specimen crumbles into powder with light finger pressure
MEDIUM	The dry specimen breaks into pieces or crumbles with considerable finger pressure
HIGH	The dry specimen cannot be broken with finger pressure; specimen will break into pieces between thumb and a hard surface
VERY HIGH	The dry specimen cannot be broken between the thumb and a hard surface

The dry strength of the silt/clay fraction could not be determined for the Oakland Harbor sediments because there was not enough time between logging of the core and compositing. In the future, this physical property can and should be evaluated by sampling selected intervals where the silt/clay ratio is uncertain. The dry strength of these samples (and the relative amount of clay) could be determined at a later time (several days or more), after the samples have been allowed to dry.

B.2.15 Dilatancy

Dilatancy is a measure of how easily a soil gives up water when shaken. For example, some clays have the ability to absorb and retain large amounts of water in their crystal lattice. "Fat" clays tend to retain their water even

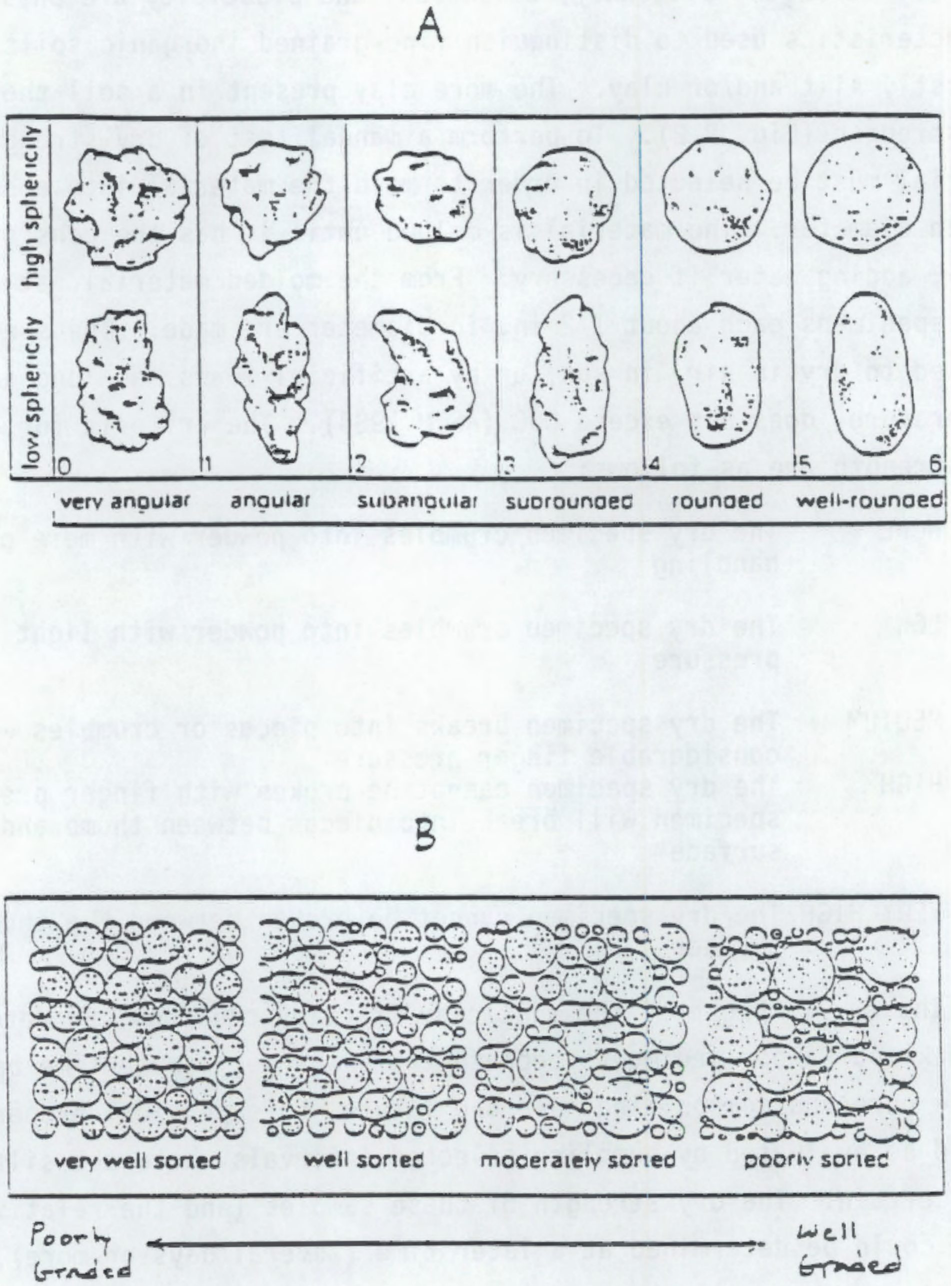


FIGURE B.3. Criteria Used to Describe Angularity (a) and Sorting/Grading (b) from Tucker (1982) under stress, whereas "lean" clays and silts tend to release water when shaken.

To test for dilatancy enough material to mold into a ball about 1/2 in. in diameter. The material is molded, with water if necessary, until it has a soft, but not sticky consistency. The soil ball is smoothed in the palm of the hand with a blade of a knife or small spatula. Then it is shaken horizontally by striking the side of the hand vigorously against the other several times. The reaction of water appearing on the surface of the soil is noted. Finally, the sample is squeezed by closing the hand or pinching the soil between the fingers. Specimens with high dilatancy will quickly yield water when shaken and absorb water when squeezed. The criteria for describing dilatancy are:

NONE	No visible change in the specimen
SLOW	Water appears slowly on the surface of the specimen during shaking and does not disappear or disappears slowly upon squeezing
RAPID	Water appears quickly on the surface of the specimen during shaking and disappears quickly upon squeezing

The range of dilatancy for the different fine-grained sediment types is shown in Figure B.2 where it is apparent that dilatancy decreases with decreasing grain size.

B.2.16 Toughness

After completion of the dilatancy test, the same specimen is shaped into an elongated pat and rolled by hand on a smooth surface or between the palms into a thread about 1/8 in. (3 mm) in diameter. (If the sample is too wet to roll easily, it should be spread into a thin layer and allowed to lose some water by evaporation.) The sample threads are folded and the sample is rerolled repeatedly until the thread crumbles at a diameter of about 1/8 in. The thread will crumble at a diameter of 1/8 in. when the soil is near the plastic limit. After the thread crumbles, the pieces are lumped together and kneaded until the lump crumbles. The toughness of the material during kneading is noted and the sample is classified into one of the following categories:

LOW	Only slight pressure is required to roll the thread near the plastic limit. The thread and lump are weak and soft.
MEDIUM	Medium pressure is required to roll the thread to near the plastic limit. The thread and lump have medium stiffness.
HIGH	Considerable pressure is required to roll the thread to near the plastic limit. The thread and the lump have very high stiffness.

The range of toughness for the different fine-grained sediment types is shown in Figure B.2, from which it is clear that toughness increases with a decrease in particle size.

B.2.17 Plasticity

On the basis of observations made during the toughness test, the plasticity of the material is described according to the following criteria:

NONPLASTIC	A 1/8 in. thread cannot be rolled at any water content.
LOW	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
MEDIUM	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
HIGH	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

The range of plasticity for the different fine-grained sediment types is shown in Figure B.2. From this figure it is apparent that an increase in plasticity accompanies a decrease in grain size.

Key to Core Log: After ASTM Procedure D2488-84

LEGEND

- Clay
- Silty Clay to Clayey Silt
- Silt
- Silty Sand to Sandy Silt
- Sand
- Root Traces
- Concentrated Organic Matter
- Mollusk Shells (Marine)
- Worm Burrow
- Peat
- Iron Concretions

Color: According to Munsell Soil Color Chart (All colors are wet)

Consistency:
- VS = very soft
- S = soft
- F = firm
- H = hard
- VH = very hard

Concentration:
- N = not cemented
- W = weakly cemented
- M = moderately cemented
- S = strongly cemented

Odor:
- S = sulfide
- P = petroleum

Type:
See ASTM D2488-84

Dilatancy:
- N = none
- S = slow
- R = rapid

Toughness:
- L = low
- M = medium
- H = high

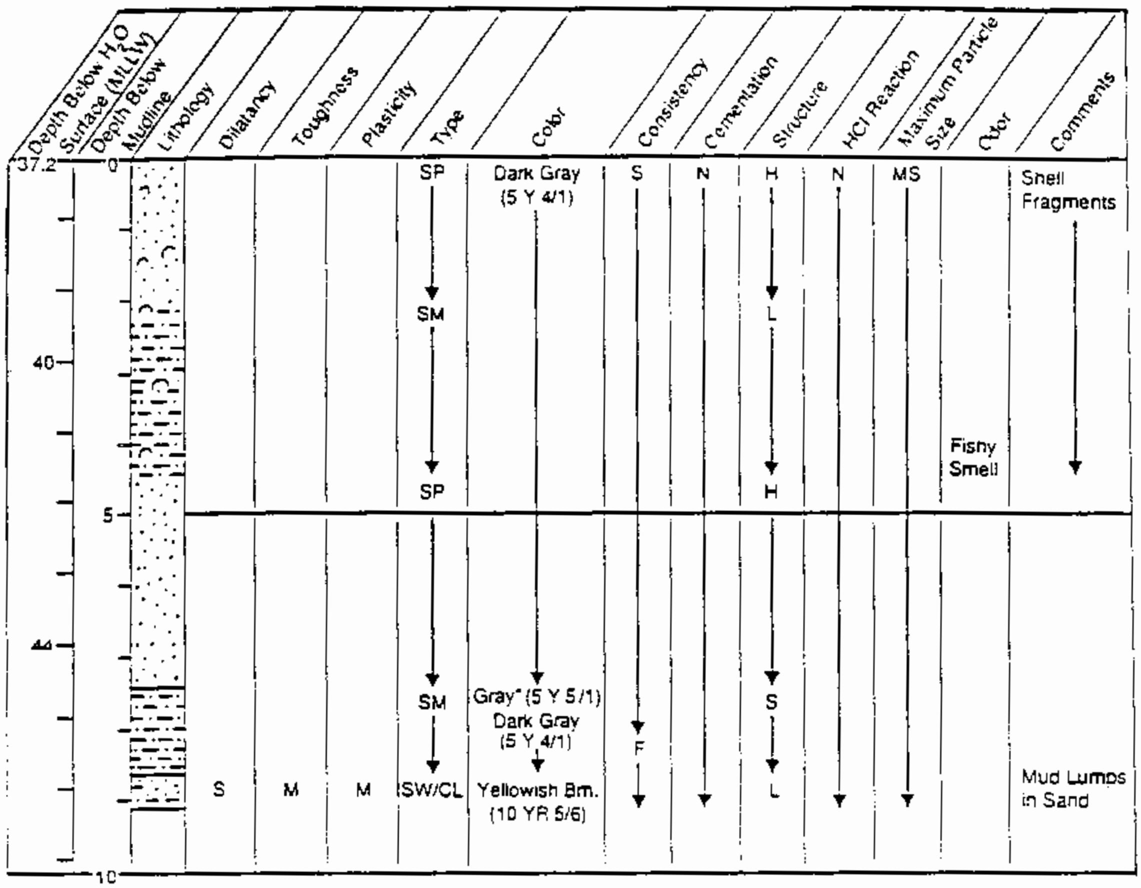
Plasticity:
- N = none
- L = low
- M = medium
- H = high

Structure:
- S = stratified
- L = laminated
- F = fissured
- Sl = slickensided
- Ln = lensed
- Bl = blocky
- M = mottled
- H = homogeneous

HCl Reaction:
- N = none
- W = weak
- S = strong

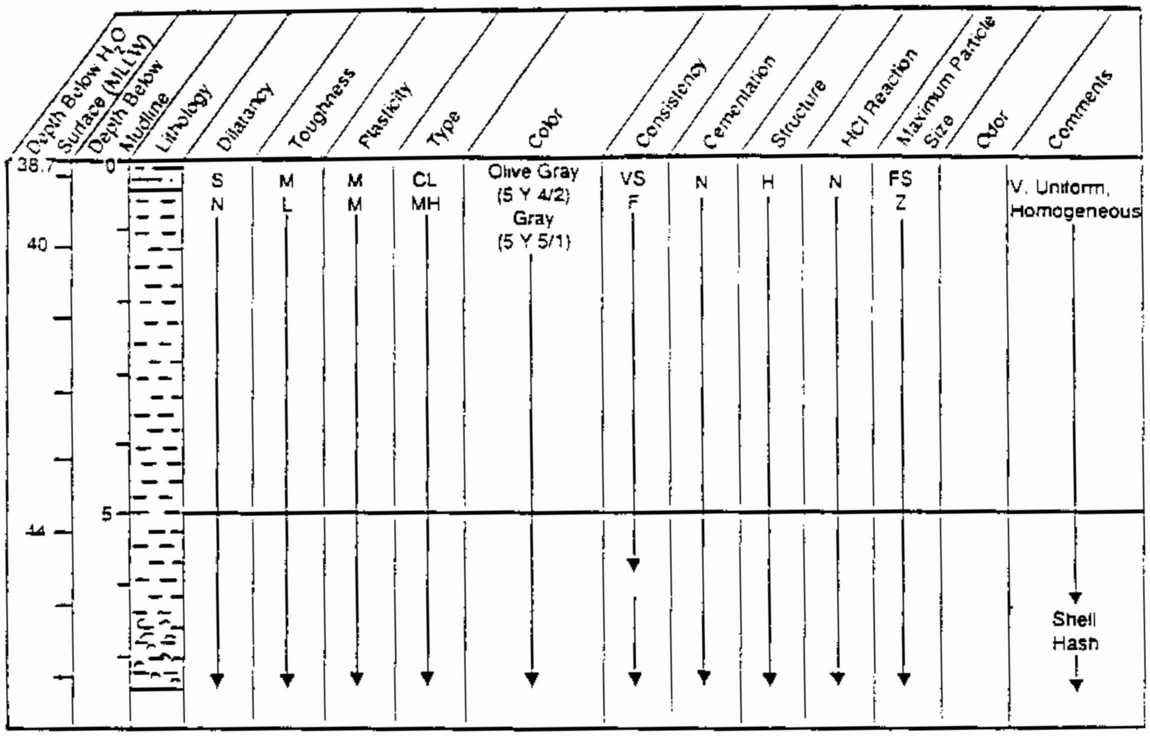
Maximum Particle Size:
- CS = coarse sand
- MS = medium sand
- FS = fine sand
- Z = silt

OI
CH-0



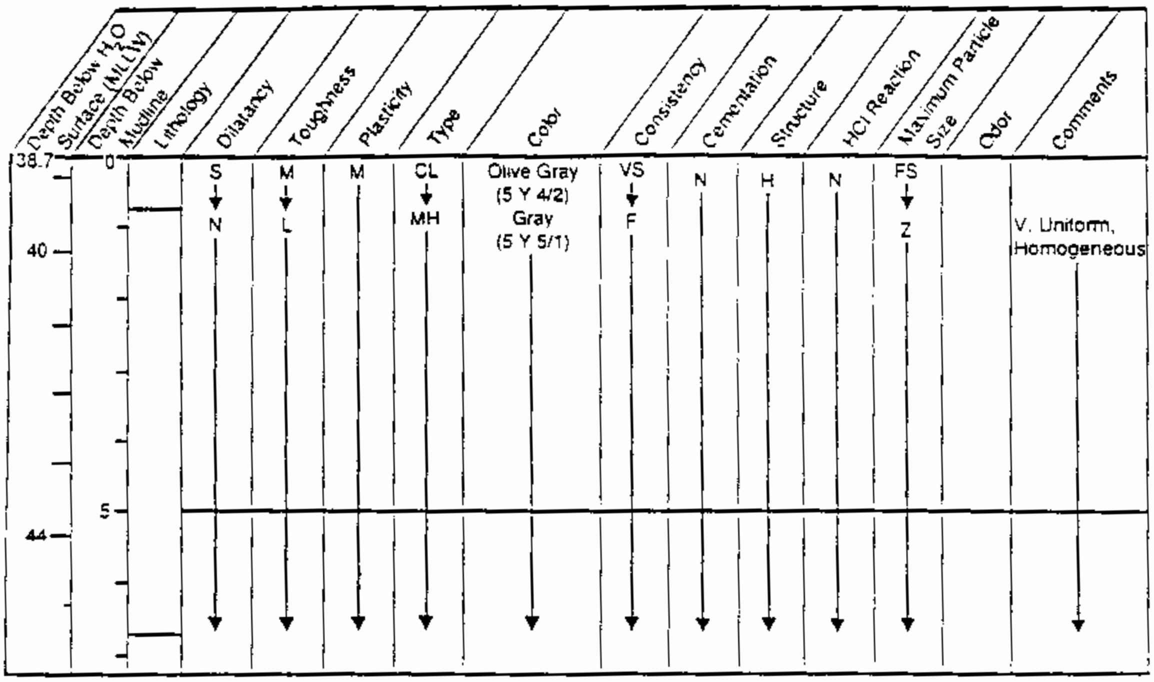
*Color has bluish tint - not represented in color chart. Color given is closest to true color.

OO
CH-1 (Rep. 1)



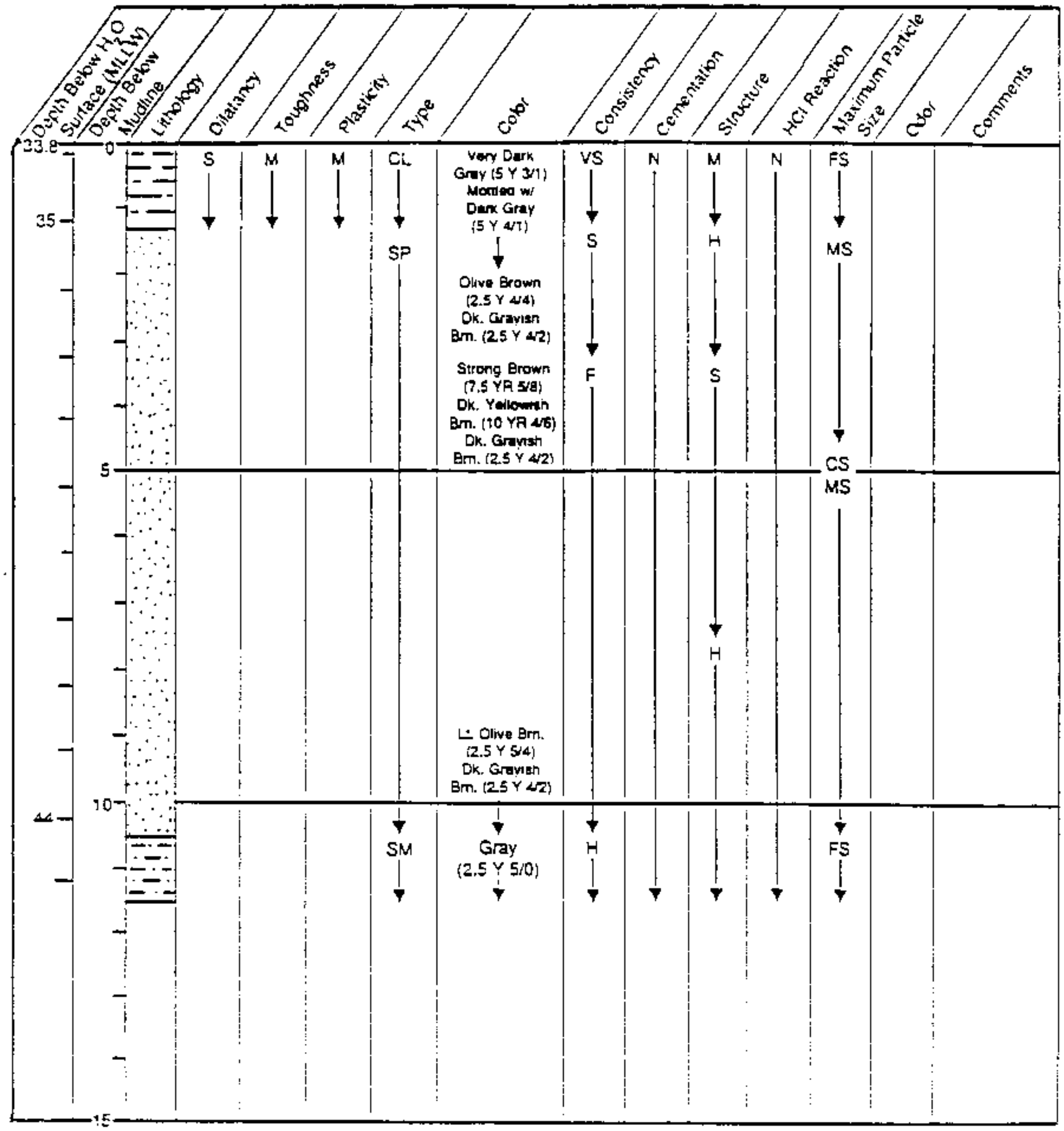
Depth Below H_2O Surface (MLLW)
Depth Below Mudline
Lithology
Dilatancy
Toughness
Plasticity
Type
Color
Consistency
Cementation
Structure
HCl Reaction
Maximum Particle Size
Odor
Comments
38.7
40
44
0
5
S
N
M
L
M
M
CL
MH
Olive Gray
(5 Y 4/2)
Gray
(5 Y 5/1)
VS
F
N
H
N
FS
Z
V. Uniform,
Homogeneous
Shell
Hash

CH-1 (Rep. 2)



Depth Below H2O Surface (MLLW)
Depth Below Mudline
Lithology
Dilatancy
Toughness
Plasticity
Type
Color
Consistency
Cementation
Structure
HCl Reaction
Maximum Particle Size
Odor
Comments
38.7
40
44
0
5
S
N
M
L
M
CL
MH
Olive Gray
(5 Y 4/2)
Gray
(5 Y 5/1)
VS
F
N
H
N
FS
Z
V. Uniform,
Homogeneous

CH-2 (Rep. 1)


Depth Below H2O Surface (MLLW)
Depth Below Mudline
Lithology
Dilatancy
Toughness
Plasticity
Type
Color
Consistency
Cementation
Structure
HCl Reaction
Maximum Particle Size
Color
Comments
33.8
35
44
0
5
10
15
S
M
M
CL
SP
SM
Very Dark Gray (5 Y 3/1) Mottled w/ Dark Gray (5 Y 4/1)
Olive Brown (2.5 Y 4/4) Dk. Grayish Brn. (2.5 Y 4/2)
Strong Brown (7.5 YR 5/8) Dk. Yellowish Brn. (10 YR 4/6) Dk. Grayish Brn. (2.5 Y 4/2)
Lt. Olive Brn. (2.5 Y 5/4) Dk. Grayish Brn. (2.5 Y 4/2)
Gray (2.5 Y 5/0)
VS
S
F
H
N
M
H
S
H
N
FS
MS
CS
MS
FS

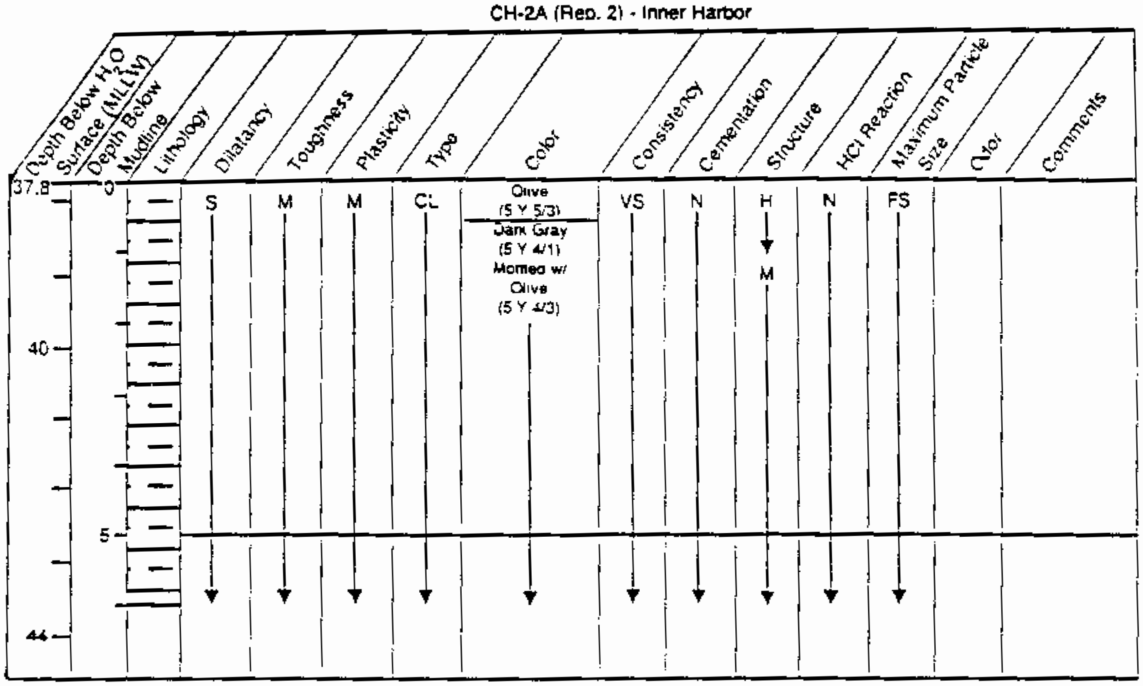
OI

CH-2A (Rep. 1) - Inner Harbor

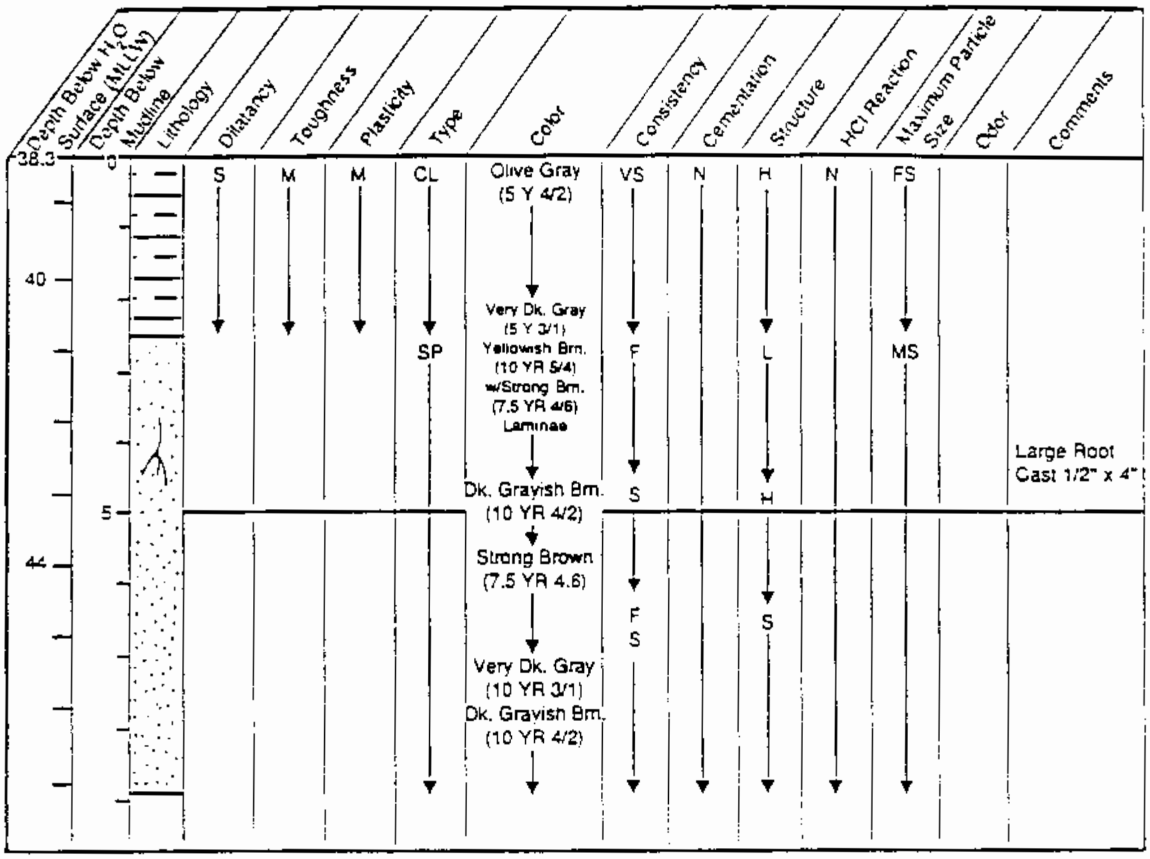
Depth Below H_2O Surface (MLLW)	Depth Below Mudline	Lithology	Dilatancy	Toughness	Plasticity	Type	Color	Consistency	Cementation	Structure	HCl Reaction	Maximum Particle Size	Odor	Comments
37.8	0		S ↓	M ↓	M ↓	CL ↓	Olive Gray (5 Y 5/2) Mottled w/ Very Dk. Gray (5 Y 3/1) ↓	VS ↓	N ↓	M ↓ L M ↓	N ↓	FS ↓		Abundant Air Pockets (Feeding Voids?) Worm Burrow
40														
	5													
44														

OI

CH-2A (Rep. 2) - Inner Harbor

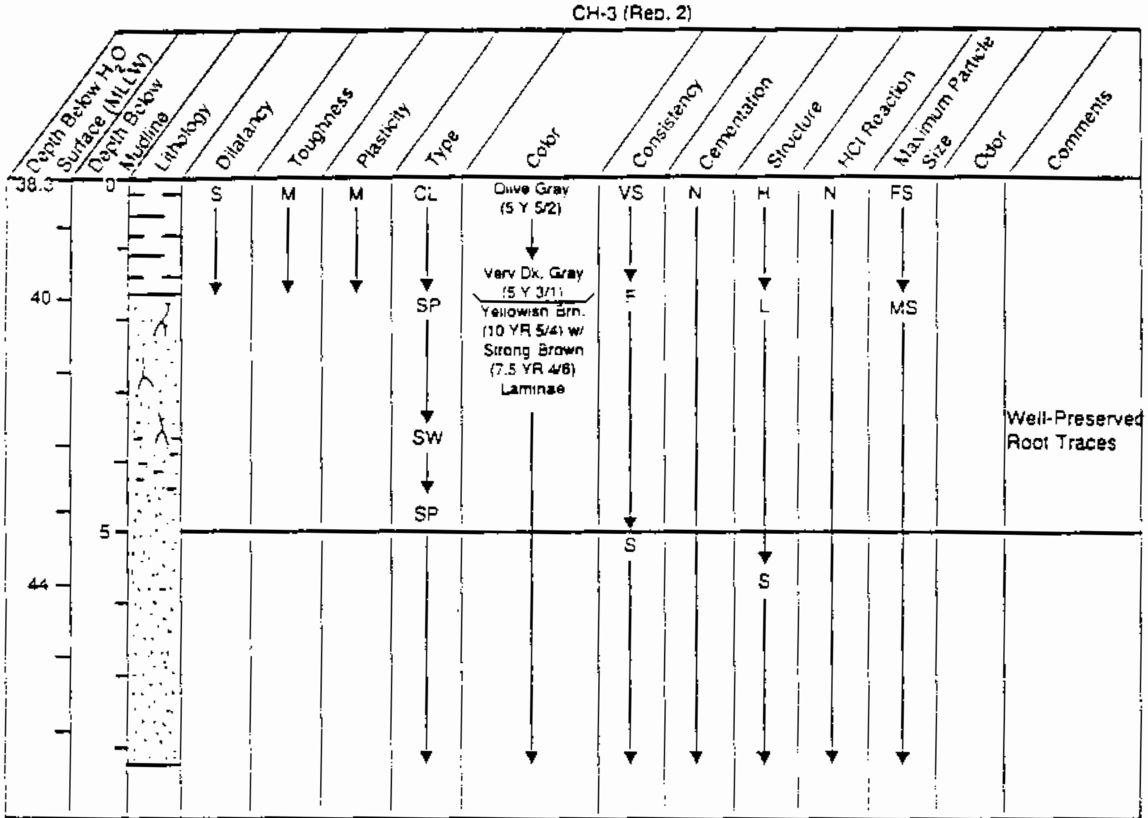


CH-3 (Rep. 1)


Depth Below H_2O Surface (MLLW)
Depth Below Mudline
Lithology
Dilatancy
Toughness
Plasticity
Type
Color
Consistency
Cementation
Structure
HCl Reaction
Maximum Particle Size
Odor
Comments
38.3
40
44
0
5
S
M
M
CL
Olive Gray (5 Y 4/2)
VS
N
H
N
FS
Very Dk. Gray (5 Y 3/1) Yellowish Brn. (10 YR 5/4) w/Strong Brn. (7.5 YR 4/6) Laminae
SP
F
L
MS
Large Root Cast 1/2" x 4"
Dk. Grayish Brn. (10 YR 4/2)
S
H
Strong Brown (7.5 YR 4.6)
F
S
S
Very Dk. Gray (10 YR 3/1)
Dk. Grayish Brn. (10 YR 4/2)

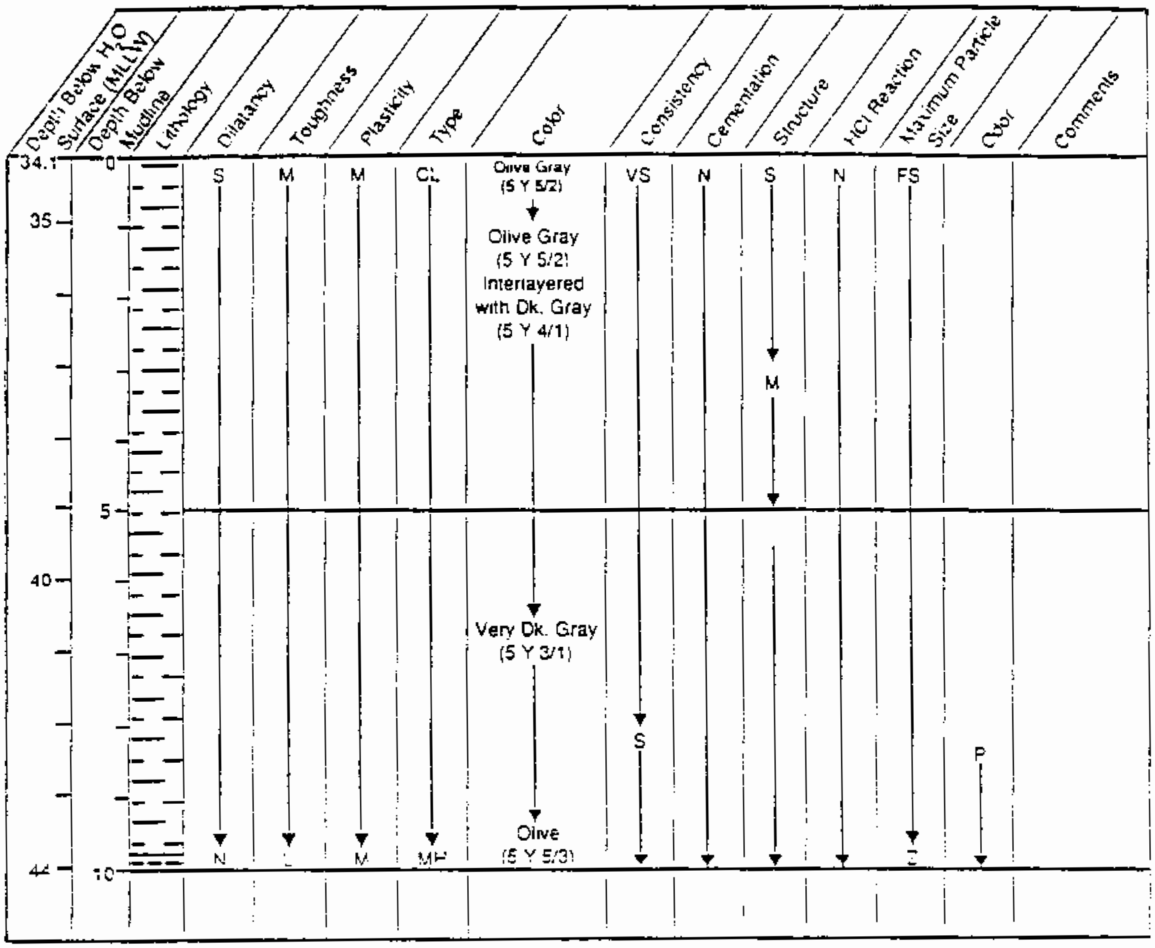
OO

CH-3 (Rep. 2)



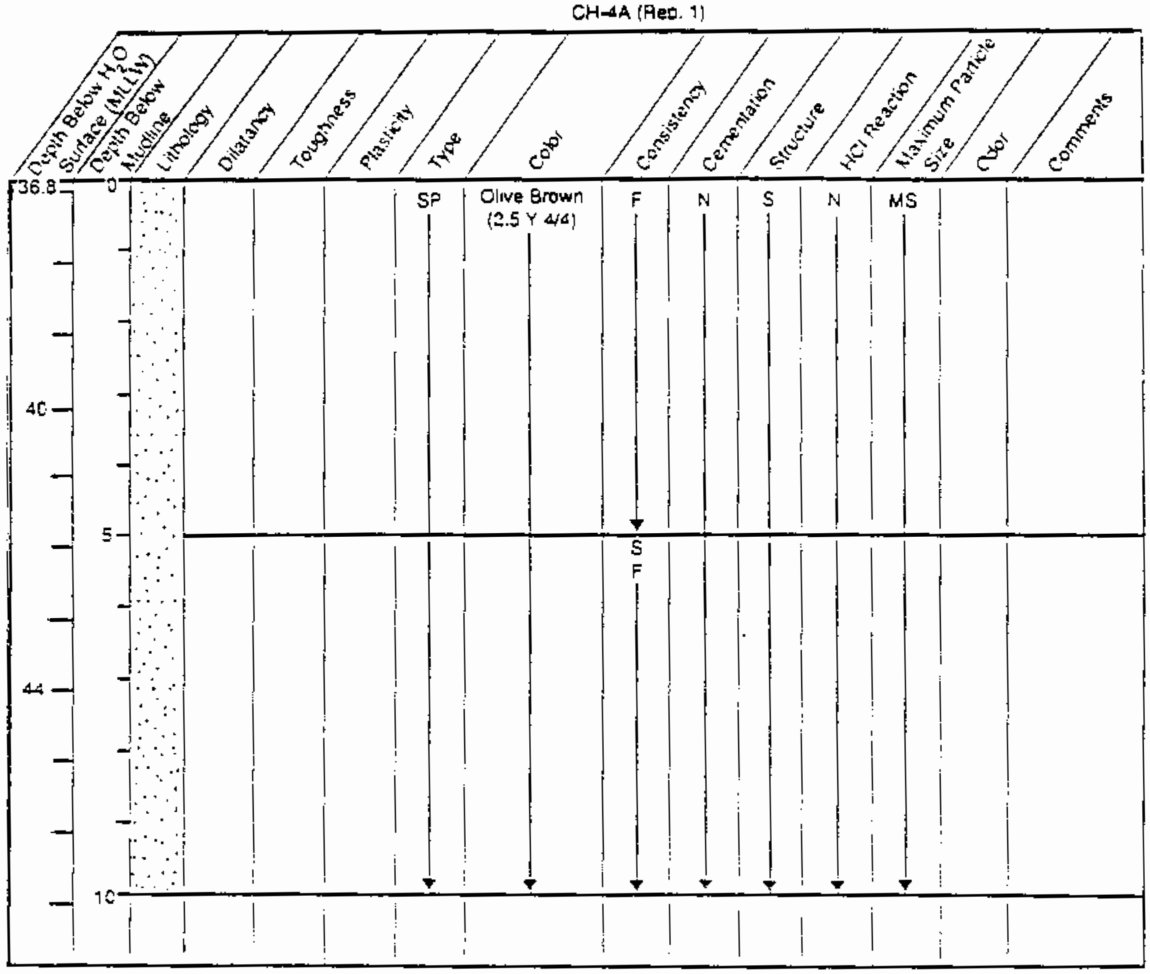
Depth Below H_2O Surface (MLLW)
Depth Below Mudline
Lithology
Dilatancy
Toughness
Plasticity
Type
Color
Consistency
Cementation
Structure
HCl Reaction
Maximum Particle Size
Odor
Comments
38.3
40
44
0
5
S
M
M
CL
Olive Gray (5 Y 5/2)
Very Dk. Gray (5 Y 3/1)
SP
Yellowish Brn. (10 YR 5/4) w/ Strong Brown (7.5 YR 4/6) Laminae
SW
SP
VS
F
S
N
H
L
S
N
FS
MS
Well-Preserved Root Traces

OO
CH-4

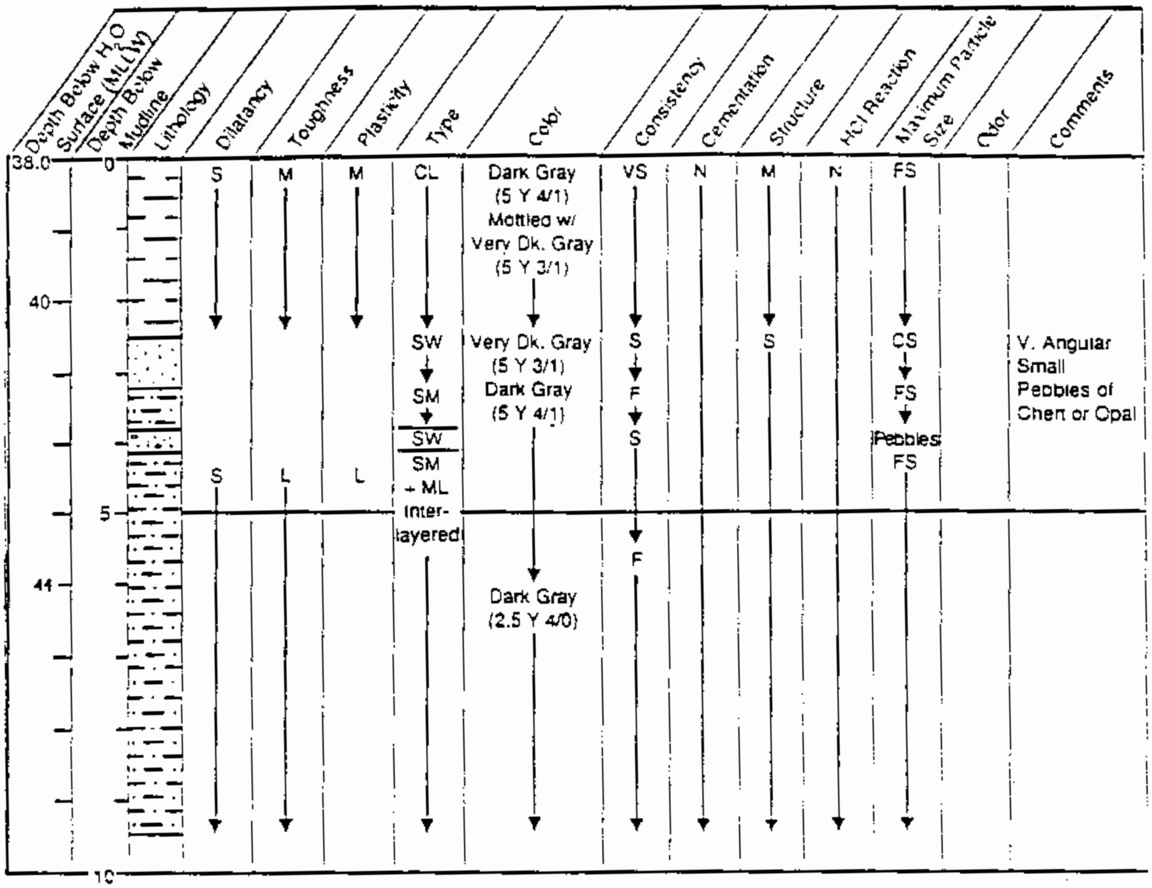

Depth Below H2O Surface (MLLW)
Depth Below Mudline
Lithology
Dilatancy
Toughness
Plasticity
Type
Color
Consistency
Cementation
Structure
HCl Reaction
Maximum Particle Size
Odor
Comments
34.1
35
40
44
0
5
10
S
M
M
CL
Olive Gray
(5 Y 5/2)
Olive Gray
(5 Y 5/2)
Interlayered
with Dk. Gray
(5 Y 4/1)
VS
N
S
N
FS
M
Very Dk. Gray
(5 Y 3/1)
S
P
N
M
MH
Olive
(5 Y 5/3)

OI

CH-4A (Rep. 1)

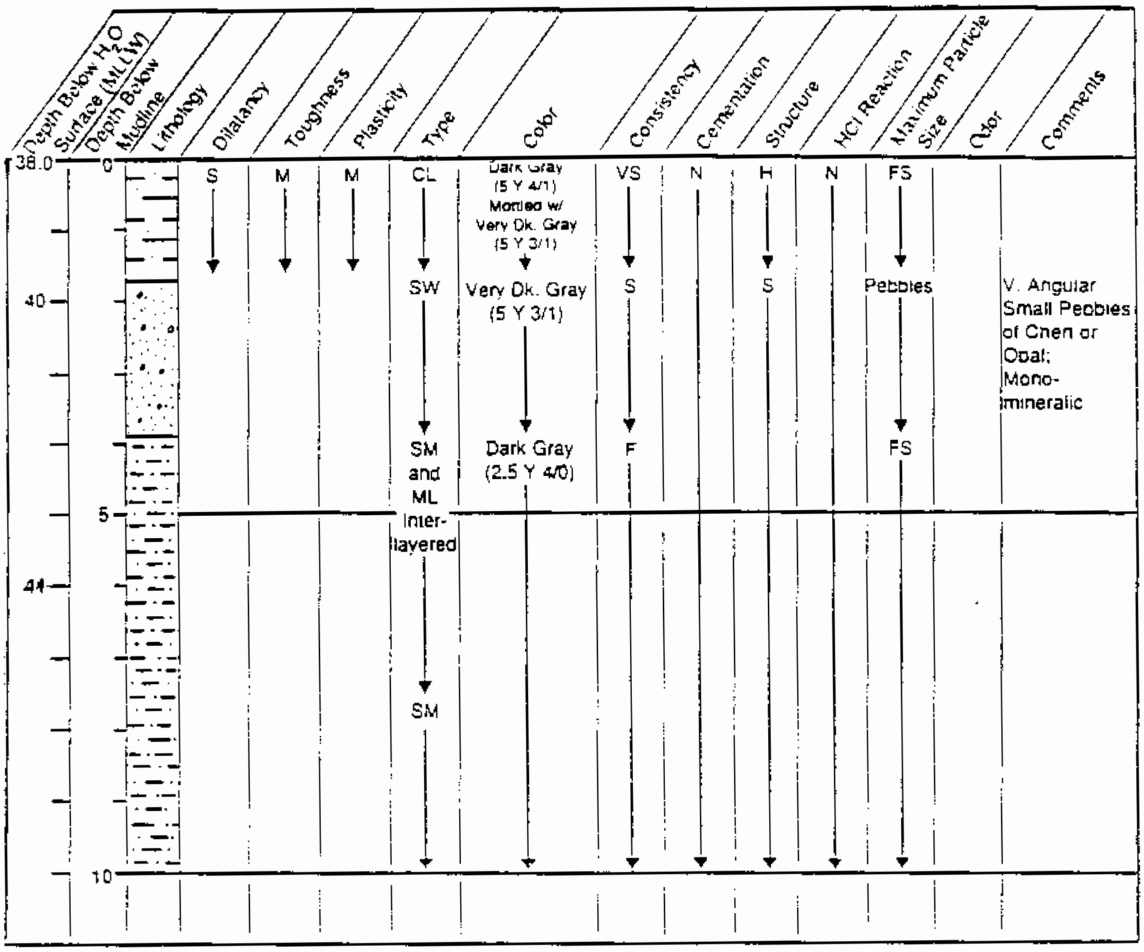

Depth Below H_2O Surface (MLLW)
Depth Below Mudline
Lithology
Dilatancy
Toughness
Plasticity
Type
Color
Consistency
Cementation
Structure
HCl Reaction
Maximum Particle Size
Odor
Comments
36.8
40
44
0
5
10
SP
Olive Brown
(2.5 Y 4/4)
F
N
S
N
MS
S
F

CH-5 (Rep. 1)


Depth Below H2O Surface (MLLW)
Depth Below Mudline
Lithology
Dilatancy
Toughness
Plasticity
Type
Color
Consistency
Cementation
Structure
HCl Reaction
Maximum Particle Size
Odor
Comments
38.0
40
5
10
S
M
M
CL
Dark Gray (5 Y 4/1) Mottled w/ Very Dk. Gray (5 Y 3/1)
VS
N
M
N
FS
SW
SM
SW
SM + ML Inter-layered
Very Dk. Gray (5 Y 3/1)
Dark Gray (5 Y 4/1)
S
F
S
S
CS
FS
Pebbles
FS
V. Angular Small Pebbles of Chert or Opal
S
L
L
F
Dark Gray (2.5 Y 4/0)

OO

Ch-5 (Rep. 2)



Depth Below H2O Surface (MLLW)
Depth Below Mudline
Lithology
Dilatancy
Toughness
Plasticity
Type
Color
Consistency
Cementation
Structure
HCl Reaction
Maximum Particle Size
Odor
Comments
38.0
40
41
0
5
10
S
M
M
CL
Dark Gray (5 Y 4/1) Mottled w/ Very Dk. Gray (5 Y 3/1)
VS
N
H
N
FS
SW
Very Dk. Gray (5 Y 3/1)
S
S
Pebbles
V. Angular Small Pebbles of Chert or Opal; Mono-mineralic
SM and ML Inter-layered
Dark Gray (2.5 Y 4/0)
F
FS
SM

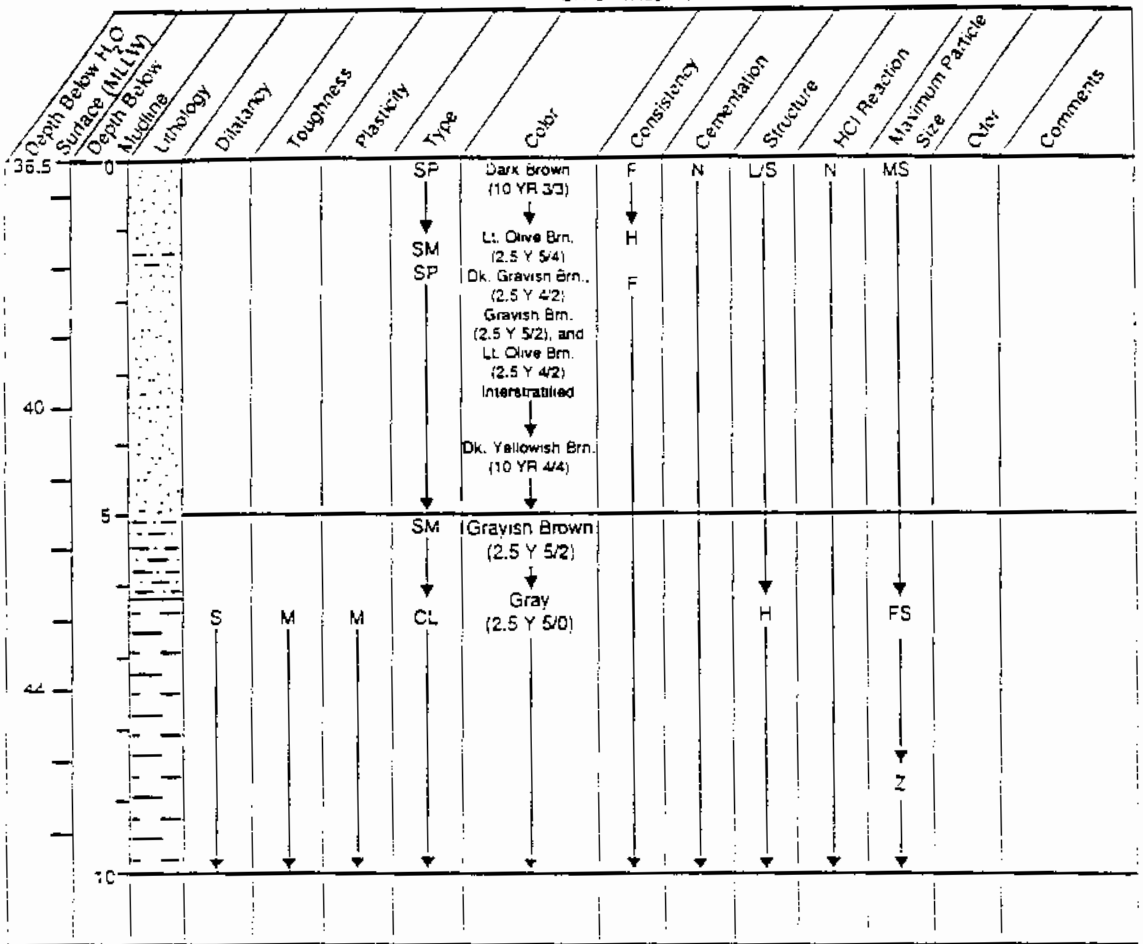
OO
CH-6

Depth Below H_2O Surface (MLLW)	Depth Below Mudline	Lithology	Dilatancy	Toughness	Plasticity	Type	Color	Consistency	Cementation	Structure	HCl Reaction	Maximum Particle Size	Color	Comments
36.0 – 40	0		S	M	M	CL	Olive Gray (5 Y 5/2) Olive Gray (5 Y 5/2) Mottled w/ Dark Gray (5 Y 4/1)	VS	N	H S/M → M	N	FS		
40 – 44	5		S	L	L	ML	Gray* (5 Y 5/1)	F		H		Pebbles		V. Angular Small Pebbles of Chert or Coal

*Color has bluish tint - not represented in color chart. Color given is closest to true color.

OI

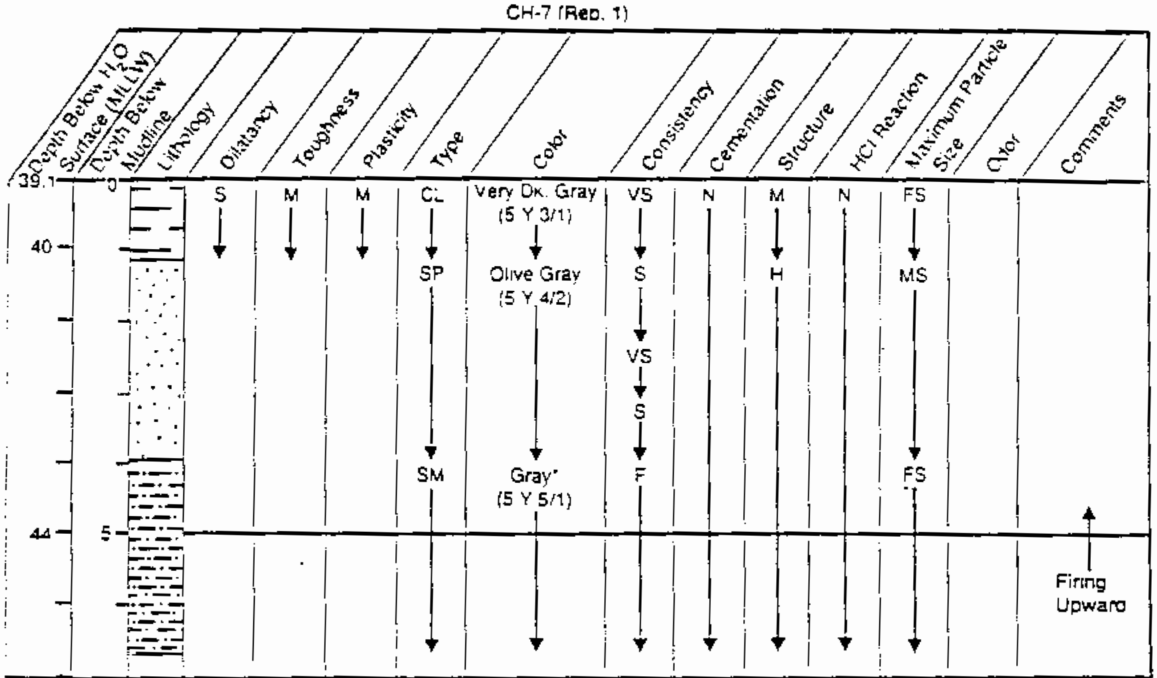
CH-6A (Rep. 1)



Depth Below H2O Surface (MLLW)
Depth Below Mudline
Lithology
Dilatancy
Toughness
Plasticity
Type
Color
Consistency
Cementation
Structure
HCl Reaction
Maximum Particle Size
Odor
Comments
36.5
40
44
0
5
10
SP
SM
SP
SM
CL
Dark Brown (10 YR 3/3)
Lt. Olive Brn. (2.5 Y 5/4)
Dk. Grayish Brn., (2.5 Y 4/2)
Grayish Brn. (2.5 Y 5/2), and
Lt. Olive Brn. (2.5 Y 4/2)
Interstratified
Dk. Yellowish Brn. (10 YR 4/4)
Grayish Brown (2.5 Y 5/2)
Gray (2.5 Y 5/0)
F
H
F
N
L/S
H
N
MS
FS
Z
S
M
M

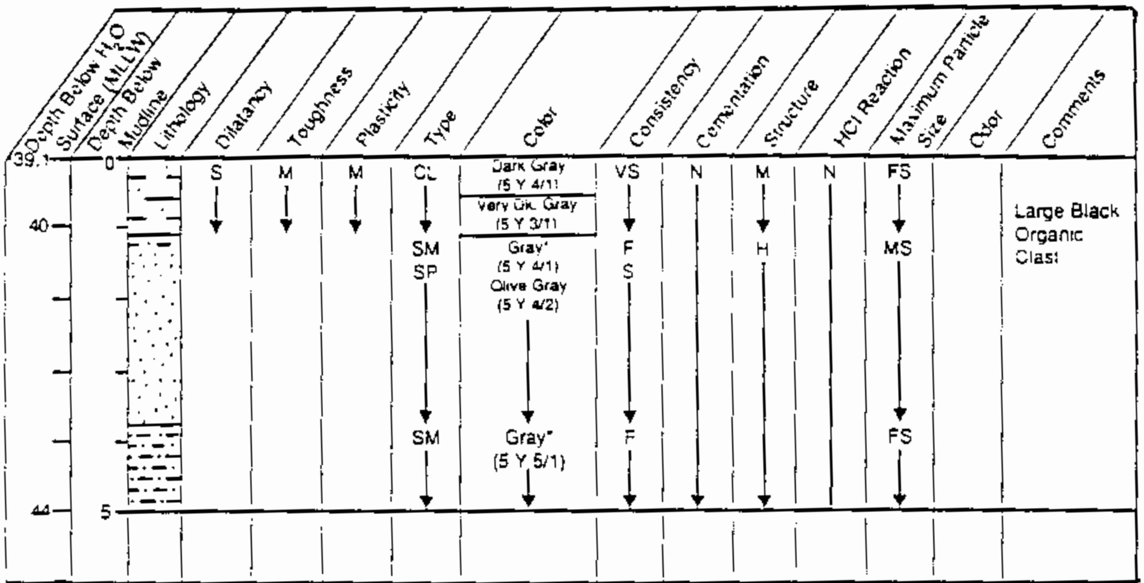
oo

CH-7 (Rep. 1)



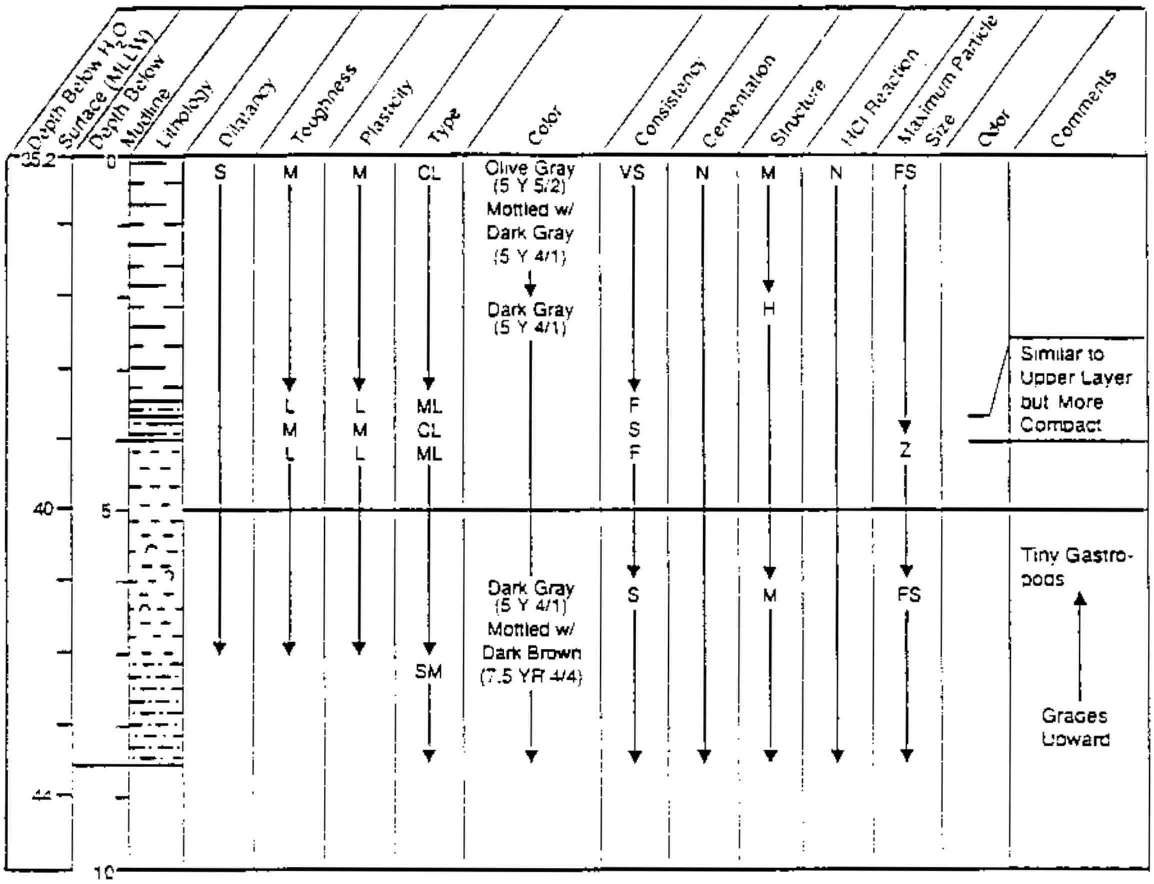
*Color has bluish tint - not represented in color chart. Color given is closest to true color.

OO
Ch-7 (Rep. 2)

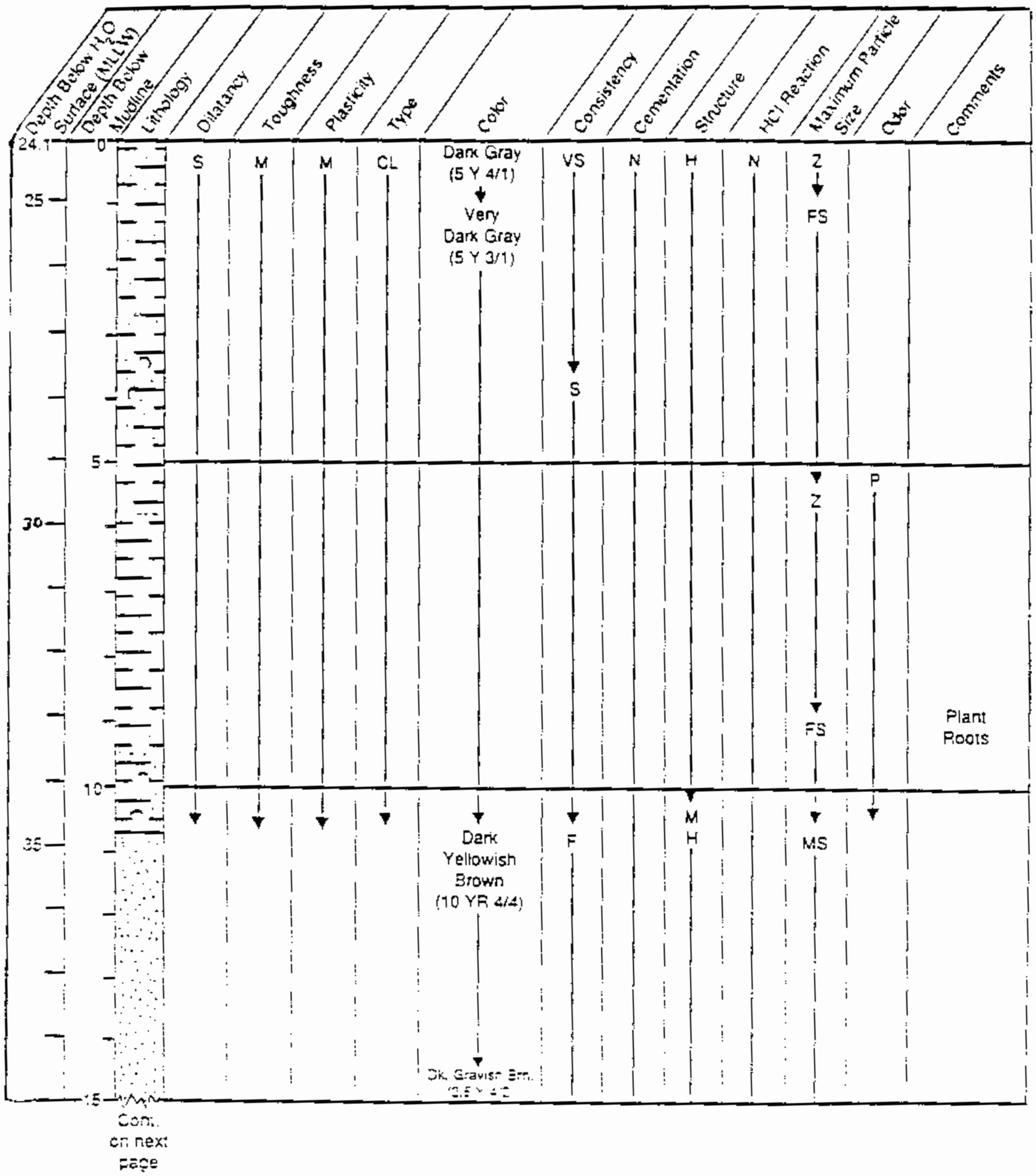


*Color has bluish tint - not represented in color chart. Color given is closest to true color.

CH-8


Depth Below H2O Surface (MLLW)
Depth Below Mudline
Lithology
Dilatancy
Toughness
Plasticity
Type
Color
Consistency
Cementation
Structure
HCl Reaction
Maximum Particle Size
Odor
Comments
35.2
0
40
5
44
10
S
M
M
CL
Olive Gray (5 Y 5/2) Mottled w/ Dark Gray (5 Y 4/1)
Dark Gray (5 Y 4/1)
VS
N
M
N
FS
H
L M L
L M L
ML CL ML
F S F
Z
Similar to Upper Layer but More Compact
Dark Gray (5 Y 4/1) Mottled w/ Dark Brown (7.5 YR 4/4)
S
M
FS
SM
Tiny Gastro-pods
Grades Upward

01
SS-4L (Rep. 1)



Depth Below H_2O Surface (MLLW)
Depth Below Mudline
Lithology
Dilatancy
Toughness
Plasticity
Type
Color
Consistency
Cementation
Structure
HCl Reaction
Maximum Particle Size
Odor
Comments
24.1
25
30
35
0
5
10
15
S
M
M
CL
Dark Gray (5 Y 4/1)
Very Dark Gray (5 Y 3/1)
VS
S
N
H
N
Z
FS
Z
FS
P
Plant Roots
Dark Yellowish Brown (10 YR 4/4)
F
M H
MS
Dk. Grayish Brn. (2.5 Y 4/2)
Cont. on next page

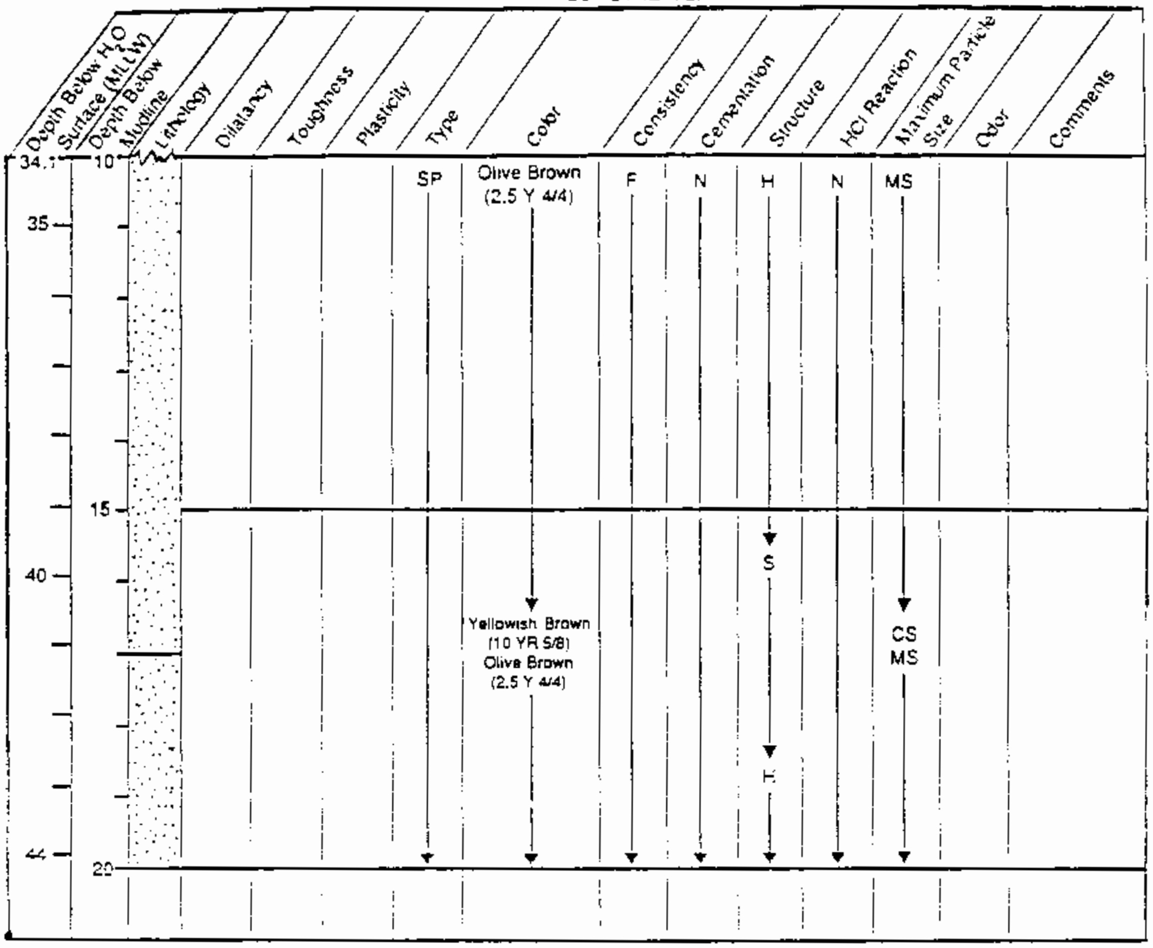
01

SS-4L (Rep. 1) - cont.

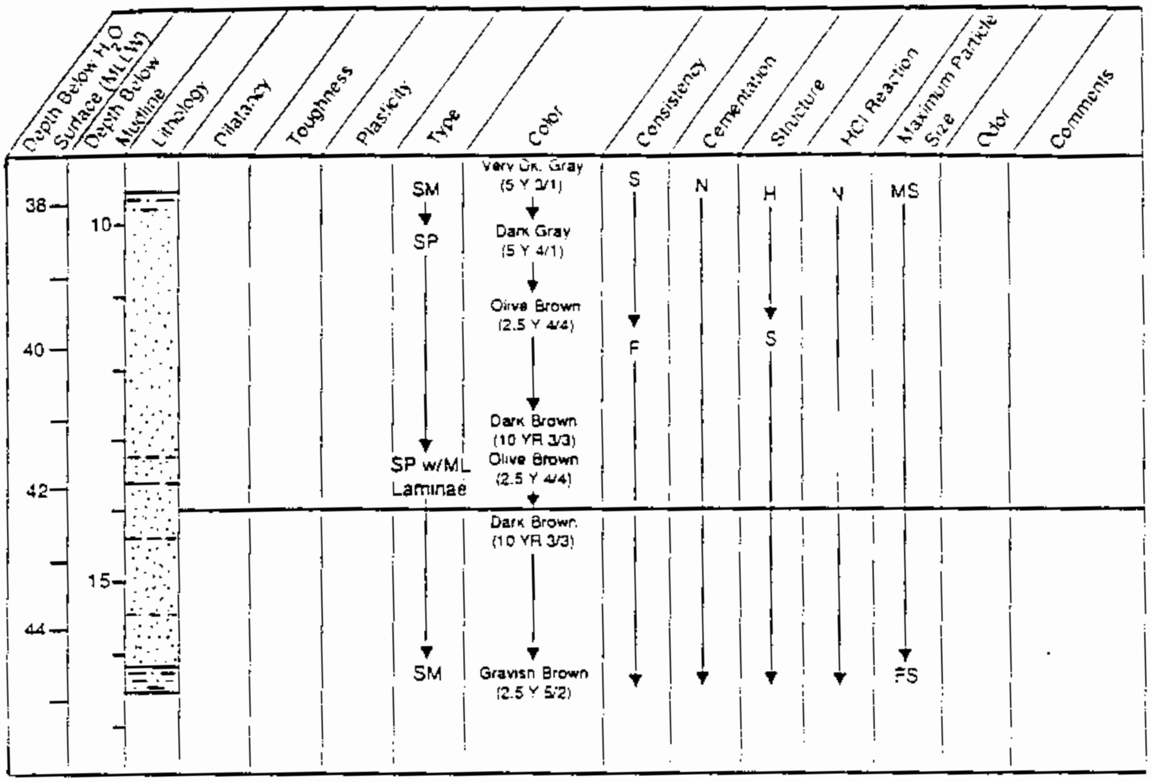
Depth Below H_2O Surface (MLLW)	Depth Below Mudline	Lithology	Dilatancy	Toughness	Plasticity	Type	Color	Consistency	Cementation	Structure	HCl Reaction	Maximum Particle Size	Odor	Comments
39.1	0					SP	Dk. Gravish Brown (2.5 Y 4/2)	F	N	H	N	MS		
40														
							Dk. Gravish Brn. (2.5 Y 4/2) w/ Laminae of Dk. Yellowish Brn. (10 YR 4/4)			S/L				
						SM	Dk. Gravish Brn. (2.5 Y 4/2) Gravish Brown (2.5 Y 5/2)			H				
44	5													

01

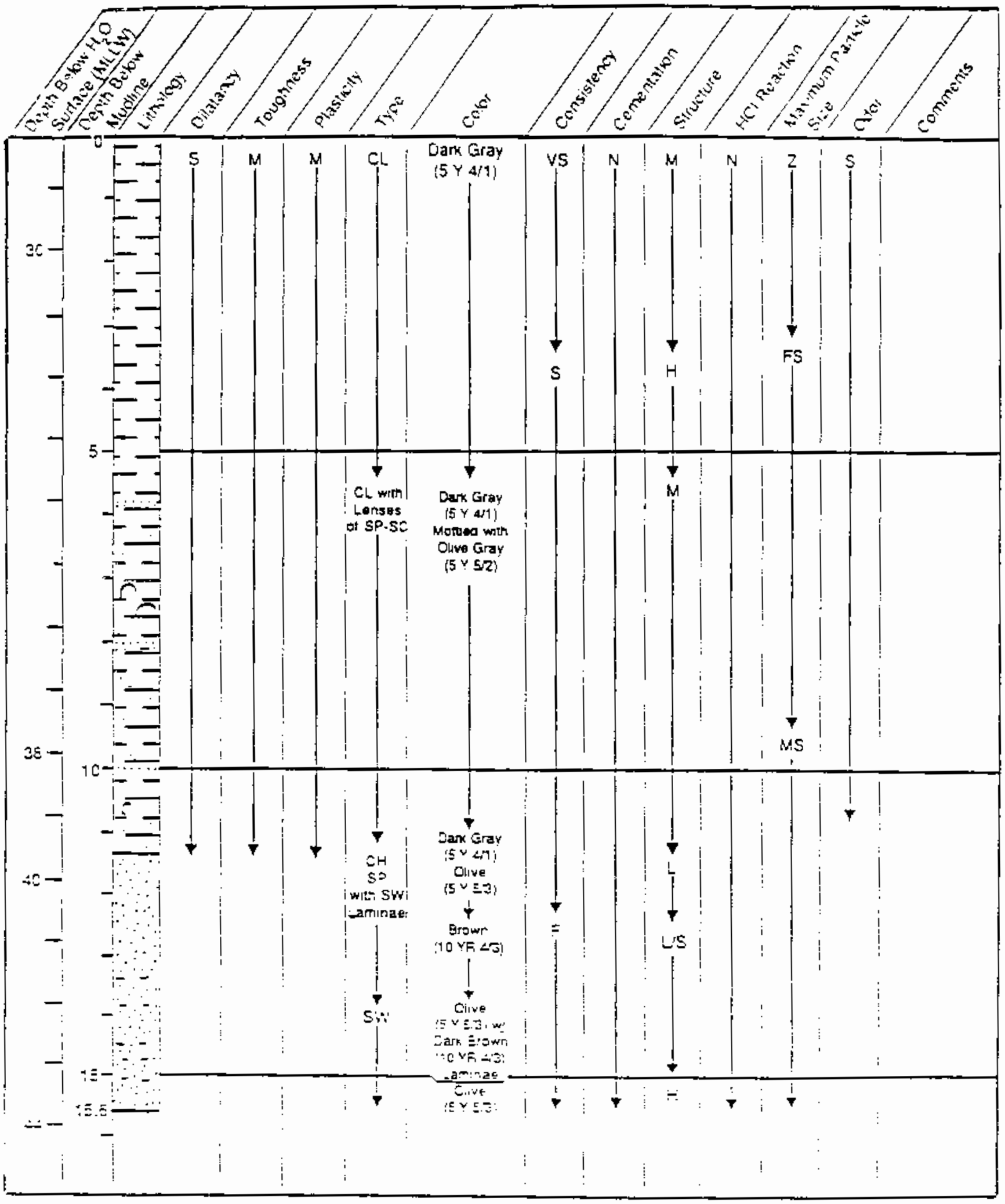
SS-4L (REP. 2)


Depth Below H_2O Surface (MLLW)
Depth Below Mudline
Lithology
Dilatancy
Toughness
Plasticity
Type
Color
Consistency
Cementation
Structure
HCl Reaction
Maximum Particle Size
Odor
Comments
34.1
35
40
44
10
15
20
SP
Olive Brown
(2.5 Y 4/4)
Yellowish Brown
(10 YR 5/8)
Olive Brown
(2.5 Y 4/4)
F
N
H
S
H
N
MS
CS
MS

OI
TS-5A (Rep. 3)

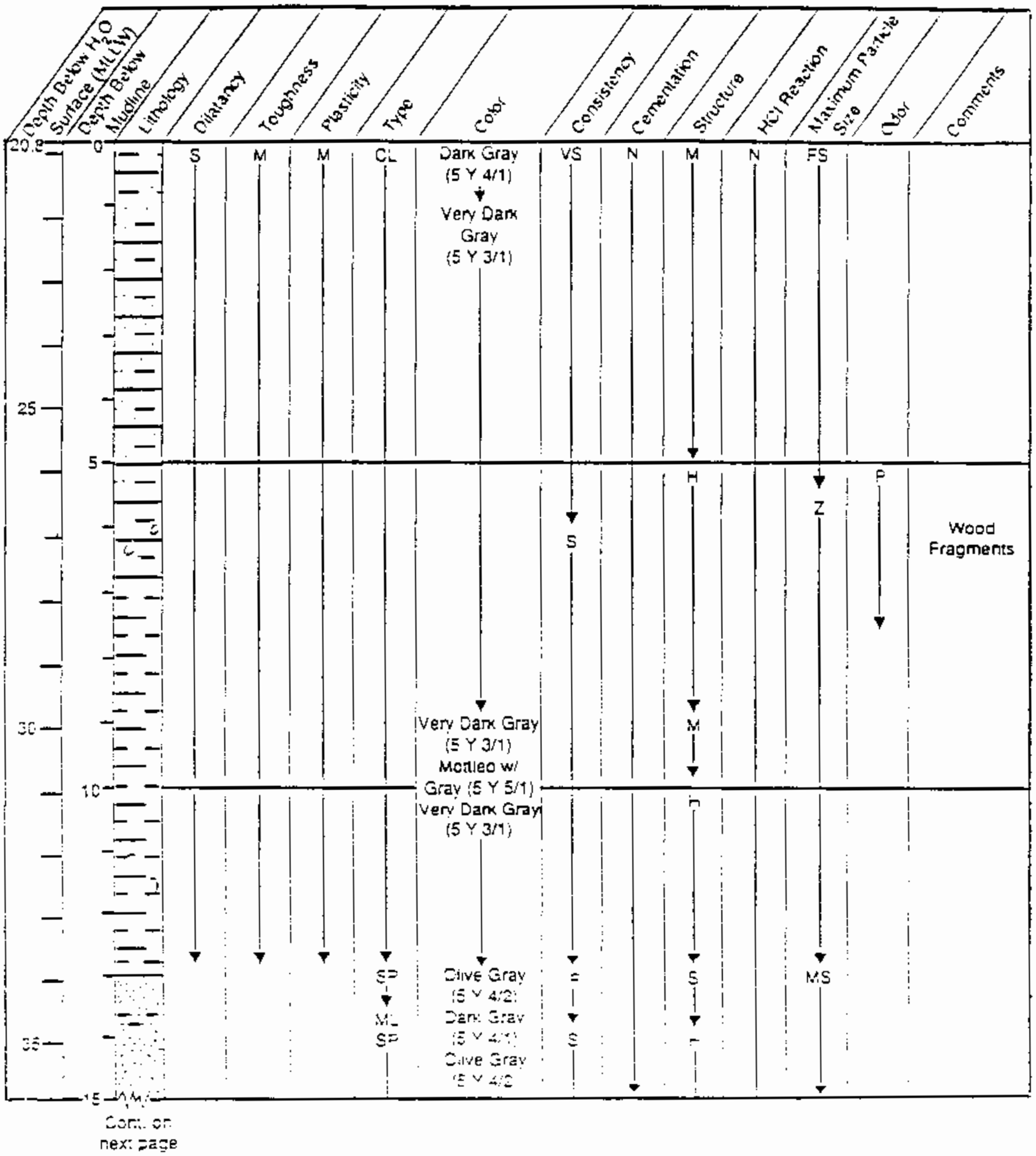

Depth Below H2O Surface (MLLW)
Depth Below Mudline
Lithology
Dilatancy
Toughness
Plasticity
Type
Color
Consistency
Cementation
Structure
HCl Reaction
Maximum Particle Size
Odor
Comments
38
40
42
44
10
15
SM
SP
SP w/ML Laminae
SM
Very Dk. Gray (5 Y 3/1)
Dark Gray (5 Y 4/1)
Olive Brown (2.5 Y 4/4)
Dark Brown (10 YR 3/3)
Olive Brown (2.5 Y 4/4)
Dark Brown (10 YR 3/3)
Grayish Brown (2.5 Y 5/2)
S
F
N
H
S
N
MS
FS

OI
TS-5A (Rep. 4)


Depth Below H_2O Surface (MLLW)
Depth Below Mudline
Lithology
Dilatancy
Toughness
Plasticity
Type
Color
Consistency
Cementation
Structure
HCl Reaction
Maximum Particle Size
Odor
Comments
30
38
40
44
0
5
10
15
15.5
S
M
M
CL
Dark Gray (5 Y 4/1)
VS
N
M
N
Z
S
S
H
FS
CL with Lenses of SP-SC
Dark Gray (5 Y 4/1) Mottled with Olive Gray (5 Y 5/2)
M
MS
CH
SP
with SW Laminae
Dark Gray (5 Y 4/1)
Olive (5 Y 5/3)
Brown (10 YR 4/3)
L
L/S
SW
Olive (5 Y 5/3) w/ Dark Brown (10 YR 4/3) Laminae
Olive (5 Y 5/3)
H

O1

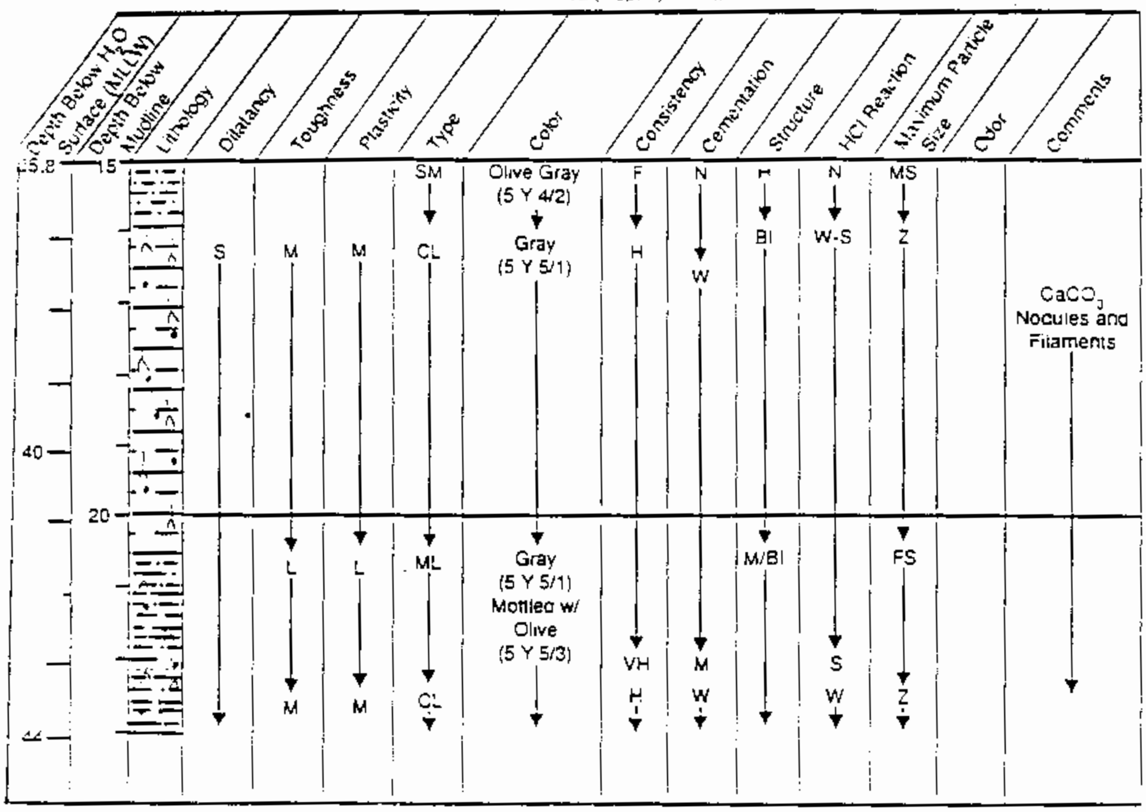
MA-1L (Rep. 1)



Depth Below H2O Surface (MLLW)
Depth Below Mudline
Lithology
Dilatancy
Toughness
Plasticity
Type
Color
Consistency
Cementation
Structure
HCl Reaction
Maximum Particle Size
Odor
Comments
20.8
25
30
35
0
5
10
15
S
M
M
CL
Dark Gray
(5 Y 4/1)
Very Dark
Gray
(5 Y 3/1)
VS
N
M
N
FS
H
Z
P
S
Wood
Fragments
Very Dark Gray
(5 Y 3/1)
Mottled w/
Gray (5 Y 5/1)
Very Dark Gray
(5 Y 3/1)
M
SP
ML
SP
Olive Gray
(5 Y 4/2)
Dark Gray
MS
Cont. on
next page

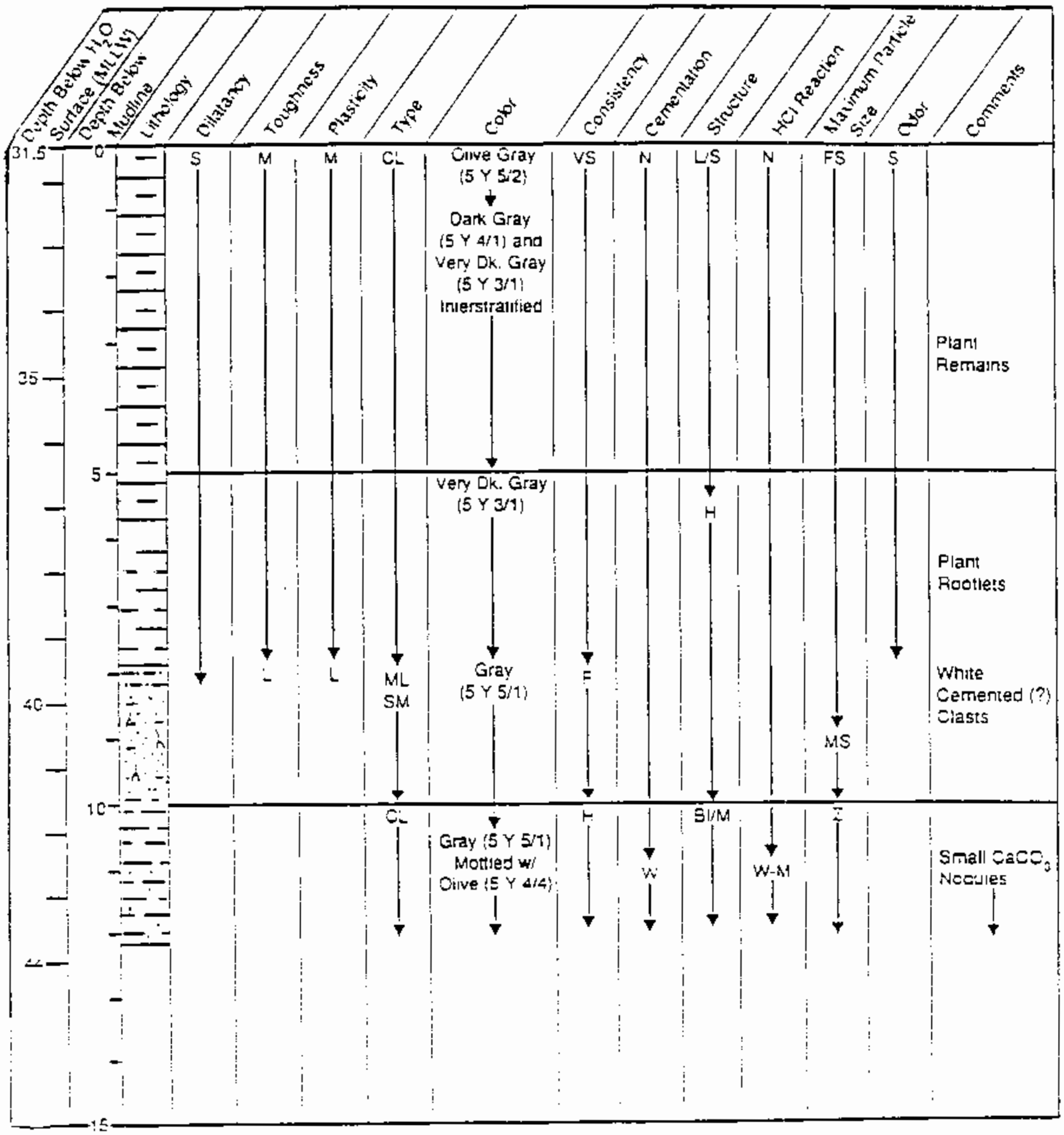
OI

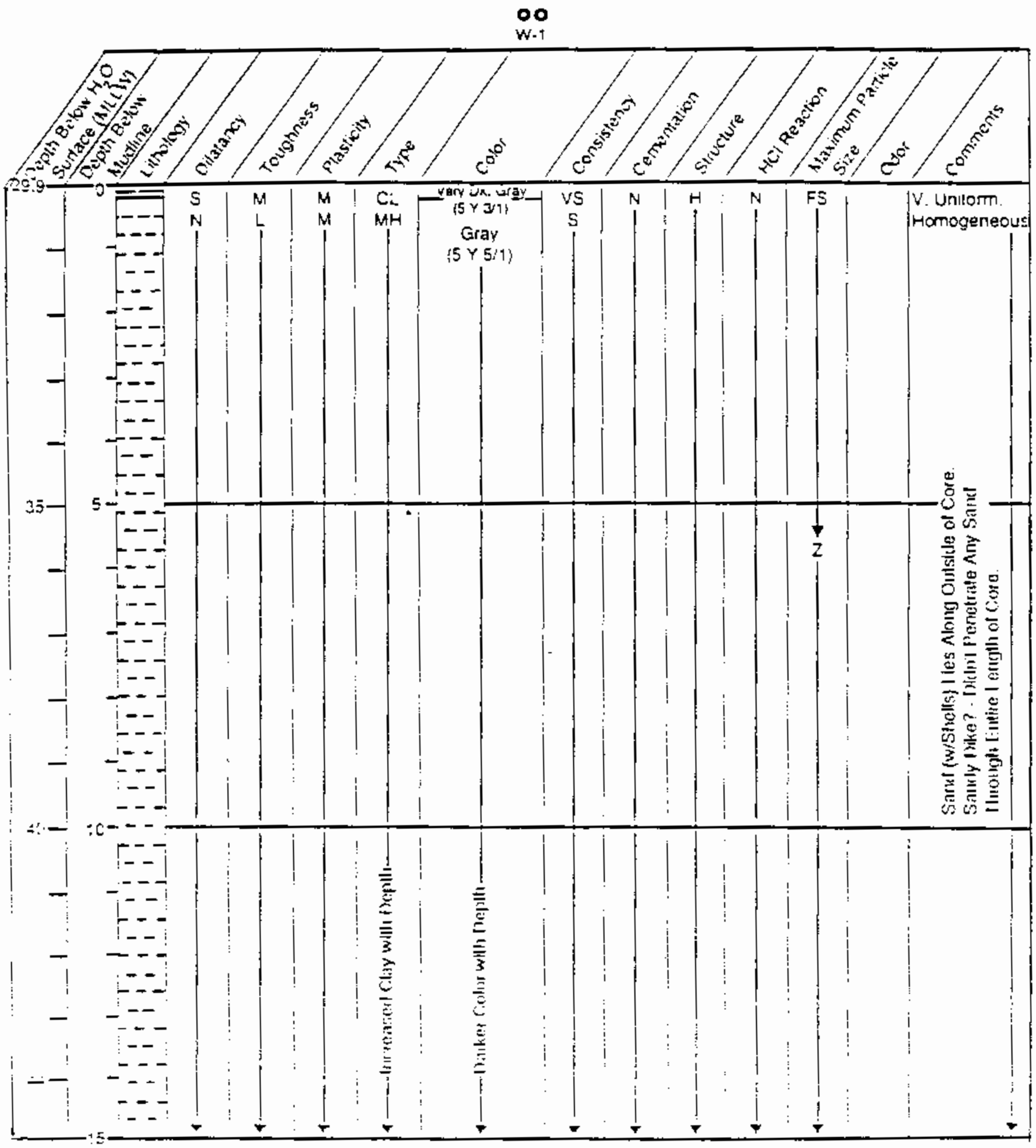
MA-1L (Rep. 1) - cont.



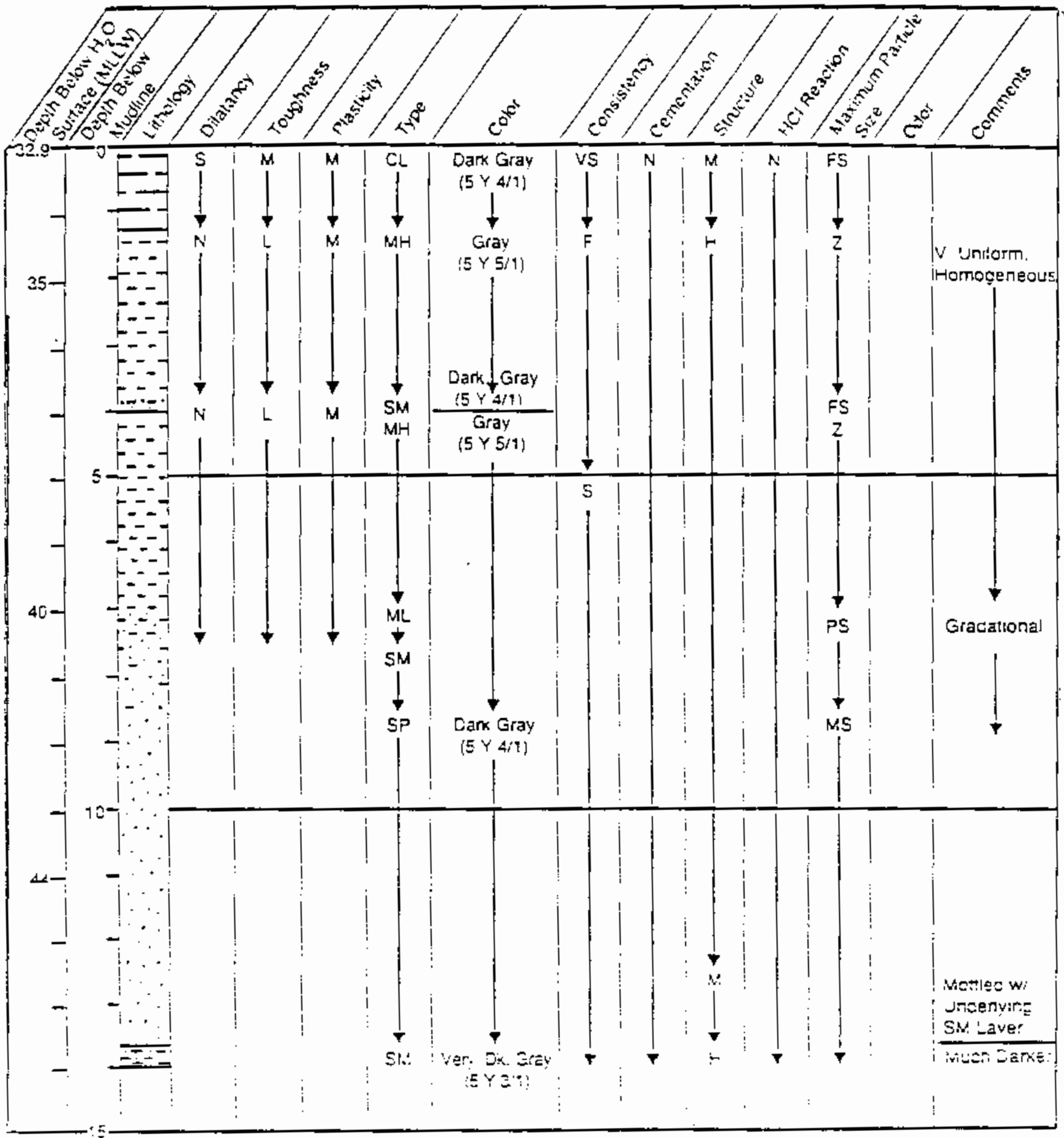
OI

MA-2 (Rep. 1)


Depth Below H_2O Surface (MLLW)
Depth Below Mudline
Lithology
Dilatancy
Toughness
Plasticity
Type
Color
Consistency
Cementation
Structure
HCl Reaction
Maximum Particle Size
Odor
Comments
31.5
35
40
0
5
10
15
S
M
M
CL
Olive Gray (5 Y 5/2)
Dark Gray (5 Y 4/1) and Very Dk. Gray (5 Y 3/1) Interstratified
VS
N
L/S
N
FS
S
Plant Remains
Very Dk. Gray (5 Y 3/1)
H
Plant Rootlets
L
L
ML SM
Gray (5 Y 5/1)
F
MS
White Cemented (?) Clasts
CL
Gray (5 Y 5/1) Mottled w/ Olive (5 Y 4/4)
H
W
Sl/M
W-M
Small $CaCO_3$ Nodules

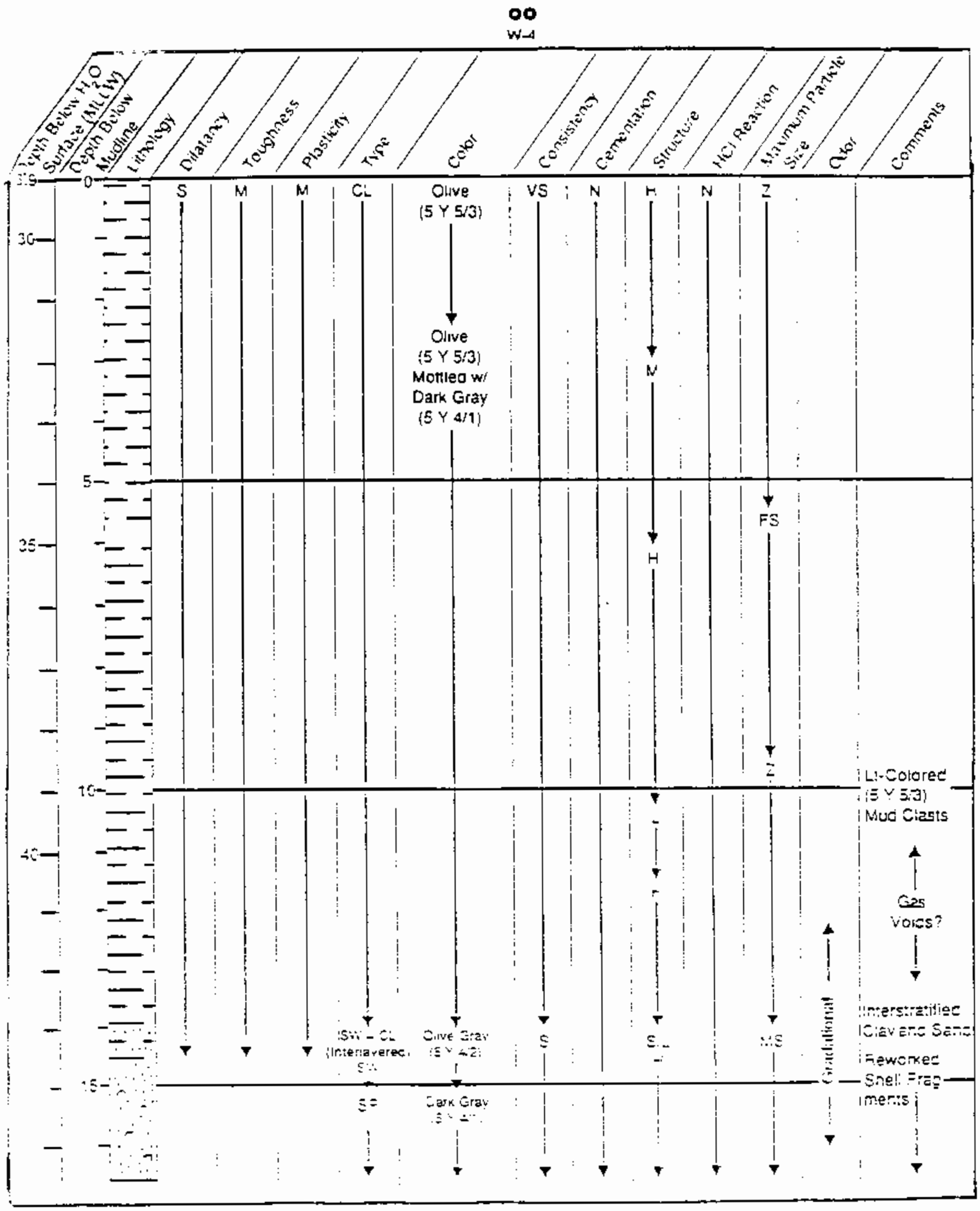

W-1
Depth Below H2O Surface (MLLW)
Depth Below Mudline
Lithology
Dilatancy
Toughness
Plasticity
Type
Color
Consistency
Cementation
Structure
HCl Reaction
Maximum Particle Size
Odor
Comments
29.9
35
0
5
10
15
S
N
M
L
M
M
CL
MH
Very Dk. Gray (5 Y 3/1)
Gray (5 Y 5/1)
VS
S
N
H
N
FS
Z
V. Uniform. Homogeneous
Sand (w/Shells) Lies Along Outside of Core. Sandy Dike? - Didn't Penetrate Any Sand Through Entire Length of Core.
Increased Clay with Depth
Darker Color with Depth

OO
W-2 (Rep. 1)


Depth Below H2O Surface (MLLW)
Depth Below Mudline
Lithology
Dilatancy
Toughness
Plasticity
Type
Color
Consistency
Cementation
Structure
HCl Reaction
Maximum Particle Size
Odor
Comments
32.9
35
40
44
0
5
10
15
S
N
N
M
L
L
M
M
M
CL
MH
SM
MH
ML
SM
SP
SM
Dark Gray
(5 Y 4/1)
Gray
(5 Y 5/1)
Dark Gray
(5 Y 4/1)
Gray
(5 Y 5/1)
Dark Gray
(5 Y 4/1)
Very Dk. Gray
(5 Y 3/1)
VS
F
S
N
M
H
M
H
N
FS
Z
FS
Z
PS
MS
V. Uniform,
Homogeneous
Gradational
Mottled w/
Underlying
SM Layer
Much Darker

oo
W-3 (Rep. 1)

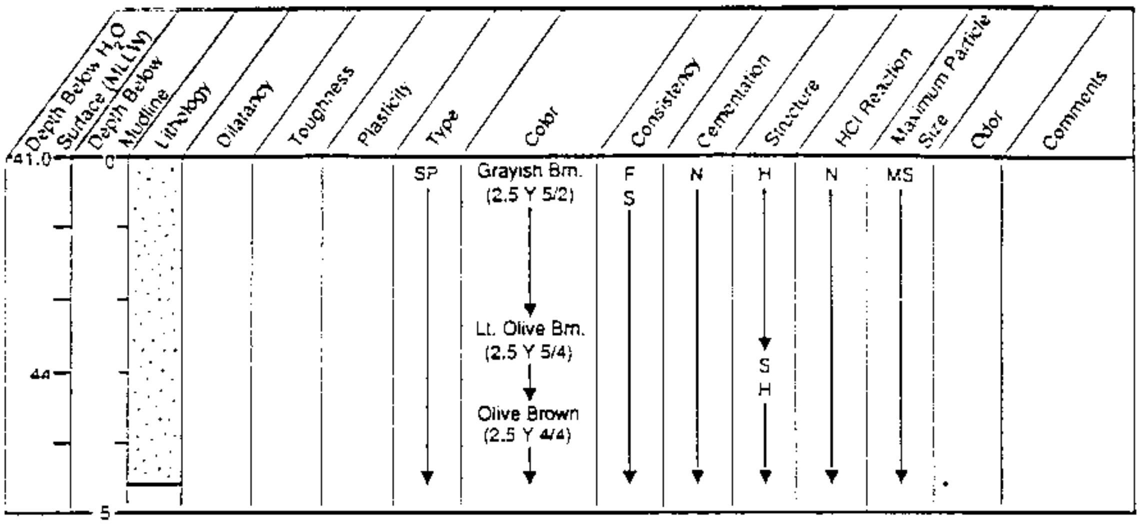
Depth Below H_2O Surface (MLLW)	Depth Below Mudline	Lithology	Dilatancy	Toughness	Plasticity	Type	Color	Consistency	Cementation	Structure	HCl Reaction	Maximum Particle Size	Odor	Comments
33.31	0		S	M	M	CL	Olive Gray (5 Y 5/2) ↓ Olive Gray (5 Y 5/2) Mottled w/ Dark Gray (5 Y 4/1)	VS	N	M	N	FS		
35														
	5						Black (5 Y 2.5 Y) Very Dk. Gray (5 Y 3/1)			H				Decayed Organics?
40														
	10		N	M	H	CH	Olive (5 Y 5/3)	S	↓	↓	↓	Z		
44														



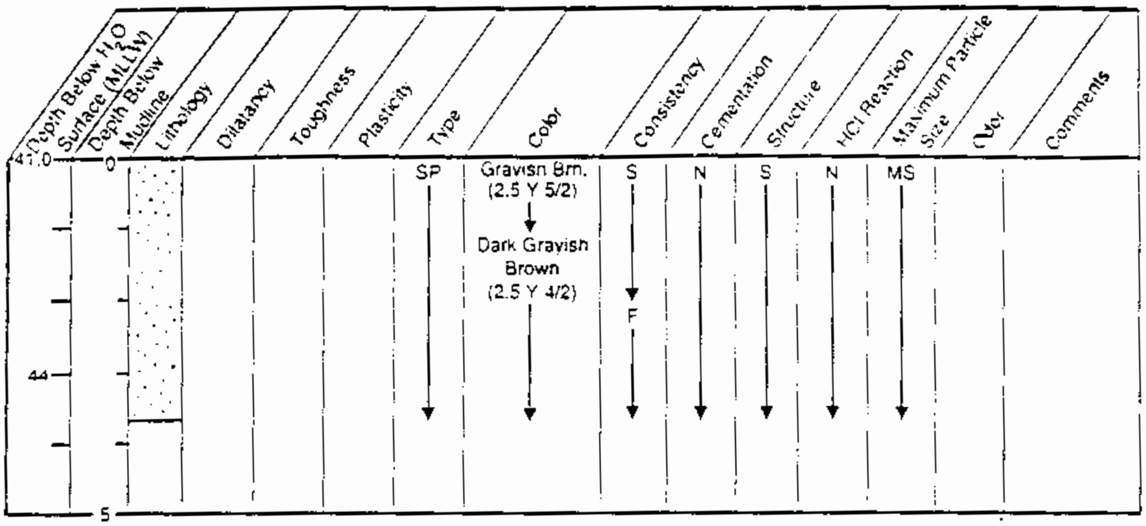
OO
W-4
Depth Below H2O Surface (MLLW)
Depth Below Mudline
Lithology
Dilatancy
Toughness
Plasticity
Type
Color
Consistency
Cementation
Structure
HCl Reaction
Maximum Particle Size
Odor
Comments
0
5
10
15
30
35
40
S
M
M
CL
Olive (5 Y 5/3)
Olive (5 Y 5/3) Mottled w/ Dark Gray (5 Y 4/1)
VS
N
H
M
H
N
Z
FS
Z
Lt-Colored (5 Y 5/3) Mud Clasts
Gas Voids?
Interstratified Clay and Sand
Reworked Shell Fragments
Gradational
SW – CL (Interlayered) SW
Olive Gray (5 Y 4/2)
S
MS
SP
Dark Gray

OO

W-5 (Rep. 2)


Depth Below H2O Surface (MLLW)
Depth Below Mudline
Lithology
Dilatancy
Toughness
Plasticity
Type
Color
Consistency
Cementation
Structure
HCl Reaction
Maximum Particle Size
Odor
Comments
41.0
0
44
5
SP
Grayish Brn.
(2.5 Y 5/2)
Lt. Olive Brn.
(2.5 Y 5/4)
Olive Brown
(2.5 Y 4/4)
F
S
N
H
S
H
N
MS

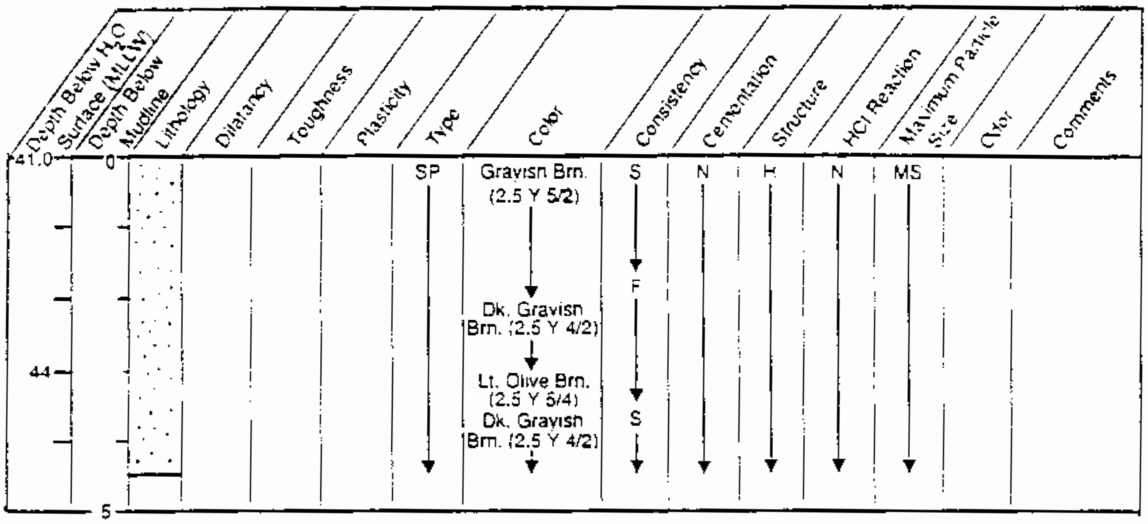
OO
W-5 (Rep. 3)



Depth Below H2O Surface (MLLW)
Depth Below Mudline
Lithology
Dilatancy
Toughness
Plasticity
Type
Color
Consistency
Cementation
Structure
HCl Reaction
Maximum Particle Size
Other
Comments
41.0
44
0
5
SP
Grayish Brn. (2.5 Y 5/2)
Dark Grayish Brown (2.5 Y 4/2)
S
F
N
S
N
MS

OO

W-5 (Rep. 4)


Depth Below H_2O Surface (MLLW)
Depth Below Mudline
Lithology
Dilatancy
Toughness
Plasticity
Type
Color
Consistency
Cementation
Structure
HCl Reaction
Maximum Particle Size
Odor
Comments
41.0
44
0
5
SP
Grayish Brn. (2.5 Y 5/2)
Dk. Grayish Brn. (2.5 Y 4/2)
Lt. Olive Brn. (2.5 Y 5/4)
Dk. Grayish Brn. (2.5 Y 4/2)
S
F
S
N
H
N
MS

B.4 REFERENCES

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APPENDIX C

SEDIMENT CHEMISTRY AND QUALITY ASSURANCE DATA

TABLE C.1. Concentrations of PAHs in Sediment Treatments, Dry Weight

Sediment Treatment	PAH Concentrations (ng/g dry wt)							
	Acenaph-thene	Acenaph-thylene	Anthra-cene	Benzo(a) Anthra-cene	Benzo(a) pyrene	Benzo(b) flouran-thene	Benzo (g,h,i) perylene	Benzo(k) fluoran-thene
Target DL	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Achieved DL	0.07	0.07	0.09	0.08	0.15	0.33	0.35	0.33
0I-CH-0	0.07U	0.07U	0.12	0.08U	0.31	0.47	0.50	0.20J
00-CH-1	0.07U	0.07U	5.00	10.86	18.92	15.79	17.06	10.60
00-CH-2	0.07U	0.07U	5.20	8.46	18.84	13.14	16.19	9.92
0I-CH-2A	13.18	0.07U	49.19	109.75	206.45	151.11	160.41	116.98
00-CH-3	8.51	0.07U	25.45	70.62	178.57	120.03	164.24	103.73
00-CH-4	12.57	0.07U	34.79	41.43	75.68	56.10	63.76	54.15
0I-CH-4A	0.07U	0.07U	0.09U	0.13	0.19	0.19J	0.19J	0.13J
00-CH-5	3.00	0.07U	10.71	20.51	47.69	37.32	43.78	34.41
00-CH-6	0.07U	0.07U	14.83	27.09	51.96	40.35	44.06	38.00
0I-CH-6A	0.07U	0.07U	0.24	0.28	0.15U	0.63	0.52	0.20J
00-CH-7	0.07U	0.07U	3.30	7.59	15.10	12.08	12.93	12.68
00-CH-8	0.07U	0.07U	20.69	36.10	56.57	52.27	42.22	43.69
0I-SS-4-L	0.07U	0.07U	0.44	1.06	2.99	1.95	2.99	1.63
0I-SS-4-L DUP	0.61	0.07U	0.52	0.41	1.34	0.91	1.42	0.73
0I-TS-5AU	104.69	0.07U	220.43	571.80	1262.93	1317.74	730.79	672.87
0I-TS-5AU DUP	126.15	0.07U	278.78	719.29	1493.92	1454.06	925.70	967.76
0I-TS-5AL	18.96	0.07U	30.13	48.90	100.08	74.95	75.69	56.34
0I-TS-5 Merritt	0.07U	0.07U	0.35	0.67	2.11	1.78	1.40	1.77
0I-MA-1L	0.49	0.07U	0.67	1.13	2.43	1.40	2.06	1.40
0I-MA-1L DUP	0.60	0.07U	0.52	0.40	1.32	0.90	1.40	0.72
0I-MA-2U	60.73	0.07U	170.09	392.14	1399.70	995.07	1089.62	0.33U
0I-MA-2L	1.77	0.07U	3.61	10.59	32.70	20.40	28.97	16.38
00-W-1	0.07U	0.07U	0.87	1.12	0.15U	3.95	1.14	3.95
00-W-2	0.52	0.07U	1.88	7.94	25.70	17.73	22.21	12.65
00-W-3	1.86	0.07U	6.11	20.56	42.36	29.82	38.89	27.21
00-W-4	0.07U	0.07U	23.97	42.45	102.07	69.61	85.46	64.11
00-W-5	0.07U	0.07U	0.08	0.08U	0.15U	0.33U	0.35U	0.33U
PR-coarse	0.07U	0.07U	0.74	2.27	3.57	3.98	4.08	1.98
PR-fine	0.07U	0.07U	0.57	1.94	3.39	3.79	4.47	2.27
Tomales Bay	0.07U	0.07U	0.31	0.79	0.63	1.84	0.78	0.53

U = Undetected.

J = An estimated value when result is less than specified detection limit.

TABLE C.1. (Contd)

	PAH Concentrations (ng/g dry wt)								
Sediment Treatment	Chrysene	Dibenzo (a,h) anthracene	Fluoran-thene	Fluorene	Indeno-(1,2,3-c,d) pyrene	Naphtha-lene	Phenan-threne	Pyrene	Total
Target DL	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	
Achieved DL	0.12	0.54	0.11	0.04	0.23	0.04	0.09	0.07	
OI-CH-0	0.35	0.54U	0.21	0.14	0.27	0.04U	0.09U	0.37	2.73
OO-CH-1	14.56	1.68	28.11	2.78	14.02	4.57	20.02	36.83	200.80
OO-CH-2	10.91	0.97	27.37	1.99	12.54	3.09	13.00	36.92	178.54
OI-CH-2A	132.67	9.82	288.98	15.76	128.41	18.10	142.30	487.38	2030.47
OO-CH-3	96.16	10.62	174.32	8.56	133.71	12.92	69.67	293.68	1470.79
OO-CH-4	56.97	4.33	140.19	13.00	52.96	6.19	61.77	222.86	896.76
OI-CH-4A	0.20	0.54U	0.10	0.04U	0.23U	1.88	0.21	0.17	2.86
OO-CH-5	28.39	3.51	50.32	4.06	33.78	0.04U	27.02	103.59	446.08
OO-CH-6	40.05	3.49	69.48	4.25	32.00	3.41	27.27	144.15	540.38
OI-CH-6A	0.46	0.54U	0.59	0.48	0.23U	9.09	2.20	0.57	15.08
OO-CH-7	10.06	1.03	15.02	1.24	10.44	0.04U	5.99	40.71	148.18
OO-CH-8	53.81	3.49	77.22	4.93	32.42	2.76	33.53	180.41	640.11
OI-SS-4-L	1.25	0.26J	2.65	0.26	2.44	2.94	1.02	5.91	27.54
OI-SS-4-L DUP	1.18	0.54U	3.37	0.04U	1.06	0.04U	1.92	4.03	17.51
OI-TS-5AU	867.51	187.93	1077.09	93.85	762.90	50.07	515.10	2046.57	10482.47
OI-TS-5AU DUP	1067.56	239.84	1283.81	115.11	939.85	60.95	562.67	2386.80	12622.24
OI-TS-5AL	67.40	6.35	125.38	25.43	67.28	9.29	130.75	235.60	1072.53
OI-TS-5 Merritt	1.22	0.54U	1.32	0.41	1.24	2.49	1.09	2.82	18.68
OI-MA-1L	1.74	0.54U	5.07	0.04U	1.40	0.04U	2.12	6.00	25.91
OI-MA-1L DUP	1.16	0.54U	3.32	0.04U	1.05	0.04U	1.87	3.98	17.23
OI-MA-2U	605.66	70.98	1189.66	36.01	957.32	92.14	453.41	2303.53	9818.06
OI-MA-2L	13.76	1.80	31.92	0.65	23.05	8.45	13.10	73.77	280.93
OO-W-1	2.58	0.54U	2.82	1.60	0.23U	0.04U	4.08	3.54	25.63
OO-W-2	11.32	1.50	20.08	0.79	18.59	0.04U	6.60	28.96	176.47
OO-W-3	28.39	2.86	44.63	2.23	34.96	1.43	16.59	64.11	362.02
OO-W-4	61.11	4.89	141.84	7.13	67.70	0.83	55.95	226.66	953.76
OO-W-5	0.12U	0.54U	0.11U	0.04U	0.23U	0.04U	0.09U	0.07U	0.08
PR-coarse	3.97	0.26J	6.42	1.63	2.67	0.04U	9.49	7.52	48.31
PR-fine	3.05	0.35J	4.84	0.94	3.02	0.04U	4.92	6.23	39.43
Tomales Bay	3.60	0.13J	1.78	2.32	0.39	4.40	17.63	2.66	37.65

TABLE C.2. Quality Assurance Summary for Sediment PAHs

Measurements of Precision: Duplicate Results

(ng/g dry wt)

Sediment Treatment	Acenaph-thene	Acenaph-thylene	Anthra-cene	Benzo(a) Anthra-cene	Benzo(a) pyrene	Benzo(b) flouran-thene	Benzo (g,h,i) perylene	Benzo(k) fluoran-thene
OI-SS-4-L	0.07U	0.07U	0.44	1.08	2.99	1.95	2.99	1.63
OI-SS-4-L DUP	0.61	0.07U	0.52	0.41	1.34	0.91	1.42	0.73
I-Stat	N/A	N/A	0.8	0.5	0.2	0.4	0.4	0.4
RPD	N/A	N/A	17	90	76	73	71	76
OI-TS-5AU	104.89	0.07U	220.43	571.80	1262.93	1317.74	730.79	672.87
OI-TS-5AU DUP	126.15	0.07U	276.78	719.29	1493.92	1454.08	925.70	967.76
I-Stat	0.1	N/A	0.1	0.1	0.1			
RPD	18	N/A	23	23	17			
OI-MA-1L	0.49	0.07U	0.67	1.13	2.43	1.40	2.06	1.40
OI-MA-1L DUP	0.60	0.07U	0.52	0.40	1.32	0.90	1.40	0.72
I-Stat	0.1	N/A	0.1	0.5	0.3	0.2	0.2	0.3
RPD	20	N/A	25	95	59	43	38	64

(ng/g dry wt)

Sediment Treatment	Chrysene	Dibenzo (a,h) anthracene	Fluoran-thene	Fluorene	Indeno-(1,2,3-c,d) pyrene	Naphtha-lene	Phenan-threne	Pyrene	Total
OI-SS-4-L	1.25	0.28J	2.66	0.28	2.44	2.94	1.02	5.91	27.54
OI-SS-4-L DUP	1.18	0.54U	3.37	0.04U	1.06	0.04U	1.92	4.03	17.51
I-Stat	0.0	N/A	0.1	N/A	0.4	N/A	0.3	0.2	0.2
RPD	6	N/A	24	N/A	79	N/A	61	38	45
OI-TS-5AU	867.51	187.93	1077.09	93.85	762.90	50.07	515.10	2046.57	10482.47
OI-TS-5AU DUP	1067.56	239.84	1283.81	115.11	939.85	60.95	562.67	2386.80	12822.24
I-Stat	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1
RPD	21	24	18	20	21	20	9	15	19
OI-MA-1L	1.74	0.54U	5.07	0.04U	1.40	0.04U	2.12	6.00	25.91
OI-MA-1L DUP	1.16	0.54U	3.32	0.04U	1.05	0.04U	1.87	3.98	17.23
I-Stat	0.2	N/A	0.2	N/A	0.1	N/A	0.1	0.2	0.2
RPD	40	N/A	42	N/A	29	N/A	17	40	40

U = Undetected.

N/A = Not Applicable

J = An estimated value when result is less than specified detection limit.

TABLE C.2. (Contd)

Measurements of Accuracy: Standard Reference Materials (SRMs)

(ng/g dry wt)

Sediment Treatment	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a) Anthracene	Benzo(a) pyrene	Benzo(b) flouranthene	Benzo (g,h,i) perylene	Benzo(k) fluoranthene
Certified Value (SQ-1)	120	100	100	110	130	100 (a)	100	100
FZ11 SRM	100.73	0.07U	130.43	157.16	189.69	182.56	146.38	ND (a)
Percent Recovery	84	0	130	143	146	182	146	NA
FZ13 SRM	93.74	0.07U	109.47	122.18	156.40	133.84	116.38	ND (a)
Percent Recovery	78	0	110	111	120	134	116	NA

(ng/g dry weight)

Sediment Treatment	Chrysene	Dibenzo (a,h) anthracene	Fluoranthene	Fluorene	Indeno-(1,2,3-c,d) pyrene	Naphthalene	Phenanthrene	Pyrene	Total
Certified Value (SQ-1)	150	74	130	120	100	99	130	110	
FZ11 SRM	176.71	125.83	184.68	113.03	6.62	49.53	157.40	167.23	1895.97
Percent Recovery	118	167	142	94	7	50	121	152	-------
FZ13 SRM	134.29	92.82	147.16	101.65	4.04	47.79	130.55	134.09	1524.40
Percent Recovery	90	125	113	85	4	48	100	122	-------

U = Undetected.

(a) Values are the sum of Benzo(b)fluoranthene and Benzo(k)fluroanthene. SRM reported as the value of Benzo(b)fluoranthene

TABLE C.2. (Contd)

Surrogate Recoveries

Sediment Treatment	d8-Naph	d10-Acen	d12-Chry	d12-Pery	d10-Phen
OI-CH-0	48	54	75	59	61
OO-CH-1	44	58	82	68	71
OO-CH-2	52	61	68	59	66
OI-CH-2A	48	66	58	57	74
OO-CH-3	44	81	92	87	75
OO-CH-4	60	70	50	43	73
OI-CH-4A	58	62	79	80	64
OO-CH-5	41	53	50	43	59
OO-CH-6	49	63	52	45	64
OI-CH-6A	78	77	78	64	70
OO-CH-7	48	54	68	50	61
OO-CH-8	48	60	58	49	69
OI-SS-4-L	53	63	78	71	56
OI-SS-4-L DUP	53	54	69	59	54
OI-TS-5AU	45	70	57	54	73
OI-TS-5AU DUP	51	77	65	60	77
OI-TS-5AL	53	66	60	58	72
OI-TS-5 Merritt	63	62	86	73	61
OI-MA-1L	26	28	52	43	37
OI-MA-1L DUP	51	52	66	57	53
OI-MA-2U	56	70	65	62	75
OI-MA-2L	52	59	78	60	65
OO-W-1	49	58	75	62	69
OO-W-2	46	53	69	58	58
OO-W-3	41	45	69	55	51
OO-W-4	39	56	41	38	60
OO-W-5	37	41	67	54	47
PR-coarse	55	66	75	59	76
PR-fine	52	60	77	65	71
Tomales Bay	66	67	70	54	64
FZ11 SRM	53	60	83	72	69
FZ13 SRM	52	60	77	68	66
FZ12 PB	66	68	76	66	64
FZ14 PB	75	80	76	66	74

PB = Procedural Blank

TABLE C.2. (Contd)

Procedural Blanks (PBs)

(ng/g dry weight)

Sediment Treatment	Acenaph-thene	Acenaph-thylene	Anthra-cene	Benzo(a) Anthra-cene	Benzo(a) pyrene	Benzo(b) flouran-thene	Benzo (g,h,i) perylene	Benzo(k) fluoran-thene
FZ12 PB	0.07U	0.08U	0.09U	0.66	0.15U	0.33U	0.35U	0.33U
FZ14 PB	0.07U	0.08U	0.09U	0.08U	0.15U	0.33U	0.35U	0.33U

(ng/g dry weight)

Sediment Treatment	Chrysene	Dibenzo (a,h) anthracene	Fluoran-thene	Fluorene	Indeno-(1,2,3-c,d) pyrene	Naphtha-lene	Phenan-threne	Pyrene
FZ12 PB	0.12U	0.54U	0.38	0.04U	0.23U	12.30	1.74	0.31
FZ14 PB	0.12U	0.54U	0.26	0.04U	0.23U	1.90	0.51	0.26

U = Undetected.

Spikes and Recoveries

PERFORMED AS SURROGATE SPIKES/RECOVERIES

TABLE C.3. Concentrations of Pesticides in Sediment Treatments, Dry Weight

Sediment Treatment	Pesticide Concentrations (ng/g dry wt)							
	a BHC	Aldrin	b BHC	d BHC	p,p DDD	p,p DDE	p,p DDT	Dieldrin
Target DL	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Achieved DL	0.02	0.02	0.02	0.03	0.04	0.03	0.02	0.02
OI-CH-0	0.02U	0.02U	0.02U	0.03U	0.04U	0.03U	0.02U	0.02U
OO-CH-1	0.02U	0.02U	0.02U	0.03U	0.04U	0.03U	0.02U	0.02U
OO-CH-2	0.02U	0.02U	0.02U	0.03U	1.85	2.20	0.02U	1.03
OO-CH-2A	0.02U	0.02U	0.02U	0.03U	4.81	3.91	0.02U	0.02U
OO-CH-3	0.02U	0.02U	0.02U	0.03U	5.77	5.24	0.02U	0.02U
OO-CH-4	0.02U	0.02U	0.02U	0.03U	9.55	4.33	0.02U	0.02U
OI-CH-4A	0.02U	0.02U	0.02U	0.03U	0.04U	0.03U	0.02U	0.02U
OO-CH-5	0.02U	0.02U	0.02U	0.03U	2.16	1.03	0.02U	0.02U
OO-CH-6	0.02U	0.02U	0.02U	0.03U	2.98	2.27	0.02U	0.02U
OI-CH-6A	0.02U	0.02U	0.02U	0.03U	0.04U	0.03U	0.02U	0.02U
OO-CH-7	0.02U	0.02U	0.02U	0.03U	0.85	0.96	0.02U	0.02U
OO-CH-8	0.02U	0.02U	0.02U	0.03U	2.70	1.87	0.02U	0.02U
OI-SS-4L	0.02U	0.02U	0.02U	0.03U	0.04U	0.03U	0.02U	0.02U
OI-SS-4L DUP	0.02U	0.02U	0.02U	0.03U	0.04U	0.03U	0.02U	0.02U
OI-TS-5AU	0.02U	0.02U	0.02U	0.03U	6.76	5.00	0.02U	0.02U
OI-TS-5AU DUP	0.02U	0.02U	0.02U	0.03U	4.52	4.22	0.02U	0.02U
OI-TS-5AL	0.02U	0.02U	0.02U	0.03U	1.08	0.88	0.02U	0.02U
OI-TS-5 Merritt	0.02U	0.02U	0.02U	0.03U	0.04U	0.03U	0.02U	0.02U
OI-MA-1L	0.02U	0.02U	0.02U	0.03U	0.04U	0.03U	0.02U	0.02U
OI-MA-1L DUP	0.02U	0.02U	0.02U	0.03U	0.04U	0.03U	0.02U	0.02U
OI-MA-2U	0.02U	0.02U	0.02U	0.03U	3.93	3.57	0.02U	0.02U
OI-MA-2L	0.02U	0.02U	0.02U	0.03U	0.04U	0.03U	0.02U	0.02U
OO-W-1	0.02U	0.02U	0.02U	0.03U	0.04U	0.03U	0.02U	0.02U
OO-W-2	0.02U	0.02U	0.02U	0.03U	0.04U	0.03U	0.02U	0.02U
OO-W-3	0.02U	0.02U	0.02U	0.03U	0.92	0.78	0.02U	0.02U
OO-W-4	0.02U	0.02U	0.02U	0.03U	8.72	4.00	0.02U	0.02U
OO-W-5	0.02U	0.02U	0.02U	0.03U	0.04U	0.03U	0.02U	0.02U
PR-coarse	0.02U	0.02U	0.02U	0.03U	0.04U	2.15	0.02U	0.02U
PR-fine	0.02U	0.02U	0.02U	0.03U	0.04U	2.38	0.02U	0.02U
Tomales Bay	0.02U	0.02U	0.02U	0.03U	0.04U	0.03U	0.02U	0.02U

U = Undetected.

TABLE C.3. (Contd)

Sediment Treatment	Endo-sulfan I	Endo-sulfan II	Endo-sulfan sulfate	Endrin	Endrin Aldehyde	g BHC	Hepta-chlor	Hepta-chlor-Epoxide
	Pesticide Concentrations (ng/g dry wt)							
Target DL	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Achieved DL	0.02	0.02	0.04	0.06	0.05	0.03	0.02	0.02
OI-CH-0	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
OO-CH-1	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
OO-CH-2	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
OO-CH-2A	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
OO-CH-3	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
OO-CH-4	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
OI-CH-4A	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
OO-CH-5	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
OO-CH-6	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
OI-CH-6A	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
OO-CH-7	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
OO-CH-8	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
OI-SS-4L	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
OI-SS-4L DUP	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
OI-TS-5AU	0.02U	0.02U	0.04U	0.06U	0.05U	2.28	0.02U	0.02U
OI-TS-5AU DUP	0.02U	0.02U	0.04U	0.06U	0.05U	2.18	0.02U	0.02U
OI-TS-5AL	0.02U	0.02U	0.04U	0.06U	0.05U	1.84	0.02U	0.02U
OI-TS-5 Merritt	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
OI-MA-1L	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
OI-MA-1L DUP	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
OI-MA-2U	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
OI-MA-2L	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
OO-W-1	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
OO-W-2	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
OO-W-3	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
OO-W-4	0.02U	0.02U	0.04U	0.06U	0.05U	2.80	0.02U	0.02U
OO-W-5	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
PR-coarse	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
PR-fine	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
Tomales Bay	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U

U = Undetected.

TABLE C.4. Quality Assurance Summary for Sediment Pesticides

Measurements of Precision: Duplicate Results

Sediment Treatment	a BHC (ng/g dry wt)	Aldrin	b BHC	d BHC	P,P DDD	P,P DDE	P,P DDT	Dieldrin
OI-SS-4L	0.02U	0.02U	0.02U	0.03U	0.04U	0.03U	0.02U	0.02U
OI-SS-4L DUP	0.02U	0.02U	0.02U	0.03U	0.04U	0.03U	0.02U	0.02U
I-Stat	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RPD	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OI-TS-5AU	0.02U	0.02U	0.02U	0.03U	6.76	5.00	0.02U	0.02U
OI-TS-5AU DUP	0.02U	0.02U	0.02U	0.03U	4.52	4.22	0.02U	0.02U
I-Stat	N/A	N/A	N/A	N/A	0.2	0.1	N/A	N/A
RPD	N/A	N/A	N/A	N/A	40	17	N/A	N/A
OI-MA-1L	0.02U	0.02U	0.02U	0.03U	0.04U	0.03U	0.02U	0.02U
OI-MA-1L DUP	0.02U	0.02U	0.02U	0.03U	0.04U	0.03U	0.02U	0.02U
I-Stat	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RPD	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Sediment Treatment	Endo-sulfan I (ng/g dry wt)	Endo-sulfan II	Endo-sulfan sulfate	Endrin	Endrin Aldehyde	g BHC	Hepta-chlor	Hepta-chlor-Epoxide
OI-SS-4L	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
OI-SS-4L DUP	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
I-Stat	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RPD	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OI-TS-5AU	0.02U	0.02U	0.04U	0.06U	0.05U	2.28	0.02U	0.02U
OI-TS-5AU DUP	0.02U	0.02U	0.04U	0.06U	0.05U	2.18	0.02U	0.02U
I-Stat	N/A	N/A	N/A	N/A	N/A	0.0	N/A	N/A
RPD	N/A	N/A	N/A	N/A	N/A	5	N/A	N/A
OI-MA-1L	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
OI-MA-1L DUP	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U
I-Stat	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RPD	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

U = Undetected

TABLE C.4. (Contd)

Measurements of Precision on Interim Reference Materials

(ng/g dry wt)

Sediment Treatment	a BHC	Aldrin	b BHC	d BHC	p,p DDD	p,p DDE	p,p DDT	Dieldrin
FZ11 SRM	2.69	1.93	0.02U	2.88	2.18	2.28	0.02U	2.58
FZ13 SRM	4.93	3.63	0.02U	0.03U	5.04	5.04	0.02U	5.09
RPD	59.00	61.00	0.00	N/A	79.00	75.00	0.00	65.00

(ng/g dry wt)

Sediment Treatment	Endo-sulfan I	Endo-sulfan II	Endo-sulfan sulfate	Endrin	Endrin Aldehyde	g BHC	Hepta-chlor	Hepta-chlor-Epoxide
FZ11 SRM	39.82	30.62	0.04U	2.88	0.05U	3.58	0.02U	2.48
FZ13 SRM	58.61	47.00	0.04U	10.59	0.05U	5.79	0.02U	4.52
RPD	38.00	42.00	0.00	114.00	0.00	47.00	0.00	58.00

TABLE C.4. Quality Assurance Summary for Sediment Pesticides/PCB (Cont'd).

Surrogate Recoveries

Sediment Treatment	DBOFB
OI-CH-0	63
OO-CH-1	68
OO-CH-2	62
OI-CH-2A	76
OO-CH-3	70
OO-CH-4	118
OI-CH-4A	69
OO-CH-5	59
OO-CH-6	86
OI-CH-6A	80
OO-CH-7	69
OO-CH-8	74
OI-SS-4-L	51
OI-SS-4-L DUP	49
OI-TS-5AU	74
OI-TS-5AU DUP	82
OI-TS-5AL	67
OI-TS-5 Merritt	52
OI-MA-1L	39
OI-MA-1L DUP	56
DI-MA-2U	68
OI-MA-2L	59
OO-W-1	73
OO-W-2	62
OO-W-3	49
OO-W-4	61
OO-W-5	39
PR-coarse	82
PR-fine	76
Tomales Bay	74
FZ11 SRM	118
FZ13 SRM	101
FZ12 PB	58
FZ14 PB	56

SRM is Standard Reference Material
PB is Procedural Blank

TABLE C.4. (Contd)

Procedural Blanks

Sediment Treatment	a BHC	Aldrin	b BHC	d BHC	p,p DDD	p,p DDE	p,p DDT	Dieldrin
	(ng/g dry wt)							
FZ12 PB	0.02U	0.02U	0.02U	0.03U	0.04U	0.03U	0.02U	0.02U
FZ14 PB	0.02U	2.34	0.02U	0.03U	0.04U	0.03U	0.02U	0.02U

Sediment Treatment	Endo-sulfan I	Endo-sulfan II	Endo-sulfan sulfate	Endrin	Endrin Aldehyde	g BHC	Hepta-chlor	Hepta-chlor-Epoxide
	(ng/g dry wt)							
FZ12 PB	0.02U	0.02U	0.04U	0.08U	0.05U	0.03U	0.02U	0.02U
FZ14 PB	0.02U	0.02U	0.04U	0.06U	0.05U	0.03U	0.02U	0.02U

Spikes and Recoveries

Sediment Treatment OI-CH-6A

Spiked Compound	Amount Spiked (ng)	Amount Recovered (ng)	Percent Recovery
g-BHC	200	156	78
Heptachlor	200	122	61
Aldrin	200	142	71
Dieldrin	500	425	85
Endrin	500	485	97
p',p'-DDT	500	676	135

Sediment Treatment OO-W-2

Spiked Compound	Amount Spiked (ng)	Amount Recovered (ng)	Percent Recovery
g-BHC	200	170	85
Heptachlor	200	124	62
Aldrin	200	142	71
Dieldrin	500	525	105
Endrin	500	645	129
p',p'-DDT	500	750	150

TABLE C.5. Concentrations of PCBs in Sediment Treatments, Dry Weight

Sediment Treatment	PCB Concentrations (ng/g dry wt) Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total
Target DL	20.0	20.0	20.0	20.0	20.0
Achieved DL	4.0	4.0	4.0	4.0	4.0
OI-CH-0	4.00U	4.00U	4.00U	4.00U	0.00
OO-CH-1	4.00U	4.00U	4.00U	4.00U	0.00
OO-CH-2	12.05	4.00U	42.78	28.12	82.95
OI-CH-2A	4.00U	4.00U	54.15	15.78	69.93
OO-CH-3	4.00U	17.16	71.08	13.02	101.26
OO-CH-4	4.00U	4.00U	48.53	16.05	64.58
OI-CH-4A	4.00U	4.00U	4.00U	4.00U	0.00
OO-CH-5	4.00U	4.00U	14.22	8.87	23.08
OO-CH-6	4.00U	4.00U	11.29	9.67	20.97
OI-CH-6A	4.00U	4.00U	4.00U	4.00U	0.00
OO-CH-7	4.00U	4.00U	1.51	3.87	5.38
OO-CH-8	4.00U	4.00U	13.72	6.61	20.34
OI-SS-4L	4.00U	4.00U	4.00U	4.00U	0.00
OI-SS-4L DUP	4.00U	4.00U	4.00U	4.00U	0.00
OI-TS-5AU	162.52	4.00U	362.94	0.00	525.46
OI-TS-5AU DUP	192.72	4.00U	349.22	4.00U	541.95
OI-TS-5AL	4.00U	12.18	41.91	4.00U	54.08
OI-TS-5 Merritt	4.00U	4.00U	4.00U	4.00U	0.00
OI-MA-1L	4.00U	4.00U	4.00U	4.00U	0.00
OI-MA-1L DUP	4.00U	4.00U	4.00U	4.00U	0.00
OI-MA-2U	4.00U	67.99	143.74	4.00U	211.73
OI-MA-2L	4.00U	4.00U	5.99	4.00U	5.99
OO-W-1	4.00U	4.00U	4.00U	4.00U	0.00
OO-W-2	4.00U	4.00U	4.00U	4.00U	0.00
OO-W-3	4.00U	4.00U	4.00U	6.57	6.57
OO-W-4	4.00U	4.00U	40.86	14.89	55.75
OO-W-5	4.00U	4.00U	4.00U	4.00U	0.00
PR-coarse	4.00U	4.00U	4.00U	4.00U	0.00
PR-fine	4.00U	4.00U	4.00U	4.00U	0.00
Tomales Bay	4.00U	4.00U	4.00U	4.00U	0.00

U = Undetected.

TABLE C.6. Quality Assurance Summary for Sediment PCBs.

Measurements of Precision: Duplicate Results

	(ng/g dry wt)				
Sediment Treatment	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total
OI-SS-4L	4.00U	4.00U	4.00U	4.00U	0.00
OI-SS-4L DUP	4.00U	4.00U	4.00U	4.00U	0.00
I-Stat	N/A	N/A	N/A	N/A	N/A
RPD					
OI-TS-5AU	162.52	4.00U	362.94	0.00	525.46
OI-TS-5AU DUP	192.72	4.00U	349.22	4.00U	541.95
I-Stat	0.1	N/A	0.0	N/A	0.0
RPD	17	N/A	4	N/A	3
OI-MA-1L	4.00U	4.00U	4.00U	4.00U	0.00
OI-MA-1L DUP	4.00U	4.00U	4.00U	4.00U	0.00
I-Stat	N/A	N/A	N/A	N/A	N/A
RPD	N/A	N/A	N/A	N/A	N/A

TABLE C.6. Quality Assurance Summary for Sediment PCBs.

Measurements of Accuracy: Standard Reference Materials (SRMs)

	(ng/g dry wt)				
Sediment Treatment	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total
Certified Value (SQ-1)	No Data	No Data	100	No Data	No Data
FZ11 SRM	4.00U	4.00U	80.40	4.00U	80.40
Percent Recovery	N/A	N/A	80	N/A	N/A
FZ13 SRM	4.00U	4.00U	84.59	4.00U	84.59
Percent Recovery	N/A	N/A	85	N/A	N/A

Surrogate Recovery

Documented in Pesticide Quality Assurance Summary (Table C.4)

Procedural Blanks

	(ng/g dry wt)				
Sediment Treatment	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total
FZ12 PB	4.00U	4.00U	4.00U	4.00U	0.00
FZ14 PB	4.00U	4.00U	4.00U	4.00U	0.00

U = Undetected.

Spikes and Recoveries

SRM data used in place of spikes.

TABLE C.7. Concentrations of Metals and Metalloids in Sediment Treatments, Dry Weight

Sediment Treatment	Dry Weight (%)	Metal and Metalloid Concentrations (µg/g dry wt)									
		Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
Target DL											
Achieved DL											
OI-CH-0	84	0.05	4.28	0.04	749.0	9.3	0.028	40.5	6.5	0.21	39.7
OI-CH-0 DUP		-	4.98	-	777.0	8.9	-	38.7	5.3	-	37.6
OO-CH-1	57	0.13	12.60	0.20	214.0	43.8	0.088	117.1	10.4	0.42	100.5
OO-CH-2	81	0.09	2.89	0.07	484.0	13.8	0.117	66.5	10.4	0.21	45.0
OO-CH-2 DUP		-	2.31	-	510.0	13.7	-	61.2	12.2	-	45.5
OI-CH-2A	47	0.48	11.00	0.27	247.0	58.1	0.310	118.9	33.0	0.50	142.7
OO-CH-3	73	0.09	4.80	0.03	368.0	14.9	0.085	59.5	10.2	0.25	47.6
OO-CH-4	47	0.66	15.50	0.47	253.0	56.5	0.082	118.6	46.8	0.43	170.3
OI-CH-4A	83	0.05	3.31	0.02	164.0	10.8	0.023	41.7	7.6	0.18	33.7
OO-CH-5	68	0.22	10.20	0.22	284.0	27.6	0.126	86.1	10.2	0.43	79.4
OO-CH-6	63	0.27	8.83	0.19	388.0	30.7	0.155	88.6	20.2	0.32	90.1
OI-CH-6A	83	0.04	6.08	0.05	689.0	14.4	0.018	65.7	3.5	0.18	50.5
OO-CH-7	77	0.09	3.67	0.13	501.0	15.9	0.051	75.8	10.8	0.28	59.4
OO-CH-8	67	0.26	9.90	0.27	273.0	38.9	0.169	117.3	19.3	0.39	102.9
OI-SS-4L	84	0.04	3.55	0.02	578.0	11.0	0.030	57.3	7.1	0.11	43.2
OI-SS-4L DUP		0.04	-	0.02	-	-	0.026	-	-	0.14	-
OI-TS-5AU	51	0.77	9.70	1.04	444.0	261.0	15.070	111.5	147.1	0.46	326.0
OI-TS-5AU DUP		0.84	-	0.99	-	-	13.980	-	-	0.43	-
OI-TS-5AL	78	0.14	4.84	0.17	439.0	21.7	0.426	58.9	24.6	0.18	68.9
OI-TS-5 Merritt	84	0.04	3.22	0.02	552.0	10.7	0.045	57.3	7.0	0.14	43.9
OI-MA-1L	83	0.09	3.42	0.66	220.0	21.2	0.075	75.9	11.7	0.29	52.7
OI-MA-1L DUP		0.09	-	0.63	-	-	0.080	-	-	0.32	-
OI-MA-2U	42	0.81	11.00	0.71	301.0	94.0	0.610	122.8	89.9	0.47	230.0
OI-MA-2L	82	0.14	6.03	0.12	195.0	26.9	0.080	73.6	9.8	0.32	58.1
OO-W-1	58	0.12	12.90	0.12	283.0	45.8	0.070	115.8	12.0	0.39	105.8
OO-W-2	67	0.11	10.61	0.17	315.0	30.3	0.093	75.4	8.9	0.32	70.4
OO-W-3	48	0.65	17.60	0.42	229.0	59.1	0.490	116.5	44.4	0.53	166.1
OO-W-4	48	0.60	49.10	0.45	281.0	56.6	0.456	115.8	49.1	0.57	159.7
OO-W-5	83	0.04	3.55	0.02	408.0	8.9	0.070	57.9	7.4	0.22	36.6
PR-coarse	67	0.05	4.91	2.00	314.0	8.4	0.059	39.7	6.7	0.25	48.1
PR-coarse DUP	-	5.87	-	323.0	9.6	-	43.2	7.2	-	45.6	
PR-fine	74	0.03	7.96	0.23	456.0	9.5	0.056	45.8	6.0	0.28	48.4
Tomales Bay	65	0.03	4.72	0.16	43.3	6.6	0.110	28.8	4.4	0.21	24.7

DUP = Duplicate

TABLE C.8. Quality Assurance Summary for Sediment Metals

Measurements of Precision: Duplicate (DUP) Results

Sediment Treatment	Dry Weight (%)	(μg/g dry wt) Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
Target DL		0.10	2.00	0.10	2.0	2.0	0.030	2.0	2.0	0.10	2.0
Achieved DL		0.01	2.00	0.01	2.0	2.0	0.030	2.0	2.0	0.04	2.0
OI-CH-0	84	0.05	4.26	0.04	749.0	9.3	0.028	40.5	6.5	0.21	39.7
OI-CH-0 DUP		-	4.98	-	777.0	8.9	-	38.7	5.3	-	37.6
I-Stat		N/A	.10	N/A	0	0	N/A	0	.1	N/A	0.0
RPD		N/A	16.00	N/A	4.0	4.0	N/A	5.0	20.0	N/A	5.0
OO-CH-2	81	0.09	2.89	0.07	464.0	13.8	0.117	66.5	10.4	0.21	45.0
OO-CH-2 DUP		-	2.31	-	510.0	13.7	-	61.2	12.2	-	45.5
I-Stat		N/A	.11	N/A	0	0	N/A	0	.1	N/A	0
RPD		N/A	22.00	N/A	5.0	1.0	N/A	8.0	16.0	N/A	0
OI-SS-4L	84	0.04	3.55	0.02	578.0	11.0	0.030	57.3	7.1	0.11	43.2
OI-SS-4L DUP		0.04	-	0.02	-	-	0.026	-	-	0.14	-
I-Stat		0	N/A	0	N/A	N/A	0.000	N/A	N/A	0.10	N/A
RPD		0	N/A	0	N/A	N/A	14.000	N/A	N/A	24.00	N/A
OI-TS-5AU	51	0.77	9.70	1.04	444.0	261.0	15.070	111.5	147.1	0.46	326.0
OI-TS-5AU DUP		0.84	-	0.99	-	-	13.980	-	-	0.43	-
I-Stat		0.0	N/A	0.0	N/A	N/A	0.0	N/A	N/A	0.0	N/A
RPD		9	N/A	5	N/A	N/A	8	N/A	N/A	7.0	N/A
OI-MA-1L	83	0.09	3.42	0.66	220.0	21.2	0.075	75.9	11.7	0.29	52.7
OI-MA-1L DUP		0.09	-	0.63	-	-	0.080	-	-	0.32	-
I-Stat		0	N/A	0.0	N/A	N/A	0.0	N/A	N/A	0.1	N/A
RPD		0	N/A	5	N/A	N/A	7	N/A	N/A	10	N/A
PR-coarse	67	0.05	4.91	2.00	314.0	8.4	0.059	39.7	6.7	0.25	48.1
PR-Coarse DUP		-	5.87	-	323.0	9.6	-	43.2	7.2	-	45.6
I-Stat		N/A	.10	N/A	3.0	13.0	N/A	8.0	7.0	N/A	0.0
RPD		N/A	0	N/A	0	0	N/A	0	0	N/A	5.0

TABLE C.8. (Contd)

Measurements of Accuracy: Standard Reference Materials (SRMs)

Sediment Treatment	(μg/g dry wt)									
	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
Target DL	0.10	2.00	0.10	2.0	2.0	0.030	2.0	2.0	0.10	2.0
Achieved DL	0.01	2.00	0.01	2.0	2.0	0.030	2.0	2.0	0.04	2.0
SRM 1646 Rep 1	0.11	10.30	0.37	72.0	18.4	0.079	38.0	26.8	0.57	135.3
SRM 1646 Rep 2	0.11	11.60	0.36	76.0	20.3	0.075	33.4	27.8	0.61	132.1
1646 Certified Value	None	11.6	0.36	76.0	18.0	0.063	32.0	28.2	-	138.0
		±1.3	±0.07	±3.0	±3.0	±0.012	±3.0	±1.8	-	±6.0
Rep 1 Within Range?		yes	yes	no	yes	no	no	yes	N/A	yes
Rep 2 Within Range?		yes	yes	yes	yes	yes	yes	yes	N/A	yes

Surrogate Recovery

Not Applicable

Procedural Blanks (PBs)

Treatment	(μg/g dry wt)									
	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
PB Rep 1	<0.01	-	<0.01	-	-	0.036	-	-	<0.04	-
PB Rep 2	<0.01	-	<0.01	-	-	0.045	-	-	<0.04	-

TABLE C.8. (Contd)

Spikes and Recoveries

Sediment Treatment	Dry Weight (%)	(µg/g dry wt)									
		Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
Target DL		0.10	2.0	0.10	2.0	2.0	0.030	2.0	2.0	0.10	2.0
Achieved DL		0.01	2.0	0.01	2.0	2.0	0.030	2.0	2.0	0.04	2.0
OI-CH-6A	83	0.04	-	0.05	-	-	0.018	-	-	0.18	50.5
OI-CH-6A + SPIKE	83	0.60	-	1.08	-	-	0.492	-	-	1.01	-
CH-6A + SPI - CH-6A		0.56	-	1.03	-	-	0.474	-	-	0.83	-
Amount Spiked		0.50	-	1.00	-	-	0.500	-	-	1.00	-
Percent Recovery		112	-	103	-	-	95	-	-	83	-
OO-W-2	67	0.11	-	0.17	-	-	0.093	-	-	0.32	70.4
OO-W-2 + SPIKE	67	0.64	-	1.17	-	-	0.646	-	-	1.26	-
W-2 + SPI - W-2		0.53	-	1.00	-	-	0.553	-	-	0.94	-
Amount Spiked		0.50	-	1.00	-	-	0.500	-	-	1.00	-
Percent Recovery		106	-	100	-	-	111	-	-	94	-

- = Data not available.

TABLE C.9. Concentrations of Organotins in Sediment Treatments, Dry Weight

Sediment Treatment	Dry Weight (%)	Dry Weight Used	Propyltin % Recovery	Organotin Concentrations (ng/g dry wt) Butyltin Concentrations Tri	Di	Mono	Total(a)
Target DL				10.0	10.0	10.0	
Achieved DL (lowest)				< 0.46	< 0.32	< 0.35	
OI-CH-0	84	10.46	53	< 0.57	< 0.32	< 0.85	NA(b)
OO-CH-1	57	12.92	61	0.84	< 0.46	< 1.20	0.84
OO-CH-2	81	10.22	73	< 0.58	< 0.32	< 0.87	NA
OI-CH-2A	47	11.05	64	6.60	1.30	< 1.42	7.90
OO-CH-3	73	9.17	129	2.94	< 0.64	< 1.70	2.94
OO-CH-4	47	11.50	79	6.40	0.97	< 1.40	7.37
OI-CH-4A	83	21.85	60	< 0.48	< 0.27	< 0.72	NA
OO-CH-5	68	19.16	49	1.10	< 0.31	< 0.82	1.10
OO-CH-6	63	13.09	48	3.00	0.73	< 1.20	3.73
OI-CH-6A	83	9.50	59	< 1.11	< 0.62	< 1.70	NA
OO-CH-7	77	18.06	56	0.94	< 0.75	< 0.35	0.94
OO-CH-8	67	16.65	49	3.40	< 0.35	< 0.95	3.40
OI-SS-4L	84	18.65	52	< 0.57	< 0.32	< 0.85	NA
OI-SS-4L DUP	-	19.55	92	< 0.54	< 0.30	< 0.81	NA
OI-TS-5AU	51	7.18	88	211.00	57.00	11.00	279.00
OI-TS-5AU DUP	-	11.96	120	187.00	43.00	3.60	233.60
OI-TS-5AL	78	18.28	103	2.30	< 0.32	< 0.86	2.30
OI-TS-5 Merritt	84	16.18	53	< 0.58	< 0.32	< 0.87	NA
OI-MA-1L	83	8.99	51	< 1.20	< 0.66	< 1.80	NA
OI-MA-1L DUP	-	16.57	71	< 0.64	< 0.36	< 0.96	NA
OI-MA-2U	42	5.16	67	76.00	65.00	9.00	150.00
OI-MA-2L	82	8.25	35	< 1.28	1.59	< 1.90	1.59
OO-W-1	58	10.71	51	< 0.63	< 1.00	< 0.46	NA
OO-W-2	67	9.27	62	< 1.14	< 0.64	< 1.70	NA
OO-W-3	46	9.93	58	4.00	< 0.59	3.90	7.90
OO-W-4	48	11.22	81	1.80	0.58	< 1.40	2.38
OO-W-5	83	9.99	51	< 1.10	< 0.59	< 1.58	NA
PR-coarse	67	16.90	84	< 0.63	< 0.35	< 0.93	NA
PR-fine	74	19.74	63	< 0.46	< 0.73	< 0.34	NA
Tomales Bay	85	18.83	102	< 0.56	< 0.31	< 0.84	NA

(a) Totals include only values above detection

(b) NA is not applicable; all values are below detection

TABLE C.10. Quality Assurance Summary for Sediment Organotins

Measurements Of Precision: Duplicate Results

Sediment Treatment	Dry Weight (%)	Dry Weight Used	Propyltin % Recovery	Butyltin Concentrations (ng/g dry wt)			
				Tri	Di	Mono	Total
OI-MA-1L	83	8.99	51	< 1.20	< 0.66	< 1.80	NA
OI-MA-1L DUP	-	16.57	71	< 0.64	< 0.36	< 0.95	NA
I-Stat	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RPD	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OI-SS-4L	84	18.65	52	< 0.57	< 0.32	< 0.85	NA
OI-SS-4L DUP	-	19.55	92	< 0.54	< 0.30	< 0.81	NA
I-Stat	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RPD	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OI-TS-5AU	51	7.18	88	211.00	57.00	11.00	279.00
OI-TS-5AU DUP	-	11.95	120	187.00	43.00	3.60	233.60
I-Stat	N/A	N/A	N/A	0.0	0.1	0.5	0.1
RPD	N/A	N/A	N/A	12	14	101	18

Measurements of Accuracy: Standard Reference Materials (SRMs)

No SRM's are available

TABLE C.10. (Contd)

Surrogate Recoveries

Included in all Tables as Propyltin % recovery

procedural Blanks

	Dry	Dry	Sediment	Weight	Weight	Propyltin	
Butyltin Concentrations (ng/g dry wt)							
Treatment	(%)	Used	% Recovery	Tri	Di	Mono	Total
Blank Rep 1	-	-	56	11.00	< 5.90	< 16.00	11.00
Blank Rep 2	-	-	89	3.20	< 5.90	< 16.00	3.20
Blank Rep 3	-	-	76	< 11.00	< 5.90	< 16.00	NA

Spikes and Recoveries

				(ng/g dry weight)			
	Dry	Dry	Sediment	Weight	Weight	Propyltin	
Butyltin Concentrations (ng/g dry wt)							
Treatment	(%)	Used	% Recovery	Tri	Di	Mono	Total
DI-CH-6A	83	9.50	59	< 1.11	< 0.62	< 1.70	NA
DI-CH-6A SPIKE	83	16.32	53	45.40	51.00	4.90	101.30
Amount Spiked	-	-	46	46.00	46.00	46.00	NA
Percent Recovery	-	-	-	99.00	111.00	11.00	NA
OO-W-2	67	9.27	62	< 1.14	< 0.64	< 1.70	NA
OO-W-2 SPIKE	67	5.57	54	133.00	171.00	9.40	313.40
Amount Spiked	-	-	135	135.00	135.00	135.00	NA
Percent Recovery	-	-	-	99.00	126.00	7.00	NA

- = Data not available.
NA = Not applicable.

TABLE C.11. Total Organic Carbon, Oil and Grease, and Petroleum Hydrocarbon Concentrations in Sediment Samples

Sediment Treatment	Rep	Total Organic Carbon (%)	Total Oil and Grease (μg/g dry wt)	Petroleum Hydrocarbons (μg/g dry wt)
Target DL		0.1	< 20	< 20
Achieved DL		0.1	< 20	< 20
OI-CH-0	1	0.05	< 20	< 20
OI-CH-0	2	0.06	ND	ND
00-CH-1	1	0.68	< 20	< 20
00-CH-2	1	0.06	69	73
00-CH-2	2	0.08	ND	ND
OI-CH-2A	1	1.05	113	95
OI-CH-2A	2	1.05	ND	ND
00-CH-3	1	0.17	< 20	< 20
00-CH-4	1	1.09	187	144
OI-CH-4A	1	0.02	< 20	< 20
00-CH-5	1	0.34	95	85
00-CH-6	1	0.44	53	48
OI-CH-6A	1	0.03	< 20	< 20
00-CH-7	1	0.13	24	41
00-CH-8	1	0.41	34	< 20
OI-SS-4L	1	0.01	< 20	< 20
OI-TS-5AU	1	1.06	1096	951
OI-TS-5AU	2	1.06	1208	ND
OI-TS-5AL	1	0.13	147	110
OI-TS-5 Merrit	1	0.01	< 20	< 20
OI-MA-1L	1	0.07	< 20	< 20
OI-MA-1L	2	ND	< 20	ND
OI-MA-2U	1	1.39	361	271
OI-MA-2L	1	0.11	< 20	< 20
OI-MA-2L	2	ND	< 20	ND
00-W-1	1	0.62	28	25
00-W-2	1	0.41	34	30
00-W-3	1	1.18	171	152
00-W-4	1	1.01	124	125
00-W-5	1	0.04	< 20	< 20
PR-coarse	1	0.35	< 20	< 20
PR-coarse	2	0.34	ND	ND
PR-fine	1	0.30	< 20	< 20
PR-fine	2	0.31	ND	ND
Tomales Bay	1	0.28	< 20	< 20

TABLE C.12. Quality Assurance Summary for Total Organic Carbon, Oil and Grease, and Petroleum Hydrocarbon Concentrations in Sediment Samples.

Measurements of Precision: Duplicate Results

Sediment Treatment	Rep	Total Organic Carbon (%)	I-Stat	RPD	Total Oil and Grease (µg/g dry wt)	I-Stat	RPD	Petroleum Hydrocarbons (µg/g dry wt)	I-Stat	RPD
OI-CH-0	1	0.05			< 20			< 20		
OI-CH-0	2	0.06	0.1	18	-	N/A	N/A	-	N/A	N/A
OO-CH-2	1	0.06			69			73		
OO-CH-2	2	0.08	0.1	29	-	N/A	N/A	-	N/A	N/A
OI-CH-2A	1	1.05			113			95		
OI-CH-2A	2	1.05	0	0	-	N/A	N/A	-	N/A	N/A
OI-TS-5AU	1	1.06			1096			951		
OI-TS-5AU	2	1.06	0	0	1208	0.1	10	-	N/A	N/A
OI-MA-1L	1	0.07			< 20			< 20		
OI-MA-1L	2	ND	N/A	N/A	< 20	N/A	N/A	-	N/A	N/A
OI-MA-2L	1	0.11			< 20			< 20		
OI-MA-2L	2	ND	N/A	N/A	< 20	N/A	N/A	-	N/A	N/A
PR-coarse	1	0.35			< 20			< 20		
PR-coarse	2	0.34	0.0	3	-	N/A	N/A	-	N/A	N/A
PR-fine	1	0.30			< 20			< 20		
PR-fine	2	0.31	0.0	3	-	N/A	N/A	-	N/A	N/A

N/A = Not Applicable

Measurements of Accuracy: Standard Reference Materials

Not Applicable

Surrogate Recovery

Not Applicable

Procedural Blanks

Not Applicable

Spikes and Recoveries

Not Applicable

TABLE C.13 Percentage of Recovered Sediment Within Sieve Size-Classes, Dry Weight

Grain	Sieve Size, mm	Phi	0I-CH-0	00-CH-1	00-CH-2	0I-CH-2A	00-CH-3	00-CH-4	0I-CH-4A	00-CH-5	00-CH-6	0I-CH-6A	00-CH-7	00-CH-8	0I-SS-4L	0I-SS-4L DUP	0I-TS-5AU
								Sediment Treatment									
Gravel	> 3.35	-2.0	0.00	0.27	0.00	0.00	0.01	0.00	0.00	3.55	0.00	0.00	0.00	0.00	0.00	0.03	0.04
	3.35 - 2.00	-1.0	0.44	0.37	0.00	0.00	0.12	0.00	0.00	2.43	0.16	0.28	0.00	0.20	0.00	0.01	0.81
Sand	2.00 - 1.00	0.0	0.08	0.06	0.20	0.03	0.77	0.01	0.00	4.23	0.23	0.17	0.19	0.47	0.00	0.15	1.05
	1.00 - 0.50	1.0	2.00	0.08	3.32	0.03	1.92	0.16	0.13	4.31	0.90	0.39	0.40	0.97	0.62	0.55	0.38
	0.50 - 0.250	2.0	63.89	0.58	68.04	1.24	37.44	3.82	65.88	35.92	14.16	43.05	62.61	4.74	63.85	59.06	9.06
	0.250 - 0.125	3.0	17.29	0.82	12.28	19.07	25.48	5.58	22.36	10.64	13.28	37.40	6.41	9.70	21.50	24.08	15.45
	0.125 - 0.0625	4.0	2.35	3.80	2.71	3.80	4.11	1.61	1.62	2.29	4.23	4.38	2.30	8.94	2.67	3.62	2.72
Silt	0.0625 - 0.048	4.5	5.47	8.67	5.81	10.25	8.11	6.00	5.60	6.66	10.14	5.23	4.24	10.67	6.13	7.13	11.04
	0.048 - 0.0312	5.0	0.41	9.95	0.32	6.65	1.76	4.05	0.26	1.42	2.44	1.02	1.62	4.82	0.15	0.62	5.24
	0.0312 - 0.023	5.5	0.56	8.36	0.61	4.68	1.96	3.33	0.05	1.50	8.21	0.42	0.77	4.86	0.29	0.02	2.49
	0.023 - 0.0156	6.0	0.41	6.70	0.30	4.13	1.58	4.27	0.16	1.29	1.77	0.33	0.23	3.70	0.17	0.33	8.32
	0.0156 - 0.0078	7.0	1.48	11.87	0.76	7.01	2.09	13.44	0.35	2.85	5.00	0.85	5.03	8.35	0.84	0.49	8.91
	0.0078 - 0.0039	8.0	0.87	6.14	0.95	6.61	2.00	7.19	0.39	3.36	4.71	0.72	1.30	9.30	0.08	0.66	3.23
Clay	0.0039 - 0.0019	9.0	0.92	6.95	0.59	7.99	1.63	8.51	0.34	3.08	5.93	0.80	1.81	5.77	0.78	0.38	2.31
	0.0019 - 0.000976	10.0	0.85	6.90	0.56	12.21	2.25	8.73	0.20	3.19	7.49	1.27	2.41	5.75	0.36	0.40	3.37
	< 0.000976	11.0	2.97	26.86	3.54	29.70	8.57	33.27	2.43	13.07	21.34	3.68	8.68	21.56	2.56	2.26	25.60
Total			100.01	100.00	100.01	113.40	100.00	99.99	99.99	99.99	99.99	99.99	100.00	100.02	100.00	99.99	100.02
% Total Solids (% dry wt)			84.44	58.17	80.09	46.49	74.23	51.06	83.63	72.03	83.89	83.85	78.43	67.61	84.25	84.36	55.88
Sample Weight (g dry wt)																	
Estimated % Recovery			0.94	95.78	93.17	91.04	94.85	91.13	94.37	95.16	91.38	95.53	95.34	92.67	93.81	92.81	93.71

TABLE C.13. (Contd)

Grain	Sieve Size, mm	Phi	Sediment Treatment OI-TS-5AU DUP	OI-TS-5AL	OI-TS-5 Merritt	OI-MA-1L	OI-MA-1L DUP	OI-MA-2U	OI-MA-2L	OO-W-1	OO-W-2	OO-W-3	OO-W-4	OO-W-5	P.R. coarse	P.R. fine	Tomales Bay
Gravel	> 3.35	-2.0	0.02	0.00	0.00	0.00	0.01	0.00	0.23	0.00	1.56	0.00	0.00	0.00	0.00	0.00	0.00
	3.35 - 2.00	-1.0	0.66	0.62	0.12	0.29	0.37	0.00	0.42	0.09	0.74	0.00	0.00	0.00	0.00	0.00	0.00
Sand	2.00 - 1.00	0.0	1.10	0.17	0.17	0.56	0.53	0.03	1.10	0.08	0.64	0.03	0.07	0.02	0.00	0.03	0.02
	1.00 - 0.50	1.0	0.92	0.06	1.87	1.88	1.52	0.02	1.50	0.28	2.35	0.11	0.29	1.30	0.16	1.64	0.60
	0.50 - 0.250	2.0	9.95	58.13	63.17	5.78	5.43	1.14	4.87	1.97	20.67	1.17	5.44	61.88	0.33	6.23	79.16
	0.250 - 0.125	3.0	15.26	23.34	23.42	15.64	19.04	3.01	12.99	1.52	12.51	1.94	7.80	21.60	77.87	67.20	9.73
	0.125 - 0.0625	4.0	2.88	1.33	2.33	17.06	14.23	1.95	9.09	2.32	3.31	1.86	1.30	3.50	3.28	7.06	3.31
Silt	0.0625 - 0.046	4.5	7.71	5.58	4.32	11.78	11.75	8.70	6.41	8.57	9.28	10.90	9.13	5.62	7.84	8.78	5.20
	0.046 - 0.0312	5.0	3.61	0.50	1.70	7.85	8.61	4.19	5.93	6.40	0.97	3.12	2.44	0.49	2.76	1.73	0.07
	0.0312 - 0.023	5.5	2.73	0.36	0.10	4.79	4.56	3.07	5.95	7.95	3.22	4.49	3.89	0.43	0.64	1.26	0.43
	0.023 - 0.0156	6.0	2.98	0.05	0.10	5.74	4.81	3.66	5.86	7.13	3.77	4.39	5.07	0.24	0.91	0.49	0.00
	0.0156 - 0.0078	7.0	5.65	1.50	0.29	2.63	5.23	8.01	6.85	11.76	7.06	7.61	5.71	0.42	0.63	0.75	0.11
	0.0078 - 0.0039	8.0	7.27	0.86	0.18	4.28	4.95	9.33	6.06	11.46	7.18	9.76	13.39	0.47	0.64	0.72	0.14
Clay	0.0039 - 0.0019	9.0	7.71	1.11	0.16	2.92	2.67	9.60	2.47	6.95	4.91	6.96	7.22	0.38	0.30	0.34	0.09
	0.0019 - 0.000976	10.0	6.14	1.05	0.53	3.95	2.10	12.33	8.32	6.83	5.39	9.93	10.99	0.71	0.49	0.55	0.00
	< 0.000976	11.0	25.40	5.35	1.76	14.65	14.19	34.74	17.96	26.69	16.44	35.72	27.25	2.64	3.72	3.22	1.28
Total			99.99	100.01	100.02	100.00	100.00	99.98	100.01	100.00	100.00	99.99	99.99	100.00	99.97	100.00	100.14
% Total Solids (% dry wt)			55.94	80.33	84.11	64.25	84.85	45.74	82.48	60.15	65.20	46.67	51.83	84.26	67.69	71.48	79.09
Sample Weight (g dry wt)																	
Estimated % Recovery			97.21	93.98	92.74	94.94	92.33	92.28	96.53	91.69	91.25	90.88	93.73	95.04	91.70	91.85	94.07

TABLE C.14. Quality Assurance for Grain Size Data

Sediment Treatment

Grain	Sieve Size, mm	OI-SS-4L	OI-SS-4L DUP	SS-4L I-Stat	RPD	OI-TS-5AU	OI-TS-5AU DUP	TS-5AU I-Stat	RPD	MA-1L	OI-MA-1L DUP	MA-1L I-Stat	RPD
Total Gravel		0.00	0.04	1.0	100	0.85	0.68	0.1	22	0.29	0.38	0.1	27
Total Sand		88.64	87.48	0.0	1	28.66	30.11	0.0	5	41.12	40.75	0.0	0
Total Silt		7.66	9.45	0.1	21	39.23	29.95	0.1	27	37.07	39.91	0.0	7
Total Clay		3.70	3.04	0.1	20	31.28	39.25	0.1	23	21.52	18.96	0.1	13
% Total Solids (% dry wt)		84.25	84.38	0.0	0	55.88	55.94	0.0	0	84.25	84.85	0.0	1

APPENDIX D

BIOASSAY RESULTS FOR MACOMA/NEPHTYS TEST

TABLE D.1 Bioassay Results for *Macoma nasuta*

Sediment Treatment	Rep	Alive	Dead	Proportion Surviving in All Reps
OI-CH-0	1	20	0	
	2	19	1	
	3	20	0	
	4	20	0	
	5	20	0	0.99
OO-CH-1	1	19	1	
	2	20	0	
	3	20	0	
	4	20	0	
	5	20	0	0.99
OO-CH-2	1	20	0	
	2	20	0	
	3	20	0	
	4	20	0	
	5	20	0	1.00
OI-CH-2A	1	20	0	
	2	20	0	
	3	20	0	
	4	20	0	
	5	20	0	1.00
OO-CH-3	1	20	0	
	2	20	0	
	3	20	0	
	4	20	0	
	5	20	0	1.00
OO-CH-4	1	20	0	
	2	20	0	
	3	20	0	
	4	20	0	
	5	20	0	1.00
OI-CH-4A	1	20	0	
	2	20	0	
	3	20	0	
	4	20	0	
	5	20	0	1.00

TABLE D.1 (Contd)

Sediment Treatment	Rep	Alive	Dead	Proportion Surviving in All Reps
00-CH-5	1	20	D	
	2	20	0	
	3	20	0	
	4	20	0	
	5	20	0	1.00
00-CH-6	1	19	1	
	2	20	0	
	3	20	0	
	4	20	0	
	5	20	0	0.99
0I-CH-6A	1	20	0	
	2	20	0	
	3	20	0	
	4	20	0	
	5	20	0	1.00
00-CH-7	1	18	2	
	2	20	0	
	3	20	0	
	4	20	0	
	5	18	2	0.96
00-CH-8	1	20	0	
	2	2D	0	
	3	20	0	
	4	20	0	
	5	20	0	1.00
0I-MA-1L	1	20	0	
	2	20	0	
	3	20	0	
	4	20	0	
	5	20	0	1.00
0I-MA-2U	1	20	0	
	2	20	0	
	3	20	0	
	4	20	0	
	5	20	0	1.00

TABLE D.1 (Contd)

Sediment Treatment	Rep	Alive	Dead	Proportion Surviving in All Reps
OI-MA-2L	1	19	1	
	2	20	0	
	3	20	0	
	4	20	0	
	5	20	0	0.99
OI-SS-4L	1	20	0	
	2	20	0	
	3	20	0	
	4	20	0	
	5	19	1	0.99
OI-TS-5AL	1	20	0	
	2	20	0	
	3	21	0	
	4	20	0	
	5	19	1	0.99
OI-TS-5AU	1	21	0	
	2	20	0	
	3	18	2	
	4	18	2	
	5	20	0	0.96
OO-W-1	1	20	0	
	2	20	0	
	3	20	0	
	4	20	0	
	5	20	0	1.00
OO-W-2	1	20	0	
	2	20	0	
	3	20	0	
	4	20	0	
	5	20	0	1.00
OO-W-3	1	20	0	
	2	20	0	
	3	20	0	
	4	20	0	
	5	20	0	1.00

TABLE D.1 (Contd)

Sediment Treatment	Rep	Alive	Dead	Proportion Surviving in All Reps
00-W-4	1	19	1	
	2	20	0	
	3	20	0	
	4	20	0	
	5	20	0	0.99
00-W-5	1	20	0	
	2	20	0	
	3	20	0	
	4	20	0	
	5	20	0	1.00
PR-coarse	1	20	0	
	2	20	0	
	3	20	0	
	4	20	0	
	5	20	0	1.00
PR-fine	1	20	0	
	2	20	0	
	3	20	0	
	4	20	0	
	5	20	0	1.00
Tomales Bay	1	20	0	
	2	20	0	
	3	20	0	
	4	20	0	
	5	20	0	1.00

TABLE D.2 Bioassay Results for *Macoma nasuta* Rank Order Based on Proportion Surviving the 10-Day Exposure

Sediment Treatment	Proportion Surviving (all replicates)
00-CH-7	0.96
0I-TS-5AU	0.96
0I-CH-0	0.99
00-CH-1	0.99
00-CH-6	0.99
0I-MA-2L	0.99
0I-SS-4L	0.99
0I-TS-5AL	0.99
00-W-4	0.99
00-CH-2	1.00
0I-CH-2A	1.00
00-CH-3	1.00
00-CH-4	1.00
0I-CH-4A	1.00
00-CH-5	1.00
0I-CH-6A	1.00
00-CH-8	1.00
0I-MA-IL	1.00
0I-MA-2U	1.00
00-W-I	1.00
00-W-2	1.00
00-W-3	1.D0
00-W-5	1.00
Tomales Bay	1.00
PR-coarse	1.00
PR-fine	1.00

TABLE D.3 Bioassay Results for *Nephtys caecoides*

Sediment Treatment	Rep	Alive	Dead	Proportion Surviving in All Reps
OI-CH-0	1	19	1	
	2	18	2	
	3	15	5	
	4	16	4	
	5	18	2	0.86
OO-CH-1	1	20	0	
	2	18	2	
	3	18	2	
	4	20	0	
	5	20	0	0.96
OO-CH-2	1	19	1	
	2	17	3	
	3	17	3	
	4	15	5	
	5	19	1	0.87
OI-CH-2A	1	18	2	
	2	18	2	
	3	19	1	
	4	16	4	
	5	19	1	0.90
OO-CH-3	1	16	4	
	2	15	5	
	3	20	0	
	4	17	3	
	5	18	2	0.86
OO-CH-4	1	16	4	
	2	20	0	
	3	20	0	
	4	19	1	
	5	20	0	0.95
OI-CH-4A	1	8	12	
	2	19	1	
	3	13	7	
	4	11	9	
	5	7	13	0.58

TABLE D.3 (Contd)

Sediment Treatment	Rep	Alive	Dead	Proportion Surviving in All Reps
OO-CH-5	1	20	0	
	2	18	2	
	3	20	0	
	4	19	1	
	5	18	2	0.95
OO-CH-6	1	18	2	
	2	20	0	
	3	17	3	
	4	20	0	
	5	18	2	0.93
OI-CH-6A	1	15	5	
	2	17	3	
	3	17	3	
	4	19	1	
	5	15	5	0.83
OO-CH-7	1	18	2	
	2	18	2	
	3	18	2	
	4	18	2	
	5	18	2	0.90
OO-CH-8	1	19	1	
	2	18	2	
	3	19	1	
	4	19	1	
	5	16	4	0.91
OI-MA-1L	1	18	2	
	2	18	2	
	3	18	2	
	4	19	1	
	5	18	2	0.91
OI-MA-2U	1	19	1	
	2	16	4	
	3	18	2	
	4	15	5	
	5	17	3	0.85

TABLE 0.3 (Contd)

Sediment Treatment	Rep	Alive	Dead	Proportion Surviving in All Reps
OI-MA-2L	1	16	4	
	2	19	1	
	3	17	3	
	4	17	3	
	5	18	2	0.87
OI-SS-4L	1	16	4	
	2	16	4	
	3	13	7	
	4	17	3	
	5	14	6	0.76
OI-TS-5AL	1	17	3	
	2	14	6	
	3	16	4	
	4	15	5	
	5	17	3	0.79
OI-TS-5AU	1	16	4	
	2	18	2	
	3	18	2	
	4	14	6	
	5	18	2	0.84
OO-W-1	1	18	2	
	2	16	4	
	3	19	1	
	4	16	4	
	5	18	2	0.87
OO-W-2	1	18	2	
	2	17	3	
	3	18	2	
	4	18	2	
	5	19	1	0.90
OO-W-3	1	17	3	
	2	20	0	
	3	20	0	
	4	20	0	
	5	20	0	0.97

TABLE D.3 (Contd)

Sediment Treatment	Rep	Alive	Dead	Proportion Surviving in All Reps
00-W-4	1	20	0	
	2	19	1	
	3	17	3	
	4	19	1	
	5	20	0	0.95
00-W-5	1	19	1	
	2	18	2	
	3	18	2	
	4	19	1	
	5	17	3	0.91
PR-coarse	1	19	1	
	2	20	0	
	3	19	1	
	4	18	2	
	5	18	2	0.94
PR-fine	1	18	2	
	2	20	0	
	3	18	2	
	4	20	0	
	5	19	1	0.95
Tomales Bay	1	20	0	
	2	18	2	
	3	19	1	
	4	20	0	
	5	20	0	0.97

TABLE D.4 Bioassay Results for *Nephtys caecoides* (Rank Order Based on Proportion Surviving the 10-Day Exposure)

Sediment Treatment	Proportion Surviving (all replicates)
OI-CH-4A	0.58
OI-SS-4L	0.76
OI-TS-5AL	0.79
OI-CH-6A	0.83
OI-TS-5AU	0.84
OI-MA-2U	0.85
OI-CH-0	0.86
OO-CH-3	0.86
OO-CH-2	0.87
OI-MA-2L	0.87
OO-W-1	0.87
OI-CH-2A	0.90
OO-CH-7	0.90
OO-W-2	0.90
OO-CH-8	0.91
OI-MA-1L	0.91
OO-W-5	0.91
OO-CH-6	0.93
PR-coarse	0.94
OO-CH-4	0.95
OO-CH-5	0.95
PR-fine	0.95
OO-W-4	0.95
OO-CH-1	0.96
Tomales Bay	0.97
OO-W-3	0.97

TABLE D.5 Macoma/Nephtys: Water Quality Summary

Treatment	Rep	Temperature (°C) Min	Temperature (°C) Max	Dissolved Oxygen (mg/L) Min	Dissolved Oxygen (mg/L) Max	pH Min	pH Max	Salinity (°/oo) Min	Salinity (°/oo) Max	Flow Rate (mL/min) Min	Flow Rate (mL/min) Max
Acceptable Range		14.0	16.0	4.0	--	7.30	8.10	32.0	34.0	115	135
OI-CH-0	1	14.8	15.8	7.0	7.8	7.82	7.96	32.0	34.0	118	130
OI-CH-0	2	14.8	15.8	6.5	7.4	7.76	7.95	32.0	33.0	115	134
OI-CH-0	3	14.5	15.7	6.9	7.6	7.74	7.96	32.0	33.0	118	130
OI-CH-0	4	14.7	15.8	6.7	7.4	7.75	7.95	32.0	34.0	116	128
OI-CH-0	5	14.6	15.7	7.0	7.5	7.80	7.94	32.0	34.0	115	126
OO-CH-1	1	14.9	16.9*	7.2	7.7	7.78	7.88	32.0	32.5	115	128
OO-CH-1	2	14.8	15.7	7.2	7.8	7.78	7.98	32.0	33.0	116	128
OO-CH-1	3	14.7	15.6	6.9	7.6	7.77	7.97	32.0	33.0	118	129
OO-CH-1	4	14.5	15.6	6.9	7.8	7.72	7.93	32.0	33.0	116	130
OO-CH-1	5	14.7	15.7	6.8	7.7	7.67	7.95	32.0	32.5	116	132
OO-CH-2	1	14.7	15.7	7.2	7.7	7.80	7.95	32.0	34.0	124	134
OO-CH-2	2	14.8	15.7	6.8	7.7	7.77	7.94	32.0	33.0	115	126
OO-CH-2	3	14.9	16.0	6.7	7.6	7.74	7.92	32.0	34.0	116	132
OO-CH-2	4	14.8	15.8	6.6	7.4	7.64	7.88	32.0	33.0	115	132
OO-CH-2	5	14.8	15.7	6.6	7.7	7.70	7.92	32.0	32.5	115	124
OI-CH-2A	1	14.8	16.3*	6.1	7.5	7.74	7.93	32.0	32.5	117	126
OI-CH-2A	2	14.8	15.6	7.0	7.8	7.78	7.93	32.0	34.0	115	132
OI-CH-2A	3	14.7	15.6	6.4	7.5	7.71	7.91	32.0	34.0	118	131
OI-CH-2A	4	14.6	15.7	6.5	7.7	7.65	7.92	32.0	32.5	120	130
OI-CH-2A	5	14.7	15.7	6.9	7.7	7.52	7.94	32.0	33.0	116	128
OO-CH-3	1	14.9	16.1*	7.4	7.8	7.79	7.98	32.0	33.0	120	129
OO-CH-3	2	14.8	15.9	6.9	7.7	7.75	7.94	32.0	33.0	120	135
OO-CH-3	3	14.6	15.7	6.8	7.7	7.71	7.96	32.0	34.0	116	132
OO-CH-3	4	14.7	15.6	6.4	7.4	7.67	7.89	32.0	33.0	118	132
OO-CH-3	5	14.7	15.7	6.8	7.7	7.65	7.91	32.0	32.5	116	126
OO-CH-4	1	14.9	16.1*	6.6	7.4	7.71	7.94	32.0	33.0	115	135
OO-CH-4	2	14.8	16.0	7.2	7.6	7.75	7.95	32.0	33.0	116	130
OO-CH-4	3	14.6	15.6	6.6	7.6	7.75	7.91	32.0	34.0	117	134
OO-CH-4	4	14.6	15.6	6.8	7.7	7.72	7.89	32.0	34.0	122	135
OO-CH-4	5	14.7	15.8	6.6	7.5	7.71	7.90	32.0	34.0	118	132
OO-CH-4A	1	15.0	15.9	5.2	7.4	7.75	7.92	32.0	33.0	118	135
OO-CH-4A	2	14.7	15.7	7.0	7.7	7.68	7.89	32.0	34.0	116	128
OO-CH-4A	3	14.6	15.7	6.1	7.4	7.56	7.86	32.0	34.0	118	134
OO-CH-4A	4	14.7	15.7	6.2	7.3	7.56	7.86	32.0	34.0	124	132
OO-CH-4A	5	15.0	15.9	6.8	7.6	7.78	7.98	32.0	34.0	120	133

* Out of Acceptable Range

TABLE D.5 (Contd)

Treatment	Rep	Temperature (°C) Min	Max	Dissolved Oxygen (mg/L) Min	Max	pH Min	Max	Salinity (°/oo) Min	Max	Flow Rate (mL/min) Min	Max
Acceptable Range		14.0	16.0	4.0	--	7.30	8.10	32.0	34.0	115	135
OO-CH-5	1	14.8	16.4*	7.2	7.7	7.76	7.97	32.0	33.0	115	135
OO-CH-5	2	15.0	16.0	7.2	7.6	7.65	7.97	32.0	34.0	115	130
OO-CH-5	3	14.9	15.8	6.3	7.3	7.69	7.96	32.0	34.0	118	133
OO-CH-5	4	14.6	15.8	7.0	7.6	7.79	7.92	32.0	34.0	115	123
OO-CH-5	5	14.6	15.7	7.0	7.5	7.80	7.93	32.0	34.0	116	132
OO-CH-6	1	14.9	16.2*	7.5	7.9	7.80	7.99	32.0	32.5	118	130
OO-CH-6	2	14.6	16.0	7.0	7.8	7.78	7.93	32.0	33.0	116	135
OO-CH-6	3	14.6	15.7	6.1	7.7	7.78	7.94	32.0	34.0	120	130
OO-CH-6	4	14.5	15.7	6.8	7.5	7.78	7.99	32.0	34.0	115	126
OO-CH-6	5	14.7	15.7	6.9	7.6	7.76	7.93	32.0	34.0	115	126
OI-CH-6A	1	14.7	16.2*	7.4	7.9	7.70	7.99	32.0	32.5	116	133
OI-CH-6A	2	14.9	15.9	6.5	7.5	7.68	7.95	32.0	34.0	115	135
OI-CH-6A	3	14.7	15.8	6.0	7.5	7.61	7.94	32.0	34.0	118	130
OI-CH-6A	4	14.8	15.7	7.0	7.6	7.71	7.96	32.0	32.5	118	134
OI-CH-6A	5	15.0	15.8	6.2	7.4	7.77	7.95	32.0	33.0	115	135
OO-CH-7	1	14.9	16.1*	6.5	7.4	7.64	7.95	32.0	33.0	115	130
OO-CH-7	2	14.6	16.0	6.9	7.6	7.66	7.99	32.0	33.0	116	130
OO-CH-7	3	15.0	16.0	6.7	7.4	7.76	7.91	32.0	34.0	116	132
OO-CH-7	4	14.8	15.9	6.9	7.7	7.81	7.96	32.0	33.0	119	128
OO-CH-7	5	14.7	15.6	7.1	7.7	7.76	7.95	32.0	33.0	116	132
OO-CH-8	1	14.9	16.5*	6.8	7.6	7.75	7.98	32.0	32.5	115	133
OO-CH-8	2	14.6	16.1*	7.3	7.8	7.79	7.98	32.0	33.0	115	130
OO-CH-8	3	14.8	16.0	6.6	7.6	7.75	7.96	32.0	33.0	117	125
OO-CH-8	4	14.6	15.7	7.1	7.7	7.79	7.92	32.0	34.0	122	135
OO-CH-8	5	14.8	15.8	6.4	7.7	7.76	7.95	32.0	33.0	120	130
OI-MA-1L	1	14.7	15.7	6.4	7.6	7.63	7.96	32.0	34.0	117	134
OI-MA-1L	2	14.7	15.7	6.9	7.4	7.68	7.97	32.0	24.0	116	130
OI-MA-1L	3	14.7	15.7	7.0	7.5	7.71	7.95	32.0	33.0	120	132
OI-MA-1L	4	15.0	15.7	6.2	7.5	7.71	7.95	32.0	33.0	118	132
OI-MA-1L	5	15.0	16.0	7.0	7.6	7.79	7.98	32.0	33.0	117	130
OI-MA-2U	1	15.0	16.0	6.9	7.5	7.68	7.95	32.0	33.0	115	130
OI-MA-2U	2	14.6	16.0	6.9	7.6	7.51	7.96	32.0	34.0	118	135
OI-MA-2U	3	14.8	15.8	6.8	7.3	7.62	7.89	32.0	34.0	116	127
OI-MA-2U	4	14.9	16.0	6.2	7.3	7.62	7.92	32.0	32.5	118	128
OI-MA-2U	5	14.8	15.8	6.7	7.5	7.65	7.90	32.0	32.5	116	130

TABLE D.5 (Contd)

Treatment	Rep	Temperature (°C) Min	Max	Dissolved Oxygen (mg/L) Min	Max	pH Min	Max	Salinity (°/oo) Min	Max	Flow Rate (mL/min) Min	Max
Acceptable Range		14.0	16.0	4.0	--	7.30	8.10	32.0	34.0	115	135
OI-MA-2L	1	14.9	15.7	7.1	7.7	7.75	7.97	32.0	33.0	117	128
OI-MA-2L	2	14.8	15.7	7.4	7.7	7.67	7.98	32.0	33.0	120	130
OI-MA-2L	3	14.9	15.8	6.5	7.8	7.57	7.91	32.0	33.0	116	122
OI-MA-2L	4	14.8	15.9	6.3	7.5	7.57	7.96	32.0	33.0	118	128
OI-MA-2L	5	14.8	16.1	6.6	7.5	7.20*	7.95	32.0	33.0	117	130
OI-SS-4L	1	14.8	16.1*	7.3	7.9	7.68	7.98	32.0	33.0	118	134
OI-SS-4L	2	14.7	15.8	6.7	7.8	7.62	7.93	32.0	34.0	116	129
OI-SS-4L	3	14.6	15.7	6.3	7.6	7.58	7.95	32.0	34.0	118	135
OI-SS-4L	4	14.9	16.0	6.7	7.5	7.65	7.91	32.0	34.0	118	130
OI-SS-4L	5	14.6	15.7	6.7	7.8	7.67	7.94	32.0	34.0	117	132
OI-TS-5AL	1	14.6	16.0	6.6	7.4	7.60	7.94	32.0	33.0	118	130
OI-TS-5AL	2	14.8	15.7	7.0	7.4	7.68	7.97	32.0	34.0	118	128
OI-TS-5AL	3	14.9	15.7	6.9	7.5	7.72	7.95	32.0	33.0	116	126
OI-TS-5AL	4	14.8	15.6	6.8	7.6	7.69	7.94	32.0	33.0	116	132
OI-TS-5AL	5	15.2	16.1*	7.1	7.6	7.75	7.94	32.0	33.0	116	132
OI-TS-5AU	1	15.0	16.0	6.3	7.3	7.68	7.94	32.0	34.0	115	135
OI-TS-5AU	2	15.0	15.8	6.4	7.6	7.75	7.93	32.0	33.0	116	130
OI-TS-5AU	3	14.8	15.7	6.2	7.4	7.62	7.93	32.0	34.0	116	128
OI-TS-5AU	4	14.5	15.7	6.8	7.4	7.66	7.92	32.0	34.0	122	130
OI-TS-5AU	5	14.7	15.7	6.1	7.5	7.59	7.99	32.0	34.0	118	126
OO-W-1	1	14.9	15.7	7.2	7.7	7.78	7.99	32.0	32.5	115	128
OO-W-1	2	14.9	16.1*	7.1	7.7	7.80	7.98	32.0	33.0	116	130
OO-W-1	3	15.0	16.0	6.4	7.6	7.71	7.96	32.0	33.0	120	131
OO-W-1	4	14.6	15.8	6.8	7.6	7.72	7.92	32.0	32.5	115	128
OO-W-1	5	14.8	15.8	6.7	7.5	7.71	7.92	32.0	33.0	116	130
OO-W-2	1	14.9	16.6*	7.0	7.6	7.64	7.98	32.0	32.5	115	134
OO-W-2	2	14.9	16.3*	7.2	7.8	7.79	7.98	32.0	32.5	118	130
OO-W-2	3	14.9	16.1*	7.2	7.6	7.79	7.97	32.0	32.5	115	128
OO-W-2	4	14.9	16.0	6.0	7.5	7.78	7.97	32.0	33.0	116	134
OO-W-2	5	14.5	15.6	6.5	7.8	7.25*	7.88	32.0	32.5	116	128
OO-W-3	1	14.7	16.2*	6.8	7.8	7.71	7.93	32.0	33.0	115	126
OO-W-3	2	14.6	15.8	6.9	7.4	7.74	7.99	32.0	34.0	115	130
OO-W-3	3	14.5	15.8	6.8	7.8	7.74	7.91	32.0	33.0	120	132
OO-W-3	4	14.8	16.0	6.7	7.5	7.73	7.88	32.0	34.0	120	135
OO-W-3	5	14.7	15.8	6.5	7.5	7.66	7.88	32.0	34.0	118	128

TABLE D.5 (Contd)

Treatment	Rep	Temperature (°C) Min	Temperature (°C) Max	Dissolved Oxygen (mg/L) Min	Dissolved Oxygen (mg/L) Max	pH Min	pH Max	Salinity (°/oo) Min	Salinity (°/oo) Max	Flow Rate (mL/min) Min	Flow Rate (mL/min) Max
Acceptable Range		14.0	16.0	4.0	--	7.30	8.10	32.0	34.0	115	135
00-W-4	1	14.6	16.3*	7.3	7.8	7.77	7.95	32.0	33.0	118	132
00-W-4	2	14.7	15.7	8.2	7.7	7.76	7.94	32.0	33.0	115	130
00-W-4	3	14.9	15.9	6.2	7.7	7.73	7.93	32.0	33.0	116	132
00-W-4	4	14.5	15.8	6.2	7.7	7.73	7.92	32.0	32.0	115	128
00-W-4	5	14.8	15.9	6.9	7.5	7.74	7.94	32.0	34.0	120	130
00-W-5	1	14.8	16.3*	7.5	7.9	7.78	7.99	32.0	32.5	115	133
00-W-5	2	14.8	16.1*	7.0	7.8	7.74	7.97	32.0	33.0	115	126
00-W-5	3	14.7	15.7	6.6	7.8	7.71	7.93	32.0	34.0	118	132
00-W-5	4	14.7	15.6	6.9	7.4	7.73	7.93	32.0	34.0	116	134
00-W-5	5	14.6	15.7	6.8	7.7	7.74	7.92	32.0	33.0	118	126
PR-coarse	1	14.6	16.0	6.2	7.7	7.66	7.94	32.0	33.0	116	126
PR-coarse	2	14.7	15.7	6.8	7.5	7.69	7.93	32.0	34.0	115	130
PR-coarse	3	14.7	15.6	6.3	7.5	7.66	7.90	32.0	34.0	118	130
PR-coarse	4	14.6	15.7	6.4	7.4	7.67	7.90	32.0	33.0	115	130
PR-coarse	5	14.7	15.7	6.7	7.5	7.65	7.94	32.0	33.0	120	130
PR-fine	1	14.9	16.8*	7.3	7.8	7.77	7.99	32.0	32.5	116	128
PR-fine	2	15.0	16.2*	7.3	7.9	7.80	7.98	32.0	32.5	115	124
PR-fine	3	14.6	15.8	6.6	7.7	7.81	7.97	32.0	34.0	115	124
PR-fine	4	14.7	15.7	6.3	7.7	7.79	7.95	32.0	34.0	118	135
PR-fine	5	14.7	15.9	7.0	7.4	7.78	7.94	32.0	34.0	120	128
Tomales Bay	1	14.9	15.6	7.0	7.9	7.80	7.97	32.0	34.0	116	134
Tomales Bay	2	14.8	15.8	6.2	7.5	7.77	7.94	32.0	34.0	117	134
Tomales Bay	3	14.8	15.8	6.7	7.3	7.74	7.94	32.0	34.0	120	129
Tomales Bay	4	14.8	15.8	6.8	7.7	7.77	7.94	32.0	34.0	123	132
Tomales Bay	5	15.1	16.1*	6.7	7.7	7.80	7.94	32.0	33.0	115	130

TABLE D.6 Summary of Observations for *Macoma* Test

Sediment Treatment	Number on Sediment Surface										
	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
OI-CH-0	1	0	0	0	0	0	0	0	0	0	0
OI-CH-0	2	0	0	0	0	0	0	0	1	1	0
OI-CH-0	3	1	0	0	1	0	0	1	1	0	1
OI-CH-0	4	4	0	0	1	0	1	0	0	0	1
OI-CH-0	5	0	0	0	0	0	0	0	0	0	0
OO-CH-1	1	0	0	0	0	0	0	0	0	0	0
OO-CH-1	2	0	0	0	0	0	0	0	0	0	0
OO-CH-1	3	0	0	0	0	0	0	0	0	0	0
OO-CH-1	4	0	0	0	0	0	0	0	0	0	0
OO-CH-1	5	0	0	0	0	0	0	0	0	0	0
OO-CH-2	1	0	1	0	0	0	0	0	0	0	0
OO-CH-2	2	0	0	0	0	0	0	0	0	0	0
OO-CH-2	3	0	0	0	0	0	0	0	0	0	0
OO-CH-2	4	0	0	0	0	0	0	0	0	0	0
OO-CH-2	5	0	0	0	0	0	0	0	0	0	0
OI-CH-2A	1	0	0	0	0	0	0	0	0	0	0
OI-CH-2A	2	0	0	0	0	0	0	0	0	0	0
OI-CH-2A	3	0	0	0	0	0	0	BL	0	0	0
OI-CH-2A	4	0	0	0	0	0	0	0	0	0	0
OI-CH-2A	5	0	0	0	0	0	0	0	0	0	0
OO-CH-3	1	0	0	0	0	0	0	0	0	1	0
OO-CH-3	2	0	0	0	0	0	0	0	0	0	0
OO-CH-3	3	0	0	0	0	0	0	0	0	0	0
OO-CH-3	4	0	0	0	0	0	0	0	0	0	0
OO-CH-3	5	0	0	0	0	0	0	0	0	0	0

Sediment Treatment	Number of Siphons Exposed										
	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
OI-CH-0	1	4	5	3	0	6	1	2	4	5	7
OI-CH-0	2	3	8	2	8	8	1	2	6	9	14
OI-CH-0	3	8	4	3	3	3	4	2	2	9	11
OI-CH-0	4	8	7	3	4	11	2	7	4	13	10
OI-CH-0	5	1	6	5	3	8	5	2	2	2	6
OO-CH-1	1	1	1	1	1	1	1	0	2	4	3
OO-CH-1	2	0	2	1	2	0	0	1	0	2	3
OO-CH-1	3	1	5	1	0	1	0	0	0	5	13
OO-CH-1	4	2	1	3	4	1	2	2	1	6	16
OO-CH-1	5	4	2	1	1	2	1	0	2	2	3
OO-CH-2	1	0	1	1	1	5	0	2	1	5	3
OO-CH-2	2	3	6	1	2	4	2	4	3	8	8
OO-CH-2	3	6	6	0	0	0	2	4	1	6	11
OO-CH-2	4	3	6	1	3	3	7	5	0	2	5
OO-CH-2	5	3	2	4	1	4	4	4	1	10	16
OI-CH-2A	1	0	1	1	0	0	0	1	0	7	6
OI-CH-2A	2	1	1	3	2	4	0	4	2	4	4
OI-CH-2A	3	0	0	2	1	1	0	1	2	1	4
OI-CH-2A	4	3	1	4	2	2	0	0	0	5	14
OI-CH-2A	5	2	2	0	3	0	1	3	1	6	5
OO-CH-3	1	1	0	0	0	0	0	0	1	3	2
OO-CH-3	2	1	4	8	1	5	2	3	4	6	6
OO-CH-3	3	1	5	1	0	0	1	2	2	6	11
OO-CH-3	4	1	0	0	0	1	0	0	1	2	9
OO-CH-3	5	1	1	5	2	0	3	2	0	4	8

BL = Not Data Available

TABLE D.6 (Contd)

Sediment Treatment	Number on Sediment Surface Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-CH-4	1	0	0	0	0	0	0	0	0	0	0
00-CH-4	2	0	0	0	0	0	0	0	0	0	0
00-CH-4	3	0	1	0	0	0	0	0	0	0	0
00-CH-4	4	1	0	0	0	0	0	0	0	0	0
00-CH-4	5	0	0	0	0	0	0	0	0	0	0
0I-CH-4A	1	0	0	0	0	0	0	0	0	0	0
0I-CH-4A	2	0	0	0	0	1	1	1	1	0	0
0I-CH-4A	3	0	0	0	0	0	0	0	0	0	0
0I-CH-4A	4	0	0	0	0	0	0	0	0	0	0
0I-CH-4A	5	0	0	0	0	0	0	0	0	0	0
00-CH-5	1	0	0	0	0	0	0	0	0	0	0
00-CH-5	2	0	0	0	0	0	1	0	0	0	0
00-CH-5	3	0	0	0	0	0	0	0	0	0	0
00-CH-5	4	0	0	0	0	0	0	0	0	0	0
00-CH-5	5	0	0	0	0	0	0	0	0	0	0
00-CH-6	1	0	0	0	0	0	0	0	0	0	0
00-CH-6	2	0	0	0	0	0	0	0	0	0	0
00-CH-6	3	0	0	0	0	0	0	0	0	0	0
00-CH-6	4	0	0	0	0	0	0	0	0	0	0
00-CH-6	5	0	0	0	0	0	0	0	0	0	0
0I-CH-6A	1	0	0	0	0	0	0	0	0	0	0
0I-CH-6A	2	0	0	0	0	0	0	0	0	0	0
0I-CH-6A	3	0	0	0	1	0	0	0	0	0	0
0I-CH-6A	4	0	0	0	0	0	0	0	0	0	0
0I-CH-6A	5	0	0	0	0	0	0	0	0	0	0

Sediment Treatment	Number of Siphons Exposed Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-CH-4	1	11	0	1	1	3	1	1	1	11	9
00-CH-4	2	3	3	2	1	0	1	1	2	5	0
00-CH-4	3	3	0	0	0	1	1	1	1	3	1
00-CH-4	4	1	1	1	1	1	0	0	2	2	6
00-CH-4	5	1	0	1	1	0	0	0	3	9	11
0I-CH-4A	1	3	2	2	3	1	0	0	1	2	0
0I-CH-4A	2	3	2	3	0	4	0	0	2	1	0
0I-CH-4A	3	4	9	4	5	2	5	1	5	3	4
0I-CH-4A	4	4	2	3	0	2	1	0	2	4	9
0I-CH-4A	5	6	6	3	3	3	3	0	2	7	0
00-CH-5	1	4	2	2	0	2	3	2	2	4	0
00-CH-5	2	3	2	4	4	3	2	3	1	7	6
00-CH-5	3	10	1	2	2	6	7	3	2	12	16
00-CH-5	4	2	3	0	1	3	3	2	3	3	4
00-CH-5	5	2	3	1	0	3	2	1	4	1	9
00-CH-6	1	5	1	0	2	1	2	1	0	2	1
00-CH-6	2	2	0	1	0	0	0	2	1	0	0
00-CH-6	3	0	0	3	0	2	0	1	0	5	2
00-CH-6	4	0	0	0	1	0	0	1	5	6	6
00-CH-6	5	1	2	1	2	1	1	1	9	16	10
0I-CH-6A	1	1	2	0	1	3	3	0	1	3	0
0I-CH-6A	2	3	0	5	2	4	3	2	3	9	0
0I-CH-6A	3	0	0	1	3	4	1	2	2	6	0
0I-CH-6A	4	4	2	2	2	2	1	1	0	1	9
0I-CH-6A	5	0	0	0	2	1	1	0	0	3	0

TABLE D.6 (Contd)

Sediment	Number on Sediment Surface										
Treatment	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-CH-7	1	0	0	1	0	1	1	0	0	0	1
00-CH-7	2	0	1	0	0	0	0	0	0	1	0
00-CH-7	3	0	0	0	0	0	0	0	1	0	0
00-CH-7	4	0	0	0	0	0	0	0	0	0	0
00-CH-7	5	0	0	0	0	2	2	1	1	1	0
00-CH-8	1	0	0	0	0	0	0	0	0	0	0
00-CH-8	2	0	0	0	0	0	1	0	0	0	0
00-CH-8	3	0	0	0	0	0	0	0	0	0	0
00-CH-8	4	0	0	0	0	0	0	0	0	0	0
00-CH-8	5	1	0	0	0	0	0	0	0	0	0
OI-MA-1L	1	0	0	0	0	0	0	0	0	0	0
OI-MA-1L	2	0	0	0	0	0	0	0	0	0	0
OI-MA-1L	3	0	0	0	0	0	0	0	0	0	0
OI-MA-1L	4	0	0	0	0	0	0	0	0	0	0
OI-MA-1L	5	0	0	0	0	0	0	0	0	0	0
OI-MA-2U	1	0	0	0	0	0	1	0	0	0	0
OI-MA-2U	2	0	0	0	0	0	0	1	0	0	0
OI-MA-2U	3	0	0	0	0	0	0	0	0	0	0
OI-MA-2U	4	0	0	0	0	0	0	0	0	0	0
OI-MA-2U	5	0	0	0	0	0	0	0	0	0	0
OI-MA-2L	1	0	0	0	0	0	2	1	1	1	0
OI-MA-2L	2	0	0	0	0	0	0	0	0	0	0
OI-MA-2L	3	0	0	0	0	0	0	0	0	0	0
OI-MA-2L	4	0	0	0	0	1	0	0	0	0	0
OI-MA-2L	5	0	0	0	0	0	0	0	0	0	0

Sediment	Number of Siphons Exposed										
Treatment	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-CH-7	1	10	12	4	1	1	6	1	2	4	2
00-CH-7	2	5	5	3	2	0	2	1	3	3	5
00-CH-7	3	5	0	0	0	0	1	0	2	7	5
00-CH-7	4	3	3	2	1	2	2	1	1	1	4
00-CH-7	5	10	8	4	4	1	2	2	3	6	7
00-CH-8	1	3	2	1	3	3	1	0	0	7	4
00-CH-8	2	3	1	1	1	6	5	1	1	3	3
00-CH-8	3	7	0	0	2	1	0	0	3	2	0
00-CH-8	4	4	0	0	0	2	1	1	1	2	5
00-CH-8	5	5	1	1	2	4	0	1	2	9	8
OI-MA-1L	1	2	2	4	1	3	2	2	2	12	0
OI-MA-1L	2	1	1	2	1	6	3	5	6	5	10
OI-MA-1L	3	1	3	1	1	3	0	3	6	0	3
OI-MA-1L	4	1	1	3	1	1	8L	3	0	3	8
OI-MA-1L	5	0	3	3	4	2	3	1	4	4	0
OI-MA-2U	1	1	4	0	0	1	2	1	1	0	0
OI-MA-2U	2	0	4	4	1	2	0	0	1	5	0
OI-MA-2U	3	0	0	1	6	0	4	1	2	1	0
OI-MA-2U	4	1	0	0	1	2	0	0	1	0	4
OI-MA-2U	5	2	3	0	0	1	0	0	0	2	3
OI-MA-2L	1	3	3	5	2	1	3	3	4	5	0
OI-MA-2L	2	2	6	4	3	1	0	2	3	2	0
OI-MA-2L	3	2	2	0	0	2	0	2	1	7	0
OI-MA-2L	4	3	1	1	1	6	0	1	7	7	0
OI-MA-2L	5	1	4	0	1	3	1	7	0	6	0

TABLE D.6 (Contd)

Sediment	Number on Sediment Surface											Sediment	Number of Siphons Exposed										
Treatment	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d	Treatment	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
OI-SS-4L	1	0	0	1	0	0	0	0	0	0	0	OI-SS-4L	1	1	3	3	1	2	1	5	0	2	5
OI-SS-4L	2	0	0	0	0	0	0	0	0	0	0	OI-SS-4L	2	5	7	2	5	4	3	3	5	8	0
OI-SS-4L	3	0	0	0	0	0	0	0	0	0	0	OI-SS-4L	3	0	3	4	0	0	0	2	2	1	0
OI-SS-4L	4	0	0	0	0	0	0	0	0	0	0	OI-SS-4L	4	1	1	2	3	0	1	0	1	0	4
OI-SS-4L	5	0	0	0	0	0	0	0	0	0	0	OI-SS-4L	5	6	3	6	6	3	4	5	2	2	6
OI-TS-5AL	1	0	1	0	0	0	0	0	0	0	0	OI-TS-5A	1	1	3	1	3	3	2	1	2	5	0
OI-TS-5AL	2	0	0	0	0	0	0	0	0	0	0	OI-TS-5AL	2	1	2	0	0	1	3	3	0	0	6
OI-TS-5AL	3	0	0	0	0	0	0	0	0	0	0	OI-TS-5AL	3	3	5	3	3	5	3	2	2	2	7
OI-TS-5AL	4	0	0	0	0	0	0	0	0	0	0	OI-TS-5AL	4	2	2	3	5	2	5	3	0	1	8
OI-TS-5AL	5	1	0	0	1	0	0	0	0	0	0	OI-TS-5AL	5	1	5	4	4	5	3	2	1	11	0
OI-TS-5AU	1	0	0	0	0	0	0	0	0	0	0	OI-TS-5AU	1	0	2	1	0	1	0	2	2	12	0
OI-TS-5AU	2	0	0	0	0	0	0	0	0	0	0	OI-TS-5AU	2	0	0	1	1	0	2	0	1	6	0
OI-TS-5AU	3	0	0	0	0	0	1	1	0	0	0	OI-TS-5AU	3	4	5	3	7	5	2	4	2	7	0
OI-TS-5AU	4	0	0	0	0	0	0	0	0	0	1	OI-TS-5AU	4	0	1	1	1	1	3	1	5	4	5
OI-TS-5AU	5	0	0	0	0	0	0	0	0	0	0	OI-TS-5AU	5	2	0	3	1	0	1	3	1	4	14
OO-W-1	1	0	0	0	0	0	0	0	0	0	0	OO-W-1	1	1	1	4	1	3	1	1	1	2	1
OO-W-1	2	0	0	0	0	0	0	0	0	0	0	OO-W-1	2	1	0	1	0	0	0	1	0	2	1
OO-W-1	3	0	0	0	0	0	0	0	0	0	0	OO-W-1	3	1	1	0	0	1	0	0	0	3	2
OO-W-1	4	0	0	0	0	0	0	0	0	0	0	OO-W-1	4	0	0	0	3	1	0	0	1	0	5
OO-W-1	5	0	0	0	0	0	0	0	0	0	0	OO-W-1	5	4	1	5	6	2	1	1	2	5	8
OO-W-2	1	0	0	0	0	0	0	0	0	0	0	OO-W-2	1	1	1	0	4	3	6	3	1	11	12
OO-W-2	2	0	0	0	0	0	0	0	0	0	0	OO-W-2	2	4	3	0	2	0	0	1	1	4	2
OO-W-2	3	0	0	0	0	0	0	0	0	0	0	OO-W-2	3	2	2	1	2	2	1	0	0	4	1
OO-W-2	4	0	0	0	0	0	1	0	0	0	0	OO-W-2	4	1	1	1	0	0	1	3	2	8	5
OO-W-2	5	0	0	0	0	0	0	0	0	0	0	OO-W-2	5	2	1	3	2	1	1	0	0	6	14

TABLE D.6 (Contd)

Number on Sediment Surface

Sediment Treatment	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-W-3	1	0	0	0	0	0	0	0	0	0	0
00-W-3	2	0	0	0	0	0	0	0	0	0	0
00-W-3	3	0	0	0	0	0	0	0	0	0	0
00-W-3	4	0	0	0	0	0	0	0	0	0	0
00-W-3	5	0	0	0	0	0	0	0	0	0	0
00-W-4	1	0	0	0	0	0	0	0	0	0	0
00-W-4	2	0	0	0	0	0	0	0	0	0	0
00-W-4	3	0	0	0	0	0	0	0	0	0	0
00-W-4	4	0	0	0	0	0	0	0	0	0	0
00-W-4	5	0	0	0	0	0	0	0	0	0	0
00-W-5	1	0	0	0	0	0	0	1	1	1	1
00-W-5	2	2	0	0	0	0	1	1	0	0	0
00-W-5	3	0	0	0	0	0	1	1	0	0	0
00-W-5	4	0	0	0	0	0	0	0	0	0	0
00-W-5	5	0	0	0	0	0	0	1	0	0	0
PR-coarse	1	0	0	0	0	0	0	0	0	0	0
PR-coarse	2	0	0	0	0	0	0	0	0	0	0
PR-coarse	3	0	0	0	0	0	0	0	0	0	0
PR-coarse	4	0	0	0	0	0	0	0	0	0	0
PR-coarse	5	0	0	0	0	0	0	0	0	0	0
PR-fine	1	0	0	0	0	0	0	0	0	0	0
PR-fine	2	0	0	0	0	0	0	0	0	0	0
PR-fine	3	0	0	0	0	0	0	0	0	0	0
PR-fine	4	0	0	0	0	0	1	0	0	0	0
PR-fine	5	0	0	0	0	0	0	0	0	0	0

Number of Siphons Exposed

Sediment Treatment	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-W-3	1	7	0	1	2	1	2	1	0	8	11
00-W-3	2	1	0	0	0	1	1	1	2	12	3
00-W-3	3	1	2	0	1	1	1	1	6	6	5
00-W-3	4	1	4	2	1	1	1	0	5	3	10
00-W-3	5	1	1	0	4	0	2	0	6	15	7
00-W-4	1	3	1	1	0	0	1	0	3	2	3
00-W-4	2	10	0	2	2	3	3	1	4	12	7
00-W-4	3	4	0	0	2	0	0	0	10	7	15
00-W-4	4	0	0	0	3	4	0	2	7	12	14
00-W-4	5	1	1	2	4	1	2	1	9	5	8
00-W-5	1	2	1	0	0	2	1	2	2	8	1
00-W-5	2	9	2	3	2	3	2	0	3	3	2
00-W-5	3	4	1	0	1	1	2	2	4	5	9
00-W-5	4	0	2	0	1	4	1	2	8	8	15
00-W-5	5	3	1	3	2	3	1	2	7	8	12
PR-coarse	1	6	4	1	7	4	2	2	4	9	4
PR-coarse	2	1	2	2	2	2	1	5	3	8	15
PR-coarse	3	3	10	2	0	7	5	2	7	18	14
PR-coarse	4	2	2	0	2	4	1	3	5	10	16
PR-coarse	5	2	3	6	2	3	2	0	1	8	10
PR-fine	1	4	3	2	2	1	1	3	3	11	6
PR-fine	2	4	2	4	0	1	1	1	1	6	2
PR-fine	3	3	4	1	1	4	1	0	2	2	6
PR-fine	4	5	5	5	2	2	2	4	2	5	10
PR-fine	5	2	3	4	1	1	4	3	2	3	5

TABLE D.6 (Contd)

Sediment Treatment	Number on Sediment Surface										
	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
Tomales Bay	1	0	0	0	0	0	0	0	0	0	0
Tomales Bay	2	0	0	0	0	0	0	0	0	0	0
Tomales Bay	3	0	0	0	1	2	0	1	0	0	0
Tomales Bay	4	0	0	0	1	0	0	0	0	0	0
Tomales Bay	5	0	0	0	0	0	0	1	0	0	0

Sediment Treatment	Number of Siphons Exposed										
	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
Tomales Bay	1	3	5	8	1	2	1	3	10	5	4
Tomales Bay	2	4	5	1	2	0	1	2	12	4	8
Tomales Bay	3	3	2	5	6	0	1	4	12	6	7
Tomales Bay	4	3	6	2	5	4	0	1	3	2	4
Tomales Bay	5	3	2	2	2	5	3	6	2	2	4

TABLE D.7 Summary of Observations for *Nephtys* Test

Sediment		Number on Sediment Surface									
Treatment	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
OI-CH-0	1	0	0	0	0	0	0	0	0	0	0
OI-CH-0	2	0	0	0	0	0	0	0	0	0	0
OI-CH-0	3	0	0	0	0	0	0	0	0	0	0
OI-CH-0	4	0	0	0	0	0	0	0	0	0	1
OI-CH-0	5	0	0	0	0	0	0	0	0	0	0
00-CH-1	1	0	0	0	0	0	0	0	0	0	0
00-CH-1	2	0	0	0	0	1	0	0	0	0	0
00-CH-1	3	0	0	0	0	1	1	0	0	0	0
00-CH-1	4	0	0	0	0	0	0	0	0	0	0
00-CH-1	5	0	0	0	0	0	0	0	0	0	0
00-CH-2	1	0	0	0	0	0	0	0	0	0	0
00-CH-2	2	0	0	0	0	0	0	0	0	0	0
00-CH-2	3	0	0	0	0	0	0	0	0	0	0
00-CH-2	4	1	0	0	0	0	0	0	0	0	0
00-CH-2	5	0	0	0	0	0	0	0	0	0	0
00-CH-2A	1	0	0	0	1	0	0	0	0	0	0
OI-CH-2A	2	0	0	0	0	0	0	0	0	0	0
OI-CH-2A	3	0	0	0	0	0	0	0	0	0	0
OI-CH-2A	4	0	0	0	0	0	0	0	0	0	0
OI-CH-2A	5	0	0	0	0	0	0	0	0	0	0
00-CH-3	1	0	0	0	1	0	0	0	0	0	0
00-CH-3	2	0	0	0	0	0	0	0	0	0	0
00-CH-3	3	0	0	0	0	0	0	0	0	0	0
00-CH-3	4	0	0	0	0	0	0	0	0	0	0
00-CH-3	5	0	0	0	0	0	0	0	0	0	0

Sediment		Number of Heads Exposed									
Treatment	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
OI-CH-0	1	0	1	0	1	0	0	0	0	0	0
OI-CH-0	2	0	0	1	0	0	0	0	0	0	0
OI-CH-0	3	0	0	0	0	0	0	0	0	0	0
OI-CH-0	4	0	0	0	0	0	0	0	0	0	3
OI-CH-0	5	0	0	0	0	0	0	0	0	0	0
00-CH-1	1	0	0	0	0	0	0	0	0	1	0
00-CH-1	2	0	0	0	1	0	0	0	0	0	0
00-CH-1	3	1	0	0	0	0	0	0	0	0	4
00-CH-1	4	0	0	0	0	0	0	0	0	0	1
00-CH-1	5	0	0	0	0	0	0	0	0	0	0
00-CH-2	1	0	0	0	0	0	0	0	0	0	0
00-CH-2	2	0	0	1	0	0	0	0	0	0	0
00-CH-2	3	0	0	0	0	0	0	0	0	0	0
00-CH-2	4	0	0	0	0	0	0	0	0	0	0
00-CH-2	5	0	0	0	0	0	0	0	0	0	0
OI-CH-2A	1	0	0	1	0	0	0	0	0	0	1
OI-CH-2A	2	0	0	0	0	0	0	0	0	0	0
OI-CH-2A	3	0	0	0	0	0	0	0	0	0	0
OI-CH-2A	4	0	0	0	0	0	0	0	0	0	0
OI-CH-2A	5	0	0	0	0	0	0	0	0	0	0
00-CH-3	1	0	0	0	0	0	0	0	0	0	0
00-CH-3	2	0	0	0	0	0	0	0	0	0	0
00-CH-3	3	0	0	0	0	0	0	0	0	0	2
00-CH-3	4	0	0	0	0	0	0	0	0	0	1
00-CH-3	5	0	0	0	0	0	0	0	0	0	0

TABLE D.7 (Contd)

Sediment Treatment	Rep	Number on Sediment Surface 1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-CH-4	1	0	0	0	0	0	0	0	0	0	3
00-CH-4	2	0	0	0	0	0	0	0	0	0	0
00-CH-4	3	0	0	0	0	0	0	0	0	0	0
00-CH-4	4	0	0	0	0	0	0	0	0	0	0
00-CH-4	5	0	0	0	0	0	0	0	0	0	0
0I-CH-4A	1	8	3	1	1	2	0	0	0	0	0
0I-CH-4A	2	0	0	0	0	0	0	0	0	0	0
0I-CH-4A	3	1	2	1	0	0	0	0	0	0	0
0I-CH-4A	4	1	5	1	1	1	0	0	0	0	0
0I-CH-4A	5	6	2	1	2	1	0	0	0	0	0
00-CH-5	1	0	0	0	0	0	0	0	0	0	0
00-CH-5	2	0	0	0	0	0	0	0	0	0	0
00-CH-5	3	0	0	0	0	0	0	0	0	0	0
00-CH-5	4	0	0	0	0	0	0	0	0	0	0
00-CH-5	5	0	0	0	0	0	0	0	0	0	0
00-CH-6	1	0	0	0	0	0	0	0	0	0	0
00-CH-6	2	0	0	0	0	0	0	0	0	0	0
00-CH-6	3	0	0	0	0	1	0	0	0	0	0
00-CH-6	4	0	0	0	0	0	0	0	0	0	0
00-CH-6	5	0	0	0	0	0	0	0	0	2	7
00-CH-6A	1	0	0	0	0	0	0	0	0	0	0
0I-CH-6A	2	0	0	0	0	1	0	0	0	0	0
0I-CH-6A	3	1	0	0	0	0	0	0	0	0	0
0I-CH-6A	4	0	0	0	0	0	0	0	0	0	0
0I-CH-6A	5	0	0	0	0	0	0	0	0	0	0

Sediment Treatment	Rep	Number of Heads Exposed 1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-CH-4	1	0	0	0	0	0	0	0	0	0	0
00-CH-4	2	0	0	0	0	0	0	0	0	0	0
00-CH-4	3	0	1	0	0	0	0	0	0	0	0
00-CH-4	4	0	0	0	0	0	0	0	0	0	0
00-CH-4	5	0	0	0	0	0	0	0	0	0	0
0I-CH-4A	1	3	4	1	0	0	0	0	0	0	0
0I-CH-4A	2	0	0	0	0	0	0	0	0	0	0
0I-CH-4A	3	0	4	0	0	0	0	0	0	0	0
0I-CH-4A	4	0	1	1	0	0	0	0	0	0	0
0I-CH-4A	5	2	1	0	0	0	1	0	0	0	0
00-CH-5	1	0	0	0	0	0	0	0	0	0	0
00-CH-5	2	0	0	0	0	0	0	0	0	0	0
00-CH-5	3	0	0	0	0	0	0	0	0	1	1
00-CH-5	4	0	0	0	0	0	0	0	0	0	0
00-CH-5	5	0	0	0	1	0	0	0	0	0	0
00-CH-6	1	0	0	0	0	0	0	0	0	0	0
00-CH-6	2	0	0	0	0	0	0	0	0	0	0
00-CH-6	3	0	0	0	1	0	0	0	0	0	0
00-CH-6	4	0	0	0	0	0	0	0	0	0	0
00-CH-6	5	0	0	0	0	0	0	0	0	1	1
0I-CH-6A	1	1	1	0	1	0	0	0	0	0	0
0I-CH-6A	2	1	0	1	1	0	0	0	0	0	0
0I-CH-6A	3	1	0	0	0	0	0	0	0	0	0
0I-CH-6A	4	0	1	0	0	0	0	0	0	0	0
0I-CH-6A	5	0	0	0	0	0	0	0	0	0	0

TABLE D.7 (Contd)

Sediment Treatment	Rep	Number on Sediment Surface 1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-CH-7	1	0	0	0	1	0	0	0	0	0	0
00-CH-7	2	0	0	0	0	0	0	0	0	0	0
00-CH-7	3	0	0	1	0	0	0	0	0	0	0
00-CH-7	4	0	0	0	0	0	0	0	0	0	0
00-CH-7	5	0	0	0	0	0	0	0	0	0	0
00-CH-8	1	0	0	0	0	0	0	0	0	0	0
00-CH-8	2	0	0	0	0	0	0	0	0	0	0
00-CH-8	3	0	0	0	1	1	0	0	0	0	0
00-CH-8	4	0	0	0	0	0	0	0	0	0	0
00-CH-8	5	0	0	0	0	0	0	0	0	0	1
0I-MA-1L	1	0	0	0	0	0	0	0	0	0	0
0I-MA-1L	2	0	0	0	0	1	0	0	0	0	0
0I-MA-1L	3	0	0	0	0	0	1	0	0	0	0
0I-MA-1L	4	0	0	0	0	0	BL	0	0	0	0
0I-MA-1L	5	0	0	0	0	0	0	0	0	0	0
0I-MA-2U	1	0	0	0	0	0	0	0	0	0	0
0I-MA-2U	2	0	0	0	0	0	0	0	0	0	0
0I-MA-2U	3	0	0	0	0	0	0	0	0	0	0
0I-MA-2U	4	0	0	0	0	0	1	0	0	0	0
0I-MA-2U	5	0	0	0	0	0	0	0	0	0	0
0I-MA-2L	1	1	0	0	0	0	0	0	0	0	0
0I-MA-2L	2	0	0	0	0	0	0	0	0	0	0
0I-MA-2L	3	0	0	0	0	0	0	0	0	0	0
0I-MA-2L	4	0	0	0	0	0	0	0	0	0	0
0I-MA-2L	5	0	0	0	0	0	0	0	0	0	0

Sediment Treatment	Rep	Number of Heads Exposed 1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-CH-7	1	0	0	0	0	1	0	0	0	0	0
00-CH-7	2	0	0	0	1	0	0	0	0	0	0
00-CH-7	3	0	0	0	0	0	0	0	0	0	0
00-CH-7	4	0	0	0	0	0	0	0	0	0	0
00-CH-7	5	0	0	0	0	0	0	0	0	0	0
00-CH-8	1	0	0	0	0	0	0	0	0	2	0
00-CH-8	2	0	1	0	0	0	0	0	0	0	0
00-CH-8	3	0	0	1	0	0	0	0	0	0	0
00-CH-8	4	0	0	0	0	0	0	0	0	0	1
00-CH-8	5	0	0	0	0	0	0	0	0	0	1
0I-MA-1L	1	1	0	0	0	0	0	0	0	0	0
0I-MA-1L	2	0	0	0	0	0	0	0	0	0	0
0I-MA-1L	3	0	0	0	0	0	0	0	0	0	0
0I-MA-1L	4	0	0	0	0	0	BL	0	0	0	0
0I-MA-1L	5	0	0	0	0	0	0	0	0	0	0
0I-MA-2U	1	0	0	0	0	0	0	0	0	0	0
0I-MA-2U	2	1	0	0	0	0	0	0	0	0	0
0I-MA-2U	3	0	0	0	0	0	0	0	0	0	0
0I-MA-2U	4	0	0	0	0	0	0	0	0	0	0
0I-MA-2U	5	0	0	0	1	0	0	0	0	0	0
0I-MA-2L	1	2	0	0	0	0	0	0	0	0	0
0I-MA-2L	2	0	0	0	0	0	0	0	0	0	0
0I-MA-2L	3	1	1	0	1	0	0	0	0	0	0
0I-MA-2L	4	0	0	1	0	0	0	0	0	0	0
0I-MA-2L	5	0	0	0	0	0	0	0	0	0	0

TABLE D.7 (Contd)

Sediment Treatment	Number on Sediment Surface										
	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
OI-SS-4L	1	0	0	0	0	0	0	0	0	0	0
OI-SS-4L	2	1	0	0	0	0	0	0	0	0	0
OI-SS-4L	3	0	0	0	0	0	0	0	0	0	0
OI-SS-4L	4	1	0	0	0	0	0	0	0	0	0
OI-SS-4L	5	1	0	0	0	0	0	0	0	0	0
OI-TS-5AL	1	0	0	0	0	0	0	0	0	0	0
OI-TS-5AL	2	0	0	0	0	0	0	0	0	0	0
OI-TS-5AL	3	0	1	0	0	0	0	0	0	0	0
OI-TS-5AL	4	0	0	0	0	0	0	0	0	0	0
OI-TS-5AL	5	0	0	0	0	0	0	0	0	0	0
OI-TS-5AU	1	1	0	0	0	1	0	0	0	0	0
OI-TS-5AU	2	0	0	0	1	1	0	0	0	0	0
OI-TS-5AU	3	1	0	0	0	0	0	0	0	0	0
OI-TS-5AU	4	0	0	0	0	0	0	0	0	0	0
OI-TS-5AU	5	0	0	0	1	0	0	0	0	0	0
OO-W-1	1	1	0	0	0	0	0	0	0	0	0
OO-W-1	2	0	0	0	0	0	0	0	0	0	0
OO-W-1	3	0	0	0	0	0	0	0	0	0	0
OO-W-1	4	0	0	0	0	0	0	0	0	0	0
OO-W-1	5	0	0	0	0	0	0	0	0	0	0
OO-W-2	1	0	1	0	0	0	0	0	0	0	0
OO-W-2	2	0	0	0	1	0	0	0	0	0	0
OO-W-2	3	0	0	0	0	0	0	0	0	0	0
OO-W-2	4	0	0	0	0	0	0	0	0	0	0
OO-W-2	5	0	0	0	0	0	0	0	0	0	0

Sediment Treatment	Number of Heads Exposed										
	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
OI-SS-4L	1	1	0	0	0	0	0	0	0	0	1
OI-SS-4L	2	0	0	0	0	0	0	0	0	0	0
OI-SS-4L	3	0	0	0	0	0	0	0	0	0	0
OI-SS-4L	4	0	0	0	0	0	0	0	0	0	0
OI-SS-4L	5	0	0	0	0	0	0	0	0	0	0
OI-TS-5AL	1	0	0	0	0	0	0	0	0	0	0
OI-TS-5AL	2	0	1	0	0	0	0	0	0	0	0
OI-TS-5AL	3	0	1	0	0	0	0	0	0	0	0
OI-TS-5AL	4	0	0	0	0	0	0	0	0	0	0
OI-TS-5AL	5	0	0	1	0	0	0	0	0	0	0
OI-TS-5AU	1	0	0	1	0	0	0	0	0	0	0
OI-TS-5AU	2	0	1	0	0	0	0	0	0	0	0
OI-TS-5AU	3	0	0	0	0	1	0	0	0	0	0
OI-TS-5AU	4	5	0	0	1	0	0	0	0	0	0
OI-TS-5AU	5	0	1	0	0	0	0	0	0	0	0
OO-W-1	1	0	0	1	0	0	0	0	0	0	0
OO-W-1	2	0	0	1	0	0	0	0	0	0	0
OO-W-1	3	0	0	0	0	0	0	0	0	0	0
OO-W-1	4	0	0	0	0	0	0	0	0	0	0
OO-W-1	5	0	0	0	0	0	0	0	0	1	0
OO-W-2	1	0	0	0	0	0	0	0	0	0	0
OO-W-2	2	1	0	0	0	0	0	0	0	0	0
OO-W-2	3	0	0	0	0	0	0	0	0	0	0
OO-W-2	4	0	1	1	0	0	0	0	0	0	0
OO-W-2	5	0	0	0	0	0	0	0	0	1	0

TABLE D.7 (Contd)

Sediment Treatment	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d	Sediment Treatment	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
	Number on Sediment Surface												Number of Heads Exposed										
00-W-3	1	0	0	0	0	0	0	0	0	0	3	00-W-3	1	0	0	0	0	0	0	0	0	0	0
00-W-3	2	0	0	0	0	0	0	0	0	0	0	00-W-3	2	0	0	0	0	0	0	0	0	0	0
00-W-3	3	0	0	0	0	0	0	0	0	0	0	00-W-3	3	0	0	0	1	0	0	0	0	1	0
00-W-3	4	0	0	0	0	0	0	0	0	0	0	00-W-3	4	0	0	0	0	0	0	0	0	0	0
00-W-3	5	0	0	0	0	0	0	0	0	0	0	00-W-3	5	0	0	0	0	0	0	0	0	0	2
00-W-4	1	0	0	0	0	0	0	0	0	0	0	00-W-4	1	0	0	0	0	0	0	0	0	0	0
00-W-4	2	0	0	0	0	0	0	0	0	1	0	00-W-4	2	0	0	0	0	0	0	0	0	1	1
00-W-4	3	0	0	0	0	0	0	0	0	0	1	00-W-4	3	0	1	0	0	1	0	1	1	2	4
00-W-4	4	0	0	0	0	0	0	0	0	0	3	00-W-4	4	0	0	0	0	0	0	0	0	1	1
00-W-4	5	0	0	0	0	0	0	0	0	0	0	00-W-4	5	0	0	0	0	0	0	0	0	0	1
00-W-5	1	0	0	0	0	0	0	0	0	0	0	00-W-5	1	0	0	0	0	0	0	0	0	0	0
00-W-5	2	0	0	0	0	0	0	0	0	0	0	00-W-5	2	0	0	0	0	0	0	0	0	0	0
00-W-5	3	0	0	0	0	0	0	0	0	0	0	00-W-5	3	0	0	0	0	0	0	0	0	0	0
00-W-5	4	0	0	0	0	0	0	0	0	0	1	00-W-5	4	0	0	0	0	0	0	0	0	0	2
00-W-5	5	0	0	0	0	0	0	0	0	0	2	00-W-5	5	0	0	0	0	0	0	0	0	2	1
PR-coarse	1	0	0	1	0	0	0	0	0	0	0	PR-coarse	1	0	1	0	0	0	0	0	0	0	0
PR-coarse	2	0	0	0	0	0	0	0	0	0	0	PR-coarse	2	1	0	0	0	0	0	0	0	0	0
PR-coarse	3	0	0	0	0	0	0	0	0	0	0	PR-coarse	3	0	0	0	0	0	0	0	0	0	2
PR-coarse	4	0	0	0	0	1	0	0	0	0	0	PR-coarse	4	0	1	0	0	0	0	0	0	0	2
PR-coarse	5	0	0	0	0	0	0	0	0	0	0	PR-coarse	5	0	0	0	0	0	0	0	0	0	1
PR-fine	1	0	0	0	0	0	0	0	0	0	0	PR-fine	1	0	0	1	0	0	0	0	0	0	0
PR-fine	2	0	0	0	0	0	0	0	0	0	0	PR-fine	2	0	0	0	0	0	0	0	0	0	0
PR-fine	3	0	0	0	0	0	0	0	0	0	0	PR-fine	3	0	0	1	0	0	0	0	0	0	0
PR-fine	4	0	0	0	0	0	0	0	0	0	1	PR-fine	4	0	0	0	0	0	0	0	0	0	0
PR-fine	5	0	0	0	0	0	0	0	0	0	0	PR-fine	5	0	0	0	0	0	0	0	0	0	0

TABLE D.7 (Contd)

Sediment Treatment	Number on Sediment Surface										
	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
Tomales Bay	1	0	0	0	0	0	0	0	0	0	0
Tomales Bay	2	0	2	0	0	0	0	0	0	0	2
Tomales Bay	3	0	0	0	0	0	0	0	0	0	0
Tomales Bay	4	0	0	0	0	0	0	0	0	0	0
Tomales Bay	5	0	0	0	0	0	0	0	0	0	0

Sediment Treatment	Number of Heads Exposed										
	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
Tomales Bay	1	0	0	0	0	0	0	0	0	0	0
Tomales Bay	2	0	0	0	0	0	0	0	0	0	0
Tomales Bay	3	0	0	0	0	0	0	0	0	0	0
Tomales Bay	4	0	0	0	0	0	0	0	0	0	0
Tomales Bay	5	0	0	0	0	0	0	0	0	0	0

APPENDIX E

BIOASSAY RESULTS FOR FLOW-THROUGH AMPELISCA/RHEPOXYNIUS TEST

TABLE E.1 Bioassay Results for *Ampelisca abdita* Flow-Through

Sediment Treatment	Rep	Alive	Dead	Proportion Surviving in All Reps
OI-CH-0	1	18	2	
	2	19	1	
	3	21	0	
	4	18	2	
	5	20	0	0.95
OO-CH-1	1	17	3	
	2	20	0	
	3	20	0	
	4	18	2	
	5	18	2	0.93
OO-CH-2	1	19	1	
	2	20	0	
	3	16	4	
	4	20	0	
	5	17	3	0.92
OI-CH-2A	1	20	0	
	2	19	1	
	3	18	2	
	4	17	3	
	5	17	3	0.91
OO-CH-3	1	16	4	
	2	17	3	
	3	18	2	
	4	16	4	
	5	20	0	0.87
OI-CH-4	1	19	1	
	2	19	1	
	3	19	1	
	4	20	0	
	5	19	1	0.96
OI-CH-4A	1	20	0	
	2	16	4	
	3	19	1	
	4	19	1	
	5	19	1	0.93
OO-CH-5	1	19	1	
	2	20	0	
	3	18	2	
	4	20	0	
	5	18	2	0.95

TABLE E.1 (Contd)

Sediment Treatment	Rep	Alive	Dead	Proportion Surviving in All Reps
OD-CH-6	1	17	3	
	2	16	4	
	3	19	1	
	4	19	1	
	5	18	2	0.89
OI-CH-6A	1	20	0	
	2	20	0	
	3	20	0	
	4	19	1	
	5	19	1	0.98
OO-CH-7	1	18	2	
	2	21	0	
	3	19	1	
	4	18	2	
	5	18	2	0.93
OO-CH-8	1	18	2	
	2	18	2	
	3	19	1	
	4	16	4	
	5	19	1	0.90
OI-MA-1L	1	19	1	
	2	18	2	
	3	20	0	
	4	19	1	
	5	18	2	0.94
OI-MA-2U	1	19	1	
	2	19	1	
	3	16	4	
	4	20	0	
	5	19	1	0.93
OI-MA-2L	1	18	2	
	2	21	0	
	3	20	0	
	4	19	1	
	5	18	2	0.95
OI-SS-4L	1	19	1	
	2	18	2	
	3	20	0	
	4	19	1	
	5	18	2	0.94

TABLE E.1 (Contd)

Sediment Treatment	Rep	Alive	Dead	Proportion Surviving in All Reps
OI-TS-5AL	1	19	1	
	2	15	5	
	3	20	0	
	4	20	0	
	5	20	0	0.94
OI-TS-5AU	1	19	1	
	2	18	2	
	3	19	1	
	4	18	2	
	5	18	2	0.92
00-W-1	1	19	1	
	2	19	1	
	3	17	3	
	4	19	1	
	5	20	0	0.94
00-W-2	1	19	1	
	2	15	5	
	3	20	0	
	4	19	1	
	5	18	2	0.91
00-W-3	1	17	3	
	2	18	2	
	3	20	0	
	4	20	0	
	5	19	1	0.94
00-W-4	1	18	2	
	2	17	3	
	3	16	4	
	4	18	2	
	5	20	0	0.89
00-W-5	1	20	0	
	2	19	1	
	3	19	1	
	4	20	0	
	5	21	0	0.98

TABLE E.1 (Contd)

Sediment Treatment	Rep	Alive	Dead	Proportion Surviving in All Reps
PR-coarse	1	2D	0	
	2	18	2	
	3	17	3	
	4	19	1	
	5	20	0	0.94
PR-fine	1	20	0	
	2	19	1	
	3	17	3	
	4	20	0	
	5	20	0	0.96
Tomales Bay	1	20	0	
	2	20	0	
	3	20	0	
	4	20	0	
	5	20	0	1.00

TABLE E.2 Bioassay Results for *Ampelisca abdita* Flow-Through Rank order Based on Proportion Surviving the 10-Day Exposure

Sediment Treatment	Proportion Surviving (all replicates)
00-CH-3	0.87
00-CH-6	0.89
00-W-4	0.89
00-CH-8	0.90
00-W-2	0.91
0I-CH-2A	0.91
0I-TS-5AU	0.92
00-CH-2	0.92
0I-MA-2U	0.93
0I-CH-4A	0.93
00-CH-7	0.93
00-CH-1	0.93
00-W-1	0.94
PR-coarse	0.94
0I-MA-1L	0.94
0I-SS-4L	0.94
0I-TS-5AL	0.94
00-W-3	0.94
0I-MA-2L	0.95
0I-CH-0	0.95
00-CH-5	0.95
00-CH-4	0.96
PR-fine	0.96
00-W-5	0.98
0I-CH-6A	0.98
Tomales Bay	1.00

TABLE E.3 Bioassay Results for *Rhepoxynius abronius* Flow-Through

Sediment Treatment	Rep	Alive	Dead	Proportion Surviving in All Reps
OI-CH-0	1	17	3	
	2	13	7	
	3	19	1	
	4	16	4	
	5	20	0	0.85
OO-CH-1	1	17	3	
	2	18	2	
	3	9	11	
	4	17	3	
	5	12	8	0.73
OO-CH-2	1	19	1	
	2	19	1	
	3	17	3	
	4	20	0	
	5	17	3	0.92
OI-CH-2A	1	13	7	
	2	12	8	
	3	12	8	
	4	14	6	
	5	14	6	0.65
OO-CH-3	1	11	9	
	2	20	0	
	3	16	4	
	4	17	3	
	5	19	1	0.83
OO-CH-4	1	16	4	
	2	15	5	
	3	15	5	
	4	15	5	
	5	20	0	0.81
OI-CH-4A	1	19	1	
	2	20	0	
	3	20	0	
	4	17	3	
	5	17	3	0.93
OO-CH-5	1	16	4	
	2	17	3	
	3	16	4	
	4	13	7	
	5	13	7	0.75

TABLE E.3 (Contd)

Sediment Treatment	Rep	Alive	Dead	Proportion Surviving in All Reps
00-CH-6	1	12	8	
	2	13	7	
	3	8	12	
	4	17	3	
	5	15	5	0.65
0I-CH-6A	1	20	0	
	2	18	2	
	3	19	1	
	4	19	1	
	5	18	2	0.94
00-CH-7	1	15	5	
	2	14	6	
	3	14	6	
	4	11	9	
	5	8	12	0.62
00-CH-8	1	12	8	
	2	10	10	
	3	10	10	
	4	9	11	
	5	11	9	0.52
0I-MA-1L	1	12	8	
	2	14	6	
	3	13	7	
	4	13	7	
	5	13	7	0.65
0I-MA-2U	1	14	6	
	2	14	6	
	3	16	4	
	4	15	5	
	5	16	4	0.75
0I-MA-2L	1	18	2	
	2	16	4	
	3	17	3	
	4	16	4	
	5	15	5	0.82
0I-SS-4L	1	19	1	
	2	20	0	
	3	19	1	
	4	19	1	
	5	19	1	0.96

TABLE E.3 (Contd)

Sediment Treatment	Rep	Alive	Dead	Proportion Surviving in All Reps
OI-TS-5AL	1	16	4	
	2	19	1	
	3	19	1	
	4	19	1	
	5	18	2	0.91
OI-TS-5AU	1	14	6	
	2	10	10	
	3	14	6	
	4	15	5	
	5	10	10	0.63
00-W-1	1	13	7	
	2	17	3	
	3	18	2	
	4	15	5	
	5	16	4	0.79
00-W-2	1	12	8	
	2	16	4	
	3	15	5	
	4	15	5	
	5	16	4	0.74
00-W-3	1	14	6	
	2	19	1	
	3	14	6	
	4	17	3	
	5	17	3	0.81
00-W-4	1	16	4	
	2	15	5	
	3	17	3	
	4	15	5	
	5	16	4	0.79
00-W-5	1	19	1	
	2	19	1	
	3	19	1	
	4	20	D	
	5	20	0	0.97

TABLE E.3 (Contd)

Sediment Treatment	Rep	Alive	Dead	Proportion Surviving in All Reps
PR-coarse	1	18	2	
	2	20	0	
	3	17	3	
	4	20	0	
	5	20	0	0.95
PR-fine	1	19	1	
	2	20	0	
	3	20	0	
	4	20	0	
	5	20	0	0.99
Tomales Bay	1	18	2	
	2	19	1	
	3	20	0	
	4	20	0	
	5	20	0	0.97

TABLE E.4 Bioassay Results for *Rhepoxynius abronius* Flow-Through Rank Order Based on Proportion Surviving the 10-Day Exposure

Sediment Treatment	Proportion Surviving (all replicates)
00-CH-8	0.52
00-CH-7	0.62
0I-TS-5AU	0.63
0I-CH-2A	0.65
00-CH-6	0.65
0I-MA-1L	0.65
00-CH-1	0.73
00-W-2	0.74
00-CH-5	0.75
0I-MA-2U	0.75
00-W-1	0.79
00-W-4	0.79
00-CH-4	0.81
00-W-3	0.81
0I-MA-2L	0.82
00-CH-3	0.83
0I-CH-0	0.85
0I-TS-5AL	0.91
00-CH-2	0.92
0I-CH-4A	0.93
00-CH-6A	0.94
PR-coarse	0.95
0I-SS-4L	0.96
Tomales Bay	0.97
00-W-5	0.97
PR-fine	0.99

TABLE E.5 Ampelisca/Rhepoxynius Flow-Through: Water Quality

Treatment	Rep	Temperature (°C) Min	Temperature (°C) Max	Dissolved Oxygen (mg/L) Min	Dissolved Oxygen (mg/L) Max	pH Min	pH Max	Salinity (°/oo) Min	Salinity (°/oo) Max	Flow Rate (mL/min) Min	Flow Rate (mL/min) Max
Acceptable Range		14.0	16.0	4.0	--	7.20	8.10	32.0	34.0	35	45
OI-CH-0	1	14.7	16.1*	6.7	7.6	7.78	7.91	32.0	33.0	36	45
OI-CH-0	2	14.6	15.5	6.7	7.5	7.60	7.92	32.0	32.5	35	44
OI-CH-0	3	14.5	15.7	6.7	7.4	7.69	7.92	32.0	32.5	36	45
OI-CH-0	4	14.5	15.5	6.6	7.4	7.71	7.95	32.0	33.0	35	44
OI-CH-0	5	14.5	15.7	6.6	7.4	7.71	7.99	32.0	33.0	36	44
OO-CH-1	1	14.7	15.6	6.9	7.5	7.71	7.92	32.0	32.5	36	45
OO-CH-1	2	14.5	15.6	6.8	7.5	7.70	7.91	32.0	32.5	36	44
OO-CH-1	3	14.3	15.5	6.5	7.6	7.70	7.91	32.0	33.0	35	45
OO-CH-1	4	14.4	15.7	6.6	7.5	7.68	7.91	32.0	33.0	35	44
OO-CH-1	5	14.3	15.6	6.8	7.5	7.70	7.92	32.0	33.0	36	45
OO-CH-2	1	14.8	15.7	6.9	7.5	7.77	7.89	32.0	33.0	35	42
OO-CH-2	2	14.7	15.5	6.9	7.4	7.72	7.98	32.0	32.5	36	45
OO-CH-2	3	14.7	15.4	7.0	7.6	7.71	7.92	32.0	33.0	35	44
OO-CH-2	4	14.7	15.6	6.8	7.5	7.70	7.91	32.0	32.5	36	40
OO-CH-2	5	14.4	15.7	6.6	7.5	7.68	7.91	32.0	33.0	35	44
OO-CH-2	1	14.7	16.1*	6.6	7.6	7.77	7.91	32.0	33.0	37	45
OO-CH-2	2	14.7	16.1*	6.8	7.7	7.77	7.91	32.0	33.0	37	42
OO-CH-2	3	14.7	15.6	7.0	7.5	7.71	7.98	32.0	33.0	36	44
OO-CH-2	4	14.7	15.4	7.0	7.5	7.71	7.91	32.0	33.0	36	45
OO-CH-2	5	14.4	15.7	6.6	7.6	7.71	7.93	32.0	33.0	36	45
OO-CH-3	1	14.6	15.7	6.8	7.5	7.72	7.91	32.0	34.0	36	45
OO-CH-3	2	14.7	15.5	7.0	7.6	7.60	7.91	32.0	34.0	37	45
OO-CH-3	3	14.7	15.5	7.0	7.8	7.60	7.91	32.0	33.0	35	45
OO-CH-3	4	14.8	15.6	6.9	7.5	7.72	7.96	32.0	33.0	35	43
OO-CH-3	5	14.7	15.4	6.8	7.5	7.60	7.92	32.0	32.5	36	41
OO-CH-4	1	14.7	15.4	7.0	7.4	7.72	7.92	32.0	32.5	36	45
OO-CH-4	2	14.8	15.6	6.8	7.4	7.71	7.99	32.0	33.0	36	45
OO-CH-4	3	14.7	15.4	6.9	7.5	7.75	7.91	32.0	32.5	35	44
OO-CH-4	4	14.4	15.5	6.7	7.4	7.72	7.98	32.0	33.0	35	44
OO-CH-4	5	14.4	15.5	6.8	7.3	7.70	7.92	32.0	32.5	37	44
OI-CH-4A	1	14.7	15.5	7.0	7.6	7.72	7.97	32.0	33.0	36	44
OI-CH-4A	2	14.3	15.6	6.7	7.5	7.69	7.91	32.0	33.0	35	45
OI-CH-4A	3	14.3	15.5	6.7	7.5	7.69	7.92	32.0	33.0	35	44
OI-CH-4A	4	14.2	15.5	6.7	7.4	7.70	7.91	32.0	33.0	36	44
OI-CH-4A	5	14.4	15.7	6.7	7.5	7.69	7.99	32.0	33.0	36	45

*Out of Acceptable Range

TABLE E.5 (Contd)

Treatment	Rep	Temperature (°C) Min	Max	Dissolved Oxygen (mg/L) Min	Max	pH Min	Max	Salinity (°/oo) Min	Max	Flow Rate (mL/min) Min	Max
Acceptable Range		14.0	16.0	4.0	--	7.30	8.10	32.0	34.0	35	45
OO-CH-5	1	14.9	15.9	6.8	7.6	7.70	7.87	32.0	33.0	35	44
OO-CH-5	2	14.7	15.8	6.8	7.5	7.76	7.91	32.0	33.0	35	44
OO-CH-5	3	14.8	15.4	6.9	7.5	7.71	7.92	32.0	33.0	36	42
OO-CH-5	4	14.5	15.5	6.6	7.4	7.71	7.95	32.0	33.0	36	43
OO-CH-5	5	14.5	15.5	6.6	7.3	7.71	7.97	32.0	33.0	36	44
OO-CH-6	1	14.8	15.7	6.9	7.4	7.75	7.90	32.0	33.0	35	43
OO-CH-6	2	14.7	15.5	6.8	7.3	7.71	7.97	32.0	32.5	35	45
OO-CH-6	3	14.6	15.7	6.5	7.5	7.70	7.94	32.0	33.0	35	44
OO-CH-6	4	14.4	15.5	6.5	7.4	7.72	7.99	32.0	33.0	36	45
OO-CH-6	5	14.5	15.6	6.7	7.4	7.72	7.93	32.0	33.0	36	44
OI-CH-6A	1	14.8	15.6	6.8	7.6	7.77	7.94	32.0	33.0	36	43
OI-CH-6A	2	14.6	15.6	7.0	7.5	7.71	7.92	32.0	32.5	35	42
OI-CH-6A	3	14.3	15.6	6.5	7.6	7.68	7.94	32.0	33.0	36	45
OI-CH-6A	4	14.3	15.5	6.7	7.4	7.68	7.96	32.0	33.0	36	45
OI-CH-6A	5	14.5	15.6	6.6	7.4	7.68	7.93	32.0	33.0	35	45
OO-CH-7	1	14.8	15.6	6.9	7.6	7.75	7.91	32.0	33.0	35	42
OO-CH-7	2	14.7	15.5	6.9	7.7	7.71	7.92	32.0	32.5	37	41
OO-CH-7	3	14.6	15.6	6.5	7.4	7.65	7.94	32.0	33.0	38	44
OO-CH-7	4	14.7	15.7	6.7	7.5	7.72	7.94	32.0	33.0	36	40
OO-CH-7	5	14.5	15.7	6.6	7.3	7.72	7.98	32.0	33.0	35	45
OO-CH-8	1	14.6	15.7	6.6	7.5	7.74	7.90	32.0	33.0	38	45
OO-CH-8	2	14.7	15.5	6.7	7.3	7.72	7.91	32.0	34.0	36	44
OO-CH-6	3	14.7	15.6	7.0	7.6	7.61	7.92	32.0	33.0	38	45
OO-CH-8	4	14.7	15.4	6.9	7.3	7.71	7.92	32.0	32.5	36	44
OO-CH-8	5	14.5	15.5	6.9	7.2	7.69	7.91	32.0	33.0	36	45
OI-MA-1L	1	14.8	15.7	6.7	7.5	7.72	7.92	32.0	34.0	38	45
OI-MA-1L	2	14.8	15.5	6.7	7.5	7.58	7.97	32.0	33.0	36	45
OI-MA-1L	3	14.5	15.7	6.7	7.6	7.69	7.92	32.0	33.0	36	44
OI-MA-1L	4	14.3	15.6	6.7	7.6	7.70	7.92	32.0	33.0	35	42
OI-MA-1L	5	14.5	15.8	6.8	7.7	7.68	7.94	32.0	33.0	35	43
OI-MA-2U	1	14.9	15.9	6.8	7.4	7.72	7.91	32.0	34.0	36	44
OI-MA-2U	2	14.8	15.8	6.9	7.8	7.61	7.93	32.0	33.0	35	44
OI-MA-2U	3	14.3	15.5	6.7	7.6	7.70	7.92	32.0	33.0	37	45
OI-MA-2U	4	14.3	15.5	6.7	7.6	7.69	7.99	32.0	33.0	35	43
OI-MA-2U	5	14.4	15.6	6.6	7.6	7.68	7.95	32.0	33.0	35	45

TABLE E.5 (Contd)

Treatment	Rep	Temperature (°C) Min	Temperature (°C) Max	Dissolved Oxygen (mg/L) Min	Dissolved Oxygen (mg/L) Max	pH Min	pH Max	Salinity (°/oo) Min	Salinity (°/oo) Max	Flow Rate (mL/min) Min	Flow Rate (mL/min) Max
OI-MA-2L	1	14.8	15.5	7.2	7.6	7.61	7.92	32.0	33.0	37	44
OI-MA-2L	2	14.5	15.7	6.6	7.5	7.68	7.91	32.0	33.0	32	45
OI-MA-2L	3	14.6	15.7	6.6	7.6	7.68	7.94	32.0	33.0	36	43
OI-MA-2L	4	14.7	15.8	6.6	7.5	7.71	7.94	32.0	33.0	36	45
OI-MA-2L	5	14.4	15.6	6.5	7.7	7.69	7.94	32.0	33.0	36	42
OI-SS-4L	1	14.9	15.6	6.9	7.6	7.74	7.90	32.0	33.0	36	42
OI-SS-4L	2	14.6	15.6	6.9	7.7	7.60	7.92	32.0	33.0	38	45
OI-SS-4L	3	14.8	15.5	7.0	7.7	7.60	7.91	32.0	33.0	36	42
OI-SS-4L	4	14.8	15.6	6.9	7.6	7.66	7.92	32.0	32.5	36	45
OI-SS-4L	5	14.3	15.5	6.8	7.5	7.71	7.92	32.0	33.0	35	42
OI-TS-5AL	1	14.9	15.7	6.6	7.5	7.76	7.92	32.0	33.0	38	44
OI-TS-5AL	2	14.9	15.6	6.9	7.5	7.72	7.91	32.0	34.0	35	44
OI-TS-5AL	3	14.3	15.6	6.6	7.6	7.69	7.91	32.0	33.0	38	44
OI-TS-5AL	4	14.3	15.6	6.7	7.5	7.69	7.98	32.0	33.0	36	44
OI-TS-5AL	5	14.4	15.7	6.6	7.6	7.66	7.99	32.0	33.0	37	45
OI-TS-5AU	1	14.4	15.6	6.7	7.4	7.69	7.91	32.0	33.0	34	45
OI-TS-5AU	2	14.3	15.5	6.6	7.5	7.69	7.91	32.0	33.0	36	45
OI-TS-5AU	3	14.4	15.6	6.5	7.6	7.67	7.94	32.0	33.0	38	45
OI-TS-5AU	4	14.3	15.5	6.6	7.6	7.66	7.94	32.0	33.5	37	43
OI-TS-5AU	5	14.5	15.9	6.5	7.5	7.70	7.94	32.0	33.5	35	40
OO-W-1	1	14.7	15.6	6.9	7.5	7.71	7.91	32.0	33.0	36	44
OO-W-1	2	14.3	15.6	6.6	7.5	7.69	7.91	32.0	33.0	36	44
OO-W-1	3	14.3	15.5	6.7	7.5	7.69	7.92	32.0	33.0	38	45
OO-W-1	4	14.4	15.6	6.6	7.6	7.70	7.94	32.0	33.5	36	45
OO-W-1	5	14.3	15.5	6.5	7.4	7.71	7.97	32.0	33.0	36	45
OO-W-2	1	14.9	15.7	6.3	7.5	7.69	7.97	32.0	32.5	35	42
OO-W-2	2	14.5	15.6	6.6	7.6	7.69	7.91	32.0	33.0	36	44
OO-W-2	3	14.4	15.7	6.6	7.6	7.71	7.94	32.0	33.5	35	44
OO-W-2	4	14.3	15.6	6.6	7.5	7.72	7.97	32.0	33.0	36	45
OO-W-2	5	14.3	15.6	6.7	7.6	7.71	7.98	32.0	33.0	36	44
OO-W-3	1	14.7	15.6	6.9	7.7	7.74	7.92	32.0	34.0	37	43
OO-W-3	2	14.4	15.8	6.6	7.2	7.65	7.90	32.0	33.0	36	42
OO-W-3	3	14.5	15.6	6.7	7.3	7.69	7.91	32.0	33.0	39	42
OO-W-3	4	14.7	15.6	6.5	7.1	7.69	7.90	32.0	33.0	36	45
OO-W-3	5	14.5	15.5	6.6	7.5	7.72	7.98	32.0	33.0	36	44

TABLE E.5 (Contd)

Treatment	Rep	Temperature (°C) Min	Temperature (°C) Max	Dissolved Oxygen (mg/L) Min	Dissolved Oxygen (mg/L) Max	pH Min	pH Max	Salinity (°/oo) Min	Salinity (°/oo) Max	Flow Rate (mL/min) Min	Flow Rate (mL/min) Max
00-W-4	1	14.7	15.6	6.8	7.5	7.75	7.91	32.0	33.0	36	45
00-W-4	2	14.8	15.6	6.9	7.4	7.70	7.95	32.0	33.0	36	44
00-W-4	3	14.5	15.6	6.7	7.2	7.68	7.90	32.0	32.5	36	45
00-W-4	4	14.3	15.5	6.6	7.2	7.70	7.91	32.0	33.0	40	44
00-W-4	5	14.4	15.8	6.9	7.3	7.69	7.91	32.0	32.5	35	45
00-W-5	1	14.7	15.5	7.0	7.6	7.73	7.91	32.0	33.0	36	49
00-W-5	2	14.7	15.5	6.7	7.4	7.72	7.97	32.0	32.5	34	44
00-W-5	3	14.7	15.5	6.7	7.4	7.71	7.97	32.0	32.5	38	45
00-W-5	4	14.8	15.7	6.7	7.3	7.71	7.97	32.0	33.0	38	43
00-W-5	5	14.5	15.6	6.6	7.4	7.69	7.91	32.0	33.0	38	46
PR-coarse	1	14.9	15.8	6.7	7.5	7.73	7.88	32.0	33.0	35	42
PR-coarse	2	14.7	15.5	7.0	7.6	7.60	7.92	32.0	33.0	35	45
PR-coarse	3	14.9	15.9	6.4	7.2	7.68	7.95	32.0	33.0	36	46
PR-coarse	4	14.8	15.7	6.8	7.5	7.63	7.96	32.0	32.5	35	42
PR-coarse	5	14.6	15.8	6.7	7.4	7.68	7.91	32.0	32.5	35	44
PR-fine	1	14.8	15.7	6.8	7.5	7.75	7.91	32.0	33.0	36	44
PR-fine	2	14.7	15.7	6.9	7.5	7.71	7.91	32.0	32.5	35	43
PR-fine	3	14.7	15.5	6.9	7.6	7.72	7.93	32.0	32.5	35	42
PR-fine	4	14.3	15.5	6.8	7.6	7.70	7.92	32.0	33.0	36	45
PR-fine	5	14.3	15.6	6.7	7.6	7.69	7.91	32.0	33.0	35	46
Tomales Bay	1	14.9	15.7	6.6	7.3	7.69	7.91	32.0	33.0	38	45
Tomales Bay	2	14.8	15.9	6.7	7.4	7.70	7.99	32.0	33.0	36	44
Tomales Bay	3	14.4	15.3	6.8	7.3	7.72	8.06	32.0	33.0	35	43
Tomales Bay	4	15.0	15.8	6.8	7.4	7.62	7.91	32.0	33.0	35	42
Tomales Bay	5	14.7	15.6	6.4	7.4	7.69	7.98	32.0	33.0	36	44

TABLE E.6 Ampelisca: Observations - Flow-Through - Sediments

Sediment Treatment	Rep	Number on Sediment Surface 1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
OI-CH-0	1	0	0	0	0	0	0	0	0	0	0
OI-CH-0	2	0	0	0	0	0	0	0	0	0	
OI-CH-0	3	0	0	0	0	0	0	0	0	0	0
OI-CH-0	4	0	0	0	0	0	0	0	0	0	0
OI-CH-0	5	0	0	0	0	0	0	0	0	0	0
OO-CH-1	1	0	0	0	0	0	0	0	0	0	0
OO-CH-1	2	0	0	0	0	0	0	0	0	0	0
OO-CH-1	3	0	0	0	0	0	0	0	0	0	0
OO-CH-1	4	0	0	0	0	0	0	0	0	0	0
OO-CH-1	5	0	0	0	0	0	0	0	0	0	0
OO-CH-2	1	0	0	0	0	0	0	0	0	0	0
OO-CH-2	2	0	0	0	0	0	0	0	0	0	0
OO-CH-2	3	0	0	0	0	0	0	0	0	0	0
OO-CH-2	4	0	0	0	0	0	0	0	0	0	0
OO-CH-2	5	0	0	0	0	0	0	0	0	0	0
OI-CH-2A	1	0	0	0	0	0	0	0	0	0	0
OI-CH-2A	2	0	0	0	0	0	0	0	0	0	0
OI-CH-2A	3	0	0	0	0	0	0	0	0	0	0
OI-CH-2A	4	0	0	0	0	0	0	0	0	0	0
OI-CH-2A	5	0	0	0	0	0	0	0	0	0	0
OO-CH-3	1	0	0	0	0	0	0	0	0	0	0
OO-CH-3	2	0	0	0	0	0	0	0	0	0	0
OO-CH-3	3	0	0	0	0	0	0	0	0	0	0
OO-CH-3	4	0	0	0	0	0	0	0	0	0	0
OO-CH-3	5	0	0	0	0	0	0	0	0	0	0

Sediment Treatment	Rep	Number on Water Surface 1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
OI-CH-0	1	0	0	0	0	0	0	0	0	0	0
OI-CH-0	2	0	0	0	0	0	0	0	0	0	
OI-CH-0	3	0	0	0	0	0	0	0	0	0	0
OI-CH-0	4	0	0	0	0	0	0	0	0	0	0
OI-CH-0	5	1	0	0	0	0	0	0	0	0	0
OO-CH-1	1	0	0	0	0	1	0	0	0	0	0
OO-CH-1	2	1	0	0	0	0	0	0	0	0	0
OO-CH-1	3	0	0	0	0	0	0	0	0	0	0
OO-CH-1	4	1	0	1	0	2	0	0	0	0	0
OO-CH-1	5	0	0	0	0	0	0	0	0	0	0
OO-CH-2	1	0	1	0	1	0	0	0	0	0	0
OO-CH-2	2	0	0	1	0	0	0	0	0	0	0
OO-CH-2	3	1	0	0	2	0	0	0	0	0	0
OO-CH-2	4	0	0	0	0	0	0	0	0	0	0
OO-CH-2	5	0	0	0	0	0	0	0	0	0	0
OI-CH-2A	1	3	0	0	0	1	0	0	0	0	0
OI-CH-2A	2	0	0	0	0	0	0	0	0	0	0
OI-CH-2A	3	0	0	0	0	0	0	0	0	0	0
OI-CH-2A	4	0	0	0	0	0	0	0	0	0	0
OI-CH-2A	5	0	0	0	0	0	0	0	0	0	0
OO-CH-3	1	0	0	0	1	0	0	0	0	0	0
OO-CH-3	2	0	0	0	0	1	0	0	0	0	0
OO-CH-3	3	0	0	0	0	0	0	0	0	0	0
OO-CH-3	4	0	0	0	0	1	0	0	0	0	0
OO-CH-3	5	1	0	1	0	0	0	0	0	0	0

TABLE E.6 (Contd)

Sediment Treatment	Rep	Number on Sediment Surface 1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-CH-4	1	0	0	0	0	0	0	0	0	0	BL
00-CH-4	2	0	0	0	0	0	0	0	0	0	0
00-CH-4	3	0	0	0	0	0	0	0	0	0	0
00-CH-4	4	0	0	0	0	0	0	0	0	0	0
00-CH-4	5	0	0	0	0	0	0	0	0	0	0
OI-CH-4A	1	0	0	0	0	0	0	0	0	0	0
OI-CH-4A	2	0	0	0	0	0	0	0	0	0	0
OI-CH-4A	3	0	0	0	0	0	0	0	0	0	0
OI-CH-4A	4	0	0	0	0	0	0	0	0	0	0
OI-CH-4A	5	0	0	0	0	0	0	0	0	0	0
00-CH-5	1	0	0	0	0	0	0	0	0	0	0
00-CH-5	2	0	0	0	0	0	0	0	0	0	0
00-CH-5	3	0	0	0	1	0	0	0	0	0	0
00-CH-5	4	0	0	0	0	0	0	0	0	0	0
00-CH-5	5	0	0	0	0	0	0	0	0	0	0
00-CH-6	1	0	0	0	0	0	0	0	0	0	0
00-CH-6	2	0	0	0	0	0	0	0	0	0	BL
00-CH-6	3	0	0	0	0	0	0	0	0	0	0
00-CH-6	4	0	0	0	0	0	0	0	0	0	0
00-CH-6	5	0	0	0	0	0	0	0	0	0	0
OI-CH-6A	1	0	0	0	0	0	0	0	0	0	0
OI-CH-6A	2	0	0	0	0	0	0	0	0	0	0
OI-CH-6A	3	0	0	0	0	0	0	0	0	0	0
OI-CH-6A	4	0	0	0	0	0	0	0	0	0	0
OI-CH-6A	5	0	0	0	0	0	0	0	0	0	0

Sediment Treatment	Rep	Number on Water Surface 1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-CH-4	1	0	0	1	0	0	0	0	0	0	BL
00-CH-4	2	0	0	0	0	0	0	0	0	0	0
00-CH-4	3	1	1	0	1	0	0	0	0	0	0
00-CH-4	4	0	1	0	1	0	0	0	0	0	0
00-CH-4	5	0	0	0	0	0	0	0	0	0	0
OI-CH-4A	1	1	0	0	0	0	0	0	0	0	0
OI-CH-4A	2	0	0	0	0	0	0	0	0	0	0
OI-CH-4A	3	1	0	0	0	0	0	0	0	0	0
OI-CH-4A	4	2	0	0	0	0	0	0	0	0	0
OI-CH-4A	5	0	0	0	0	0	1	0	0	0	0
00-CH-5	1	0	0	0	0	0	0	0	0	0	0
00-CH-5	2	0	0	0	0	0	0	0	0	0	0
00-CH-5	3	0	1	0	0	0	0	0	0	0	0
00-CH-5	4	0	1	0	0	0	0	0	0	0	0
00-CH-5	5	0	0	0	0	0	0	0	0	0	0
00-CH-6	1	0	1	1	0	0	0	0	0	0	0
00-CH-6	2	0	0	0	0	0	0	0	0	0	BL
00-CH-6	3	0	0	0	0	0	0	0	0	0	0
00-CH-6	4	0	0	0	0	0	0	0	0	0	0
00-CH-6	5	0	1	0	0	0	0	0	0	0	0
OI-CH-6A	1	0	0	0	0	0	0	0	0	0	0
OI-CH-6A	2	1	0	0	0	0	0	0	0	0	0
OI-CH-6A	3	0	0	0	0	0	0	0	0	0	0
OI-CH-6A	4	0	0	0	0	0	0	0	0	0	0
OI-CH-6A	5	0	0	0	0	0	0	0	0	0	0

TABLE E.6 (Contd)

Sediment Treatment	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
		Number on Sediment Surface									
00-CH-7	1	0	0	0	0	0	0	0	0	0	0
00-CH-7	2	0	0	0	0	0	0	0	0	0	0
00-CH-7	3	0	0	0	0	0	0	0	0	0	0
00-CH-7	4	0	0	0	0	0	0	0	0	0	0
00-CH-7	5	0	0	0	0	0	0	0	0	0	0
00-CH-8	1	0	0	0	0	0	0	0	0	0	0
00-CH-8	2	0	0	0	0	0	0	0	0	0	0
00-CH-8	3	0	0	0	0	0	0	0	0	0	0
00-CH-8	4	0	0	0	0	0	0	0	0	0	0
00-CH-8	5	0	0	0	0	0	0	0	0	0	0
0I-MA-1L	1	0	0	0	0	0	0	0	0	0	0
0I-MA-1L	2	0	0	0	0	0	0	0	0	0	0
0I-MA-1L	3	0	0	0	0	0	0	0	0	0	0
0I-MA-1L	4	0	0	0	0	0	0	0	0	0	0
0I-MA-1L	5	0	0	0	0	0	0	0	0	0	0
0I-MA-2U	1	0	0	0	0	0	0	0	0	0	0
0I-MA-2U	2	0	0	0	0	0	0	0	0	0	0
0I-MA-2U	3	0	0	0	0	0	0	0	0	0	0
0I-MA-2U	4	0	0	0	0	0	0	0	0	0	0
0I-MA-2U	5	0	0	0	0	0	0	0	0	0	0
0I-MA-2L	1	0	0	0	0	0	1	0	0	0	0
0I-MA-2L	2	0	0	0	0	0	0	0	0	0	0
0I-MA-2L	3	0	0	0	0	0	0	0	0	0	0
0I-MA-2L	4	0	0	0	0	0	0	0	0	0	0
0I-MA-2L	5	0	0	0	0	0	0	0	0	0	0

Sediment Treatment	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
		Number on Water Surface									
00-CH-7	1	1	0	0	0	0	0	0	0	0	0
00-CH-7	2	0	0	0	0	0	0	0	0	0	0
00-CH-7	3	0	0	0	0	0	0	0	0	0	0
00-CH-7	4	0	0	0	1	0	0	0	0	0	0
00-CH-7	5	0	0	0	0	0	0	0	0	0	0
00-CH-8	1	0	0	0	0	0	0	0	0	0	0
00-CH-8	2	0	0	0	2	0	0	0	0	0	0
00-CH-8	3	0	0	0	0	0	0	0	0	0	0
00-CH-8	4	0	0	0	0	0	0	0	0	0	0
00-CH-8	5	0	0	0	0	0	0	0	0	0	0
0I-MA-1L	1	0	0	0	0	0	0	0	0	BL	0
0I-MA-1L	2	0	0	0	0	0	0	0	0	0	0
0I-MA-1L	3	0	0	0	0	0	0	0	0	0	0
0I-MA-1L	4	0	0	0	1	0	0	0	0	0	0
0I-MA-1L	5	0	0	0	0	1	0	0	0	0	0
0I-MA-2U	1	0	0	0	0	0	0	0	0	0	0
0I-MA-2U	2	1	0	0	0	0	0	0	0	0	0
0I-MA-2U	3	0	0	0	0	0	0	0	0	0	0
0I-MA-2U	4	0	0	0	0	1	0	0	0	0	0
0I-MA-2U	5	1	0	0	0	0	0	0	0	0	0
0I-MA-2L	1	0	0	0	0	0	0	0	0	0	0
0I-MA-2L	2	0	0	0	0	0	0	0	0	0	0
0I-MA-2L	3	0	0	0	0	0	0	0	0	0	0
0I-MA-2L	4	0	0	0	0	0	0	0	0	0	0
0I-MA-2L	5	0	0	0	0	0	0	0	0	0	0

TABLE E.6 (Contd)

Sediment Treatment	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
		Number on Sediment Surface									
OI-SS-4L	1	0	0	0	0	0	0	0	0	0	0
OI-SS-4L	2	0	0	0	0	0	0	0	0	0	0
OI-SS-4L	3	0	0	0	0	0	0	0	0	0	0
OI-SS-4L	4	0	0	0	0	0	0	0	0	0	0
OI-SS-4L	5	0	0	0	0	0	0	0	0	0	0
OI-TS-5AL	1	0	0	0	0	0	1	0	0	0	0
OI-TS-5AL	2	0	0	0	0	0	0	0	0	0	0
OI-TS-5AL	3	0	0	0	0	0	0	0	0	0	0
OI-TS-5AL	4	0	0	0	0	0	0	0	0	0	0
OI-TS-5AL	5	0	0	0	0	0	0	0	0	0	0
OI-TS-5AU	1	0	0	0	0	0	0	0	0	0	0
OI-TS-5AU	2	0	0	0	0	0	0	0	0	0	0
OI-TS-5AU	3	0	0	0	0	0	0	0	0	0	0
OI-TS-5AU	4	BL	0	0	0	0	0	0	0	0	0
OI-TS-5AU	5	0	0	0	0	0	0	0	0	0	0
OO-W-1	1	0	0	0	0	0	0	0	0	0	0
OO-W-1	2	0	0	0	0	0	0	0	0	0	0
OO-W-1	3	0	0	0	0	0	0	0	0	0	0
OO-W-1	4	0	0	0	0	0	0	0	0	0	0
OO-W-1	5	0	0	0	0	0	0	0	0	0	0
OO-W-2	1	0	0	0	0	0	0	0	0	0	0
OO-W-2	2	0	0	0	0	0	0	0	0	0	0
OO-W-2	3	0	0	0	0	0	0	0	0	0	0
OO-W-2	4	0	0	0	0	0	0	0	0	0	0
OO-W-2	5	0	0	0	0	0	0	0	0	0	0

Sediment Treatment	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
		Number on Water Surface									
OI-SS-4L	1	0	0	0	0	0	0	0	0	0	0
OI-SS-4L	2	0	0	0	0	0	0	0	0	0	0
OI-SS-4L	3	0	0	0	0	0	0	0	0	0	0
OI-SS-4L	4	0	0	0	0	0	1	0	0	0	0
OI-SS-4L	5	0	0	0	0	0	0	0	0	0	0
OI-TS-5AL	1	3	0	1	0	0	0	0	0	0	0
OI-TS-5AL	2	0	0	0	0	0	0	0	0	0	0
OI-TS-5AL	3	0	0	0	0	0	0	0	0	0	0
OI-TS-5AL	4	0	0	0	0	0	0	0	0	0	0
OI-TS-5AL	5	0	0	0	0	0	0	0	0	0	0
OI-TS-5AU	1	1	0	1	1	0	0	0	0	0	0
OI-TS-5AU	2	0	0	0	0	0	0	0	0	0	0
OI-TS-5AU	3	0	0	0	0	0	0	0	0	0	0
OI-TS-5AU	4	BL	0	0	0	0	0	0	0	0	0
OI-TS-5AU	5	0	0	0	0	0	0	0	0	0	0
OO-W-1	1	0	0	0	0	0	0	0	0	0	0
OO-W-1	2	0	0	0	1	0	0	0	0	0	0
OO-W-1	3	0	0	0	1	0	0	0	0	0	0
OO-W-1	4	0	0	0	0	0	0	0	0	0	0
OO-W-1	5	0	0	0	0	0	0	0	0	0	0
OO-W-2	1	0	0	0	0	0	0	0	0	0	0
OO-W-2	2	0	0	0	0	0	0	0	0	0	0
OO-W-2	3	0	0	0	0	0	0	0	0	0	0
OO-W-2	4	0	0	0	0	0	0	0	0	0	0
OO-W-2	5	0	0	0	0	0	0	0	0	0	0

TABLE E.6 (Contd)

Sediment Treatment	Number on Sediment Surface										
	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-W-3	1	0	0	0	0	0	0	0	0	0	0
00-W-3	2	0	0	0	0	0	0	0	0	0	0
00-W-3	3	0	0	0	0	0	0	0	0	0	0
00-W-3	4	0	0	0	0	0	0	0	0	0	0
00-W-3	5	0	0	0	0	0	0	0	0	0	0
00-W-4	1	0	0	0	0	0	0	0	0	0	0
00-W-4	2	0	0	0	0	0	0	0	0	0	0
00-W-4	3	0	0	0	0	0	0	0	0	0	0
00-W-4	4	0	0	0	0	0	0	0	0	0	0
00-W-4	5	0	0	0	0	0	0	0	0	0	0
00-W-5	1	0	0	0	0	0	0	0	0	0	0
00-W-5	2	0	0	0	0	0	0	0	0	0	BL
00-W-5	3	0	0	0	BP	0	0	0	0	0	BL
00-W-5	4	0	0	0	BP	0	0	0	0	0	0
00-W-5	5	0	0	0	0	0	0	0	0	0	0
PR-coarse	1	0	0	0	0	0	0	0	0	0	0
PR-coarse	2	0	0	0	0	0	0	0	0	0	0
PR-coarse	3	0	0	0	0	0	0	0	0	0	0
PR-coarse	4	0	0	0	0	0	0	0	0	0	0
PR-coarse	5	0	0	0	0	0	0	0	0	0	0
PR-fine	1	0	0	0	0	0	0	0	0	0	0
PR-fine	2	0	0	0	0	0	0	0	0	0	0
PR-fine	3	0	0	0	0	0	0	0	0	0	0
PR-fine	4	0	0	0	0	0	0	0	0	0	0
PR-fine	5	0	0	0	0	0	0	0	0	0	0

Sediment Treatment	Number on Water Surface										
	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-W-3	1	0	0	0	0	0	0	0	0	0	0
00-W-3	2	0	1	0	0	0	0	0	0	0	0
00-W-3	3	0	0	0	0	0	0	0	0	0	0
00-W-3	4	0	0	0	0	0	0	0	0	0	0
00-W-3	5	0	0	0	0	0	0	0	0	0	0
00-W-4	1	0	0	1	0	0	0	0	0	0	1
00-W-4	2	1	0	0	1	0	0	0	0	0	0
00-W-4	3	0	0	0	0	0	0	0	0	0	0
00-W-4	4	0	0	0	0	0	0	0	0	0	0
00-W-4	5	1	0	0	0	0	0	0	0	0	0
00-W-5	1	0	0	1	0	0	0	0	0	0	0
00-W-5	2	0	0	0	BP	0	0	0	0	0	BL
00-W-5	3	0	0	0	0	0	0	0	0	0	BL
00-W-5	4	0	0	0	0	0	0	0	0	0	0
00-W-5	5	0	0	0	0	0	0	0	0	0	0
PR-coarse	1	0	0	0	0	0	0	0	0	0	0
PR-coarse	2	0	0	0	0	0	0	0	0	0	0
PR-coarse	3	0	0	0	0	0	0	0	0	0	0
PR-coarse	4	0	1	0	0	0	0	0	0	0	0
PR-coarse	5	0	0	0	0	0	0	0	0	0	0
PR-fine	1	0	0	0	0	0	0	0	0	0	0
PR-fine	2	0	0	0	1	0	0	0	0	0	0
PR-fine	3	0	0	0	0	0	0	0	0	0	0
PR-fine	4	0	0	0	0	0	0	0	0	0	0
PR-fine	5	0	0	0	0	0	0	0	0	0	0

TABLE E.6 (Contd)

Sediment Treatment	Number on Sediment Surface Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
Tomales Bay	1	0	0	0	0	0	0	0	0	0	0
Tomales Bay	2	0	0	0	0	0	0	0	0	0	0
Tomales Bay	3	0	0	0	0	0	0	0	0	0	0
Tomales Bay	4	0	0	1	0	0	0	0	0	0	0
Tomales Bay	5	0	0	0	0	0	0	0	0	0	0

Sediment Treatment	Number on Water Surface Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
Tomales Bay	1	0	0	0	0	0	0	0	0	0	0
Tomales Bay	2	0	0	0	0	0	0	0	0	0	0
Tomales Bay	3	0	0	0	0	0	0	0	0	0	0
Tomales Bay	4	0	0	0	0	0	0	0	0	0	0
Tomales Bay	5	0	0	0	0	0	0	0	0	0	0

TABLE E.7 Rhepoxynius: Observations - Flow-Through - Sediment

Sediment Treatment	Rep	Number on Sediment Surface 1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
OI-CH-0	1	0	1	0	0	0	0	1	1	1	1
OI-CH-0	2	0	0	0	0	1	1	2	2	1	0
OI-CH-0	3	0	0	1	0	0	0	0	0	0	0
OI-CH-0	4	0	0	0	0	0	0	0	0	0	0
OI-CH-0	5	0	0	0	0	0	0	0	0	0	0
00-CH-1	1	1	0	0	0	0	1	1	1	1	1
00-CH-1	2	0	0	0	0	0	2	1	1	1	0
00-CH-1	3	0	0	0	0	0	0	1	0	0	0
00-CH-1	4	0	1	0	0	0	0	0	1	0	1
00-CH-1	5	0	0	0	0	0	0	0	1	1	1
00-CH-2	1	0	0	0	0	0	0	0	0	0	0
00-CH-2	2	0	0	0	0	0	0	1	1	0	1
00-CH-2	3	0	0	0	0	0	0	1	0	0	0
00-CH-2	4	0	0	0	0	0	0	0	0	0	0
00-CH-2	5	0	1	0	1	0	0	0	1	2	1
OI-CH-2A	1	0	0	1	0	0	1	1	0	0	0
OI-CH-2A	2	0	0	0	1	0	0	0	0	0	0
OI-CH-2A	3	0	0	0	1	0	0	0	0	0	1
OI-CH-2A	4	1	0	1	0	1	0	0	0	0	0
OI-CH-2A	5	0	0	0	0	0	0	0	0	0	0
00-CH-3	1	0	0	1	0	1	1	0	0	0	0
00-CH-3	2	1	0	1	1	1	0	0	0	0	0
00-CH-3	3	0	1	0	1	2	1	0	2	2	2
00-CH-3	4	0	0	0	0	0	0	0	1	0	0
00-CH-3	5	0	1	0	0	0	0	1	2	1	1

Sediment Treatment	Rep	Number on Water Surface 1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
OI-CH-0	1	3	2	1	1	0	0	0	2	0	1
OI-CH-0	2	4	0	1	2	0	0	0	0	0	0
OI-CH-0	3	0	0	0	1	0	0	0	0	0	0
OI-CH-0	4	0	0	2	0	0	0	0	0	0	0
OI-CH-0	5	3	0	0	0	0	0	0	0	0	0
00-CH-1	1	1	0	2	5	5	2	1	1	0	1
00-CH-1	2	1	2	4	4	4	0	0	0	0	1
00-CH-1	3	0	0	2	0	0	1	0	2	0	3
00-CH-1	4	0	0	0	1	1	0	1	1	0	0
00-CH-1	5	0	2	2	4	1	0	0	0	0	0
00-CH-2	1	0	3	4	8	1	0	1	0	0	0
00-CH-2	2	0	6	8	1	4	0	0	1	0	1
00-CH-2	3	1	4	5	2	2	1	0	0	0	1
00-CH-2	4	0	1	7	7	3	1	0	0	1	0
00-CH-2	5	0	3	1	3	3	0	2	0	0	0
OI-CH-2A	1	0	4	7	3	6	0	1	0	0	2
OI-CH-2A	2	1	5	3	1	3	1	2	1	3	2
OI-CH-2A	3	0	6	3	1	3	1	2	0	4	1
OI-CH-2A	4	0	1	1	2	6	1	0	1	0	2
OI-CH-2A	5	2	2	4	1	0	0	2	1	0	1
00-CH-3	1	0	0	0	0	1	0	0	0	1	0
00-CH-3	2	0	1	5	2	1	1	2	2	0	3
00-CH-3	3	1	0	3	5	2	1	1	0	1	0
00-CH-3	4	0	1	3	6	1	1	2	0	3	1
00-CH-3	5	2	2	5	3	1	0	1	0	0	2

TABLE E.7 (Contd)

Sediment Treatment	Rep	Number on Sediment Surface 1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-CH-4	1	0	0	0	1	0	0	0	0	1	1
00-CH-4	2	0	0	0	0	0	0	0	1	0	0
00-CH-4	3	0	0	0	2	0	0	2	1	1	0
00-CH-4	4	0	0	0	0	0	0	0	0	0	0
00-CH-4	5	0	0	0	0	0	0	0	0	0	0
0I-CH-4A	1	0	0	0	0	0	1	0	0	1	0
0I-CH-4A	2	0	0	0	0	0	0	0	0	0	0
0I-CH-4A	3	0	0	0	0	0	0	0	0	0	0
0I-CH-4A	4	0	0	1	0	0	0	0	0	0	0
0I-CH-4A	5	1	1	1	1	2	1	0	0	1	1
00-CH-5	1	0	0	0	0	0	1	1	1	1	1
00-CH-5	2	0	1	1	0	0	0	1	1	1	1
00-CH-5	3	0	0	0	0	0	0	0	0	0	0
00-CH-5	4	0	0	0	1	1	2	1	2	2	1
00-CH-5	5	2	0	0	1	0	0	0	0	0	1
00-CH-6	1	0	0	0	0	0	0	0	0	0	0
00-CH-6	2	0	0	0	0	0	0	0	0	1	2
00-CH-6	3	0	0	0	1	0	1	1	0	1	1
00-CH-6	4	0	0	0	0	0	0	0	0	0	1
00-CH-6	5	0	0	0	0	0	0	0	1	0	0
0I-CH-6A	1	0	0	0	0	0	0	0	0	0	0
0I-CH-6A	2	0	0	0	0	0	0	0	0	0	0
0I-CH-6A	3	0	0	0	0	0	0	0	0	0	0
0I-CH-6A	4	0	0	0	0	0	0	1	1	1	1
0I-CH-6A	5	0	2	0	0	0	0	0	1	1	0

Sediment Treatment	Rep	Number on Water Surface 1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-CH-4	1	4	2	1	2	1	0	3	2	1	2
00-CH-4	2	2	1	1	1	0	0	1	0	1	1
00-CH-4	3	9	4	2	3	0	1	0	0	1	0
00-CH-4	4	3	1	2	0	1	0	1	1	1	1
00-CH-4	5	4	1	2	0	0	1	0	1	0	1
0I-CH-4A	1	1	0	3	0	0	2	0	0	0	1
0I-CH-4A	2	1	0	1	1	0	0	0	0	0	0
0I-CH-4A	3	0	0	3	3	1	1	0	0	0	0
0I-CH-4A	4	2	0	1	0	0	1	0	0	1	0
0I-CH-4A	5	5	0	0	3	2	0	0	0	0	1
00-CH-5	1	2	4	7	1	1	0	1	0	0	0
00-CH-5	2	0	2	1	0	0	1	1	2	0	0
00-CH-5	3	0	6	4	1	2	3	3	2	2	3
00-CH-5	4	3	4	2	3	1	0	2	0	1	1
00-CH-5	5	0	1	0	0	0	1	2	0	1	0
00-CH-6	1	4	3	4	0	1	0	2	1	0	0
00-CH-6	2	0	0	1	1	0	0	0	0	0	BL
00-CH-6	3	1	0	0	4	1	1	1	0	0	1
00-CH-6	4	0	2	5	0	0	2	0	0	0	0
00-CH-6	5	0	0	2	1	0	1	0	1	0	0
0I-CH-6A	1	0	0	0	2	3	0	0	0	0	0
0I-CH-6A	2	4	1	0	2	2	1	0	0	0	0
0I-CH-6A	3	0	0	0	1	2	0	0	0	0	0
0I-CH-6A	4	1	0	1	1	0	2	0	0	0	1
0I-CH-6A	5	1	0	0	1	1	1	0	1	1	0

TABLE E.7 (Contd)

Sediment Treatment	Number on Sediment Surface										
	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-CH-7	1	0	0	2	1	0	0	0	0	0	0
00-CH-7	2	0	0	0	0	0	0	0	0	0	0
00-CH-7	3	0	0	0	0	0	0	1	0	0	0
00-CH-7	4	1	0	1	0	0	0	0	0	0	0
00-CH-7	5	1	1	0	1	1	0	0	0	0	0
00-CH-8	1	0	0	0	0	0	0	0	0	2	0
00-CH-8	2	0	0	0	0	0	0	1	0	1	0
00-CH-8	3	0	0	0	0	0	0	0	0	0	0
00-CH-8	4	0	0	0	0	0	0	1	1	1	1
00-CH-8	5	0	0	0	0	0	0	0	0	0	0
0I-MA-1L	1	0	2	4	0	3	4	2	2	1	3
0I-MA-1L	2	0	0	0	0	0	0	0	0	2	0
0I-MA-1L	3	0	0	1	0	0	1	2	2	2	2
0I-MA-1L	4	1	1	2	1	1	0	1	1	1	1
0I-MA-1L	5	0	0	0	0	1	0	0	1	0	0
0I-MA-2U	1	1	1	0	0	0	0	0	0	1	1
0I-MA-2U	2	0	0	0	1	0	0	0	0	0	0
0I-MA-2U	3	0	0	0	0	0	0	0	0	0	0
0I-MA-2U	4	0	0	0	0	0	0	0	0	0	0
0I-MA-2U	5	0	0	0	1	0	1	1	0	1	0
0I-MA-2L	1	0	0	0	0	0	0	0	0	0	0
0I-MA-2L	2	0	0	0	0	1	1	2	2	1	2
0I-MA-2L	3	0	0	0	0	0	0	0	1	0	0
0I-MA-2L	4	0	0	0	1	2	0	0	0	0	1
0I-MA-2L	5	0	0	0	0	0	0	1	1	1	1

Sediment Treatment	Number on Water Surface										
	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-CH-7	1	8	3	0	0	0	0	0	0	0	0
00-CH-7	2	3	3	1	3	1	0	2	1	1	2
00-CH-7	3	1	3	0	0	0	0	2	0	0	1
00-CH-7	4	0	1	0	2	0	0	2	0	0	1
00-CH-7	5	0	0	0	0	0	0	0	0	0	0
00-CH-8	1	0	0	0	0	0	1	0	0	0	0
00-CH-8	2	0	4	2	0	0	0	0	0	0	0
00-CH-8	3	1	2	3	0	0	0	0	0	0	1
00-CH-8	4	3	1	3	1	0	1	2	0	1	0
00-CH-8	5	0	0	0	0	0	0	0	0	0	0
0I-MA-1L	1	0	0	0	0	0	0	0	0	BL	0
0I-MA-1L	2	1	0	1	2	1	1	0	0	2	1
0I-MA-1L	3	0	0	1	3	2	0	0	0	1	0
0I-MA-1L	4	0	0	0	1	1	2	0	1	1	0
0I-MA-1L	5	1	0	1	1	4	2	1	1	0	0
0I-MA-2U	1	3	0	0	2	0	0	0	2	0	1
0I-MA-2U	2	4	0	4	4	3	2	2	2	3	0
0I-MA-2U	3	1	0	2	1	0	2	0	0	3	3
0I-MA-2U	4	3	0	2	2	4	1	2	1	3	4
0I-MA-2U	5	5	0	4	4	8	4	2	3	4	0
0I-MA-2L	1	0	0	5	4	0	0	1	2	1	1
0I-MA-2L	2	0	0	1	0	1	0	0	0	0	1
0I-MA-2L	3	1	0	0	0	0	0	0	0	0	0
0I-MA-2L	4	1	0	1	0	0	1	0	0	0	0
0I-MA-2L	5	2	0	0	2	2	2	0	1	2	1

TABLE E.7 (Contd)

Sediment Treatment	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
		Number on Sediment Surface									
OI-SS-4L	1	0	0	0	0	0	0	1	1	1	1
OI-SS-4L	2	0	0	0	0	0	0	0	0	0	0
OI-SS-4L	3	0	1	1	1	1	1	1	1	1	0
OI-SS-4L	4	0	0	0	0	0	0	0	0	0	0
OI-SS-4L	5	0	0	0	0	1	1	1	0	0	1
OI-TS-5AL	1	0	0	0	0	0	0	0	0	0	0
OI-TS-5AL	2	0	0	0	0	0	0	0	0	0	0
OI-TS-5AL	3	0	0	0	0	2	2	1	2	2	2
OI-TS-5AL	4	0	0	0	0	0	0	0	0	0	0
OI-TS-5AL	5	1	0	1	0	0	0	0	0	0	0
OI-TS-5AU	1	0	0	0	0	0	1	0	0	0	1
OI-TS-5AU	2	1	0	0	0	0	0	0	0	0	0
OI-TS-5AU	3	1	0	0	0	0	1	0	0	0	0
OI-TS-5AU	4	2	0	0	0	0	0	0	0	0	1
OI-TS-5AU	5	0	0	0	0	0	0	0	0	0	0
OO-W-1	1	1	0	0	0	0	0	1	1	1	1
OO-W-1	2	0	0	0	0	0	0	0	0	0	1
OO-W-1	3	0	0	0	0	1	0	0	0	0	0
OO-W-1	4	0	0	0	1	0	0	0	0	0	0
OO-W-1	5	0	0	1	1	1	1	0	0	0	1
OO-W-2	1	0	0	0	0	0	0	0	0	1	1
OO-W-2	2	0	1	0	0	0	0	1	1	1	1
OO-W-2	3	0	0	0	0	0	0	0	0	0	0
OO-W-2	4	0	1	1	1	0	0	0	0	0	0
OO-W-2	5	0	0	0	0	0	0	0	0	0	0

Sediment Treatment	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
		Number on Water Surface									
OI-SS-4L	1	2	0	0	0	0	0	0	0	0	0
OI-SS-4L	2	2	0	0	1	1	0	0	0	0	0
OI-SS-4L	3	1	0	1	2	0	0	0	0	0	0
OI-SS-4L	4	0	0	0	1	0	0	0	1	0	0
OI-SS-4L	5	0	0	1	1	1	0	0	0	1	0
OI-TS-5AL	1	7	0	5	6	5	3	1	2	2	1
OI-TS-5AL	2	0	0	1	0	0	2	0	1	3	0
OI-TS-5AL	3	4	2	4	7	4	1	0	0	1	1
OI-TS-5AL	4	2	1	2	1	1	2	1	0	1	0
OI-TS-5AL	5	3	0	3	5	0	1	0	0	1	1
OI-TS-5AU	1	3	1	5	2	1	3	0	0	2	1
OI-TS-5AU	2	1	0	0	0	4	0	1	2	2	0
OI-TS-5AU	3	6	0	4	1	1	1	0	0	1	0
OI-TS-5AU	4	1	0	0	1	1	0	0	2	0	1
OI-TS-5AU	5	0	0	0	0	3	0	0	0	0	0
OO-W-1	1	0	0	2	5	2	1	0	0	0	0
OO-W-1	2	0	3	3	3	1	2	0	2	0	0
OO-W-1	3	0	2	1	2	3	1	1	3	4	0
OO-W-1	4	0	2	2	0	2	0	0	0	0	1
OO-W-1	5	0	4	2	3	3	3	0	2	2	0
OO-W-2	1	3	3	4	6	2	1	1	1	0	0
OO-W-2	2	0	0	0	3	0	0	0	0	1	0
OO-W-2	3	0	4	6	5	4	1	1	2	1	0
OO-W-2	4	1	1	1	3	1	1	1	2	1	0
OO-W-2	5	0	1	2	3	4	0	1	0	0	0

TABLE E.7 (Contd)

Sediment Treatment	Number on Sediment Surface										
	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-W-3	1	2	0	0	0	0	0	0	2	2	2
00-W-3	2	1	0	0	2	0	0	0	0	0	0
00-W-3	3	0	0	0	0	0	0	0	0	1	0
00-W-3	4	0	0	0	0	0	0	0	0	0	0
00-W-3	5	1	0	0	0	0	0	0	0	0	0
00-W-4	1	BL	0	0	0	0	0	0	0	0	0
00-W-4	2	0	0	1	0	0	0	1	1	1	2
00-W-4	3	0	0	1	0	0	1	0	0	1	1
00-W-4	4	0	0	1	1	0	0	0	0	1	2
00-W-4	5	0	0	0	0	0	0	0	0	0	0
00-W-5	1	0	0	0	0	0	0	0	0	0	0
00-W-5	2	0	0	0	1	0	0	0	0	0	0
00-W-5	3	0	0	0	BP	0	0	0	0	0	2
00-W-5	4	0	0	0	BP	0	0	0	0	0	0
00-W-5	5	0	0	0	0	0	0	0	0	0	0
PR-coarse	1	0	1	1	1	1	1	0	1	1	1
PR-coarse	2	0	0	0	2	0	0	0	0	0	0
PR-coarse	3	0	1	1	1	1	1	1	1	1	0
PR-coarse	4	0	0	0	0	0	0	0	0	0	1
PR-coarse	5	0	0	0	0	0	0	0	0	0	0
PR-fine	1	1	1	0	0	0	0	0	0	0	0
PR-fine	2	0	0	0	0	0	0	0	0	0	0
PR-fine	3	1	0	0	0	1	0	0	0	0	0
PR-fine	4	0	0	0	0	0	0	0	0	0	1
PR-fine	5	0	0	0	0	0	0	0	0	0	0

Sediment Treatment	Number on Water Surface										
	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-W-3	1	2	3	4	3	0	1	2	0	1	0
00-W-3	2	3	6	2	0	0	1	1	1	2	0
00-W-3	3	0	1	0	0	0	0	0	0	0	0
00-W-3	4	1	1	0	7	0	0	1	0	0	1
00-W-3	5	2	0	0	0	0	1	0	1	1	2
00-W-4	1	7	1	4	0	0	2	1	1	1	2
00-W-4	2	4	6	BL	0	1	4	2	1	5	1
00-W-4	3	5	5	2	2	0	1	0	1	1	1
00-W-4	4	2	4	7	7	1	0	1	0	1	7
00-W-4	5	6	3	1	4	0	2	2	0	2	4
00-W-5	1	0	1	0	2	0	0	0	0	0	0
00-W-5	2	0	2	0	BP	0	0	0	0	0	BL
00-W-5	3	0	0	2	3	0	1	0	2	0	BL
00-W-5	4	1	0	3	1	0	0	0	0	0	0
00-W-5	5	1	0	1	0	0	0	0	0	1	0
PR-coarse	1	1	0	2	2	0	0	1	0	1	0
PR-coarse	2	2	5	3	0	3	1	1	0	1	0
PR-coarse	3	1	0	0	1	1	0	0	0	0	0
PR-coarse	4	0	1	0	4	2	1	0	0	1	0
PR-coarse	5	0	3	1	2	1	0	0	0	0	0
PR-fine	1	2	2	0	2	1	0	0	0	0	0
PR-fine	2	0	3	0	BL	0	0	0	0	0	0
PR-fine	3	1	2	0	2	2	0	0	0	0	0
PR-fine	4	0	0	0	1	0	0	1	0	0	0
PR-fine	5	0	0	0	2	0	0	0	0	0	0

TABLE E.7 (Contd)

Sediment Treatment	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
	Number on Sediment Surface										
Tomales Bay	1	1	1	1	0	2	1	2	1	0	0
Tomales Bay	2	0	1	0	0	0	0	0	0	0	1
Tomales Bay	3	0	0	0	0	0	0	0	0	1	1
Tomales Bay	4	0	0	0	0	0	0	0	0	0	0
Tomales Bay	5	0	0	0	0	0	0	0	0	0	0

Sediment Treatment	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
	Number on Water Surface										
Tomales Bay	1	0	3	0	2	0	0	0	0	0	0
Tomales Bay	2	0	0	1	0	1	0	0	0	0	0
Tomales Bay	3	0	0	0	0	0	0	0	0	0	0
Tomales Bay	4	0	1	0	0	0	0	0	0	0	0
Tomales Bay	5	0	0	0	0	0	0	0	0	0	0

APPENDIX F

BIOASSAY RESULTS FOR STATIC AMPELISCA/RHEPOXYNIUS TEST

TABLE F.1 Bioassay Results for *Ampelisca abidta* Static

Sediment Treatment	Rep	Alive	Dead	Proportion Surviving in All Reps
OI-CH-0	1	17	3	
	2	19	1	
	3	18	2	
	4	19	1	
	5	18	2	0.91
OO-CH-1	1	20	0	
	2	17	3	
	3	18	2	
	4	18	2	
	5	19	1	0.92
OO-CH-2	1	20	0	
	2	20	0	
	3	19	1	
	4	18	2	
	5	19	1	0.96
OI-CH-2A	1	21	0	
	2	18	2	
	3	18	2	
	4	20	0	
	5	20	0	0.96
OO-CH-3	1	19	1	
	2	18	2	
	3	19	1	
	4	17	3	
	5	19	1	0.92
OO-CH-4	1	18	2	
	2	17	3	
	3	20	0	
	4	18	2	
	5	19	1	0.92
OI-CH-4A	1	18	2	
	2	20	0	
	3	19	1	
	4	20	0	
	5	20	0	0.97
OO-CH-5	1	17	3	
	2	19	1	
	3	19	1	
	4	18	2	
	5	19	1	0.92

TABLE F.1 (Contd)

Sediment Treatment	Rep	Alive	Dead	Proportion Surviving in All Reps
00-CH-6	1	17	3	
	2	15	5	
	3	18	2	
	4	18	2	
	5	19	1	0.87
0I-CH-6A	1	20	0	
	2	19	1	
	3	20	0	
	4	20	0	
	5	19	1	0.98
00-CH-7	1	19	1	
	2	19	1	
	3	19	1	
	4	17	3	
	5	18	2	0.92
00-CH-8	1	20	0	
	2	16	4	
	3	20	0	
	4	18	2	
	5	16	4	0.90
0I-MA-1L	1	19	1	
	2	18	2	
	3	16	4	
	4	19	1	
	5	17	3	0.89
0I-MA-2U	1	19	1	
	2	20	0	
	3	18	2	
	4	20	0	
	5	20	0	0.97
0I-MA-2L	1	20	0	
	2	20	0	
	3	18	2	
	4	18	2	
	5	19	1	0.95
0I-SS-4L	1	19	1	
	2	19	1	
	3	16	4	
	4	18	2	
	5	20	0	0.92

TABLE F.1 (Contd)

Sediment Treatment	Rep	Alive	Dead	Proportion Surviving in All Reps
OI-TS-5AL	1	9	11	
	2	8	12	
	3	13	7	
	4	8	12	
	5	9	11	0.47
OI-TS-5AU	1	16	4	
	2	13	7	
	3	16	4	
	4	14	6	
	5	13	7	0.72
00-W-1	1	18	2	
	2	19	1	
	3	16	4	
	4	20	0	
	5	20	0	0.93
00-W-2	1	16	4	
	2	17	3	
	3	20	0	
	4	18	2	
	5	17	3	0.88
00-W-3	1	19	1	
	2	20	0	
	3	17	3	
	4	18	2	
	5	18	2	0.92
00-W-4	1	20	0	
	2	18	2	
	3	19	1	
	4	15	5	
	5	18	2	0.90
00-W-5	1	18	2	
	2	20	0	
	3	17	3	
	4	20	0	
	5	20	0	0.95

TABLE F.1 (Contd)

Sediment Treatment	Rep	Alive	Dead	Proportion Surviving in All Reps
PR-coarse	1	20	0	
	2	19	1	
	3	20	0	
	4	20	0	
	5	18	2	0.97
PR-fine	1	21	0	
	2	18	2	
	3	20	0	
	4	20	0	
	5	19	1	0.97
Tomales Bay	1	20	0	
	2	19	1	
	3	20	0	
	4	19	1	
	5	20	0	0.98

TABLE F.2 Bioassay Results for *Ampelisca abdita* Static (Rank order Based on Proportion Surviving the 10-Day Exposure)

Sediment Treatment	Proportion Surviving (all replicates)
OI-TS-5AL	0.47
OI-TS-5AU	0.72
OO-CH-6	0.87
OO-W-2	0.88
OI-MA-1L	0.89
OO-W-4	0.90
OO-CH-8	0.90
OI-CH-0	0.91
OO-CH-7	0.92
OI-SS-4L	0.92
OO-CH-5	0.92
OO-W-3	0.92
OO-CH-4	0.92
OO-CH-3	0.92
OO-CH-1	0.92
OO-W-1	0.93
OO-W-5	0.95
OI-MA-2L	0.95
OI-CH-2A	0.96
OO-CH-2	0.96
OI-MA-2U	0.97
PR-coarse	0.97
OI-CH-4A	0.97
PR-fine	0.97
OI-CH-6A	0.98
Tomales Bay	0.98

TABLE F.3 Bioassay Results for *Rhepoxynius abronius* Static

Sediment Treatment	Rep	Alive	Dead	Proportion Surviving in All Reps
OI-CH-0	1	18	2	
	2	18	2	
	3	19	1	
	4	20	0	
	5	17	3	0.92
OO-CH-1	1	17	3	
	2	20	0	
	3	19	1	
	4	20	0	
	5	17	3	0.93
OO-CH-2	1	18	2	
	2	20	0	
	3	19	1	
	4	17	3	
	5	18	2	0.92
OI-CH-2A	1	20	0	
	2	19	1	
	3	18	2	
	4	17	3	
	5	14	6	0.88
OO-CH-3	1	17	3	
	2	20	0	
	3	16	4	
	4	16	4	
	5	18	2	0.87
OO-CH-4	1	17	3	
	2	19	1	
	3	15	5	
	4	19	1	
	5	18	2	0.88
OI-CH-4A	1	19	1	
	2	19	1	
	3	20	0	
	4	20	0	
	5	20	0	0.98
OO-CH-5	1	18	2	
	2	17	3	
	3	20	0	
	4	17	3	
	5	20	0	0.92

TABLE F.3 (Contd)

Sediment Treatment	Rep	Alive	Dead	Proportion Surviving in All Reps
00-CH-6	1	19	1	
	2	17	3	
	3	20	0	
	4	18	2	
	5	18	2	0.92
0I-CH-6A	1	20	0	
	2	20	0	
	3	20	0	
	4	18	2	
	5	19	1	0.97
00-CH-7	1	18	2	
	2	20	0	
	3	17	3	
	4	17	3	
	5	19	1	0.91
00-CH-8	1	19	1	
	2	18	2	
	3	16	4	
	4	16	4	
	5	18	2	0.87
0I-MA-1L	1	12	8	
	2	13	7	
	3	11	9	
	4	17	3	
	5	10	10	0.63
0I-MA-2U	1	18	2	
	2	16	4	
	3	17	3	
	4	18	2	
	5	17	3	0.86
0I-MA-2L	1	19	1	
	2	18	2	
	3	16	4	
	4	19	1	
	5	20	0	0.92
0I-SS-4L	1	18	2	
	2	19	1	
	3	20	0	
	4	19	1	
	5	19	1	0.95

TABLE F.3 (Contd)

Sediment Treatment	Rep	Alive	Dead	Proportion Surviving in All Reps
0I-TS-5AL	1	19	1	
	2	15	5	
	3	20	0	
	4	18	2	
	5	16	4	0.88
0I-TS-5AU	1	19	1	
	2	15	5	
	3	15	5	
	4	20	0	
	5	11	9	0.80
00-W-1	1	18	2	
	2	18	2	
	3	16	4	
	4	18	2	
	5	19	1	0.89
00-W-2	1	17	3	
	2	18	2	
	3	19	1	
	4	19	1	
	5	17	3	0.90
00-W-3	1	19	1	
	2	17	3	
	3	20	0	
	4	18	2	
	5	19	1	0.93
00-W-4	1	18	2	
	2	19	1	
	3	19	1	
	4	20	0	
	5	18	2	0.94
00-W-5	1	20	0	
	2	19	1	
	3	20	0	
	4	17	3	
	5	19	1	0.95

TABLE F.3 (Contd)

Sediment Treatment	Rep	Alive	Dead	Proportion Surviving in All Reps
PR-coarse	1	20	0	
	2	20	0	
	3	20	0	
	4	20	0	
	5	20	0	1.00
PR-fine	1	19	1	
	2	20	0	
	3	20	0	
	4	20	0	
	5	19	1	0.98
Tomales Bay	1	20	0	
	2	20	0	
	3	20	0	
	4	20	0	
	5	20	0	1.00

TABLE F.4 Bioassay Results for *Rhepoxynius abronius* Static (Rank Order Based on Proportion Surviving the 10-Day Exposure)

Sediment Treatment	Proportion Surviving (all replicates)
OI-MA-1L	0.63
OI-TS-5AU	0.80
OI-MA-2U	0.86
OO-CH-3	0.87
OO-CH-8	0.87
OO-CH-4	0.88
OI-CH-2A	0.88
OI-TS-5AL	0.88
OO-W-1	0.89
OO-W-2	0.90
OO-CH-7	0.91
OI-CH-0	0.92
OO-CH-5	0.92
OO-CH-2	0.92
OO-CH-6	0.92
OI-MA-2L	0.92
OO-W-3	0.93
OO-CH-1	0.93
OO-W-4	0.94
OI-SS-4L	0.95
OO-W-5	0.95
OI-CH-6A	0.97
PR-fine	0.98
OI-CH-4A	0.98
Tomales Bay	1.00
PR-coarse	1.00

TABLE F.5 Ampelisca/Rhepoxynius Static: Water Quality

Treatment	Rep	Temperature (°C) Min	Temperature (°C) Max	Dissolved Oxygen (mg/L) Min	Dissolved Oxygen (mg/L) Max	pH Min	pH Max	Salinity (°/oo) Min	Salinity (°/oo) Max
OI-CH-0	1	14.4	15.7	7.4	8.1	7.89	8.15	32.0	33.5
OI-CH-0	2	14.7	15.7	7.1	8.3	7.98	8.17	32.0	33.0
OI-CH-0	3	14.5	15.2	7.7	8.3	7.97	8.11	32.0	33.0
OI-CH-0	4	14.5	15.5	7.8	8.4	7.99	8.14	32.0	33.0
OI-CH-0	5	14.4	15.3	7.8	8.4	7.97	8.15	32.5	33.0
OO-CH-1	1	14.5	15.3	7.7	8.2	8.03	8.23	32.0	34.0
OO-CH-1	2	14.4	15.3	7.8	8.4	8.03	8.23	32.5	34.0
OO-CH-1	3	14.3	15.2	7.8	8.3	8.04	8.23	32.5	33.0
OO-CH-1	4	14.3	15.1	7.7	8.3	8.06	8.25	32.0	33.0
OO-CH-1	5	14.3	15.1	7.7	8.4	8.04	8.68	32.0	33.0
OO-CH-2	1	14.5	15.4	7.8	8.4	7.99	8.10	32.0	34.0
OO-CH-2	2	14.5	15.4	7.8	8.3	7.94	8.10	32.0	33.0
OO-CH-2	3	14.3	15.3	7.9	8.3	7.91	8.14	32.0	33.0
OO-CH-2	4	14.3	15.2	7.7	8.3	8.00	8.15	32.0	33.0
OO-CH-2	5	14.5	15.3	7.4	8.3	7.98	8.21	32.0	33.0
OI-CH-2A	1	14.6	15.7	7.4	8.4	7.92	8.15	32.0	34.0
OI-CH-2A	2	14.4	15.3	7.8	8.4	8.04	8.20	32.5	34.0
OI-CH-2A	3	14.3	15.5	7.7	8.4	7.98	8.18	32.0	33.0
OI-CH-2A	4	14.3	15.2	7.6	8.4	7.97	8.21	32.0	33.0
OI-CH-2A	5	14.3	15.1	7.5	8.2	8.00	8.21	32.0	33.0
OO-CH-3	1	14.5	15.1	7.8	8.4	8.02	8.17	32.0	33.0
OO-CH-3	2	14.5	15.3	7.7	8.4	8.03	8.17	32.0	33.0
OO-CH-3	3	14.5	15.2	7.8	8.4	7.80	8.21	32.0	33.0
OO-CH-3	4	14.5	15.2	7.8	8.3	7.88	8.20	32.0	33.0
OO-CH-3	5	14.3	15.1	7.8	8.3	8.04	8.21	32.0	33.0
OO-CH-4	1	14.4	15.7	7.5	8.3	7.95	8.21	32.0	33.0
OO-CH-4	2	14.7	15.7	7.6	8.3	7.93	8.19	32.0	33.0
OO-CH-4	3	14.7	15.3	6.7	8.1	7.82	8.18	32.0	33.0
OO-CH-4	4	14.5	15.3	7.7	8.3	7.96	8.28	32.5	33.0
OO-CH-4	5	14.5	15.3	7.7	8.1	7.98	8.22	32.0	33.0
OI-CH-4A	1	14.3	15.3	7.7	8.2	7.90	8.14	32.0	33.0
OI-CH-4A	2	14.5	15.3	7.6	8.3	8.07	8.23	32.0	33.0
OI-CH-4A	3	14.5	15.2	7.6	8.4	8.06	8.22	32.5	33.0
OI-CH-4A	4	14.6	15.3	7.5	8.3	8.01	8.18	32.0	33.0
OI-CH-4A	5	14.6	15.2	7.7	8.3	7.72	8.19	32.0	33.0

TABLE F.5 (Contd)

Treatment	Rep	Temperature (°C) Min	Max	Dissolved Oxygen (mg/L) Min	Max	pH Min	Max	Salinity (°/oo) Min	Max
00-CH-5	1	14.5	15.7	7.5	8.4	7.98	8.23	32.0	33.0
00-CH-5	2	14.4	15.7	7.5	8.1	7.92	8.18	32.0	33.5
00-CH-5	3	14.3	15.2	7.6	8.2	7.98	8.20	32.0	33.0
00-CH-5	4	14.3	15.1	7.4	8.1	7.97	8.24	32.0	33.0
00-CH-5	5	14.2	15.1	7.6	8.4	7.99	8.25	32.0	33.0
00-CH-6	1	14.3	15.6	7.5	8.3	7.97	8.19	32.0	33.0
00-CH-6	2	14.5	15.7	7.7	8.4	7.97	8.15	32.0	33.0
00-CH-6	3	14.4	15.3	7.6	8.4	7.97	8.05	32.0	33.5
00-CH-6	4	14.5	15.4	7.7	8.3	8.06	8.23	32.5	33.0
00-CH-6	5	14.4	15.2	7.5	8.2	7.94	8.15	32.0	33.0
0I-CH-6A	1	14.7	15.6	7.2	8.1	7.89	8.15	32.0	34.0
0I-CH-6A	2	14.5	15.1	7.6	8.3	8.05	8.22	32.0	33.0
0I-CH-6A	3	14.3	15.1	7.6	8.3	8.02	8.24	32.0	33.0
0I-CH-6A	4	14.4	15.2	7.7	8.3	7.86	8.17	32.0	33.0
0I-CH-6A	5	14.3	15.2	7.7	8.2	7.94	8.19	32.0	33.0
00-CH-7	1	14.3	15.7	7.5	8.3	7.92	8.15	32.0	33.0
00-CH-7	2	14.7	15.7	7.4	8.4	7.95	8.17	32.0	33.5
00-CH-7	3	14.3	15.1	7.8	8.2	7.90	8.18	32.0	33.0
00-CH-7	4	14.5	15.2	7.5	8.2	7.96	8.17	32.0	33.0
00-CH-7	5	14.4	15.2	7.7	8.2	7.92	8.17	32.0	33.0
00-CH-8	1	14.4	15.7	7.4	8.3	7.92	8.14	32.0	33.0
00-CH-8	2	14.6	15.6	7.5	8.3	7.97	8.22	32.0	33.0
00-CH-8	3	14.5	15.6	7.4	8.2	7.96	8.18	32.0	33.0
00-CH-8	4	14.3	15.3	7.7	8.3	7.99	8.16	32.0	33.0
00-CH-8	5	14.4	15.2	7.4	8.2	7.91	8.21	32.0	33.0
0I-MA-1L	1	14.5	15.2	7.6	8.4	8.09	8.27	32.5	33.0
0I-MA-1L	2	14.4	15.2	7.6	8.2	8.02	8.26	32.5	33.0
0I-MA-1L	3	14.3	15.1	7.7	8.4	7.87	8.22	32.0	33.0
0I-MA-1L	4	14.4	15.2	7.7	8.4	7.88	8.23	32.0	34.0
0I-MA-1L	5	14.3	15.2	7.7	8.4	7.90	8.20	32.0	33.0
0I-MA-2U	1	14.7	15.7	7.3	8.3	7.80	8.11	32.0	34.0
0I-MA-2U	2	14.4	15.3	7.5	8.3	7.88	8.12	32.5	34.0
0I-MA-2U	3	14.5	15.2	7.5	8.3	8.00	8.17	32.0	33.0
0I-MA-2U	4	14.5	15.2	7.6	8.5	7.79	8.13	32.0	33.0
0I-MA-2U	5	14.5	15.2	7.5	8.3	7.71	8.15	32.0	33.0

TABLE F.5 (Contd)

Treatment	Rep	Temperature (°C) Min	Max	Dissolved Oxygen (mg/L) Min	Max	pH Min	Max	Salinity (°/oo) Min	Max
OI-MA-2L	1	14.6	15.7	7.4	8.4	7.85	8.15	32.0	34.0
OI-MA-2L	2	14.5	15.5	7.4	8.3	8.02	8.14	32.5	33.0
OI-MA-2L	3	14.6	15.4	7.7	8.3	7.95	8.17	32.0	33.0
OI-MA-2L	4	14.6	15.2	7.6	8.2	8.02	8.25	32.0	33.0
OI-MA-2L	5	14.5	15.3	7.7	8.3	7.20	8.20	32.0	33.0
OI-SS-4L	1	14.3	15.7	7.3	8.4	7.60	8.12	32.0	34.0
OI-SS-4L	2	14.3	15.7	7.5	8.3	7.83	8.17	32.0	34.0
OI-SS-4L	3	14.4	15.3	7.7	8.3	7.95	8.18	32.5	33.5
OI-SS-4L	4	14.3	15.3	7.7	8.4	7.90	8.15	32.5	34.0
OI-SS-4L	5	14.5	15.2	7.6	8.4	8.01	8.20	32.0	33.0
TOI-MA-5AL	1	14.5	15.7	7.5	8.4	7.94	8.16	32.0	33.0
TOI-MA-5AL	2	14.6	15.7	7.5	8.4	7.93	8.13	32.0	33.5
TOI-MA-5AL	3	14.4	15.3	7.7	8.2	7.97	8.16	32.0	33.0
TOI-MA-5AL	4	14.5	15.1	7.7	8.2	7.94	8.10	32.0	33.0
TOI-MA-5AL	5	14.3	15.2	7.8	8.3	7.96	8.17	32.0	33.0
TOI-MA-5AU	1	14.6	15.7	6.3	8.0	7.83	8.07	32.0	34.0
TOI-MA-5AU	2	14.5	15.5	6.8	8.3	7.93	8.17	32.0	33.0
TOI-MA-5AU	3	14.5	15.4	6.3	8.1	7.68	8.10	32.0	33.0
TOI-MA-5AU	4	14.3	15.2	7.6	8.3	7.89	8.20	32.0	33.0
TOI-MA-5AU	5	14.3	15.2	5.3	8.4	7.43	8.22	32.0	33.0
OO-W-1	1	14.6	15.7	7.5	8.4	7.96	8.23	32.0	34.0
OO-W-1	2	14.3	15.6	7.3	8.2	7.90	8.24	32.0	34.0
OO-W-1	3	14.6	15.3	7.7	8.1	8.04	8.21	32.0	33.0
OO-W-1	4	14.5	15.1	7.5	8.2	8.00	8.25	32.0	33.0
OO-W-1	5	14.5	15.3	7.7	8.3	8.05	8.26	32.0	33.0
OO-W-2	1	14.3	15.6	7.2	8.3	7.95	8.23	32.0	33.0
OO-W-2	2	14.5	15.3	7.8	8.4	8.03	8.21	32.0	33.5
OO-W-2	3	14.5	15.3	7.7	8.2	7.86	8.22	32.0	33.0
OO-W-2	4	14.3	15.1	7.7	8.4	7.99	8.23	32.0	33.0
OO-W-2	5	14.3	15.2	7.8	8.3	8.06	8.24	32.0	33.0
OO-W-3	1	14.6	15.6	6.5	8.4	7.88	8.20	32.0	33.5
OO-W-3	2	14.5	15.3	7.7	8.3	7.95	8.18	32.0	33.0
OO-W-3	3	14.5	15.2	7.6	8.3	7.98	8.20	32.0	33.0
OO-W-3	4	14.3	15.1	7.6	8.4	8.04	8.26	32.0	33.0
OO-W-3	5	14.3	15.2	7.3	8.4	7.99	8.23	32.0	33.0

TABLE F.5 (Contd)

Treatment	Rep	Temperature (°C) Min	Max	Dissolved Oxygen (mg/L) Min	Max	pH Min	Max	Salinity (°/oo) Min	Max
00-W-4	1	14.4	15.6	7.6	8.3	7.96	8.20	32.0	33.0
00-W-4	2	14.4	15.3	7.8	8.3	8.01	8.13	32.0	33.5
00-W-4	3	14.5	15.4	7.7	8.2	7.97	8.20	32.0	33.0
00-W-4	4	14.3	15.2	7.6	8.2	7.97	8.22	32.0	33.0
00-W-4	5	14.4	15.3	7.8	8.2	7.89	8.22	32.0	33.0
00-W-5	1	14.8	15.4	7.9	8.3	7.98	8.17	32.5	33.0
00-W-5	2	14.5	15.2	7.8	8.4	7.99	8.18	32.0	33.0
00-W-5	3	14.4	15.2	7.8	8.3	7.94	8.17	32.0	33.0
00-W-5	4	14.4	15.3	7.6	8.2	7.91	8.17	32.0	33.0
00-W-5	5	14.3	15.2	7.7	8.3	7.93	8.17	32.0	33.0
PR-coarse	1	14.5	15.8	7.4	8.3	7.95	8.15	32.0	34.0
PR-coarse	2	14.4	15.4	7.7	8.4	8.00	8.15	32.0	33.0
PR-coarse	3	14.5	15.1	7.8	8.3	8.04	8.15	32.0	33.0
PR-coarse	4	14.4	15.1	7.8	8.4	7.99	8.18	32.0	33.0
PR-coarse	5	14.3	15.1	7.7	8.3	7.94	8.12	32.0	33.0
PR-fine	1	14.5	15.7	7.5	8.3	7.98	8.15	32.0	34.0
PR-fine	2	14.7	15.8	7.5	8.4	7.98	8.18	32.0	34.0
PR-fine	3	14.5	15.2	7.7	8.3	8.07	8.17	32.0	33.0
PR-fine	4	14.3	15.3	7.8	8.4	8.04	8.17	32.0	33.0
PR-fine	5	14.3	15.2	7.8	8.3	7.99	8.17	32.0	33.0
Tomales Bay	1	14.4	15.3	7.5	8.4	7.92	8.18	32.5	33.0
Tomales Bay	2	14.3	15.2	7.7	8.2	7.92	8.15	32.0	33.0
Tomales Bay	3	14.4	15.2	7.9	8.4	7.97	8.17	32.5	33.0
Tomales Bay	4	14.5	15.3	7.9	8.3	7.91	8.15	32.5	33.0
Tomales Bay	5	14.4	15.3	7.5	8.3	7.88	8.13	32.0	33.0

TABLE F.6 Summary Observation for *Ampelisca* Static Test

Sediment Treatment	Number on Sediment Surface: Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
0I-CH-0	1	0	1	1	0	0	0	0	0	0	0
0I-CH-0	2	ONP	ONP	ONP	0	0	0	0	0	0	0
0I-CH-0	3	0	0	0	0	0	0	0	0	0	0
0I-CH-0	4	0	ONP	0	0	0	0	0	0	0	0
0I-CH-0	5	ONP	ONP	0	0	0	0	0	0	0	0
00-CH-1	1	0	0	ONP	0	0	0	0	0	0	0
00-CH-1	2	0	0	ONP	1	ONP	ONP	0	0	0	0
00-CH-1	3	0	ONP	ONP	0	ONP	0	0	0	0	0
00-CH-1	4	0	0	0	0	0	0	0	0	0	0
00-CH-1	5	0	0	0	0	0	0	0	0	0	0
00-CH-2	1	0	1	ONP	0	0	0	0	0	0	0
00-CH-2	2	0	0	0	0	0	0	0	0	0	0
00-CH-2	3	0	0	ONP	0	0	0	0	0	0	0
00-CH-2	4	0	0	0	0	0	0	0	0	0	0
00-CH-2	5	0	0	0	0	0	0	0	0	0	0
0I-CH-2A	1	0	0	0	0	0	0	0	0	0	0
0I-CH-2A	2	0	0	ONP	0	0	1	0	0	0	0
0I-CH-2A	3	0	0	ONP	0	0	0	0	0	0	0
0I-CH-2A	4	0	0	0	0	0	0	0	0	0	0
0I-CH-2A	5	0	0	0	0	0	0	0	0	0	0
00-CH-3	1	0	0	0	0	0	0	0	0	0	0
00-CH-3	2	0	0	0	0	0	0	0	0	0	0
00-CH-3	3	0	0	0	0	0	0	0	0	0	0
00-CH-3	4	0	0	0	0	0	0	0	0	0	0
00-CH-3	5	0	0	0	0	0	0	0	0	0	0

Sediment Treatment	Number on Water Surface: Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
0I-CH-0	1	1	1	1	0	0	0	0	0	0	0
0I-CH-0	2	0	1	4	1	0	0	0	0	0	0
0I-CH-0	3	2	0	3	2	0	0	0	0	0	0
0I-CH-0	4	0	1	1	1	0	0	0	0	0	0
0I-CH-0	5	0	1	0	0	0	0	0	0	0	0
00-CH-1	1	0	0	0	1	0	0	0	0	0	0
00-CH-1	2	0	0	1	0	0	0	0	0	0	1
00-CH-1	3	1	0	0	1	2	0	0	0	0	0
00-CH-1	4	0	0	1	1	2	0	0	0	0	0
00-CH-1	5	0	0	0	1	0	0	0	0	0	0
00-CH-2	1	2	0	1	0	0	0	0	0	0	0
00-CH-2	2	1	0	2	1	1	0	0	0	0	0
00-CH-2	3	1	0	3	2	0	0	0	0	0	0
00-CH-2	4	1	1	3	2	0	0	0	0	0	0
00-CH-2	5	0	0	4	1	3	0	0	0	0	1
0I-CH-2A	1	0	0	0	0	1	0	0	0	0	0
0I-CH-2A	2	1	1	3	2	2	0	0	0	0	0
0I-CH-2A	3	1	1	0	0	0	0	0	0	0	0
0I-CH-2A	4	0	0	0	0	0	0	0	0	0	0
0I-CH-2A	5	0	0	1	0	0	1	0	0	0	0
00-CH-3	1	0	0	0	0	1	0	0	0	0	0
00-CH-3	2	1	0	2	3	0	0	0	0	0	0
00-CH-3	3	0	2	1	2	3	0	0	0	0	0
00-CH-3	4	1	1	4	3	0	0	0	0	0	0
00-CH-3	5	0	1	4	0	1	0	1	0	0	0

ONP = observation not possible

TABLE F.6 (Contd)

Sediment Treatment	Rep	Number on Sediment Surface 1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-CH-4	1	0	ONP	0	0	0	0	0	0	0	0
00-CH-4	2	0	ONP	ONP	0	0	0	0	0	0	0
00-CH-4	3	0	0	0	0	1	0	0	0	0	0
00-CH-4	4	0	ONP	0	0	0	0	0	0	0	0
00-CH-4	5	0	0	0	0	0	0	0	0	0	0
0I-CH-4A	1	0	0	0	0	0	0	0	0	0	0
0I-CH-4A	2	0	0	0	0	0	0	0	0	0	0
0I-CH-4A	3	0	0	0	0	0	0	0	0	0	0
0I-CH-4A	4	0	0	0	0	0	0	0	0	0	0
0I-CH-4A	5	0	0	0	0	0	0	0	0	0	0
00-CH-5	1	0	ONP	ONP	0	0	0	0	0	0	0
00-CH-5	2	0	ONP	0	0	0	0	0	0	0	0
00-CH-5	3	0	0	0	0	0	0	0	0	0	0
00-CH-5	4	0	0	0	0	0	0	0	0	0	0
00-CH-5	5	0	ONP	0	0	0	0	0	0	0	0
00-CH-6	1	0	ONP	ONP	ONP	0	0	0	0	0	0
00-CH-6	2	ONP	ONP	0	0	0	0	0	0	0	0
00-CH-6	3	ONP	ONP	0	0	ONP	0	0	0	0	0
00-CH-6	4	0	ONP	0	0	0	0	0	0	0	0
00-CH-6	5	0	0	0	0	0	0	0	0	0	0
0I-CH-6A	1	0	0	0	0	0	0	0	0	0	0
0I-CH-6A	2	0	0	0	0	0	0	0	0	0	0
0I-CH-6A	3	0	0	0	0	0	0	0	0	0	0
0I-CH-6A	4	0	0	0	0	0	0	0	0	0	0
0I-CH-6A	5	0	0	0	0	0	0	0	0	0	0

Sediment Treatment	Rep	Number on Water Surface 1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-CH-4	1	0	0	1	2	0	0	0	0	0	0
00-CH-4	2	1	1	2	1	0	0	0	0	0	0
00-CH-4	3	0	0	1	0	0	0	0	0	2	2
00-CH-4	4	1	1	0	2	0	0	0	0	0	0
00-CH-4	5	1	2	3	2	1	0	0	1	0	0
0I-CH-4A	1	0	0	0	1	0	0	0	0	0	0
0I-CH-4A	2	2	0	2	2	1	1	0	1	0	0
0I-CH-4A	3	0	0	0	0	0	0	0	0	0	1
0I-CH-4A	4	1	0	1	0	0	0	0	0	0	0
0I-CH-4A	5	0	0	4	1	0	0	0	0	0	0
00-CH-5	1	1	1	1	2	0	0	0	0	0	0
00-CH-5	2	1	0	2	0	0	0	0	0	1	0
00-CH-5	3	0	1	2	2	0	1	0	0	0	1
00-CH-5	4	0	1	2	3	0	0	0	0	0	0
00-CH-5	5	0	0	1	0	0	0	0	0	1	0
00-CH-6	1	1	1	4	2	0	0	1	0	2	0
00-CH-6	2	0	0	2	0	0	0	0	0	1	1
00-CH-6	3	0	1	1	0	0	0	0	0	0	0
00-CH-6	4	0	0	0	2	0	0	0	0	0	0
00-CH-6	5	0	1	1	2	0	0	0	0	0	0
0I-CH-6A	1	2	1	2	1	1	0	0	0	0	0
0I-CH-6A	2	0	0	1	2	1	1	1	0	0	0
0I-CH-6A	3	0	5	0	0	1	3	0	0	0	0
0I-CH-6A	4	0	0	1	0	1	0	0	0	0	0
0I-CH-6A	5	0	0	2	0	2	1	0	0	0	0

TABLE F.6 (Contd)

Sediment Treatment	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
		Number on Sediment Surface									
OO-CH-7	1	0	ONP	ONP	0	1	0	0	0	0	0
OO-CH-7	2	ONP	ONP	ONP	0	0	0	0	0	0	0
OO-CH-7	3	0	0	0	0	0	0	0	0	0	0
OO-CH-7	4	0	0	0	0	1	0	0	0	0	0
OO-CH-7	5	0	0	0	0	0	0	0	0	0	0
OO-CH-8	1	ONP	ONP	ONP	ONP	0	0	0	0	0	0
OO-CH-8	2	ONP	ONP	ONP	ONP	ONP	0	0	0	0	0
OO-CH-8	3	0	ONP	ONP	ONP	0	0	0	0	0	0
OO-CH-8	4	0	ONP	0	0	0	0	0	0	0	0
OO-CH-8	5	0	ONP	0	0	0	0	0	0	0	0
OI-MA-1L	1	0	0	0	0	0	ONP	0	0	0	0
OI-MA-1L	2	0	0	0	0	0	0	0	0	0	0
OI-MA-1L	3	0	0	0	ONP	0	ONP	ONP	0	0	0
OI-MA-1L	4	0	0	0	0	0	0	0	0	0	0
OI-MA-1L	5	0	0	ONP	0	0	1	0	0	0	
OI-MA-2U	1	0	0	ONP	ONP	0	0	0	0	0	0
OI-MA-2U	2	0	0	0	ONP	0	0	0	0	0	0
OI-MA-2U	3	0	0	0	0	0	0	0	0	0	0
OI-MA-2U	4	0	0	0	0	0	0	0	0	0	0
OI-MA-2U	5	0	0	0	0	0	0	1	0	0	0
OI-MA-2L	1	0	0	ONP	ONP	ONP	0	0	0	0	0
OI-MA-2L	2	0	0	0	ONP	0	0	0	0	0	0
OI-MA-2L	3	0	0	0	ONP	0	0	0	0	0	0
OI-MA-2L	4	0	0	0	0	0	0	0	0	0	0
OI-MA-2L	5	0	0	0	ONP	0	ONP	0	0	0	0

Sediment Treatment	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
		Number on Water Surface									
OO-CH-7	1	2	0	2	3	0	0	0	0	1	0
OO-CH-7	2	0	0	2	2	0	0	0	0	0	0
OO-CH-7	3	2	1	0	4	0	0	0	0	0	0
OO-CH-7	4	0	0	2	2	0	0	0	0	0	0
OO-CH-7	5	0	0	0	1	0	0	0	0	0	0
OO-CH-8	1	1	1	4	3	0	0	0	0	0	0
OO-CH-8	2	0	0	0	2	0	0	1	0	0	0
OO-CH-8	3	0	2	2	2	0	0	0	0	0	0
OO-CH-8	4	0	0	0	1	0	0	0	0	0	0
OO-CH-8	5	2	0	2	1	0	0	0	0	1	1
OI-MA-1L	1	0	0	2	0	0	0	0	0	0	0
OI-MA-1L	2	0	0	3	2	0	0	0	0	0	0
OI-MA-1L	3	0	0	5	1	0	1	0	0	0	0
OI-MA-1L	4	0	0	3	5	1	5	0	0	0	0
OI-MA-1L	5	0	0	0	1	1	0	0	0	0	
OI-MA-2U	1	2	0	2	1	0	0	0	0	0	0
OI-MA-2U	2	0	0	0	0	0	1	0	0	0	0
OI-MA-2U	3	0	2	1	0	0	1	0	0	0	0
OI-MA-2U	4	1	1	3	0	0	2	0	0	0	0
OI-MA-2U	5	1	1	1	0	0	0	0	0	0	0
OI-MA-2L	1	0	0	1	1	2	0	0	0	0	0
OI-MA-2L	2	0	0	0	0	0	1	0	0	0	0
OI-MA-2L	3	0	2	2	1	0	1	0	0	0	0
OI-MA-2L	4	1	0	2	0	0	0	0	0	0	0
OI-MA-2L	5	0	0	1	0	0	3	0	0	0	0

TABLE F.6 (Contd)

Sediment Treatment	Rep	Number on Sediment Surface 1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
OI-SS-4L	1	0	0	0	0	0	0	0	0	0	0
OI-SS-4L	2	0	0	0	0	0	0	0	0	0	0
OI-SS-4L	3	0	0	0	0	0	0	0	0	0	0
OI-SS-4L	4	0	0	0	0	0	0	0	0	0	0
OI-SS-4L	5	0	0	0	0	0	0	0	0	0	0
OI-TS-5AL	1	0	ONP	0	0	0	0	0	0	0	0
OI-TS-5AL	2	0	ONP	ONP	0	0	0	0	0	0	0
OI-TS-5AL	3	0	ONP	0	0	0	0	0	0	0	0
OI-TS-5AL	4	0	0	0	0	0	0	0	0	0	0
OI-TS-5AL	5	0	0	0	0	2	0	0	0	0	0
OI-TS-5AU	1	0	0	1	0	0	0	0	0	0	0
OI-TS-5AU	2	0	0	0	0	0	0	0	0	0	0
OI-TS-5AU	3	0	0	0	0	0	0	0	0	0	0
OI-TS-5AU	4	0	0	0	ONP	0	0	0	0	0	0
OI-TS-5AU	5	0	0	0	0	0	0	0	0	0	0
OO-W-1	1	0	ONP	ONB	ONP	ONP	0	0	0	0	0
OO-W-1	2	0	0	ONP	ONP	ONP	0	0	0	0	0
OO-W-1	3	0	0	ONP	ONP	0	0	0	0	0	0
OO-W-1	4	0	0	ONP	0	0	0	0	0	0	0
OO-W-1	5	0	0	0	0	0	0	0	0	0	0
OO-W-2	1	0	0	ONP	DNP	ONP	0	0	0	0	0
OO-W-2	2	0	0	ONP	0	0	0	0	0	0	0
OO-W-2	3	0	0	0	0	0	0	0	0	0	0
OO-W-2	4	0	0	0	0	0	0	0	0	0	0
OO-W-2	5	0	0	0	0	0	0	0	0	0	0

Sediment Treatment	Rep	Number on Water Surface 1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
OI-SS-4L	1	0	0	0	1	1	1	0	0	0	0
OI-SS-4L	2	0	0	0	1	0	0	0	0	0	0
OI-SS-4L	3	1	0	0	1	0	2	0	0	0	0
OI-SS-4L	4	0	1	0	0	0	0	0	0	0	0
OI-SS-4L	5	1	0	0	0	0	0	0	0	0	0
OI-TS-5AL	1	3	0	3	8	0	1	0	3	0	0
OI-TS-5AL	2	1	1	4	6	3	0	0	0	0	0
OI-TS-5AL	3	1	1	6	12	0	0	0	1	0	0
OI-TS-5AL	4	1	3	3	3	0	0	0	0	0	0
OI-TS-5AL	5	0	4	2	6	0	3	0	0	1	0
OI-TS-5AU	1	0	0	1	0	0	0	0	0	0	0
OI-TS-5AU	2	0	0	3	0	0	1	0	0	0	0
OI-TS-5AU	3	0	3	1	0	0	0	0	0	0	0
OI-TS-5AU	4	2	2	3	2	3	2	0	1	0	0
OI-TS-5AU	5	0	1	1	1	0	1	0	0	0	0
OO-W-1	1	0	4	5	0	1	0	0	0	0	0
OO-W-1	2	0	0	1	4	2	0	0	0	0	1
OO-W-1	3	0	1	4	3	1	0	0	0	0	0
OO-W-1	4	0	0	2	3	1	0	0	0	0	0
OO-W-1	5	1	1	0	0	0	0	0	0	0	0
OO-W-2	1	0	1	1	2	1	0	0	0	1	0
OO-W-2	2	0	0	0	0	0	0	0	0	0	0
OO-W-2	3	0	0	1	1	0	0	0	0	0	0
OO-W-2	4	1	2	1	0	0	0	0	0	0	0
OO-W-2	5	0	1	2	2	2	0	0	0	0	0

TABLE F.6 (Contd)

Sediment Treatment	Number on Sediment Surface Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-W-3	1	0	ONP	ONP	0	0	0	0	0	0	0
00-W-3	2	0	ONP	0	0	0	0	0	0	0	0
00-W-3	3	0	0	0	0	0	0	0	0	0	0
00-W-3	4	0	0	0	0	0	0	0	0	0	0
00-W-3	5	0	0	0	0	0	0	0	0	0	0
00-W-4	1	0	ONP	ONP	0	0	0	0	0	0	0
00-W-4	2	0	ONP	0	0	0	0	0	0	0	0
00-W-4	3	0	ONP	0	0	0	0	0	0	0	0
00-W-4	4	0	0	0	0	0	0	0	0	0	0
00-W-4	5	0	0	0	0	0	0	0	0	0	0
00-W-5	1	0	ONP	0	0	0	0	0	0	0	0
00-W-5	2	0	0	0	0	0	0	0	0	0	0
00-W-5	3	0	0	0	0	0	0	0	0	0	0
00-W-5	4	0	0	0	0	0	0	0	0	0	0
00-W-5	5	0	0	0	0	3	0	0	0	0	0
PR-coarse	1	0	0	0	0	0	0	0	0	0	0
PR-coarse	2	0	0	1	0	0	0	0	0	0	0
PR-coarse	3	0	0	0	0	0	0	0	0	0	0
PR-coarse	4	0	0	0	0	0	0	0	0	0	0
PR-coarse	5	0	0	0	0	0	0	0	0	0	0
PR-fine	1	0	0	0	0	0	0	0	0	0	0
PR-fine	2	0	0	0	0	0	0	0	0	0	0
PR-fine	3	0	0	0	0	0	0	0	0	0	0
PR-fine	4	0	0	0	0	0	0	0	0	0	0
PR-fine	5	0	0	0	0	0	2	1	0	0	1

Sediment Treatment	Number on Water Surface Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-W-3	1	1	1	2	0	0	0	0	0	1	0
00-W-3	2	0	1	1	2	0	0	0	0	0	0
00-W-3	3	0	2	0	0	0	0	0	0	0	0
00-W-3	4	0	0	2	4	0	0	0	0	0	1
00-W-3	5	1	1	2	8	1	1	0	0	0	0
00-W-4	1	4	0	2	3	0	0	0	1	0	0
00-W-4	2	2	0	1	2	0	0	0	0	0	0
00-W-4	3	1	1	1	1	0	0	0	0	1	0
00-W-4	4	0	0	0	1	0	0	0	0	0	0
00-W-4	5	0	0	1	0	0	0	0	0	0	0
00-W-5	1	0	1	0	1	0	0	0	0	0	0
00-W-5	2	1	1	0	2	0	0	0	0	0	0
00-W-5	3	1	0	0	0	0	0	0	0	0	0
00-W-5	4	2	0	0	0	0	0	0	0	0	0
00-W-5	5	0	0	1	0	0	0	0	0	0	0
PR-coarse	1	1	0	BL	0	0	0	0	0	0	0
PR-coarse	2	0	0	0	0	0	0	0	0	0	0
PR-coarse	3	0	0	1	0	0	0	0	0	0	0
PR-coarse	4	0	0	0	0	1	0	0	0	0	0
PR-coarse	5	0	1	0	0	0	0	0	0	0	1
PR-fine	1	0	0	0	1	0	0	0	0	0	0
PR-fine	2	0	0	1	0	0	0	0	0	0	0
PR-fine	3	1	0	0	0	0	0	0	0	0	0
PR-fine	4	0	0	0	0	0	0	0	0	0	0
PR-fine	5	0	0	0	0	0	0	0	0	0	0

ONP = observation not possible
BL = observation not recorded on data sheet

TABLE F.6 (Contd)

Sediment Treatment	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
		Number on Sediment Surface									
NEW CONTROL	1	0	0	0	0	2	0	0	0	0	0
NEW CONTROL	2	0	0	0	0	0	0	0	0	0	0
NEW CONTROL	3	0	0	0	0	0	0	0	0	0	0
NEW CONTROL	4	0	0	0	0	0	0	0	0	0	0
NEW CONTROL	5	0	0	0	0	0	0	0	0	0	0

Sediment Treatment	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
		Number on Water Surface									
NEW CONTROL	1	0	0	0	0	0	0	0	0	0	0
NEW CONTROL	2	0	0	0	0	0	0	0	0	0	0
NEW CONTROL	3	0	1	0	0	0	0	0	0	0	0
NEW CONTROL	4	0	1	0	0	0	0	0	0	0	0
NEW CONTROL	5	0	1	0	0	0	0	0	0	0	0

TABLE F.7 Summary Observations for *Rhepoxynius* Static Test

Sediment Treatment	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
		Number on Sediment Surface									
OI-CH-0	1	0	1	2	1	1	1	1	0	0	1
OI-CH-0	2	ONP	ONP	0	0	0	0	0	0	0	0
OI-CH-0	3	0	0	0	0	0	0	0	1	1	1
OI-CH-0	4	0	ONP	0	0	0	0	0	0	0	0
OI-CH-0	5	ONP	0	0	0	2	2	3	2	3	3
OO-CH-1	1	0	0	ONP	0	0	0	0	0	0	0
OO-CH-1	2	0	0	ONP	1	ONP	ONP	0	0	0	0
OO-CH-1	3	0	ONP	ONP	0	ONP	0	0	1	1	1
OO-CH-1	4	0	0	0	0	0	0	0	0	0	0
OO-CH-1	5	0	0	0	0	0	0	0	0	0	0
OO-CH-2	1	0	0	0	0	0	0	0	0	0	0
OO-CH-2	2	0	0	0	0	0	0	0	0	0	0
OO-CH-2	3	0	0	0	0	0	0	0	0	0	0
OO-CH-2	4	0	0	1	0	0	1	1	0	0	0
OO-CH-2	5	0	1	0	0	0	0	0	1	1	1
OI-CH-2A	1	1	1	0	0	0	0	0	0	0	0
OI-CH-2A	2	0	1	0	0	1	1	1	0	0	0
OI-CH-2A	3	0	0	0	0	0	0	0	0	0	0
OI-CH-2A	4	0	0	0	0	0	0	0	0	0	0
OI-CH-2A	5	0	0	0	1	0	1	0	0	0	0
OO-CH-3	1	0	0	0	0	0	0	0	0	0	0
OO-CH-3	2	0	0	0	0	0	0	0	0	0	0
OO-CH-3	3	0	0	0	0	0	0	0	1	1	0
OO-CH-3	4	0	0	0	0	0	0	0	0	1	0
OO-CH-3	5	0	0	0	2	1	0	0	0	0	0

Sediment Treatment	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
		Number on Water Surface									
OI-CH-0	1	3	1	1	2	0	0	0	2	0	0
OI-CH-0	2	1	2	3	0	0	0	0	1	0	0
OI-CH-0	3	5	5	4	1	0	0	0	0	0	1
OI-CH-0	4	1	4	1	2	0	0	0	1	0	0
OI-CH-0	5	6	0	0	2	0	0	0	2	0	0
OO-CH-1	1	0	1	4	6	2	0	0	0	0	0
OO-CH-1	2	0	1	3	5	0	0	4	0	2	0
OO-CH-1	3	3	0	5	3	2	0	1	0	0	1
OO-CH-1	4	0	2	1	1	2	0	0	2	1	0
OO-CH-1	5	0	2	3	5	2	0	0	0	0	0
OO-CH-2	1	3	6	7	2	4	0	1	1	2	0
OO-CH-2	2	3	3	4	5	2	1	0	0	0	0
OO-CH-2	3	2	2	4	2	0	0	0	1	0	0
OO-CH-2	4	3	3	4	3	3	1	1	1	0	0
OO-CH-2	5	1	3	4	6	2	0	0	0	0	1
OI-CH-2A	1	2	5	6	7	4	0	1	0	1	0
OI-CH-2A	2	2	5	7	6	4	1	0	1	1	2
OI-CH-2A	3	2	3	1	5	4	1	1	1	1	2
OI-CH-2A	4	0	3	2	6	6	0	0	0	0	0
OI-CH-2A	5	2	3	2	4	6	1	1	1	1	1
OO-CH-3	1	1	2	2	3	3	0	3	3	0	1
OO-CH-3	2	0	1	1	2	1	0	1	1	0	0
OO-CH-3	3	6	3	5	3	2	1	0	1	0	2
OO-CH-3	4	2	0	1	4	2	0	0	0	0	1
OO-CH-3	5	0	0	1	1	2	0	1	1	0	0

ONP = observation not possible

TABLE F.7 (Contd)

Sediment Treatment	Number on Sediment Surface										
	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-CH-4	1	0	0	0	1	0	0	0	0	0	0
00-CH-4	2	0	0	0	0	0	0	0	0	0	1
00-CH-4	3	0	0	0	1	1	1	1	1	0	0
00-CH-4	4	1	0	0	1	0	0	0	0	0	0
00-CH-4	5	0	0	0	0	0	1	0	1	0	0
0I-CH-4A	1	0	0	0	0	0	0	0	0	0	0
0I-CH-4A	2	0	0	0	0	0	0	0	0	0	0
0I-CH-4A	3	0	0	0	0	0	0	0	0	0	0
0I-CH-4A	4	0	0	0	0	0	0	1	1	0	1
0I-CH-4A	5	0	0	0	0	0	0	0	0	0	0
00-CH-5	1	0	ONP	ONP	0	0	2	0	0	0	1
00-CH-5	2	1	0	0	0	0	1	0	0	0	0
00-CH-5	3	0	0	1	0	0	0	0	0	0	0
00-CH-5	4	0	1	0	0	0	0	0	0	0	0
00-CH-5	5	0	ONP	0	0	0	0	0	0	0	0
00-CH-6	1	0	ONP	ONP	ONP	0	0	0	0	0	0
00-CH-6	2	ONP	ONP	0	1	0	0	0	0	0	0
00-CH-6	3	ONP	ONP	0	0	ONP	0	0	0	0	0
00-CH-6	4	0	ONP	0	0	0	0	1	1	0	0
00-CH-6	5	0	0	1	0	0	0	0	0	0	0
0I-CH-6A	1	0	0	0	0	0	0	1	0	0	0
0I-CH-6A	2	0	0	0	0	0	0	0	0	0	0
0I-CH-6A	3	0	0	0	1	0	0	0	0	0	0
0I-CH-6A	4	0	0	0	0	0	0	0	0	0	1
0I-CH-6A	5	0	0	0	0	1	0	1	0	0	0

Sediment Treatment	Number on Water Surface										
	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-CH-4	1	4	4	3	3	0	1	1	0	2	1
00-CH-4	2	6	9	7	6	0	1	1	1	3	1
00-CH-4	3	7	4	4	4	0	0	2	0	2	1
00-CH-4	4	2	4	7	5	1	1	3	3	2	1
00-CH-4	5	3	3	6	2	0	1	0	0	0	1
0I-CH-4A	1	0	0	0	0	0	1	0	0	0	0
0I-CH-4A	2	0	0	0	1	1	0	0	0	0	0
0I-CH-4A	3	0	0	2	0	0	1	0	0	0	1
0I-CH-4A	4	0	0	1	0	2	1	0	0	0	0
0I-CH-4A	5	0	0	0	1	1	0	0	0	0	0
00-CH-5	1	8	6	9	5	0	4	2	0	1	1
00-CH-5	2	4	4	4	5	1	4	3	2	3	3
00-CH-5	3	3	2	5	1	0	0	1	1	1	0
00-CH-5	4	2	2	3	2	0	1	2	1	1	0
00-CH-5	5	0	0	3	0	0	0	0	3	1	1
00-CH-6	1	3	5	5	3	0	2	2	1	0	3
00-CH-6	2	3	6	3	3	1	2	2	1	0	0
00-CH-6	3	1	5	2	3	0	0	0	2	1	1
00-CH-6	4	0	1	3	3	0	1	0	0	0	1
00-CH-6	5	1	2	6	1	0	0	0	1	0	1
0I-CH-6A	1	0	1	5	2	3	4	0	0	0	0
0I-CH-6A	2	0	1	0	0	0	0	0	0	0	0
0I-CH-6A	3	0	0	0	1	1	0	0	0	0	0
0I-CH-6A	4	0	0	1	0	1	1	0	0	0	2
0I-CH-6A	5	0	0	1	0	0	0	0	0	1	0

TABLE F.7 (Contd)

Sediment Treatment	Number on Sediment Surface										
	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-CH-7	1	0	1	1	0	1	1	2	0	0	0
00-CH-7	2	ONP	ONP	0	0	0	0	0	0	1	0
00-CH-7	3	0	0	0	0	0	0	0	0	1	0
00-CH-7	4	0	0	0	0	1	1	1	1	0	0
00-CH-7	5	0	0	0	0	0	0	0	0	0	0
00-CH-8	1	ONP	ONP	ONP	ONP	0	0	0	1	0	0
00-CH-8	2	ONP	ONP	ONP	ONP	ONP	0	1	0	0	0
00-CH-8	3	0	ONP	ONP	ONP	0	0	0	0	0	0
00-CH-8	4	1	ONP	0	2	1	0	0	0	0	0
00-CH-8	5	0	ONP	0	0	0	0	0	0	0	0
0I-MA-1L	1	0	0	0	0	0	ONP	0	0	2	1
0I-MA-1L	2	0	0	0	1	0	2	2	2	1	1
0I-MA-1L	3	0	0	0	ONP	0	ONP	ONP	0	1	0
0I-MA-1L	4	0	0	0	1	0	0	0	0	0	0
0I-MA-1L	5	0	0	ONP	0	0	0	1	0	0	
0I-MA-2U	1	0	0	ONP	0	0	0	0	0	0	0
0I-MA-2U	2	1	1	1	0	0	0	0	0	0	0
0I-MA-2U	3	0	1	1	0	0	0	0	0	0	0
0I-MA-2U	4	0	0	0	0	0	0	0	0	0	0
0I-MA-2U	5	0	1	0	0	2	1	2	0	0	0
0I-MA-2L	1	0	0	ONP	ONP	0	0	0	0	0	0
0I-MA-2L	2	0	0	0	1	2	0	0	0	0	0
0I-MA-2L	3	0	0	0	0	1	1	1	0	0	0
0I-MA-2L	4	0	0	0	0	1	0	0	0	0	0
0I-MA-2L	5	0	0	0	ONP	0	ONP	0	0	0	0

Sediment Treatment	Number on Water Surface										
	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-CH-7	1	2	5	5	1	0	2	2	1	1	0
00-CH-7	2	1	3	1	3	0	1	0	0	2	0
00-CH-7	3	4	2	3	3	1	1	0	1	0	1
00-CH-7	4	3	2	2	1	0	0	0	0	0	1
00-CH-7	5	3	5	2	1	0	0	0	2	0	0
00-CH-8	1	4	2	4	3	0	0	1	0	0	0
00-CH-8	2	0	3	3	2	0	2	1	3	2	1
00-CH-8	3	4	5	5	1	0	3	2	2	0	2
00-CH-8	4	0	3	0	1	0	1	0	1	1	0
00-CH-8	5	1	0	3	2	0	1	2	2	2	1
0I-MA-1L	1	0	3	0	4	5	3	0	0	1	1
0I-MA-1L	2	0	0	0	3	1	1	0	0	1	1
0I-MA-1L	3	0	0	4	2	3	3	0	0	0	0
0I-MA-1L	4	0	0	4	5	3	1	0	0	1	2
0I-MA-1L	5	0	1	2	1	0	0	0	1	0	
0I-MA-2U	1	0	0	3	5	5	3	0	0	0	0
0I-MA-2U	2	0	1	4	5	7	6	1	1	1	1
0I-MA-2U	3	0	1	6	3	2	2	0	0	0	0
0I-MA-2U	4	1	0	5	4	7	8	0	1	1	2
0I-MA-2U	5	2	1	1	4	4	4	0	0	2	1
0I-MA-2L	1	0	1	2	3	3	0	0	0	0	0
0I-MA-2L	2	0	3	0	3	5	2	0	0	0	1
0I-MA-2L	3	0	4	3	4	3	1	0	0	0	2
0I-MA-2L	4	0	0	0	1	1	0	0	1	0	1
0I-MA-2L	5	0	0	0	0	0	1	0	1	0	0

TABLE F.7 (Contd)

Sediment Treatment	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
	Number on Sediment Surface										
0I-SS-4L	1	0	1	1	0	0	1	0	0	0	0
0I-SS-4L	2	0	0	0	0	0	0	0	0	0	0
0I-SS-4L	3	0	0	0	0	0	0	0	0	0	0
0I-SS-4L	4	0	0	0	0	1	1	1	1	1	1
0I-SS-4L	5	0	0	0	0	1	0	1	0	0	0
0I-TS-5AL	1	1	0	2	0	0	1	0	0	0	0
0I-TS-5AL	2	0	0	0	0	1	0	0	0	1	0
0I-TS-5AL	3	1	0	0	0	2	0	1	0	0	0
0I-TS-5AL	4	0	1	0	1	0	0	0	0	0	0
0I-TS-5AL	5	0	0	1	0	1	0	0	1	1	0
0I-TS-5AU	1	1	1	0	0	0	0	0	0	0	0
0I-TS-5AU	2	2	2	0	0	0	0	0	0	0	0
0I-TS-5AU	3	2	2	1	0	0	0	0	0	1	3
0I-TS-5AU	4	0	0	0	ONP	0	0	0	0	0	0
0I-TS-5AU	5	0	1	0	0	0	0	2	1	0	0
00-W1	1	0	ONP	ONP	ONP	ONP	0	0	0	0	0
00-W1	2	0	0	ONP	ONP	ONP	0	0	0	0	0
00-W1	3	0	0	ONP	ONP	1	1	1	4	1	1
00-W1	4	0	0	ONP	0	0	0	0	0	1	0
00-W1	5	0	0	1	0	0	0	0	0	0	0
00-W2	1	0	0	ONP	ONP	ONP	0	1	0	0	0
00-W2	2	0	0	1	0	0	0	0	0	0	0
00-W2	3	0	0	0	0	0	0	0	0	0	0
00-W2	4	0	0	0	0	0	0	0	0	1	0
00-W2	5	0	0	1	0	0	0	0	0	0	0

Sediment Treatment	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
	Number on Water Surface										
0I-SS-4L	1	1	1	2	4	3	0	0	0	0	0
0I-SS-4L	2	1	1	1	0	0	0	0	0	0	0
0I-SS-4L	3	0	1	0	1	0	0	0	0	0	0
0I-SS-4L	4	0	2	1	1	0	0	0	0	0	0
0I-SS-4L	5	0	0	1	0	1	0	0	1	0	0
0I-TS-5AL	1	5	5	5	3	0	1	0	0	1	0
0I-TS-5AL	2	11	10	10	6	1	2	3	2	1	1
0I-TS-5AL	3	5	5	5	4	0	1	2	0	3	1
0I-TS-5AL	4	5	2	7	2	2	2	1	3	0	0
0I-TS-5AL	5	9	8	7	4	0	0	2	2	1	2
0I-TS-5AU	1	0	3	7	5	8	5	0	0	0	0
0I-TS-5AU	2	0	3	4	6	4	4	1	1	3	2
0I-TS-5AU	3	0	5	6	4	2	1	1	3	1	1
0I-TS-5AU	4	0	0	6	4	4	5	0	0	1	0
0I-TS-5AU	5	0	0	7	6	1	1	1	1	1	0
00-W1	1	0	1	1	2	1	0	0	2	1	0
00-W1	2	0	1	2	5	2	0	0	0	0	0
00-W1	3	1	3	3	4	7	0	0	0	0	0
00-W1	4	2	4	5	3	1	0	2	1	3	1
00-W1	5	3	0	5	5	1	0	0	1	0	0
00-W2	1	4	4	8	4	4	0	3	2	1	2
00-W2	2	1	4	6	1	2	0	1	1	1	1
00-W2	3	1	2	2	7	5	1	0	0	1	0
00-W2	4	0	2	5	3	0	0	0	0	1	0
00-W2	5	0	3	3	3	3	0	0	0	0	0

TABLE F.7 (Contd)

Sediment Treatment	Rep	Number on Sediment Surface 1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-W3	1	0	0	0	0	0	0	0	0	0	1
00-W3	2	0	2	0	1	0	0	0	3	0	0
00-W3	3	0	0	0	0	0	0	0	0	0	0
00-W3	4	0	1	0	0	1	0	0	0	2	0
00-W3	5	0	2	0	0	0	1	0	1	0	0
00-W4	1	0	DNP	0	0	0	0	0	0	0	1
00-W4	2	0	1	0	0	0	0	0	0	0	0
00-W4	3	1	DNP	0	0	0	0	1	1	1	2
00-W4	4	0	0	0	0	0	0	0	0	0	0
00-W4	5	0	0	0	0	0	0	0	0	0	0
00-W5	1	0	0	0	0	0	0	0	0	0	0
00-W5	2	0	1	1	0	0	0	0	0	0	0
00-W5	3	0	0	0	0	0	0	0	0	0	0
00-W5	4	0	1	0	0	1	2	2	2	3	3
00-W5	5	0	0	0	1	2	0	0	0	0	0
PR-coarse	1	0	1	0	0	0	0	0	0	0	0
PR-coarse	2	0	0	0	0	0	0	0	0	0	0
PR-coarse	3	0	0	0	0	0	0	0	0	0	0
PR-coarse	4	0	0	0	0	0	0	0	0	0	0
PR-coarse	5	0	0	0	0	0	0	0	0	0	0
PR-fine	1	0	0	0	0	0	0	0	0	0	0
PR-fine	2	0	0	1	0	0	0	0	0	0	0
PR-fine	3	0	0	0	0	0	0	0	0	0	0
PR-fine	4	0	0	0	0	0	0	0	0	0	0
PR-fine	5	1	1	1	1	1	1	1	1	1	1

Sediment Treatment	Rep	Number on Water Surface 1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
00-W3	1	3	6	5	2	0	0	0	0	1	1
00-W3	2	0	2	5	3	0	0	1	0	1	0
00-W3	3	5	6	5	3	2	1	2	0	0	0
00-W3	4	4	1	3	4	0	0	0	0	0	1
00-W3	5	3	3	4	3	0	2	2	1	1	1
00-W4	1	7	6	7	2	0	0	0	1	0	0
00-W4	2	6	11	4	6	0	0	0	0	0	0
00-W4	3	3	8	7	5	0	2	0	1	1	0
00-W4	4	4	7	7	2	0	0	1	0	0	0
00-W4	5	2	2	1	5	0	2	1	1	1	1
00-W5	1	1	1	0	2	0	0	0	0	1	0
00-W5	2	1	1	1	1	0	0	0	0	1	0
00-W5	3	2	3	2	0	0	0	0	1	0	0
00-W5	4	2	1	2	2	1	1	0	0	0	0
00-W5	5	4	4	4	1	2	2	2	1	3	3
PR-coarse	1	1	1	1	1	1	0	0	0	0	0
PR-coarse	2	4	3	1	2	0	0	0	0	0	0
PR-coarse	3	2	0	1	2	0	0	0	0	0	0
PR-coarse	4	0	0	0	1	1	0	0	0	0	0
PR-coarse	5	0	2	2	2	1	0	0	0	0	0
PR-fine	1	0	0	0	1	0	0	0	0	0	0
PR-fine	2	2	2	1	1	0	0	0	0	0	0
PR-fine	3	0	0	0	0	0	0	1	0	0	0
PR-fine	4	2	0	0	3	0	0	0	0	0	0
PR-fine	5	2	2	0	1	0	0	0	0	0	0

TABLE F.7 (Contd)

Sediment Treatment	Number on Sediment Surface										
	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
Tomales Bay	1	0	1	1	1	1	0	0	0	0	0
Tomales Bay	2	0	0	0	0	0	0	0	0	0	0
Tomales Bay	3	0	0	0	0	0	0	0	0	0	0
Tomales Bay	4	0	0	0	0	0	0	0	0	0	0
Tomales Bay	5	0	0	0	0	0	0	0	0	0	0

Sediment Treatment	Number on Water Surface										
	Rep	1d	2d	3d	4d	5d	6d	7d	8d	9d	10d
Tomales Bay	1	0	0	1	0	0	0	0	0	0	0
Tomales Bay	2	1	0	0	1	0	0	0	0	0	0
Tomales Bay	3	1	0	3	0	0	0	0	0	0	0
Tomales Bay	4	1	0	0	0	0	0	0	1	0	0
Tomales Bay	5	1	0	0	0	0	0	0	0	0	0

APPENDIX G

CHEMISTY AND QUALITY ASSURANCE DATA FOR TISSUE ANALYSES

TABLE G.1. Concentrations of PAHs in Tissues of *Macoma nasuta* After 10-Day Exposure to Sediment Treatments (Mean Blank Corrected, Dry Weight)

Sediment Treatment	Rep	Acenaph-thene	Acenaph-thylene	Anthra-cene	Benzo(a) Anthra-cene	Benzo(a) pyrene	Benzo(b) fluoran-thene	Benzo (g,h,i) perylene	Benzo(k) fluoran-thene
		(ug/kg dry wt)							
Target DL		20	20	20	20	20	20	20	20
Achieved DL		1.08	1.33	0.57	1.33	2.54	5.39	5.77	5.52
OI-CH-0	1	1.08U	1.33U	0.57U	2.85	2.54U	4.28	5.77U	2.97
OI-CH-0 DUP	1	1.08U	1.33U	0.57U	1.33U	1.60	2.49	5.77U	2.49
OI-CH-0	2	1.08U	1.33U	2.91	1.33U	2.54U	4.97	5.77U	3.55
OI-CH-0	3	1.08U	1.33U	2.93	3.92	2.54U	3.24	5.77U	2.54
OI-CH-0	4	1.08U	1.33U	3.37	0.61	2.54U	5.61	5.77U	3.46
OI-CH-0	5	1.08U	1.33U	3.61	1.33U	2.54U	4.67	5.77U	3.32
OO-CH-1	1	1.08U	1.33U	2.98	3.73	2.54U	5.88	5.77U	3.22
OO-CH-1 DUP	1	3.48	1.33U	0.57U	1.33U	2.81	2.78	5.77U	2.30
OO-CH-1	2	1.08U	1.33U	0.57U	1.33U	2.54U	2.75	5.77U	2.62
OO-CH-1	3	1.08U	1.33U	2.77	1.33U	2.54U	3.78	5.77U	2.29
OO-CH-1	4	1.08U	1.33U	2.78	1.33U	2.54U	4.78	5.77U	2.98
OO-CH-1	5	1.08U	1.33U	3.38	0.75	2.54U	5.56	5.77U	5.52U
OO-CH-2	1	1.08U	1.33U	6.24	1.33U	4.36	11.44	5.77U	12.33
OO-CH-2	2	1.08U	1.33U	5.42	0.87	1.65	15.48	5.77U	7.03
OO-CH-2	3	1.08U	1.33U	2.60	1.33U	2.54U	6.23	5.77U	4.44
OO-CH-2	4	1.08U	1.33U	2.70	1.33U	2.54U	6.40	5.77U	6.89
OO-CH-2	5	1.08U	1.33U	4.56	1.33U	4.79	13.89	5.77U	10.36
OI-CH-2A	1	1.08U	1.33U	3.14	1.33U	4.50	15.59	6.02	10.39
OI-CH-2A	2	1.08U	8.17	0.57U	1.33U	2.54U	12.02	5.77U	6.69
OI-CH-2A	3	1.08U	7.40	0.57U	1.33U	4.86	13.84	5.77U	8.51
OI-CH-2A	4	1.08U	5.13	0.57U	1.33U	1.22	16.70	5.77U	8.93
OI-CH-2A	5	1.08U	5.80	0.57U	0.07	3.04	13.64	5.77U	9.74
OO-CH-3	1	1.08U	5.64	0.57U	1.33U	2.54U	8.10	5.77U	7.14
OO-CH-3	2	1.08U	7.04	0.57U	1.33U	2.54U	6.88	26.32	4.46
OO-CH-3	3	1.08U	1.33U	2.33	1.33U	2.54U	8.09	5.77U	6.59
OO-CH-3	4	1.08U	1.33U	2.38	1.33U	0.74	10.95	6.32	10.05
OO-CH-3	5	1.08U	1.33U	13.26	12.02	8.70	19.08	5.77U	15.69
OO-CH-4	1	1.08U	1.33U	11.47	3.57	8.86	20.93	8.71	14.47
OO-CH-4	2	1.08U	1.33U	11.58	5.73	20.14	27.00	7.21	20.07
OO-CH-4	3	8.47	4.19	12.84	4.12	8.88	19.13	5.77U	12.01
OO-CH-4	4	1.08U	5.62	13.52	7.52	9.29	20.41	5.77U	16.82
OO-CH-4	5	1.08U	3.79	10.70	3.52	4.11	17.11	5.77U	11.18

U = Undetected.
DUP = Duplicate

TABLE G.1. (Contd)

Sediment Treatment	Rep	Chrysene	Dibenzo (a,h) anthracene	Fluoranthene	Fluorene	Indeno (1,2,3-c,d) pyrene	Naphthalene	Phenanthrene	Pyrene
		(ug/kg dry wt)							
Target DL		20	20	20	20	20	20	20	20
Achieved DL		2.03	8.88	1.76	0.70	3.81	0.70	0.57	1.21
OI-CH-0	1	5.74	8.88U	9.67	0.70U	3.81U	0.70U	0.57U	8.37
OI-CH-0 DUP	1	6.86	8.88U	10.43	0.70U	3.81U	18.97	8.67	6.66
OI-CH-0	2	10.91	8.88U	22.69	0.04	3.81U	0.70U	2.76	17.88
OI-CH-0	3	8.70	8.88U	12.13	5.03	3.81U	50.14	13.26	8.68
OI-CH-0	4	9.21	8.88U	14.42	8.70	3.81U	68.07	18.42	11.27
OI-CH-0	5	15.85	8.88U	28.46	9.38	3.81U	44.15	20.57	22.99
00-CH-1	1	8.08	8.88U	13.92	6.07	3.81U	53.59	12.33	13.76
00-CH-1 DUP	1	5.50	8.88U	16.49	3.06	3.81U	19.61	12.52	13.87
00-CH-1	2	6.45	8.88U	11.92	8.75	3.81U	34.02	18.05	10.58
00-CH-1	3	7.22	8.88U	16.95	5.71	3.81U	50.08	16.70	15.09
00-CH-1	4	12.77	8.88U	34.97	2.45	3.81U	0.70U	7.30	25.01
00-CH-1	5	6.81	8.88U	17.48	5.48	3.81U	7.45	12.88	11.90
00-CH-2	1	25.72	8.88U	73.38	0.45	3.81U	0.70U	6.43	87.01
00-CH-2	2	21.58	8.88U	52.11	4.10	3.81U	11.95	13.08	61.73
00-CH-2	3	7.87	8.88U	17.05	0.70U	3.81U	0.70U	0.57U	25.71
00-CH-2	4	9.03	8.88U	20.68	0.70U	3.81U	0.70U	0.57U	31.73
00-CH-2	5	17.47	8.88U	47.41	0.52	3.81U	0.70U	7.66	68.88
OI-CH-2A	1	14.86	8.88U	27.83	1.31	3.81U	0.70U	3.70	53.39
OI-CH-2A	2	10.71	8.88U	15.67	0.70U	3.81U	0.70U	0.57U	28.70
OI-CH-2A	3	15.39	8.88U	29.18	0.70U	4.52	0.70U	0.57U	87.99
OI-CH-2A	4	17.39	8.88U	48.27	0.70U	3.81U	0.70U	0.57U	78.49
OI-CH-2A	5	17.38	8.88U	52.40	0.70U	3.61U	0.70U	0.57U	76.20
00-CH-3	1	11.05	8.88U	25.47	0.70U	4.22	0.70U	0.57U	29.39
00-CH-3	2	8.10	8.88U	20.80	0.70U	3.81U	0.70U	0.57U	23.06
00-CH-3	3	11.82	8.88U	26.08	0.70U	3.81U	0.70U	0.57U	24.80
00-CH-3	4	13.92	8.88U	27.37	0.70U	3.81U	0.70U	0.57U	34.16
00-CH-3	5	26.86	8.88U	113.57	32.65	3.81U	0.70U	99.08	88.94
00-CH-4	1	25.17	8.88U	64.01	0.70U	5.19	0.70U	0.57U	72.81
00-CH-4	2	28.26	8.88U	74.79	0.70U	5.24	0.70U	0.57U	103.63
00-CH-4	3	21.81	8.88U	71.67	0.70U	3.81U	0.70U	0.57U	101.21
00-CH-4	4	23.90	8.88U	85.59	0.70U	3.81U	0.70U	0.57U	137.58
00-CH-4	5	22.14	8.88U	70.98	0.70U	3.81U	0.70U	0.57U	113.38

TABLE G.1. (Contd)

Sediment Treatment	Rep	(ug/kg dry wt) Acenaph-thene	Acenaph-thylene	Anthra-cene	Benzo(a) Anthra-cene	Benzo(a) pyrene	Benzo(b) fluoran-thene	Benzo (g,h,i) perylene	Benzo(k) fluoran-thene
OI-CH-4A	1	1.08U	1.33U	2.96	5.24	2.54U	5.39U	5.77U	5.52U
OI-CH-4A DUP	1	1.08U	1.33U	0.57U	3.43	2.54U	6.44	5.77U	3.78
OI-CH-4A	2	1.08U	1.33U	2.36	1.33U	2.54U	5.44	4.04	4.92
OI-CH-4A	3	1.08U	1.33U	2.05	1.33U	2.54U	3.21	5.77U	2.95
OI-CH-4A	4	1.08U	1.33U	2.27	2.57	2.54U	5.52	5.77U	4.14
OI-CH-4A	5	1.08U	4.83	2.81	1.33U	2.54U	7.81	5.77U	5.68
OO-CH-5	1	1.08U	1.33U	2.65	1.33U	2.54U	8.78	5.77U	7.78
OO-CH-5 DUP	1	1.08U	1.33U	2.50	3.64	5.21	6.79	1.88	4.79
OO-CH-5	2	1.08U	5.98	2.77	1.33U	2.54U	9.78	5.77U	6.95
OO-CH-5	3	1.08U	5.36	3.58	1.33U	2.54U	11.47	5.77U	6.93
OO-CH-5	4	1.08U	6.26	3.25	1.33U	2.54U	10.26	5.77U	6.39
OO-CH-5	5	1.08U	7.20	2.94	1.33U	2.54U	10.49	5.77U	7.71
OO-CH-6	1	5.89	8.39	12.41	8.51	9.08	24.37	7.71	23.10
OO-CH-6	2	1.08U	1.33U	8.62	2.93	3.71	22.95	5.77U	18.60
OO-CH-6	3	1.08U	6.49	8.66	8.47	6.45	25.21	7.70	20.91
OO-CH-6	4	1.08U	6.04	7.07	3.45	3.88	22.09	6.41	18.37
OO-CH-6	5	6.92	5.67	6.83	6.16	5.91	23.62	5.33	17.19
OI-CH-6A	1	1.08U	3.53	0.57U	1.33U	2.54U	5.39U	5.77U	5.52U
OI-CH-6A	2	1.08U	2.78	0.57U	1.33U	2.54U	3.29	5.77U	1.86
OI-CH-6A	3	1.08U	2.83	2.61	1.33U	2.54U	6.85	5.77U	6.61
OI-CH-6A	4	1.08U	3.09	0.57U	1.33U	2.54U	4.54	5.77U	3.09
OI-CH-6A	5	1.08U	3.04	2.87	1.66	2.54U	7.45	5.77U	5.95
OO-CH-7	1	1.08U	2.72	3.23	1.38U	2.54U	7.82	5.77U	6.58
OO-CH-7	2	1.08U	4.51	4.25	1.33U	2.54U	11.08	2.42	7.87
OO-CH-7	3	1.08U	4.86	0.57U	1.33U	2.54U	12.53	5.77U	11.16
OO-CH-7	4	1.08U	2.37	4.74	1.33U	2.54U	11.28	5.77U	10.26
OO-CH-7	5	1.08U	3.70	3.92	1.33U	2.54U	9.46	5.77U	8.20
OO-CH-8	1	1.08U	4.86	6.61	5.28	5.74	25.02	5.77U	15.67
OO-CH-8	2	20.27	13.97	9.86	3.64	7.45	21.10	5.77U	14.77
OO-CH-8	3	1.08U	7.66	6.44	1.33U	6.07	22.32	5.77U	13.88
OO-CH-8	4	8.98	8.41	6.78	5.37	10.46	23.50	5.77U	20.26
OO-CH-8	5	1.08U	1.33U	7.47	29.35	27.97	39.52	5.77U	22.21
OI-SS-4L	2	1.08U	1.33U	0.57U	5.88	3.79	6.09	5.77U	3.71
OI-SS-4L DUP	2	1.08U	1.33U	0.57U	2.64	3.05	4.98	5.77U	3.68
OI-SS-4L	3	1.08U	1.33U	0.57U	3.49	5.48	6.55	5.77U	5.43
OI-SS-4L	4	1.08U	1.33U	0.57U	3.37	3.90	5.89	5.77U	3.25
OI-SS-4L	5	1.08U	1.33U	0.57U	4.89	4.74	5.35	5.77U	5.56

TABLE G.1. (Contd)

Sediment Treatment	Rep	Chrysene	Dibenzo (a,h) anthracene	Fluoranthene	Fluorene	Indeno (1,2,3-c,d) pyrene	Naphthalene	Phenanthrene	Pyrene
		(ug/kg dry wt)							
OI-CH-4A	1	11.34	8.88U	25.30	0.70U	3.81U	0.70U	0.57U	21.35
OI-CH-4A DUP	1	10.04	8.88U	25.02	0.70U	3.81U	0.70U	0.57U	19.61
OI-CH-4A	2	8.51	8.88U	29.72	0.70U	3.81U	0.70U	0.57U	25.94
OI-CH-4A	3	7.73	8.88U	15.63	0.70U	3.81U	0.70U	0.57U	11.27
OI-CH-4A	4	10.13	8.88U	26.51	0.70U	3.81U	0.70U	0.57U	21.54
OI-CH-4A	5	14.22	8.88U	23.54	0.70U	3.81U	0.70U	0.57U	16.75
OO-CH-5	1	10.30	8.88U	13.35	0.70U	3.81U	0.70U	0.57U	16.27
OO-CH-5 DUP	1	7.19	8.88U	11.99	0.70U	3.81U	13.97	11.34	18.94
OO-CH-5	2	13.04	8.88U	23.58	0.70U	3.81U	0.70U	0.57U	40.88
OO-CH-5	3	10.74	8.88U	15.71	0.70U	3.81U	0.70U	0.57U	30.53
OO-CH-5	4	8.58	8.88U	17.76	0.70U	3.81U	0.70U	0.57U	44.90
OO-CH-5	5	8.55	8.88U	19.43	0.70U	3.81U	0.70U	0.57U	45.34
OO-CH-6	1	28.11	8.88U	45.98	0.70U	4.54	0.70U	0.57U	128.13
OO-CH-6	2	26.40	8.88U	43.70	0.70U	3.81U	0.70U	0.57U	117.52
OO-CH-6	3	26.25	8.88U	54.28	0.70U	5.31	0.70U	0.57U	130.49
OO-CH-6	4	19.18	8.88U	37.17	0.70U	4.58	0.70U	0.57U	126.83
OO-CH-6	5	31.68	8.88U	85.17	0.70U	2.96	0.70U	0.57U	133.48
OI-CH-6A	1	3.78	8.88U	10.28	0.70U	3.81U	0.70U	0.57U	5.36
OI-CH-6A	2	5.99	8.88U	15.14	0.70U	3.81U	0.70U	0.57U	12.35
OI-CH-6A	3	14.90	8.88U	33.04	0.70U	3.81U	0.70U	0.57U	17.03
OI-CH-6A	4	14.71	8.88U	31.74	0.70U	3.81U	0.70U	0.57U	18.97
OI-CH-6A	5	25.48	8.88U	54.47	0.70U	3.81U	0.70U	0.57U	36.29
OO-CH-7	1	6.79	8.88U	12.32	0.70U	3.81U	0.70U	0.57U	39.81
OO-CH-7	2	9.44	8.88U	26.80	0.70U	3.81U	0.70U	0.57U	74.56
OO-CH-7	3	9.51	8.88U	15.60	0.70U	3.81U	0.70U	0.57U	73.16
OO-CH-7	4	12.80	8.88U	25.93	0.70U	3.81U	0.70U	0.57U	59.06
OO-CH-7	5	8.95	8.88U	13.87	0.70U	3.81U	0.70U	0.57U	54.07
OO-CH-8	1	23.93	8.88U	52.45	0.70U	3.81U	0.70U	0.57U	144.64
OO-CH-8	2	26.55	8.88U	57.83	14.87	3.81U	21.83	29.82	162.99
OO-CH-8	3	19.00	8.88U	42.51	0.70U	3.81U	0.70U	0.57U	167.73
OO-CH-8	4	23.07	8.88U	47.91	5.63	3.81U	0.70U	8.95	180.11
OO-CH-8	5	46.21	8.88U	58.09	0.70U	3.81U	0.70U	0.57U	189.27
OI-SS-4L	2	13.29	8.88U	31.12	2.60	3.81U	26.52	16.79	32.73
OI-SS-4L DUP	2	10.11	8.88U	26.10	0.70U	3.81U	30.28	14.29	25.51
OI-SS-4L	3	11.07	8.88U	24.80	4.87	2.55	18.99	11.28	38.85
OI-SS-4L	4	7.78	8.88U	21.04	0.70U	3.81U	7.81	10.44	34.28
OI-SS-4L	5	9.13	8.88U	26.63	3.57	3.81U	19.76	17.88	47.17

TABLE G.1. (Contd)

		(ug/kg dry wt)							
Sediment Treatment	Rep	Acenaph-thene	Acenaph-thylene	Anthra-cene	Benzo(a) Anthra-cene	Benzo(a) pyrene	Benzo(b) fluoran-thene	Benzo (g,h,i) perylene	Benzo(k) fluoran-thene
OI-TS-5AU	1	1.08U	1.33U	41.07	249.74	304.24	439.70	61.16	290.80
OI-TS-5AU	2	10.42	5.58	55.03	219.42	306.74	429.87	62.33	281.52
OI-TS-5AU	3	5.96	2.48	30.14	133.90	187.66	261.37	37.02	178.34
OI-TS-5AU	4	6.62	4.69	39.92	185.17	239.76	345.87	43.83	217.05
OI-TS-5AU	5	7.59	1.33U	36.55	138.29	182.77	266.38	39.87	133.61
OI-TS-5AL	2	18.10	1.33U	103.91	108.37	76.81	87.28	23.35	59.82
OI-TS-5AL	3	9.82	1.33U	74.44	104.19	78.57	87.70	23.16	57.80
OI-TS-5AL	4	6.99	1.33U	71.88	124.68	96.52	102.10	32.52	86.44
OI-TS-5AL DUP	4	11.36	1.33U	85.49	152.01	112.28	118.45	36.29	99.24
OI-TS-5AL	5	5.71	1.33U	50.91	128.09	99.47	112.33	32.21	83.46
OI-MA-1L	1	1.08U	3.42	19.85	0.28	2.54U	7.90	5.77U	8.43
OI-MA-1L DUP	1	9.00	3.60	20.78	1.33U	2.54U	9.81	5.77U	5.54
OI-MA-1L	2	10.15	4.30	23.70	5.61	1.86	12.34	5.77U	11.27
OI-MA-1L	3	1.08U	3.70	9.67	9.59	2.54U	11.66	5.77U	8.71
OI-MA-1L	4	1.08U	1.33U	9.03	1.22	2.54U	9.39	5.77U	8.02
OI-MA-1L	5	5.71	1.33U	21.47	5.57	3.81	12.27	5.77U	8.98
OI-MA-1L RXTRCT	5	4.21	1.33U	14.99	11.26	8.41	7.69	3.57	9.57
OI-MA-2U	1	1.08U	1.33U	9.74	24.45	159.88	194.84	46.69	89.86
OI-MA-2U	2	1.08U	1.33U	14.21	36.39	204.26	225.63	63.63	120.50
OI-MA-2U	3	1.08U	1.33U	17.42	52.35	192.59	215.40	70.63	122.92
OI-MA-2U	4	1.08U	1.33U	10.64	24.93	108.88	129.20	32.59	73.62
OI-MA-2U	5	1.08U	1.33U	0.57U	32.53	129.92	176.86	48.16	97.18
OI-MA-2L	2	1.08U	1.33U	0.57U	1.33U	8.90	10.95	5.77U	7.16
OI-MA-2L	3	1.08U	1.33U	0.57U	2.18	4.42	7.82	5.77U	6.23
OI-MA-2L	4	1.08U	1.33U	0.57U	1.33U	2.54U	5.39U	5.77U	5.52U
OI-MA-2L	5	1.08U	1.33U	0.57U	5.74	4.21	4.94	5.77U	6.18
OO-W-1	1	1.08U	1.33U	0.57U	2.63	1.33	2.69	5.77U	1.44
OO-W-1	2	1.08U	1.33U	0.57U	1.33U	2.03	1.38	5.77U	1.15
OO-W-1	3	1.08U	1.33U	0.57U	1.76	1.64	3.08	5.77U	2.07
OO-W-1	4	1.08U	1.33U	0.57U	1.33U	0.90	1.64	5.77U	1.54
OO-W-1	5	1.08U	1.33U	0.57U	1.33U	1.68	1.01	5.77U	0.93
OO-W-2	1	1.08U	1.33U	0.57U	1.33U	4.46	5.80	5.77U	5.52U
OO-W-2	2	1.08U	1.33U	0.57U	7.01	8.50	10.84	5.77U	5.88
OO-W-2	3	1.08U	1.33U	0.57U	1.33U	4.52	7.20	5.77U	3.79
OO-W-2	4	1.08U	1.33U	0.57U	1.33U	7.99	7.41	5.77U	4.22
OO-W-2	5	1.08U	1.33U	0.57U	2.87	5.76	6.96	5.77U	5.41

TABLE G.1. (Contd)

		(ug/kg dry wt)							
Sediment Treatment	Rep	Chrysene	Dibenzo (a,h) anthracene	Fluoranthene	Fluorene	Indeno (1,2,3-c,d) pyrene	Naphthalene	Phenanthrene	Pyrene
OI-TS-5AU	1	387.61	8.41	816.01	10.69	52.49	16.56	107.66	1649.39
OI-TS-5AU	2	418.99	10.32	666.73	16.20	53.35	22.64	142.19	1799.16
OI-TS-5AU	3	236.24	5.66	377.58	8.20	29.55	9.87	77.81	1100.59
OI-TS-5AU	4	336.25	7.19	541.67	10.36	40.36	11.23	98.47	1461.07
OI-TS-5AU	5	239.16	5.44	366.72	9.32	28.81	16.81	86.19	1090.69
OI-TS-5AL	2	141.15	8.88U	739.35	65.91	17.37	12.00	813.82	920.84
OI-TS-5AL	3	143.22	6.88U	842.45	35.21	17.49	9.16	520.25	841.99
OI-TS-5AL	4	169.20	3.40	667.95	29.94	25.44	16.83	506.25	843.81
OI-TS-5AL DUP	4	196.85	3.12	762.93	31.57	28.14	27.16	587.80	979.12
OI-TS-5AL	5	158.00	2.09	581.20	19.92	22.70	21.34	365.38	882.08
OI-MA-1L	1	16.78	8.88U	155.68	0.70U	3.81U	0.70U	88.02	158.69
OI-MA-1L DUP	1	16.49	8.88U	153.67	0.70U	3.81U	0.70U	74.18	158.90
OI-MA-1L	2	26.46	8.66U	220.80	0.70U	3.81U	0.70U	100.77	221.98
OI-MA-1L	3	33.67	8.88U	104.48	0.70U	3.81U	0.70U	18.65	65.79
OI-MA-1L	4	21.80	8.88U	104.56	0.70U	3.81U	0.70U	29.86	109.60
OI-MA-1L	5	26.63	8.88U	198.72	0.70U	3.81U	0.70U	67.95	133.58
OI-MA-2U	1	55.16	8.86U	90.85	0.70U	29.23	21.48	23.16	1160.18
OI-MA-2U	2	77.42	4.86	145.88	0.70U	40.19	26.27	40.35	1705.83
OI-MA-2U	3	94.96	8.88U	242.64	5.93	42.56	24.98	59.41	1763.13
OI-MA-2U	4	66.45	2.50	140.96	0.70U	20.54	16.05	27.63	1066.80
OI-MA-2U	5	71.31	8.66U	139.50	0.70U	36.26	56.52	36.21	1183.10
OI-MA-2L	2	11.81	8.88U	25.73	0.70U	3.81U	18.61	14.43	57.23
OI-MA-2L	3	11.00	8.88U	20.03	0.70U	3.81U	21.05	12.72	42.32
OI-MA-2L	4	2.03U	8.86U	6.83	0.70U	3.81U	30.11	7.31	9.53
OI-MA-2L	5	17.42	8.88U	51.15	0.70U	3.81U	10.83	10.32	63.10
OO-W-1	1	9.80	8.88U	11.82	0.70U	3.81U	8.79	8.51	11.06
OO-W-1	2	6.60	8.88U	11.93	0.70U	3.81U	13.36	8.46	6.70
OO-W-1	3	12.06	6.88U	15.97	0.70U	3.81U	6.77	6.24	12.94
OO-W-1	4	2.03U	8.88U	11.57	2.10	3.81U	12.70	7.96	8.72
OO-W-1	5	4.53	8.86U	7.39	0.70U	3.81U	9.85	7.06	5.32
OO-W-2	1	9.00	8.86U	9.13	0.70U	3.81U	23.54	9.12	4.55
OO-W-2	2	19.66	8.88U	41.09	0.70U	3.81U	19.53	11.61	36.33
OO-W-2	3	6.50	8.88U	12.02	0.70U	3.81U	21.22	9.07	8.22
OO-W-2	4	7.27	8.88U	11.73	0.70U	3.81U	29.44	10.53	8.33
OO-W-2	5	9.51	8.86U	15.07	0.70U	3.81U	20.69	9.53	10.31

TABLE G.1. (Contd)

Sediment Treatment	Rep	Acenaph-thene	Acenaph-thylene	Anthra-cene	Benzo(a) Anthra-cene	Benzo(a) pyrene	Benzo(b) fluoran-thene	Benzo (g,h,i) perylene	Benzo(k) fluoran-thene
		(ug/kg dry wt)							
00-W-3	1	1.08U	1.33U	5.95	12.64	10.26	14.73	0.60	9.23
00-W-3	2	1.08U	1.33U	0.57U	4.50	6.16	7.87	5.77U	4.95
00-W-3	3	1.08U	1.33U	0.57U	6.86	8.36	12.82	0.68	5.77
00-W-3	4	1.08U	1.33U	0.57U	3.21	5.09	5.91	5.77U	5.16
00-W-3	5	1.08U	1.33U	0.57U	6.87	9.26	9.95	0.67	10.63
00-W-4	1	1.08U	1.33U	4.57	10.17	13.07	17.27	0.50	9.42
00-W-4	2	1.08U	1.33U	4.74	8.65	11.15	12.34	5.77U	12.91
00-W-4	3	1.08U	1.33U	4.16	13.72	10.39	15.25	0.63	13.53
00-W-4	4	1.08U	1.33U	3.56	4.85	9.50	11.11	0.35	6.90
00-W-4	5	1.08U	1.33U	3.16	9.26	9.27	10.09	0.48	6.07
00-W-5	1	1.08U	1.33U	0.57U	1.33U	2.15	4.16	5.77U	3.47
00-W-5	2	1.08U	1.33U	0.57U	1.33U	2.54U	5.39U	5.77U	5.52U
00-W-5	3	1.08U	1.33U	0.57U	1.33U	2.54U	2.90	5.77U	1.55
00-W-5	4	1.08U	1.33U	0.57U	1.33U	2.54U	2.96	5.77U	2.01
00-W-5	5	1.08U	1.33U	0.57U	3.04	2.54U	3.24	5.77U	1.65
PR-coarse	2	1.08U	1.33U	2.70	30.18	10.00	13.74	2.88	12.92
PR-coarse	3	1.08U	1.33U	0.57U	1.33U	2.54U	4.66	5.77U	1.99
PR-coarse	4	1.08U	1.33U	2.12	7.70	5.01	9.75	2.99	5.00
PR-coarse	5	1.08U	1.33U	0.57U	3.91	3.17	2.52	5.77U	3.69
PR-fine	1	1.08U	1.33U	0.57U	2.05	2.14	3.30	5.77U	3.74
PR-fine	2	1.08U	1.33U	0.57U	1.33U	1.54	2.31	1.10	1.66
PR-fine	3	1.08U	1.33U	0.57U	1.33U	1.96	1.31	5.77U	1.69
PR-fine	4	1.08U	1.33U	0.57U	1.33U	2.54U	5.39U	5.77U	5.52U
PR-fine	5	1.08U	1.33U	0.57U	1.33U	2.54U	2.44	5.77U	5.52U
Tomales Bay	1	1.08U	1.33U	0.57U	1.33U	2.54U	3.24	5.77U	2.09
Tomales Bay	2	1.08U	1.33U	0.57U	4.28	2.54U	2.09	5.77U	2.51
Tomales Bay	3	1.08U	1.33U	1.71	5.74	2.31	4.88	5.77U	2.47
Tomales Bay DUP	3	1.08U	1.33U	2.13	7.28	2.54U	4.58	5.77U	3.39
Tomales Bay	4	1.08U	1.33U	1.77	6.16	4.08	6.17	2.31	4.72
Tomales Bay	5	1.08U	1.33U	0.57U	3.06	4.54	4.45	1.34	3.97

TABLE G.1. (Contd)

Sediment Treatment	Rep	Chrysene	Dibenzo (a,h) anthracene	Fluoranthene	Fluorene	Indeno (1,2,3-c,d) pyrene	Naphthalene	Phenanthrene	Pyrene
		(ug/kg dry wt)							
OO-W-3	1	24.80	8.88U	50.72	0.70U	3.81U	23.52	25.24	69.46
OO-W-3	2	14.54	8.88U	19.20	0.70U	3.81U	20.74	8.74	36.91
OO-W-3	3	15.20	8.88U	31.73	0.70U	2.15	21.76	13.23	71.59
OO-W-3	4	10.14	8.88U	18.28	0.70U	3.81U	19.62	8.69	14.58
OO-W-3	5	15.53	8.88U	35.30	0.70U	3.81U	16.72	12.57	80.23
OO-W-4	1	18.50	8.88U	42.15	0.70U	3.81U	16.32	13.99	79.91
OO-W-4	2	20.51	8.88U	54.22	0.70U	3.81U	17.25	15.93	96.81
OO-W-4	3	24.91	8.88U	50.85	0.70U	2.93	18.03	12.68	68.52
OO-W-4	4	13.84	8.88U	38.81	0.70U	3.81U	14.84	10.98	74.84
OO-W-4	5	18.93	8.88U	48.40	0.70U	3.81U	7.10	10.72	84.73
OO-W-5	1	16.13	8.88U	27.69	0.70U	3.81U	12.78	7.61	21.82
OO-W-5	2	4.94	8.88U	10.03	0.70U	3.81U	9.75	6.89	7.34
OO-W-5	3	13.72	8.88U	20.80	0.70U	3.81U	14.19	9.10	15.51
OO-W-5	4	10.68	8.88U	21.09	0.70U	3.81U	12.83	8.38	17.12
OO-W-5	5	9.58	8.88U	19.10	0.70U	3.81U	11.39	9.44	13.75
PR-coarse	2	46.31	8.88U	78.45	0.70U	3.81U	14.16	12.68	64.57
PR-coarse	3	9.82	8.88U	24.18	0.70U	3.81U	12.30	16.82	21.04
PR-coarse	4	18.99	8.88U	49.99	0.70U	3.81U	10.66	12.61	67.34
PR-coarse	5	13.30	8.88U	24.19	0.70U	3.81U	18.79	10.26	16.15
PR-fine	1	14.35	8.88U	17.50	0.70U	3.81U	13.27	8.21	15.17
PR-fine	2	4.14	8.88U	11.61	0.70U	3.81U	12.84	8.91	10.29
PR-fine	3	6.03	8.88U	10.20	0.70U	3.81U	12.95	8.22	8.22
PR-fine	4	4.66	8.88U	10.08	0.70U	3.81U	13.57	12.20	6.55
PR-fine	5	4.73	8.88U	13.25	0.70U	3.81U	11.05	8.59	11.99
Tomales Bay	1	7.22	8.88U	11.36	0.70U	3.81U	21.42	11.72	9.69
Tomales Bay	2	12.06	8.88U	16.68	0.70U	3.81U	18.67	10.25	16.96
Tomales Bay	3	17.63	8.88U	37.26	0.70U	3.81U	18.45	12.10	13.79
Tomales Bay DUP	3	17.36	8.88U	39.98	0.70U	3.81U	18.69	11.59	13.77
Tomales Bay	4	18.75	8.88U	42.36	0.70U	1.46	14.47	10.92	29.94
Tomales Bay	5	16.22	8.88U	20.96	0.70U	3.81U	21.81	10.95	22.05

TABLE G.2. Concentrations of PAHs in Tissues of Macoma nasuta After 10-Day Exposure to Sediment Treatments (Mean Blank Corrected, Wet Weight)

Sediment Treatment	Rep	Acenaph-thene	Acenaph-thylene	Anthra-cene	Benzo(a) Anthra-cene	Benzo(a) pyrene	Benzo(b) fluoran-thene	Benzo (g,h,i) perylene	Benzo(k) fluoran-thene
		(ug/kg wet wt)							
OI-CH-0	1	0.17U	0.21U	0.09U	0.48	0.40U	0.71	-	0.49
OI-CH-0 DUP	1	0.17U	0.21U	0.09U	0.21U	0.23	0.36	-	0.36
OI-CH-0	2	0.17U	0.21U	0.46	0.21U	0.40U	0.78	-	0.56
OI-CH-0	3	0.17U	0.21U	0.47	0.62	0.40U	0.52	-	0.40
OI-CH-0	4	0.17U	0.21U	0.51	0.09	0.40U	0.85	-	0.53
OI-CH-0	5	0.17U	0.21U	0.58	0.21U	0.40U	0.77	-	0.55
OO-CH-1	1	0.17U	0.21U	0.43	0.54	0.40U	0.85	-	0.47
OO-CH-1 DUP	1	0.49	0.21U	0.09U	0.21U	0.40	0.39	-	0.32
OO-CH-1	2	0.17U	0.21U	0.09U	0.21U	0.40U	0.41	-	0.39
OO-CH-1	3	0.17U	0.21U	0.43	0.21U	0.40U	0.59	-	0.36
OO-CH-1	4	0.17U	0.21U	0.45	0.21U	0.40U	0.77	-	0.48
OO-CH-1	5	0.17U	0.21U	0.56	0.13	0.40U	0.92	-	0.87U
OO-CH-2	1	0.17U	0.21U	0.94	0.21U	0.68	1.73	-	1.86
OO-CH-2	2	0.17U	0.21U	0.75	0.09	0.14	2.15	-	0.98
OO-CH-2	3	0.17U	0.21U	0.41	0.21U	0.40U	0.91	-	0.65
OO-CH-2	4	0.17U	0.21U	0.39	0.21U	0.40U	0.92	-	0.99
OO-CH-2	5	0.17U	0.21U	0.69	0.21U	0.74	2.08	-	1.56
OI-CH-2A	1	0.17U	0.21U	0.62	0.21U	1.35	3.07	1.19	2.05
OI-CH-2A	2	0.17U	1.30	0.09U	0.21U	0.40U	1.92	-	1.07
OI-CH-2A	3	0.17U	1.14	0.09U	0.21U	0.80	2.13	-	1.31
OI-CH-2A	4	0.17U	0.81	0.09U	0.21U	0.28	2.63	-	1.41
OI-CH-2A	5	0.17U	0.89	0.09U	0.21U	0.62	2.10	-	1.50
OO-CH-3	1	0.17U	0.85	0.09U	0.21U	0.40U	1.23	-	1.08
OO-CH-3	2	0.17U	0.98	0.09U	0.21U	0.40U	0.98	3.66	0.62
OO-CH-3	3	0.17U	0.21U	0.35	0.21U	0.40U	1.23	-	1.00
OO-CH-3	4	0.17U	0.21U	0.35	0.21U	0.08	1.59	0.92	1.48
OO-CH-3	5	0.17U	0.21U	1.89	1.71	1.18	2.72	-	2.24
OO-CH-4	1	0.17U	0.21U	1.61	0.50	1.16	2.94	1.22	2.03
OO-CH-4	2	0.17U	0.21U	1.60	0.79	2.68	3.73	1.00	2.77
OO-CH-4	3	1.17	0.58	1.77	0.67	1.12	2.64	-	1.66
OO-CH-4	4	0.17U	0.84	2.03	1.13	1.40	3.06	-	2.52
OO-CH-4	5	0.17U	0.50	1.41	0.46	0.38	2.26	-	1.48

U = Undetected.

- = Zero.

TABLE G.2. (Contd)

Sediment Treatment	Rep	Chrysene	Dibenzo (a,h) anthracene	Fluoranthene	Fluorene	Indeno (1,2,3-c,d) pyrene	Naphthalene	Phenanthrene	Pyrene
		(ug/kg wet wt)							
OI-CH-0	1	0.96	-	1.61	0.11U	0.91U	0.11U	0.09U	1.40
OI-CH-0 DUP	1	1.00	-	1.52	0.11U	0.91U	2.76	1.26	0.97
OI-CH-0	2	1.71	-	3.57	0.01	0.91U	0.11U	0.43	2.81
OI-CH-0	3	1.38	-	1.93	0.80	0.91U	7.98	2.11	1.38
OI-CH-0	4	1.40	-	2.20	1.32	0.91U	10.36	2.81	1.72
OI-CH-0	5	2.60	-	4.67	1.54	0.91U	7.24	3.37	3.77
OO-CH-1	1	1.17	-	2.02	0.88	0.91U	7.78	1.79	2.00
OO-CH-1 DUP	1	0.92	-	2.33	0.43	0.91U	2.77	1.77	1.96
OO-CH-1	2	0.97	-	1.79	1.32	0.91U	5.12	2.72	1.59
OO-CH-1	3	1.12	-	2.64	0.89	0.91U	7.80	2.60	2.36
OO-CH-1	4	2.07	-	5.67	0.40	0.91U	0.11U	1.16	4.06
OO-CH-1	5	1.13	-	2.91	0.91	0.91U	1.24	2.14	1.98
OO-CH-2	1	3.89	-	11.09	0.07	0.91U	0.11U	0.97	13.15
OO-CH-2	2	3.00	-	7.25	0.57	0.91U	1.66	1.82	8.59
OO-CH-2	3	1.13	-	2.50	0.11U	0.91U	0.11U	0.09U	3.77
OO-CH-2	4	1.29	-	2.96	0.11U	0.91U	0.11U	0.09U	4.54
OO-CH-2	5	2.63	-	7.15	0.08	0.91U	0.11U	1.15	10.08
OI-CH-2A	1	2.93	-	5.49	0.26	0.91U	0.11U	0.73	10.53
OI-CH-2A	2	1.71	-	2.60	0.11U	0.91U	0.11U	0.09U	4.57
OI-CH-2A	3	2.36	-	4.46	0.11U	0.69	0.11U	0.09U	10.45
OI-CH-2A	4	2.74	-	7.60	0.11U	0.91U	0.11U	0.09U	12.35
OI-CH-2A	5	2.67	-	8.07	0.11U	0.91U	0.11U	0.09U	12.04
OO-CH-3	1	1.67	-	3.86	0.11U	0.64	0.11U	0.09U	4.45
OO-CH-3	2	1.13	-	2.89	0.11U	0.91U	0.11U	0.09U	3.20
OO-CH-3	3	1.80	-	3.97	0.11U	0.91U	0.11U	0.09U	3.74
OO-CH-3	4	2.02	-	3.98	0.11U	0.91U	0.11U	0.09U	4.96
OO-CH-3	5	4.12	-	16.20	4.66	0.91U	0.11U	14.14	12.69
OO-CH-4	1	3.53	-	8.99	0.11U	0.73	0.11U	0.09U	10.22
OO-CH-4	2	3.90	-	10.33	0.11U	0.72	0.11U	0.09U	14.32
OO-CH-4	3	3.01	-	9.90	0.11U	0.91U	0.11U	0.09U	13.98
OO-CH-4	4	3.58	-	12.83	0.11U	0.91U	0.11U	0.09U	20.61
OO-CH-4	5	2.93	-	9.38	0.11U	0.91U	0.11U	0.09U	14.98

TABLE G.2 (Contd)

		(ug/kg wet wt)							
Sediment Treatment	Rep	Acenaph-thene	Acenaph-thylene	Anthra-cene	Benzo(a) Anthra-cene	Benzo(a) pyrene	Benzo(b) fluoran-thene	Benzo (g,h,i) perylene	Benzo(k) fluoran-thene
OI-CH-4A	1	0.17U	0.21U	0.45	0.80	0.40U	0.85U	-	0.87U
OI-CH-4A DUP	1	0.17U	0.21U	0.09U	0.53	0.40U	0.99	-	0.58
OI-CH-4A	2	0.17U	0.21U	0.35	0.21U	0.40U	0.81	0.60	0.73
OI-CH-4A	3	0.17U	0.21U	0.31	0.21U	0.40U	0.49	-	0.45
OI-CH-4A	4	0.17U	0.21U	0.33	0.37	0.40U	0.79	-	0.59
OI-CH-4A	5	0.17U	0.71	0.41	0.21U	0.40U	1.14	-	0.83
OO-CH-5	1	0.17U	0.21U	0.40	0.21U	0.40U	1.34	-	1.18
OO-CH-5 DUP	1	0.17U	0.21U	0.33	0.49	0.69	0.90	0.25	0.64
OO-CH-5	2	0.17U	0.88	0.41	0.21U	0.40U	1.44	-	1.32
OO-CH-5	3	0.17U	0.78	0.52	0.21U	0.40U	1.68	-	1.01
OO-CH-5	4	0.17U	0.98	0.60	0.21U	0.40U	1.58	-	0.98
OO-CH-5	5	0.17U	0.89	0.37	0.21U	0.40U	1.30	-	0.96
OO-CH-6	1	0.91	0.99	1.92	1.32	1.47	3.78	1.19	3.58
OO-CH-6	2	0.17U	0.21U	1.15	0.39	0.34	3.08	-	2.48
OO-CH-6	3	0.17U	0.98	1.31	1.28	1.00	3.81	1.16	3.18
OO-CH-6	4	0.17U	0.90	1.05	0.51	0.58	3.29	0.96	2.74
OO-CH-6	5	1.07	0.88	1.05	0.95	0.97	3.64	0.82	2.85
OI-CH-6A	1	0.17U	0.56	0.09U	0.21U	0.40U	0.85U	-	0.87U
OI-CH-6A	2	0.17U	0.42	0.09U	0.21U	0.40U	0.50	-	0.26
OI-CH-6A	3	0.17U	0.41	0.38	0.21U	0.40U	1.01	-	0.97
OI-CH-6A	4	0.17U	0.44	0.09U	0.21U	0.40U	0.64	-	0.44
OI-CH-6A	5	0.17U	0.44	0.42	0.24	0.40U	1.09	-	0.87
OO-CH-7	1	0.17U	0.42	0.50	0.21U	0.40U	1.20	-	1.01
OO-CH-7	2	0.17U	0.67	0.63	0.21U	0.40U	1.65	0.36	1.17
OO-CH-7	3	0.17U	0.65	0.09U	0.21U	0.40U	1.69	-	1.50
OO-CH-7	4	0.17U	0.33	0.67	0.21U	0.40U	1.59	-	1.45
OO-CH-7	5	0.17U	0.53	0.56	0.21U	0.40U	1.34	-	1.16
OO-CH-8	3	0.17U	1.11	0.94	0.21U	0.85	3.25	-	2.02
OO-CH-8	1	0.17U	0.72	0.98	0.78	0.85	3.71	-	2.32
OO-CH-8	2	2.85	1.97	1.39	0.54	0.97	2.97	-	2.08
OO-CH-8	4	1.30	1.22	0.98	0.78	1.48	3.40	-	2.93
OO-CH-8	5	0.17U	0.21U	1.08	4.18	3.90	5.60	-	3.15
OI-SS-4L	2	0.17U	0.21U	0.09U	0.92	0.59	0.95	-	0.58
OI-SS-4L DUP	2	0.17U	0.21U	0.09U	0.41	0.48	0.77	-	0.57
OI-SS-4L	3	0.17U	0.21U	0.09U	0.50	0.79	0.95	-	0.78
OI-SS-4L	4	0.17U	0.21U	0.09U	0.47	0.54	0.81	-	0.45
OI-SS-4L	5	0.17U	0.21U	0.09U	0.77	0.75	0.84	-	0.87

TABLE G.2 (Contd)

Sediment Treatment	Rep	Chrysene	Dibenzo (a,h) anthracene	Fluoranthene	Fluorene	Indeno (1,2,3-c,d) pyrene	Naphthalene	Phenanthrene	Pyrene
		(ug/kg wet wt)							
OI-CH-4A	1	1.74	-	3.88	0.11U	0.91U	0.11U	0.09U	3.28
OI-CH-4A DUP	1	1.54	-	3.84	0.11U	0.91U	0.11U	0.09U	3.04
OI-CH-4A	2	1.27	-	4.42	0.11U	0.91U	0.11U	0.09U	3.86
OI-CH-4A	3	1.18	-	2.38	0.11U	0.91U	0.11U	0.09U	1.71
OI-CH-4A	4	1.46	-	3.81	0.11U	0.91U	0.11U	0.09U	3.09
OI-CH-4A	5	2.08	-	3.44	0.11U	0.91U	0.11U	0.09U	2.45
OO-CH-5	1	1.57	-	2.03	0.11U	0.91U	0.11U	0.09U	2.47
OO-CH-5 DUP	1	0.96	-	1.60	0.11U	0.91U	1.86	1.51	2.26
OO-CH-5	2	1.92	-	3.47	0.11U	0.91U	0.11U	0.09U	6.01
OO-CH-5	3	1.57	-	2.30	0.11U	0.91U	0.11U	0.09U	4.47
OO-CH-5	4	1.32	-	2.73	0.11U	0.91U	0.11U	0.09U	6.90
OO-CH-5	5	1.06	-	2.41	0.11U	0.91U	0.11U	0.09U	5.63
OO-CH-6	1	4.36	-	7.13	0.11U	0.70	0.11U	0.09U	19.86
OO-CH-6	2	3.52	-	5.82	0.11U	0.91U	0.11U	0.09U	15.65
OO-CH-6	3	3.97	-	8.21	0.11U	0.80	0.11U	0.09U	19.73
OO-CH-6	4	2.86	-	5.54	0.11U	0.88	0.11U	0.09U	18.88
OO-CH-6	5	4.89	-	10.05	0.11U	0.46	0.11U	0.09U	20.59
OI-CH-6A	1	0.60	-	1.65	0.11U	0.91U	0.11U	0.09U	0.86
OI-CH-6A	2	0.91	-	2.31	0.11U	0.91U	0.11U	0.09U	1.88
OI-CH-6A	3	2.18	-	4.84	0.11U	0.91U	0.11U	0.09U	2.50
OI-CH-6A	4	2.08	-	4.48	0.11U	0.91U	0.11U	0.09U	2.68
OI-CH-6A	5	3.71	-	7.94	0.11U	0.91U	0.11U	0.09U	5.29
OO-CH-7	1	1.05	-	1.90	0.11U	0.91U	0.11U	0.09U	6.13
OO-CH-7	2	1.41	-	3.96	0.11U	0.91U	0.11U	0.09U	11.11
OO-CH-7	3	1.28	-	2.10	0.11U	0.91U	0.11U	0.09U	9.84
OO-CH-7	4	1.81	-	3.66	0.11U	0.91U	0.11U	0.09U	8.33
OO-CH-7	5	1.27	-	1.97	0.11U	0.91U	0.11U	0.09U	7.68
OO-CH-8	3	2.76	-	6.18	0.11U	0.91U	0.11U	0.09U	24.38
OO-CH-8	1	3.55	-	7.78	0.11U	0.91U	0.11U	0.09U	21.45
OO-CH-8	2	3.74	-	8.11	2.09	0.91U	3.07	4.17	22.95
OO-CH-8	4	3.34	-	6.93	0.81	0.91U	0.11U	1.01	23.17
OO-CH-8	5	8.55	-	6.23	0.11U	0.91U	0.11U	0.09U	26.83
OI-SS-4L	2	2.08	-	4.86	0.41	0.91U	4.14	2.62	5.11
OI-SS-4L DUP	2	1.58	-	4.07	0.11U	0.91U	4.73	2.23	3.98
OI-SS-4L	3	1.60	-	3.58	0.68	0.37	2.75	1.63	5.33
OI-SS-4L	4	1.07	-	2.90	0.11U	-	1.05	1.44	4.73
OI-SS-4L	5	1.44	-	4.51	0.56	-	3.11	2.81	7.42

TABLE G.2. (Contd)

Sediment Treatment	Rep	(ug/kg wet wt) Acenaph-thene	Acenaph-thylene	Anthra-cene	Benzo(a) Anthra-cene	Benzo(a) pyrene	Benzo(b) fluoran-thene	Benzo (g,h,i) perylene	Benzo(k) fluoran-thene
0I-TS-5AU	1	0.17U	0.21U	4.90	29.76	36.28	52.44	7.29	34.68
0I-TS-5AU	2	1.47	0.79	7.79	31.06	43.42	60.81	8.62	39.85
0I-TS-5AU	3	0.87	0.36	4.40	19.54	27.39	38.14	5.40	26.03
0I-TS-5AU	4	0.96	0.67	5.74	26.61	34.45	49.70	6.30	31.19
0I-TS-5AU	5	1.03	0.21U	4.97	18.79	24.84	36.20	5.42	18.16
0I-TS-5AL	2	2.63	0.21U	15.13	15.76	11.15	12.71	3.40	8.71
0I-TS-5AL	3	1.60	0.21U	12.16	17.02	12.84	14.33	3.79	9.44
0I-TS-5AL	4	1.05	0.21U	10.76	18.86	14.45	15.28	4.87	12.94
TS-5AL DUP	4	1.70	0.21U	12.80	22.75	16.80	17.73	5.43	14.85
0I-TS-5AL	5	0.91	0.21U	8.09	20.37	15.62	17.86	5.12	13.27
0I-MA-1L	1	0.17U	0.21U	0.09U	0.21U	0.40U	0.85U	-	0.87U
0I-MA-1L DUP	1	1.40	0.58	3.22	0.21U	0.40U	1.49	-	0.86
0I-MA-1L	2	1.39	0.59	3.25	0.77	0.14	1.69	-	1.54
0I-MA-1L	3	0.17U	0.56	1.49	1.45	0.40U	1.79	-	1.01
0I-MA-1L	4	0.17U	0.21U	1.38	0.19	0.40U	1.43	-	0.92
0I-MA-1L	5	0.65	0.21U	3.20	0.83	0.57	1.83	-	1.34
0I-MA-2U	1	0.17U	0.21U	1.61	4.05	26.46	32.25	7.73	14.87
0I-MA-2U	2	0.17U	0.21U	2.05	5.24	29.41	32.48	9.16	17.35
0I-MA-2U	3	0.17U	0.21U	2.43	7.31	26.86	30.06	9.86	17.16
0I-MA-2U	4	0.17U	0.21U	1.46	3.42	14.96	17.75	4.48	10.11
0I-MA-2U	5	0.17U	0.21U	0.09U	4.43	17.68	24.06	6.55	13.22
0I-MA-2L	2	0.17U	0.21U	0.09U	0.21U	0.96	1.52	-	0.99
0I-MA-2L	3	0.17U	0.21U	0.09U	0.34	0.70	1.23	-	0.98
0I-MA-2L	4	0.17U	0.21U	0.09U	0.21U	0.40U	0.85U	-	0.87U
0I-MA-2L	5	0.17U	0.21U	0.09U	0.88	0.64	0.75	-	0.94
00-W-1	1	0.17U	0.21U	0.09U	0.38	0.19	0.38	-	0.21
00-W-1	2	0.17U	0.21U	0.09U	0.21U	0.29	0.20	-	0.16
00-W-1	3	0.17U	0.21U	0.09U	0.24	0.23	0.44	-	0.29
00-W-1	4	0.17U	0.21U	0.09U	0.21U	0.13	0.25	-	0.23
00-W-1	5	0.17U	0.21U	0.09U	0.21U	0.24	0.15	-	0.13
00-W-2	1	0.17U	0.21U	0.09U	0.21U	0.67	0.85	-	0.87U
00-W-2	2	0.17U	0.21U	0.09U	1.02	1.23	1.54	-	0.85
00-W-2	3	0.17U	0.21U	0.09U	0.21U	0.63	1.00	-	0.53
00-W-2	4	0.17U	0.21U	0.09U	0.21U	1.18	1.09	-	0.62
00-W-2	5	0.17U	0.21U	0.09U	0.44	0.68	1.06	-	0.83

TABLE G.2. (Contd)

Sediment Treatment	Rep	Chrysene	Dibenzo (a,h) anthracene	Fluoranthene	Fluorene	Indeno (1,2,3-c,d) pyrene	Naphthalene	Phenanthrene	Pyrene
		(ug/kg wet wt)							
OI-TS-5AU	1	46.22	1.00	73.46	1.27	6.26	1.97	12.84	196.70
OI-TS-5AU	2	59.30	1.46	94.37	2.29	7.55	3.20	20.13	254.85
OI-TS-5AU	3	34.48	0.86	55.10	1.20	4.31	1.44	11.36	160.62
OI-TS-5AU	4	48.32	1.03	77.84	1.49	5.60	1.61	14.15	208.52
OI-TS-5AU	5	32.50	0.74	52.55	1.27	3.91	2.28	11.71	148.22
OI-TS-5AL	2	20.56	-	107.64	9.60	2.53	1.75	118.49	134.04
OI-TS-5AL	3	23.40	-	104.95	5.75	2.86	1.50	84.99	137.55
OI-TS-5AL	4	25.33	0.51	99.98	4.48	3.81	2.52	75.78	126.30
TS-5AL DUP	4	29.46	0.47	114.19	4.73	4.21	4.06	87.95	146.55
OI-TS-5AL	5	25.12	0.33	92.41	3.17	3.61	3.39	58.09	140.25
OI-MA-1L	1	0.32U	-	0.28U	0.11U	0.91U	0.11U	0.09U	0.19U
OI-MA-1L DUP	1	2.56	-	23.83	0.11U	0.91U	0.11U	11.51	24.66
OI-MA-1L	2	3.63	-	30.26	0.11U	0.91U	0.11U	13.81	30.42
OI-MA-1L	3	5.08	-	15.75	0.11U	0.91U	0.11U	2.84	9.92
OI-MA-1L	4	3.33	-	15.96	0.11U	0.91U	0.11U	4.56	16.73
OI-MA-1L	5	3.97	-	29.59	0.11U	0.91U	0.11U	10.12	19.89
OI-MA-2U	1	9.13	-	15.04	0.11U	4.84	3.56	3.83	192.03
OI-MA-2U	2	11.15	0.70	20.97	0.11U	5.79	3.78	5.81	245.55
OI-MA-2U	3	13.25	-	33.87	0.83	5.94	3.49	8.29	246.09
OI-MA-2U	4	9.13	0.34	19.36	0.11U	2.62	2.07	3.82	145.03
OI-MA-2U	5	9.70	-	18.98	0.11U	4.80	7.56	4.93	158.24
OI-MA-2L	2	1.64	-	3.56	0.11U	0.91U	2.58	2.00	7.93
OI-MA-2L	3	1.73	-	3.15	0.11U	0.91U	3.31	2.00	6.66
OI-MA-2L	4	0.32U	-	0.99	0.11U	0.91U	4.38	1.06	1.39
OI-MA-2L	5	2.66	-	7.81	0.11U	0.91U	1.65	1.58	9.53
OO-W-1	1	1.40	-	1.69	0.11U	0.91U	1.26	1.22	1.58
OO-W-1	2	0.94	-	1.69	0.11U	0.91U	1.89	1.20	0.95
OO-W-1	3	1.70	-	2.26	0.11U	0.91U	1.24	0.88	1.83
OO-W-1	4	0.32U	-	1.73	0.31	0.91U	1.90	1.19	1.31
OO-W-1	5	0.65	-	1.07	0.11U	0.91U	1.42	1.02	0.77
OO-W-2	1	1.36	-	1.38	0.11U	0.91U	3.56	1.38	0.69
OO-W-2	2	2.65	-	5.96	0.11U	0.91U	2.83	1.68	5.27
OO-W-2	3	0.90	-	1.67	0.11U	0.91U	2.94	1.26	1.14
OO-W-2	4	1.07	-	1.73	0.11U	0.91U	4.34	1.55	1.23
OO-W-2	5	1.45	-	2.30	0.11U	0.91U	3.16	1.45	1.57

TABLE G.2. (Contd)

Sediment Treatment	Rep	(ug/kg wet wt) Acenaph-thene	Acenaph-thylene	Anthra-cene	Benzo(a) Anthra-cene	Benzo(a) pyrene	Benzo(b) fluoran-thene	Benzo (g,h,i) perylene	Benzo(k) fluoran-thene
00-W-3	1	0.17U	0.21U	0.86	1.83	1.49	2.14	0.60	1.34
00-W-3	2	0.17U	0.21U	0.09U	0.76	1.04	1.33	-	0.84
00-W-3	3	0.17U	0.21U	0.09U	1.07	1.30	2.00	0.68	0.90
00-W-3	4	0.17U	0.21U	0.09U	0.40	0.63	0.73	-	0.84
00-W-3	5	0.17U	0.21U	0.09U	0.91	1.23	1.32	0.67	1.44
00-W-4	1	0.17U	0.21U	0.69	1.53	1.97	2.80	0.50	1.42
00-W-4	2	0.17U	0.21U	0.64	1.17	1.51	1.67	-	1.75
00-W-4	3	0.17U	0.21U	0.61	2.01	1.52	2.24	0.63	1.98
00-W-4	4	0.17U	0.21U	0.51	0.70	1.36	1.60	0.35	0.99
00-W-4	5	0.17U	0.21U	0.48	1.26	1.28	1.37	0.48	0.82
00-W-5	1	0.17U	0.21U	0.09U	0.21U	0.31	0.60	-	0.50
00-W-5	2	0.17U	0.21U	0.09U	0.21U	0.40U	0.85U	-	0.87U
00-W-5	3	0.17U	0.21U	0.09U	0.21U	0.40U	0.40	-	0.21
00-W-5	4	0.17U	0.21U	0.09U	0.21U	0.40U	0.40	-	0.27
00-W-5	5	0.17U	0.21U	0.09U	0.44	0.40U	0.47	-	0.24
PR-coarse	2	0.17U	0.21U	0.41	4.58	1.51	2.07	0.44	1.95
PR-coarse	3	0.17U	0.21U	0.09U	0.21U	0.40U	0.78	-	0.32
PR-coarse	4	0.17U	0.21U	0.29	1.07	0.69	1.35	0.41	0.69
PR-coarse	5	0.17U	0.21U	0.09U	0.58	0.45	0.36	-	0.53
PR-fine	1	0.17U	0.21U	0.09U	0.29	0.30	0.47	-	0.53
PR-fine	2	0.17U	0.21U	0.09U	0.21U	0.23	0.34	0.16	0.25
PR-fine	3	0.17U	0.21U	0.09U	0.21U	0.27	0.18	-	0.24
PR-fine	4	0.17U	0.21U	0.09U	0.21U	0.40U	0.85U	-	0.87U
PR-fine	5	0.17U	0.21U	0.09U	0.21U	0.40U	0.35	-	0.87U
Tomales Bay	1	0.17U	0.21U	0.09U	0.21U	0.40U	0.43	-	0.28
Tomales Bay	2	0.17U	0.21U	0.09U	0.58	0.40U	0.28	-	0.34
Tomales Bay	3	0.17U	0.21U	0.25	0.84	0.34	0.71	-	0.36
Tomales Bay DUP	3	0.17U	0.21U	0.29	0.99	0.40U	0.62	-	0.46
Tomales Bay	4	0.17U	0.21U	0.26	0.91	0.60	0.91	0.34	0.70
Tomales Bay	5	0.17U	0.21U	0.09U	0.35	0.52	0.51	0.15	0.46

TABLE G.2. (Contd)

		(ug/kg wet wt)							
Sediment Treatment	Rep	Chrysene	Dibenzo (a,h) anthracene	Fluoran-thene	Fluorene	Indeno (1,2,3-c,d) pyrene	Naphtha-lene	Phenan-threne	Pyrene
OO-W-3	1	3.60	-	7.38	0.11U	0.91U	3.41	3.66	10.07
OO-W-3	2	2.46	-	3.25	0.11U	0.91U	3.51	1.48	6.24
OO-W-3	3	2.37	-	4.94	0.11U	0.33	3.39	2.06	11.14
OO-W-3	4	1.26	-	2.27	0.11U	0.91U	2.44	1.08	1.81
OO-W-3	5	2.06	-	4.68	0.11U	0.91U	2.22	1.67	10.65
OO-W-4	1	2.78	-	6.34	0.11U	0.91U	2.46	2.11	12.03
OO-W-4	2	2.77	-	7.33	0.11U	0.91U	2.33	2.16	13.09
OO-W-4	3	3.65	-	7.46	0.11U	0.43	2.64	1.86	10.05
OO-W-4	4	1.99	-	5.57	0.11U	0.91U	2.13	1.58	10.75
OO-W-4	5	2.57	-	6.57	0.11U	0.91U	0.96	1.46	11.50
OO-W-5	1	2.33	-	3.99	0.11U	0.91U	1.84	1.10	3.14
OO-W-5	2	0.73	-	1.47	0.11U	0.91U	1.43	1.01	1.08
OO-W-5	3	1.88	-	2.84	0.11U	0.91U	1.94	1.24	2.12
OO-W-5	4	1.45	-	2.87	0.11U	0.91U	1.74	1.14	2.33
OO-W-5	5	1.39	-	2.78	0.11U	0.91U	1.66	1.38	2.00
PR-coarse	2	6.99	-	11.85	0.11U	0.91U	2.14	1.92	9.75
PR-coarse	3	1.57	-	3.87	0.11U	0.91U	1.97	2.70	3.37
PR-coarse	4	2.63	-	6.92	0.11U	0.91U	1.48	1.75	9.33
PR-coarse	5	1.90	-	3.48	0.11U	0.91U	1.97	1.47	2.31
PR-fine	1	2.04	-	2.49	0.11U	0.91U	1.89	1.17	2.16
PR-fine	2	0.62	-	1.73	0.11U	0.91U	1.92	1.33	1.54
PR-fine	3	0.84	-	1.43	0.11U	0.91U	1.81	1.15	1.15
PR-fine	4	0.72	-	1.55	0.11U	0.91U	2.08	1.87	1.00
PR-fine	5	0.67	-	1.89	0.11U	0.91U	1.57	1.22	1.71
Tomales Bay	1	0.96	-	1.51	0.11U	0.91U	2.85	1.56	1.29
Tomales Bay	2	1.63	-	2.55	0.11U	0.91U	2.52	1.36	2.29
Tomales Bay	3	2.57	-	5.43	0.11U	0.91U	2.69	1.76	2.01
Tomales Bay DUP	3	2.37	-	5.45	0.11U	0.91U	2.56	1.58	1.88
Tomales Bay	4	2.76	-	6.23	0.11U	0.22	2.13	1.61	4.41
Tomales Bay	5	1.87	-	2.42	0.11U	0.91U	2.51	1.26	2.54

TABLE G.3. Quality Assurance Summary for Tissue PAHS

Measurements of Precision: Duplicate Results

(ug/kg dry weight)

Sediment Treatment	Rep	Acenaph-thene	Acenaph-thylene	Anthra-cene	Benzo(a) Anthra-cene	Benzo(a) pyrene	Benzo(b) fluoran-thene	Benzo (g,h,i) perylene	Benzo(k) fluoran-thene
OI-CH-0	1	1.08U	1.33U	0.57U	2.86	2.54U	4.28	5.77U	2.97
OI-CH-0 DUP	1	1.08U	1.33U	0.57U	1.33U	1.60	2.49	5.77U	2.49
I-Stat		N/A	N/A	N/A	N/A	N/A	0.3	N/A	0.1
RPD		N/A	N/A	N/A	N/A	N/A	53	N/A	18
OO-CH-1	1	1.08U	1.33U	2.96	3.73	2.54U	5.88	5.77U	3.22
OO-CH-1 DUP	1	3.48	1.33U	0.57U	1.33U	2.81	2.78	5.77U	2.30
I-Stat		N/A	N/A	N/A	N/A	N/A	0.4	N/A	0.2
RPD		N/A	N/A	N/A	N/A	N/A	72	N/A	33
OI-CH-4A	1	1.08U	1.33U	2.95	5.24	2.54U	5.39U	5.77U	5.52U
OI-CH-4A DUP	1	1.08U	1.33U	0.57U	3.43	2.54U	6.44	5.77U	3.78
I-Stat		N/A	N/A	N/A	0.2	0	N/A	N/A	N/A
RPD		N/A	N/A	N/A	42	0	N/A	N/A	N/A
OO-CH-5	1	1.08U	1.33U	2.65	1.33U	2.54U	8.78	5.77U	7.78
OO-CH-5 DUP	1	1.08U	1.33U	2.50	3.64	5.21	6.79	1.88	4.79
I-Stat		N/A	N/A	0.0	N/A	N/A	0.1	N/A	0.2
RPD		N/A	N/A	6	N/A	N/A	26	N/A	48
OI-SS-4L	2	1.08U	1.33U	0.57U	5.88	3.79	6.09	5.77U	3.71
OI-SS-4L DUP	2	1.08U	1.33U	0.57U	2.64	3.05	4.96	5.77U	3.68
I-Stat		N/A	N/A	N/A	0.4	0.1	0.1	N/A	0.0
RPD		N/A	N/A	N/A	76	22	21	N/A	1
OI-TS-5AL	4	6.99	1.33U	71.86	124.68	96.52	102.10	32.52	86.44
OI-TS-5AL DUP	4	11.35	1.33U	85.49	152.01	112.28	118.46	36.29	99.24
I-Stat		0.2	N/A	0.1	0.1	0.1	0.1	0.1	0.1
RPD		48	N/A	17	20	15	15	11	14
OI-MA-1L	1	1.08U	3.42	19.85	0.28	2.54U	7.90	5.77U	8.43
OI-MA-1L DUP	1	9.00	3.60	20.76	1.33U	2.54U	9.61	5.77U	5.54
I-Stat		N/A	0.0	0.0	N/A	N/A	0.1	N/A	0.2
RPD		N/A	5	5	N/A	N/A	19	N/A	41
OI-MA-1L RXTRCT	5	4.21	1.33U	14.99	11.26	8.41	7.89	3.57	9.57
Tomales Bay	3	1.08U	1.33U	1.71	5.74	2.31	4.86	5.77U	2.47
Tomales Bay DUP	3	1.08U	1.33U	2.13	7.28	2.54U	4.58	5.77U	3.39
I-Stat		N/A	N/A	0.1	0.1	N/A	0.0	N/A	0.2
RPD		N/A	N/A	22	24	N/A	6	N/A	31

U = Undetected.

TABLE G.3. (Contd)

Measurements of Precision: Duplicate Results

(ug/kg dry weight)

Sediment Treatment	Rep	Chrysene	Dibenzo (a,h) anthracene	Fluoranthene	Fluorene	Indeno (1,2,3-c,d) pyrene	Naphthalene	Phenanthrene	Pyrene
OI-CH-0	1	5.74	8.88U	9.67	0.70U	3.81U	0.70U	0.57U	8.37
OI-CH-0 DUP	1	6.86	8.88U	10.43	0.70U	3.81U	18.97	8.67	6.66
I-Stat		0.1	N/A	0.0	N/A	N/A	N/A	N/A	0.1
RPD		18	N/A	8	N/A	N/A	N/A	N/A	23
OO-CH-1	1	6.08	8.88U	13.92	6.07	3.81U	53.59	12.33	13.76
OO-CH-1 DUP	1	6.50	8.88U	16.49	3.06	3.81U	19.61	12.52	13.87
I-Stat		0.1	N/A	0.1	0.3	N/A	0.5	0.0	0.0
RPD		21	N/A	17	66	N/A	93	2	1
OI-CH-4A	1	11.34	8.88U	26.30	0.70U	3.81U	0.70U	0.57U	21.35
OI-CH-4A DUP	1	10.04	8.88U	26.02	0.70U	3.81U	0.70U	0.57U	19.61
I-Stat		0.1	N/A	0.0	N/A	N/A	N/A	N/A	0.0
RPD		12	N/A	1	N/A	N/A	N/A	N/A	8
OO-CH-5	1	10.30	8.88U	13.35	0.70U	3.81U	0.70U	0.57U	16.27
OO-CH-5 DUP	1	7.19	8.88U	11.99	0.70U	3.81U	13.97	11.34	16.94
I-Stat		0.2	N/A	0.1	N/A	N/A	N/A	N/A	0.0
RPD		36	N/A	11	N/A	N/A	N/A	N/A	4
OI-SS-4L	2	13.29	8.88U	31.12	2.60	3.81U	26.52	16.79	32.73
OI-SS-4L DUP	2	10.11	8.88U	26.10	0.70U	3.81U	30.28	14.29	25.51
I-Stat		0.1	N/A	0.1	N/A	N/A	0.1	0.1	0.1
RPD		27	N/A	18	N/A	N/A	13	16	25
OI-TS-5AL	4	169.20	3.40	667.96	29.94	25.44	16.83	506.25	843.81
OI-TS-5AL DUP	4	196.85	3.12	762.93	31.57	28.14	27.16	587.60	979.12
I-Stat		0.1	0.0	0.1	0.0	0.1	0.2	0.1	0.1
RPD		15	9	13	5	10	47	15	15
OI-MA-1L	1	16.78	8.88U	155.68	0.70U	3.81U	0.70U	88.02	158.69
OI-MA-1L DUP	1	16.49	8.88U	153.67	0.70U	3.81U	0.70U	74.18	158.90
I-Stat		0.0	N/A	0.0	N/A	N/A	N/A	0.1	0.0
RPD		2	N/A	1	N/A	N/A	N/A	17	0
OI-MA-1L RXTRCT	5	22.42	8.88U	181.96	3.54	3.81U	27.39	108.90	211.19
Tomales Bay	3	17.63	8.88U	37.28	0.70U	3.81U	18.45	12.10	13.79
Tomales Bay DUP	3	17.36	8.88U	39.98	0.70U	3.81U	18.89	11.59	13.77
I-Stat		0.0	N/A	0.0	N/A	N/A	0.0	0.0	0.0
RPD		2	N/A	7	N/A	N/A	2	4	0

TABLE G.3. (Contd)

Measurements of Accuracy: Standard Reference Materials

Sediment Treatment	Rep	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a) Anthracene	Benzo(a) pyrene	Benzo(b) fluoranthene	Benzo (g,h,i) perylene	Benzo(k) fluoranthene
		(ug/kg dry wt)							
Certified Value	-	N/A	N/A	N/A	27	23	117(a)	N/A	117
HI01 A		5.45	10.10	13.25	32.08	9.76	43.77(a)	11.60	-----
Percent Recovery		N/A	N/A	N/A	119	42	37	N/A	N/A
HI02 IRM		1.08U	1.33U	15.64	42.84	13.76	71.28(a)	0.95	-----
Percent Recovery		N/A	N/A	N/A	159	60	61	N/A	
FU99C IRM		1.08U	1.33U	20.61	24.36	10.57	84.01(a)	5.77U	-----
Percent Recovery		N/A	N/A	N/A	90	46	72	N/A	N/A
FU99D SRM		1.08U	19.94	24.67	22.24	8.69	84.58(a)	16.41	31.51
Percent Recovery		N/A	N/A	N/A	82	38	72	N/A	N/A

Sediment Treatment	Rep	Chrysene	Dibenzo (a,h) anthracene	Fluoranthene	Fluorene	Indeno (1,2,3-c,d) pyrene	Naphthalene	Phenanthrene	Pyrene
		(ug/kg dry wt)							
Certified Value	-	98	N/A	193	N/A	N/A	N/A	39	191
HI01 A		104.72	8.88U	197.68	4.65	2.48	26.26	29.04	208.28
Percent Recovery		107	N/A	102	N/A	N/A	N/A	74	109
HI02 IRM		120.44	8.88U	230.14	0.70U	8.90	20.70	27.64	244.30
Percent Recovery		123	N/A	119	N/A	N/A	N/A	71	128
FU99C IRM		122.30	8.88U	258.18	14.86	3.81U	106.96	46.66	268.43
Percent Recovery		125	N/A	134	N/A	N/A	N/A	120	141
FU99D SRM		134.05	8.88U	263.41	0.70U	12.28	0.70U	10.38	261.03
Percent Recovery		137	N/A	136	N/A	N/A	N/A	27	137

(a) Reported as the sum of Benzo(b)fluroanthene and benzo(k)fluoranthene concentrations

TABLE G.3. (Contd)

Surrogate Recoveries

Sediment Treatment	Rep	d8-Naph	d10-Acen	d12-Chry	d12-Pery	d10-Phen
0I-CH-0	1	71	75	113	92	75
0I-CH-0	2	61	67	109	82	73
0I-CH-0	3	76	81	121	101	78
0I-CH-0	4	73	76	113	91	74
0I-CH-0	5	68	75	106	92	69
00-CH-1	1	67	72	114	98	71
00-CH-1	2	69	77	119	94	74
00-CH-1	3	71	78	114	96	73
00-CH-1	4	60	65	104	87	69
00-CH-1	5	69	80	105	72	77
00-CH-2	1	37	67	70	52	73
00-CH-2	2	75	77	88	48	70
00-CH-2	3	31	35	45	35	35
00-CH-2	4	38	44	66	60	45
00-CH-2	5	61	72	98	86	76
0I-CH-2A	1	68	78	121	116	76
0I-CH-2A	2	62	66	75	59	63
0I-CH-2A	3	64	66	77	57	62
0I-CH-2A	4	64	68	69	50	60
0I-CH-2A	5	68	70	72	52	64
00-CH-3	1	71	72	74	55	63
00-CH-3	2	61	70	76	54	65
00-CH-3	3	56	65	111	95	73
00-CH-3	4	53	61	127	112	75
00-CH-3	5	62	72	140	121	78
00-CH-4	1	57	66	120	110	72
00-CH-4	2	51	60	137	125	69
00-CH-4	3	66	67	68	49	60
00-CH-4	4	69	77	69	51	65
00-CH-4	5	56	65	66	47	61

TABLE G.3. (Contd)

Surrogate Recoveries

Sediment Treatment	Rep	d8-Naph	d10-Acen	d12-Chry	d12-Pery	d10-Phen
OI-CH-4A	1	72	78	127	109	76
OI-CH-4A DUP	1	67	73	127	98	74
OI-CH-4A	2	65	71	127	100	71
OI-CH-4A	3	71	75	109	92	75
OI-CH-4A	4	78	75	105	89	73
OI-CH-4A	5	67	67	63	42	62
OO-CH-5	1	37	49	66	44	51
OO-CH-5	2	68	68	70	51	63
OO-CH-5	3	63	63	65	43	57
OO-CH-5	4	65	70	63	50	62
OO-CH-5	5	67	66	74	45	60
OO-CH-6	1	56	66	84	59	64
OO-CH-6	2	49	59	75	53	57
OO-CH-6	3	57	67	85	60	66
OO-CH-6	4	49	59	82	59	61
OO-CH-6	5	55	67	86	63	65
OI-CH-6A	1	52	63	81	54	62
OI-CH-6A	2	56	68	84	58	65
OI-CH-6A	3	42	58	81	58	62
OI-CH-6A	4	59	70	84	60	67
OI-CH-6A	5	55	69	87	61	67
OO-CH-7	1	15	45	83	59	59
OO-CH-7	2	42	58	85	62	64
OO-CH-7	3	55	66	84	65	63
OO-CH-7	4	3	34	82	63	58
OO-CH-7	5	60	70	83	68	67
OO-CH-8	1	74	74	73	51	66
OO-CH-8	2	67	72	66	46	64
OO-CH-8	3	66	71	70	50	62
OO-CH-8	4	67	73	71	50	65
OO-CH-8	5	79	85	119	84	80
OI-SS-4L	2	46	56	73	43	53
OI-SS-4L DUP	2	48	49	70	40	49
OI-SS-4L	3	52	57	71	43	53
OI-SS-4L	4	26	45	72	43	52
OI-SS-4L	5	57	58	69	41	52

TABLE G.3. (Contd)

Surrogate Recoveries

Sediment Treatment	Rep	d8-Naph	d10-Acen	d12-Chry	d12-Pery	d10-Phen
OI-TS-5AU	1	43	52	75	53	54
OI-TS-5AU	2	60	64	81	58	59
OI-TS-5AU	3	39	49	72	51	52
OI-TS-5AU	4	45	50	69	49	49
OI-TS-5AU	5	41	42	60	42	40
OI-TS-5AL	2	51	57	71	51	54
OI-TS-5AL	3	31	38	55	40	40
OI-TS-5AL	4	56	61	79	57	58
OI-TS-5AL DUP	4	64	69	91	66	67
OI-TS-5AL	5	59	61	77	54	58
OI-MA-1L	1	58	71	80	60	67
OI-MA-1L DUP	1	49	60	82	58	59
OI-MA-1L	2	54	63	82	60	60
OI-MA-1L	3	52	59	79	57	59
OI-MA-1L	4	5	36	84	62	59
OI-MA-1L	5	26	44	85	60	61
OI-MA-2U	1	45	46	74	53	49
OI-MA-2U	2	59	60	82	57	57
OI-MA-2U	3	52	53	80	55	52
OI-MA-2U	4	36	47	79	56	54
OI-MA-2U	5	51	52	70	48	49
OI-MA-2L	2	31	54	75	53	52
OI-MA-2L	3	46	48	87	49	51
OI-MA-2L	4	63	66	132	78	89
OI-MA-2L	5	27	31	64	37	41
OO-W-1	1	51	52	73	51	48
OO-W-1	2	59	60	83	57	57
OO-W-1	3	51	54	73	49	52
OO-W-1	4	49	52	68	46	51
OO-W-1	5	47	50	64	44	47
OO-W-2	1	58	57	69	50	52
OO-W-2	2	57	56	75	52	52
OO-W-2	3	59	56	70	50	53
OO-W-2	4	56	55	71	49	52
OO-W-2	5	53	54	75	52	52

TABLE G.3. (Contd)

Surrogate Recoveries

Sediment Treatment	Rep	d8-Naph	d10-Acen	d12-Chry	d12-Pery	d10-Phen
00-W-3	1	54	63	73	52	52
00-W-3	2	60	59	75	53	56
00-W-3	3	56	59	72	53	56
00-W-3	4	55	55	75	52	54
00-W-3	5	52	54	69	51	53
00-W-4	1	52	57	72	53	56
00-W-4	2	53	58	71	52	55
00-W-4	3	58	59	74	54	55
00-W-4	4	46	53	70	51	51
00-W-4	5	41	49	65	48	49
00-W-5	1	56	54	72	50	51
00-W-5	2	46	46	67	46	45
00-W-5	3	61	60	77	57	55
00-W-5	4	60	58	77	58	54
00-W-5	5	54	55	76	60	53
PR-coarse	2	56	56	75	56	54
PR-coarse	3	60	60	82	62	57
PR-coarse	4	47	50	78	59	55
PR-coarse	5	56	56	79	59	55
PR-fine	1	56	57	74	56	54
PR-fine	2	58	61	83	62	58
PR-fine	3	60	62	79	61	58
PR-fine	4	61	60	79	59	55
PR-fine	5	58	62	80	60	58
Tomales Bay	1	55	56	73	55	52
Tomales Bay	2	54	57	71	51	54
Tomales Bay	3	55	59	76	58	56
Tomales Bay DUP	3	55	57	73	56	54
Tomales Bay	4	53	58	71	54	53
Tomales Bay	5	53	54	74	56	50

TABLE G.3. (Contd)

Surrogate Recoveries

Sediment Treatment	Rep	d8-Naph	d10-Acen	d12-Chry	d12-Pery	d10-Phen
FU99C SRM	-	76	81	72	78	73
FU99D SRM	-	49	57	82	57	60
HI01 A SRM	-	46	50	67	45	51
HI02 IRM	-	57	57	74	54	54
FX91 PB	-	49	48	75	49	47
FX92 PB	-	55	52	67	46	48
FX93 PB	-	68	64	77	55	58
FX94 PB	-	60	59	74	55	53
FZ18 PB	-	72	73	107	73	68
FZ19 PB	-	68	72	107	79	73

TABLE G.3. (Contd)

Procedural Blanks

Sediment Treatment	Rep	Acenaph-thene	Acenaph-thylene	Anthra-cene	Benzo(a) Anthra-cene	Benzo(a) pyrene	Benzo(b) fluoran-thene	Benzo (g,h,i) perylene	Benzo(k) fluoran-thene
		(ug/kg dry wt)							
FX91 PB	-	1.08U	1.33U	0.57U	1.33U	2.54U	5.39U	5.77U	5.52U
FX92 PB	-	1.08U	1.33U	0.57U	1.33U	2.54U	5.39U	5.77U	5.52U
FX93 PB	-	1.08U	1.33U	0.57U	1.33U	2.54U	5.39U	5.77U	5.52U
FX94 PB	-	1.08U	1.33U	0.57U	1.33U	2.54U	5.39U	5.77U	5.52U
FZ18 PB	-	1.08U	1.33U	0.57U	0.55	11.84	5.39U	5.77U	5.52U
FZ19 PB	-	1.08U	1.33U	0.57U	1.33U	2.54U	5.39U	5.77U	5.52U

Sediment Treatment	Rep	Chrysene	Dibenzo (a,h) anthracene	Fluoran-thene	Fluorene	Indeno (1,2,3-c,d) pyrene	Naphtha-lene	Phenan-threne	Pyrene
		(ug/kg dry wt)							
FX91 PB	-	2.03U	8.88U	1.78U	0.70U	3.81U	31.55	6.02	1.21U
FX92 PB	-	2.03U	8.88U	1.78U	0.70U	3.81U	0.70U	0.57U	1.21U
FX93 PB	-	2.03U	8.88U	1.78U	0.70U	3.81U	13.70	0.57U	1.21U
FX94 PB	-	2.03U	8.88U	1.78U	0.70U	3.81U	28.71	3.92	1.21U
FZ18 PB	-	2.91	8.88U	1.78U	1.64	3.81U	73.15	3.76	0.18
FZ19 PB	-	2.03U	8.88U	0.44	0.70U	3.81U	0.70U	0.57U	1.21U

Spikes and Recoveries

Performed as surrogate spikes/recoveries

TABLE G.4. Concentrations of Pesticides in Tissues of *Macoma nasuta* After 10-day Exposure to Sediment Treatments, Dry Weight

(ng/g dry wt)

Sediment Treatment	Rep	aBHC	Aldrin	bBHC	Chlor-dane	dBHC	4,4'-DDD	4,4'-DDE	4,4'-DDT	Dieldrin	Endo-sulfan I	Endo-sulfan II	Endo-sulfan Sulfate	Endrin	gBHC	Hepta-chlor	Hepta-chlor Epoxide	Toxa-phene
Target DL		2.5	2.5	2.5	25	2.5	2.5	2.5	5.0	2.5	2.5	2.5	5.0	2.5	2.5	2.5	2.5	50
Achieved DL		6.3	6.3	6.3	13	13	6.3	3.8	6.3	13	13	13	13	13	6.3	13	6.3	63
OI-CH-0	1	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-CH-0 REEX	1	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-CH-0	2	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-CH-0	3	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-CH-0	4	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-CH-0	5	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OO-CH-1	1	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OO-CH-1 REEX	1	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OO-CH-1	2	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OO-CH-1	3	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OO-CH-1	4	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OO-CH-1	5	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OO-CH-2	1	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OO-CH-2	2	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OO-CH-2	3	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OO-CH-2	4	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OO-CH-2	5	6.3U	6.3U	6.3U	13U	13U	6.3U	13.31	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-CH-2A	1	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-CH-2A	2	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-CH-2A	3	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-CH-2A	4	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-CH-2A	5	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U

U = Undetected.

TABLE G.4. (Contd)

(ng/g dry wt)

Sediment Treatment	Rep	aBHC	Aldrin	bBHC	Chlor-dane	dBHC	4,4'-DDD	4,4'-DDE	4,4'-DDT	Dieldrin	Endo-sulfan I	Endo-sulfan II	Endo-sulfan Sulfate	Endrin	gBHC	Hepta-chlor	Hepta-chlor Epoxide	Toxa-phene
00-CH-3	1	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-3	2	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-3	3	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-3	4	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-3	5	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-4	1	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-4	2	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-4	3	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-4	4	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-4	5	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
0I-CH-4A	1	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
0I-CH-4A DUP	1	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
0I-CH-4A	2	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
0I-CH-4A	3	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
0I-CH-4A	4	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
0I-CH-4A	5	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-5	1	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-5 REEX	1	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-5	2	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-5	3	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-5	4	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-5	5	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-6	1	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-6	2	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-6	3	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-6	4	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-6	5	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U

TABLE G.4. (Contd)

(ng/g dry wt)

Sediment Treatment	Rep	aBHC	Aldrin	bBHC	Chlor-dane	dBHC	4,4'-DDD	4,4'-DDE	4,4'-DDT	Dieldrin	Endo-sulfan I	Endo-sulfan II	Endo-sulfan Sulfate	Endrin	gBHC	Hepta-chlor	Hepta-chlor Epoxide	Toxa-phene
0I-CH-6A	1	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
0I-CH-6A	2	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
0I-CH-6A	3	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
0I-CH-6A	4	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
0I-CH-6A	5	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-7	1	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-7	2	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-7	3	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-7	4	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-7	5	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-8	1	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-8	2	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-8	3	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-8	4	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-CH-8	5	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
0I-SS-4L	2	6.3U	6.3U	6.3U	13U	13U	6.3U	3.84	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
0I-SS-4L DUP	2	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
0I-SS-4L	3	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
0I-SS-4L	4	6.3U	6.3U	6.3U	13U	13U	6.3U	3.62	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
0I-SS-4L	5	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
0I-TS-6AU	1	6.3U	6.3U	6.3U	13U	13U	6.3U	12.58	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
0I-TS-5AU	2	6.3U	6.3U	6.3U	13U	13U	6.3U	10.60	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
0I-TS-5AU	3	6.3U	6.3U	6.3U	13U	13U	6.3U	6.85	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
0I-TS-5AU	4	6.3U	6.3U	6.3U	13U	13U	6.3U	9.74	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
0I-TS-5AU	5	6.3U	6.3U	6.3U	13U	13U	6.3U	7.36	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U

TABLE G.4. (Contd)

(ng/g dry wt)

Sediment Treatment	Rep	aBHC	Aldrin	bBHC	Chlor-dane	dBHC	4,4'-DDD	4,4'-DDE	4,4'-DDT	Dieldrin	Endo-sulfan I	Endo-sulfan II	Endo-sulfan Sulfate	Endrin	gBHC	Hepta-chlor	Hepta-chlor Epoxide	Toxa-phene
OI-TS-6AL	2	6.3U	6.3U	6.3U	13U	13U	6.3U	6.87	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-TS-5AL	3	6.3U	6.3U	6.3U	13U	13U	6.3U	6.12	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-TS-5AL	4	6.3U	6.3U	6.3U	13U	13U	6.3U	6.68	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-TS-5AL DUP	4	6.3U	6.3U	6.3U	13U	13U	6.3U	9.29	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-TS-5AL	5	6.3U	6.3U	6.3U	13U	13U	6.3U	6.16	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-MA-1L	1	6.3U	6.3U	6.3U	13U	13U	6.3U	14.09	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-MA-1L DUP	1	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-MA-1L	2	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-MA-1L	3	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-MA-1L	4	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-MA-1L	5	6.3U	6.3U	6.3U	13U	13U	6.3U	3.6U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-MA-1L DUP	5	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-MA-2U	1	6.3U	6.3U	6.3U	13U	13U	6.3U	6.04	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-MA-2U	2	6.3U	6.3U	6.3U	13U	13U	6.3U	7.64	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-MA-2U	3	6.3U	6.3U	6.3U	13U	13U	6.3U	7.88	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-MA-2U	4	6.3U	6.3U	6.3U	13U	13U	6.3U	5.82	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-MA-2U	5	6.3U	6.3U	6.3U	13U	13U	6.3U	7.36	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-MA-2L	2	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-MA-2L	3	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-MA-2L	4	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-MA-2L	5	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OO-W-1	1	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OO-W-1	2	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OO-W-1	3	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OO-W-1	4	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OO-W-1	5	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U

TABLE G.4. (Contd)

Sediment Treatment	Rep	aBHC	Aldrin	bBHC	Chlordane	dBHC	4,4'-DDD	4,4'-DDE	4,4'-DDT	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan Sulfate	Endrin	gBHC	Heptachlor	Heptachlor Epoxide	Toxaphene
		(ng/g dry wt)																
00-W-2	1	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-W-2	2	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-W-2	3	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-W-2	4	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-W-2	5	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-W-3	1	6.3U	6.3U	6.3U	13U	13U	6.3U	6.21	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-W-3	2	6.3U	6.3U	6.3U	13U	13U	6.3U	3.55	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-W-3	3	6.3U	6.3U	6.3U	13U	13U	6.3U	5.78	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-W-3	4	6.3U	6.3U	6.3U	13U	13U	6.3U	4.03	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-W-3	5	6.3U	6.3U	6.3U	13U	13U	6.3U	6.03	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-W-4	1	6.3U	6.3U	6.3U	13U	13U	6.3U	6.64	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-W-4	2	6.3U	6.3U	6.3U	13U	13U	6.3U	5.92	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-W-4	3	6.3U	6.3U	6.3U	13U	13U	6.3U	5.46	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-W-4	4	6.3U	6.3U	6.3U	13U	13U	6.3U	4.87	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-W-4	5	6.3U	6.3U	6.3U	13U	13U	6.3U	5.18	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-W-5	1	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-W-5	2	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-W-5	3	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-W-5	4	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
00-W-5	5	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
PR-coarse	2	6.3U	6.3U	6.3U	13U	13U	6.3U	4.64	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
PR-coarse	3	6.3U	6.3U	6.3U	13U	13U	6.3U	3.74	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
PR-coarse	4	6.3U	6.3U	6.3U	13U	13U	6.3U	3.61	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
PR-coarse	5	6.3U	6.3U	6.3U	13U	13U	6.3U	4.20	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U

TABLE G.4. (Contd)

Sediment Treatment	Rep	aBHC	Aldrin	bBHC	Chlor-dane	dBHC	4,4'-DDD	4,4'-DDE	4,4'-DDT	Dieldrin	Endo-sulfan I	Endo-sulfan II	Endo-sulfan Sulfate	Endrin	gBHC	Hepta-chlor	Hepta-chlor Epoxide	Toxa-phene
		(ng/g dry wt)																
PR-fine	1	6.3U	6.3U	6.3U	13U	13U	6.3U	4.22	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
PR-fine	2	6.3U	6.3U	6.3U	13U	13U	6.3U	4.69	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
PR-fine	3	6.3U	6.3U	6.3U	13U	13U	6.3U	5.71	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
PR-fine	4	6.3U	6.3U	6.3U	13U	13U	6.3U	4.58	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
PR-fine	5	6.3U	6.3U	6.3U	13U	13U	6.3U	4.92	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
Tomales Bay	1	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
Tomales Bay	2	6.3U	6.3U	6.3U	13U	13U	6.3U	3.70	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
Tomales Bay	3	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
Tomales DUP	3	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
Tomales Bay	4	6.3U	6.3U	6.3U	13U	13U	6.3U	3.40	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U
Tomales Bay	5	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U	13U	13U	13U	13U	6.3U	13U	6.3U	63U

TABLE G.5. Concentrations of Pesticides in Tissues of *Macoma nasuta* After 10-day Exposure to Sediment Treatments, Wet Weight

		(ng/g wet wt)																
Sediment Treatment	Rep	aBHC	Aldrin	bBHC	Chlor-dane	dBHC	4,4'-DDD	4,4'-DDE	4,4'-DDT	Dieldrin	Endo-sulfan I	Endo-sulfan II	Endo-sulfan Sulfate	Endrin	gBHC	Hepta-chlor	Hepta-chlor Epoxide	Toxa-phene
OI-CH-0	1	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-CH-0 REEX	1	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-CH-0	2	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-CH-0	3	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-CH-0	4	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-CH-0	5	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-1	1	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-1 REEX	1	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-1	2	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-1	3	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-1	4	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-1	5	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-2	1	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-2	2	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-2	3	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-2	4	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-2	5	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	2.00	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-CH-2A	1	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-CH-2A	2	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-CH-2A	3	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-CH-2A	4	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-CH-2A	5	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-

U = Undetected.

\- = Zero.

TABLE G.5. (Contd)

Sediment Treatment	Rep	aBHC	Aldrin	bBHC	Chlor-dane	dBHC	4,4'-DDD	4,4'-DDE	4,4'-DDT	Dieldrin	Endo-sulfan I	Endo-sulfan II	Endo-sulfan Sulfate	Endrin	gBHC	Hepta-chlor	Hepta-chlor Epoxide	Toxa-phene
		(ng/g wet wt)																
00-CH-3	1	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-3	2	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-3	3	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-3	4	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-3	5	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-4	1	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-4	2	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-4	3	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-4	4	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-4	5	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
0I-CH-4A	1	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
0I-CH-4A DUP	1	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
0I-CH-4A	2	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
0I-CH-4A	3	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
0I-CH-4A	4	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
0I-CH-4A	5	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-5	1	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-5 REEX	1	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-5	2	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-5	3	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-5	4	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-5	5	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-6	1	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-6	2	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-6	3	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-6	4	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-CH-6	5	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-

TABLE G.5. (Contd)

Sediment Treatment	Rep	aBHC	Aldrin	bBHC	Chlordane	dBHC	4,4'-DDD	4,4'-DDE	4,4'-DDT	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan Sulfate	Endrin	gBHC	Heptachlor	Heptachlor Epoxide	Toxaphene
		(ng/g wet wt)																
DI-CH-6A	1	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
DI-CH-6A	2	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
DI-CH-6A	3	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
DI-CH-6A	4	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
DI-CH-6A	5	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
DD-CH-7	1	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
DD-CH-7	2	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
DD-CH-7	3	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
DD-CH-7	4	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
DD-CH-7	5	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
DD-CH-8	1	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
DD-CH-8	2	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
DD-CH-8	3	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
DD-CH-8	4	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
DD-CH-8	5	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
DI-SS-4L	2	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.50	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
DI-SS-4L DUP	2	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
DI-SS-4L	3	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
DI-SS-4L	4	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.50	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
DI-SS-4L	5	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
DI-TS-5AU	1	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	1.50	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
DI-TS-5AU	2	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	1.50	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
DI-TS-5AU	3	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	1.00	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
DI-TS-5AU	4	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	1.40	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
DI-TS-5AU	5	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	1.00	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-

TABLE G.5. (Contd)

Sediment Treatment	Rep	aBHC	Aldrin	bBHC	Chlor-dane	dBHC	4,4'-DDD	4,4'-DDE	4,4'-DDT	Dieldrin	Endo-sulfan I	Endo-sulfan II	Endo-sulfan Sulfate	Endrin	gBHC	Hepta-chlor	Hepta-chlor Epoxide	Toxa-phene
		(ng/g wet wt)																
OI-TS-5AL	2	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	1.00	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-TS-5AL	3	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	1.00	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-TS-5AL	4	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	1.00	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-TS-5AL DUP	4	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	1.40	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-TS-5AL	5	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	1.30	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-MA-1L	1	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	2.19	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-MA-1L DUP	1	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-MA-1L	2	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-MA-1L	3	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-MA-1L	4	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-MA-1L	5	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-MA-1L DUP	5	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-MA-2U	1	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	1.00	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-MA-2U	2	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	1.10	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-MA-2U	3	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	1.10	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-MA-2U	4	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.80	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-MA-2U	5	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	1.00	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-MA-2L	2	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-MA-2L	3	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-MA-2L	4	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OI-MA-2L	5	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OO-W-1	1	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OO-W-1	2	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OO-W-1	3	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OO-W-1	4	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
OO-W-1	5	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-

TABLE G.5. (Contd)

Sediment Treatment	Rep	aBHC	Aldrin	bBHC	Chlordane	dBHC	4,4'-DDD	4,4'-DDE	4,4'-DDT	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan Sulfate	Endrin	gBHC	Heptachlor	Heptachlor Epoxide	Toxaphene
		(ng/g wet wt)																
00-W-2	1	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.6U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-W-2	2	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.6U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-W-2	3	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.6U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-W-2	4	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.6U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-W-2	5	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.6U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-W-3	1	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.90	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-W-3	2	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.80	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-W-3	3	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.90	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-W-3	4	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.60	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-W-3	5	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.80	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-W-4	1	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	1.00	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-W-4	2	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.80	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-W-4	3	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.80	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-W-4	4	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.70	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-W-4	5	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.70	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-W-5	1	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.6U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-W-5	2	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-W-5	3	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-W-5	4	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.6U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
00-W-5	5	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
PR-coarse	2	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.70	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
PR-coarse	3	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.80	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
PR-coarse	4	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.60	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
PR-coarse	5	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.60	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-

TABLE G.5. (Contd)

		(ng/g wet wt)																	
Sediment Treatment	Rep	aBHC	Aldrin	bBHC	Chlor-dane	dBHC	4,4'-DDD	4,4'-DDE	4,4'-DDT	Dieldrin	Endo-sulfan I	Endo-sulfan II	Endo-sulfan Sulfate	Endrin	gBHC	Hepta-chlor	Hepta-chlor Epoxide	Toxa-phene
PR-fine	1	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.60	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
PR-fine	2	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.70	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
PR-fine	3	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.80	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
PR-fine	4	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.70	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
PR-fine	5	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.70	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
Tomales Bay	1	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
Tomales Bay	2	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.60	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
Tomales Bay	3	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
Tomales DUP	3	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
Tomales Bay	4	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.60	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-
Tomales Bay	5	1.0U	1.0U	1.0U	2.0U	2.0U	1.0U	0.5U	1.0U	2.0U	2.0U	2.0U	2.0U	2.0U	1.0U	2.0U	1.0U	-

TABLE G.6. Quality Assurance Summary for Dry-Weight Tissue Pesticides

Measurements of Precision: Duplicate Results

(ng/g dry wt)

Sediment Treatment	Rep	aBHC	Aldrin	bBHC	Chlor-dane	dBHC	4,4'-DDD	4,4'-DDE	4,4'-DDT	Dieldrin
OI-CH-4A	1	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U
OI-CH-4A DUP	1	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U
I-Stat		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RPD		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OI-SS-4L	2	6.3U	6.3U	6.3U	13U	13U	6.3U	3.84	6.3U	13U
OI-SS-4L DUP	2	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U
I-Stat		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RPD		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OI-TS-5AL	4	6.3U	6.3U	6.3U	13U	13U	6.3U	6.68	6.3U	13U
DI-TS-5AL DUP	4	6.3U	6.3U	6.3U	13U	13U	6.3U	9.29	6.3U	13U
I-Stat		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RPD		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OI-MA-1L	1	6.3U	6.3U	6.3U	13U	13U	6.3U	14.09	6.3U	13U
OI-MA-1L DUP	1	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U
I-Stat		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RPD		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OI-MA-1L	5	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U
OI-MA-1L DUP	5	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U
I-Stat		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RPD		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tomales Bay	3	6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U
Tomales DUP	3	6.3U	6.3U	6.3U	13U	13U	6.3U	3.6U	6.3U	13U
I-Stat		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RPD		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Sediment Treatment	Rep	Endo-sulfan I	Endo-sulfan II	Endo-sulfan Sulfate	Endrin	gBHC	Hepta-chlor	Hepta-chlor Epoxide	Toxa-phene
OI-CH-4A	1	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-CH-4A DUP	1	13U	13U	13U	13U	6.3U	13U	6.3U	63U
I-Stat		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RPD		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OI-SS-4L	2	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-SS-4L DUP	2	13U	13U	13U	13U	6.3U	13U	6.3U	63U
I-Stat		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RPD		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OI-TS-5AL	4	13U	13U	13U	13U	6.3U	13U	6.3U	63U
DI-TS-5AL DUP	4	13U	13U	13U	13U	6.3U	13U	6.3U	63U
I-Stat		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RPD		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OI-MA-1L	1	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-MA-1L DUP	1	13U	13U	13U	13U	6.3U	13U	6.3U	63U
I-Stat		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RPD		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OI-MA-1L	5	13U	13U	13U	13U	6.3U	13U	6.3U	63U
OI-MA-1L DUP	5	13U	13U	13U	13U	6.3U	13U	6.3U	63U
I-Stat		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RPD		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tomales Bay	3	13U	13U	13U	13U	6.3U	13U	6.3U	63U
Tomales DUP	3	13U	13U	13U	13U	6.3U	13U	6.3U	63U
I-Stat		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RPD		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

U = Undetected.

TABLE G.6. (Contd)

Measurements of Accuracy: Standard Reference Materials (SRMs)

Sediment Treatment	Rep	aBHC (ng/g dry wt)	Aldrin	bBHC	Chlordane	dBHC	4,4'-DDD	4,4'-DDE	4,4'-DDT	Dieldrin
Certified Value	-	N/A	N/A	N/A	41	N/A	95	19	8	14
FU99C IRM	-	6.3U	6.3U	6.3U	25.00	13.0U	6.3U	59.22	6.3U	13.0U
Percent Recovery		N/A	N/A	N/A	61	N/A	0	312	0	0
FU99D IRM	-	6.3U	6.3U	6.3U	21.00	13.0U	6.3U	52.29	6.3U	13.0U
Percent Recovery		N/A	N/A	N/A	51	N/A	0	275	0	0
HI01 IRM	-	6.3U	6.3U	6.3U	39.00	13.0U	33.80	44.76	84.96	13.0U
Percent Recovery		N/A	N/A	N/A	95	N/A	36	236	1062	0
HI02 IRM	-	6.3U	6.3U	6.3U	45.00	13.0U	34.17	50.77	99.58	13.0U
Percent Recovery		N/A	N/A	N/A	110	N/A	36	267	1245	0

Sediment Treatment	Rep	Endosulfan I (ng/g dry wt)	Endosulfan II	Endosulfan Sulfate	Endrin	gBHC	Heptachlor	Heptachlor Epoxide	Toxaphene
Certified Value	-	N/A	N/A	N/A	N/A	N/A	4	N/A	N/A
FU99C IRM	-	13U	13U	13U	39.35	6.3U	37.52	6.3U	63U
Percent Recovery		N/A	N/A	N/A	N/A	N/A	938	N/A	N/A
FU99D IRM	-	13U	13U	13U	32.61	6.3U	32.61	6.3U	63U
Percent Recovery		N/A	N/A	N/A	N/A	N/A	815	N/A	N/A
HI01 IRM	-	13U	13U	13U	13U	6.3U	13U	6.3U	63U
Percent Recovery		N/A	N/A	N/A	N/A	N/A	0	N/A	N/A
HI02 IRM	-	13U	13U	13U	13U	6.3U	13U	6.3U	63U
Percent Recovery		N/A	N/A	N/A	N/A	N/A	0	N/A	N/A

TABLE G.6. (Contd)

Surrogate Recoveries

Sediment Treatment	Rep	DBOFB	DBC
OI-CH-0	1	N/A	2
OI-CH-0	2	N/A	4
OI-CH-0	3	N/A	4
OI-CH-0	4	N/A	4
OI-CH-0	5	N/A	4
OO-CH-1	1	N/A	4
OO-CH-1	2	N/A	4
OO-CH-1	3	N/A	4
OO-CH-1	4	N/A	4
OO-CH-1	5	N/A	49
OO-CH-2	1	N/A	51
OO-CH-2	2	N/A	52
OO-CH-2	3	N/A	27
OO-CH-2	4	N/A	33
OO-CH-2	5	N/A	61
OI-CH-2A	1	N/A	56
OI-CH-2A	2	N/A	56
OI-CH-2A	3	N/A	56
OI-CH-2A	4	N/A	47
OI-CH-2A	5	N/A	61
OO-CH-3	1	N/A	56
OO-CH-3	2	N/A	56
OO-CH-3	3	N/A	47
OO-CH-3	4	N/A	53
OO-CH-3	5	N/A	53
OO-CH-4	1	N/A	44
OO-CH-4	2	N/A	47
OO-CH-4	3	N/A	50
OO-CH-4	4	N/A	53
OO-CH-4	5	N/A	51

TABLE G.6. (Contd)

Surrogate Recoveries

Sediment Treatment	Rep	DBOFB	DBC
OI-CH-4A	1	N/A	54
OI-CH-4A DUP	1	N/A	55
OI-CH-4A	2	N/A	52
OI-CH-4A	3	N/A	54
OI-CH-4A	4	N/A	54
OI-CH-4A	5	N/A	52
OO-CH-5	1	N/A	54
OO-CH-5	2	N/A	54
OO-CH-5	3	N/A	51
OO-CH-5	4	N/A	54
OO-CH-5	5	N/A	56
OO-CH-6	1	N/A	29
OO-CH-6	2	N/A	35
OO-CH-6	3	N/A	32
OO-CH-6	4	N/A	40
OO-CH-6	5	N/A	43
OI-CH-6A	1	N/A	42
OI-CH-6A	2	N/A	34
OI-CH-6A	3	N/A	42
OI-CH-6A	4	N/A	42
OI-CH-6A	5	N/A	43
OO-CH-7	1	N/A	41
OO-CH-7	2	N/A	37
OO-CH-7	3	N/A	41
OO-CH-7	4	N/A	40
OO-CH-7	5	N/A	41
OO-CH-8	1	N/A	58
OO-CH-8	2	N/A	57
OO-CH-8	3	N/A	55
OO-CH-8	4	N/A	62
OO-CH-8	5	N/A	57
OI-SS-4L	2	61	N/A
OI-SS-4L DUP	2	63	N/A
OI-SS-4L	3	69	N/A
OI-SS-4L	4	68	N/A
OI-SS-4L	5	69	N/A

DUP = Duplicate

TABLE G.6. (Contd)

Surrogate Recoveries

Sediment Treatment	Rep	DBOFB	DBC
OI-TS-5AU	1	71	N/A
OI-TS-5AU	2	74	N/A
OI-TS-5AU	3	66	N/A
OI-TS-5AU	4	65	N/A
OI-TS-5AU	5	55	N/A
OI-TS-5AL	2	68	N/A
OI-TS-5AL	3	54	N/A
OI-TS-5AL	4	75	N/A
OI-TS-5AL DUP	4	85	N/A
OI-TS-5AL	5	72	N/A
OI-MA-1L	1	N/A	41
OI-MA-1L DUP	1	N/A	38
OI-MA-1L	2	N/A	41
OI-MA-1L	3	N/A	41
OI-MA-1L	4	N/A	49
OI-MA-1L	5	N/A	44
OI-MA-2U	1	65	N/A
OI-MA-2U	2	71	N/A
OI-MA-2U	3	66	N/A
OI-MA-2U	4	69	N/A
OI-MA-2U	5	65	N/A
OI-MA-2L	2	66	N/A
OI-MA-2L	3	65	N/A
OI-MA-2L	4	105	N/A
OI-MA-2L	5	52	N/A
00-W-1	1	66	N/A
00-W-1	2	75	N/A
00-W-1	3	67	N/A
00-W-1	4	69	N/A
00-W-1	5	62	N/A
00-W-2	1	67	N/A
00-W-2	2	69	N/A
00-W-2	3	68	N/A
00-W-2	4	68	N/A
00-W-2	5	67	N/A

TABLE G.6. (Contd)

Surrogate Recoveries

Sediment Treatment	Rep	DBOFB	DBC
00-W-3	1	66	N/A
00-W-3	2	69	N/A
00-W-3	3	69	N/A
00-W-3	4	68	N/A
00-W-3	5	64	N/A
00-W-4	1	66	N/A
00-W-4	2	67	N/A
00-W-4	3	69	N/A
00-W-4	4	64	N/A
00-W-4	5	62	N/A
00-W-5	1	66	N/A
00-W-5	2	58	N/A
00-W-5	3	70	N/A
00-W-5	4	67	N/A
00-W-5	5	66	N/A
PR-coarse	2	69	N/A
PR-coarse	3	72	N/A
PR-coarse	4	69	N/A
PR-coarse	5	70	N/A
PR-fine	1	69	N/A
PR-fine	2	69	N/A
PR-fine	3	77	N/A
PR-fine	4	72	N/A
PR-fine	5	74	N/A
Tomales Bay	1	63	N/A
Tomales Bay	2	68	N/A
Tomales Bay	3	66	N/A
Tomales Bay DUP	3	64	N/A
Tomales Bay	4	63	N/A
Tomales Bay	5	63	N/A

TABLE G.6. (Contd)

Surrogate Recoveries

Sediment Treatment	Rep	DBOFB	DBC
FU99C SRM	-	N/A	N/A
FU99D SRM	-	N/A	N/A
HI01 A SRM	-	69	N/A
HI02 IRM	-	69	N/A
FX91 PB	-	59	N/A
FX92 PB	-	64	N/A
FX93 PB	-	71	N/A
FX94 PB	-	69	N/A
FZ18 PB	-	N/A	N/A
FZ19 PB	-	N/A	N/A

TABLE G.6. (Contd)

Procedural Blanks (PBs)

Sediment Treatment	Rep	aBHC (ng/g dry wt)	Aldrin	bBHC	Chlordane	dBHC	4,4'-DDD	4,4'-DDE	4,4'-DDT	Dieldrin
FX91 PB		6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U
FX92 PB		6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U
FX93 PB		6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U
FX94 PB		6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U
FZ18 PB		6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U
FZ19 PB		6.3U	6.3U	6.3U	13U	13U	6.3U	3.8U	6.3U	13U

Sediment Treatment	Rep	Endosulfan I (ng/g dry wt)	Endosulfan II	Endosulfan Sulfate	Endrin	gBHC	Heptachlor	Heptachlor Epoxide	Toxaphene
FX91 PB		13U	13U	13U	13U	6.3U	13U	6.3U	63U
FX92 PB		13U	13U	13U	13U	6.3U	13U	6.3U	63U
FX93 PB		13U	13U	13U	13U	6.3U	13U	6.3U	63U
FX94 PB		13U	13U	13U	13U	6.3U	13U	6.3U	63U
FZ18 PB		13U	13U	13U	13U	6.3U	13U	6.3U	63U
FZ19 PB		13U	13U	13U	13U	6.3U	13U	6.3U	63U

Spikes and Recoveries

Performed as surrogate spikes/recoveries

TABLE G.6. (Contd)

Spikes and Recoveries

Sediment Treatment OI-CH-6A, Rep 1

Spiked Compound	Amount Spiked (ng)	Amount Recovered (ng)	Percent Recovery
g-BHC	60	56	93
Heptachlor	60	55	91
Aldrin	60	63	105
Dieldrin	150	147	98
Endrin	150	150	100
p',p'-DDT	150	155	103

Sediment Treatment OO-CH-8, Rep 3

Spiked Compound	Amount Spiked (ng)	Amount Recovered (ng)	Percent Recovery
g-BHC	60	34	56
Heptachlor	60	32	54
Aldrin	60	38	63
Dieldrin	150	95	63
Endrin	150	96	64
p',p'-DDT	150	102	68

Sediment Treatment OI-MA-2L, Rep 4

Spiked Compound	Amount Spiked (ng)	Amount Recovered (ng)	Percent Recovery
g-BHC	60	30	50
Heptachlor	60	29	49
Aldrin	60	32	53
Dieldrin	150	0	0
Endrin	150	0	0
p',p'-DDT	150	90	60

TABLE G.6. (Contd)

Spikes and Recoveries

Sediment Treatment OI-TS-5AU, Rep 5

Spiked Compound	Amount Spiked (ng)	Amount Recovered (ng)	Percent Recovery
g-BHC	60	53	89
Heptachlor	60	59	98
Aldrin	60	63	105
Dieldrin	150	0	0
Endrin	150	0	0
p',p'-DDT	150	176	117

Sediment Treatment Tomales Bay, Rep 5

Spiked Compound	Amount Spiked (ng)	Amount Recovered (ng)	Percent Recovery
g-BHC	60	41	68
Heptachlor	60	41	68
Aldrin	60	46	76
Dieldrin	150	33	22
Endrin	150	0	0
p',p'-DDT	150	122	81

TABLE G.7. Concentrations of Polychlorinated Biphenyls (PCBs) in Tissues of *Macoma nasuta* After 10-Day Exposure to Sediment Treatments, Dry Weight

Sediment Treatment	Rep	Aroclor 1242 (ng/g dry wt)	Aroclor 1248 (ng/g dry wt)	Aroclor 1254 (ng/g dry wt)	Aroclor 1260 (ng/g dry wt)
Target DL		10	10	10	10
Achieved DL		63	63	63	63
OI-CH-0	1	63U	63U	63U	63U
OI-CH-0 RE-EX	1	63U	63U	63U	63U
OI-CH-0	2	63U	63U	63U	63U
OI-CH-0	3	63U	63U	63U	63U
OI-CH-0	4	63U	63U	63U	63U
OI-CH-0	5	63U	63U	63U	63U
OO-CH-1	1	63U	63U	63U	63U
OO-CH-1 RE-EX	1	63U	63U	63U	63U
OO-CH-1	2	63U	63U	63U	63U
OO-CH-1	3	63U	63U	63U	63U
OO-CH-1	4	63U	63U	63U	63U
OO-CH-1	5	63U	63U	63U	63U
OO-CH-2	1	63U	63U	83.31	63U
OO-CH-2	2	63U	63U	81.20	63U
OO-CH-2	3	63U	63U	63U	63U
OO-CH-2	4	63U	63U	63U	63U
OO-CH-2	5	63U	63U	109.53	63U
OI-CH-2A	1	63U	63U	63U	63U
OI-CH-2A	2	63U	63U	63U	63U
OI-CH-2A	3	63U	63U	63U	63U
OI-CH-2A	4	63U	63U	63U	63U
OI-CH-2A	5	63U	63U	63U	63U
OO-CH-3	1	63U	63U	63U	63U
OO-CH-3	2	63U	63U	63U	63U
OO-CH-3	3	63U	63U	63U	63U
OO-CH-3	4	63U	63U	63U	63U
OO-CH-3	5	63U	63U	63U	63U
OO-CH-4	1	63U	63U	63U	63U
OO-CH-4	2	63U	63U	63U	63U
OO-CH-4	3	63U	63U	63U	63U
OO-CH-4	4	63U	63U	63U	63U
OO-CH-4	5	63U	63U	63U	63U
OI-CH-4A	1	63U	63U	63U	63U
OI-CH-4A DUP	1	63U	63U	63U	63U
OI-CH-4A	2	63U	63U	63U	63U
OI-CH-4A	3	63U	63U	63U	63U
OI-CH-4A	4	63U	63U	63U	63U
OI-CH-4A	5	63U	63U	63U	63U

U = Undetected
OUP = Duplicate

TABLE G.7. (Contd)

Sediment Treatment	Rep	Aroclor 1242 (ng/g dry wt)	Aroclor 1248	Aroclor 1254	Aroclor 1260
00-CH-5	1	63U	63U	63U	63U
00-CH-5 RE-EX	1	63U	63U	63U	63U
00-CH-5	2	63U	63U	63U	63U
00-CH-5	3	63U	63U	63U	63U
00-CH-5	4	63U	63U	63U	63U
00-CH-5	5	63U	63U	63U	63U
00-CH-6	1	63U	63U	63U	63U
00-CH-6	2	63U	63U	63U	63U
00-CH-6	3	63U	63U	63U	63U
00-CH-6	4	63U	63U	63U	63U
00-CH-6	5	63U	63U	63U	63U
OI-CH-6A	1	63U	63U	63U	63U
OI-CH-6A	2	63U	63U	63U	63U
OI-CH-6A	3	63U	63U	63U	63U
OI-CH-6A	4	63U	63U	63U	63U
OI-CH-6A	5	63U	63U	63U	63U
00-CH-7	1	63U	63U	63U	63U
00-CH-7	2	63U	63U	63U	63U
00-CH-7	3	63U	63U	63U	63U
00-CH-7	4	63U	63U	63U	63U
00-CH-7	5	63U	63U	63U	63U
00-CH-8	1	63U	63U	63U	63U
00-CH-8	2	63U	63U	133.17	63U
00-CH-8	3	63U	63U	63U	63U
00-CH-8	4	63U	63U	63U	63U
00-CH-8	5	63U	63U	63U	63U
OI-SS-4L	2	63U	63U	63U	63U
OI-SS-4L DUP	2	63U	63U	63U	63U
OI-SS-4L	3	63U	63U	63U	63U
OI-SS-4L	4	63U	63U	63U	63U
OI-SS-4L	5	63U	63U	63U	63U
OI-TS-5AU	1	63U	63U	285.10	63U
OI-TS-5AU	2	63U	63U	219.02	63U
OI-TS-5AU	3	63U	63U	130.19	63U
OI-TS-5AU	4	63U	63U	187.89	63U
OI-TS-5AU	5	63U	63U	154.53	63U

TABLE G.7. (Contd)

Sediment Treatment	Rep	(ng/g dry wt) Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260
OI-TS-5AL	2	63U	63U	103.03	63U
OI-TS-5AL	3	63U	63U	91.82	63U
OI-TS-5AL	4	63U	63U	106.89	63U
OI-TS-5AL DUP	4	63U	63U	152.66	63U
OI-TS-5AL	5	63U	63U	119.50	63U
OI-MA-1L	1	63U	63U	63U	63U
OI-MA-1L DUP	1	63U	63U	63U	63U
OI-MA-1L	2	63U	63U	63U	63U
OI-MA-1L	3	63U	63U	63U	63U
OI-MA-1L	4	63U	63U	63U	63U
OI-MA-1L	5	63U	63U	63U	63U
OI-MA-1L DUP	5	63U	63U	63U	63U
OI-MA-2U	1	63U	63U	138.96	63U
OI-MA-2U	2	63U	63U	166.71	63U
OI-MA-2U	3	63U	63U	150.46	63U
OI-MA-2U	4	63U	63U	101.92	63U
OI-MA-2U	5	63U	63U	139.65	63U
OI-MA-2L	2	63U	63U	63U	63U
OI-MA-2L	3	63U	63U	63U	63U
OI-MA-2L	4	63U	63U	63U	63U
OI-MA-2L	5	63U	63U	63U	63U
00-W-1	1	63U	63U	63U	63U
00-W-1	2	63U	63U	63U	63U
00-W-1	3	63U	63U	63U	63U
00-W-1	4	63U	63U	63U	63U
00-W-1	5	63U	63U	63U	63U
00-W-2	1	63U	63U	63U	63U
00-W-2	2	63U	63U	63U	63U
00-W-2	3	63U	63U	63U	63U
00-W-2	4	63U	63U	63U	63U
00-W-2	5	63U	63U	63U	63U
00-W-3	1	63U	63U	63U	63U
00-W-3	2	63U	63U	63U	63U
00-W-3	3	63U	63U	63U	63U
00-W-3	4	63U	63U	63U	63U
00-W-3	5	63U	63U	63U	63U

TABLE G.7. (Contd)

Sediment Treatment	Rep	Aroclor 1242 (ng/g dry wt)	Aroclor 1248 (ng/g dry wt)	Aroclor 1254 (ng/g dry wt)	Aroclor 1260 (ng/g dry wt)
00-W-4	1	63U	63U	73.08	63U
00-W-4	2	63U	63U	63U	63U
00-W-4	3	63U	63U	63U	63U
00-W-4	4	63U	63U	63U	63U
00-W-4	5	63U	63U	63U	63U
00-W-5	1	63U	63U	63U	63U
00-W-5	2	63U	63U	63U	63U
00-W-5	3	63U	63U	63U	63U
00-W-5	4	63U	63U	63U	63U
00-W-5	5	63U	63U	63U	63U
PR-coarse	2	63U	63U	63U	63U
PR-coarse	3	63U	63U	63U	63U
PR-coarse	4	63U	63U	63U	63U
PR-coarse	5	63U	63U	63U	63U
PR-fine	1	63U	63U	63U	63U
PR-fine	2	63U	63U	63U	63U
PR-fine	3	63U	63U	63U	63U
PR-fine	4	63U	63U	63U	63U
PR-fine	5	63U	63U	63U	63U
Tomales Bay	1	63U	63U	63U	63U
Tomales Bay	2	63U	63U	63U	63U
Tomales Bay	3	63U	63U	63U	63U
Tomales Bay DUP	3	63U	63U	63U	63U
Tomales Bay	4	63U	63U	63U	63U
Tomales Bay	5	63U	63U	63U	63U

TABLE G.8. Concentrations of Polychlorinated Biphenyls (PCBs) in Tissues of *Macoma nasuta* After 10-Day Exposure to Sediment Treatments, Wet Weight

Sediment Treatment	Rep	Aroclor 1242 (ng/g wet wt)	Aroclor 1248 (ng/g wet wt)	Aroclor 1254 (ng/g wet wt)	Aroclor 1260 (ng/g wet wt)
Achieved DL		10	10	10	10
OI-CH-0	1	10U	10U	10U	10U
OI-CH-0 RE-EX	1	10U	10U	10U	10U
OI-CH-0	2	10U	10U	10U	10U
OI-CH-0	3	10U	10U	10U	10U
OI-CH-0	4	10U	10U	10U	10U
OI-CH-0	5	10U	10U	10U	10U
OO-CH-1	1	10U	10U	10U	10U
OO-CH-1	2	10U	10U	10U	10U
OO-CH-1 RE-EX	1	10U	10U	10U	10U
OO-CH-1	3	10U	10U	10U	10U
OO-CH-1	4	10U	10U	10U	10U
OO-CH-1	5	10U	10U	10U	10U
OO-CH-2	1	10U	10U	12.61	10U
OO-CH-2	2	10U	10U	11.32	10U
OO-CH-2	3	10U	10U	10U	10U
OO-CH-2	4	10U	10U	10U	10U
OO-CH-2	5	10U	10U	16.49	10U
OI-CH-2A	1	10U	10U	10U	10U
OI-CH-2A	2	10U	10U	10U	10U
OI-CH-2A	3	10U	10U	10U	10U
OI-CH-2A	4	10U	10U	10U	10U
OI-CH-2A	5	10U	10U	10U	10U
OO-CH-3	1	10U	10U	10U	10U
OO-CH-3	2	10U	10U	10U	10U
OO-CH-3	3	10U	10U	10U	10U
OO-CH-3	4	10U	10U	10U	10U
OO-CH-3	5	10U	10U	10U	10U
OO-CH-4	1	10U	10U	10U	10U
OO-CH-4	2	10U	10U	10U	10U
OO-CH-4	3	10U	10U	10U	10U
OO-CH-4	4	10U	10U	10U	10U
OO-CH-4	5	10U	10U	10U	10U
OI-CH-4A	1	10U	10U	10U	10U
OI-CH-4A DUP	1	10U	10U	10U	10U
OI-CH-4A	2	10U	10U	10U	10U
OI-CH-4A	3	10U	10U	10U	10U
OI-CH-4A	4	10U	10U	10U	10U
OI-CH-4A	5	10U	10U	10U	10U

U = Undetected.

TABLE G.8. (Contd)

Sediment Treatment	Rep	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260
		(ng/g wet wt)			
00-CH-5	1	10U	10U	10U	10U
00-CH-5 RE-EX	1	10U	10U	10U	10U
00-CH-5	2	10U	10U	10U	10U
00-CH-5	3	10U	10U	10U	10U
00-CH-5	4	10U	10U	10U	10U
00-CH-5	5	10U	10U	10U	10U
00-CH-6	1	10U	10U	10U	10U
00-CH-6	2	10U	10U	10U	10U
00-CH-6	3	10U	10U	10U	10U
00-CH-6	4	10U	10U	10U	10U
00-CH-6	5	10U	10U	10U	10U
OI-CH-6A	1	10U	10U	10U	10U
OI-CH-6A	2	10U	10U	10U	10U
OI-CH-6A	3	10U	10U	10U	10U
OI-CH-6A	4	10U	10U	10U	10U
OI-CH-6A	5	10U	10U	10U	10U
00-CH-7	1	10U	10U	10U	10U
00-CH-7	2	10U	10U	10U	10U
00-CH-7	3	10U	10U	10U	10U
00-CH-7	4	10U	10U	10U	10U
00-CH-7	5	10U	10U	10U	10U
00-CH-8	1	10U	10U	10U	10U
00-CH-8	2	10U	10U	18.77	10U
00-CH-8	3	10U	10U	10U	10U
00-CH-8	4	10U	10U	10U	10U
00-CH-8	5	10U	10U	10U	10U
OI-SS-4L	2	10U	10U	10U	10U
OI-SS-4L DUP	2	10U	10U	10U	10U
OI-SS-4L	3	10U	10U	10U	10U
OI-SS-4L	4	10U	10U	10U	10U
OI-SS-4L	5	10U	10U	10U	10U
OI-TS-5AU	1	10U	10U	34.00	10U
OI-TS-5AU	2	10U	10U	31.00	10U
OI-TS-5AU	3	10U	10U	19.D0	10U
OI-TS-5AU	4	10U	10U	27.00	10U
OI-TS-5AU	5	10U	10U	21.00	10U

TABLE G.8. (Contd)

Sediment Treatment	Rep	Aroclor 1242 (ng/g wet wt)	Aroclor 1248 (ng/g wet wt)	Aroclor 1254 (ng/g wet wt)	Aroclor 1260 (ng/g wet wt)
OI-TS-5AL	2	10U	10U	15.00	10U
OI-TS-5AL	3	10U	10U	15.00	10U
OI-TS-5AL	4	10U	10U	16.00	10U
OI-TS-5AL DUP	4	10U	10U	23.00	10U
OI-TS-5AL	5	10U	10U	19.00	10U
OI-MA-1L	1	10U	10U	1DU	10U
OI-MA-1L DUP	1	10U	10U	10U	10U
OI-MA-1L	2	10U	10U	10U	10U
OI-MA-1L	3	10U	10U	10U	10U
OI-MA-1L	4	10U	10U	10U	10U
OI-MA-1L	5	10U	10U	10U	10U
OI-MA-1L DUP	5	10U	10U	10U	10U
OI-MA-2U	1	10U	10U	23.00	10U
OI-MA-2U	2	10U	10U	24.00	10U
OI-MA-2U	3	10U	10U	21.00	10U
OI-MA-2U	4	10U	10U	14.00	10U
OI-MA-2U	5	10U	10U	19.00	10U
OI-MA-2L	2	10U	10U	10U	10U
OI-MA-2L	3	10U	10U	10U	10U
OI-MA-2L	4	10U	10U	10U	10U
OI-MA-2L	5	10U	10U	10U	10U
00-W-1	1	10U	10U	10U	10U
00-W-1	2	10U	10U	10U	10U
00-W-1	3	10U	10U	10U	10U
00-W-1	4	10U	10U	10U	10U
00-W-1	5	10U	10U	10U	10U
00-W-2	1	10U	10U	10U	10U
00-W-2	2	10U	10U	10U	10U
00-W-2	3	10U	10U	10U	10U
00-W-2	4	10U	10U	10U	10U
00-W-2	5	10U	10U	10U	10U
00-W-3	1	10U	10U	10U	10U
00-W-3	2	10U	10U	10U	10U
00-W-3	3	10U	10U	10U	10U
00-W-3	4	10U	10U	10U	10U
00-W-3	5	10U	10U	10U	10U

TABLE G.8. (Contd)

Sediment Treatment	Rep	Aroclor 1242 (ng/g wet wt)	Aroclor 1248	Aroclor 1254	Aroclor 1260
00-W-4	1	10U	10U	11.00	10U
00-W-4	2	10U	10U	10U	10U
00-W-4	3	10U	10U	10U	10U
00-W-4	4	10U	10U	10U	10U
00-W-4	5	10U	10U	10U	10U
00-W-5	1	10U	10U	10U	10U
00-W-5	2	10U	10U	10U	10U
00-W-5	3	10U	10U	10U	10U
00-W-5	4	10U	10U	10U	10U
00-W-5	5	10U	10U	10U	10U
PR-coarse	2	10U	10U	10U	10U
PR-coarse	3	10U	10U	10U	10U
PR-coarse	4	10U	10U	10U	10U
PR-coarse	5	10U	10U	10U	10U
PR-fine	1	10U	10U	10U	10U
PR-fine	2	10U	10U	10U	10U
PR-fine	3	10U	10U	10U	10U
PR-fine	4	10U	10U	10U	10U
PR-fine	5	10U	10U	10U	10U
Tomales Bay	1	10U	10U	10U	10U
Tomales Bay	2	10U	10U	10U	10U
Tomales Bay	3	10U	10U	10U	10U
Tomales Bay DUP	3	10U	10U	10U	10U
Tomales Bay	4	10U	10U	10U	10U
Tomales Bay	5	10U	10U	10U	10U

TABLE G.9. Quality Assurance Summary for Dry-Weight Tissue PCBs

Measurements of Precision: Duplicate Results

Sediment Treatment	Rep	Aroclor 1242 (ng/g dry wt)	Aroclor 1248	Aroclor 1254	Aroclor 1260
OI-CH-4A	1	63U	63U	63U	63U
OI-CH-4A DUP	1	63U	63U	63U	63U
I-Stat		N/A	N/A	N/A	N/A
RPD		N/A	N/A	N/A	N/A
OI-SS-4L	2	63U	63U	63U	63U
OI-SS-4L DUP	2	63U	63U	63U	63U
I-Stat		N/A	N/A	N/A	N/A
RPD		N/A	N/A	N/A	N/A
OI-TS-5AL	4	63U	63U	106.89	63U
OI-TS-5AL DUP	4	63U	63U	152.66	63U
I-Stat		N/A	N/A	0.2	N/A
RPD		N/A	N/A	35	N/A
OI-MA-1L	1	63U	63U	63U	63U
OI-MA-1L DUP	1	63U	63U	63U	63U
I-Stat		N/A	N/A	N/A	N/A
RPD		N/A	N/A	N/A	N/A
OI-MA-1L	5	63U	63U	63U	63U
OI-MA-1L DUP	5	63U	63U	63U	63U
I-Stat		N/A	N/A	N/A	N/A
RPD		N/A	N/A	N/A	N/A
Tomales Bay	3	63U	63U	63U	63U
Tomales Bay DUP	3	63U	63U	63U	63U
I-Stat		N/A	N/A	N/A	N/A
RPD		N/A	N/A	N/A	N/A

DUP = Duplicate

TABLE G.9. (Contd)

Measurements of Accuracy: Standard Reference Materials (SRMs)

Sediment Treatment	Rep	Aroclor 1242 (ng/g dry wt)	Aroclor 1248	Aroclor 1254	Aroclor 1260
Certified Value	-	Data not available			
FU99C IRM	-	63U	63U	1595.37	63U
Percent Recovery					
FU99D IRM	-	63U	63U	1221.03	63U
Percent Recovery					
HI01 IRM	-	63U	63U	1562.12	63U
Percent Recovery					
HI02 IRM	-	63U	63U	1786.64	63U
Percent Recovery					

Surrogate Recovery

Reported in PAH Quality Assurance Data (Table G.3)

TABLE G.9. (Contd)

Procedural Blanks

Sediment Treatment	Rep	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260
		(ng/g dry wt)			
FX91 PB	-	63U	63U	63U	63U
FX92 PB	-	63U	63U	63U	63U
FX93 PB	-	63U	63U	63U	63U
FX94 PB	-	63U	63U	63U	63U
FZ18 PB	-	63U	63U	63U	63U
FZ19 PB	-	63U	63U	63U	63U

Spikes and Recoveries

SRM Data used in place of Spikes

TABLE G.10. Concentrations of Metals in Tissues of *Macoma nasuta* After 10 Day Exposure to Sediment Treatments, Dry Weight

Sediment Treatment	Rep	Dry Weight (%)	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
			(µg/g dry wt)									
Target DL			0.1	2	0.1	0.1	2	0.02	0.1	0.1	0.1	2
Achieved DL			0.01	1	0.1	0.11	1	0.01	0.01	0.1	0.1	1
OI-CH-0	1	15	1.00	22	0.32	0.56	55	0.18	4.6	4.20	3.7	121
OI-CH-0	2	16	0.39	24	0.31	0.67	32	0.11	5.0	2.00	3.1	111
OI-CH-0	3	17	0.88	28	0.32	0.74	42	0.14	3.4	3.90	3.2	82
OI-CH-0	4	17	0.83	22	0.25	0.92	54	0.12	3.7	2.10	2.7	89
OI-CH-0	5	18	0.57	26	0.23	0.65	41	0.11	3.8	2.30	3.2	97
OO-CH-1	1	17	0.69	30	0.26	0.77	44	0.11	4.0	2.10	3.1	105
OO-CH-1	2	16	1.30	28	0.38	0.68	109	0.22	4.1	4.10	3.4	80
OO-CH-1	3	16	1.20	26	0.47	0.84	69	0.21	5.1	6.50	3.2	130
OO-CH-1	4	15	1.60	26	0.50	1.20	138	0.39	5.0	6.30	3.9	268
OO-CH-1	5	15	0.77	27	0.32	0.95	50	0.15	3.9	7.20	3.3	130
OO-CH-2	1	15	0.78	29	0.28	0.92	47	0.12	4.2	3.10	3.3	152
OO-CH-2	2	16	1.10	31	0.48	0.85	77	0.19	5.8	5.50	3.8	124
OO-CH-2	3	16	0.58	27	0.34	0.76	32	0.09	3.8	2.90	3.4	118
OO-CH-2	4	18	0.78	26	0.31	1.10	49	0.14	3.8	2.60	3.2	163
OO-CH-2	5	16	1.70	26	0.34	1.60	80	0.26	3.6	9.90	3.5	121
OI-CH-2A	1	16	0.75	32	0.55	1.10	34	0.11	4.0	5.60	3.5	191
OI-CH-2A	2	17	0.42	24	0.29	0.83	38	0.14	2.9	2.00	2.9	99
OI-CH-2A	3	16	0.05	22	0.23	0.80	19	0.05	2.7	1.20	2.8	82
OI-CH-2A	4	18	0.88	25	0.27	0.70	41	0.12	3.1	3.20	2.9	140
OI-CH-2A	5	17	0.66	23	0.34	0.79	35	0.09	3.0	2.90	2.8	146
OO-CH-3	1	16	0.64	31	0.33	1.30	38	0.09	4.4	3.20	4.0	128
OO-CH-3	2	18	0.60	29	0.36	2.00	47	0.12	5.1	3.80	4.2	174
OO-CH-3	3	15	1.40	31	0.85	0.82	85	0.21	4.8	4.20	3.5	175
OO-CH-3	4	16	1.60	27	0.44	2.70	73	0.18	3.1	5.80	3.5	221
OO-CH-3	5	15	1.50	26	0.31	1.10	58	0.17	3.5	6.90	3.5	136
OO-CH-4	1	16	0.65	25	0.35	0.91	37	0.12	3.3	2.80	2.7	109
OO-CH-4	2	15	1.00	24	0.50	1.30	56	0.17	3.5	4.80	3.2	139
OO-CH-4	3	16	0.88	26	0.26	0.77	46	0.11	3.3	2.50	3.0	98
OO-CH-4	4	16	0.95	28	0.26	0.79	65	0.17	4.0	3.50	2.7	82
OO-CH-4	5	17	0.99	26	0.37	0.80	44	0.14	3.7	4.00	3.4	126
OI-CH-4A	1	17	1.50	29	0.51	0.70	53	0.15	2.8	4.80	3.7	168
OI-CH-4A DUP	1	17	1.40	28	0.56	1.00	58	0.15	3.0	5.20	3.4	162
OI-CH-4A	2	17	1.20	35	0.30	0.73	54	0.12	3.2	4.50	3.1	94
OI-CH-4A	3	16	0.22	32	0.33	0.81	17	0.08	3.7	1.40	3.7	86
OI-CH-4A	4	16	0.61	29	0.28	0.56	30	0.12	3.9	2.80	2.5	83
OI-CH-4A	5	17	0.23	28	0.18	1.20	14	0.08	2.2	1.40	2.5	89

DUP = Duplicate

TABLE G.10. (Contd)

Sediment Treatment	Rep	Dry Weight (%)	(µg/g dry wt) Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
OO-CH-5	1	17	0.26	27	0.23	0.56	24	0.12	3.8	3.00	2.2	98
OO-CH-5	2	17	0.97	26	0.45	1.10	38	0.14	4.2	6.60	2.7	125
OO-CH-5	3	16	0.46	21	0.27	1.10	35	0.12	2.8	2.30	2.3	112
OO-CH-5	4	16	0.19	24	0.23	0.58	24	0.09	3.1	1.20	2.5	153
OO-CH-5	5	15	0.84	29	0.33	0.85	36	0.14	3.7	4.10	2.9	92
OO-CH-6	1	14	1.40	25	0.32	0.83	86	0.26	6.5	12.00	3.2	145
OO-CH-6	2	15	0.06	27	0.28	1.20	14	0.08	5.1	1.60	3.0	143
OO-CH-6	3	14	1.10	27	0.36	1.00	41	0.18	5.3	4.20	3.3	125
OO-CH-6	4	16	0.95	20	0.42	1.50	42	0.15	3.6	5.00	2.9	110
OO-CH-6	5	15	1.44	29	0.50	1.30	55	0.10	4.3	9.20	3.3	169
OI-CH-6A	1	17	1.01	28	0.46	1.70	37	0.13	4.2	4.20	2.8	157
OI-CH-6A	2	18	0.93	25	0.35	1.50	44	0.14	5.3	3.30	2.9	103
OI-CH-6A	3	16	0.56	26	0.23	0.90	29	0.09	3.5	1.50	3.0	93
OI-CH-6A	4	16	0.75	27	0.27	0.75	29	0.11	4.1	2.00	2.9	147
OI-CH-6A	5	16	0.43	26	0.28	0.91	18	0.07	3.0	1.40	2.8	124
OO-CH-7	1	16	0.71	29	0.24	0.69	43	0.12	3.2	2.00	2.6	99
OO-CH-7	2	15	1.40	27	0.46	0.69	70	0.18	4.3	7.50	3.1	167
OO-CH-7	3	16	1.10	32	0.31	0.68	57	0.15	3.3	3.60	3.0	149
OO-CH-7	4	16	0.16	31	0.24	0.98	19	0.07	3.3	1.30	2.6	75
OO-CH-7	5	17	1.00	26	0.26	0.46	52	0.16	2.9	3.30	2.9	90
OO-CH-8	1	16	0.54	27	0.28	0.87	41	0.12	3.1	2.50	2.8	125
OO-CH-8	2	17	0.56	25	0.29	0.53	26	0.09	3.2	3.10	2.0	95
OO-CH-8	3	17	0.58	27	0.30	0.66	32	0.12	3.5	2.70	2.6	103
OO-CH-8	4	15	0.96	29	0.27	1.10	42	0.13	3.1	3.40	3.1	83
OO-CH-8	5	14	0.10	31	0.22	0.76	17	0.08	3.2	1.40	2.8	137
OI-SS-4L	1	18	0.73	27	0.38	1.20	32	0.11	3.9	4.00	2.5	109
OI-SS-4L DUP	1	18	0.63	25	0.38	1.20	30	0.13	3.7	3.90	3.1	116
OI-SS-4L	2	17	0.56	24	0.18	1.50	30	0.11	2.5	2.30	2.7	79
OI-SS-4L	3	15	1.10	25	0.33	1.00	60	0.19	2.9	3.40	2.9	121
OI-SS-4L	4	16	0.34	34	0.24	1.00	24	0.10	2.9	1.40	2.7	81
OI-SS-4L	5	16	1.20	28	0.34	0.90	45	0.17	2.2	3.70	3.1	87
OI-TS-5AU	1	16	1.00	25	0.33	1.10	38	0.15	3.1	5.10	2.5	90
OI-TS-5AU DUP	1	16	1.00	23	0.30	1.20	36	0.14	2.9	5.10	2.2	90
OI-TS-5AU	2	16	0.14	27	0.11	0.92	11	0.08	1.9	1.40	2.5	72
OI-TS-5AU	3	15	0.24	28	0.22	1.40	24	0.08	2.7	1.50	3.1	70
OI-TS-5AU	4	15	0.41	26	0.24	2.10	19	0.11	2.7	2.40	2.6	106
OI-TS-5AU	5	15	0.78	25	0.27	1.60	30	0.17	2.6	2.90	3.1	100

TABLE G.10. (Contd)

Sediment Treatment	Rep	Dry Weight (%)	(µg/g dry wt) Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
0I-TS-5AL	1	18	0.55	25	0.13	0.70	43	0.14	2.6	1.90	12.0	65
0I-TS-5AL DUP	1	18	0.55	26	0.12	1.00	42	0.13	2.6	1.90	2.1	64
0I-TS-5AL	2	16	0.58	26	0.20	0.89	27	0.13	2.7	1.90	3.0	77
0I-TS-5AL	3	16	0.71	28	0.20	0.93	42	0.17	3.1	2.40	3.2	71
0I-TS-5AL	4	16	0.34	32	0.97	2.40	15	0.10	3.0	2.40	2.8	146
0I-TS-5AL	5	17	0.59	28	0.22	2.00	26	0.12	2.5	2.20	3.0	93
0I-MA-1L	1	18	0.63	24	0.22	0.84	20	0.08	2.5	1.70	2.3	76
0I-MA-1L DUP	1	18	0.65	24	0.23	0.82	20	0.07	2.5	1.90	2.8	79
0I-MA-1L	2	17	0.80	25	0.29	0.81	17	0.09	3.8	2.90	2.5	113
0I-MA-1L	3	18	0.75	32	0.22	0.52	35	0.09	2.3	3.50	2.6	78
0I-MA-1L	4	17	1.80	28	0.37	0.81	91	0.26	3.2	6.90	2.7	104
0I-MA-1L	5	18	0.37	26	0.30	0.65	23	0.10	2.2	1.50	2.6	93
0I-MA-2U	1	18	0.50	26	0.22	1.10	22	0.08	2.7	3.30	2.7	97
0I-MA-2U	2	15	0.40	29	0.29	1.40	20	0.08	3.7	2.60	3.2	88
0I-MA-2U	3	16	0.26	23	0.29	0.82	142	0.11	3.6	2.10	2.6	140
0I-MA-2U	4	17	0.81	31	0.27	1.10	53	0.13	2.5	2.60	3.1	113
0I-MA-2U	5	15	0.58	27	0.18	0.97	35	0.14	2.1	4.30	3.0	106
0I-MA-2L	1	16	0.17	25	0.16	0.88	26	0.12	2.7	1.20	2.7	98
0I-MA-2L DUP	1	16	0.18	22	0.15	1.00	27	0.11	2.6	1.20	2.5	105
0I-MA-2L	2	17	0.99	28	0.34	0.83	41	0.13	2.5	4.00	2.8	121
0I-MA-2L	3	15	0.37	27	0.18	0.77	28	0.10	2.1	1.30	2.3	72
0I-MA-2L	4	15	0.31	26	0.28	1.10	22	0.09	3.0	2.50	3.2	63
0I-MA-2L	5	16	0.66	28	0.26	0.98	31	0.16	3.8	2.80	3.3	63
00-W-1	1	17	1.10	27	0.32	0.80	53	0.16	2.5	3.60	3.1	134
00-W-1	2	16	0.35	32	0.30	1.10	29	0.14	3.6	1.40	3.0	142
00-W-1	3	17	0.96	26	0.54	1.20	65	0.20	3.5	6.50	3.2	181
00-W-1	4	15	0.96	26	0.50	1.20	32	0.14	3.7	6.40	3.3	116
00-W-1	5	16	0.71	25	0.34	1.10	39	0.13	3.7	3.30	2.9	107
00-W-2	1	16	1.31	31	0.30	0.88	52	0.17	3.8	4.00	3.2	143
00-W-2	2	16	0.01	35	0.15	0.86	19	0.12	4.3	0.73	3.3	83
00-W-2	3	16	0.66	30	0.23	1.30	40	0.20	3.5	2.40	2.8	95
00-W-2	4	17	1.50	31	0.28	0.89	84	0.26	3.2	6.90	3.4	73
00-W-2	5	16	0.44	52	0.20	1.10	38	0.24	4.0	1.40	3.8	131
00-W-3	1	18	1.10	33	0.33	0.86	56	0.23	2.8	3.50	3.1	115
00-W-3	2	18	1.50	43	0.28	0.84	79	0.32	4.1	4.40	3.5	82
00-W-3	3	18	0.29	40	0.21	0.61	28	0.15	2.3	2.00	2.5	82
00-W-3	4	15	0.87	32	0.24	0.72	55	0.20	2.4	3.30	14.0	79
00-W-3	5	16	1.10	41	0.29	0.87	38	0.15	3.2	3.90	3.3	103

TABLE G.10. (Contd)

Sediment Treatment	Rep	Dry Weight (%)	Ag (µg/g dry wt)	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
OO-W-4	1	15	0.07	31	0.09	0.89	11	0.09	2.4	1.10	3.1	104
OO-W-4	2	16	1.20	46	0.37	0.99	79	0.28	3.6	7.00	3.1	136
OO-W-4	3	16	1.20	35	0.39	0.97	78	0.27	3.8	2.80	3.8	175
OO-W-4	4	17	0.62	38	0.28	0.95	31	0.14	3.4	2.10	3.2	121
OO-W-4	5	16	0.79	15	0.32	0.84	50	0.16	2.4	3.00	2.4	117
OO-W-5	1	16	0.61	25	0.25	0.77	28	0.12	3.3	1.80	2.5	117
OO-W-5	3	16	0.91	28	0.33	1.70	44	0.16	4.1	2.90	2.8	82
OO-W-5	4	17	0.37	25	0.27	0.86	22	0.11	2.7	1.00	2.6	141
OO-W-5	5	13	0.30	36	0.22	1.30	16	0.09	3.3	1.20	3.3	112
PR-coarse	1	15	0.78	32	0.31	1.40	51	0.14	3.6	1.70	3.8	89
PR-coarse	2	16	0.13	36	0.26	0.90	21	0.12	3.1	1.30	2.7	130
PR-coarse	3	15	0.51	28	0.29	0.70	21	0.09	2.9	1.90	3.0	74
PR-coarse	4	15	1.23	32	0.42	0.97	65	0.16	4.2	4.20	13.0	99
PR-coarse	5	15	0.54	30	0.25	0.85	27	0.09	3.0	2.30	3.1	74
PR-fine	1	19	0.28	31	0.28	0.66	20	0.09	2.8	0.79	2.2	88
PR-fine	2	15	0.54	32	0.27	0.94	18	0.07	3.1	1.60	3.0	96
PR-fine	3	15	0.73	37	0.28	0.97	58	0.48	3.5	4.20	3.1	90
PR-fine	4	16	0.10	26	0.23	0.92	15	0.08	2.4	1.20	2.0	99
PR-fine	5	17	<0.01	30	0.36	1.10	47	0.17	3.8	3.80	2.6	91
Tomales Bay	2	14	0.88	29	0.42	1.10	35	0.14	4.6	3.10	3.5	181
Tomales Bay	3	16	0.49	25	0.19	0.61	34	0.13	3.0	2.10	2.8	107
Tomales Bay	4	16	0.95	29	0.26	1.10	46	0.18	2.8	3.90	2.9	96
Tomales Bay	5	15	0.58	28	0.39	0.82	33	0.13	4.0	2.90	3.1	96

TABLE G.11. Concentrations of Metals in Tissues of *Macoma nasuta* After 10-Day Exposure to Sediment Treatments, Wet Weight

Sediment Treatment	Rep	Ag (µg/g wet wt)	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
OI-CH-0	1	0.2	3.3	-	0.1	8.3	-	0.7	0.6	0.6	18.2
OI-CH-0	2	0.1	3.8	-	0.1	5.1	-	0.8	0.3	0.5	17.8
OI-CH-0	3	0.1	4.8	0.1	0.1	7.1	-	0.6	0.7	0.5	13.9
OI-CH-0	4	0.1	3.7	-	0.2	9.2	-	0.6	0.4	0.5	15.1
OI-CH-0	5	0.1	4.2	-	0.1	6.6	-	0.6	0.4	0.5	15.5
OO-CH-1	1	0.1	5.1	-	0.1	7.5	-	0.7	0.4	0.5	17.9
OO-CH-1	2	0.2	4.5	0.1	0.1	17.4	-	0.7	0.7	0.5	12.8
OO-CH-1	3	0.2	4.2	0.1	0.1	11.0	-	0.8	1.0	0.5	20.8
OO-CH-1	4	0.2	3.9	0.1	0.2	20.7	0.1	0.8	0.9	0.6	40.2
OO-CH-1	5	0.1	4.1	-	0.1	7.5	-	0.6	1.1	0.5	19.5
OO-CH-2	1	0.1	4.4	-	0.1	7.1	-	0.6	0.5	0.5	22.8
OO-CH-2	2	0.2	5.0	0.1	0.1	12.3	-	0.9	0.9	0.8	19.6
OO-CH-2	3	0.1	4.3	0.1	0.1	5.1	-	0.6	0.5	0.5	18.9
OO-CH-2	4	0.1	4.7	0.1	0.2	8.8	-	0.7	0.5	0.6	29.3
OO-CH-2	5	0.3	4.2	0.1	0.3	12.8	-	0.6	1.6	0.6	19.4
OI-CH-2A	1	0.1	5.1	0.1	0.2	5.4	-	0.6	0.9	0.6	30.6
OI-CH-2A	2	0.1	4.1	-	0.1	6.5	-	0.5	0.3	0.5	16.8
OI-CH-2A	3	-	3.5	-	0.1	3.0	-	0.4	0.2	0.4	13.1
OI-CH-2A	4	0.2	4.5	-	0.1	7.4	-	0.6	0.6	0.5	25.2
OI-CH-2A	5	0.1	3.9	0.1	0.1	6.0	-	0.5	0.5	0.5	24.8
OO-CH-3	1	0.1	5.0	0.1	0.2	6.1	-	0.7	0.5	0.6	20.5
OO-CH-3	2	0.1	5.2	0.1	0.4	8.5	-	0.9	0.7	0.8	31.3
OO-CH-3	3	0.2	4.7	0.1	0.1	12.8	-	0.7	0.6	0.5	26.3
OO-CH-3	4	0.3	4.3	0.1	0.4	11.7	-	0.5	0.9	0.6	35.4
OO-CH-3	5	0.2	3.9	-	0.2	8.7	-	0.5	1.0	0.5	20.4
OO-CH-4	1	0.1	4.0	0.1	0.1	5.9	-	0.5	0.4	0.4	17.4
OO-CH-4	2	0.2	3.6	0.1	0.2	8.4	-	0.5	0.7	0.5	20.9
OO-CH-4	3	0.1	4.2	-	0.1	7.4	-	0.5	0.4	0.5	15.7
OO-CH-4	4	0.2	4.5	-	0.1	10.4	-	0.6	0.6	0.4	13.1
OO-CH-4	5	0.2	4.8	0.1	0.1	7.5	-	0.6	0.7	0.6	21.4
OI-CH-4A	1	0.3	4.9	0.1	0.1	9.0	-	0.5	0.8	0.6	28.6
OI-CH-4A DUP	1	0.2	4.8	0.1	0.2	9.9	-	0.5	0.9	0.6	27.5
OI-CH-4A	2	0.2	6.0	0.1	0.1	9.2	-	0.5	0.8	0.5	18.0
OI-CH-4A	3	-	5.1	0.1	0.1	2.7	-	0.6	0.2	0.6	13.8
OI-CH-4A	4	0.1	4.6	-	0.1	4.8	-	0.6	0.4	0.4	13.3
OI-CH-4A	5	-	4.8	-	0.2	2.4	-	0.4	0.2	0.4	15.1

- = Not detected

DUP = Duplicate

TABLE G.11. (Contd)

Sediment Treatment	Rep	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
		(µg/g wet wt)									
00-CH-5	1	-	4.6	-	0.1	4.1	-	0.6	0.5	0.4	16.7
00-CH-5	2	0.2	4.4	0.1	0.2	6.1	-	0.7	1.1	0.5	21.3
00-CH-5	3	0.1	3.4	-	0.2	5.8	-	0.4	0.4	0.4	17.9
00-CH-5	4	-	3.8	-	0.1	3.8	-	0.5	0.2	0.4	24.5
00-CH-5	5	0.1	4.4	-	0.1	5.4	-	0.6	0.6	0.4	13.8
00-CH-6	1	0.2	3.5	-	0.1	12.0	-	0.9	1.7	0.4	20.3
00-CH-8	2	-	4.1	-	0.2	2.1	-	0.8	0.2	0.5	21.5
00-CH-8	3	0.2	3.8	0.1	0.1	5.7	-	0.7	0.8	0.5	17.5
00-CH-6	4	0.2	3.2	0.1	0.2	8.7	-	0.6	0.8	0.5	17.6
00-CH-6	5	0.2	4.4	0.1	0.2	8.3	-	0.6	1.4	0.5	25.4
OI-CH-6A	1	0.2	4.8	0.1	0.3	6.3	-	0.7	0.7	0.5	26.7
OI-CH-6A	2	0.2	4.5	0.1	0.3	7.9	-	1.0	0.6	0.5	16.5
OI-CH-6A	3	0.1	4.2	-	0.1	4.6	-	0.6	0.2	0.5	14.9
OI-CH-6A	4	0.1	4.3	-	0.1	4.6	-	0.7	0.3	0.5	23.5
OI-CH-6A	5	0.1	4.2	-	0.1	2.9	-	0.5	0.2	0.4	19.8
00-CH-7	1	0.1	4.6	-	0.1	6.9	-	0.5	0.3	0.4	15.8
00-CH-7	2	0.2	4.1	0.1	0.1	10.5	-	0.6	1.1	0.5	25.1
00-CH-7	3	0.2	5.1	-	0.1	9.1	-	0.5	0.6	0.5	23.8
00-CH-7	4	-	5.0	-	0.2	3.0	-	0.5	0.2	0.4	12.0
00-CH-7	5	0.2	4.4	-	0.1	8.8	-	0.5	0.6	0.5	15.3
00-CH-8	1	0.1	4.3	-	0.1	6.6	-	0.5	0.4	0.4	20.0
00-CH-8	2	0.1	4.3	-	0.1	4.4	-	0.5	0.5	0.3	16.2
00-CH-8	3	0.1	4.6	0.1	0.1	5.4	-	0.6	0.5	0.4	17.5
00-CH-8	4	0.1	4.4	-	0.2	6.3	-	0.5	0.5	0.5	12.5
00-CH-8	5	-	4.3	-	0.1	2.4	-	0.4	0.2	0.4	19.2
OI-SS-4L	1	0.1	4.9	0.1	0.2	5.8	-	0.7	0.7	0.5	19.6
OI-SS-4L DUP	1	0.1	4.5	0.1	0.2	5.4	-	0.7	0.7	0.6	20.9
OI-SS-4L	2	0.1	4.1	-	0.3	5.1	-	0.4	0.4	0.5	13.4
OI-SS-4L	3	0.2	3.8	-	0.2	9.0	-	0.4	0.5	0.4	18.2
OI-SS-4L	4	0.1	5.4	-	0.2	3.6	-	0.5	0.2	0.4	13.0
OI-SS-4L	5	0.2	4.5	0.1	0.1	7.2	-	0.4	0.6	0.5	13.9
OI-TS-5AU	1	0.2	4.0	0.1	0.2	6.1	-	0.5	0.8	0.4	14.4
OI-TS-5AU DUP	1	0.2	3.7	-	0.2	5.8	-	0.5	0.8	0.4	14.4
OI-TS-5AU	2	-	4.3	-	0.1	1.8	-	0.3	0.2	0.4	11.5
OI-TS-5AU	3	-	4.2	-	0.2	3.6	-	0.4	0.2	0.5	10.5
OI-TS-5AU	4	0.1	3.9	-	0.3	2.9	-	0.4	0.4	0.4	15.9
OI-TS-5AU	5	0.1	3.8	-	0.2	4.5	-	0.4	0.4	0.5	15.0

TABLE G.11. (Contd)

Sediment Treatment	Rep	Ag (μg/g wet wt)	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
OI-TS-5AL	1	0.1	4.5	-	0.1	7.7	-	0.5	0.3	2.2	11.7
OI-TS-5AL DUP	1	0.1	4.5	-	0.2	7.6	-	0.5	0.3	0.4	11.5
OI-TS-5AL	2	0.1	4.2	-	0.1	4.3	-	0.4	0.3	0.5	12.3
OI-TS-5AL	3	0.1	4.5	-	0.1	6.7	-	0.5	0.4	0.5	11.4
OI-TS-5AL	4	0.1	5.1	0.2	0.4	2.4	-	0.5	0.4	0.4	23.4
OI-TS-5AL	5	0.1	4.8	-	0.3	4.4	-	0.4	0.4	0.5	15.8
OI-MA-1L	1	0.1	4.3	-	0.2	3.8	-	0.5	0.3	0.4	14.0
OI-MA-1L DUP	1	0.1	4.3	-	0.1	3.6	-	0.5	0.3	0.5	14.2
OI-MA-1L	2	0.1	4.3	-	0.1	2.9	-	0.6	0.5	0.4	19.2
OI-MA-1L	3	0.1	5.8	-	0.1	6.3	-	0.4	0.8	0.5	14.0
OI-MA-1L	4	0.3	4.8	0.1	0.1	15.5	-	0.5	1.2	0.5	17.7
OI-MA-1L	5	0.1	4.7	0.1	0.1	4.1	-	0.4	0.3	0.5	16.7
OI-MA-2U	1	0.1	4.7	-	0.2	4.0	-	0.5	0.6	0.5	17.5
OI-MA-2U	2	0.1	4.4	-	0.2	3.0	-	0.6	0.4	0.5	13.2
OI-MA-2U	3	-	3.7	-	0.1	22.7	-	0.6	0.3	0.4	22.4
OI-MA-2U	4	0.1	5.3	-	0.2	9.0	-	0.4	0.4	0.5	19.2
OI-MA-2U	5	0.1	4.1	-	0.1	5.3	-	0.3	0.6	0.5	15.9
OI-MA-2L	1	-	4.0	-	0.1	4.5	-	0.4	0.2	0.4	15.7
OI-MA-2L DUP	1	-	3.5	-	0.2	4.3	-	0.4	0.2	0.4	16.8
OI-MA-2L	2	0.2	4.8	0.1	0.1	7.0	-	0.4	0.7	0.5	20.6
OI-MA-2L	3	0.1	4.1	-	0.1	4.2	-	0.3	0.2	0.3	10.8
OI-MA-2L	4	-	3.9	-	0.2	3.3	-	0.5	0.4	0.5	12.5
OI-MA-2L	5	0.1	4.5	-	0.2	5.0	-	0.6	0.4	0.5	13.3
OO-W-1	1	0.2	4.6	0.1	0.1	9.0	-	0.4	0.6	0.5	22.8
OO-W-1	2	0.1	5.1	-	0.2	4.6	-	0.6	0.2	0.5	22.7
OO-W-1	3	0.2	4.4	0.1	0.2	11.1	-	0.8	1.1	0.5	30.8
OO-W-1	4	0.1	3.9	0.1	0.2	4.8	-	0.6	1.0	0.5	17.4
OO-W-1	5	0.1	4.0	0.1	0.2	6.2	-	0.6	0.5	0.5	17.1
OO-W-2	1	0.2	5.0	-	0.1	8.3	-	0.6	0.8	0.5	22.9
OO-W-2	2	-	5.6	-	0.1	3.0	-	0.7	0.1	0.5	13.3
OO-W-2	3	0.1	4.8	-	0.2	6.4	-	0.8	0.4	0.4	15.2
OO-W-2	4	0.3	5.3	-	0.2	10.9	-	0.5	1.2	0.6	12.4
OO-W-2	5	0.1	8.3	-	0.2	5.8	-	0.8	0.2	0.6	21.0
OO-W-3	1	0.2	5.9	0.1	0.2	10.1	-	0.5	0.6	0.6	20.7
OO-W-3	2	0.3	7.7	0.1	0.2	14.2	0.1	0.7	0.8	0.8	14.8
OO-W-3	3	0.1	7.2	-	0.1	5.0	-	0.4	0.4	0.5	14.8
OO-W-3	4	0.1	4.8	-	0.1	8.3	-	0.4	0.5	2.1	11.9
OO-W-3	5	0.2	6.6	-	0.1	6.1	-	0.5	0.6	0.5	16.5

TABLE G.11. (Contd)

Sediment Treatment	Rep	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
		(µg/g wet wt)									
00-W-4	1	-	4.7	-	0.1	1.7	-	0.4	0.2	0.5	15.6
00-W-4	2	0.2	7.4	0.1	0.2	12.6	-	0.6	1.1	0.5	21.8
00-W-4	3	0.2	5.6	0.1	0.2	12.5	-	0.6	0.4	0.6	28.0
00-W-4	4	0.1	6.1	-	0.2	5.3	-	0.6	0.4	0.5	20.6
00-W-4	5	0.1	2.4	0.1	0.1	8.0	-	0.4	0.5	0.4	18.7
00-W-5	1	0.1	4.0	-	0.1	4.5	-	0.5	0.3	0.4	16.7
00-W-5	3	0.1	4.5	0.1	0.3	7.0	-	0.7	0.5	0.4	13.1
00-W-5	4	0.1	4.3	-	0.1	3.7	-	0.5	0.2	0.4	24.0
00-W-5	5	-	4.7	-	0.2	2.1	-	0.4	0.2	0.4	14.6
PR-coarse	1	0.1	4.6	-	0.2	7.7	-	0.5	0.3	0.6	13.4
PR-coarse	2	-	5.8	-	0.1	3.4	-	0.5	0.2	0.4	20.8
PR-coarse	3	0.1	4.2	-	0.1	3.2	-	0.4	0.3	0.5	11.1
PR-coarse	4	0.2	4.8	0.1	0.1	9.8	-	0.6	0.6	2.0	14.9
PR-coarse	5	0.1	4.5	-	0.1	4.1	-	0.5	0.3	0.5	11.1
PR-fine	1	-	5.9	0.1	0.1	3.8	-	0.5	0.2	0.4	16.7
PR-fine	2	0.1	4.8	-	0.1	2.7	-	0.5	0.2	0.5	14.4
PR-fine	3	0.1	5.6	-	0.1	8.4	-	0.5	0.6	0.5	13.5
PR-fine	4	-	4.2	-	0.1	2.4	-	0.4	0.2	0.3	15.8
PR-fine	5	-	5.1	0.1	0.2	8.0	-	0.6	0.6	0.4	15.5
Tomales Bay	2	0.1	4.1	0.1	0.2	4.9	-	0.6	0.4	0.5	22.5
Tomales Bay	3	0.1	4.0	-	0.1	5.4	-	0.5	0.3	0.4	17.1
Tomales Bay	4	0.2	4.6	-	0.2	7.4	-	0.4	0.6	0.5	15.4
Tomales Bay	5	0.1	4.2	0.1	0.1	5.0	-	0.6	0.4	0.5	14.4

TABLE G.12. Quality Assurance Summary for Dry Weight Tissue Metals

Measurements of Precision: Duplicate Results

Sediment Treatment	Rep	Dry Weight (%)	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
			(µg/g dry weight)									
OI-CH-4A	1	17	1.50	29	0.51	0.70	53	0.15	2.8	4.80	3.7	168
OI-CH-4A DUP	1	17	1.40	28	0.56	1.00	58	0.15	3.0	5.20	3.4	162
I-Stat			0.0	0.0	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0
RPD			7	4	9	35	9	0	7	8	9	1
OI-SS-4L	1	18	0.73	27	0.38	1.20	32	0.11	3.9	4.00	2.5	109
OI-SS-4L DUP	1	18	0.63	25	0.38	1.20	30	0.13	3.7	3.90	3.1	118
I-Stat			0.1	0	0.0	0.0	0	0.0	0.0	0.0	0.1	0
RPD			15	7	0	0	6	17	5	3	21	4
OI-TS-5AU	1	16	1.00	25	0.33	1.10	38	0.15	3.1	5.10	2.5	90
OI-TS-5AU DUP	1	16	1.00	23	0.30	1.20	36	0.14	2.9	5.10	2.2	90
I-Stat			0.0	0	0.0	0.0	0	0.0	0.0	0.0	0.1	0
RPD			0	8	10	9	5	7	7	0	13	0
OI-TS-5AL	1	18	0.55	25	0.13	0.70	43	0.14	2.6	1.90	12.0	65
OI-TS-5AL DUP	1	18	0.55	25	0.12	1.00	42	0.13	2.6	1.90	12.1	64
I-Stat			0.0	0	0.0	0.2	0	0.0	0.0	0.0	0.0	0
RPD			0.0	0	8	35	2	7	0	0	1	2
OI-MA-1L	1	16	0.63	24	0.22	0.84	20	0.06	2.5	1.70	2.3	78
OI-MA-1L DUP	1	16	0.65	24	0.23	0.82	20	0.07	2.5	1.90	2.6	79
I-Stat			0.0	0	0.0	0.0	0	0.1	0.0	0.1	0.1	0
RPD			3	0	4	2	0	15	0	11	12	1
OI-MA-2L	1	16	0.17	25	0.16	0.86	28	0.12	2.7	1.20	2.7	98
OI-MA-2L DUP	1	16	0.18	22	0.15	1.00	27	0.11	2.6	1.20	2.5	105
I-Stat			0.0	0	0.0	0.1	0	0.0	0.0	0.0	0.0	0
RPD			8	13	7	15	4	9	4	0	7	7

TABLE G.12. (Contd)

Measurements of Accuracy: Standard Reference Materials

Sediment Treatment	Rep	Dry Weight (%)	(µg/g dry wt) Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
Certified Value			None	10.1 +-1.4	4.18 +-0.28	0.40 +-0.07	20.8 +-1.2	0.225 +-0.037	0.26 +-0.06	1.36 +-0.29	7.34 +-0.42	92.5 +-2.3
DOLT	1		1.00	12.1	4.4	0.35	20	0.18	0.23	1.4	7.2	101.0
Within Range?			N/A	no	yes	yes	yes	yes	yes	yes	yes	no
DOLT	2		0.91	14.2	4.2	0.33	18	0.24	0.27	1.1	6.2	92.0
Within Range?			N/A	no	yes	yes	no	yes	yes	yes	no	yes
DOLT	3		0.73	12.6	4.1	0.36	20	0.24	0.26	1.1	6.5	114.0
Within Range?			N/A	no	yes	yes	yes	yes	yes	yes	no	no
DOLT	4		0.99	11.4	4.2	0.46	20	0.21	0.22	1.4	7.1	101.0
Within Range?			N/A	yes	yes	yes	yes	yes	yes	yes	yes	no

Surrogate Recovery

Not Applicable

TABLE G.12. (Contd)

Procedural Blanks

Sediment Treatment	Rep	Dry Weight (%)	(µg/g dry weight) Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
P-BLK	1		<0.01	< 1.0	< 0.1	0.14	< 1	< 0.01	< 0.01	< 0.1	< 0.1	3.0
P-BLK	2		<0.01	< 1.0	< 0.1	0.17	< 1	0.03	0.36	-	0.2	2.0
P-BLK	3		<0.01	< 1.0	< 0.1	0.11	< 1	0.01	0.17	< 0.1	< 0.1	4.0
P-BLK	4		<0.01	< 1.0	< 0.1	0.11	< 1	0.01	0.43	0.1	0.5	1.0

TABLE G.12. (Contd)

Spikes and Recoveries

Sediment Treatment	Rep	Dry Weight (%)	(µg/g dry weight) Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
OI-CH-6A	1	17	1.01	28	0.46	1.70	37	0.13	4.2	4.2	2.8	157
OI-CH-6A SPI	1	17	1.25	82	5.52	6.90	85	0.63	9.2	10.4	8.7	-
(CH-6A Rep 1)-(CH-6A Rep 1-SPI)			0.24	56	5.06	5.20	48	0.50	5.0	6.2	5.9	-
Amount Spiked			0.25	50	5.00	5.00	50	0.50	5.0	5.0	5.0	-
Percent Recovery			96	112	101	104	96	100	100	124	118	-
OO-W-2	1	16	1.31	31	0.30	0.88	52	0.17	3.8	4.0	3.2	143
OO-W-2 SPI	1	16	1.66	81	5.37	6.70	107	0.72	9.0	8.1	8.9	-
(W-2 Rep 1)-(W-2 Rep 1-SPI)			0.35	50	5.07	5.80	55	0.55	5.4	4.1	5.7	-
Amount Spiked			0.25	50	5.00	5.00	50	0.50	5.0	5.0	5.0	-
Percent Recovery			140	100	101	116	110	110	108	82	114	-
OO-W-5	1	16	0.61	25	0.25	0.77	28	0.12	3.3	1.8	2.5	117
OO-W-5 SPI	1	16	0.94	68	5.44	5.40	76	0.62	8.9	5.8	8.1	-
(W-5 Rep 1)-(W-5 Rep 1-SPI)			0.33	43	5.19	4.60	48	0.50	5.6	4.0	5.6	-
Amount Spiked			0.25	50	5.00	5.00	50	0.50	5.0	5.0	5.0	-
Percent Recovery			132	86	104	92	96	100	112	80	112	-
PR-coarse	1	15	0.76	32	0.31	1.40	61	0.14	3.6	1.7	3.8	89
PR-coarse SPI	1	15	1.07	69	5.58	5.90	107	0.64	9.2	5.7	8.7	-
(coarse Rep 1)-(coarse Rep 1-SPI)			0.29	37	5.37	4.50	56	0.50	5.6	4.0	4.9	-
Amount Spiked			0.75	50	5.00	5.00	50	0.50	5.0	5.0	5.0	-
Percent Recovery			116	74	107	90	112	100	112	80	98	-

- = Data not available.

TABLE G.13. Concentrations of Organotins in Tissues of *M. nasuta* After 10-Day Exposure to Sediment Treatments, Dry Weight

Sediment Treatment	Rep	Dry Weight (%)	Propyl Tin % Recovery	Butyltin Concentrations (µg/kg dry weight) Tri	Di	Mono	Total
Target DL				10.0	10.0	10.0	
Achieved DL (lowest)				10.0	5.6	4.4	----
OI-CH-0	1	15	92	< 12.0	36.0	< 8.9	36.0
OI-CH-0	2	16	88	< 11.0	55.0	< 8.3	55.0
OI-CH-0	3	17	93	< 11.0	28.0	< 7.8	28.0
OI-CH-0	4	17	90	< 11.0	29.0	< 8.0	29.0
OI-CH-0	5	16	90	< 12.0	< 19.0	< 8.7	NA
OO-CH-1	1	17	87	< 11.0	30.0	< 8.0	30.0
OO-CH-1	2	18	86	< 11.0	18.0	< 8.3	18.0
OO-CH-1	3	16	107	< 12.0	71.0	< 8.6	71.0
OO-CH-1	4	15	67	< 12.0	< 20.0	< 9.2	NA
OO-CH-1	5	15	62	< 14.0	6.5	< 6.0	6.5
OO-CH-2	1	15	73	< 13.0	43.0	< 9.3	43.0
OO-CH-2	2	16	53	< 12.0	< 19.0	< 8.6	NA
OO-CH-2	3	16	99	< 12.0	48.0	< 8.5	48.0
OO-CH-2	4	18	61	12.0	< 16.0	< 7.4	12.0
OO-CH-2	5	16	72	12.0	51.0	< 8.4	63.0
OI-CH-2A	1	16	84	17.0	27.0	< 6.5	44.0
OI-CH-2A	2	17	80	19.0	83.0	< 7.9	102.0
OI-CH-2A	3	16	82	12.0	< 18.0	< 8.3	12.0
OI-CH-2A	4	18	57	< 11.0	49.0	< 4.9	49.0
OI-CH-2A	5	17	57	12.0	26.0	< 8.0	38.0
OO-CH-3	1	16	113	< 12.0	33.0	< 8.5	33.0
OO-CH-3	2	18	85	< 10.0	28.0	< 7.5	28.0
OO-CH-3	3	15	96	< 13.0	29.0	< 9.3	29.0
OO-CH-3	4	16	92	< 11.0	93.0	< 8.5	93.0
OO-CH-3	5	15	103	< 12.0	23.0	< 9.0	23.0
OO-CH-4	1	16	99	< 11.0	< 18.0	< 8.3	NA
OO-CH-4	2	15	97	< 11.0	31.0	< 8.1	31.0
OO-CH-4	3	16	84	21.0	40.0	< 8.4	61.0
OO-CH-4	4	16	85	12.0	65.0	< 8.6	77.0
OO-CH-4	5	17	90	< 11.0	18.0	< 7.9	18.0
OI-CH-4A	1	17	94	< 11.0	49.0	< 8.0	49.0
OI-CH-4A DUP	1	17	81	< 12.0	41.0	< 5.3	41.0
OI-CH-4A	2	17	96	< 11.0	55.0	< 8.0	55.0
OI-CH-4A	3	16	91	< 12.0	49.0	< 8.7	49.0
OI-CH-4A	4	16	106	27.0	26.0	< 8.7	53.0
OI-CH-4A	5	17	74	15.0	< 17.0	< 7.8	15.0

NA = Not applicable

TABLE G.13. Concentrations of Organotins in Tissues of *Macoma nasuta* After 10-Day Exposure to Sediment Treatments, Dry Weight (cont'd)

Sediment Treatment	Rep	Dry Weight (%)	Propyl Tin % Recovery	Butyltin Concentrations (µg/kg dry weight) Tri	Di	Mono	Total
00-CH-5	1	17	88	< 10.0	22.0	< 7.7	22.0
00-CH-5	2	17	84	< 11.0	< 18.0	< 8.1	NA
00-CH-5	3	16	98	17.0	< 19.0	< 8.7	17.0
00-CH-5	4	16	91	14.0	163.0	20.0	197.0
00-CH-5	5	15	90	< 12.0	23.0	< 8.9	23.0
00-CH-6	1	14	89	26.0	< 21.0	< 9.8	26.0
00-CH-6	2	15	115	25.0	< 20.0	< 9.1	25.0
00-CH-6	3	14	79	< 13.0	97.0	<10.0	97.0
00-CH-6	4	16	97	23.0	20.0	< 8.3	43.0
00-CH-6	5	15	96	20.0	23.0	< 9.1	43.0
0I-CH-6A	1	17	103	12.0	25.0	< 7.8	37.0
0I-CH-6A	2	18	87	< 11.0	9.5	< 4.9	9.5
0I-CH-6A	3	16	81	28.0	53.0	< 5.4	81.0
0I-CH-6A	4	16	83	< 13.0	15.0	< 5.4	15.0
0I-CH-6A	5	16	80	< 12.0	9.6	< 5.3	9.6
00-CH-7	1	16	73	< 12.0	< 6.5	< 5.1	NA
00-CH-7	2	15	73	16.0	33.0	< 5.7	49.0
00-CH-7	3	16	66	14.0	52.0	5.6	71.6
00-CH-7	4	16	77	32.0	42.0	5.8	79.8
00-CH-7	5	17	74	13.0	54.0	< 4.8	67.0
00-CH-8	1	16	82	< 13.0	56.0	5.9	61.9
00-CH-8	2	17	68	16.0	27.0	< 5.2	43.0
00-CH-8	3	17	68	18.0	27.0	< 4.9	45.0
00-CH-8	4	15	75	17.0	60.0	< 5.5	77.0
00-CH-8	5	14	61	< 13.0	16.0	< 5.7	16.0
0I-SS-4L	1	16	88	17.0	22.0	< 5.0	39.0
0I-SS-4L DUP	1	18	72	< 12.0	20.0	< 4.9	20.0
0I-SS-4L	2	17	93	16.0	58.0	< 4.9	74.0
0I-SS-4L	3	15	70	< 13.0	56.0	< 5.7	56.0
0I-SS-4L	4	16	75	< 12.0	34.0	< 5.2	34.0
0I-SS-4L	5	16	82	< 13.0	162.0	< 5.4	162.0
0I-TS-5AU	1	16	72	40.0	< 6.6	< 5.2	40.0
0I-TS-5AU DUP	1	16	71	42.0	17.0	< 5.3	59.0
0I-TS-5AU DUP	1	16	70	40.0	14.0	< 5.5	54.0
0I-TS-5AU	2	16	80	44.0	25.0	< 5.5	69.0
0I-TS-5AU	3	15	81	39.0	40.0	< 5.7	79.0
0I-TS-5AU	4	15	66	< 14.0	39.0	< 5.8	39.0
0I-TS-5AU	5	15	85	52.0	85.0	< 5.3	137.0

NA = Not applicable.

TABLE G.14. Concentrations of Organotins in Tissues of *M. nasuta* After 10-Day Exposure to Sediment Treatments, Wet Weight

(μg/kg wet weight)

Sediment Treatment	Rep	Propyl Tin % Recovery	Butyltin Concentrations Tri	Di	Mono	Total
OI-CH-0	1	-	< 1.8	5.4	< 1.3	5.4
OI-CH-0	2	-	< 1.8	8.9	< 1.3	8.9
OI-CH-0	3	-	< 1.8	4.8	< 1.3	4.8
OI-CH-0	4	-	< 1.8	4.9	< 1.4	4.9
OI-CH-0	5	-	< 1.9	< 3.0	< 1.4	NA
OO-CH-1	1	-	< 1.8	5.1	< 1.4	5.1
OO-CH-1	2	-	< 1.8	2.9	< 1.3	2.9
OO-CH-1	3	-	< 1.9	11.0	< 1.4	11.0
OO-CH-1	4	-	< 1.9	< 3.0	< 1.4	NA
OO-CH-1	5	-	< 2.0	1.6	< 0.9	1.6
OO-CH-2	1	-	< 1.9	6.4	< 1.4	6.4
OO-CH-2	2	-	< 1.9	< 3.0	< 1.4	NA
OO-CH-2	3	-	< 1.9	7.6	< 1.4	7.6
OO-CH-2	4	-	2.1	< 2.9	< 1.3	2.1
OO-CH-2	5	-	2.0	8.2	< 1.4	10.2
OI-CH-2A	1	-	2.8	4.3	< 1.4	7.1
OI-CH-2A	2	-	3.3	14.0	< 1.3	17.3
OI-CH-2A	3	-	1.9	< 2.9	< 1.3	1.9
OI-CH-2A	4	-	< 2.0	8.8	< 0.9	8.8
OI-CH-2A	5	-	2.0	4.4	< 1.4	6.4
OO-CH-3	1	-	< 1.8	5.3	< 1.4	5.3
OO-CH-3	2	-	< 1.8	5.1	< 1.4	5.1
OO-CH-3	3	-	< 1.9	4.3	< 1.4	4.3
OO-CH-3	4	-	< 1.8	15.0	< 1.4	15.0
OO-CH-3	5	-	< 1.8	3.4	< 1.3	3.4
OO-CH-4	1	-	< 1.8	< 2.9	< 1.3	NA
OO-CH-4	2	-	< 1.7	4.6	< 1.2	4.6
OO-CH-4	3	-	3.3	6.3	< 1.3	9.6
OO-CH-4	4	-	1.9	10.0	< 1.4	11.9
OO-CH-4	5	-	< 1.8	3.0	< 1.4	3.0
OI-CH-4A	1	-	< 1.8	8.3	< 1.4	8.3
OI-CH-4A DUP	1	-	< 2.0	6.9	< 0.9	6.9
OI-CH-4A	2	-	< 1.8	9.4	< 1.4	9.4
OI-CH-4A	3	-	< 1.9	7.8	< 1.4	7.8
OI-CH-4A	4	-	4.3	4.2	< 1.4	8.5
OI-CH-4A	5	-	2.6	< 2.9	< 1.3	2.6

- = Data not available.

NA = Not applicable.

TABLE G.14. Concentrations of Organotins in Tissues of *Macoma nasuta* After 10-Day Exposure to Sediment Treatments, Wet Weight (cont'd)

(μg/kg wet weight)

Sediment Treatment	Rep	Propyl Tin % Recovery	Butyltin Concentrations Tri	Di	Mono	Total
00-CH-5	1	-	< 1.8	3.7	< 1.3	3.7
00-CH-5	2	-	< 1.9	< 3.0	< 1.4	NA
00-CH-5	3	-	2.6	< 3.0	< 1.4	2.6
00-CH-5	4	-	2.2	26.0	3.2	31.4
00-CH-5	5	-	< 1.8	3.5	< 1.3	3.5
00-CH-6	1	-	3.6	< 3.0	< 1.4	3.6
00-CH-6	2	-	3.7	< 2.9	< 1.4	3.7
00-CH-6	3	-	< 1.9	14.0	< 1.4	14.0
00-CH-6	4	-	3.7	3.3	< 1.3	7.0
00-CH-6	5	-	2.9	3.4	< 1.4	6.3
0I-CH-6A	1	-	2.0	4.2	< 1.3	6.2
0I-CH-6A	2	-	< 2.0	1.7	< 0.9	1.7
0I-CH-6A	3	-	4.5	8.4	< 0.9	12.9
0I-CH-6A	4	-	< 2.0	2.4	< 0.9	2.4
0I-CH-6A	5	-	< 2.0	1.5	< 0.9	1.5
00-CH-7	1	-	< 1.9	< 1.0	< 0.8	NA
00-CH-7	2	-	2.3	5.0	< 0.9	7.3
00-CH-7	3	-	2.3	8.3	0.9	11.5
00-CH-7	4	-	5.2	7.7	0.9	13.8
00-CH-7	5	-	2.2	9.1	< 0.8	11.3
00-CH-8	1	-	< 2.1	8.9	0.9	9.8
00-CH-8	2	-	2.7	4.5	< 0.9	7.2
00-CH-8	3	-	3.1	4.6	< 0.8	7.7
00-CH-8	4	-	2.5	8.9	< 0.8	11.4
00-CH-8	5	-	< 1.9	2.3	< 0.8	2.3
0I-SS-4L	1	-	3.0	4.0	< 0.9	7.0
0I-SS-4L DUP	1	-	< 2.1	3.7	< 0.9	3.7
0I-SS-4L	2	-	2.8	9.9	< 0.8	12.7
0I-SS-4L	3	-	< 2.0	8.4	< 0.9	8.4
0I-SS-4L	4	-	< 1.9	5.5	< 0.8	5.5
0I-SS-4L	5	-	< 2.0	26.0	< 0.9	26.0
0I-TS-5AU	1	-	6.4	< 1.1	< 0.8	6.4
0I-TS-5AU DUP	1	-	6.7	2.7	< 0.9	9.4
0I-TS-5AU DUP	1	-	6.4	2.3	< 0.9	8.7
0I-TS-5AU	2	-	7.0	4.0	< 0.9	11.0
0I-TS-5AU	3	-	5.8	6.0	< 0.9	11.8
0I-TS-5AU	4	-	< 2.0	5.8	< 0.9	5.8
0I-TS-5AU	5	-	7.9	13.0	< 0.8	20.9

TABLE G.14. Concentrations of Organotins in Tissues of *Macoma nasuta* After 10-Day Exposure to Sediment Treatments, Wet Weight (cont'd)

Sediment Treatment	Rep	Propyl Tin % Recovery	Butyltin Concentrations (µg/kg wet weight) Tri	Di	Mono	Total
OI-TS-5AL	1	-	< 2.1	6.6	< 0.9	6.6
OI-TS-5AL DUP	1	-	< 1.9	6.7	< 0.8	6.7
OI-TS-5AL	2	-	< 2.0	6.9	< 0.9	6.9
OI-TS-5AL	3	-	2.8	2.2	< 0.9	5.0
OI-TS-5AL	4	-	< 2.0	5.2	< 0.9	5.2
OI-TS-5AL	5	-	2.0	4.1	< 0.9	6.1
OI-MA-1L	1	-	3.6	5.5	< 0.9	9.1
OI-MA-1L DUP	1	-	2.3	4.8	< 0.9	7.1
OI-MA-1L	2	-	2.9	8.0	< 0.8	10.9
OI-MA-1L	3	-	2.7	8.7	< 0.8	11.4
OI-MA-1L	4	-	2.5	2.2	< 0.9	4.7
OI-MA-1L	5	-	4.0	14.0	< 0.8	18.0
OI-MA-2U	1	-	3.5	8.9	< 0.9	12.4
OI-MA-2U	2	-	2.9	12.0	< 0.9	14.9
OI-MA-2U	3	-	< 2.0	12.0	< 0.9	12.0
OI-MA-2U	4	-	3.5	2.0	< 0.8	5.5
OI-MA-2U	5	-	6.3	13.0	< 0.9	19.3
OI-MA-2U DUP	5	-	2.5	6.0	< 0.9	8.5
OI-MA-2L	1	-	2.3	9.5	< 0.9	11.8
OI-MA-2L DUP	1	-	< 2.0	10.0	< 0.9	10.0
OI-MA-2L	2	-	2.3	4.3	< 0.9	6.6
OI-MA-2L	3	-	< 2.1	4.9	< 0.9	4.9
OI-MA-2L	4	-	2.5	11.0	< 0.8	13.5
OI-MA-2L	5	-	< 2.1	4.1	< 0.9	4.1
OO-W-1	1	-	< 2.0	4.6	< 0.9	4.6
OO-W-1	2	-	< 2.1	5.2	< 0.9	5.2
OO-W-1	3	-	< 2.1	12.0	< 0.9	12.0
OO-W-1	4	-	< 2.0	9.3	< 0.9	9.3
OO-W-1	5	-	< 2.0	9.5	1.4	10.9
OO-W-2	1	-	< 2.0	9.1	< 0.9	9.1
OO-W-2	2	-	< 2.0	5.0	< 0.9	5.0
OO-W-2	3	-	< 2.0	5.9	1.0	6.9
OO-W-2	4	-	< 2.0	8.0	< 0.9	8.0
OO-W-2	5	-	< 1.9	6.6	< 0.9	6.6
OO-W-3	1	-	< 1.9	5.8	< 0.9	5.8
OO-W-3	2	-	< 2.0	6.8	< 0.9	6.8
OO-W-3	3	-	2.9	8.2	1.1	12.2
OO-W-3	4	-	< 1.9	11.0	< 0.9	11.0
OO-W-3	5	-	< 2.0	17.0	1.7	18.7

TABLE G.14. Concentrations of Organotins in Tissues of *Macoma nasuta* After 10-Day Exposure to Sediment Treatments, Wet Weight (cont'd)

(µg/kg wet weight)

Sediment Treatment	Rep	Propyl Tin % Recovery	Butyltin Concentrations Tri	Di	Mono	Total
00-W-4	1	-	< 2.0	3.3	< 0.9	3.3
00-W-4	2	-	< 2.1	3.3	< 0.9	3.3
00-W-4	3	-	< 2.0	3.3	< 0.9	3.3
00-W-4	4	-	< 2.0	4.8	< 0.9	4.8
00-W-4 DUP	4	-	< 2.0	4.2	< 0.9	4.2
00-W-4	5	-	< 1.9	8.7	< 0.9	8.7
00-W-5	1	-	< 2.0	5.7	< 0.9	5.7
00-W-5	2	-	< 2.1	8.9	< 0.9	8.9
00-W-5	3	-	< 2.1	4.4	< 0.9	4.4
00-W-5	4	-	< 2.0	8.0	< 0.9	8.0
00-W-5	5	-	< 2.0	11.0	< 0.9	11.0
P.R. coarse	1	-	< 2.0	2.3	< 0.9	2.3
P.R. coarse	2	-	< 2.0	14.0	1.3	15.3
P.R. coarse	3	-	< 2.0	8.1	< 0.9	8.1
P.R. coarse	4	-	2.2	4.0	< 0.9	6.2
P.R. coarse	5	-	3.9	17.0	1.8	20.9
P.R. fine	1	-	3.3	4.9	< 0.9	8.2
P.R. fine	2	-	< 2.1	6.1	< 0.9	6.1
P.R. fine	3	-	2.6	4.8	< 0.9	7.4
P.R. fine	4	-	< 2.0	14.0	1.5	15.5
P.R. fine	5	-	< 1.9	3.5	< 0.9	3.5
Tomales Bay	1	-	< 2.0	2.9	< 0.9	2.9
Tomales Bay	2	-	< 2.1	1.9	< 0.9	1.9
Tomales Bay	3	-	< 2.1	2.8	< 0.9	2.8
Tomales Bay	4	-	< 2.1	8.7	1.4	10.1
Tomales Bay	5	-	< 2.0	4.7	< 0.9	4.7

TABLE G.15. Quality Assurance Summary for Dry Weight Tissue Organotins

Measurements of Precision: Duplicate Results

Sediment Treatment	Rep	Dry Weight (%)	Propyl Tin % Recovery	(µg/kg dry weight) Butyltin Concentrations Tri	Di	Mono	Total
0I-CH-4A	1	17	94	< 11.0	49.0	< 8.0	49.0
0I-CH-4A DUP	1	17	61	< 12.0	41.0	< 5.3	41.0
I-Stat				N/A	0.1	N/A	
RPD				N/A	18	N/A	
0I-SS-4L	1	18	88	17.0	22.0	< 5.0	39.0
0I-SS-4L DUP	1	18	72	< 12.0	20.0	< 4.9	20.0
I-Stat				N/A	0.1	N/A	
RPD				N/A	10	N/A	
0I-TS-5AU	1	16	72	40.0	< 6.6	< 5.2	40.0
0I-TS-5AU DUP	1	16	71	42.0	17.0	< 5.3	59.0
I-Stat				0.0	N/A	N/A	
RPD				5	N/A	N/A	
0I-MA-1L	1	18	89	20.0	31.0	< 4.7	51.0
0I-MA-1L DUP	1	18	73	13.0	27.0	< 4.9	40.0
I-Stat				0.2	0.1	N/A	
RPD				42	14	N/A	
0I-MA-2U	1	18	74	20.0	49.0	< 4.9	69.0
0I-MA-2U DUP	5	15	65	16.0	40.0	< 6.0	56.0
I-Stat				0.1	0.1	N/A	
RPD				22	20	N/A	
0I-MA-2L	1	16	67	14.0	60.0	< 6.0	74.0
0I-MA-2L DUP	1	16	85	< 13.0	65.0	< 5.5	65.0
I-Stat				N/A	0.0	N/A	
RPD				N/A	8	N/A	
00-W-4	4	17	83	< 12.0	28.0	< 5.2	28.0
00-W-4 DUP	4	17	74	< 12.0	25.0	< 5.3	25.0
I-Stat				N/A	0.1	N/A	
RPD				N/A	11	N/A	

TABLE G.15. Quality Assurance Summary for Dry Weight Tissue Organotins (Cont'd)

Measurements of Accuracy: Standard Reference Materials

Not Available

Surrogate Recoveries

Included in all tables as Propyl Tin % recovery

Procedural Blanks

Sediment Treatment	Rep	Dry Weight (%)	Propyl Tin % Recovery	(µg/kg dry weight) Butyltin Concentrations Tri	Di	Mono	Total
Blank	1		59	< 10.0	< 5.6	< 4.4	NA
Blank	2		40	< 10.0	< 5.6	< 4.4	NA
Blank	3		57	< 10.0	< 5.6	< 4.4	NA
Blank	4		62	< 10.0	< 5.6	< 4.6	NA
Blank	5		51	< 10.0	< 5.6	< 4.6	NA
Blank	6		34	< 10.0	< 5.6	< 4.[illegible]	NA
Blank	7		82	< 11.0	< 5.7	< 4.6	NA

TABLE G.15. Quality Assurance Summary for Dry Weight Tissue Organotins (Cont'd)

Spikes and Recoveries

Sediment Treatment	Rep	Dry Weight (%)	Propyl Tin % Recovery	(µg/kg dry weight) Butyltin Concentrations Tri	Di	Mono	Total
DI-CH-6A	1	17	103	12.0	25.0	< 7.8	37.0
DI-CH-6A SPI	1	17	113	840	857	138	1835
Amount Spiked				852	852	852	NA
Percent Recovery				97	98	16	NA
OO-CH-8	1	16	82	< 13.0	56.0	5.9	61.9
OO-CH-8 SPI	1	16	75	664	777	223	1664
Amount Spiked				882	882	882	NA
Percent Recovery				75	82	25	NA
OO-W-2	1	16	78	< 13.0	57.0	< 5.6	57.0
OO-W-2 SPI	1	16	67	679	796	113	1588
Amount Spiked				915	915	-	NA
Percent Recovery				74	81	-	NA
OO-W-5	1	16	83	< 13.0	36.0	< 5.7	36.0
OO-W-5 SPI	1	16	101	794	842	165	1801
Amount Spiked				962	962	962	NA
Percent Recovery				86	85	18	NA
P.R. coarse	1	15	87	< 13.0	15.0	< 6.0	15.0
P.R. coarse SPI	1	15	84	866	957	249	2072
Amount Spiked				962	962	-	1924
Percent Recovery				-	-	-	NA

- = Data not available.
NA = Not applicable.

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