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Sequim, Washington

September 1996

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

Pacific Northwest National Laboratory
Operated for the U.S. Department of Energy
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Summary

The Hudson River (Federal Project No. 41) was one of seven waterways that the U.S. Army Corps of Engineers-New York District (USACE-NYD) requested the Battelle Marine Sciences Laboratory (MSL) to sample and evaluate for dredging and disposal in March 1994. Sediment samples were collected from the Hudson River, as well as from Buttermilk Channel, Gravesend Bay Anchorage, South Brother Island, Port Chester, Eastchester, and Brown's Creek, during a survey conducted from March 7 through 14, 1994. Combining sample collection and evaluation of multiple dredged material projects was more cost-effective for the USACE-NYD because the expense of reference site testing and quality control analyses could be shared among project budgets.

Tests and analyses were conducted on Hudson River sediment core samples according to the manual developed by the USACE and the U.S. Environmental Protection Agency (EPA), *Evaluation of Dredged Material Proposed for Ocean Disposal (Testing Manual)*, commonly referred to as the "Green Book," and the regional manual developed by the USACE-NYD and EPA Region II, *Guidance for Performing Tests on Dredged Material to be Disposed of in Ocean Waters*. The evaluation of proposed dredged material from the Hudson River included bulk sediment chemical analyses, chemical analyses of site water and elutriate, water-column and benthic acute toxicity tests, and bioaccumulation studies. Individual sediment core samples collected from Hudson River were analyzed for grain size, moisture content, and total organic carbon (TOC). A composite sediment sample, representing the entire area proposed for dredging, was analyzed for bulk density, specific gravity, metals, chlorinated pesticides, polychlorinated biphenyl (PCB) congeners, polynuclear aromatic hydrocarbons (PAH), and 1,4-dichlorobenzene. Site water and elutriate water, prepared from the suspended-particulate phase (SPP) of Hudson River sediment, were analyzed for metals, pesticides, and PCBs. Water-column or SPP toxicity tests were performed with three species, the mysid *Mysidopsis bahia*, the juvenile silverside *Menidia beryllina*, and larvae of the mussel *Mytilus galloprovincialis*. Benthic acute toxicity tests were performed with three amphipods, *Ampelisca abdita*, *Rhepoxynius abronius*, and *Eohaustorius estuarius*, as well as with the mysid *M. bahia*. The amphipod benthic toxicity test procedures followed EPA guidance for reduction of total ammonia

concentrations in test systems prior to test initiation. A similar procedure was followed for the mysid toxicity test. Bioaccumulation tests were conducted with the burrowing worm *Nereis virens* and the surface-feeding clam *Macoma nasuta*.

Hudson River sediment core samples were black, silty-clayey material. Hudson River sediment composite samples contained elevated levels of metals, pesticides (particularly the DDD/DDE/DDT group of compounds), PCBs, PAHs, and 1,4-dichlorobenzene.

No statistically significant acute toxicity was found in static renewal tests with *A. abdita*, *R. abronius* (except Reach A sediment), and *M. bahia*. Survival of *M. bahia* in tests with Hudson River sediment composites ranged from 89% (Reach A) to 95% (Reach B) in the static renewal exposure and from 0% (Reaches A and C) to 12% (Reach D) in the static exposure, indicating that the procedure to reduce overlying water total ammonia concentrations in the test chambers to nontoxic levels prior to test initiation and during the test resulted in increased survival of *M. bahia*. All four Hudson River sediment composites were acutely toxic and had a greater than 20% increase in mortality over the reference sediment in the static renewal test with *E. estuarius*, and a greater than 10% increase in mortality over the reference sediment in the static test with *M. bahia*. In water-column toxicity tests, 100% SPP treatments created from all four Hudson River reaches were acutely toxic to all three species tested, except Reach D SPP in the *M. bahia* test. The median lethal concentrations (LC_{50}) ranged from 69.8% SPP for *M. galloprovincialis* to >100% SPP for *M. bahia* survival in Reach A sediment, from 21.0% SPP for *M. galloprovincialis* to 22.7% SPP for *M. bahia* survival in Reach B sediment, and 30.1% SPP for *M. galloprovincialis* to 70.1% SPP for *M. bahia* survival in Reach C sediment. The LC_{50}s were >100% SPP for all three species for Reach D sediment. The median effective concentrations (EC_{50}) for *M. galloprovincialis* normal development, a more sensitive measure than survival, ranged from <10% for Reach B sediment to 22.4% SPP for Reach D sediment.

Concentrations of some contaminants were elevated in tissues of *N. virens* and *M. nasuta* were exposed to Hudson River sediment in 28-day bioaccumulation tests. Concentrations of pesticides and PCBs were generally the same or slightly higher in *N. virens* than in *M. nasuta*. Concentrations of metals and PAHs were generally higher in *M. nasuta*. Tissues of both species exposed to sediment from each of the four Hudson

River reaches had tissue body burdens that were lower than the U.S. Food and Drug Administration (FDA) action levels for poisonous or deleterious substances in fish and shellfish for human consumption for selected pesticides, FDA levels of concern for chronic shellfish consumption for selected metals, and regional USACE-NYD bioaccumulation matrix values. When tissue burdens of organisms exposed to Hudson River sediments were compared with those exposed to Mud Dump Reference Site sediment, the tissue burdens were statistically significantly higher for metals, pesticides, PCBs, and PAHs. Therefore, Hudson River sediment from all four reaches requires further evaluation to determine limiting permissible concentration (LPC) and benthic effects compliance.

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1.0 Introduction

1.1 Project Objectives

The objective of the Hudson River project (Federal Project No. 41) was to evaluate proposed dredged material from four reaches of the Hudson River to determine its suitability for unconfined ocean disposal at the Mud Dump Site. The Mud Dump Site is the present dredged material disposal site for the Port of New York and New Jersey. It lies in the apex of the New York Bight about 6 miles east of Sandy Hook, New Jersey, and 12 miles south of Rockaway Point, New York.

Tests and analyses were conducted on Hudson River sediment core samples according to the manual developed by the U.S. Army Corps of Engineers (USACE) and the U.S. Environmental Protection Agency (EPA), *Evaluation of Dredged Material Proposed for Ocean Disposal (Testing Manual)* (EPA/USACE 1991), commonly referred to as the "Green Book," and the regional manual developed by the USACE-New York District (NYD) and EPA Region II, *Guidance for Performing Tests on Dredged Material to be Disposed of in Ocean Waters* (USACE-NYD/EPA Region II 1992), hereinafter referred to as the "Regional Guidance Manual." The Regional Guidance Manual provides specifications for the use of local or appropriate test species in biological tests and identifies chemical contaminants of concern.

As required by the Regional Guidance Manual, the evaluation of proposed dredged material from the Hudson River included bulk sediment chemical analyses, chemical analyses of site water and elutriate, water-column and benthic acute toxicity tests, and bioaccumulation studies. Individual sediment core samples collected from the Hudson River were analyzed for grain size, moisture content, and total organic carbon (TOC). Composite sediment samples, one representing each reach proposed for dredging, were analyzed for bulk density, specific gravity, metals, chlorinated pesticides, polychlorinated biphenyl (PCB) congeners, polynuclear aromatic hydrocarbons (PAH), and 1,4-dichlorobenzene. Site waters and elutriate waters, prepared from the suspended-particulate phase (SPP) of Hudson River sediment, were analyzed for metals, pesticides, and PCBs. Water-column or SPP toxicity tests were performed with three species, the mysid *Mysidopsis bahia*, the juvenile silverside *Menidia beryllina*, and larvae of the mussel *Mytilus galloprovincialis*.

Bioaccumulation tests were conducted with the burrowing worm *Nereis virens* and the surface-feeding clam *Macoma nasuta*. Benthic acute toxicity tests were performed with three amphipods, *Ampelisca abdita*, *Rhepoxynius abronius*, and *Eohaustorius estuarius*, as well as with the mysid *M. bahia*.

1.2 Project Background

The proposed Hudson River project area is shown in Figure 1.1. Reach A begins on the east (New York) bank of the Hudson at the Battery, and extends north, past the Holland Tunnel to the area near Pier 57 and the Marine Aviation terminal. Reach B continues from the Pier 57 area north to the area near Pier 65 (adjacent to 40th Street in Manhattan). Reach C begins on the west bank of the Hudson in Jersey City, New Jersey, just south of Liberty State Park, and extends north to Hoboken, New Jersey. Reach D continues from Hoboken north to Weehawken, New Jersey. The entire project requires dredging and disposal of an estimated 800,000 cu yd of sediment. Project depth of the channel is -40 ft mean low water (MLW) plus 2 ft of overdepth. The Hudson River was one of seven waterways that the USACE-NYD requested the Battelle Marine Sciences Laboratory (MSL) to evaluate in a series of dredged material projects that became known as the New York/New Jersey Federal Projects 2 program. The projects evaluated under the Federal Projects 2 program were the Hudson River, Buttermilk Channel, South Brother Island, Gravesend Bay Anchorage, Brown's Creek, Port Chester, and Eastchester. Sediment samples from 12 reaches in these waterways were collected during a survey that took place from March 7 through March 14, 1994. Combining sample collection and evaluation of multiple dredged material projects was more cost-effective for the USACE-NYD because the expense of reference site testing and quality control analyses could be shared among project budgets.

1.3 Organization of This Report

Following this introduction, Section 2 presents the methods and materials used for sample collection, sample processing, sediment sample analysis of physical and chemical parameters, and quality assurance. Results of all physical/chemical analyses and bioassays

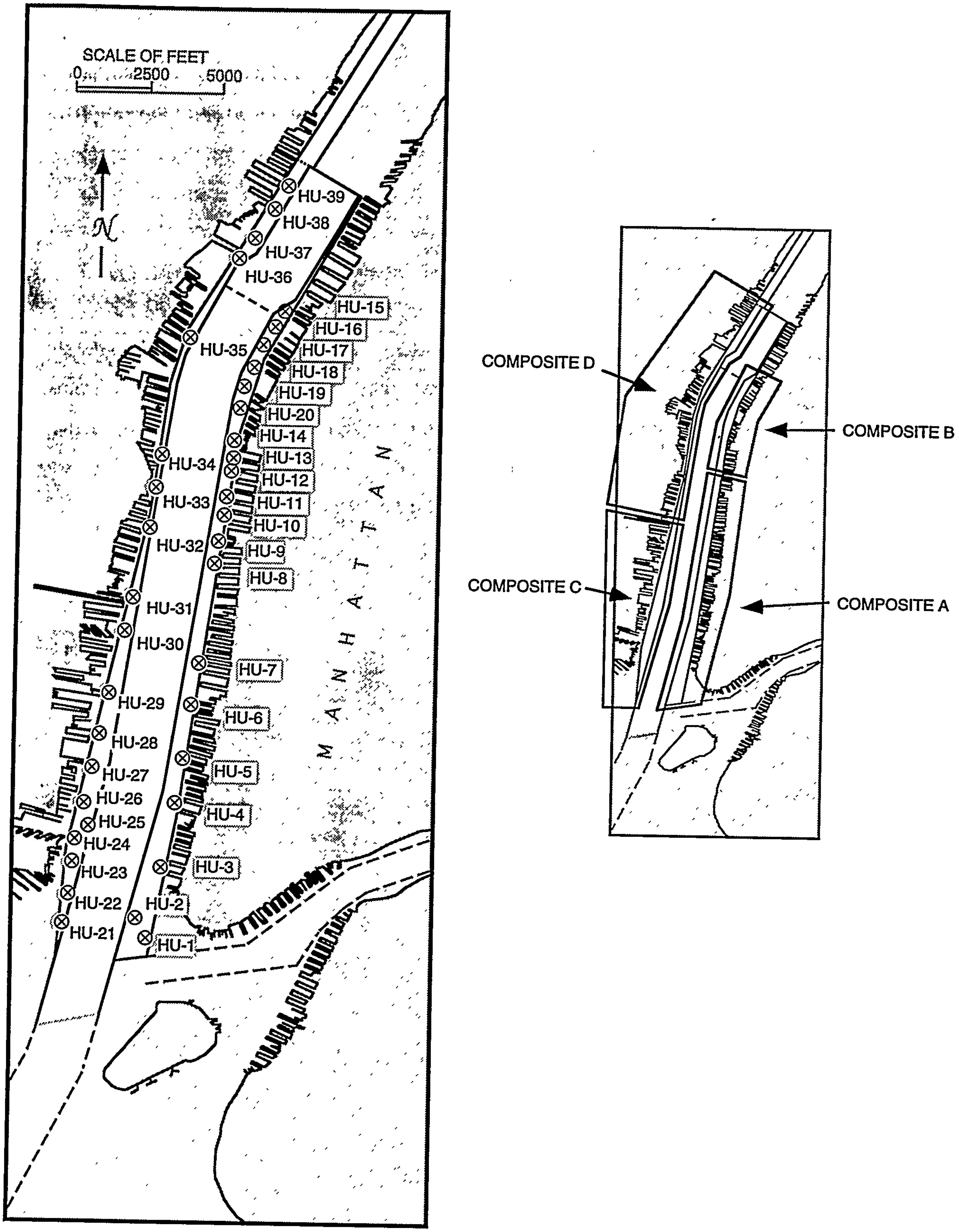

FIGURE 1.1. Location of the Hudson River Sample Collection Stations

are presented in Section 3. A discussion of the results and conclusions are provided in Section 4. Section 5 lists the literature cited in this report. Appendix A contains tabulated quality control data for all physical and chemical sediment analyses. Appendix B contains results of replicate sample analyses and quality control data for site water and elutriate chemical parameters. Appendix C contains raw data associated with water-column toxicity tests, including water quality measurements, test animal survival data, and results of reference toxicant tests. Similar data for benthic acute toxicity tests are provided in Appendix D. Appendix E contains water quality measurements, test animal survival data, and results of reference toxicant tests for the bioaccumulation tests. Appendix F contains replicate sample results and quality control data for chemical analyses of *M. nasuta* tissue samples generated by the bioaccumulation tests, and Appendix G contains replicate sample results and quality control data for chemical analyses of *N. virens* tissue samples.

2.0 Materials and Methods

2.1 Sediment and Water Collection

Sediment samples were collected from 38 stations along the Hudson River: 9 in Reach A, 10 in Reach B, 10 in Reach C, and 9 in Reach D. Sampling locations were selected by the USACE-NYD based on recent bathymetric surveys. The locations, their coordinates, and water and core sampling depths are presented with the sampling results in Section 3.0. Water samples were collected at a representative location in each Hudson River reach and in the Mud Dump Site. Reference sediment was collected from the Mud Dump Reference Site. All samples were collected aboard the M/V *Gelberman* or the M/V *Hayward*, two vessels owned and operated by USACE-NYD at Caven Point, New Jersey.

2.1.1 Test Sediment and Site Water Sampling

Test sediment core samples were collected using a vibracore sampler deployed from the *Gelberman* or *Hayward*. The approximate sampling locations were first determined with the aid of reference to landmarks, such as shoreline features or buoys, as well as by water depth. Then, a hand-held Magellan Global Positioning System (GPS) was used to identify and record (within 30 m) each sampling station. The vessel's LORAN was available as a backup system. Water depth at the time of sampling was measured by a fathometer on the ship. The actual water depth was corrected to MLW depth by correcting to the tide height at the time the depth was recorded. The difference between the MLW depth and the project depth, plus 2 ft overdepth, yielded the amount of core required.

Core samples were collected aboard the *Gelberman* using the MSL's vibracore sampler, and aboard the *Hayward* using a vibracore owned and operated by Ocean Surveys, Inc., Old Saybrook, Connecticut. The vibracore sampler consisted of a 4-in. outer diameter (OD), steel core barrel attached to an electric vibratory hammer. The vibratory hammer could be fitted to steel core barrels of various lengths, depending on the length of core needed. To collect a core sample, the core barrel was fitted with a 3.125-in. interior diameter (ID), steam-cleaned, Lexan polycarbonate tube. The vibracore was then suspended by the ship's crane. Once the coring apparatus was directly above the sampling station, the core was lowered through the water to the sediment surface. At this point, the station coordinates were recorded from the Magellan GPS, and water depth was recorded from the ship's fathometer. The vibratory hammer was switched on until the corer penetrated through the sediment to the desired project depth. Adequate penetration was determined relative to graduated marks on the outside of the core barrel and on the cable suspending the vibracore from the crane. The vibracore apparatus was then pulled out of the sediment and lowered onto the ship's deck. A cutter-head and core-catcher assembly prevented loss of the sediment through the bottom of the core liner. After each core was brought on board, the liner was pulled from the barrel and the length of cored sediment was measured from the mudline to determine whether the appropriate depth had been reached. If the core length was insufficient, the liner was replaced, and sampling for a second core was attempted. If the core achieved project depth plus 2 ft overdepth, it was capped, sealed with tape, and labeled. While on board the sampling vessel, cores were kept cool (~4°C) in a freezer on the deck of the ship. If necessary, cores were cut into shorter sections to fit in the freezer.

A surface-water sample for site water chemical analysis was collected at one station in each reach of the Hudson River. Site water was also collected from the Mud Dump Site for chemical analysis and used as dilution water in water-column toxicity tests. Water samples were collected using a clean, epoxy-coated bucket below the surface of the water. Water was then transferred to precleaned, 20-L polypropylene carboys. (Prior to the sampling survey, carboys were washed with hot water and detergent, acid-rinsed with dilute hydrochloric acid, then rinsed with distilled water, followed by acetone and methylene chloride.) The carboys were rinsed with site water three times before filling. Water samples were labeled and stored in a freezer at ~4°C while on board the ship.

A log book was maintained containing records of each sample collected, and included station designation, coordinates, replicate number, date, sampling time, water depth, core length, and number of core sections per core. At the end of each sampling day, when the *Gelberman* or *Hayward* returned to Caven Point, all sediment cores and water samples were loaded into a refrigerated van, thermostatically controlled to maintain approximately 4°C. Sample identification numbers were logged in on chain-of-custody forms daily.

At the conclusion of the sample collection survey, sediment cores and water samples were shipped by refrigerated van from Caven Point, New Jersey, to the MSL in Sequim, Washington. The shipment departed from Caven Point on March 14, 1994, and arrived at the MSL on March 18, 1994.

2.1.2 Reference and Control Sediment Sampling

Reference sediment for toxicity and bioaccumulation tests was collected from the Mud Dump Reference Site. Four 5-gal containers of surficial sediment were collected using a pipe-dredge sampler. The sampler was deployed from the *Gelberman* and towed astern of the ship for approximately 10 to 20 min. After recovery, water was drained from the sampler, and sediment was transferred to epoxy-coated steel buckets. The buckets were covered, labeled, and stored at ambient temperature (<10°C in the shade) while aboard the ship, then were transferred to the refrigerated van at the end of the sampling day.

Records of reference sediment collection also included coordinates, replicate number, date, sampling time, and water depth. Reference sediment samples were loaded into the refrigerated van at the staging area upon return to port, and sample identification numbers were logged in on chain-of-custody forms.

Native control sediments were used in each toxicity and bioaccumulation test to validate test procedures. Control sediment used in *M. nasuta* and *M. bahia* tests was collected from Sequim Bay, Washington, using a Van Veen sampler deployed from an MSL research vessel. *R. abronius* control sediment was collected from West Beach, at Whidbey Island, Washington, using a small anchor-dredge sampler specially designed for collecting the amphipods and their sediment. Location of these control sites was determined by reference to known shoreline features. While in transit from the sampling site, these control sediments were held in coolers at ambient temperature, and they were stored in the walk-in cold room at 4°C±2°C upon arrival at the MSL. Native sediment for *A. abdita, E. estuarius*, and *N. virens* were provided with the test organisms by their respective suppliers.

2.2 Test Organism Collection

Eight test species were used to evaluate sediment samples from the Hudson River project area:

- *Ampelisca abdita*, a tube-dwelling, surface detrital-feeding amphipod
- *Rhepoxynius abronius*, a free-burrowing, subsurface detrital feeding amphipod
- *Eohaustorius estuarius*, a free-burrowing, subsurface detrital feeding amphipod
- *Mysidopsis bahia*, a juvenile mysid shrimp
- *Menidia beryllina*, a juvenile silverside fish
- *Mytilus galloprovincialis*, the larval zooplankton stage of the mussel
- *Macoma nasuta*, the bent-nose clam, a burrowing, surface-detrital feeder
- *Nereis virens*, a burrowing, deposit-feeding polychaete.

All test organisms except mysids, silversides, and mussels were wild capture animals, collected either by a commercial supplier or by MSL personnel. The amphipod *A. abdita* was supplied by East Coast Amphipod, Kingston, Rhode Island. *A. abdita* and its native sediment were collected from Narragansett Bay, Rhode Island, by dragging a large dip net along the sediment surface. Test organisms were carefully removed from their tubes for counting, and then placed in clean, native sediment for overnight transport to the MSL. The amphipod *R. abronius* and its native control sediment were collected by MSL personnel from West Beach, at Whidbey Island, Washington, using an anchor-dredge sampler. The amphipods were transported to the MSL in clean coolers containing approximately 10 cm of sediment and 5 gal of clean seawater at a temperature approximating natural conditions. The amphipod *E. estuarius* and its native sediment were supplied by Northwest Aquatic Sciences, Newport, Oregon. They were collected with a benthic dredge, transferred to small plastic containers with native sediment, and shipped in coolers to the MSL by overnight service. Mysids were purchased from Aquatic Biosystems, Fort Collins, Colorado. Mysids that were less than 24 h old were shipped via overnight delivery in plastic bags containing oxygen-supersaturated seawater maintained at approximately 15°C with "blue ice." Silversides were supplied by Aquatic Research Organisms in Hampton, New Hampshire, and were shipped via overnight delivery in plastic bags containing oxygen-supersaturated seawater maintained at approximately 22°C with blue ice. Mussels used for obtaining *M. galloprovincialis* larvae were purchased from the commercial supplier Marinus, Inc., Long Beach, California. *Mussels were wrapped in moist paper towels and transported in a Styrofoam cooler packed with blue ice to maintain an ambient temperature of approximately 15°C. Clams (*M. nasuta*) were collected from intertidal zones in Discovery Bay, Washington, by Johnson and Gunstone. The clams were kept in large containers filled with sediment and seawater obtained from the collection site and transported to the MSL. Worms (*N. virens*) were purchased through Envirosystems, Inc., and were collected from an intertidal region in Newcastle, Maine. The worms were packed in insulated boxes with mats of moist seaweed and shipped at ambient temperature to the MSL via overnight delivery.

All organisms were shipped or transported in native sediment or under conditions designed to ensure their viability. After arrival at the MSL, the test organisms were gradually acclimated to test conditions. Animals with abnormal behavior or appearance were not used in toxicological tests. All acclimation and animal care records became part of the raw data files for these projects.

2.3 Sediment Sample Preparation

Sediment sample preparation consisted of all steps performed in the laboratory between receipt of the samples at the MSL and the preparation of samples for biological testing and physical/chemical analyses. Sediment samples for physical, chemical, and biological analysis were prepared from individual core samples, composites of a number of core samples, reference sediment, and control sediment. All sediment samples were assigned random, unique code numbers to ensure that samples were handled without bias by staff in the biology or chemistry laboratories.

Sediment for biological testing was used within the 6-week holding period specified in the Green Book. During this holding time, the sediment samples were received at the MSL; inventoried against chain-of-custody forms; processed and used for benthic and water-column toxicity tests, elutriate analysis, and bioaccumulation tests; and subsampled for sediment physical/chemical analyses. This section describes procedures followed for equipment preparation, compositing strategy, and preparation of sediments for biological testing and chemical analyses.

2.3.1 Laboratory Preparation and Safety Considerations

2.3.1.1 Glassware and Equipment Preparation

All glassware, stainless-steel or titanium utensils, Nalgene, Teflon, and other laboratory containers and equipment underwent stringent cleaning procedures to avoid contamination of samples. Glassware (e.g., test containers, aquaria, sediment transfer dishes) was washed with hot water and detergent, rinsed with deionized water, soaked in a 5% solution of reagent grade nitric acid for a minimum of 4 h, rinsed again with deionized water, and then allowed to air dry. Glassware was then rinsed with methylene chloride and allowed to dry under a fume hood. Polyvinyl chloride (PVC), Nalgene, and Teflon tools were treated in the same manner as glassware. Stainless-steel bowls, spoons, spatulas, and other utensils were washed with hot water and detergent, rinsed with deionized water, and allowed to air dry. They were then solvent-rinsed with methylene chloride and allowed to dry under a fume hood.

Neoprene stoppers and polyethylene sheets or other porous materials were washed with hot water and detergent and rinsed with deionized water. These items were then "seasoned" by continuous soaking in 0.45-μm filtered seawater for at least 2 days prior to use. Large pieces of laboratory equipment, such as epoxy-coated sediment mixers, were washed with a dilute solution of detergent, and thoroughly rinsed with tap water followed by deionized water.

Equipment used for determining water quality, including the meters for pH, dissolved oxygen (DO), temperature, salinity, and ammonia, were calibrated according to the manufacturers' specifications and internal the MSL standard operating procedures (SOPs).

2.3.1.2 Laboratory Safety

Because the potential toxicity of the Hudson River sediments was unknown, sediment processing and testing were segregated from other laboratory activities. Specific areas at the MSL were established for sample storage and for core-cutting, sediment mixing, and sediment sieving. Work areas were covered with plastic sheeting to contain any waste sediment. Wastewater generated during all operations was retained in 55-gal barrels and periodically pumped through activated charcoal filters and into the MSL's wastewater treatment system. These procedures minimized any potential for crosscontamination of sediment samples.

Laboratory staff members were protected by personal safety equipment such as Tyvek suits, plastic aprons, safety glasses, and rubber gloves. Those who were likely to have the most exposure to the potential volatile compounds in the bulk sediment (i.e., those responsible for opening, homogenizing, and compositing core samples) were also provided with half-mask respirators.

2.3.2 Preparation of Sediment for Benthic Testing and Bulk Sediment Analyses

Each Lexan core liner was opened either by removing the cap at both ends or by cutting the core longitudinally with a saw. As each core sample was opened, it was examined for physical characteristics (e.g., sediment type and consistency, color, odor). In particular, the presence of any strata in the cores was noted. All core observations were recorded in the sediment preparation log book. The sediment between the mudline and project depth was then transferred from the core liner to a clean, stainless-steel bowl by scooping the sediment from the core liner with a spoon or spatula. Sediment was mixed by hand with stainless-steel utensils until the color and consistency appeared homogenous, creating a sample representative of the individual sampling station. Sieving was not necessary because no organisms were present in the sediment samples.

Aliquots of the homogenized sediment were then transferred to the appropriate sample jar(s) for physical or chemical analyses required on individual core samples. A portion of each homogenized core sample was also retained as an archive sample. The remainder of the homogenized sediment from the individual core stations was combined, by reach, to create a composite sample representing each of the four reaches of the Hudson River project area, designated COMP HU-A (Stations HU-1 through HU-10), HU-B (Stations HU-11 through HU-20), HU-C (Stations HU-21 through HU-30), and HU-D (Stations HU-31 through HU-39). Composited sediments were homogenized in an epoxy-coated mixer. Aliquots of the homogenized, composited sediments were transferred to appropriate sample jar(s) for physical or chemical analyses required on the composite sample. A portion of the each homogenized composited sediment was also retained as an archive sample. The remainder was stored in labeled epoxy-coated pails, tightly covered, at 4°C ± 2°C until use for SPP/elutriate preparation or benthic toxicity and bioaccumulation tests.

Mud Dump Reference Site sediment, *M. nasuta* native control sediment, and *N. virens* native control sediment individually were homogenized in a large, epoxy-coated mixer. Prior to mixing, these sediments were pressed through a 1-mm mesh to remove live organisms that might affect the outcome of toxicity tests. After mixing, aliquots for physical and chemical analyses were removed. Native control sediments for *A. abdita*, *R. abronius*, and *E. estuarius* were sieved through a 0.5-mm mesh to remove live organisms and mixed in stainless-steel bowls after sieving. All reference and control sediments were stored at 4°C ± 2°C until use in benthic toxicity and bioaccumulation tests.

2.3.3 Preparation of Suspended Particulate Phase (SPP) and Elutriate

Toxicological effects of dredged sediments dissolved and suspended in the water-column at an open-water disposal site were simulated in the laboratory by preparation of the SPP. To prepare SPP, a sediment-water slurry was created and centrifuged at low speed. The centrifugation procedure replaced the 1-h settling procedure described for elutriate preparation in the Green Book. Low speed centrifugation provided a more timely SPP preparation and maintained consistency between projects. The supernatant was decanted and reserved for testing with water-column organisms. The elutriate phase was prepared by centrifuging the SPP again at a high speed and collecting the supernatant. This liquid was analyzed for chemical constituents to identify potential water-soluble contaminants that may remain in the water-column after dredge and disposal operations.

The SPP was prepared by creating a 4:1 (volume:volume) water-to-sediment slurry in 1–L glass jars with Teflon-lined lids. Because the salinity of dredging site water was below salinity tolerance and acceptable test limits for test organisms, Sequim Bay seawater was used in preparation of SPP. The jars were marked at 200 mL and 400 mL and filled to the 200-mL mark with 0.45-μm-filtered Sequim Bay seawater. Homogenized, composited sediment (COMP HU-A, HU-B, HU-C, or HU-D) was added until the water was displaced to the 400-mL mark. Each jar was then filled to 1 L with filtered seawater, placed on a shaker table, and agitated for 30 min at 120 to 150 cycles/min. The slurry was then transferred to 500-mL Teflon jars, tightly sealed, and centrifuged at approximately 1750 rpm for 10 min, at a relative centrifugal force of approximately 1000 g. Following centrifugation, the supernatant was poured into 4-L glass jars. The Teflon jars were rinsed after each use and the above process continued until an adequate amount of SPP was produced from each composite. Between SPP preparations, all glass and Teflon containers were cleaned according to procedures described in Section 2.3.1.1. When all SPP for a treatment was prepared, portions were taken for elutriate preparation. The remaining SPP was either used immediately for biological tests or stored at 4°C ± 2°C and used within 24 h for testing. The COMP HU-A, HU-B, HU-C, or HU-D SPP was mixed with Mud Dump Site water to yield four dilutions: 0%, 10%, 50%, and 100% SPP.

To prepare elutriate for chemical analyses, a 1-L aliquot of each SPP preparation was collected in an acid-washed Teflon bottle for trace metals analysis, and three 1-L aliquots were collected in EPA-certified amber glass bottles for analysis of organic compounds. The SPP for metals analysis was transferred to acid-washed polycarbonate centrifuge jars, and the SPP for analysis of organic compounds was transferred to Teflon centrifuge jars. Both were centrifuged at 2000 rpm for 30 min at a relative centrifugal force of approximately 1200 g. The decanted supernatant liquid was the elutriate phase. One liter of elutriate was submitted for triplicate trace metals analysis and three 1-L portions were submitted for analysis of organic compounds.

2.4 Physical and Chemical Analytical Procedures

Individual sediment cores, composited bulk sediment, water, elutriate, and tissue samples were analyzed for selected physical and chemical parameters. Table 2.1 lists the parameters measured in each sample type, the method used for each analysis, and the target analytical detection limits. The following sections briefly describe the procedures used for physical and chemical analyses. Procedures followed those required by the Regional Guidance Manual unless otherwise noted.

TABLE 2.1: List of Analytes, Methods, and Target Detection Limits

Analyte	Methods	Sediment Detection Limit [a]	Tissue Detection Limit [b]	Water Detection Limit
PHYSICAL PARAMETERS				
Grain Size	Plumb (1981)			
Specific Gravity	ASTM D-854 (ASTM 1992)			
Bulk Density	EM 1110-2-1906 (USACE 1970)			
Percent Moisture	Sediment: Plumb (1981)	1.0 %		
	Tissue: Freeze-dry		1.0 %	
METALS				
Arsenic	EPA 200.2, -.3, -.8 [c]	0.1 µg/g	1.0 µg/g	
Cadmium	EPA 200.2, -.3, -.8 [c]	0.01 µg/g	0.1 µg/g	0.025 µg/L
Chromium	EPA 200.2, -.3, -.8 [c]	0.02 µg/g	0.2 µg/g	1.0 µg/L
Copper	EPA 200.2, -.3, -.8 [c]	0.1 µg/g	1.0 µg/g	0.35 µg/L
Lead	EPA 200.2, -.3, -.8 [c]	0.1 µg/g	0.1 µg/g	0.35 µg/L
Mercury	EPA 245.5 (sed.); 245.6 (tiss.) [c]	0.02 µg/g	0.02 µg/g	
	Bloom and Crecelius (1983) (water)			
0.002 µg/L				
Nickel	EPA 200.2, -.3, -.8 [c]	0.1 µg/g	0.1 µg/g	0.3 µg/L
Silver	EPA 200.2, -.3, -.9 [c]	0.1 µg/g	0.1 µg/g	0.25 µg/L
Zinc	EPA 200.2, -.3, -.8 [c]	0.1 µg/g	1.0 µg/g	0.15 µg/L
ORGANIC COMPOUNDS				
TOC	EPA (1986)	0.1%		
Pesticides				
Aldrin	EPA 8080 (sediment, tissue)	1.0 ng/g	0.4 ng/g	
	EPA 608 (water) [c]			0.004 µg/L
α-Chlordane	EPA 8080 (sediment, tissue)	1.0 ng/g	0.4 ng/g	
	EPA 608 (water) [c]			0.014 µg/L
trans-Nonachlor	EPA 8080 (sediment, tissue)	1.0 ng/g	0.4 ng/g	
	EPA 608 (water) [c]			0.014 µg/L
Dieldrin	EPA 8080 (sediment, tissue)	1.0 ng/g	0.4 ng/g	
	EPA 608 (water) [c]			0.002 µg/L
4,4'-DDT	EPA 8080 (sediment, tissue)	1.0 ng/g	0.4 ng/g	
	EPA 608 (water) [c]			0.012 µg/L
2,4'-DDT	EPA 8080 (sediment, tissue)	1.0 ng/g	0.4 ng/g	
	EPA 608 (water) [c]			0.020 µg/L
4,4'-DDD	EPA 8080 (sediment, tissue)	1.0 ng/g	0.4 ng/g	
	EPA 608 (water) [c]			0.011 µg/L
2,4'-DDD	EPA 8080 (sediment, tissue)	1.0 ng/g	0.4 ng/g	
	EPA 608 (water) [c]			0.020 µg/L
4,4'-DDE	EPA 8080 (sediment, tissue)	1.0 ng/g	0.4 ng/g	
	EPA 608 (water) [c]			0.004 µg/L
2,4'-DDE	EPA 8080 (sediment, tissue)	1.0 ng/g	0.4 ng/g	
	EPA 608 (water) [c]			0.020 µg/L

TABLE 2.1. (contd)

Analyte	Method(s)	Sediment Detection Limit	Tissue Detection Limit	Water Detection Limit
Endosulfan I	EPA 8080 (sediment, tissue)	1.0 ng/g	0.4 ng/g	
	EPA 608 (water) [c]			0.014 μg/L
Endosulfan II	EPA 8080 (sediment, tissue)	1.0 ng/g	0.4 ng/g	
	EPA 608 (water) [c]			0.004 μg/L
Endosulfan sulfate	EPA 8080 (sediment, tissue)	1.0 ng/g	0.4 ng/g	
	EPA 608 (water) [c]			0.010 μg/L
Heptachlor	EPA 8080 (sediment, tissue)	1.0 ng/g	0.4 ng/g	
	EPA 608 (water) [c]			0.003 μg/L
Heptachlor epoxide	EPA 8080 (sediment, tissue)	1.0 ng/g	0.4 ng/g	
	EPA 608 (water) [c]			0.100 μg/L
PCBs				
8 (2,4′)	NYSDEC (1992) [c]	1.0 ng/g	0.4 ng/g	0.0005 μg/L
18 (2,2′,5)	NYSDEC (1992) [c]	1.0 ng/g	0.4 ng/g	0.0005 μg/L
28 (2,4,4′)	NYSDEC (1992) [c]	1.0 ng/g	0.4 ng/g	0.0005 μg/L
44 (2,2′,3,5′)	NYSDEC (1992) [c]	1.0 ng/g	0.4 ng/g	0.0005 μg/L
49 (2,2′,4,5′)	NYSDEC (1992) [c]	1.0 ng/g	0.4 ng/g	0.0005 μg/L
52 (2,2′,5,5′)	NYSDEC (1992) [c]	1.0 ng/g	0.4 ng/g	0.0005 μg/L
66 (2,3′,4,4′)	NYSDEC (1992) [c]	1.0 ng/g	0.4 ng/g	0.0005 μg/L
87 (2,2′,3,4,5′)	NYSDEC (1992) [c]	1.0 ng/g	0.4 ng/g	0.0005 μg/L
101 (2,2′,3,5,5′)	NYSDEC (1992) [c]	1.0 ng/g	0.4 ng/g	0.0005 μg/L
105 (2,3,3′,4,4′)	NYSDEC (1992) [c]	1.0 ng/g	0.4 ng/g	0.0005 μg/L
118 (2,3′,4,4′,5)	NYSDEC (1992) [c]	1.0 ng/g	0.4 ng/g	0.0005 μg/L
128 (2,2′,3,3′,4,4′)	NYSDEC (1992) [c]	1.0 ng/g	0.4 ng/g	0.0005 μg/L
138 (2,2′,4,4′,5,5′)	NYSDEC (1992) [c]	1.0 ng/g	0.4 ng/g	0.0005 μg/L
153 (2,2′,4,4′,5,5′)	NYSDEC (1992) [c]	1.0 ng/g	0.4 ng/g	0.0005 μg/L
170 (2,2′,3,3′,4,4′,5)	NYSDEC (1992) [c]	1.0 ng/g	0.4 ng/g	0.0005 μg/L
180 (2,2′,3,4′,5,5′,6)	NYSDEC (1992) [c]	1.0 ng/g	0.4 ng/g	0.0005 μg/L
183 (2,2′,3,4,4′,5′,6)	NYSDEC (1992) [c]	1.0 ng/g	0.4 ng/g	0.0005 μg/L
184 (2,2′,3,4,4′,6,6′)	NYSDEC (1992) [c]	1.0 ng/g	0.4 ng/g	0.0005 μg/L
187 (2,2′,3,4′,5,5′,6)	NYSDEC (1992) [c]	1.0 ng/g	0.4 ng/g	0.0005 μg/L
195 (2,2′,3,3′,4,4′,5,6)	NYSDEC (1992) [c]	1.0 ng/g	0.4 ng/g	0.0005 μg/L
206 (2,2′,3,3′,4,4′,5,5′,6)	NYSDEC (1992) [c]	1.0 ng/g	0.4 ng/g	0.0005 μg/L
209 (2,2′,3,3′,4,4′,5,5′,6,6′)	NYSDEC (1992) [c]	1.0 ng/g	0.4 ng/g	0.0005 μg/L

TABLE 2.1. (contd)

Analyte	Method(s)	Sediment Detection Limit	Tissue Detection Limit	Water Detection Limit
PAHs				
Acenapthene	EPA 8270 [(c)]	10 ng/g	4 ng/g	
Acenaphthylene	EPA 8270 [(c)]	10 ng/g	4 ng/g	
Anthracene	EPA 8270 [(c)]	10 ng/g	4 ng/g	
Fluorene	EPA 8270 [(c)]	10 ng/g	4 ng/g	
Naphthalene	EPA 8270 [(c)]	10 ng/g	4 ng/g	
Phenanthrene	EPA 8270 [(c)]	10 ng/g	4 ng/g	
Benz[*a*]anthracene	EPA 8270 [(c)]	10 ng/g	4 ng/g	
Benzo[*a*]pyrene	EPA 8270 [(c)]	10 ng/g	4 ng/g	
Benzo[*b*]fluoranthene	EPA 8270 [(c)]	10 ng/g	4 ng/g	
Benzo[g,h,i]perylene	EPA 8270 [(c)]	10 ng/g	4 ng/g	
Benzo[*k*]fluoranthene	EPA 8270 [(c)]	10 ng/g	4 ng/g	
Chrysene	EPA 8270 [(c)]	10 ng/g	4 ng/g	
Dibenzo[a,h]anthracene	EPA 8270 [(c)]	10 ng/g	4 ng/g	
Fluoranthene	EPA 8270 [(c)]	10 ng/g	4 ng/g	
Indeno[1,2,3-*cd*]pyrene	EPA 8270 [(c)]	10 ng/g	4 ng/g	
Pyrene	EPA 8270 [(c)]	10 ng/g	4 ng/g	
1,4-Dichlorobenzene	EPA 8270 [(c)]	1.0 ng/g	0.4 ng/g	
OTHER MEASUREMENTS				
Total Lipids	Bligh and Dyer (1959)/ Randall (1988)		0.1%	

(a) Detection limits are in dry weight for all sediment parameters except Hg.
(b) Detection limits are in wet weight for all organic and inorganic tissue parameters.
(c) Equivalent Battelle standard operating procedures will be substituted for the methods cited.

2.4.1 Grain Size and Percentage of Moisture

Grain size was measured following two methods described by Plumb (1981). The wet sieve method was used to determine the size distribution of sand or coarser-grained particles larger than a U.S. No. 230 standard sieve (62.5-μm mesh). The size distribution of particles smaller than a U.S. No. 230 sieve was determined using the pipet method. Grain size was reported as percentages within four general size classes:

gravel > 2000-μm diameter
sand < 2000-μm and ≥62.5-μm diameter
silt <62.5-μm diameter and ≥ 3.9-μm diameter
clay ≤3.9-μm diameter.

As a quality control measurement of precision, one sample was selected randomly from each analytical batch and analyzed in triplicate. Precision was expressed in terms of relative standard deviation (RSD). The data quality objective for precision grain size analysis was ≤20% RSD between triplicate analyses.

Percentage of moisture was obtained using the Plumb (1981) method for determining total solids. The procedure involves drying a sediment sample at 100°C until a constant weight is obtained. Percentage of moisture was calculated by subtracting the percentage of total solids from 100%. One sample from the batch was analyzed in triplicate to assess method precision.

2.4.2 Bulk Density and Specific Gravity

Bulk density, or unit weight, was determined according to EM 111-2-1906 (USACE 1970). Specific gravity, the ratio of the mass of a given volume of material to an equal volume of water at the same temperature, was measured according to ASTM D-854.

2.4.3 TOC

Samples were analyzed for TOC according to the EPA Edison, New Jersey, Laboratory Procedure (EPA 1986). Inorganic carbon was removed from the sediment sample by acidification. The sample was combusted and the evolved carbon dioxide was quantitated using a carbon-hydrogen-nitrogen (CHN) analyzer. TOC was reported as a percentage of the dry weight of the unacidified sample.

2.4.4 Metals

Sediment samples for analysis of As, Cd, Cr, Cu, Pb, Ni, and Zn were prepared according to an MSL SOP equivalent to EPA Method 200.2 (EPA 1991). Solid samples were first freeze-dried and blended in a Spex mixer mill. A 0.2- to 0.5-g aliquot of dried homogeneous sample was then digested with acid. Sediment samples for Ag were digested in aqua-regia and analyzed by graphite furnace atomic absorption (GFAA) according to an MSL SOP based on EPA Method 200.9 (EPA 1991). For other metals, samples with peroxide and nitric acid were heated in sealed Teflon bombs overnight at approximately 130 °C. Sediment samples were analyzed for As, Cd, Cr, Cu, Pb, Ni, and Zn using inductively coupled plasma/mass spectrometry (ICP/MS), following an MSL SOP based on EPA Method 200.8 (EPA 1991). Sediments were analyzed for Hg by cold vapor atomic fluorescence (CVAF) according to an MSL procedure for total Hg determination equivalent to EPA Method 245.5 (EPA 1991).

2.4.5 Chlorinated Pesticides and PCBs

Sediment samples for pesticide and PCB analyses were extracted and analyzed according to a Battelle procedure similar to EPA Method 8080 for pesticides and the New York State Department of Environmental Conservation (NYSDEC) Congener-Specific Method 91-11 (NYSDEC 1992). The method also uses techniques from the National Oceanic and Atmospheric Administration (NOAA) Mussel Watch procedure (NOAA 1993). A 20- to 50-g sample of homogenized sediment was first combined with sodium sulfate in a sample jar to remove water. Samples were extracted by adding successive portions of methylene chloride and agitating sample jars at ambient temperature using an ambient shaking technique. Extracts volumes were reduced and solvent exchanged to hexane, followed by Florisil column chromatography cleanup. Interferences were removed using high performance liquid chromatography (HPLC); tissue sample extracts underwent an additional cleanup by gel permeation chromatography (GPC). Sample extracts were concentrated and analyzed using gas chromatography with electron capture detection (GC-ECD) by the internal standard technique.

The concentration of total PCB in each matrix was estimated by calculating the sum of the 22 congeners (x) and multiplying by 2 (Mario Del Vicario, Chief of the Marine and Wetlands

Protection Branch, U.S. Environmental Protection Agency Region 2, Feb 14, 1996, letter to John F. Tavolaro, Chief, Operations Support Branch, U.S. Army Corps of Engineers, New York District). One-half of the achieved detection limit was used in summation when an analyte was undetected.

2.4.6 PAHs and 1,4-Dichlorobenzene

Sediment samples were prepared for the analysis of 16 PAHs and 1,4-dichlorobenzene (see Table 2.1) according to an MSL method based on the NOAA Mussel Watch procedure (NOAA 1993). A 20- to 50-g sample of homogenized sediment or macerated tissue was first combined with sodium sulfate in a sample jar to remove water. Samples were extracted by adding successive portions of methylene chloride and agitating sample jars at ambient temperature using an ambient shaker technique. Extracts volumes were reduced and solvent exchanged to hexane, followed by column chromatography cleanup. Interferences were removed using HPLC, tissue sample extracts underwent an additional cleanup by GPC. Sample extracts were concentrated and analyzed using gas chromatography with mass spectrometry (GC/MS) in the selective ion monitoring (SIM) mode.

2.5 Biological Testing Procedures

2.5.1 Water-Column Toxicity Tests

Water-column effects of open-water dredged-material disposal were evaluated by exposing three species of water-column organisms to the SPP of the four Hudson River sediment composites. The three test species were *M. beryllina* (silverside), *M. bahia* (mysid), and *M. galloprovincialis* (mussel).

2.5.1.1 Water-Column Toxicity Test with *Menidia beryllina*

Upon receipt, the *M. beryllina* were placed in 10-gal glass aquaria and gradually acclimated from 27.5‰ seawater to 30.0‰ Sequim Bay seawater over a 24-h period. *M. beryllina* were received and held at 20°C ± 2°C prior to testing and were fed concentrated brine shrimp nauplii daily. During acclimation and holding, 2% to 3%

mortality of the silversides was observed.

Test containers for the water-column toxicity test with silversides were 500-mL glass jars, labeled with sediment treatment code, concentration, position number, and replicate number. Five replicates of each concentration were tested. A 300-mL test volume of SPP was placed in each of the five replicate test chambers. Each test chamber was then placed in a randomly assigned position on a water table at 20°C±2°C and allowed to equilibrate to test temperature for several hours. After the concentrations were prepared and placed on the water table, water quality parameters were measured and recorded for all replicates of each sediment treatment.

To initiate the test, *M. beryllina* were transferred from the holding tank to test chambers using a wide-bore pipet and small transfer cups. Ten individuals were introduced to each test chamber, creating a test population of 50 silversides per concentration for each treatment. Ten animals per test chamber were used, rather than the 20 animals per chamber as described in the Regional Guidance Manual, because it is not possible to make accurate daily observations of *M. beryllina* behavior when using 20 animals. Test initiation time and date were recorded. Following test initiation, water quality parameters were recorded in one replicate each day. Because several treatments had DO levels lower than 40% saturation prior to test initiation, all test chambers were aerated to maintain consistency in handling DO concentration among test containers. Acceptable parameters for this test were as follows:

Temperature	20°C±2°C
DO	>40% saturation (>3.04 mg/L at 20°C, 30‰)
pH	7.8±0.5
Salinity	30.0‰±2.0‰.

The test was run under a 16-h light/8-h dark photoperiod, and silversides were fed brine shrimp nauplii daily during the test. Observations of the animals were performed at 2 h, 24 h, 48 h, and 72 h, when the number of live, dead, and missing organisms was recorded. At the end of the 96-h test period, water quality parameters were measured for all test chambers, and the number of live, dead, and missing silversides was recorded on termination forms. As a quality control check, a second observer confirmed surviving test organisms on at least 10% of the termination counts.

A 96-h, water-only, reference toxicant test was performed concurrently with the toxicity test with each population of *M. beryllina* to establish the health and expected response of the test organisms. Reference toxicant tests were conducted in the same manner as the water-column toxicity test. *M. beryllina* were exposed to a seawater control plus four concentrations of copper sulfate: 16, 64, 160, and 400 μg/L copper, using three replicates of each concentration.

2.5.1.2 Water-Column Toxicity Test with *Mysidopsis bahia*

Upon receipt, the *M. bahia* were placed in 10-gal aquaria and gradually acclimated from 28.0‰ seawater to 30‰ Sequim Bay seawater over a 24-h period. Mysids were received and held at 20°C±2°C until testing and were fed concentrated brine shrimp nauplii twice daily prior to testing. Mortality of the *M. bahia* during holding was less than 1%.

The water-column toxicity test with the mysid was performed in 200 mL of test solution in 400-mL jars, labeled with sediment treatment code, concentration, position number, and replicate number. Five replicates of each concentration were tested. Each of the test chambers received 200 mL of test solution, then was placed randomly in a recirculating water bath and allowed to equilibrate to test temperature for several hours. Prior to test initiation, water quality parameters were measured in each replicate of each sediment treatment concentration. Acceptable water quality parameters for this test were as follows:

Temperature	20°C±2°C
DO	>40% saturation (>3.04 mg/L at 20°C, 30‰)
pH	7.8±0.5
Salinity	30.0‰±2.0‰.

To initiate the test, *M. bahia* were transferred from the holding tank to test chambers using a wide-bore pipet and small transfer cups. Ten individuals were introduced to each test chamber, creating a test population of 50 mysids per concentration (200 mysids per treatment). Ten animals per test chamber were used, rather than the 20 animals per chamber as described in the Regional Guidance Manual, because it is not possible to make accurate daily observations of *M. bahia* behavior when using 20 animals. Test initiation time and date were documented on data forms. Observations of test organisms were performed at 4 h, 24 h, 48 h, and 72 h, using a fluorescent light table to enhance visibility of the *M. bahia*. After test initiation, water quality parameters were measured daily in one replicate concentration of each sediment treatment. During the 96-h exposure, *M. bahia* were fed <24-h-old brine shrimp daily. Excess food was removed with a small pipet, taking care not to disturb test animals. Molted exoskeletons and any particles from the SPP solutions were also removed daily.

Prior to test termination, water quality parameters were measured in all replicates. At 96 h, the number of live and dead animals was recorded for each test container. An animal was considered dead if it did not respond to gentle probing. As a quality control check, a second observer confirmed surviving test organisms on at least 10% of the termination counts.

A 96-h, water-only, reference toxicant test was performed concurrently with the toxicity test with each batch of *M. bahia* to establish the health and expected response of the test organisms. The reference toxicant test was conducted in the same manner as the water-column toxicity test. *M. bahia* were exposed to a seawater control plus four concentrations of copper sulfate: 100, 150, 200, and 300 μg/L copper, using three replicates of each concentration.

2.5.1.3 Water-Column Toxicity Test with *Mytilus galloprovincialis* Larvae

Prior to testing, adult *M. galloprovincialis* were held in flowing, unfiltered Sequim Bay seawater at ambient temperatures for approximately 5 days.

Chambers for the bivalve larvae test were 500-mL glass jars labeled with sediment treatment code, concentration, position number, and replicate number. Dilutions of COMP HU-A, HU-B, HU-C, and HU-D SPP (0%, 10%, 50%, and 100%) were prepared with Mud Dump Site water in a 2000-mL graduated cylinder, then 300 mL of test solution was poured directly into each test chamber. Test chambers were placed in random positions on a water table and allowed to equilibrate to test temperature for several hours. Initial water quality parameters were measured in all replicates once test chambers reached testing temperatures (16°C$\pm$2°C).

Spawning was induced by placing *M. galloprovincialis* into 15°C, filtered seawater and rapidly raising the holding water temperature to 20°C. Spawning generally occurs within 1 h of temperature elevation; however, on the first day of spawning, gametes were shed after 3 h to 4 h. For this group of mussels, the water bath was changed when DO levels fell below 3.0 mg/L. When spawning began, males and females were identified and isolated in individual jars containing filtered seawater and allowed to shed gametes for approximately 45 min. Eggs from each female were passed through a 75-μm Nytex screen into separate jars to remove feces, detritus, and byssal fibers. Sperm from at least three males were pooled and 10 mL of sperm solution was then added to each of the egg stocks. Egg-sperm solutions were mixed every 10 min with a perforated plunger. After fertilization had proceeded for 1 h, fertilization rate (percentage of fertilized) was determined by removing a subsample and observing the number of multi-cell stage embryos. Fertilization was considered successful if greater than 90% of the embryos were in the multi-cell stage. Egg stocks with greater than 90% fertilization were combined and rinsed on a 20-μm Nytex screen to remove excess sperm. Stock embryo solution density was estimated by removing a 0.1-mL subsample and counting all multi-cell embryos, then multiplying by 10 to yield embryo density (embryos/mL). Stock solution was diluted or concentrated to yield 7500 to 9000 embryos/mL. The test was initiated by introducing 1 mL of stock solution into each test chamber to produce embryo densities of 25 to 30 embryos/mL. Test initiation date and time were recorded on data sheets. Following initiation, 10-mL stocking-density subsamples were removed from each container and preserved in 5% formaldehyde to determine the actual stocking density.

Water quality parameters were measured in one replicate concentration per treatment daily throughout the test. Acceptable ranges for water quality parameters were as follows:

Temperature	16°C±2°C
DO	>60% saturation (>4.9 mg/L at 16°C, 30‰)
pH	7.8±0.5
Salinity	30.0‰±2.0‰.

Because several treatments had DO levels below the acceptable level of 40% saturation, each chamber was provided with gentle aeration to maintain consistency in handling DO concentration among test containers. The bivalve test was terminated after 48 h when greater than 80% of the larvae in the controls had reached the D-cell stage. Final water quality parameters were recorded for all replicates. The contents of each chamber were then gently homogenized with a perforated plunger, and a 10-mL sub-sample removed and placed into a 20-mL scintillation vial. Subsamples were then fixed with 1 mL of 50% solution of formaldehyde in seawater. Samples were scored for the appearance of normal and abnormal D-shaped larvae, blastula larvae, and total number of larvae. At least 10% of the counts were confirmed by a second observer.

A 48-h reference toxicant test was conducted to establish the health and expected response of the test organisms. The reference toxicant test was set up and conducted in the same manner as the liquid-phase tests. *M. galloprovincialis* larvae were exposed to a filtered seawater control plus copper sulfate concentrations of 1, 4, 16, and 64 μg/L copper, with three replicates per concentration.

2.5.2 Benthic Acute Toxicity Tests

Deposited sediment effects of open-water dredged material disposal were evaluated by benthic acute toxicity tests with three marine amphipod species, *A. abdita*, *R. abronius*, and *E. estuarius*, and the mysid *M. bahia*.

2.5.2.1 Static Renewal Tests with *Ampelisca abdita*, *Rhepoxynius abronius*, and *Eohaustorius estuarius*

Upon receipt, the *A. abdita* were placed in a tub of clean sand from their collection area and gradually acclimated with flowing seawater from 28‰ to 30.5‰ salinity seawater over a period of 2 days. *A. abdita* were received at approximately 11°C and acclimated to 20°C ± 2°C over 4 days. They were held at 20°C ± 2°C for one day and were not fed prior to testing. *R. abronius* were also placed in a tub of clean sand from their collection area and held under flowing seawater upon arrival at the laboratory. They were received and held at a salinity of 30‰ ± 2‰ and a temperature of 15°C ± 2°C until testing. *R. abronius* were not fed during the 11-day holding period. *E. estuarius* were received at the laboratory at approximately 14°C and 13‰ salinity and acclimated to 15°C and 30.5‰ salinity over a period of 4 days. They were held in a tub of clean sand from their collection area and maintained under flowing seawater. Tests were initiated 11 days after receipt of *E. estuarius*.

All amphipod static renewal tests were performed in 1-L glass jars modified for use as flow-through test chambers. The test chambers were fitted with funneled lids and screened outflow and overflow ports (Figure 2.1). The flow-through system was turned on periodically long enough to deliver seawater at a rate of two chamber exchanges per day.

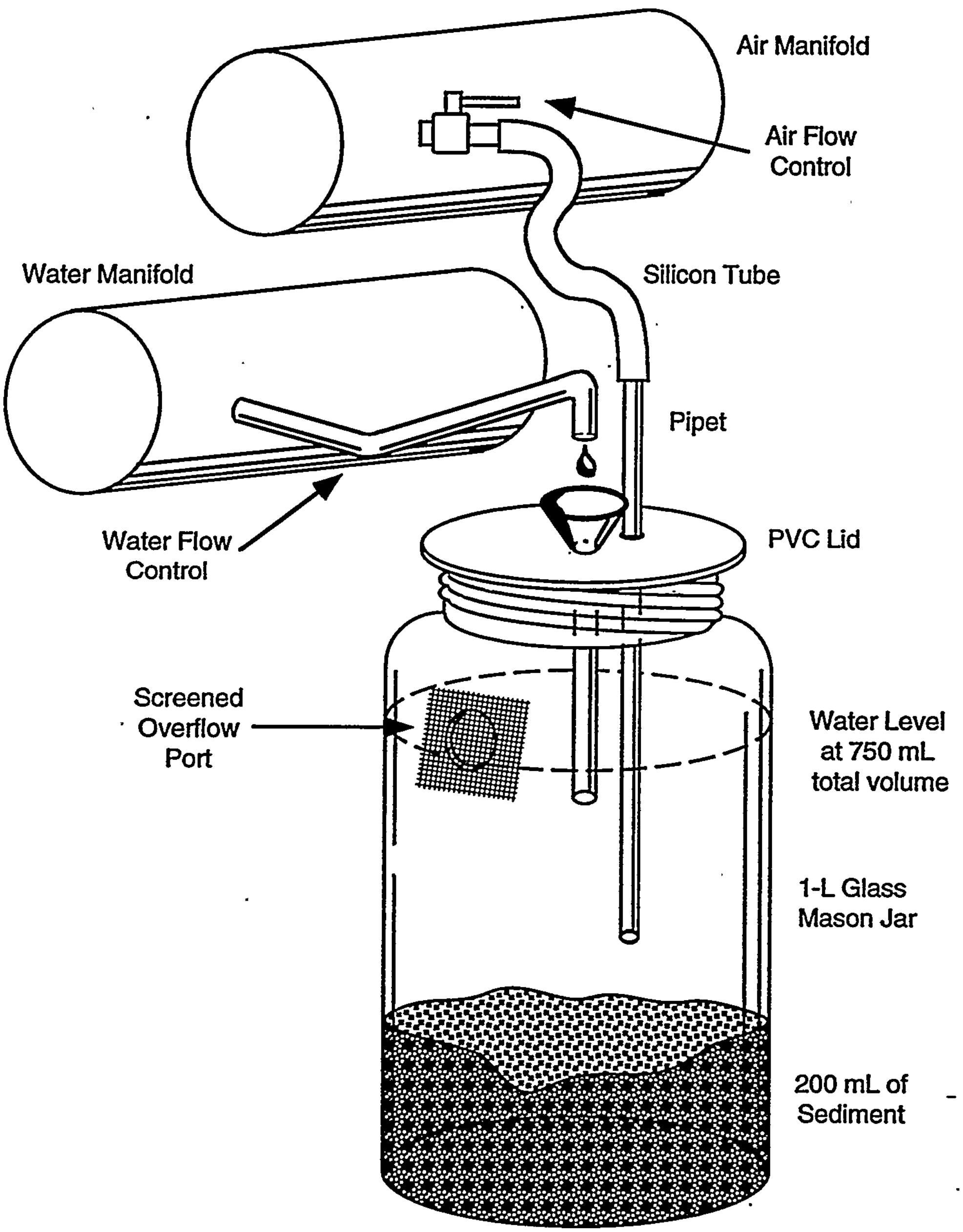

FIGURE 2.1. Testing Containers for Static Renewal Amphipod Toxicity Tests

Five replicates of each COMP HU-A, HU-B, HU-C, and HU-D sediment, Mud Dump Reference Site sediment, and native test animal control sediment were tested.

Concentrations of ammonia have been encountered in the pore water of sediment core samples from New York/New Jersey waterways at concentrations high enough to affect survival of amphipods in benthic toxicity tests (Barrows et al. 1996). Therefore, the amphipod tests were conducted according to the ammonia protocols issued by EPA and the USACE (EPA/USACE 1993). This guidance requires postponing test initiation (exposure of test animals) until pore water total ammonia concentrations are ≤30 mg/L for *A. abdita* and *R. abronius*, and ≤60 mg/L for *E. estuarius*. During this "purging" period, test chambers were set up and maintained under test conditions, and the overlying water was exchanged twice daily until the pore water ammonia concentrations reached the level appropriate for the particular amphipod. Pore water measurements were made on "dummy" containers that were set up and maintained in the same manner as the actual test containers but without animals added to them. The pore water was obtained by siphoning off the overlying water in the dummy jar and centrifuging the sediment in a Teflon jar for at least 20 min at approximately 3000 rpm. Salinity, temperature, and pH were also determined in the pore water samples.

The amphipod benthic toxicity tests were initiated by the addition of 20 organisms to each test chamber for a test population of 100 amphipods per sediment treatment. Amphipods were gently sieved from their native sediment in holding tanks and transferred to glass baking dishes. For each test chamber, five animals were counted and transferred by pipet into each of four small, plastic cups. The animals in each transfer cup were recounted by a second analyst. Animals were placed in the test chamber by dipping the cup below the water surface to release the amphipods.

Salinity, temperature, DO, and pH were measured in all replicates prior to test initiation, in at least one replicate per treatment daily, and in all replicates at test termination. Measurements of total ammonia levels in the overlying water and pore water also continued during testing. Overlying water ammonia was measured in all replicates prior to test initiation (Day 0), in at least one replicate per treatment daily, and in all replicates at test termination (Day 10). Pore water ammonia was measured on Day 0 and Day 10. The following were the acceptable ranges for water quality parameters during the amphipod tests:

	A. abdita	*R. abronius*	*E. estuarius*
Temperature	20°C±2°C	14°C±2°C	14°C±2°C
DO	>60% saturation	>60% saturation	>60% saturation
pH	7.8±0.5	7.8±0.5	7.8±0.5
Salinity	30‰±2‰	30‰±2‰	30‰±2‰
Ammonia	≤30 mg/L	≤30 mg/L	≤60 mg/L
Renewal Rate	2 exchanges/day	2 exchanges/day	2 exchanges/day.

Gentle aeration was provided throughout the test, and the amphipods were not fed during testing. At the end of the 10-day period, the contents of each chamber were gently sieved through 0.5-mm mesh, and the number of live, dead, and missing amphipods was recorded on termination forms. An animal was considered dead if it did not respond to gentle probing. As a quality control check, a second observer confirmed surviving test organisms on at least 10% of the termination counts.

Reference toxicant tests with cadmium chloride were performed concurrently with each species. The reference toxicant tests were 96-h, water-only exposures that were otherwise conducted following the same procedures as for the static tests with sediment. *A. abdita* were exposed to nominal concentrations of 0, 0.25, 0.5, 1, and 2 mg/L cadmium. *R. abronius* were exposed to nominal concentrations of 0, 0.38, 0.75, 1.5, and 3 mg/L cadmium. *E. estuarius* were exposed to nominal concentrations of 0, 5, 10, 20, and 30 mg/L cadmium.

2.5.2.2 Static Test and Static Renewal Test With *Mysidopsis bahia*

Upon receipt at the laboratory, *M. bahia* were placed in 10-gal aquaria and gradually acclimated from 28‰ seawater to 30‰ Sequim Bay seawater over a 24-h period. Mysids were received and held for 4 days at 20°C±2°C until testing and were fed concentrated brine shrimp nauplii twice daily. Mortality of *M. bahia* during holding was less than 1%.

The 10-day static benthic acute toxicity test with *M. bahia* was performed in 1-L glass jars. To prepare each test container, 200 mL of seawater was placed in each jar, sediment was added until water was displaced up to the 400-mL mark, then seawater was added up to the 750-mL mark. Five replicates each of COMP HU-A, HU-B, HU-C, HU-D sediment, Mud Dump Reference Site sediment, and native test animal control sediment were tested.

The mysid benthic toxicity test was initiated by the addition of 20 organisms to each test chamber for a test population of 100 mysid per sediment treatment. Mysids were transferred from holding tanks to glass baking dishes. For each test chamber, five animals were counted and transferred by pipet into each of four small, plastic cups. The animals in each transfer cup were recounted by a second analyst. The animals were placed in test chambers by dipping the cup below the water surface to release the mysids.

Salinity, temperature, DO, and pH were measured in all replicates prior to test initiation, in at least one replicate per treatment daily, and in all replicates at test termination. The following were the acceptable ranges for water quality parameters during the *M. bahia* benthic test:

Temperature	20°C±2°C
DO	>40% saturation
pH	7.8±0.5
Salinity	30‰ ± 2‰.

Gentle aeration was provided to all test chambers during the test to maintain consistency in handling DO concentration among test containers. At the end of the 10-day period, the contents of each chamber were gently sieved through 0.5-mm mesh, and the number of live and dead or missing mysids was recorded on termination forms. An animal was considered dead if it did not respond to gentle prodding. As a quality control check, a second observer confirmed surviving test organisms on at least 10% of the termination counts.

Because the same mysid population was used for the benthic test and the water-column test, one 96-h, water-only reference toxicant test with copper sulfate (0, 100, 150, 200, and 300 μg/L copper) was performed concurrently with these tests. (Refer to Section 2.5.1.2.)

To evaluate effects of reducing overlying water ammonia concentrations on mysids, an additional mysid test was conducted as a static renewal test at the request of the USACE-NYD. The test chambers were slightly modified to allow the test to be conducted as a static renewal test with seawater delivered intermittently via the flow-through system, as in the amphipod static renewal tests. The lower outflow of the test chamber was plugged with a solid stopper, and the top outflow was covered with a screen.

For the static renewal test, sediment and water were place in the test jars using the same procedure as the static test. Once the jars were filled, the sediment and water were stirred with a stainless-steel spatula to create a slurry, which was then allowed to settle overnight. The following day, the flow-through system was turned on for an equivalent of six test chamber exchanges per day. This procedure was repeated for a second day. On the third day, the test was initiated by the addition of test animals. For the duration of the 10-day test, the overlying water was renewed at a rate of two test chamber exchanges per day. The same standard procedures and test conditions described above for the static test were followed for the remainder of the test.

2.5.3 Bioaccumulation Tests with *Nereis virens* and *Macoma nasuta*

The polychaete *N. virens* and the bivalve *M. nasuta* were used to evaluate the potential bioaccumulation of contaminants from dredged material. The bioaccumulation tests were 28-day flow-through exposures to sediment followed by a 24-h depuration period that allowed the organisms to void their digestive tracts of sediment. *N. virens* and *M. nasuta* were tested in separate 10-gal flow-through aquaria. Animals were exposed to five replicates of each Hudson River sediment composite (COMP HU-A, HU-B, and HU-C), Mud Dump Reference Site sediment, and native control sediment. Each chamber contained 25 *M. nasuta* or 25 *N. virens*. Water quality parameters (temperature, DO, pH, and salinity) were measured in all replicates at test initiation, in at least one replicate per treatment daily, and in all replicates at test termination. Flow rates were measured daily in all chambers. The Regional Guidance Manual provides an acceptable temperature range of 13°C ± 1°C for *M. nasuta*; however, laboratory logistics required that *M. nasuta* shared a 15°C flow-through water supply with *R. abronius.* This alteration of test temperature was not expected to affect the outcome of the test; bioaccumulation tests with *M. nasuta* have been be conducted at 15°C ± 2°C successfully at the MSL. After discussion with the USACE-NYD project manager, the following ranges for water quality parameters were established as acceptable for the *M. nasuta* and *N. virens* tests:

	M. nasuta	*N. virens*
Temperature	14°C ± 2°C	20°C ± 2°C
DO	> 60% saturation	> 60% saturation
pH	7.8 ± 0.5	7.8 ± 0.5
Salinity	30‰ ± 2‰	
30‰ ± 2‰		
Flow Rate	125 ± 10 mL/min	125 ± 10 mL/min.

Aeration was provided to all test chambers to maintain consistency in handling DO concentrations among test chambers. Water quality, organism behavior (e.g., burrowing activity, feeding) and organism mortality were recorded daily. Dead organisms were removed daily. At the end of the 28-day testing period, *M. nasuta* and *N. virens* were placed in flowing seawater for 24 h, after which the tissues were transferred into the appropriate chemistry jars for metals, pesticide/PCB, PAH, and 2,3,7,8-TCDD/TCDF analyses. All tissue samples were frozen immediately and stored at <-20°C until analysis.

Water-only reference toxicant tests (96-h) were also performed using copper sulfate in six geometrically increasing concentrations. The exposures were conducted using a test volume of 5 L in static 9.5-L (2.5-gal) aquaria. Three replicates of each concentration were tested, each containing 10 organisms. Water quality parameters were monitored at the same frequency and maintained within the same limits as the 28-day test, except there were no flow rates. The *M. nasuta* reference toxicant test was conducted with treatments of 0, 0.25, 0.50, 0.75, 1.0, 1.5 and 2.5 mg/L copper; the *N. virens* test was conducted with treatments of 0, 0.05, 0.075, 0.15, 0.20, 0.25, and 0.30 mg/L copper.

2.6 Data Analysis and Interpretation Procedures

Statistical analyses were conducted to determine the magnitude and significance of toxicity and bioaccumulation in test treatments relative to the reference treatment. Each statistical test was based on a completely random design that allowed unbiased comparison between treatments.

2.6.1 Randomization

All water-column and benthic toxicity tests were designed as completely random tests. Organisms were randomly allocated to treatments, and treatments were randomly positioned on water tables. To determine randomization, a random-number table was generated for each test using the discrete random-number generator in Microsoft *Excel* spreadsheet software.

2.6.2 Statistical Analysis of Water-Column Tests

Two statistical tests are presented in the 1991 Green Book for the interpretation of SPP (water-column) tests. The first is a one-sided Student's t-test between survival in control test replicates and survival in the 100% SPP test replicates. This test is to be performed only when survival in the 100% SPP is less than the control (0% SPP) survival, and when control survival is >90% for non-larval tests and >70% for larval tests. Prior to conducting the t-test, angular transformation (arcsine of the square root) of the proportion surviving in test replicates was performed to reduce possible heterogeneity of variance between mean survival of test organisms in the control and in the 100% SPP. The second test required by the 1991 Green Book is an LC_{50} or EC_{50} calculation, the concentration of SPP that is lethal to (LC_{50}) or affects (EC_{50}) 50% of the organisms tested. The LC_{50} or EC_{50} values for these tests were calculated using the trimmed Spearman-Karber method (Finney 1971). The Spearman-Karber estimator is appropriate only if mortality (or effect) increased with concentration, and if ≥50% mortality (or effect) is observed in test treatments when normalized to control survival. If 50% mortality (or effect) did not occur in the 100% SPP concentrations for any treatments, then LC_{50} or EC_{50} values were reported as >100% SPP.

2.6.3 Statistical Analysis of Benthic Acute Toxicity Tests

Benthic toxicity of all sediment treatments was compared by analysis of variance (ANOVA) on the arcsine square-root of the proportion of organisms surviving the test. The arcsine square-root transformation stabilizes the within-class variances to help meet assumptions of the ANOVA. The Green Book recommends Dunnett's test (Dunnett 1964) for comparing test treatments to a single reference treatment. All treatments were compared using Dunnett's test for comparison of all test treatments to the reference site using an experiment-wise error of $\alpha=0.05$.

2.6.4 Statistical Analysis of Bioaccumulation

The results of the chemical analyses of test organism tissues exposed to the dredged sediment treatments were statistically compared with those tissues similarly exposed to the Mud Dump Reference Site treatment using Dunnett's test with an experiment-wise error $\alpha = 0.05$. The Dunnett's tests determined whether or not the concentrations of contaminants of concern in the organisms exposed to the dredged sediments statistically exceeded those of organisms exposed to the reference site.

Statistical analyses were performed on the dry weight concentrations. When a compound (metals, pesticides, PCBs, and PAHs) was undetected (indicated by a "Q" flag in the report tables and a "U" flag in data tables), one-half the detection limit of a compound was used in numerical calculations. If a compound was undetected in all five replicates of a test treatment, or if the mean concentration of a compound was greater in tissue samples from the reference treatment than in tissue samples from the test treatments, no further analysis was necessary. If a compound was undetected in all five replicates of the reference treatment, a one-sided, one-sample t-test ($\alpha = 0.05$) was used to determine if the tissue concentrations from organisms exposed to the dredged sediment treatments were statistically greater than the mean detection limit for that compound from the reference tissue. Results of background and control tissues were not statistically compared with the reference.

Magnification factors were calculated for each compound as the dry weight ratio of the mean tissue concentration from organisms exposed to dredged sediment treatments to the mean tissue concentration from organisms exposed to the Mud Dump Reference Site sediment. Whole detection limits were used for non-detects in this calculation.

2.7 Quality Assurance/Quality Control Procedures

The quality assurance/quality control (QA/QC) procedures for the Hudson River project were consistent with the Regional Guidance Manual and the Green Book, and were documented in the Work/Quality Assurance Project Plan, *Evaluation of Dredged Material Proposed for Ocean Disposal from Federal Projects in New York (Part 2)* prepared by the MSL and submitted to the USACE-NYD for this program. This document describes all QA/QC procedures that were followed for sample collection, sample tracking and storage, and physical/chemical analyses. A member of Pacific Northwest National Laboratory's (PNNL) quality engineering staff was present throughout all phases of this program to observe procedures, review and audit data, and ensure that accepted protocols were followed. Laboratory notebooks or data accumulation notebooks were assigned to each portion of these studies and served as records of day-to-day project activities.

3.0 Results

This section presents results of sample collection and processing, and physical and chemical analyses conducted on sediment samples collected from the proposed Hudson River project area.

3.1 Sample Collection and Processing

Sediment core samples were collected from the Hudson River project area on March 9, 10, and 11, 1994. The project area extended from the southern tip of Manhattan north, on the eastern shore to Pier 65 at 40th Street, and on the western shore to Weehawken, New Jersey (Figure 1.1). Table 3.1 lists each sampling station within the Hudson River project area, sampling coordinates, collection date, length of core required for testing, length of core actually collected, and vessel used as a sampling platform. Coordinates for the Mud Dump Reference Site grab samples and site water samples collected are also listed. Thirty-eight core samples were collected, 19 of which were collected from the outer channel adjacent to the pierlines on both the New York and New Jersey sides of the Hudson River. A core could not be collected at Station HU-7, located near the Holland Tunnel ventilator, because the core sampler encountered obstructions in the sediment. Twenty-nine of the Hudson River core samples were collected to project depth plus 2 ft of overdepth. Out of the remaining eight cores, all were collected at least to project depth (without overdepth) except two (HU-18 and HU-27).

Upon delivery of the sediment core samples to the MSL on March 18, 1994, samples were prepared for physical and chemical analyses according to the procedures described in Section 2. Individual sediment core samples were analyzed for grain size, moisture content, and TOC. Four composited sediment core samples were created, one each for Reach A through D of the Hudson River project area. Each sediment composite sample was analyzed for bulk density, specific gravity, metals, chlorinated pesticides, PCB congeners, PAHs, and 1,4-dichlorobenzene.

TABLE 3.1. Summary of Sediment Sample Data for Hudson River Project Area

Station	Collection Date	Station Coordinates Latitude N	Longitude W	Core Length Required (ft)	Core Length Collected (ft)	Depth (ft)	Vessel
Core Samples							
Reach A							
HU-1	3/9/94	40° 41.98' N	74° 01.26' W	9.0	10.0	---[a]	*Hayward*
HU-2	3/9/94	40° 42.08' N	74° 01.31' W	3.75	7.8	---	*Hayward*
HU-3	3/9/94	NR[b]	NR	5.0	5.0	---	*Hayward*
HU-4	3/9/94	40° 42.80' N	74° 01.21' W	7.0	6.25	---	*Hayward*
HU-5	3/9/94	40° 43.01' N	74° 01.15' W	3.0	7.0	---	*Hayward*
HU-6	3/9/94	40° 43.30' N	74° 01.03' W	8.0	8.1	---	*Hayward*
HU-7	NC[c]						
HU-8	3/9/94	40° 44.23' N	74° 00.85' W	6.5	5.0	---	*Hayward*
HU-9	3/9/94	40° 44.43' N	74° 00.83' W	6.0	7.0	---	*Hayward*
HU-10	3/9/94	40° 44.56' N	74° 00.80' W	15.0	15.0	---	*Hayward*
Reach B							
HU-11	3/9/94	40° 44.70' N	74° 00.73' W	9.6	11.6	---	*Hayward*
HU-12	3/11/94	40° 44.79' N	74° 00.73' W	18.5	17.5	---	*Hayward*
HU-13	3/10/94	40° 44.87' N	74° 00.69' W	6.3	7.3	---	*Hayward*
HU-14	3/11/94	40° 44.96' N	74° 00.68' W	18.5	18.5	---	*Hayward*
HU-15	3/10/94	40° 45.70' N	74° 00.39' W	8.8	8.8	---	*Hayward*
HU-16	3/10/94	40° 45.67' N	74° 00.38' W	16.2	16.2	---	*Hayward*
HU-17	3/10/94	40° 45.51' N	74° 00.46' W	8.3	8.3	---	*Hayward*
HU-18	3/10/94	40° 45.29' N	74° 00.56' W	23.4	20.0	---	*Hayward*
HU-19	3/10/94	40° 45.20' N	74° 00.62' W	12.2	12.2	---	*Hayward*
HU-20	3/10/94	40° 45.13' N	74° 00.64' W	24.8	24.8	---	*Hayward*
Reach C							
HU-21	3/11/94	40° 42.05' N	74° 01.95' W	7.0	7.4	---	*Hayward*
HU-22	3/11/94	40° 42.25' N	74° 01.91' W	5.6	7.3	---	*Hayward*
HU-23	3/11/94	40° 42.48' N	74° 01.88' W	10.7	10.7	---	*Hayward*
HU-24	3/11/94	40° 42.59' N	74° 01.88' W	13.7	12.0	---	*Hayward*
HU-25	3/11/94	40° 42.65' N	74° 01.76' W	5.0	6.0	---	*Hayward*
HU-26	3/11/94	40° 42.80' N	74° 01.80' W	10.0	10.0	---	*Hayward*
HU-27	3/11/94	40° 43.02' N	74° 01.74' W	8.2	5.3	---	*Gelberman*
HU-28	3/11/94	NR	NR	7.4	7.4	---	*Gelberman*
HU-29	3/11/94	40° 43.49' N	74° 01.64' W	6.9	5.0	---	*Gelberman*
HU-30	3/11/94	40° 43.82' N	74° 01.55' W	6.7	9.7	---	*Gelberman*
Reach D							
HU-31	3/11/94	40° 44.07' N	74° 01.50' W	6.8	6.0	---	*Gelberman*
HU-32	3/11/94	40° 44.42' N	74° 01.38' W	11.2	11.7	---	*Hayward*
HU-33	3/11/94	40° 44.66' N	74° 01.33' W	6.4	4.7	---	*Gelberman*
HU-34	3/11/94	40° 44.93' N	74° 01.27' W	14.0	15.5	---	*Hayward*
HU-35	3/11/94	NR	NR	7.5	8.3	---	*Gelberman*
HU-36	3/11/94	40° 46.01' N	74° 00.80' W	6.0	6.5	---	*Gelberman*
HU-37	3/11/94	40° 46.20' N	74° 00.65' W	15.0	15.0	---	*Hayward*
HU-38	3/11/94	40° 46.48' N	74° 00.40' W	7.0	7.0	---	*Gelberman*
HU-39	3/11/94	40° 46.59' N	74° 00.33' W	22.5	22.5	---	*Hayward*

TABLE 3.1. (contd)

Station	Collection Date	Station Coordinates Latitude N	Longitude W	Core Length Required (ft)	Core Length Collected (ft)	Depth (ft)	Vessel
Grab Samples							
MDRS[d]	3/13/94	40° 20.19' N	73° 52.20' W	----	----	67	*Gelberman*
MDRS	3/13/94	40° 20.21' N	73° 52.19' W	----	----	65	*Gelberman*
MDRS	3/13/94	40° 20.22' N	73° 52.19' W	----	----	66	*Gelberman*
MDRS	3/13/94	40° 20.22' N	73° 52.19' W	----	----	66	*Gelberman*
MDRS	3/13/94	40° 20.21' N	73° 52.23' W	----	----	65	*Gelberman*
MDRS	3/13/94	40° 20.21' N	73° 52.23' W	----	----	64	*Gelberman*
MDRS	3/13/94	40° 20.22' N	73° 52.23' W	----	----	66	*Gelberman*
MDRS	3/13/94	40° 20.21' N	73° 52.24' W	----	----	66	*Gelberman*
MDRS	3/13/94	NR	NR	----	----	66	*Gelberman*
MDRS	3/13/94	NR	NR	----	----	66	*Gelberman*
MDRS	3/13/94	NR	NR	----	----	NR	*Gelberman*
MDRS	3/13/94	NR	NR	----	----	NR	*Gelberman*

(a) -- Not applicable.
(b) NR Data not recorded during sample collection.
(c) NC No core collected at this station.
(d) MDRS Mud Dump Reference Site.

3.2 Physical and Chemical Analyses

3.2.1 Sediment Core Sample Description

Table 3.2 lists physical characteristics observed as each intact core sample was examined.

3.2.2 Grain Size, Percentage of Moisture, Total Organic Carbon, Specific Gravity, and Bulk Density

Table 3.3 shows the results of the analysis of individual Hudson River sediment samples for grain size, percentage of moisture, and TOC. Associated quality control data are provided in Appendix A.

Hudson River sediments were predominantly silt and clay. Percentages of silt ranged from 23% to 62%; and clay ranged from 18% to 43%. Two samples had high percentages of gravel (HU-10 and HU-18), and four samples had more than 30% sand (HU-3, HU-15, HU-18, and HU-25). The moisture content ranged from 36% to 65% in all samples.

TABLE 3.2. Hudson River Project Area Sediment Core Descriptions

	Depth Below Mudline (-ft MLW)			
Station	Core Top	Core Bottom	Project Depth[a]	Description of Observations
HU-1	33.0	43.0	42.0	Uniform black, silt-clay material. Clam shells on surface; patches of grayish, clayey material at approximately 36.5 ft; sand in lower 2 ft of core; grayish clay below 42 ft. Petroleum and hydrogen sulfide odor.
HU-2	38.3	42.0	42.0	Uniform black silt-clay material.
HU-3	37.0	42.0	42.0	Uniform black-grayish silt-clay material. Layer of reddish-brown sand (3 in. thick) at 39.3 ft; band of clay at approximately 4.15 ft.
HU-4	35.0	41.0	42.0	Uniform black, silt-clay material, slightly compacted at bottom.
HU-5	39.0	44.0	42.0	Uniform black, silt-clay material.
HU-6	34.0	42.1	42.0	Uniform black, silt-clay material.
HU-8	35.5	40.5	42.0	Uniform black silt-clay material.
HU-9	36.0	43.0	42.0	Uniform black silt-clay material interspersed with shell pieces throughout.
HU-10	27.0	42.0	42.0	Uniform black, silt-clay material. Shell hash and wood chips mixed in at 34.5 ft; band of gray clay (1.5 ft deep) at 38.5 ft to 40 ft. Shell hash and wood chips near 42 ft.
HU-11	32.4	43.5	42.0	Light brown silt layer at surface (0.5 ft thick). Black silty-clay; slippery material to 38 ft, more condensed with mixed clam shells to 41 ft. Between 41 ft and 42 ft, gray clay mixed in with black silt/clay.
HU-12	23.5	41.0	42.0	Yellowish silty clay at surface 0.5 ft. Black silt-clay material for remainder of core except: 0.5 ft of gray silt/clay at 30 ft. and gray clay between 38 ft and 41 ft.
HU-13	35.4	43.0	42.0	Uniform black silt-clay material except black flocculent/silt at surface 0.5 ft.
HU-14	23.5	42.0	42.0	Uniform black silt-clay material to 33.5 ft; thin band of sand and shell hash. Lower 8 ft of core was mixture of gray clay, black silty clay, and flecks of shell hash.

TABLE 3.2. (contd)

Station	Depth Below Mudline (-ft MLW) Core Top	Core Bottom	Project Depth[a]	Description of Observations
HU-15	33.2	42.0	42.0	Uniform black silt-clay material with minor amount of sand mixed in below 36 ft.
HU-16	25.8	42.0	42.0	Black silt-clay material with shell bits near surface and small patches of sand throughout.
HU-17	33.7	42.0	42.0	Uniform black silt-clay material.
HU-18	18.6	39.6	42.0	Black silt-clay material except narrow band gravel and broken glass at 24.5 ft, gravel mixed in below 28.5 ft, shell hash and red brick pieces below 32 ft. Below 37 ft, grayish clay that could not be penetrated below 39.6 ft.
HU-19	29.8	42.0	42.0	Uniform black silt-clay material.
HU-20	17.2	42.0	42.0	Dark gray silty clay to 25 ft; black silty-clay to 35 ft, dark gray clay to 42 ft. Gritty black layer with mothball odor (0.3 ft thick) at 34.7 ft.
HU-21	35.0	42.3	42.0	Uniform black silt-clay material.
HU-22	36.4	43.8	42.0	Uniform black silt-clay material.
HU-23	31.3	42.0	42.0	Uniform black silt-clay material.
HU-24	28.3	40.3	42.0	Light gray flocculent at surface 0.7 ft. Uniform black silt-clay material below.
HU-25	37.0	43.0	42.0	Uniform black silt-clay material.
HU-26	32.0	43.0	42.0	Black silt-clay material with gray silty clay bands interspersed throughout.
HU-27	33.8	39.1	42.0	Uniform black silt-clay material.
HU-28	34.5	42.0	42.0	Light flocculent material in upper 1 ft; black silt-clay material below.
HU-29	35.0	40.0	42.0	Light flocculent material in upper 1 ft; black silt-clay material below.
HU-30	35.3	45.0	42.0	Uniform black silt-clay material.

TABLE 3.2. (contd)

Station	Depth Below Mudline (-ft MLW) Core Top	Core Bottom	Project Depth[a]	Description of Observations
HU-31	35.1	41.1	42.0	Light gray flocculent in upper 0.8 ft; black silt-clay material below.
HU-32	30.8	42.5	42.0	Black silt-clay material with light gray silt bands at 33.5 ft (0.5 ft thick), 39 ft and 40 ft (0.3 ft thick), and 41 ft (1 ft thick).
HU-33	35.7	40.4	42.0	Uniform black silt-clay material.
HU-34	28.0	43.5	42.0	Light flocculent material in upper 0.5 ft; black silt-clay material below. Light gray clay band at 36 ft (0.5 ft thick); red clay band at 39.2 ft (0.3 ft thick).
HU-35	34.5	42.8	42.0	Black silt-clay material. Large pieces clam shells at 38.5 ft (0.5 ft thick). Gray clay below 39 ft.
HU-36	36.0	42.5	42.0	Uniform black silt-clay material. Gray clay below 41.6 ft.
HU-37	27.0	42.5	42.0	Black silt-clay material; gray clay band at 34.3 ft (0.3 ft thick). Gray clay below 40 ft.
HU-38	35.0	42.0	42.0	Light flocculent material in upper 0.5 ft; uniform black silt-clay material below.
HU-39	19.5	42.0	42.0	Uniform black silt-clay material.

(a) Project depth plus 2 ft overdepth.

TOC was generally between 2% and 4%, with lower TOC values found in cores HU-25 and HU-39 and higher TOC values from cores HU-4, HU-8, HU-10, and HU-18.

Specific gravity of the Hudson River composites was 2.57, 2.60, 2.63, and 2.64 for HU-A, HU-B, HU-C, and HU-D, respectively. Bulk density was 91, 95, 92, and 93 lb/cu ft on a wet weight basis for HU-A, HU-B, HU-C, and HU-D, respectively. On a dry weight basis, bulk density was 47, 50, 45, and 46 lbs/ cu ft for HU-A, HU-B, HU-C, and HU-D, respectively.

TABLE 3.3. Results of Analysis of Hudson River Project Area Sediment Samples for Grain Size and Percentage of Moisture

	Total Percent (dry weight)					
Station	Gravel >2000 μm	Sand 62.4-2000 μm	Silt 3.9-62.4 μm	Clay <3.9 μm	Percentage of Moisture	Total Organic Carbon
HU-1	0	22	48	30	47	3.20[a]
HU-2	1	18	47	34	55	3.83
HU-3	2	32	35	31	52	3.64
HU-4	2	16	44	38	60	4.09
HU-5	0	16	41	43	58	3.28
HU-6	0	13	48	39	54	4.76
HU-8	6	19	46	29	49	4.82
HU-9	1	14	47	38	52	3.93
HU-10	40	16	23	21	41	4.79
HU-11	1	15	48	36	54	3.51
HU-12	0	12	49	39	49	2.88[b]
HU-13	0	13	49	38	55	3.00
HU-14	0	19	48	33	49	2.77
HU-15	0	36	37	27	46	2.21
HU-16	0	26	46	28	48	2.52
HU-17	0	15	51	34	44	2.91
HU-18	23	31	28	18	36	4.15
HU-19	1	20	45	34	49	3.76
HU-20	1	21	46	32	42	2.14[b]
HU-21	0	16	47	37	56	3.20[a]
HU-22	0	16	48	36	58	3.36
HU-23	0	25	45	30	49	2.58
HU-24	0	16	52	32	51	2.91
HU-25	2	42	35	21	43	1.66
HU-26	0	14	51	35	50	2.63
HU-27	0	20	50	30	54	2.38
HU-28	1	14	49	36	52	3.22
HU-29	8	25	41	26	48	2.84
HU-30	1	9	55	35	54	3.92
HU-31	0	7	54	39	51	3.14
HU-32	0	6	52	42	53	3.10[b]
HU-33	0	16	51	33	51	2.89
HU-34	0	5	55	40	51	2.26
HU-35	2	11	57	30	44	2.33
HU-36	1	10	53	36	49	3.11
HU-37	1	10	54	35	46	2.20
HU-38	0	12	52	36	52	3.47[b]
HU-39	0	5	62	33	48	1.93[a]
Mud Dump Reference	1	98	0	1	16	0.01

(a) Value is a mean of three replicate analyses.
(b) Value is a mean of two replicate analyses.

3.2.3 Metals

Table 3.4 shows the results of the analysis of the Hudson River composite and the Mud Dump Reference Site sediment samples for metals. A quality control sample summary and quality control data associated with the metals analysis are provided in Appendix A. The Mud Dump Reference Site concentrations were determined in samples collected during the Federal Projects 2 survey.

Of the four Hudson River composites, COMP HU-D had the lowest concentrations for all metals except As. Five of the eight metals were most concentrated in COMP HU-A. Concentrations of Ag, Cd, Cr, Ni, Pb, and Zn were approximately an order of magnitude higher in Hudson River composites than in the reference site sediment. Mercury and copper were approximately two orders of magnitude greater in Hudson River composites than in the reference site sediment.

3.2.4 Chlorinated Pesticides

Table 3.5 shows the results of the analysis of Hudson River and Mud Dump Reference Site sediments for chlorinated pesticides. A quality control sample summary and associated quality control data are provided in Appendix A.

Of the four Hudson River composites, the lowest concentrations of pesticides and total DDT consistently were found in COMP HU-D. The dominant pesticides in these composites were 2,4'-DDD, 4,4'-DDD, and 4,4'-DDE. Seven pesticides were found at elevated concentrations in Hudson River composites relative to reference site sediment. 2,4'-DDD, 4,4'-DDD, 4,4'-DDE, α-chlordane, and endosulfan II were two or more orders of magnitude higher in Hudson River composites than in reference site sediment. Endosulfan I and 2,4'-DDE coeluted in the primary GC analysis of these samples, but examination of the

TABLE 3.4. Results of Analysis of Hudson River Project Area Samples for Metals

	Concentration (mg/kg dry weight)				
Analyte	COMP HU-A	COMP HU-B	COMP HU-C	COMP HU-D	Mud Dump Reference Site
Ag	6.94	7.20	6.22	3.11	0.119 U[a]
As	24.0	18.1	15.2	19.1	5.64
Cd	3.30	2.77	4.06	1.52	0.085
Cr	135	125	169	87.2	10.0
Cu	228	163	174	108	1.90
Hg	5.26	3.31	2.55	1.79	0.006
Ni	38.2	34.8	40.0	34.6	3.10
Pb	259	232	194	141	6.50
Zn	273	228	252	175	14.1

(a) U Undetected at or above the given concentration.

confirmatory analysis using a second GC column revealed that neither compound was detected. The value shown is the detection limit for 2,4'-DDE. Pesticides were either undetected or detected at concentrations near or below the target detection limit (1.0 μg/kg dry weight) in reference site sediment.

3.2.5 PCBs

Table 3.6 shows the results of the analysis of the Hudson River and Mud Dump Reference Site sediments for PCBs. A quality control sample summary and associated quality control data are provided in Appendix A.

All of the 22 PCB congeners analyzed were detected in all Hudson River composites, with only 1 congener (PCB 195) below the detection limit in all composites. The total PCB concentration was highest in COMP HU-C (1,064 μg/kg) and lowest in COMP HU-D (286 μg/kg). These total PCB concentrations were at least an order of magnitude higher than in reference site sediment (13.3 μg/kg). PCBs were either undetected or detected at concentrations near or below the target detection limit (1.0 μg/kg dry weight) in reference site sediment.

TABLE 3.5. Results of Analysis of Hudson River Project Area Sediment for Chlorinated Pesticides

	Concentration in µg/kg dry weight									
	COMP HU-A		COMP HU-B		COMP HU-C		COMP HU-D		Mud Dump Reference Site	
2,4-DDD	15.7		13.0		12.0		9.99		0.0109	J[a]
2,4-DDT	1.07	U[b]	0.96	U	0.96	U	1.06	U	0.604	U
4,4-DDD	50.7		27.5		24.9		7.26		0.0625	J
4,4-DDE	31.0		14.3		19.1		4.41		0.0132	J
4,4-DDT	2.65	J	1.23	J	0.52	J	0.27	J	3.45	U
Total DDT[c]	102		57.8		58.3		23.8		2.91	
Aldrin	1.02	U	0.92	U	0.92	U	1.01	U	0.579	U
α-Chlordane	2.31		2.89		3.50		0.72	J	0.00670	J
Dieldrin	3.91		5.07		5.22		1.73	J	0.215	J
Endosulfan I /2,4-DDE[d]	2.80	U	2.51	U	2.52	U	2.78	U	1.59	U
Endosulfan II	6.24		8.32		3.53		2.91		0.0450	J
Endosulfan sulfate	2.08		1.31	J	0.78	J	1.96	U	1.12	U
Heptachlor	2.29	U	2.06	U	2.06	U	2.28	U	1.30	U
Heptachlor epoxide	1.27	U	1.14	U	1.15	U	1.26	U	0.721	U
trans-Nonachlor	0.45	J	0.91	J	1.38	J	0.28	J	0.00417	J

(a) J Analyte detected is below established method detection limit.
(b) U Undetected at or above the given concentration.
(c) Sum of 2,4-DDD, 2,4-DDE, 2,4-DDT, 4,4′-DDD, 4,4′-DDE, and 4,4′-DDT; one-half of the detection limit used in summation when analyte was undetected.
(d) Endosulfan I and 2,4-DDE coelute; both compounds were undetected; value shown is the detection limit for 2,4-DDE.

3.2.6 PAHs and 1,4-Dichlorobenzene

Table 3.7 shows the results of the analysis of the Hudson River and Mud Dump Reference Site sediments for PAHs. A quality control sample summary and associated quality control data are provided in Appendix A.

All 17 PAHs analyzed were detected in all 4 Hudson River composites. Low-molecular-weight PAHs (LPAH) made up between 22% (COMP HU-D) and 36% (COMP HU-B) of the total PAH concentration. High-molecular-weight PAHs (HPAH) made up the remainder of total PAHs, between 64% (COMP HU-B) and 78% (COMP HU-D) of the total

TABLE 3.6. Results of Analysis of Hudson River Project Area Sediment for PCBs

	Concentration in μg/kg dry weight									
	COMP HU-A		COMP HU-B		COMP HU-C		COMP HU-D		Mud Dump Reference Site	
PCB 8	5.69		11.8		12.7		3.39	J[a]	2.91	U[b]
PCB 18	18.8		30.1		39.4		11. 7		1.85	U
PCB 28	39.7		65.8		97.3		23.3		1.21	U
PCB 44	18.2		28.1		40.3		11.1		0.223	J
PCB 49	18.8		31.3		46.3		10.9		0.0423	J
PCB 52	27.7		37.2		54.5		14.0		0.0569	J
PCB 66	43.2		60.8		65.9		18.0		0.0366	J
PCB 87	7.20		8.0		11.0		3.14		0.0462	J
PCB 101	17.0		19.4		27.7		7.96		0.0381	J
PCB 105	5.14		6.60		10.0		2.60		0.0259	J
PCB 118	13.7		16.9		26.6		6.47		0.0195	J
PCB 128	14.0		11.1		6.47		4.80		0.915	U
PCB 138	17.9		17.9		26. 3		6.28		0.0721	J
PCB 153	12.8		13.3		19.8		4.37	J	0.0312	J
PCB 170	7.34		6.79		8.15		1.98		0.972	U
PCB 180	11.1		9.70		13.3		3.49		0.649	U
PCB 183	2.47		1.85		2.56		0.79	J	0.721	U
PCB 184	0.76	J	0.46	J	1.33		0.43	J	0.00648	J
PCB 187	5.90		4.94		6.26		1.94		0.00681	J
PCB 195	1.37	J	0.98	J	0.60	J	0.22	J	0.828	U
PCB 206	11.8		9.37		7.57		3.50		1.26	U
PCB 209	17.8		9.72		8.00		2.77		0.790	U
Total PCB[c]	636		804		1064		286		13.3	

(a) J Analyte detected is below established method detection limit.
(b) U Undetected at or above the given concentration.
(c) Total PCB = 2(x), where x = sum of all PCB congeners detected; one-half of the detection limit used in summation when analyte was undetected.

PAH concentration. The highest total PAH concentration was found in COMP HU-B (34600 μg/kg), and COMP HU-D had the lowest total PAH concentration (8720 μg/kg). Hudson River composites had PAH concentrations two to three orders of magnitude higher than those found in the reference site sediment. Concentrations of PAHs in Mud Dump Reference Site sediment were either undetected or detected at concentrations below the target detection limit (0.01 μg/kg).

TABLE 3.7. Results of Analysis of Hudson River Project Area Sediment for PAHs and 1,4-Dichlorobenzene

	Concentration in μg/kg dry weight					
	COMP HU-A	COMP HU-B	COMP HU-C	COMP HU-D	Mud Dump Reference Site	
Naphthalene	840	1730	425	197	1.13	J[a]
Biphenyl	199	485	77.7	42.4	6.94	U[b]
Acenaphthylene	424	365	149	141	6.61	U
Acenaphthene	543	1030	145	125	8.59	U
Fluorene	534	1210	217	155	7.11	U
Phenanthrene	2130	5640	1030	779	0.720	J
Anthracene	1040	1830	484	476	6.96	U
Total LPAH[c]	5710	12300	2530	1920	20.0	
Fluoranthene	2840	5020	1510	1390	0.528	J
Pyrene	3310	5040	1450	1410	0.554	J
Benz[a]anthracene	1720	2350	728	769	0.621	J
Chrysene	1900	2400	790	790	9.42	U
Benzo[b]fluoranthene	1770	2310	897	736	0.499	J
Benzo[k]fluoranthene	581	840	338	276	8.42	U
Benzo[a]pyrene	1670	2150	741	684	6.58	U
Indeno[1,2,3-cd]pyrene	807	967	460	337	5.68	U
Dibenz[a,h]anthracene	267	327	120	96.8	5.77	U
Benzo[g,h,i]perylene	793	956	435	319	4.77	U
Total HPAH[c]	15700	22400	7470	6810	22.5	
Total PAH[c]	21400	34700	10000	8730	42.5	
1,4-Dichlorobenzene	65.1	64.4	111	24.4	0.794	U

(a) J Analyte detected is below established method detection limit.
(b) U Undetected at or above given concentration.
(c) Total LPAH, HPAH, and PAH = sum of analytes; one-half detection limits used in summation when analyte was undetected.

The concentration of 1,4-dichlorobenzene ranged from 24.4 μg/kg (COMP HU-D) to 111 μg/kg (COMP HU-C) in Hudson River composites. 1,4-dichlorobenzene was not detected in reference site sediment.

3.3 Site Water and Elutriate Analyses

Metals, chlorinated pesticides, and PCBs were determined in dredging site water collected from the four Hudson River reaches, and in elutriate samples prepared from control seawater (Sequim Bay, Washington) and the Hudson River sediment composites. Mud Dump Site water and Sequim Bay control water were also analyzed. All water and elutriate samples were analyzed in triplicate. Mean results of the triplicate analyses are presented and discussed in the following sections. Complete results of all site water and elutriate samples as well as a quality control summary and associated quality control data are provided in Appendix B.

3.3.1 Metals

Results of analysis of Sequim Bay control water, Mud Dump Site water, Hudson River site waters, and Hudson River elutriates are shown in Table 3.8. In general, the site water samples from each of the four reaches had higher concentrations of metals than their corresponding elutriate samples. In particular, concentrations of Ag, Cd, Cu, Hg, Ni, Pb, and Zn were greater in the site water than in the elutriate from the corresponding reach. Exceptions were noted in HU-A, HU-B, and HU-C samples, where elutriate concentrations of Cr were higher (< 2 times) than site water concentrations, and in HU-C samples, where the elutriate concentrations of Ni were twice as high as the HU-C site water concentrations.

Concentrations of Cd, Cr, and Zn were similar between the control water and Mud Dump Site water, whereas concentrations of Ag, Cu, Hg, Ni, and Pb were at least twice as high in the Mud Dump Site water than in the control water. All Hudson River site waters had elevated levels of all metals measured when compared with Mud Dump Site water.

3.3.2 Chlorinated Pesticides and PCBs

Results of analysis of Sequim Bay control water, Mud Dump Site water, Hudson River site waters, and Hudson River elutriates are shown in Table 3.9. Pesticides were mostly undetected in site water samples from each of the four reaches, but were present at elevated concentrations in the four corresponding elutriates. The dominant pesticides

Table 3.8. Results of Analysis of Hudson River Site Water and Elutriate for Metals

	Concentration in $\mu g/L$									
Analyte	Control Water	Mud Dump Site Water	HU-A Site Water	HU-A Elutriate	HU-B Site Water	HU-B Elutriate	HU-C Site Water	HU-C Elutriate	HU-D Site Water	HU-D Elutriate
Ag	0.0035 Q[a]	0.0223	0.103	0.0233	0.187	0.0667	0.142	0.0320	0.120	0.0213
Cd	0.0557	0.0603	0.110	0.0228	0.106	0.0340	0.0897	0.0317	0.112	0.0382
Cr	0.180	0.270	0.853	1.29	1.81	2.34	0.890	1.83	1.36	0.800
Cu	0.471	2.06	4.66	1.20	6.57	1.93	5.38	1.21	5.70	1.03
Hg	0.0003	0.0096	0.0185	0.0116	0.0364	0.0188	0.0288	0.0136	0.0270	0.0127
Ni	0.469	1.27	1.75	1.49	2.10	1.41	1.83	2.31	2.57	1.41
Pb	0.0430	0.931	3.58	1.01	5.14	1.13	4.16	1.06	5.00	0.882
Zn	9.20	10.3	13.1	6.07	12.5	1.94	29.9	2.16	37.4	1.53

(a) Q Undetected at or above twice the given concentration.

Table 3.9. Results of Analysis of Hudson River Site Water and Elutriate for Chlorinated Pesticides and PCBs

	Concentration in ng/L[a]									
Analyte	Control Water	Mud Dump Site Water	HU-A Site Water	HU-A Elutriate	HU-B Site Water	HU-B Elutriate	HU-C Site Water	HU-C Elutriate	HU-D Site Water	HU-D Elutriate
Pesticides										
2,4'-DDD	0.39 Q[b]	0.38 Q	0.38 Q	11.6	0.38 Q	7.40	0.38 Q	5.97	0.51 Q	6.30
2,4'-DDT	0.40 Q	0.39 Q	0.39 Q	0.55 Q	0.39 Q	0.42 Q	0.39 Q	0.41 Q	0.52 Q	0.42 Q
4,4'-DDD	0.57 Q	0.56 Q	0.56 Q	10.5	0.56 Q	7.12	0.56 Q	7.24	0.74 Q	3.63
4,4'-DDE	0.49 Q	0.47 Q	0.47 Q	35.8	0.47 Q	19.2	0.47 Q	22.3	0.63 Q	8.00
4,4'-DDT	0.49 Q	0.48 Q	0.48 Q	0.68 Q	0.48 Q	0.52 Q	0.48 Q	0.51 Q	0.64 Q	0.52 Q
Total DDT[c]	2.34	2.28	2.28	59.1	2.28	34.7	2.28	36.4	3.04	18.9
Aldrin	0.36 Q	0.36 Q	0.36 Q	0.50 Q	5.14	0.38 Q	0.36 Q	0.38 Q	0.48 Q	0.38 Q
α-Chlordane	0.46 Q	0.45 Q	0.52	2.44	0.45 Q	1.96	0.45 Q	3.32	0.87	1.03
Dieldrin	0.48 Q	0.47 Q	1.64	4.89	0.47 Q	3.86	0.47 Q	5.63	0.83	3.87
Endosulfan I	0.42 Q	0.41 Q	0.41 Q	12.6	0.41 Q	0.44 Q	0.41 Q	0.43 Q	0.54 Q	0.44 Q
Endosulfan II	5.51 Q	5.38 Q	5.38 Q	7.57 Q	5.38 Q	5.80 Q	5.38 Q	5.73 Q	4.49	4.42
Endosulfan sulfate	4.03 Q	3.94 Q	3.94 Q	5.54 Q	3.94 Q	6.85	3.94 Q	11.2	5.25 Q	4.17
Heptachlor	1.02	0.32 Q	0.32 Q	0.44 Q	0.32 Q	0.34 Q	0.32 Q	0.34 Q	0.42 Q	0.34 Q
Heptachlor epoxide	0.42 Q	0.41 Q	0.41 Q	1.77	0.41 Q	1.66	0.41 Q	2.93	0.55 Q	0.44 Q
trans-Nonachlor	0.47 Q	0.46 Q	0.46 Q	0.96	0.46 Q	1.05	0.46 Q	1.46	0.62 Q	0.72
PCBs										
PCB 8	0.43 Q	0.42 Q	0.42 Q	1.54	0.42 Q	3.96	0.42 Q	2.62	0.56 Q	0.45 Q
PCB 18	0.52 Q	0.51 Q	0.51 Q	10.9	0.51 Q	16.3	0.51 Q	21.1	0.68 Q	13.8
PCB 28	0.59 Q	0.57 Q	0.57 Q	14.2	0.57 Q	18.2	0.57 Q	24.7	0.76 Q	9.53
PCB 44	0.60 Q	0.59 Q	0.59 Q	14.1	0.59 Q	17.8	0.59 Q	23.2	0.78 Q	12.5
PCB 49	0.51 Q	0.50 Q	0.50 Q	12.5	2.13	17.0	0.50 Q	23.1	0.67 Q	10.9
PCB 52	0.60 Q	0.59 Q	0.59 Q	18.8	1.56	24.6	1.98	29.3	1.28	15.2
PCB 66	0.47 Q	0.46 Q	0.46 Q	60.3	0.58	48.8	0.46 Q	35.2	0.61 Q	41.7
PCB 87	0.53 Q	0.51 Q	2.13	6.36	0.51 Q	6.30	0.51 Q	8.51	0.69 Q	3.78
PCB 101	0.53 Q	0.52 Q	1.14	16.5	0.52 Q	15.2	0.52 Q	20.3	0.69 Q	9.07
PCB 105	0.63 Q	0.62 Q	0.62 Q	2.79	0.62 Q	3.29	0.62 Q	4.94	0.83 Q	2.01
PCB 118	0.50 Q	0.49 Q	0.49 Q	10.5	0.49 Q	5.73	0.49 Q	16.8	0.65 Q	6.73
PCB 128	0.56 Q	0.55 Q	0.55 Q	4.34	0.55 Q	2.87	0.55 Q	3.35	0.73 Q	1.87
PCB 138	0.67 Q	0.66 Q	0.66 Q	18.0	0.66 Q	16.0	0.66 Q	23.2	0.87 Q	3.90

Table 3.9. (contd)

Analyte	Concentration in ng/L[a]									
	Control Water	Mud Dump Site Water	HU-A Site Water	HU-A Elutriate	HU-B Site Water	HU-B Elutriate	HU-C Site Water	HU-C Elutriate	HU-D Site Water	HU-D Elutriate
PCB 153	0.64 Q	0.63 Q	0.63 Q	13.3	0.63 Q	13.1	0.63 Q	17.9	0.84 Q	7.40
PCB 170	0.19	0.56 Q	0.56 Q	5.97	0.56 Q	5.06	0.56 Q	6.43	0.75 Q	2.73
PCB 180	0.50 Q	0.49 Q	0.49 Q	11.8	0.49 Q	9.70	0.49 Q	12.2	0.65 Q	4.78
PCB 183	0.52 Q	0.51 Q	0.51 Q	3.48	0.51 Q	2.53	0.51 Q	3.61	0.68 Q	1.41
PCB 184	0.49	0.51 Q	0.51 Q	0.72 Q	0.51 Q	0.55 Q	0.51 Q	0.54 Q	0.68 Q	0.55 Q
PCB 187	0.49 Q	0.48 Q	0.48 Q	0.68 Q	0.48 Q	0.52 Q	0.48 Q	0.51 Q	0.64 Q	0.52 Q
PCB 195	0.57 Q	0.55 Q	0.55 Q	4.56	0.55 Q	4.03	0.55 Q	3.41	0.74 Q	2.05
PCB 206	0.55 Q	0.54 Q	0.54 Q	10.8	0.54 Q	9.40	0.54 Q	5.76	0.72 Q	4.57
PCB 209	0.61 Q	0.60 Q	0.60 Q	9.12	0.60 Q	5.71	0.60 Q	5.42	0.80 Q	2.88
Total PCB[d]	23.4	23.8	28.2	502	29.2	494	26.4	584	32.6	316

(a) Concentration shown is the mean of triplicate sample analyses.
(b) Q Undetected at or above the twice the given concentration.
(c) Sum of 2,4'-DDD, 2,4'-DDE, 2,4'-DDT, 4.4'-DDD, 4,4'-DDE, and 4,4'-DDT; one-half of the detection limit used in summation when analyte was undetected.
(d) Total PCB = ($\sum$ all PCBs) x 2, where undetected values equal one-half the detection limit.

found were the DDD/DDE/DDT group of compounds, α-chlordane, dieldrin, endosulfan I/2,4'-DDE (HU-A only), endosulfan sulfate (HU-B and HU-C), and heptachlor epoxide. PCBs were also mostly undetected in site water samples from each of the four reaches, but were present at elevated concentrations in the four corresponding elutriates.

3.4 Water-Column and Benthic Toxicity Testing

Both benthic and water-column tests were performed on the Hudson River composites. Suspended-particulate-phase tests were conducted with the silverside *M. beryllina*, the mysid *M. bahia*, and larvae of the bivalve *M. galloprovincialis*. Benthic-phase tests were performed with the infaunal amphipods *A. abdita*, *R. abronius*, and *E. estuarius*, and the mysid *M. bahia*. This section discusses the results of all sediment and reference toxicant testing. Complete test results, water quality measurements, and the results of the reference toxicant tests are presented in Appendix C for water-column tests, and Appendix D for benthic test results. Throughout this section, the terms "significantly different" and "significantly lower" are used to express *statistically* significant differences only ($\alpha = 0.05$). Biologically significant response is statistically significant mortality that is at least 20% greater than mortality in the reference treatment for amphipods (≥10% for mysids), as specified in the Regional Guidance Manual. Tests for statistical significance between test treatments and control or reference treatments were performed following methods outlined in Section 2.6. All ammonia values reported are total ammonia.

3.4.1 *Menidia beryllina* Water-Column Toxicity Test

Results of the *M. beryllina* water-column toxicity test are summarized in Table 3.10. Complete test results as well as water quality data are presented in Appendix C. Control survival was greater than 90% for all four composites, validating this test. Survival in the 100% SPP from Reaches A, B, and C was between 0% and 10%, whereas survival in Reach D was 60%. Relative to the controls, survival was significantly reduced in the 100% SPP treatments of all four composites. The *M. beryllina* LC_{50}s ranged from 22.0% SPP in the HU-B composite to >100% SPP in the HU-D composite.

All water quality parameters were within acceptable ranges throughout the test. Ammonia concentrations in the 100% SPP preparation reached 32.3 mg/L (HU-A), 57 mg/L

(HU-B), 40 mg/L (HU-C), and 18.3 mg/L (HU-D). The copper reference toxicant test produced an LC_{50} of 98.1 μg/L Cu, within the control limits established at the MSL (71 μg/L to 136 μg/L Cu).

3.4.2 *Mysidopsis bahia* Water-Column Toxicity Test

Results of the *M. bahia* water-column toxicity test are summarized in Table 3.10. Complete test results as well as water quality data are presented in Appendix C. Control survival was greater than 90% for all four composites, validating this test. Relative to the controls, survival in composites HU-A, HU-B, and HU-C was significantly reduced in the 100% SPP preparation, with ≤2% survival for composites HU-B and HU-C and 68% survival for composite HU-A. No significant reduction in survival was observed in composite HU-D (98% survival). The *M. bahia* LC_{50}s ranged from 22.7% SPP (composite HU-B) to >100% SPP (composite HU-A and HU-D).

All water quality parameters were within acceptable ranges throughout the test, with the exception of pH, which rose above 8.3 in the several replicates of HU-B 50% SPP and 100% SPP treatments of HU-A, HU-B, and HU-C, and salinity in one replicate of 100% HU-D (36.5‰). Ammonia concentrations in the 100% SPP treatment were 25.5 mg/L (HU-A), approximately 40 mg/L (HU-B and HU-C), and 16.6 mg/L (HU-D). The copper reference toxicant test produced an LC_{50} of 150.8 μg/L Cu, which was within the control limits established at the MSL (116 μg/L to 229 μg/L Cu).

3.4.3 *Mytilus galloprovincialis* Water-Column Toxicity Test

Results of the *M. galloprovincialis* water-column toxicity test are summarized in Table 3.10. Complete test results and water quality data are presented in Appendix C. This test was validated by greater than 90% survival and normal development in the controls. Survival in the 100% SPP treatments of the Hudson River sediments was ≤5%, with the exception of composite HU-D (76% survival). Significantly reduced survival, relative to the controls, was observed in the 100% SPP treatment of all four composites. The LC_{50}s ranged from 21.0% SPP (composite HU-B) to >100% SPP (composite HU-D).

TABLE 3.10. Summary of Water-Column Toxicity Tests Performed with Hudson River Sediment[a]

Test Organism and Composite	Survival in 0% SPP	Survival in 100% SPP	0% and 100% Significantly Different	LC_{50} (%SPP)[b]
Menidia beryllina (HU-A)	90%	10%	Yes	69.9%
Menidia beryllina (HU-B)	92%	0%	Yes	22.0%
Menidia beryllina (HU-C)	98%	0%	Yes	40.3%
Menidia beryllina (HU-D)	96%	60%	Yes	>100%
Mysidopsis bahia (HU-A)	98%	68%	Yes	>100%
Mysidopsis bahia (HU-B)	100%	0%	Yes	22.7%
Mysidopsis bahia (HU-C)	98%	2%	Yes	70.1%
Mysidopsis bahia (HU-D)	100%	98%	No	>100%
Mytilus galloprovincialis (HU-A)	97%	5%	Yes	69.8%
Mytilus galloprovincialis (HU-B)	95%	2%	Yes	21.0%
Mytilus galloprovincialis (HU-C)	96%	1%	Yes	30.1%
Mytilus galloprovincialis (HU-D) (Survival)	96%	76%	Yes	>100%
Mytilus galloprovincialis (HU-A)	96%	0%	Yes	21.8%[c]
Mytilus galloprovincialis (HU-B)	94%	0%	Yes	<10%[c]
Mytilus galloprovincialis (HU-C)	96%	0%	Yes	22.0%[c]
Mytilus galloprovincialis (HU-D) (Normal development)	95%	0%	Yes	22.4%[c]

(a) Test duration was 96-h for all tests except *M. galloprovincialis*, which was a 48-h exposure.
(b) Median lethal concentration (LC_{50}) based on survival to end of test.
(c) Median effective concentration (EC_{50}) based on normal development to the D-cell, prodissoconch stage.

Normal development, considered a more sensitive indicator of toxicity, was significantly reduced, with 0% normal prodissoconch in the 100% SPP treatment of all four composites. The EC_{50} was approximately 22.0% SPP for composites HU-A, HU-C, and HU-D and <10% SPP for composite HU-B.

All water quality parameters were within acceptable ranges throughout the test, with the exception of pH, which rose to approximately 8.4 (composites HU-A and HU-D) and 8.5 (composites HU-B and HU-C) in the 100% SPP treatments. The ammonia concentration in the 100% SPP treatments were 16.3 mg/L (HU-A), 65.5 mg/L (HU-B), 40 mg/L (HU-C), and 10.6 mg/L (HU-D). The copper reference toxicant test revealed an LC_{50} of 45.6 μg/L Cu and an EC_{50} of 6.5 μg/L Cu. Although the EC_{50} is within the control limits established for copper at the MSL (EC_{50}: 5.7 μg/L to 21 μg/L copper), the LC_{50} was outside established limits at MSL (5.8 μg/L to 35 μg/L copper) indicating that this response could have been less sensitive than normal.

3.4.4 *Ampelisca abdita* Benthic Toxicity Test

Results of the benthic toxicity test with *A. abdita* are summarized in Table 3.11. Complete test results and water quality data are presented in Appendix D. Prior to test setup, ammonia concentrations measured in the Hudson River bulk sediment composites were approximately 165 mg/L in HU-A, 258 mg/L in HU-B, 219 mg/L in HU-C, and 141 mg/L in HU-D. At test termination, ammonia concentrations in the pore water were 6.69 mg/L in HU-A, 9.77 mg/L in HU-B, 12.3 mg/L in HU-C, and 6.03 mg/L in HU-D. Test chambers containing sediment and overlying water were set up (March 25, 1994) and maintained under test temperatures with aeration during the ammonia purging period. Overlying water was exchanged twice daily, delivered via a flow-through system (i.e., the seawater flow into the test chambers was turned on long enough to completely replace water in the test chamber, twice daily). Pore water ammonia was measured in "dummy" jars every few days; the test was initiated after 10 days (April 4, 1994) when the pore water ammonia concentration were 28.4 mg/L in HU-A, 27.9 mg/L in HU-B, 28.7 mg/L in HU-C, and 18.8 mg/L in HU-D.

Survival in the *Ampelisca* control sediment was 97%, validating this test. Survival in the Hudson River composites ranged from 76% and 77% in composites HU-A and HU-C to 93% in composite HU-D. *Ampelisca* survival was significantly different than that in the Mud Dump Reference sediment (93% survival) in composites HU-A and HU-C, only. None of the composites elicited a biologically significant reduction in survival, as defined in the Regional Guidance Manual.

TABLE 3.11. Summary of Benthic Acute Toxicity Tests Performed with Hudson River Sediment

Test Organism and Composite	Mean % Survival	Significantly Different Than Mud Dump Reference	Biologically Significant[a]
A. abdita (HU-A)	76%	Yes	No
A. abdita (HU-B)	81%	No	No
A. abdita (HU-C)	77%	Yes	No
A. abdita (HU-D)	93%	No	No
R. abronius (HU-A)	68%	Yes	Yes
R. abronius (HU-B)	82%	Yes	No
R. abronius (HU-C)	84%	Yes	No
R. abronius (HU-D)	83%	Yes	No
E. estuarius (HU-A)	51%	Yes	Yes
E. estuarius (HU-B)	59%	Yes	Yes
E. estuarius (HU-C)	66%	Yes	Yes
E. estuarius (HU-D)	56%	Yes	Yes
M. bahia-SR[b] (HU-A)	89%	No	No
M. bahia-SR (HU-B)	95%	No	No
M. bahia-SR (HU-C)	90%	No	No
M. bahia-SR (HU-D)	93%	No	No
M. bahia-S[c] (HU-A)	0%	Yes	Yes
M. bahia-S (HU-B)	1%	Yes	Yes
M. bahia-S (HU-C)	0%	Yes	Yes
M. bahia-S (HU-D)	12%	Yes	Yes

(a) Biologically significant: Significantly significant mortality in the test treatment that is at least 20% greater than the reference for amphipods and at least 10% greater than the reference for mysids, as required by the Regional Guidance Manual.

(b) SR Static renewal test.

(c) S Static test.

Water quality parameters were within acceptable ranges throughout the test. The cadmium reference toxicant test revealed an LC_{50} of 0.66 mg/L Cd, within the control range established by other scientists and at the MSL (0.5 mg/L to 1.4 mg/L Cd). Ammonia concentrations were less than 1.0 mg/L in the overlying water during the 10-day test.

3.4.5 *Rhepoxynius abronius* Benthic Toxicity Test

Results of the benthic toxicity test with *R. abronius* are summarized in Table 3.11. Complete test results and water-quality data are presented in Appendix D. The same procedure that was followed to reduce ammonia concentrations ranging from 141 mg/L to 258 mg/L in pore water of the four Hudson River composites to about 30 mg/L or less in the *A. abdita* test was used in the *R. abronius* test. Test chambers containing sediment and overlying water were set up (March 25, 1994) and maintained under test temperatures with aeration during the ammonia purging period. Overlying water was exchanged twice daily. The test was initiated after 11 days (April 5, 1994) when the pore water ammonia concentrations were 21.4 mg/L in HU-A, 17.9 mg/L in HU-B, 33.5 mg/L in HU-C, and 12.5 mg/L in HU-D.

Survival in the West Beach control sediment was 98%, validating this test. Survival in the Hudson River composites was 68% in the HU-A composite and approximately 83% in composites HU-B, HU-C, and HU-D. Significant reductions in survival were observed in all four composites, relative to that in the Mud Dump Reference sediment (98% survival). Only the Reach A composite elicited a biologically significant response.

All water quality parameters were within acceptable ranges throughout the test. Ammonia concentrations were less than 3.5 mg/L in the overlying water during the 10-day test. At test termination, ammonia concentrations in the pore water were 16 mg/L in HU-A, 5.7 mg/L in HU-B, 3.3 mg/L in HU-C, and 7.7 mg/L in HU-D. The cadmium reference toxicant test revealed an LC_{50} of 1.14 mg/L Cd, which was within the control limits established at the MSL (0.48 mg/L to 1.70 mg/L Cd).

3.4.6 *Eohaustorius estuarius* Benthic Toxicity Test

Results of the benthic toxicity test with *E. estuarius* are summarized in Table 3.11. Complete test results and water quality data are presented in Appendix D. The ammonia purging procedure used in the *A. abdita* and *R. abronius* tests was also used in the *E. estuarius* test, except the target pore water ammonia concentration for test initiation was 60 mg/L or less. Test chambers containing sediment and overlying water were set up (April 7, 1994) and maintained under test temperatures with aeration during the ammonia purging period. Overlying water was exchanged twice daily. The test was initiated after 12 days (April 19,1994) when the pore water ammonia concentrations were 22.7 mg/L in HU-A, 45.8 mg/L in HU-B, 50.8 mg/L in HU-C, and 24.9 mg/L in HU-D.

Survival in the control sediment was 99%, validating this test. Survival in the Hudson River composites ranged from 51% in composite HU-A to 66% in composite HU-C. Survival in all four composites was significantly lower than that in the Mud Dump Reference sediment (96% survival). Exposure of *E. estuarius* to each of the four composites resulted in biologically significant reductions in survival.

All water quality parameters were within acceptable ranges throughout the test. Highest measured ammonia concentrations in the overlying water ranged from 3.98 mg/L in HU-D to 7.58 mg/L in HU-C during the 10-day test. At test termination, ammonia concentrations in the pore water were 5.91 mg/L in HU-A, 13.1 mg/L in HU-B, 10.2 mg/L in HU-C, and 14.5 mg/L in HU-D. The cadmium reference toxicant test produced an LC_{50} of 8.54 mg/L Cd, which was within the control limits established at the MSL (7.92 mg/L to 22.9 mg/L Cd).

3.4.7 *Mysidopsis bahia* Static Renewal Benthic Toxicity Test

Results of the static renewal benthic toxicity test with *M. bahia* are summarized in Table 3.11. Complete test results and water quality data are presented in Appendix D. As described in Section 2.5.2.2, ammonia purging procedures were employed to reduce ammonia in the overlying water to nontoxic concentrations. Test chambers containing sediment and overlying water were set up (April 27, 1994) and maintained under test temperatures with aeration during the ammonia purging period. Overlying water was exchanged six times daily for two days. Initial pore water ammonia concentrations ranged from 141 mg/L (HU-D) to 258 mg/L (HU-B). The test was initiated (April 30, 1994) when the overlying water ammonia concentrations were 6.01 mg/L in HU-A, 5.70 mg/L in HU-B, 6.69 mg/L in HU-C, and 4.96 mg/L in HU-D. Pore water ammonia concentrations were

59.2 mg/L in HU-A, 106 mg/L in HU-B, 60.2 mg/L in HU-C, and 51.1 mg/L in HU-D.

Control survival was 95%, validating this test. Survival in the Hudson River composites was ≥89% and was not significantly lower than that in the Mud Dump Reference (87% survival). No biologically significant reductions in survival were observed in any of the Hudson River composites.

All water quality parameters were within acceptable ranges throughout the test. Overlying water ammonia concentrations during the 10-day test ranged from 2.89 mg/L to 28.7 mg/L in HU-A, 3.15 mg/L to 27.7 mg/L in HU-B, 3.31 mg/L to 30.0 mg/L in HU-C, and 2.61 mg/L to 27.4 mg/L in HU-D. At test termination, ammonia concentrations in the pore water were 5.91 mg/L in HU-A, 13.1 mg/L in HU-B, 10.2 mg/L in HU-C, and 14.5 mg/L in HU-D. The copper reference toxicant test produced an LC_{50} of 151 μg/L Cu, which was within the control limits previously established at the MSL (116 μg/L to 229 μg/L Cu).

3.4.8 *Mysidopsis bahia* Static Benthic Toxicity Test

Results of the static benthic toxicity test with *M. bahia* are summarized in Table 3.11. Complete test results and water quality data are presented in Appendix D. The mysid static test was not manipulated in any way to reduce pore water or overlying water ammonia concentrations prior to test initiation. This test was validated by 93% survival in the controls. Mysid survival was between 0% and 12% in all Hudson River composites. All four composites exhibited statistically and biologically significant reductions in survival relative to the Mud Dump Reference composite (89% survival).

All water quality parameters were within acceptable ranges throughout the test. Overlying water ammonia concentrations during the 10-day test ranged from 17.9 mg/L to 81.1 mg/L in HU-A, 25.4 mg/L to 96.8 mg/L in HU-B, 21.1 mg/L to 88.5 mg/L in HU-C, and 15.0 mg/L to 76.0 mg/L in HU-D. At test termination, ammonia concentrations in the pore water were 5.91 mg/L in HU-A, 13.1 mg/L in HU-B, 10.2 mg/L in HU-C, and 14.5 mg/L in HU-D. The copper reference toxicant test produced an LC_{50} of 346 μg/L Cu, above the control range previously established at the MSL (116 μg/L to 229 μg/L Cu), indicating that this population of mysids could be slightly less sensitive than those used in previous tests.

3.5 Bioaccumulation Tests with *Macoma nasuta* and *Nereis virens*

Bioaccumulation tests with *Macoma nasuta* and *Nereis virens* were conducted using the four Hudson River composites, the Mud Dump Reference Site composite, and the control sediment. Both *M. nasuta* and *N. virens* were exposed for 28 days under flow-through conditions. Survival was greater than 90% in the *M. nasuta* control exposure, and 89% in the *N. virens* control exposure. No significant difference in *M. nasuta* or *N. virens* survival was observed between the Hudson River composites and the Mud Dump Reference Site sediment. Complete test results and water quality data are presented in Appendix E for both species. Tissues of the exposed organisms were analyzed for metals and selected organic contaminants (pesticides, PCBs, and PAHs), the results of which are summarized in this section. Analytical results, including a quality control summary and associated quality control data, are presented in Appendix F for *M. nasuta* and Appendix G for *N. virens*. The mean lipid content of background (unexposed) tissues was 2.1 percent dry weight for *M. nasuta* and 0.6 percent dry weight for *N. virens*.

The statistical analysis of tissue data was performed using one-half detection limits for non-detects and sample dry weight concentrations to remove any variance associated with water content in each sample. Throughout this section the term "significantly different" is used to express *statistically* significant differences only. Tests for statistical significance between the treatment and reference treatment were performed following methods outlined in Section 2.6. Statistical difference between reference site and test sediment exposures is shown in the following tables with the results of sample analysis on a wet weight basis. The wet weight mean tissue concentrations were calculated using one-half detection limits for non-detects. Reporting data in this manner allows for comparison of wet weight concentrations obtained from this study with regulatory levels such as the U.S. Food and Drug Administration (FDA) action levels reported in Section 4.0 of this report. At the end of this section, magnification factors are presented tht show a comparison of tissue concentrations. Magnification factors are a ratio of Hudson River composite exposed tissue concentrations to the Mud Dump Reference Site sediment exposed tissue concentrations. Whole detection limits and dry weight concentrations were used to create the magnification factors.

3.5.1 Bioaccumulation of Metals in *Macoma nasuta*

All nine metals analyzed were detected in *M. nasuta* tissues exposed to each of the four Hudson River treatments (Table 3.12). Relative to the reference tissues, significantly elevated concentrations of Cr, Cu, Hg, Ni, and Pb were observed in tissues exposed to all four of the Hudson River composites. None of the metals concentrations in the Hudson River tissues exceeded reference tissue concentrations by more than a factor of five.

TABLE 3.12. Mean Concentrations of Metals in *M. nasuta* Tissues Exposed to Hudson River and Mud Dump Reference Sediment

	Concentration (mg/kg wet weight)[a]										
Analyte	Mud Dump Reference		COMP HU-A	SD[b]	COMP HU-B	SD	COMP HU-C	SD	COMP HU-D	SD
Ag	0.0372		0.0540	No	0.0620	Yes	0.0710	Yes	0.0418	No
As	3.16		3.36	No	3.00	No	3.10	No	2.96	No
Cd	0.0355		0.0380	No	0.0345	No	0.0513	Yes	0.0290	No
Cr	0.408		0.644	Yes	0.629	Yes	1.07	Yes	0.557	Yes
Cu	1.78		2.87	Yes	2.74	Yes	3.09	Yes	2.22	Yes
Hg	0.0180		0.0287	Yes	0.0244	Yes	0.0303	Yes	0.0240	Yes
Ni	0.402		0.568	Yes	0.524	Yes	0.699	Yes	0.493	Yes
Pb	0.157	Q[c]	1.16	Yes	0.971	Yes	1.33	Yes	0.773	Yes
Zn	13.1		12.3	No	11.5	No	11.3	No	11.1	No

(a) Results shown are a mean of five replicate tissue analyses.
(b) SD Concentration is significantly different from that in Mud Dump Reference Site tissues.
(c) Q Analyte detected at or above twice the given concentrations.

3.5.2 Bioaccumulation of Pesticides in *Macoma nasuta*

Of the 16 pesticides analyzed, between 7 and 9 pesticides were detected in tissues exposed to the Hudson River composites (Table 3.13). Compared to the Mud Dump Reference Site tissues, all Hudson River tissues had significantly elevated concentrations of aldrin, dieldrin, 2,4'-DDD, 4,4'-DDD, and 4,4'-DDE. Additionally, significant elevations of α-chlordane (Reaches B, C, and D) and 4,4'-DDT (Reaches A and B) were detected. In all four reaches, tissue concentrations of 4,4'-DDE and DDD exceeded reference tissues by a factor of >10.

3.5.3 Bioaccumulation of PCBs in *Macoma nasuta*

All PCB congeners analyzed, except PCBs 8, 183, 184, and 195, were detected in *M. nasuta* tissues exposed to each of the four Hudson River composites (Table 3.14). Relative to the reference tissues, 11 PCB congeners were significantly elevated in Reach C, 12 congeners in Reach B, and 17 congeners in Reaches A and D. Total estimated PCBs ranged from 92.1 μg/kg (Reach A) to 135 μg/kg (Reach D). Two PCB congeners (PCBs 18 and 44) were observed at concentrations that were statistically significant and elevated greater than 10 times the reference tissues concentrations in all four Hudson River treatments. In addition, five PCB congeners (49, 52, 66, 87, and 101) were significantly elevated and had magnification factors of >10 in three of the four Hudson River reaches.

3.5.4 Bioaccumulation of PAHs and 1,4-Dichlorobenzene in *Macoma nasuta*

All PAHs analyzed, except benzo[k]fluoranthene in Reaches C and D, were detected at significantly elevated concentrations in tissues exposed to the four Hudson River composites (Table 3.15). Fluroanthene and pyrene showed the greatest tissue accumulations of PAHs in clam tissue from all Hudson reaches. Of the four Hudson River reaches, the lowest levels of PAH bioaccumulation were found in COMP HU-C. Total PAHs ranged were 1630 μg/kg (wet weight) from Reach A tissues, 1940 μg/kg from Reach B tissues, 463 μg/kg in Reach C tissues, and 1510 μg/kg in Reach D tissues. This tissue concentration ranking does not follow the ranking for sediment PAH concentrations. Total HPAH constituted between 72% (Reach B) and 90% (Reach C) of the total PAH content in

TABLE 3.13. Mean Concentrations of Pesticides in *M. nasuta* Tissues Exposed to Hudson River and Mud Dump Reference Sediment

	Concentration (μg/kg wet weight)[a]												
Analyte	Mud Dump Reference		COMP HU-A		SD[b]	COMP HU-B		SD	COMP HU-C		SD	COMP HU-D		SD
2,4'-DDD	0.12	Q[c]	0.83		Yes	1.11		Yes	1.45		Yes	0.48		Yes
2,4'-DDE	0.18		0.13	Q	No	0.13	Q	No	0.16	Q	No	0.13	Q	No
2,4'-DDT	0.09	Q	0.09	Q	No	0.09	Q	No	0.11	Q	No	0.09	Q	No
4,4'-DDD	0.13	Q	2.65		Yes	3.71		Yes	4.08		Yes	2.85		Yes
4,4'-DDE	0.34		8.55		Yes	8.42		Yes	9.62		Yes	5.53		Yes
4,4'-DDT	1.23		5.11		Yes	8.55		Yes	2.01		No	2.69		No
Total DDT[d]	2.09		17.4		Yes	22.0		Yes	17.4		Yes	11.8		Yes
α-Chlordane	0.05	Q	0.14		No	0.72		Yes	0.95		Yes	0.30		Yes
Aldrin	0.35		2.81		Yes	2.21		Yes	3.47		Yes	1.73		Yes
Dieldrin	0.26	Q	0.81		Yes	1.65		Yes	1.85		Yes	1.34		Yes
Endosulfan I	0.09	Q	0.09	Q	No	0.09	Q	No	0.11	Q	No	0.09	Q	No
Endosulfan II	0.09	Q	0.09	Q	No	0.09	Q	No	0.11	Q	No	0.09	Q	No
Endosulfan Sulfate	0.09	Q	0.09	Q	No	0.09	Q	No	0.26		No	0.09	Q	No
Heptachlor	0.09	Q	0.09	Q	No	0.09	Q	No	0.11	Q	No	0.09	Q	No
Heptachlor Epoxide	0.06	Q	0.07	Q	No	0.07	Q	No	0.08	Q	No	0.06	Q	No
trans-Nonachlor	0.07	Q	0.07	Q	No	0.13		No	0.19		No	0.07	Q	No

(a) Results shown are a mean of five replicate tissue analyses; one-half the detection limit used for undetected analytes.
(b) SD Concentration is significantly different from that in Mud Dump Reference Site tissues.
(c) Q Analyte detected at or above twice the given concentration.
(d) Sum of 2,4'-DDD, 2,4'-DDE, 2,4'-DDT, 4.4'-DDD, 4,4'-DDE, and 4,4'-DDT; one-half of the detection limit used in summation when analyte was undetected.

TABLE 3.14. Mean Concentrations of PCBs in *M. nasuta* Tissues Exposed to Hudson River and Mud Dump Reference Sediment

Analyte	Mud Dump Reference		COMP HU-A		SD[b]	COMP HU-B		SD	COMP HU-C		SD	COMP HU-D		SD
	Concentration (μg/kg wet weight)[a]													
PCB 8	0.87		0.20	Q[c]	No	1.91		No	0.60		No	1.49		No
PCB 18	0.21	Q	5.71		Yes	10.5		Yes	10.9		Yes	9.57		Yes
PCB 28	0.62		7.08		Yes	2.80		No	5.00		No	10.2		Yes
PCB 44	0.08	Q	2.05		Yes	6.10		Yes	9.06		Yes	3.48		Yes
PCB 49	0.17		4.65		Yes	1.80		No	3.88		No	7.58		Yes
PCB 52	0.81		6.35		Yes	10.0		Yes	12.1		Yes	10.2		Yes
PCB 66	0.18		5.74		Yes	1.92		No	3.96		No	8.73		Yes
PCB 87	0.16		1.20		Yes	2.46		Yes	2.64		Yes	1.93		Yes
PCB 101	0.45		3.60		Yes	4.59		Yes	5.55		Yes	5.23		Yes
PCB 105	0.09		0.85		Yes	0.30		No	0.61		No	0.86		Yes
PCB 118	0.17		2.33		Yes	0.78		No	1.65		No	2.63		Yes
PCB 128	0.07	Q	0.33		Yes	0.55		Yes	0.77		Yes	0.32		Yes
PCB 138	0.18		1.40		Yes	2.21		Yes	2.41		Yes	1.45		Yes
PCB 153	0.15		1.77		Yes	0.46		No	0.93		No	1.67		Yes
PCB 170	0.12		0.14		No	0.37		Yes	0.41		No	0.41		Yes
PCB 180	0.09	Q	0.66		Yes	1.01		Yes	1.19		Yes	0.73		Yes
PCB 183	0.12	Q	0.12	Q	No	0.12	Q	No	0.46		No	0.12	Q	No
PCB 184	0.12	Q	0.12	Q	No	0.12	Q	No	0.14	Q	No	0.12	Q	No
PCB 187	0.06	Q	1.08		Yes	0.71		Yes	0.59		Yes	0.34		Yes
PCB 195	0.05	Q	0.05	Q	No	0.05	Q	No	0.06	Q	No	0.05	Q	No
PCB 206	0.05	Q	0.36		Yes	0.47		Yes	0.34		Yes	0.36		Yes
PCB 209	0.05	Q	0.24		Yes	0.23		Yes	0.23		Yes	0.12		No
Total PCB[d]	9.74		92.1		Yes	98.9		Yes	127		Yes	135		Yes

(a) Value shown is a mean of five replicate tissue analyses; one-half the detection limit used for undetected analytes.
(b) SD Concentration is significantly different from that in Mud Dump Reference Site tissues.
(c) Q Undetected at or above twice the given concentration.
(d) Total PCB = ($\sum$ all PCBs) x 2, where undetected values equal one-half the detection limit.

TABLE 3.15. Mean Concentrations of PAHs and 1,4-Dichlorobenzene in *M. nasuta* Tissues Exposed to Hudson River and Mud Dump Reference Sediment

	Concentration (μg/kg wet weight)[a]									
Analyte	Mud Dump Reference		COMP HU-A	SD[b]	COMP HU-B	SD	COMP HU-C	SD	COMP HU-D	SD
Naphthalene	1.12		4.43	Yes	9.16	Yes	4.08	Yes	3.52	Yes
Acenaphthylene	0.36	Q[c]	3.02	Yes	2.81	Yes	1.75	Yes	3.21	Yes
Acenaphthene	0.64	Q	13.4	Yes	37.7	Yes	3.18	Yes	8.25	Yes
Fluorene	0.61	Q	12.9	Yes	49.1	Yes	3.45	Yes	9.18	Yes
Phenanthrene	1.26	Q	132	Yes	341	Yes	22.1	Yes	103	Yes
Anthracene	1.10	Q	59.8	Yes	106	Yes	13.3	Yes	45.2	Yes
Total LPAH[d]	5.08		225		546		47.9		173	
Fluoranthene	2.64	Q	318	Yes	408	Yes	87.3	Yes	322	Yes
Pyrene	2.25	Q	388	Yes	410	Yes	116	Yes	372	Yes
Benz[a]anthracene	2.36		192	Yes	164	Yes	45.1	Yes	169	Yes
Chrysene	1.12	Q	207	Yes	160	Yes	57.8	Yes	187	Yes
Benzo[b]fluoranthene	3.37		121	Yes	99.9	Yes	46.6	Yes	134	Yes
Benzo[k]fluoranthene	1.83		31.5	Yes	27.4	Yes	10.8	No	13.8	No
Benzo[a]pyrene	1.21		100	Yes	80.9	Yes	30.0	Yes	94.5	Yes
Indeno[1,2,3-cd]pyrene	0.87	Q	19.3	Yes	15.3	Yes	8.55	Yes	18.5	Yes
Dibenz[a,h]anthracene	0.62	Q	5.29	Yes	4.21	Yes	2.50	Yes	4.84	Yes
Benzo[g,h,i]perylene	0.99		20.7	Yes	17.8	Yes	9.72	Yes	19.2	Yes
Total HPAH[d]	17.3		1400		1388		415		1340	
Total PAH[d]	22.4		1630		1940		463		1510	
1,4-Dichlorobenzene	0.92	Q	0.92	Q No	0.92	Q No	1.11	Q No	0.93	Q No

(a) Values shown are a mean of five replicate tissue analyses; one-half the detection limit used for undetected analytes.
(b) SD Concentration is significantly different from that in Mud Dump Reference Site tissues.
(c) Q Undetected at or above twice the given concentration.
(d) Sum of PAHs; one-half the detection limit used for undetected analytes.

Hudson River exposed *M. nasuta* tissues. Tissue concentrations of all PAHs, except naphthalene, acenaphthylene, and dibenz[a,h]anthracene (and indeno[1,2,3-cd]pyrene in Reach B) were over 10 times higher in *M. nasuta* exposed to Hudson River Reach A and B sediments than those in the reference tissues. In tissues exposed to Reaches C and D, fewer PAHs were magnified at >10 times. The compound 1,4-dichlorobenzene was undetected in all replicates of all Hudson River composite tissues.

3.5.5 Bioaccumulation of Metals in *Nereis virens*

All nine metals analyzed were detected in tissues from all four Hudson River treatments (Table 3.16). Relative to the reference tissues, none of the metals was found at significantly elevated concentrations, and none of the metals concentrations in the Hudson River tissues exceeded reference tissue concentrations by more than a factor of five.

3.5.6 Bioaccumulation of Pesticides in *Nereis virens*

All analyzed pesticides, except endosulfan I, 2,4'-DDE, and 2,4'-DDT, were detected in tissues exposed to the Hudson River composites (Table 3.17). Relative to reference tissues, aldrin, dieldrin (except Reach B), ∝-chlordane, 4,4'-DDD, and 4,4'-DDE were detected at significantly elevated concentrations in all four Hudson River composites. Aldrin (except Reach D), 4,4'-DDD, and 4,4'-DDE were present in all four Hudson River treatments at concentrations >10 times those of the reference tissues.

3.5.7 Bioaccumulation of PCBs in *Nereis virens*

All PCB congeners were detected at significantly elevated concentrations in tissues exposed to all four Hudson River reaches, with the exception of PCBs 8, 66, 128, 153, 170, 184, 187, and 195 (Table 3.18). PCBs that were observed at concentrations >10 times those of the reference tissues were PCB congeners 18, 28, 44, 49, 52, and 101. Concentrations of PCB congeners 87, 105, and 118 were >10 times those of the reference tissues in at least one reach. Total estimated PCBs ranged from 116 μg/kg in Reach A tissues to 282 μg/kg in Reach C tissues.

TABLE 3.16. Mean Concentrations of Metals in *N. virens* Tissues Exposed to Hudson River and Mud Dump Reference Sediment

	Concentration (mg/kg wet weight)[a]								
Analyte	Mud Dump Reference	COMP HU-A	SD	COMP HU-B	SD	COMP HU-C	SD	COMP HU-D	SD
Ag	0.0224	0.0145	No	0.0236	No	0.0120 Q	No	0.0206	No
As	2.07	2.02	No	1.97	No	1.89	No	1.98	No
Cd	0.0619	0.0614	No	0.0673	No	0.0625	No	0.0640	No
Cr	0.103 Q[b]	0.124	No	0.255	No	0.130	No	0.154	No
Cu	3.30	1.47	No	1.93	No	1.40	No	1.66	No
Hg	0.0121	0.0100	No	0.0129	No	0.0095	No	0.0120	No
Ni	0.0928 Q	0.111	No	0.165	No	0.117	No	0.118	No
Pb	0.311	0.354	No	0.583	No	0.313	No	0.469	No
Zn	11.2	12.7	No	30.9	No	10.9	No	21.5	No

(a) Results shown are a mean of five replicate tissue analyses.
(b) Q Undetected at or above twice the given concentration.

3.5.8 Bioaccumulation of PAHs and 1,4-Dichlorobenzene in *Nereis virens*

All PAHs analyzed were detected in tissues exposed to the Hudson River composites (Table 3.19). Fluroanthene and pyrene showed the greatest tissue accumulations of PAHs in worm tissue from all Hudson reaches. Of the four Hudson River reaches, the lowest levels of PAH bioaccumulation were found in COMP HU-C. Total PAHs ranged were 457 μg/kg (wet weight) from Reach A tissues, 425 μg/kg from Reach B tissues, 115 μg/kg in Reach C tissues, and 469 μg/kg in Reach D tissues. This tissue concentration ranking does not follow the ranking for sediment PAH concentrations. Total HPAH constituted between 77% (Reach B) and 90% (Reach D) of the total PAH content in Hudson River exposed *N. virens* tissues. Relative to the reference tissues, 11 to 13 PAHs were detected at significantly elevated concentrations in Reaches A, B, and D. In Reach C, seven PAH compounds were significantly elevated relative to the reference tissues. In Reaches A, B, and D, fluoranthene, pyrene, and chrysene were observed at concentrations ≥10 times higher than those of the reference tissues. Concentrations of phenanthrene

TABLE 3.17. Mean Concentrations of Pesticides in *N. virens* Tissues Exposed to Hudson River and Mud Dump Reference Sediment

Analyte	Mud Dump Reference	COMP HU-A	SD[b]	COMP HU-B	SD	COMP HU-C	SD	COMP HU-D	SD
	Concentration (μg/kg wet weight)[a]								
2,4'-DDD	0.18	1.94	Yes	1.46	No	2.05	No	1.57	No
2,4'-DDE	0.14 Q[c]	0.14 Q	No	0.15 Q	No	0.14 Q	No	0.18 Q	No
2,4'-DDT	0.09 Q	0.10 Q	No	0.11 Q	No	0.10 Q	No	0.12 Q	No
4,4'-DDD	0.51	7.52	Yes	7.97	Yes	8.79	Yes	7.73	Yes
4,4'-DDE	0.15	5.75	Yes	5.08	Yes	5.82	Yes	3.74	Yes
4,4'-DDT	0.08 Q	0.08 Q	No	0.09 Q	No	0.09 Q	No	0.52	No
Total DDT[d]	1.15	15.5	Yes	14.9	Yes	17.0	Yes	13.9	Yes
α-Chlordane	0.05 Q	0.38	Yes	0.96	Yes	1.52	Yes	0.50	Yes
Aldrin	0.07 Q	2.25	Yes	2.34	Yes	1.79	Yes	1.38	Yes
Dieldrin	0.58	1.87	Yes	1.34	No	2.61	Yes	2.13	Yes
Endosulfan I	0.09 Q	0.10 Q	No	0.11 Q	No	0.10 Q	No	0.12 Q	No
Endosulfan II	0.09 Q	0.10 Q	No	0.11 Q	No	0.10 Q	No	0.13	No
Endosulfan Sulfate	0.09 Q	0.26	No	0.34	No	0.22	No	0.39	No
Heptachlor	0.10 Q	0.55	No	1.04	No	1.63	Yes	1.05	Yes
Heptachlor Epoxide	0.07 Q	0.16	No	0.15	No	0.07 Q	No	0.09 Q	No
trans- Nonachlor	0.54	0.73	No	1.26	No	1.33	No	0.68	No

(a) Results shown are a mean of five replicate tissue analyses; one-half the detection limit used for non-detects.
(b) SD Concentration is significantly different from that in Mud Dump Reference Site tissues.
(c) Q Analyte detected at or above twice the given concentration.
(d) Sum of 2,4'-DDD, 2,4'-DDE, 2,4'-DDT, 4.4'-DDD, 4,4'-DDE, and 4,4'-DDT; one-half of the detection limit used in summation when analyte was undetected.

TABLE 3.18. Mean Concentrations of PCBs in *N. virens* Tissues Exposed to Hudson River and Mud Dump Reference Sediment

Analyte	Concentration (μg/kg wet weight) [a]												
	Mud Dump Reference		COMP HU-A		SD[b]	COMP HU-B		SD	COMP HU-C		SD	COMP HU-D		SD
PCB 8	0.21	Q[c]	0.22	Q	No	0.20	Q	No	0.23	Q	No	0.28	Q	No
PCB 18	0.22	Q	6.06		Yes	11.4		Yes	13.8		Yes	10.3		Yes
PCB 28	0.11	Q	7.17		Yes	15.7		Yes	15.9		Yes	11.5		Yes
PCB 44	0.09	Q	2.65		Yes	6.25		Yes	7.52		Yes	5.23		Yes
PCB 49	0.12	Q	5.08		Yes	11.4		Yes	12.5		Yes	8.30		Yes
PCB 52	0.32		8.75		Yes	19.3		Yes	22.7		Yes	13.6		Yes
PCB 66	0.05	Q	0.05	Q	No	12.7		Yes	15.6		Yes	5.53		No
PCB 87	0.11		0.78		Yes	2.21		Yes	2.62		Yes	1.09		Yes
PCB 101	0.46		5.54		Yes	10.0		Yes	11.7		Yes	7.21		Yes
PCB 105	0.18		1.47		Yes	2.91		Yes	3.78		Yes	1.90		Yes
PCB 118	0.15	Q	2.84		Yes	6.02		Yes	6.27		Yes	3.93		Yes
PCB 128	0.25		0.65		No	1.18		Yes	1.46		Yes	0.83		No
PCB 138	1.18		3.66		Yes	6.14		Yes	7.83		Yes	4.60		Yes
PCB 153	2.01		4.69		No	7.24		No	7.73		No	5.25		No
PCB 170	0.28		0.94		No	1.68		Yes	1.76		Yes	0.78		No
PCB 180	0.58		2.34		Yes	3.44		Yes	3.51		Yes	2.04		Yes
PCB 183	0.17		0.78		Yes	1.16		Yes	1.25		Yes	0.60		Yes
PCB 184	0.12	Q	0.13	Q	No	0.12	Q	No	0.14	Q	No	0.16	Q	No
PCB 187	0.50		1.59		Yes	2.32		Yes	2.55		Yes	1.18		No
PCB 195	0.05	Q	0.15		No	0.14		No	0.16		No	0.13		No
PCB 206	0.23		1.45		Yes	2.16		Yes	1.18		Yes	1.03		Yes
PCB 209	0.16		0.91		Yes	0.94		Yes	0.81		Yes	0.63		Yes
Total PCB[d]	15.1		116		Yes	249		Yes	282		Yes	172		Yes

(a) Value shown is a mean of five replicate tissue analyses; one-half the detection limit used for non-detects.
(b) SD Concentration is significantly different from that in Mud Dump Reference Site tissues.
(c) Q Undetected at or above twice the given concentration.
(d) Total PCB = ($\sum$ all PCBs) x 2, where undetected values equal one-half the detection limit.

TABLE 3.19. Mean Concentrations of PAHs in *N. virens* Tissues Exposed to Hudson River and Mud Dump Reference Sediment

Analyte	Mud Dump Reference		COMP HU-A		SD[b]	COMP HU-B		SD	COMP HU-C		SD	COMP HU-D		SD
	Concentration (μg/kg wet weight)[a]													
Naphthalene	4.49		3.08		No	6.40		No	5.18		No	4.22		No
Acenaphthylene	0.88		2.82		Yes	2.93		Yes	1.85		Yes	2.64		Yes
Acenaphthene	2.02		11.1		Yes	21.7		Yes	3.33		No	6.12		Yes
Fluorene	1.85		4.33		No	9.16		Yes	2.07		No	3.73		No
Phenanthrene	3.01		22.7		Yes	44.9		Yes	4.66		No	19.9		Yes
Anthracene	1.17	Q[c]	8.59		Yes	11.1		Yes	2.82		No	9.94		No
Total LPAH[d]	13.4		52.6			96.3			19.9			46.6		
Fluoranthene	2.80	Q	132		Yes	125		Yes	23.8		Yes	122		Yes
Pyrene	3.86		146		Yes	116		Yes	31.5		Yes	129		Yes
Benz[a]anthracene	3.43		17.9		Yes	12.5		Yes	4.34		No	25.7		Yes
Chrysene	1.18	Q	55.7		Yes	35.5		Yes	12.5		Yes	52.4		Yes
Benzo[b]fluoranthene	2.66		17.3		Yes	11.8		Yes	7.21		Yes	29.2		Yes
Benzo[k]fluoranthene	1.09		7.91		Yes	6.15		Yes	3.37		Yes	13.3		Yes
Benzo[a]pyrene	0.78	Q	14.2		Yes	10.1		Yes	4.22		Yes	22.3		No
Indeno[1,2,3-cd]pyrene	1.43		4.56		No	4.39		No	3.14		No	12.9		Yes
Dibenz[a,h]anthracene	0.66	Q	1.72		No	1.66		No	1.24		No	3.51		No
Benzo[g,h,i]perylene	1.27		6.19		Yes	5.81		Yes	3.27		No	11.5		Yes
Total HPAH[d]	19.2		404			329			94.6			422		
Total PAH[d]	32.6		457			425			115			469		
1,4-Dichlorobenzene	0.97	Q	1.01	Q	No	0.93	Q	No	1.06	Q	No	1.27	Q	No

(a) Values shown are a mean of five replicate tissue analyses; one-half the detection limit used for undetected analytes.
(b) SD Concentration is significantly different from that in Mud Dump Reference Site tissues.
(c) Q Undetected at or above twice the given concentration.
(d) Sum of PAHs; one-half the detection limit used for undetected analytes.

(Reach B) and benzo[a]pyrene (Reach D) were also ≥10 times reference levels. Magnification factors in Reach C tissues did not exceed 10 for any PAH compound. The compound 1,4-dichlorobenzene was not detected in the Hudson River tissues.

3.5.9 Magnification Factors of Compounds in *Macoma nasuta* and *Nereis virens*

Tables 3.20 (Reaches A and B) and 3.21 (Reaches C and D) show the calculated magnification factors for all compounds analyzed in tissues of *M. nasuta* and *N. virens*. Magnification factors were calculated with the dry weight concentrations of the compounds in tissues of the test organisms. These factors show the magnitude of the difference in tissue concentrations in tissues exposed to Hudson River composite sediments relative to those exposed to the Mud Dump Reference Site sediments. When all replicate analyses of a compound were undetected for tissues exposed to the Mud Dump Reference Site sediment, the magnification factor displayed is the magnitude of difference from the detection limit.

TABLE 3.20. Magnification Factors of All Analyzed Compounds in Tissues Exposed to Hudson River Sediment Composites (Reach A and Reach B) Compared with Mud Dump Reference Site Sediment

	Magnification Factors [a]			
	COMP HU-A		COMP HU-B	
Analyte	*M. nasuta*	*N. virens*	*M. nasuta*	*N. virens*
Ag	1.38	0.97	1.61	1.19
As	1.14	0.99	1.04	0.93
Cd	1.16	1.01	1.09	1.06
Cr	1.67	1.01	1.68	1.48
Cu	1.77	0.47	1.72	0.59
Hg	1.72	0.84	1.50	1.02
Ni	1.53	1.01	1.46	1.17
Pb	3.93	0.98	3.36	1.52
Zn	1.01	1.14	0.96	2.71
2,4'-DDD	3.56	6.97	4.61	5.44
2,4'-DDE	0.94	1.05	0.95	1.12
2,4'-DDT	1.05	1.05	1.06	1.11
4,4'-DDD	**10.8**	**13.2**	**14.9**	**13.6**
4,4'-DDE	**25.0**	**25.7**	**24.8**	**22.0**
4,4'-DDT	4.52	1.04	7.53	1.11
α-Chlordane	1.91	3.89	7.56	9.25
Aldrin	7.67	**16.7**	6.08	**17.3**
Dieldrin	1.74	2.70	3.34	2.05
Endosulfan I	1.04	1.05	1.05	1.12
Endosulfan II	1.04	1.05	1.05	1.12
Endosulfan Sulfate	1.04	1.79	1.05	2.27
Heptachlor	1.03	3.01	1.03	5.50
Heptachlor Epoxide	1.05	1.63	1.07	1.52
trans-Nonachlor	1.03	1.42	1.28	2.31
PCB 8	0.41	1.05	2.02	0.93
PCB 18	**13.9**	**13.6**	**26.2**	**25.0**
PCB 28	**11.8**	**34.3**	5.12	**73.1**
PCB 44	**12.6**	**15.4**	**38.0**	**35.3**
PCB 49	**20.0**	**20.6**	8.64	**44.9**
PCB 52	8.13	**20.6**	**13.1**	**44.0**
PCB 66	**24.7**	1.04	8.95	**130**
PCB 87	5.97	4.31	**12.4**	**12.0**
PCB 101	8.46	**11.9**	**11.0**	**20.9**
PCB 105	7.46	7.37	3.16	**14.2**

TABLE 3.20. (contd)

Analyte	COMP HU-A *M. nasuta*	COMP HU-A *N. virens*	COMP HU-B *M. nasuta*	COMP HU-B *N. virens*
PCB 118	8.32	9.36	3.36	**19.3**
PCB 128	2.30	1.89	3.81	3.32
PCB 138	4.95	3.15	7.90	5.14
PCB 153	**10.9**	2.38	3.34	3.57
PCB 170	1.13	3.34	2.19	5.62
PCB 180	3.83	4.13	5.92	5.89
PCB 183	1.03	3.14	1.04	4.54
PCB 184	1.03	1.05	1.04	0.94
PCB 187	8.90	3.22	5.70	4.57
PCB 195	1.05	1.72	1.07	1.56
PCB 206	3.38	6.20	4.51	8.92
PCB 209	2.68	5.86	2.68	5.80
Naphthalene	2.45	0.63	5.16	1.29
Acenaphthylene	4.38	2.39	4.10	2.42
Acenaphthene	**10.8**	4.83	**30.7**	9.36
Fluorene	**10.9**	1.92	**41.7**	4.02
Phenanthrene	**54.1**	5.89	**140**	**11.6**
Anthracene	**28.1**	3.67	**50.0**	4.70
Fluoranthene	**62.0**	**23.4**	**79.9**	**22.0**
Pyrene	**88.6**	**27.5**	**94.3**	**21.8**
Benz[a]anthracene	**83.2**	5.18	**71.3**	3.60
Chrysene	**95.5**	**23.5**	**74.1**	**14.7**
Benzo[b]fluoranthene	**37.0**	5.77	**30.8**	3.89
Benzo[k]fluoranthene	**16.4**	4.47	**14.3**	3.37
Benzo[a]pyrene	**67.8**	9.11	**55.1**	6.41
Indeno[1,2,3-cd]pyrene	**11.5**	2.14	9.12	2.02
Dibenz[a,h]anthracene	4.38	1.47	3.51	1.42
Benzo[g,h,i]perylene	**15.1**	3.37	**13.1**	3.11
1,4-Dichlorobenzene	1.04	1.05	1.05	0.93

(a) Magnification factors are the number of times the test treatment concentration is greater than the reference treatment concentration on a dry weight basis. When the compound is undetected, the achieved detection limit is used in the calculation. Magnification factors greater than or equal to 5 but less than 10 appear as underlined values. Magnification factors greater than or equal to 10 appear in bold type.

TABLE 3.21. Magnification Factors of All Analyzed Compounds in Tissues Exposed to Hudson River Sediment Composites (Reach C and Reach D) Compared with Mud Dump Reference Site Sediment

	Magnification Factors [a]			
	COMP HU-C		COMP HU-D	
Analyte	*M. nasuta*	*N. virens*	*M. nasuta*	*N. virens*
Ag	1.86	0.94	1.13	1.00
As	1.11	0.89	1.05	0.91
Cd	1.64	0.98	0.93	0.99
Cr	2.90	1.01	1.54	1.11
Cu	1.97	0.42	1.43	0.49
Hg	1.89	0.75	1.52	0.94
Ni	1.95	1.01	1.38	1.01
Pb	4.67	0.90	2.76	1.23
Zn	0.95	0.94	0.95	1.86
2,4'-DDD	<u>6.37</u>	<u>7.30</u>	2.25	<u>5.75</u>
2,4'-DDE	1.14	0.96	0.97	1.22
2,4'-DDT	1.26	1.06	1.08	1.21
4,4'-DDD	**17.2**	**14.7**	**12.1**	**13.3**
4,4'-DDE	**29.6**	**24.9**	**17.0**	**16.0**
4,4'-DDT	1.99	1.05	2.37	3.93
α-Chlordane	**10.6**	**14.4**	3.37	<u>5.12</u>
Aldrin	**10.1**	**12.9**	4.96	<u>9.73</u>
Dieldrin	3.91	3.65	2.83	2.97
Endosulfan I	1.26	1.06	1.07	1.22
Endosulfan II	1.26	1.06	1.07	1.18
Endosulfan Sulfate	1.69	1.58	1.07	2.30
Heptachlor	1.24	<u>8.16</u>	1.04	<u>5.34</u>
Heptachlor Epoxide	1.27	1.06	1.07	1.22
trans-Nonachlor	1.81	2.40	1.05	1.33
PCB 8	0.83	1.06	1.56	1.22
PCB 18	**26.9**	**29.7**	**24.5**	**22.3**
PCB 28	<u>6.86</u>	**73.4**	**18.0**	**52.7**
PCB 44	**59.0**	**41.8**	**22.8**	**29.0**
PCB 49	**14.5**	**48.8**	**34.3**	**32.3**
PCB 52	**15.6**	**51.1**	**13.7**	**30.6**
PCB 66	**13.8**	**158**	**39.4**	**54.5**
PCB 87	**14.0**	**13.9**	**10.1**	<u>5.79</u>
PCB 101	**13.1**	**24.0**	**12.9**	**14.9**

TABLE 3.21. (contd)

Analyte	COMP HU-C *M. nasuta*	COMP HU-C *N. virens*	COMP HU-D *M. nasuta*	COMP HU-D *N. virens*
PCB 105	4.86	**18.1**	7.95	9.21
PCB 118	5.30	**19.9**	9.87	**12.5**
PCB 128	5.59	4.04	2.33	2.31
PCB 138	8.74	6.44	5.39	3.82
PCB 153	5.03	3.76	**10.8**	2.56
PCB 170	2.87	5.80	2.55	2.88
PCB 180	7.26	5.92	4.43	3.49
PCB 183	2.20	4.85	1.05	2.55
PCB 184	1.24	1.06	1.05	1.22
PCB 187	5.63	4.95	2.89	2.43
PCB 195	1.27	1.73	1.07	1.62
PCB 206	3.41	4.79	3.63	4.47
PCB 209	2.84	4.97	1.53	3.82
Naphthalene	2.38	1.06	2.05	0.89
Acenaphthylene	2.62	1.51	4.90	2.20
Acenaphthene	2.67	1.41	7.00	2.60
Fluorene	3.06	1.08	8.17	1.57
Phenanthrene	9.57	1.25	**44.5**	5.23
Anthracene	6.59	1.40	**22.3**	4.24
Fluoranthene	**17.9**	4.08	**66.3**	**21.5**
Pyrene	**27.9**	5.79	**89.9**	**24.0**
Benz[a]anthracene	**20.6**	1.25	**77.4**	7.62
Chrysene	**28.0**	5.11	**90.7**	**21.6**
Benzo[b]fluoranthene	**14.8**	2.33	**43.3**	9.83
Benzo[k]fluoranthene	6.20	1.89	8.00	7.39
Benzo[a]pyrene	**21.3**	2.62	**67.6**	**14.6**
Indeno[1,2,3-cd]pyrene	5.32	1.49	**11.6**	6.19
Dibenz[a,h]anthracene	2.16	1.24	4.22	2.93
Benzo[g,h,i]perylene	7.44	1.78	**14.8**	6.26
1,4-Dichlorobenzene	1.27	1.06	1.09	1.22

(a) Magnification factors are the number of times the test treatment concentration is greater than the reference treatment concentration on a dry weight basis. When the compound is undetected, the achieved detection limit is used in the calculation. Magnification factors greater than or equal to 5 but less than 10 appear as underlined values. Magnification factors greater than or equal to 10 appear in bold type.

4.0 Discussion and Conclusions

In this section, physical and chemical analyses, and bioassays performed on the four Hudson River sediment composites (HU-A through HU-D) are evaluated relative to the Mud Dump Reference Site sediment by guidelines of the Green Book Tier III. Tier III evaluations include water-column toxicity tests, benthic toxicity tests, and whole sediment bioaccumulation studies. Tier III evaluations assess the impact of contaminants in the dredged material on marine organisms to determine whether there is potential for the material to have an unacceptable environmental effect during ocean disposal. The Green Book provides the following guidance for determining whether the proposed dredged material is unacceptable for ocean disposal based on the Tier III test:

- Water-Column Toxicity. The limiting permissible concentration (LPC) of dissolved plus suspended contaminants cannot exceed 0.01 of the acutely toxic concentration at the boundaries of the disposal site within the first 4 h after disposal, or at any point in the marine environment after the first 4 h. The acutely toxic concentration, in this case, is taken to be the LC_{50}; therefore, acute toxicity in SPP tests would require at least 50% mortality in an SPP treatment to be evaluated according to the Green Book. A numerical mixing model should be used to predict whether concentrations greater than 0.01 of the acutely toxic SPP concentrations are likely to occur beyond the boundaries of the disposal site within the first 4 h after disposal.

- Benthic Acute Toxicity. The proposed dredged material does not meet the LPC for benthic toxicity when organism reduced survival in the test sediment compared with that in reference site sediment is statistically significant, and the decrease in survival is at least 20% for *A. abdita*, *R. abronius*, and *E. estuarius*, or at least 10% for *M. bahia.*

- Bioaccumulation. The proposed dredged material does not meet the LPC for bioaccumulation if tissue concentrations of one or more contaminants of concern are greater than the applicable FDA levels. The FDA levels of concern for chronic shellfish consumption for concentrations of As, Cd, Cr, Ni, and Pb (FDA 1993a, 1993b, 1993c, 1993d, 1993e), as well as bioaccumulation matrix values provided by USACE -NYD(1981) for total DDT, PCBs, Hg and Cd were also considered. When the bioaccumulation of contaminants in the dredged material exceeds that in the reference material exposures, further case-specific evaluation criteria listed in the Green Book should be consulted to determine LPC and benthic effects compliance.

Sections 4.1 through 4.3 discuss the proposed Hudson River dredged material in terms of sediment characterization and Tier III evaluations. The contribution of the Hudson River sediment composites to water-column or benthic acute toxicity and potential for bioaccumulation relative to the reference sediment are also presented.

4.1 Sediment Physical and Chemical Characterization

Hudson River project area core samples were black, silty-clayey material. Percentages of silt ranged from 23% to 62%, and clay ranged from 18% to 43%. Sediment moisture contents varied from 36% to 60% in individual cores. Levels of all metals in Hudson River project area sediment exceeded those found in the Mud Dump Reference Site sediment. The dominant pesticides found were those in the DDD/DDE/DDT group of compounds. All of the 22 PCB congeners analyzed were detected in Hudson River project area sediment, with total PCB concentrations ranging from 286 µg/kg, dry weight (composite HU-D) to 1064 µg/kg, dry weight (composite HU-C), about one to two orders of magnitude higher than in Mud Dump Reference Site sediment. All 17 PAHs analyzed were detected in Hudson River project area sediment. Total PAH ranged from 8720 µg/kg, dry weight (composite HU-D) to 34,600 µg/kg, dry weight (composite HU-B); HPAHs constituted at least 65% of the total PAH in all Hudson River sediment composites. The concentration of 1,4-dichlorobenzene ranged from 24.4 µg/kg, dry weight (composite HU-D) to 111 µg/kg, dry weight (composite HU-C), approximately one or two orders of magnitude higher than in Mud Dump Reference Site sediment.

4.2 Toxicity

In water-column toxicity tests, 100% SPP treatments of all Hudson River project area sediment composites were acutely toxic to all three species tested, except for composite HU-D with *M. bahia*. For composite HU-A, the LC_{50}s ranged from 69.8% SPP for *M. galloprovincialis* survival to >100% SPP for *M. bahia*. For composite HU-B, the LC_{50}s ranged from 21.0% SPP for *M. galloprovincialis* survival to 22.7% SPP for *M. bahia*. For composite HU-C, the LC_{50}s ranged from 30.1% SPP for *M. galloprovincialis* survival to 70.1% SPP for *M. bahia*. The LC_{50}s for composite HU-D were all >100% SPP. The EC_{50}s for *M. galloprovincialis* normal development, a more sensitive measure than survival, ranged from <10% SPP (composite HU-B) to 22.4% SPP for HU-D. The LPCs for water-column effects outside of the disposal site boundaries after 4 h are 0.70% SPP for HU-A sediment, 0.21% for HU-B sediment, 0.30% for HU-C sediment, and >1.0% for HU-D sediment. A projection of SPP concentrations exceeding these values after 4 h at the Mud Dump Site boundary would be unacceptable.

Statistically significant acute toxicity was found with all Hudson River project area sediment composites in static renewal tests with *R. abronius*, *M. bahia*, and *E. estuarius*, and the static test with *M. bahia*. Hudson River sediments were acutely toxic and had at least a 20% increase in mortality (10% for mysids) over the reference sediment in static renewal tests with *R. abronius* (HU-A), *E. estuarius* (HU-A, HU-B, HU-C, and HU-D) and the static test with *M. bahia* (HU-A, HU-B, HU-C, and HU-D). Therefore, all sediment composites failed to meet the LPC for benthic toxicity to these test organisms if the observed effects are due to persistent contaminants.

4.3 Bioaccumulation

When *N. virens* and *M. nasuta* were exposed to Hudson River sediment composites in 28-day bioaccumulation tests, concentrations of numerous contaminants were elevated in tissues of both species. Concentrations of metals, PAHs, and PCBs were generally higher in *M. nasuta* than in *N. virens*. Tables 4.1 and 4.2 compare the mean concentrations of selected contaminants found in tissues of each test species with the FDA action levels for poisonous or deleterious substances in fish and shellfish for human consumption for selected pesticides, FDA levels of concern for chronic shellfish consumption for selected metals, and the USACE-NYD bioaccumulation matrix levels. The *N. virens* and *M. nasuta* tissues exposed to Hudson River sediment had tissue body burdens that were lower than the FDA levels for each of these selected contaminants. Concentrations of total PCBs in *M. nasuta* tissues exposed to HU-C and HU-D sediments were 0.127 mg/kg and 0.135 mg/kg, respectively, slightly exceeding the USACE-NYD regional guidance matrix level of 0.10 mg/kg for total PCBs.

Figure 4.1 indicates the number of compounds in each contaminant group that was statistically significantly elevated, and whether the bioaccumulation was a greater than two- but less than fivefold increase over the reference; greater than five- but less than

TABLE 4.1. Comparison of Contaminant Concentrations in *M. nasuta* Tissues Exposed to Proposed Dredged Material from Hudson River Reaches A through D with Federal Guidance Levels for Bioaccumulation

Substance	Guidance Level (mg/kg wet wt)	Mean Concentration[a] in *M. nasuta* Tissues (mg/kg wet wt)			
		HU-A	HU-B	HU-C	HU-D
Chlordane[b]	0.3[c]	0.00021	0.00085	0.00114	0.00037
Total DDT[d]	5.0[c]	0.0174	0.02208	0.0174	0.0118
Dieldrin + Aldrin	0.3[c]	0.00362	0.00386	0.00532	0.00307
Heptachlor + Heptachlor epoxide	0.3[c]	0.00016	0.00016	0.00019	0.00015
Total PCBs[e]	2.0[c]	0.0921	0.0989	0.127	0.135
Arsenic	86[f]	3.36	3.00	3.10	2.96
Cadmium	3.7[f]	0.0380	0.0345	0.0513	0.0290
Chromium	13[f]	0.644	0.629	1.07	0.557
Lead	1.7[f]	1.166	0.971	1.33	0.773
Nickel	80[f]	0.568	0.524	0.699	0.493
Methyl mercury	1.0[f]	0.0287[g]	0.0244[g]	0.0303[g]	0.0240[g]
Total DDT[d]	0.04[h]	0.0174	0.02208	0.0174	0.0118
Total PCBs[e]	0.10[h]	0.0921	0.0989	0.127	0.135
Mercury (total)	0.20[h]	0.0287	0.0244	0.0303	0.0240
Cadmium	0.30[h]	0.0380	0.0345	0.0513	0.0290

(a) Concentration shown is mean of five replicate tissue analyses. If any constituents were undetected, one-half of the detection limit was used in calculation of the mean concentration.
(b) FDA action levels for poisonous and deleterious substances in fish and shellfish for human food.
(c) Values for Hudson River-exposed tissues are sum of α-chlordane and *trans*-nonachlor only, whereas FDA action level is a sum of 9 chlordane analytes.
(d) Sum of mean values for 2,4'-DDT, 4,4'-DDT, 2,4'-DDE, 4,4'-DDE, 2,4'-DDD, and 4,4'-DDD. One-half of the detection limit was used in the summation when mean values were undetected in a replicate. Due to a chromatographic interference, values determined for DDT may be a false positive or biased high.
(e) Total PCBs estimated as (2 X sum of 22 congeners). One-half of the detection limit was used in the summation when mean values were undetected in a replicate.
(f) FDA level of concern for chronic shellfish consumption.
(g) Value is for total mercury.
(h) NYD bioaccumulation matrix value designated in 1981 (USACE 1981).

TABLE 4.2. Comparison of Contaminant Concentrations in *N. virens* Tissues Exposed to Proposed Dredged Material from Hudson River Reaches A through D with Federal Guidance Levels for Bioaccumulaiton

Substance	Guidance Level (mg/kg wet wt)	Mean Concentration[a] in *N. virens* Tissues (mg/kg wet wt) HU-A	HU-B	HU-C	HU-D
Chlordane[b]	0.3[c]	0.00111	0.00222	0.00285	0.00118
Total DDT[d]	5.0[c]	0.0155	0.0149	0.0170	0.0139
Dieldrin + Aldrin	0.3[c]	0.00412	0.00368	0.00440	0.00351
Heptachlor + Heptachlor epoxide	0.3[c]	0.00071	0.00119	0.00170	0.00114
Total PCBs[e]	2.0[c]	0.116	0.249	0.282	0.172
Arsenic	86[f]	2.02	1.97	1.89	1.98
Cadmium	3.7[f]	0.0614	0.0673	0.0625	0.0640
Chromium	13[f]	0.124	0.255	0.130	0.154
Lead	1.7[f]	0.354	0.583	0.313	0.469
Nickel	80[f]	0.111	0.165	0.117	0.118
Methyl mercury	1.0[f]	0.0100[g]	0.0129[g]	0.0095[g]	0.0120[g]
Total DDT[d]	0.04[h]	0.0155	0.0149	0.0170	0.0139
Total PCBs[e]	0.40[h]	0.116	0.249	0.282	0.172
Mercury (total)	0.20[h]	0.0100	0.0129	0.0095	0.0120
Cadmium	0.30[h]	0.0614	0.0673	0.0625	0.0640

(a) Concentration shown is mean of five replicate tissue analyses. If any constituents were undetected, one-half of the detection limit was used in calculation of the mean concentration.
(b) FDA action levels for poisonous and deleterious substances in fish and shellfish for human food.
(c) Values for Hudson River-exposed tissues are sum of α-chlordane and *trans*-nonachlor only, whereas FDA action level is a sum of 9 chlordane analytes.
(d) Sum of mean values for 2,4'-DDT, 4,4'-DDT, 2,4'-DDE, 4,4'-DDE, 2,4'-DDD, and 4,4'-DDD. One-half of the detection limit was used in the summation when mean values were undetected in a replicate. Due to a chromatographic interference, values determined for DDT may be a false positive or biased high.
(e) Total PCBs estimated as (2 X sum of 22 congeners). One-half of the detection limit was used in the summation when mean values were undetected in a replicate.
(f) FDA level of concern for chronic shellfish consumption.
(g) Value is for total mercury.
(h) NYD bioaccumulation matrix value designated in 1981 (USACE 1981).

Acute Toxicity	Sediment Treatment	Hudson River Reach A	Hudson River Reach B	Hudson River Reach C	Hudson River Reach D
Acute Toxicity	*A. abdita* Benthic Static Renewal Test	-[(a)]	-	-	-
	E. estuarius Benthic Static Renewal Test	AT[(b)]	AT	AT	AT
	R. abronius Benthic Static Renewal Test	AT	-	-	-
	M. bahia Benthic Static Renewal Test	-	-	-	-
	M. bahia Benthic Static Test	AT	AT	AT	AT
	M. beryllina SPP Test	S[(c)]	S	S	S
	M. bahia SPP Test	S	S	S	-
	M. galloprovinciallis SPP Test	S	S	S	S

	Test Species[(d)]	*N. virens*	*M. nasuta*	*N. virens*	*M. nasuta*	*N. virens*	*M. nasuta*	*N. virens*	*M. nasuta*
Any Significant Bioaccumulation	# of Metals (9 total)	-	5	-	6	-	7	-	5
	# of Pesticide compounds (15 total)	6	6	4	7	6	6	6	6
	# of PCB congeners (22 total)	15	17	18	12	18	11	14	17
	# of PAH compounds (16 total)	12	16	13	16	7	15	11	15
	1,4-dichlorobenzene	-	-	-	-	-	-	-	-
Bioaccumulaton < 2 times Ref.	# of Metals (9 total)	-	4	-	5	-	5	-	4
	# of Pesticide compounds (15 total)	-	1	-	-	-	-	-	-
	# of PCB congeners (22 total)	-	-	-	-	-	-	-	-
	# of PAH compounds (16 total)	-	-	-	-	2	-	-	-
	1,4-dichlorobenzene	-	-	-	-	-	-	-	-
Bioaccumulaton ≥2<5 times Ref.	# of Metals (9 total)	-	1	-	1	-	2	-	1
	# of Pesticide compounds (15 total)	2	2	-	2	1	1	1	4
	# of PCB congeners (22 total)	5	5	3	4	5	2	5	5
	# of PAH compounds (16 total)	5	3	7	2	3	5	2	3
	1,4-dichlorobenzene	-	-	-	-	-	-	-	-
Bioaccumulaton ≥5<10 times Ref.	# of Metals (9 total)	-	-	-	-	-	-	-	-
	# of Pesticide compounds (15 total)	1	1	1	3	1	1	3	1
	# of PCB congeners (22 total)	4	6	5	3	3	4	2	3
	# of PAH compounds (16 total)	4	-	2	2	2	4	6	2
	1,4-dichlorobenzene	-	-	-	-	-	-	-	-
Bioaccumulaton ≥10 times Ref.	# of Metals (9 total)	-	-	-	-	-	-	-	-
	# of Pesticide compounds (15 total)	3	2	3	2	4	4	2	2
	# of PCB congeners (22 total)	6	6	10	5	10	5	7	9
	# of PAH compounds (16 total)	3	13	4	12	-	6	3	10
	1,4-dichlorobenzene	-	-	-	-	-	-	-	-

(a) - No significant difference/no significant bioaccumulation at this level.
(b) AT Acutely Toxic: Significantly different from reference and mortality at least 20% (at least 10% for mysids) greater than reference.
(c) S Significantly different mortality between 0% and 100% SPP.
(d) Number of compounds bioaccumulating in tissues of test species.

FIGURE 4.1. Summary Matrix of Hudson River Toxicity and Bioaccumulation Potential

tenfold increase over the reference; or a greater than tenfold increase over the reference site treatment. When tissue burdens of organisms exposed to all four Hudson River sediment composites were compared with those exposed to Mud Dump Reference Site sediment, the tissue burdens were significantly higher ($p=0.05$) for metals, pesticides, PCBs, and PAHs. Therefore, Hudson River sediment from Reaches A, B, C, and D requires further evaluation to determine LPC and benthic effects compliance.

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Appendix A

Quality Assurance/Quality Control Data for Sediment Physical/Chemical Analyses, Hudson River Project

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects-2

PARAMETER: Grain Size, Bulk Density, Specific Gravity and Total Solids

LABORATORY: Soil Technology, Bainbridge Island, Washington

MATRIX: Sediment

QA/QC DATA QUALITY OBJECTIVES

	Reference Method	Range of Recovery	SRM Accuracy	Relative Precision	Detection Limit (dry wt)
Grain Size	ASTM D-2217 and D-422	N/A	N/A	≤20%	1.0%
Bulk Density	ASTM D-854	N/A	N/A	≤20%	N/A
Specific Gravity	EM 1110-2-1906	N/A	N/A	≤20%	N/A
Total Solids	Plumb 1981	N/A	N/A	N/A	1.0%

METHOD Grain size was measured for four fractions using a combination of sieve and pipet techniques, following ASTM method D-2217 and D-422 for wet sieving. Bulk density was measured in accordance with ASTM method D-854. Specific gravity was measured in accordance with USACE Method EM 1110-2-1906. Total solids were measured gravimetrically following Plumb (1981).

HOLDING TIMES Samples were analyzed within the 6 month holding time.

DETECTION LIMITS Target detection limits of 1.0% by weight for each fraction were met for all samples.

METHOD BLANKS Not applicable.

MATRIX SPIKES Not applicable.

REPLICATES Six samples were analyzed in triplicate for grain size for the entire set of NY/NJ Federal Projects-2 program. Precision was measured by calculating the relative standard deviation (RSD) among triplicate results. The RSD's ranged from 0% to 10%, indicating acceptable precision. Two samples were analyzed in duplicate for bulk density and specific gravity. Precision was measured by calculating the relative percent difference (RPD) between the replicate results. The RPDs for bulk density were 0% and 2% while the RPDs for specific gravity were both 1%, indicating acceptable precision of the methods.

For total solids, three samples were analyzed in duplicate and four samples were analyzed in triplicate. All RSDs and RPDs were 0%.

QA/QC SUMMARY/GRAIN SIZE, BULK DENSITY, SPECIFIC GRAVITY and TOTAL SOLIDS (continued)

SRMs Not applicable.

REFERENCES

ASTM D-2217. Standard Method for Wet Preparation of Soil Samples for Particle-size Analysis and Determination of Soil Constants.

ASTM D-422. Standard Method for Particle-Size Analysis of Soils.

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QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects-2

PARAMETER: Total Organic Carbon (TOC)

LABORATORY: Global Geochemistry, Canoga Park, California

MATRIX: Sediment

QA/QC DATA QUALITY OBJECTIVES

Reference Method	Range of Recovery	SRM Accuracy	Relative Precision	Detection Limit (dry wt)
EPA 1986	N/A	≤20%	≤10%	0.1%

METHOD TOC was analyzed in accordance with EPA (1986). Analysis was performed by combustion and quantitation of evolved carbon dioxide using a LECO analyzer.

HOLDING TIMES Samples were analyzed within the 6 month holding time.

DETECTION LIMITS Target detection limits of 0.1% was met for all samples.

METHOD BLANKS Thirty-four method blanks were analyzed with the entire set of NY/NJ Federal Projects-2 program sediment samples. TOC levels detected in blanks ranged from 0.001% to 0.008% which were less than the established detection limit.

MATRIX SPIKES Not applicable.

REPLICATES Four samples were analyzed in triplicate and three samples were analyzed in duplicate. Precision was measured by calculating the relative standard deviation (RSD) or relative percent difference (RPD) between the replicate results. All RSDs and RPDs were between 1% and 10% indicating acceptable precision of the method.

SRMs Standard reference material MESS-1, obtained from the National Research Council of Canada, was analyzed at least once per batch of sediment samples. Although MESS-1 is not certified for TOC, accuracy was measured by calculating the percent difference (PD) from the in-house consensus value. PD values reported ranged from 1% to 8%.

REFERENCES

EPA (U.S. Environmental Protection Agency) 1986. Determination of Total Organic Carbon in Sediment. Environmental Protection Agency, Region II, Environmental Services Division, Monitoring Management Branch, Edison, New Jersey.

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects-2

PARAMETER: Metals

LABORATORY: Battelle/Marine Sciences Laboratory, Sequim, Washington

MATRIX: Sediment

QA/QC DATA QUALITY OBJECTIVES

	Reference Method	Range of Recovery	SRM Accuracy	Relative Precision	Achieved Detection Limit (mg/kg dry wt)
Arsenic	ICP/MS	75-125%	≤20%	≤20%	0.572
Cadmium	ICP/MS	75-125%	≤20%	≤20%	0.020
Chromium	ICP/MS	75-125%	≤20%	≤20%	0.401
Copper	ICP/MS	75-125%	≤20%	≤20%	0.525
Lead	ICP/MS	75-125%	≤20%	≤20%	0.136
Mercury	CVAA	75-125%	≤20%	≤20%	0.001
Nickel	ICP/MS	75-125%	≤20%	≤20%	0.849
Silver	ICP/MS	75-125%	≤20%	≤20%	0.119
Zinc	ICP/MS	75-125%	≤20%	≤20%	2.55

METHOD

A total of nine metals was analyzed: silver (Ag), arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), nickel (Ni), lead (Pb) and zinc (Zn). Hg was analyzed using cold-vapor atomic absorption spectroscopy (CVAA) according to the method of Bloom and Crecelius (1983). The remaining metals were analyzed by inductively coupled plasma mass spectrometry (ICP/MS) following EPA Method 200.8 (EPA 1991)

To prepare sediment samples for analysis, samples were freeze-dried and blended in a Spex mixer-mill. Approximately 5 g of mixed sample was ground in a ceramic ball mill. For ICP/MS and CVAA analyses, 0.2- to 0.5-g aliquots of dried homogenous sample were digested using nitric acid following modified EPA Method 200.2 (EPA 1991). Sediment samples initially showed poor matrix spike recovery for Ag. (Refer to Matrix Spike section of this QA/QC Summary.) EPA Method 200.2 was modified by the addition of aqua regia to the digestion procedure and all samples were reanalyzed for Ag.

HOLDING TIMES

Samples were received on 3/30/94 and were logged into Battelle's log-in system. Samples were frozen to -80°C and subsequently freeze dried. Samples were all analyzed within 180 days of collection. The following list summarizes all analysis dates:

Task	Date Performed
Sample Digestion	5/5/94
ICP-MS	5/20/94
CVAA-Hg	5/9/94

DETECTION LIMITS

Target detection limits were exceeded for some metals; however, metals were detected above the MDLs in all samples with the exception of Ag in one sample. MDLs were determined by multiplying the standard deviation of the mean of four replicate low level sediment spikes by 3.5.

METHOD BLANKS

Two method blanks were analyzed. No metals were detected above the MDL in either blank with the exception of Pb in Blank-2. The value was less than three times the MDL and all sample values were detected at levels greater than five times the blank concentration, so no data were flagged. All data were blank corrected.

MATRIX SPIKES

Two samples were spiked with all nine metals. In the original set of matrix spikes, recoveries of all metals, with the exception of Ag, were within the QC limits of 75% to 125%. Recoveries of Ag in the original spikes were low (3% and 10%). After reanalysis of the matrix spikes with the addition of aqua regia to the digestion procedure (see Methods section of this QA/QC Summary), matrix spike recoveries improved (93%) and concentrations of Ag in the dredging site sediments increased slightly. The low recovery of Ag appears to occur in analysis of marine sediment samples having high (in excess of approximately 5 µg/g) Ag concentrations. During the EPA Method 200.2 digestion procedure, a precipitate of AgCl can form with the Ag in the sediment and the Cl in the seawater.

REPLICATES

Two samples were digested and analyzed in triplicate. Precision of triplicate analyses is reported by calculating the relative standard deviation (RSD) between the replicate results. RSD values ranged from 1% to 5%, within the QC limits of ±20%, indicating acceptable precision.

SRM

Standard Reference Material (SRM) 1646 (estuarine sediment from the National Institute of Standards and Technology [NIST]), was analyzed for all metals. Only results for Cd, Cu and Hg were within ±20% of the certified value (Ag is not certified). Results for As, Ni, and Pb were between 20 and 30% of the certified values. The poorest result was with Cr, where the mean was 46% of the certified value. Values for the remaining metals were low because the digestion method used is not as strong as the method (perchloric acid) used to certify the SRM; thus, the results of this analysis should not be expected to match the SRM certified values. Therefore, no corrective actions were taken.

REFERENCES

Bloom, N. S., and E.A. Crecelius. 1983. "Determination of Mercury in Seawater at Sub-Nanogram per Liter Levels." *Mar. Chem.* 14:49-59.

EPA (U.S. Environmental Protection Agency). 1991. *Methods for the Determination of Metals in Environmental Samples.* EPA-600/4-91-010. Environmental Services Division, Monitoring Management Branch., Washington D.C.

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects-2

PARAMETER: Additional Metals

LABORATORY: Battelle/Marine Sciences Laboratory, Sequim, Washington

MATRIX: Sediment

QA/QC DATA QUALITY OBJECTIVES

	Reference Method	Range of Recovery	SRM Accuracy	Relative Precision	Achieved Detection Limit (mg/kg dry wt)
Antimony	ICP/MS	75-125%	≤20%	≤20%	0.03
Beryllium	ICP/MS	75-125%	≤20%	≤20%	0.5
Selenium	GFAA	75-125%	≤20%	≤20%	0.13
Thallium	ICP/MS	75-125%	≤20%	≤20%	0.024

METHOD

An additional four metals were analyzed for a subset of sediment samples: Antimony (Sb), Beryllium (Be), Selenium (Se) and Thallium (Tl).

To prepare sediment samples for analysis, samples were freeze-dried and blended in a Spex mixer-mill. Approximately 5 g of mixed sample was ground in a ceramic ball mill. For inductively coupled plasma mass spectrometry (ICP/MS) and graphite furnace atomic absorption (GFAA) analyses, 0.2- to 0.5-g aliquots of dried homogenous sample were digested according to EPA Method 200.2 (EPA 1991), modified by the addition of aqua regia to the digestion procedure. Se was analyzed using GFAA. The other three metals were analyzed by ICP/MS following EPA Method 200.8 (EPA 1991).

HOLDING TIMES

Samples were received on 3/30/94 and was logged into Battelle's log-in system. Samples were frozen to -80°C and subsequently freeze-dried. According to instructions from the program manager, 21 samples were composited into 8 samples. A subset of 17 samples (the Port Chester and Eastchester sediment composites) were analyzed for an additional four metals as requested in a memo from the program manager dated 1/11/95. The following list summarizes all analysis dates:

Task	Date Performed
Aqua Regia	2/1/95
ICP/MS - Sb, Be, Tl	3/7/95
GFAA - Se	2/7/95

DETECTION LIMITS

Target detection limits were met for Sb, Se, and Tl. The detection limit (DL) for Be exceeds the target detection limit. However, all but three values were greater than the estimated DL and these values were flagged with a J to indicate an estimation.

METHOD BLANKS Two method blanks were analyzed. Only Sb was detected in one of the blanks; however, the values were less than three times the MDL and all sample values were detected at levels greater than five times the blank concentration. Therefore, no data were flagged and all data were blank corrected.

MATRIX SPIKES One sample was spiked with all four metals. Recoveries of all metals except Sb (228%) were within the QC limits of 75% to 125%.

REPLICATES One sample was digested and analyzed in triplicate. Precision for triplicate analyses is reported by calculating the relative standard deviation (RSD) between replicate results. RSD values ranged from 2% to 12%, which is within the QC limits of ±20%, indicating acceptable precision.

SRM SRM 1646 (estuarine sediment from the National Institute of Standards and Technology [NIST]), was analyzed for all metals. None of the four additional metals are certified. However, non-certified values are reported and all four metals, with the exception of one replicate for Sb, are within 39% of the non-certified values.

REFERENCES

EPA (U.S. Environmental Protection Agency). 1991. *Methods for the Determination of Metals in Environmental Samples.* EPA-600/4-91-010. Environmental Services Division, Monitoring Management Branch, Washington D.C.

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects-2

PARAMETER: Chlorinated Pesticides, PCB Congeners, and 1,4-Dichlorobenzene

LABORATORY: Battelle Ocean Sciences, Duxbury, Massachusetts

MATRIX: Sediment

QA/QC DATA QUALITY OBJECTIVES

Reference Method	MS Recovery	Surrogate Recovery	SRM Accuracy	Relative Precision	Detection Limit (dry wt)
GC/ECD	50-120%	30-150%	≤30%	≤30%	1.0 - 20 ng/g

METHOD

Sediment samples were extracted with methylene chloride according to a modified version of EPA Method 8080 and the National Oceanic and Atmospheric Administration (NOAA) Status and Trends cleanup procedure (Krahn et al. 1988). Extracts were analyzed using gas chromatography with electron capture detection (GC/ECD) following a modified version of EPA Method 8270. Pesticide detections were qualitatively confirmed on a secondary column.

HOLDING TIMES

Samples were collected from 3/22/94 through 3/25/94, and after compositing, were held frozen at -20°C until shipment to the analytical laboratory. Sediment samples were received by Battelle Ocean Sciences on 4/22/94. Samples were held frozen at -20°C until extraction and analysis. Samples were extracted by 5/6/94 and analyzed from 6/2/94 to 6/29/94.

DETECTION LIMITS

Target detection limits were exceeded for most of the analytes. Actual detection limits were determined by the Method Detection Limit (MDL) verification study. Four sediment samples with very low background concentrations of contaminants were spiked with target compounds. For each analyte, the standard deviation of the four spiked replicates was multiplied by 3.5.

METHOD BLANKS

One method blank was extracted with batch of samples. No pesticides or PCB congeners were detected in the blank.

SURROGATES

Two compounds, DBOFB and PCB congener 112, were added to all samples prior to extraction to assess the efficiency of the analysis. The mean recoveries of DBOFB and PCB 112 were 71% and 60%, respectively. Recoveries of these compounds were within the QC guidelines of 30% -150% for all samples analyzed.

MATRIX SPIKES

One sample in each batch was spiked with pesticides and PCB congeners. Recoveries for PCB congener CL_2 (25% and 47%) fell below the acceptable criteria of 50% to 120%. The reason for this low recovery is probably that the PCB congener CL_2 coeluted with alpha-BHC. All other PCB congener recoveries ranged from 54% to 121%. Recoveries for all pesticides and 1,4-dichlorobenzene ranged from 57% to 115%. Since >80% of all analytes were between 50% and 120%, no corrective action was taken.

QA/QC SUMMARY/CHLORINATED PESTICIDES and PCB CONGENERS (continued)

REPLICATES

One sample from each batch was extracted in triplicate. Precision was measured by calculating the relative standard deviation (RSD) between the replicate results. RSDs were evaluated only when pesticides or PCB congeners were detected in all three replicates. RSDs ranged from 5% to 114%. Six of the RSDs were greater than 30% but of those six, only three were for analytes that were >10 times the MDL. These three were 31% for CL_3(18), 114% for CL_5(105) and 52% for CL_6(138).

SRMs

One SRM, 1941a, a marine sediment sample obtained from the National Institute of Science and Technology (NIST) was analyzed with each batch. Many of the values exceeded the acceptable criteria of ≤30%; however all were <10 times the MDL. Percent differences were calculated using SRM concentrations that were corrected for surrogate recovery.

REFERENCES

Krahn, M.M., C.A. Wigren, R.W. Pearce, L.K. Moore, R.G. Bogar, W.D. MacLeod, Jr., S-L Chan, and D.W. Brown. 1988. *New HPLC Cleanup and Revised Extraction Procedures for Organic Contaminants.* NOAA Technical Memorandum NMFS F/NWC-153. National Oceanic and Atmospheric Administration, National Marine Fisheries, Seattle, Washington.

EPA (U.S. Environmental Protection Agency). 1986. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.* SW-846. U.S. Document No. 955-001-00000, U.S. Environmental Protection Agency, Washington D.C.

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects-2

PARAMETER: Polynuclear Aromatic Hydrocarbons (PAH)

LABORATORY: Battelle Ocean Sciences, Duxbury, Massachusetts

MATRIX: Sediment

QA/QC DATA QUALITY OBJECTIVES

Reference Method	MS/MSD Recovery	Surrogate Recovery	SRM Accuracy	Relative Precision	Detection Limit (dry wt)
GC/MS/SIM	50-120%	30-150%	≤30%	≤30%	10 ng/g

METHOD

Sediment samples were extracted according to a modified version of EPA Method 8080 and the NOAA Status and Trends cleanup procedure (Krahn et al. 1988). Extracts were analyzed using gas chromatography/mass spectrometry (GC/MS) in the selected ion mode (SIM) following a modified version of EPA Method 8270.

HOLDING TIMES

Samples were collected from 3/22/94 through 3/25/94, and after compositing, were held frozen at -20°C until shipment to the analytical laboratory. Sediment samples were received by Battelle Ocean Sciences, Duxbury, Massachusetts, on 4/22/94. Samples were held frozen at approximately -20°C until extraction and analysis. Samples were extracted by 5/6/94 and analyzed from 5/16/94 to 6/28/94.

DETECTION LIMITS

Target detection limits of 10 ng/g dry weight were met for most of the PAH compounds. Actual detection limits were determined by the Method Detection Limit (MDL) verification study. Four sediment samples with very low background concentrations of contaminants were spiked with target compounds. For each analyte, the standard deviation of the four spiked replicates was multiplied by 3.5. Actual detection limits ranged from 7.18 to 20.84 µg/kg.

METHOD BLANKS

One method blank was extracted with each batch of samples. No PAH compounds were detected above the MDL; however, 2 of the 17 compounds were detected below the MDL and are flagged with a "J" to indicate the values are estimates. They are pyrene in Batch 1 and naphthalene in Batch 2.

SURROGATES

Three isotopically labelled compounds were added prior to extraction to assess the efficiency of the method. These were naphthalene-d_8, acenaphthene-d_{10}, and chrysene-d_{12}. Recoveries of surrogates were within the quality control limits of 30% -150% with one exception. For Batch 1, mean recoveries of naphthalene-d_8, acenaphthene-d_{10}, and chrysene-d_{12} were 52%, 59%, and 48%, respectively. In one sample, recovery of chrysene-d_{12} was 28%. For Batch 2, mean recoveries of naphthalene-d_8, acenaphthene-d_{10}, and chrysene-d_{12} were 62%, 64%, and 57%, respectively.

QA/QC SUMMARY/PAHs (continued)

MATRIX SPIKES

One sample was spiked with all PAH compounds for each batch. Matrix spike recoveries for all analytes in Batch 2 ranged from 57% to 67%. Matrix spike recoveries for all analytes in Batch 1 ranged from 26% to 73%. Six of the analytes in Batch 1 fell outside the acceptable ranges of 50% to 120%. They are 48% for fluoranthene; 47% for pyrene; 44% for benzo[a]anthracene; 38% for chrysene; 26% for benzo[b]fluoranthene; and 32% for benzo[a]pyrene. These PAHs were present at naturally elevated levels in the background sample. A blank spike was prepared with this batch and had acceptable recoveries for all target PAHs. As a result, it appears that the failure of selected PAHs to meet the recovery criteria is related to the sediment sample. The recoveries of PAHs in the MS sample for Batch 2 met the acceptance criteria.

REPLICATES

One sample was extracted in triplicate for each batch. Precision was measured by calculating the relative standard deviation (RSD) between the replicate results. The RSDs ranged from 1% to 20%, within the target precision goal of ≤30%.

SRMs

One SRM,1941a, a marine sediment sample obtained from the National Institute of Standards and Technology, was analyzed with each batch of samples. Twelve of the 17 PAH compounds analyzed are certified at levels above the MDLs. Of these, all compounds were detected within 30% of the certified mean, with the exception of chrysene (58% and 73%), benzo[b]fluoranthene (32% and 45%), and dibenz[a,h]anthracene (63% and 40%) in both batches. Percent differences were calculated using SRM concentrations that were corrected for surrogate recovery.

REFERENCES

Krahn, M.M., C.A. Wigren, R.W. Pearce, L.K. Moore, R.G. Bogar, W.D. MacLeod, Jr., S-L Chan, and D.W. Brown. 1988. *New HPLC Cleanup and Revised Extraction Procedures for Organic Contaminants.* NOAA Technical Memorandum NMFS F/NWC-153. National Oceanic and Atmospheric Administration, National Marine Fisheries, Seattle, Washington.

EPA (U.S. Environmental Protection Agency). 1986. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.* SW-846. U.S. Document No. 955-001-00000, U.S. Environmental Protection Agency, Washington D.C.

TABLE A.1. Quality Assurance/Quality Control Data for Grain Size Analysis

Sediment Treatment	Gravimetric Water Content (%)	Batch No.	Total Percent (dry weight) Gravel >2000 μm	Sand 62.4-2000 μm	Silt 3.9-62.4 μm	Clay <3.9 μm
R-CLIS, Replicate 1	109	1	0	6	59	35
R-CLIS, Replicate 2	109	1	0	6	60	34
R-CLIS, Replicate 3	109	1	0	6	60	34
RSD			NA[(a)]	0%	1%	2%
EC-8, Replicate 1	151	2	0	21	39	40
EC-8, Replicate 2	151	2	0	20	40	40
EC-8, Replicate 3	151	2	1	21	38	40
RSD			NA	3%	3%	0%
HU-2, Replicate 1	124	3	1	18	47	34
HU-2, Replicate 2	124	3	0	19	47	34
HU-2, Replicate 3	124	3	2	18	47	33
RSD			NA	3%	0%	2%
HU-22, Replicate 1	139	4	0	16	48	36
HU-22, Replicate 2	139	4	0	16	48	36
HU-22, Replicate 3	139	4	0	15	47	38
RSD			NA	4%	1%	3%
BU-2, Replicate 1	171	5	0	13	42	45
BU-2, Replicate 2	171	5	0	13	40	47
BU-2, Replicate 3	171	5	0	14	41	45
RSD			NA	4%	2%	3%
BC-4, Replicate 1	222	6	0	15	55	30
BC-4, Replicate 2	222	6	0	14	56	30
BC-4, Replicate 3	222	6	0	17	55	28
RSD			NA	10%	1%	4%

(a) NA Not applicable.

TABLE A.2. Quality Assurance/Quality Control Data for Analysis of Specific Gravity and Bulk Density

Sediment Treatment	Replicate	Sample ID	Batch	Bulk Density Wet lbs/cu ft	Bulk Density Dry lbs/cu ft	Specific Gravity
COMP HU-C	1	NY2-GRA-17	1	92	45	2.61
COMP HU-C	2	NY2-GRA-17	1	ND[a]	ND	2.64
RPD				NA[b]	NA	1%
I-Stat				NA	NA	0.01
COMP SB-A	1	NY2-GRA-1	1	83	30	2.58
COMP SB-A	2	NY2-GRA-1	1	83	30	2.56
RPD				0%	0%	1%
I-Stat				0.00	0.00	0.00
COMP GR	1	NY2-GRA-9	1	116	94	2.67
COMP GR	2	NY2-GRA-9	1	118	96	ND
RPD				2%	2%	NA
I-Stat				0.01	0.01	NA

(a) ND No data; not tested.
(b) NA Not applicable.

TABLE A.3. Quality Assurance/Quality Control Data for Analysis of TOC and Percentage of Moisture

Sediment Treatment	Batch No.	TOC (% dry wt.)
Method Blanks		
Blank-1	1	0.003
Blank-2	1	0.001
Blank-1	2	0.003
Blank-2	2	0.003
Blank-1	3	0.003
Blank-2	3	0.002
Blank-3	3	0.003
Blank-4	3	0.003
Blank-5	3	0.002
Blank-1	4	0.005
Blank-2	4	0.008
Blank-3	4	0.002
Blank-4	4	0.002
Blank-5	4	0.004
Blank-6	4	0.004
Blank-1	5	0.003
Blank-2	5	0.002
Blank-3	5	0.002
Blank-4	5	0.004
Blank-5	5	0.004
Blank-1	6	0.001
Blank-2	6	0.002
Blank-3	6	0.002
Blank-4	6	0.002
Blank-5	6	0.002
Blank-6	6	0.005
Blank-7	6	0.004
Blank-8	6	0.004
Blank-9	6	0.004
Blank-10	6	0.006
Blank-11	6	0.004
Blank-12	6	0.002
Blank-13	6	0.002
Blank-14	6	0.002

TABLE A.3. (contd)

Sediment Treatment	Batch No.	TOC (% dry wt.)	Percent Difference[(a)]
Standard Reference Material			
Non-certified Value		2.6	
SRM MESS-1	1	2.49	4%
SRM MESS-1	2	2.44	6%
SRM MESS-1	2	2.62	1%
SRM MESS-1	3	2.56	2%
SRM MESS-1	4	2.42	7%
SRM MESS-1	5	2.40	8%
SRM MESS-1	6	2.40	8%
SRM MESS-1	6	2.39	8%
SRM MESS-1	6	2.45	6%
MESS-1Y	6	2.47	
MESS-1Y, Duplicate	6	2.48	
RPD			0%

TABLE A.3. (contd)

Sediment Treatment	Batch No.	TOC (% dry wt.)	Total Percent Solids
Analytical Replicates			
EC-2, Replicate 1	1	1.02	66
EC-2, Replicate 2	1	1.13	66
RPD		10%	0%
GR-1, Replicate 1	1	0.12	80
GR-1, Replicate 2	1	0.13	80
RPD		8%	0%
EC-3, Replicate 1	2	1.26	75
EC-3, Replicate 2	2	1.23	75
EC-3, Replicate 3	2	1.31	75
RSD		3%	0%
HU-1, Replicate 1	3	3.17	53
HU-1, Replicate 2	3	3.13	53
HU-1, Replicate 3	3	3.30	53
RSD		3%	0%
HU-21, Replicate 1	4	3.26	44
HU-21, Replicate 2	4	3.19	44
HU-21, Replicate 3	4	3.15	44
RSD		2%	0%
HU-39, Replicate 1	5	1.95	52
HU-39, Replicate 2	5	1.95	52
HU-39, Replicate 3	5	1.88	52
RSD		2%	0%
BU-4, Replicate 1	6	3.42	37
BU-4, Replicate 2	6	3.44	37
RPD		1%	0%

(a) Percent Difference between results obtained from analysis of SRM MESS-1 and non-certified value of 2.6%. SRM MESS-1 is not certified for TOC, but according to historical analyses from Battelle's records, the estimated value is 2.6% TOC.

TABLE A.4. Quality Assurance/Quality Control Data for Metals in Sediment

Sediment Treatment	Batch	Metals (µg/g dry wt)									
		Ag (ICP/MS)	Ag (ICP/Aqua)	As	Cd	Cr	Cu	Hg	Ni	Pb	Zn
Method Blanks											
Blank-1	1	0.119 U[a]	0.131	0.572 U	0.020	0.401 U	0.525 U	0.001 U	0.849 U	0.14 U	2.55 U
Blank-2	1	0.119 U	0.119 U	0.572 U	0.020	0.401 U	0.525 U	0.001 U	0.849 U	0.41	2.55 U
Blank-3	1	NA[b]	NA	NA	NA	NA	NA	0.001 U	NA	NA	NA
Mean blank		NA	NA	NA	NA	NA	NA	NA	NA	0.2	NA
Standard Reference Material											
Certified value		NC[c]	NC	11.6	0.36	76	18	0.063	32	28.2	138
Range		NC	NC	±1.3	±0.07	±3	±3	±0.012	±3	±1.8	±6
SRM 1646	1	0.119 U	0.275	8.72	0.331	42.7	16.4	0.074	25.4	22.7	93.6
SRM 1646	1	0.119 U	0.136	8.89	0.350	39.9	16.1	0.079	23.5	22.4	90.6
SRM 1646	1	NA	NA	NA	NA	NA	NA	0.077	NA	NA	NA
SRM 1646	1	NA	NA	NA	NA	NA	NA	0.070	NA	NA	NA
Percent Difference		NA	NA	25%[d]	8%	44%[d]	9%	17%	21%[d]	20%	32%[d]
Percent Difference		NA	NA	23%[d]	3%	48%[d]	11%	25%[d]	27%[d]	21%[d]	34%[d]
Percent Difference		NA	NA	NA	NA	NA	NA	22%[d]	NA	NA	NA
Percent Difference		NA	NA	NA	NA	NA	NA	11%	NA	NA	NA
Matrix Spike Results											
EC-11/CT COMP EC-B-II	1	2.91	3.38	11.1	4.15	104	250	1.21	44.1	322	379
EC-11/CT COMP EC-B-II MS	1	4.85	22.0	192	21.4	589	696	11.4	135	840	1140
Concentration Recovered		1.94	18.6	181	17.3	485	446	10.2	90.9	518	761
Amount Spiked		20.0	20.0	200	20.0	500	500	10.0	100	500	1000
Percent Recovery		10%[e]	93%	90%	86%	97%	89%	102%	91%	104%	76%

TABLE A.4. (contd)

Sediment Treatment	Batch	Metals (µg/g dry wt) Ag (ICP/MS)	Ag (ICP/Aqua)	As	Cd	Cr	Cu	Hg	Ni	Pb	Zn
COMP HU-C	1	6.22	7.02	15.2	4.06	169	174	2.55	40.0	194	252
COMP HU-C, MS	1	6.85	25.6	193	21.4	656	612	12.1	125	715	1010
Concentration Recovered		0.63	18.6	178	17.3	487	438	9.55	85.0	521	758
Amount Spiked		20.0	20.0	200	20.0	500	500	10.0	100	500	1000
Percent Recovery		3% (e)	93%	89%	87%	97%	88%	96%	85%	104%	76%
Analytical Replicates											
EC-11/CT COMP EC-B-II, Re	1	2.78	3.36	10.9	4.26	102	248	1.27	44.6	322	375
EC-11/CT COMP EC-B-II, Re	1	3.05	3.44	11.3	4.04	107	254	1.18	44.6	333	383
EC-11/CT COMP EC-B-II, Re	1	2.91	3.33	11.1	4.15	103	248	1.19	43.1	312	378
RSD		5%	2%	2%	3%	3%	1%	4%	2%	3%	1%
COMP HU-C, Replicate 1	1	6.10	7.05	15.2	4.05	171	174	2.57	40.3	196	247
COMP HU-C, Replicate 2	1	6.05	7.03	15.5	4.11	167	173	2.66	39.4	193	253
COMP HU-C, Replicate 3	1	6.51	6.98	15.0	4.02	170	175	2.42	40.3	194	257
RSD		4%	1%	2%	1%	1%	1%	5%	1%	1%	2%

(a) U Undetected at or above given concentration.
(b) NA Not applicable.
(c) NC Not certified.
(d) Outside quality control criteria (±20%) for SRMs.
(e) Outside quality control criteria (75-125%) for matrix spike recoveries.

TABLE A.5. Quality Control Data for 1,4-Dichlorobenzene, Pesticides, and PCB Congeners in Sediment

Batch:	1	MATRIX SPIKE 1	1	1	1	1	1
Treatment:	Blank	EC-10	EC-10, MS	Concentration Recovered	Amount Spiked	Concentration Spiked	Percent Recovery
Sample Size (g)	9.076 [a]	6.689	2.289	NA[b]	NA	NA	
Units (dry wt) :	µg/kg	µg/kg	µg/kg	µg/kg	ng	µg/kg	
1,4-Dichlorobenzene	1.19 U[c]	84.46	510.36	425.91	1425	623	68
2,4-DDD	0.97 U	16.57	18.72	2.15	NS [d]	NS	NA
2,4-DDT	0.91 U	NA	NA	NA	NS	NS	NA
4,4-DDD	1.56 U	53.31	154.73	101.42	201.0	88	115
4,4-DDE	2.29 U	38.55	117.11	78.56	200.5	88	90
4,4-DDT	5.19 U	2.19 J[e]	74.76	72.56	200.5	88	83
Aldrin	0.87 U	1.18 U	58.05	58.05	200.5	88	66
alpha-Chlordane	1.27 U	14.46	85.02	70.56	200.5	88	81
Dieldrin	1.85 U	8.52	66.86	58.34	200.0	87	67
Endosulfan I /2,4-DDE	2.39 U	3.24 U	73.57	73.57	200.5	88	84
Endosulfan II	1.78 U	2.42 U	72.03	72.03	200.5	88	82
Endosulfan Sulfate	1.68 U	2.28 U	86.48	86.48	200.5	88	99
Endrin[f]	3.24 U	4.40 U	78.26	78.26	200.5	88	90
Endrin Aldehyde[f]	1.93 U	2.62 U	66.18	66.18	200.0	87	76
Heptachlor	1.96 U	2.65 U	87.96	87.96	200.5	88	100
Heptachlor Epoxide	1.09 U	1.47 U	81.04	81.04	200.5	88	93
alpha-BHC[f]	1.21 U	0.28 J	69.22	68.94	200.5	88	79
beta-BHC[f]	0.09 J	2.42 U	64.97	64.97	200.5	88	74
delta-BHC[f]	1.20 J	2.20 U	68.21	68.21	200.5	88	78
Lindane[f]	0.33 J	1.92 U	72.05	72.05	200.5	88	82
Methoxychlor[f]	2.03 U	2.75 U	94.68	94.68	200.0	87	108
Toxaphene[f]	61.41 U	83.32 U	NA	NA	NS	NS	NA
trans-Nonachlor	1.86 U	7.45	5.57	5.57	NS	NS	NA
CL2(08)	4.38 U	6.47	28.20	21.74	200.00	87	25 [g]
CL3(18)	2.78 U	26.86	98.05	71.18	200.00	87	81
CL3(28)	1.83 U	42.91	148.46	105.55	200.00	87	121 [g]
CL4(44)	2.65 U	43.52	118.73	75.21	200.00	87	86
CL4(49)	1.66 U	34.91	44.50	9.60	NS	NS	NA
CL4(52)	1.54 U	51.61	122.53	70.92	200.00	87	81
CL4(66)	1.45 U	59.60	158.19	98.58	200.00	87	113
CL5(87)	0.88 U	13.96	15.20	1.24	NS	NS	NA
CL5(101)	0.74 U	33.21	98.14	64.93	200.00	87	74
CL5(105)	0.49 U	12.92	85.99	73.07	200.00	87	84
CL5(118)	1.30 U	28.18	87.87	59.69	200.00	87	68
CL6(128)	1.38 U	5.45	82.99	77.54	200.00	87	89
CL6(138)	1.19 U	31.64	101.08	69.45	200.00	87	79
CL6(153)	5.77 U	26.37	91.20	64.83	200.00	87	74
CL7(170)	1.46 U	17.20	88.02	70.82	200.00	87	81
CL7(180)	0.98 U	31.37	96.83	65.45	200.00	87	75
CL7(183)	1.09 U	4.97	NA	NA	NS	NS	NA
CL7(184)	1.09 U	0.49 J	NA	NA	NS	NS	NA
CL7(187)	0.82 U	15.44	70.69	55.25	200.00	87	63
CL8(195)	1.24 U	6.36	76.77	70.41	200.00	87	81
CL9(206)	1.90 U	14.96	90.94	75.98	200.00	87	87
CL10(209)	1.18 U	9.42	90.27	80.85	200.00	87	93
Surrogate Recoveries (%)							
DBOFB	73	82	86	NA	NA	NA	NA
CL5(112)	64	55	67	NA	NA	NA	NA

TABLE A.5. (contd)

		MATRIX SPIKE					
Batch:	2	2	2	2	2	2	2
Treatment:	Blank	R-MUD	R-MUD, MS	Concentration Recovered	Amount Spiked	Concentration Spiked	
Sample Size (g)	8.542[a]	13.660	13.220	NA	NA	NA	Percent
Units (dry wt):	µg/kg	µg/kg	µg/kg	µg/kg	ng	µg/kg	Recovery
1,4-Dichlorobenzene	1.27 U	0.79 U	61.78	61.78	1425.00	108	57
2,4-DDD	1.04 U	0.01 J	NA	NA	NS	NS	NA
2,4-DDT	0.97 U	0.60 U	NA	NA	NS	NS	NA
4,4-DDD	1.65 U	0.06 J	11.72	11.66	201.00	15	77
4,4-DDE	2.43 U	0.01 J	10.08	10.07	200.50	15	66
4,4-DDT	5.51 U	3.45 U	10.99	10.99	200.50	15	72
Aldrin	0.93 U	0.58 U	11.35	11.35	200.50	15	75
alpha-Chlordane	1.35 U	0.01 J	11.39	11.39	200.00	15	75
Dieldrin	1.97 U	0.21 J	11.34	11.13	200.50	15	73
Endosulfan I /2,4-DDE	2.54 U	1.59 U	13.52	13.52	200.50	15	89
Endosulfan II	1.89 U	0.05 J	13.24	13.19	200.50	15	87
Endosulfan Sulfate	1.79 U	1.12 U	10.86	10.86	200.50	15	72
Endrin[f]	NA	NA	NA	NA	NS	NS	NA
Endrin Aldehyde[f]	NA	NA	NA	NA	NS	NS	NA
Heptachlor	2.08 U	1.30 U	10.27	10.27	200.50	15	68
Heptachlor Epoxide	1.15 U	0.72 U	10.60	10.60	200.50	15	70
alpha-BHC[f]	NA	NA	NA	NA	NS	NS	NA
beta-BHC[f]	NA	NA	NA	NA	NS	NS	NA
delta-BHC[f]	NA	NA	NA	NA	NS	NS	NA
Lindane[f]	NA	NA	NA	NA	NS	NS	NA
Methoxychlor[f]	NA	NA	NA	NA	NS	NS	NA
Toxaphene[f]	NA	NA	NA	NA	NS	NS	NA
trans-Nonachlor	1.98 U	0.00 J	NA	NA	NS	NS	NA
CL2(08)	4.65 U	2.91 U	7.05	7.05	200.00	15	47 [g]
CL3(18)	2.95 U	1.85 U	8.12	8.12	200.00	15	54
CL3(28)	1.94 U	1.21 U	10.03	10.03	200.00	15	66
CL4(44)	2.82 U	0.22 J	10.29	10.07	200.00	15	67
CL4(49)	1.76 U	0.04 J	NA	NA	NS	NS	NA
CL4(52)	1.63 U	0.06 J	9.91	9.85	200.00	15	65
CL4(66)	1.54 U	0.04 J	10.43	10.39	200.00	15	69
CL5(87)	0.93 U	0.05 J	NA	NA	NS	NS	NA
CL5(101)	0.78 U	0.04 J	10.27	10.23	200.00	15	68
CL5(105)	0.52 U	0.03 J	9.12	9.09	200.00	15	60
CL5(118)	1.38 U	0.02 J	9.25	9.23	200.00	15	61
CL6(128)	1.46 U	0.92 U	9.42	9.42	200.00	15	62
CL6(138)	1.26 U	0.07 J	9.36	9.29	200.00	15	61
CL6(153)	6.13 U	0.03 J	8.56	8.53	200.00	15	56
CL7(170)	1.55 U	0.97 U	9.26	9.26	200.00	15	61
CL7(180)	1.04 U	0.65 U	9.32	9.32	200.00	15	62
CL7(183)	1.15 U	0.72 U	NA	NA	NS	NS	NA
CL7(184)	1.15 U	0.01 J	NA	NA	NS	NS	NA
CL7(187)	0.87 U	0.01 J	9.28	9.27	200.00	15	61
CL8(195)	1.32 U	0.83 U	9.35	9.35	200.00	15	62
CL9(206)	2.02 U	1.26 U	9.13	9.13	200.00	15	60
CL10(209)	1.26 U	0.79 U	9.41	9.41	200.00	15	62
Surrogate Recoveries (%)							
DBOFB	66	65	69	NA	NA	NA	
CL5(112)	72	49	64	NA	NA	NA	

TABLE A.5. (contd)

	STANDARD REFERENCE MATERIAL					
Batch:	1	1	1	2	2	2
Treatment:	SRM NIST 1941a	Certified Value	Percent Difference[h]	SRM NIST 1941a	Certified Value	Percent Difference
Sample Size (g)	5.133			5.057		
Units (dry wt):	µg/kg	µg/kg		µg/kg	µg/kg	
1,4-Dichlorobenzene	NA	NC[i]	NA	NA	NC	NA
2,4-DDD	NA	NC	NA	NA	NC	NA
2,4-DDT	NA	NC	NA	NA	NC	NA
4,4-DDD	2.56 J	5.06	4	NA	NC	NA
4,4-DDE	3.46 J	6.59	8	4.86	5.06	103
4,4-DDT	NA	NC	NA	3.16 J	6.59	1
Aldrin	NA	NC	NA	NA	NC	NA
alpha-Chlordane	1.01 J	2.33	44	NA	NC	NA
Dieldrin	NA	NC	NA	1.06 J	2.33	14
Endosulfan I /2,4-DDE	C[j]	0.73	NA	NA	NC	NA
Endosulfan II	NA	NC	NA	ND	0.73	NA
Endosulfan Sulfate	NA	NC	NA	NA	NC	NA
Endrin[f]	NA	NC	NA	NA	NC	NA
Endrin Aldehyde[f]	NA	NC	NA	NA	NC	NA
Heptachlor	NA	NC	NA	NA	NC	NA
Heptachlor Epoxide	NA	NC	NA	NA	NC	NA
alpha-BHC[f]	NA	NC	NA	NA	NC	NA
beta-BHC[f]	NA	NC	NA	NA	NC	NA
delta-BHC[f]	NA	NC	NA	NA	NC	NA
Lindane[f]	NA	NC	NA	NA	NC	NA
Methoxychlor[f]	NA	NC	NA	NA	NC	NA
Toxaphene[f]	NA	NC	NA	NA	NC	NA
trans-Nonachlor	0.39 J	1.26	61	0.60 J	1.26	10
CL2(08)	NA	NC	NA	NA	NC	NA
CL3(18)	NA	NC	NA	NA	NC	NA
CL3(28)	NA	NC	NA	NA	NC	NA
CL4(44)	3.88 J	4.80	4	3.92 J	4.80	54
CL4(49)	3.03	9.50	59	3.14 J	9.50	38
CL4(52)	3.20	6.89	40	3.89	6.89	6
CL4(66)	7.11	6.80	34	6.07	6.80	68
CL5(87)	1.45 J	6.70	55	1.72	6.70	46
CL5(101)	9.02	11.00	5	6.94	11.00	19
CL5(105)	1.18	3.65	33	1.05	3.65	39
CL5(118)	3.29	10.00	32	3.55	10.00	25
CL6(128)	3.07	1.87	238	1.82 J	1.87	106
CL6(138)	4.96	13.38	24	6.05	13.38	4
CL6(153)	5.21 J	17.60	39	5.21 J	17.60	37
CL7(170)	4.82	3.00	230	C	3.00	NA
CL7(180)	5.47	5.83	93	5.10	5.83	85
CL7(183)	NA	NC	NA	NA	NC	NA
CL7(184)	NA	NC	NA	NA	NC	NA
CL7(187)	NA	NC	NA	NA	NC	NA
CL8(195)	NA	NC	NA	NA	NC	NA
CL9(206)	C	3.67	NA	2.93 J	3.67	69
CL10(209)	7.52	8.34	85	5.26	8.34	33
Surrogate Recoveries (%)						
DBOFB	78	NA	NA	53	NA	NA
CL5(112)	49	NA	NA	47	NA	NA

TABLE A.5. (contd)

	TRIPLICATE ANALYSES							
Batch:	1	1	1		2	2	2	
Treatment:	EC-15 Replicate 1	EC-15 Replicate 2	EC-15 Replicate 3		GR-10 Replicate 1	GR-10 Replicate 2	GR-10 Replicate 3	
Sample Size (g)	9.854	9.442	9.339		8.182	8.594	8.657	
Units (dry wt) :	μg/kg	μg/kg	μg/kg	RSD(%)	μg/kg	μg/kg	μg/kg	RSD(%)
1,4-Dichlorobenzene	10.65	8.00	7.52	19	17.73	25.25	19.82	19
2,4-DDD	10.32	13.52	10.13	17	6.58	9.27	6.64	21
2,4-DDT	0.84 U	0.87 U	0.88 U	NA	1.01 U	0.96 U	0.95 U	NA
4,4-DDD	41.51	47.84	42.18	8	5.56	6.05	5.52	5
4,4-DDE	13.20	12.90	10.14	14	4.58	5.53	5.01	9
4,4-DDT	2.35 J	4.25 J	2.57 J	34	0.38 J	0.19 J	0.16 J	48
Aldrin	0.80 U	0.84 U	0.85 U	NA	0.97 U	0.92 U	0.91 U	NA
alpha-Chlordane	18.62	23.16	22.52	11	1.02 J	1.41	1.09 J	18
Dieldrin	7.09	7.58	6.22	10	1.27 J	1.35 J	1.46 J	7
Endosulfan I /2,4-DDE	2.20 U	2.30 U	2.32 U	NA	2.65 U	2.52 U	2.51 U	NA
Endosulfan II	1.64 U	1.71 U	1.73 U	NA	1.38 J	1.77 J	0.97 J	29
Endosulfan Sulfate	1.55 U	1.62 U	1.64 U	NA	0.31 J	0.44 J	0.28 J	25
Endrin[l]	2.98 U	3.11 U	3.15 U	NA	NA	NA	NA	NA
Endrin Aldehyde[l]	1.78 U	1.86 U	1.88 U	NA	NA	NA	NA	NA
Heptachlor	1.80 U	1.88 U	1.90 U	NA	2.17 U	2.07 U	2.05 U	NA
Heptachlor Epoxide	1.00 U	1.04 U	1.05 U	NA	1.20 U	1.15 U	1.14 U	NA
alpha-BHC[l]	1.11 U	1.16 U	1.17 U	NA	NA	NA	NA	NA
beta-BHC[l]	1.64 U	1.71 U	1.73 U	NA	NA	NA	NA	NA
delta-BHC[l]	1.49 U	1.56 U	1.58 U	NA	NA	NA	NA	NA
Lindane[l]	1.30 U	1.36 U	1.37 U	NA	NA	NA	NA	NA
Methoxychlor[l]	1.87 U	1.95 U	1.97 U	NA	NA	NA	NA	NA
Toxaphene[l]	56.56 U	59.03 U	59.68 U	NA	NA	NA	NA	NA
trans-Nonachlor	11.31	14.64	14.13	13	0.54 J	0.66 J	0.53 J	12
CL2(08)	7.98	8.19	6.21	15	2.53 J	2.95 J	2.64 J	8
CL3(18)	19.18	23.08	22.08	9	3.81	4.43	4.15	7
CL3(28)	51.14	30.02	31.95	31 [k]	13.08	17.79	14.05	17
CL4(44)	24.24	31.36	29.22	13	5.15	6.44	5.42	12
CL4(49)	23.21	27.19	24.75	8	5.38	7.00	6.50	13
CL4(52)	29.20	41.52	36.00	17	6.66	8.07	6.98	10
CL4(66)	88.09	103.82	92.36	9	10.53	11.61	9.40	10
CL5(87)	5.33	7.44	6.83	17	1.78	2.11	1.90	8
CL5(101)	24.93	29.25	28.42	8	5.15	6.22	5.24	11
CL5(105)	4.86	41.07	7.37	114 [k]	2.29	2.35	1.85	13
CL5(118)	13.11	16.42	15.16	11	4.74	6.11	5.26	13
CL6(128)	4.50	6.23	7.30	24	2.96	3.47	3.17	8
CL6(138)	67.37	36.36	24.29	52 [k]	5.60	7.00	6.08	11
CL6(153)	12.25	10.68	12.57	9	4.21 J	5.46 J	5.04 J	13
CL7(170)	9.06	9.86	8.44	8	2.11	2.81	2.31	15
CL7(180)	9.43	12.62	10.25	15	3.04	3.82	3.20	12
CL7(183)	1.45	2.28	2.07	22	0.60 J	0.89 J	0.73 J	19
CL7(184)	1.19	0.79 J	0.42 J	48	0.38 J	0.36 J	0.45 J	11
CL7(187)	3.29	4.79	3.73	20	1.61	2.04	1.72	12
CL8(195)	1.57	2.03	1.59	15	0.35 J	0.41 J	0.37 J	8
CL9(206)	4.73	5.62	4.95	9	0.74 J	1.07 J	0.86 J	19
CL10(209)	4.10	5.87	4.75	18	1.27 J	1.49	1.49	9
Surrogate Recoveries (%)								
DBOFB	84	94	85	NA	50	63	58	NA
CL5(112)	34	43	34	NA	39	50	44	NA

TABLE A.5. (contd)

Qualifiers

(a) Sample concentration of the procedural blank adjusted for the average sample size of the batch.
(b) NA Not applicable.
(c) U Undetected at or above given concentration.
(d) NS Not spiked.
(e) J Concentration estimated; analyte detected below method detection limit (MDL), but above instrument detection limit (IDL).
(f) Analyte required only in samples designated for Central Long Island Disposal Testing Site.
(g) Outside quality control criteria (50-120%) for matrix spike recoveries.
(h) Percent Difference from certified
= absolute value [(certified value ,µg/kg - value detected corrected for surrogate recovery, µg/kg) / certified value, µg/kg].
(i) NC No certified value available.
(j) C Analyte not determined due to co-eluting peak.
(k) Outside quality control criteria (±30%) for replicates.

TABLE A.6. MDL Verification Study for Analysis of Pesticides and PCBs in Sediment

Battelle ID:	OG99	OH01	OH02	OH03	OH04	OH05	OH06	OH07	Standard Deviation STD (n-1)	Method Detection Limit MDL[a] µg/kg	Method Detection Limit MDL (ng)
Sample Size (g):	20.919	19.455	19.201	18.645	19.087	19.434	18.896	18.612			
Units (dry wt):	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg			
1,4-Dichlorobenzene	1.934	1.589	1.642	1.966	1.820	1.483	1.965	2.685	0.372	1.114	21.485
2,4-DDD	NS[b]	NS	NS	NS	NS	NS	NS	NS	NA[c]	NA	NA
2,4-DDT	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA	NA
4,4-DDD	0.494	0.516	0.533	0.637	0.526	0.570	0.453	0.503	0.055	0.165	3.180
4,4-DDE	0.380	0.433	0.422	0.477	0.464	0.462	0.451	0.456	0.031	0.093	1.791
4,4-DDT	0.853	0.455	0.487	0.474	0.515	0.546	0.498	0.499	0.129	0.387	7.460
Aldrin	0.379	0.460	0.443	0.502	0.459	0.431	0.450	0.477	0.036	0.108	2.077
Alpha-chlordane	0.344	0.427	0.375	0.471	0.435	0.413	0.438	0.440	0.040	0.121	2.328
Dieldrin	0.400	0.451	0.478	0.493	0.456	0.499	0.465	0.441	0.032	0.095	1.836
Endosulfan I	0.423	0.556	0.480	0.562	0.531	0.506	0.517	0.540	0.045	0.136	2.628
Endosulfan II	0.500	0.538	0.544	0.575	0.552	0.558	0.529	0.526	0.023	0.068	1.319
Endosulfan Sulfate	0.416	0.426	0.448	0.476	0.463	0.489	0.473	0.462	0.025	0.076	1.458
Endrin[d]	0.381	0.490	0.512	0.557	0.552	0.550	0.540	0.549	0.059	0.178	3.439
Endrin Aldehyde[d]	0.425	0.534	0.532	0.619	0.568	0.526	0.558	0.578	0.056	0.169	3.256
Heptachlor	0.445	0.516	0.476	0.561	0.527	0.480	0.528	0.549	0.040	0.119	2.296
Heptachlor epoxide	0.442	0.542	0.495	0.572	0.549	0.514	0.543	0.560	0.042	0.127	2.444
A-BHC[d]	0.342	0.415	0.428	0.450	0.433	0.384	0.415	0.433	0.034	0.103	1.985
B-BHC[d]	0.442	0.547	0.539	0.541	0.495	0.493	0.513	0.504	0.035	0.104	1.996
D-BHC[d]	0.429	0.537	0.489	0.510	0.532	0.473	0.491	0.485	0.034	0.103	1.989
Lindane[d]	0.386	0.477	0.457	0.482	0.458	0.431	0.452	0.460	0.030	0.091	1.745
Methoxychlor[d]	0.319	0.446	0.497	0.489	0.530	0.553	0.561	0.554	0.081	0.242	4.673
Toxaphene[d]	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA	NA
Trans-nonachlor	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA	NA

TABLE A.6. (contd)

Battelle ID:	OG99	OH01	OH02	OH03	OH04	OH05	OH06	OH07	Standard Deviation STD (n-1)	Method Detection Limit MDL[a] µg/kg	Method Detection Limit MDL (ng)
Sample Size (g):	20.919	19.455	19.201	18.645	19.087	19.434	18.896	18.612			
Units (dry wt):	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg			
CL2(08)	0.273	0.302	0.289	0.319	0.244	0.312	0.319	0.378	0.039	0.117	2.265
CL3(18)	0.376	0.447	0.416	0.489	0.452	0.415	0.423	0.445	0.034	0.100	1.937
CL3(28)	0.376	0.491	0.465	0.482	0.439	0.463	0.459	0.486	0.037	0.112	2.155
CL4(44)	0.425	0.529	0.478	0.551	0.506	0.470	0.489	0.511	0.039	0.116	2.243
CL4(49)	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA	NA
CL4(52)	0.418	0.491	0.442	0.522	0.471	0.426	0.450	0.473	0.035	0.104	2.000
CL4(66)	0.423	0.526	0.487	0.519	0.493	0.436	0.477	0.490	0.036	0.108	2.087
CL5(87)	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA	NA
CL5(101)	0.459	0.587	0.530	0.597	0.551	0.501	0.519	0.532	0.045	0.134	2.581
CL5(105)	0.373	0.381	0.416	0.459	0.405	0.435	0.423	0.421	0.028	0.084	1.618
CL5(118)	0.399	0.479	0.454	0.486	0.463	0.469	0.460	0.467	0.027	0.080	1.534
CL6(128)	0.363	0.414	0.401	0.394	0.400	0.404	0.385	0.401	0.015	0.046	0.887
CL6(138)	0.379	0.422	0.411	0.421	0.418	0.410	0.407	0.417	0.014	0.042	0.806
CL6(153)	0.359	0.416	0.418	0.437	0.430	0.414	0.402	0.414	0.024	0.071	1.378
CL7(170)	0.343	0.402	0.376	0.407	0.394	0.384	0.378	0.380	0.020	0.060	1.149
CL7(180)	0.341	0.384	0.380	0.430	0.426	0.397	0.395	0.390	0.028	0.084	1.622
CL7(183)	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA	NA
CL7(184)	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA	NA
CL7(187)	0.329	0.384	0.358	0.421	0.400	0.403	0.391	0.378	0.029	0.086	1.654
CL8(195)	0.328	0.367	0.364	0.397	0.390	0.382	0.381	0.371	0.021	0.064	1.227
CL9(206)	0.267	0.303	0.314	0.326	0.328	0.305	0.277	0.299	0.022	0.065	1.256
CL10(209)	0.359	0.399	0.402	0.448	0.447	0.430	0.437	0.425	0.030	0.090	1.738
Surrogate Recoveries (%)											
DBOFB	55	67	58	66	64	61	63	65			
CL5(112)	58	63	61	67	64	67	62	61			

(a) MDL The Method Detection Limit (2.998 x standard deviation).
(b) NS Not spiked.
(c) NA Not applicable.
(d) Analyte required only in samples designated for Central Long Island Disposal Testing Site.

TABLE A.7. Quality Control Data for Polynuclear Aromatic Hydrocarbons (PAH) in Sediment

	BLANKS		MATRIX SPIKE							
Batch:	1	2	1	1			2	2		
Treatment:	Blank	Blank	EC-10	EC-10, MS			R-MUD	R-MUD, MS		
Percent Moisture:	NA[a]	NA	56.369	19.842	Concentration				Concentration	
Dry Weight (g)	9.076[b]	8.542	6.689	2.289	Spiked	Percent	13.655	13.216	Spiked	Percent
Units (dry wt):	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	Recovery	µg/kg	µg/kg	µg/kg	Recovery
naphthalene	12.36 U[c]	0.73 J[d]	293.40	1949.96	2595.02	64	1.13 J	280.30	449	62
1-methylnaphthalene[e]	13.00 U	NA	95.73	1781.30	2575.36	65	NA	NA	NS [f]	NA
2-methylnaphthalene[e]	10.96 U	NA	190.08	1754.99	NS	NA	NA	NA	NS	NA
biphenyl	10.45 U	11.10 U	64.14	1699.62	2588.69	63	6.94 U	285.69	448	64
2,6-dimethylnaphthalene[e]	10.21 U	NA	89.93	1798.88	2579.29	66	NA	NA	NS	NA
acenaphthylene	9.94 U	10.57 U	392.81	2109.65	2484.93	69	6.61 U	275.33	430	64
acenaphthene	12.93 U	13.74 U	199.96	1884.07	2681.52	63	8.59 U	299.51	464	64
fluorene	10.69 U	11.36 U	234.41	1876.21	2570.55	64	7.11 U	271.59	445	61
phenanthrene	10.78 U	11.45 U	1129.33	2727.93	2584.10	62	0.72 J	285.68	448	64
anthracene	10.46 U	11.12 U	839.49	2036.08	1956.09	61	6.96 U	211.15	339	62
1-methylphenanthrene[e]	9.57 U	NA	343.98	2220.41	2555.70	73	NA	NA	NS	NA
fluoranthene	9.72 U	10.32 U	4118.64	5351.78	2594.15	48 [g]	0.53 J	288.99	449	64
pyrene	2.83 J	12.46 U	4171.38	5396.57	2590.65	47 [g]	0.55 J	286.47	449	64
benz[a]anthracene	11.56 U	12.29 U	2017.45	3005.59	2245.09	44 [g]	0.62 J	230.70	389	59
chrysene	14.17 U	15.06 U	2535.99	3529.16	2602.88	38 [g]	9.42 U	291.13	451	65
benzo[b]fluoranthene	10.68 U	11.34 U	3396.16	4074.64	2582.35	26 [g]	0.50 J	277.16	447	62
benzo[k]fluoranthene	12.66 U	13.46 U	780.34	2498.31	2572.30	67	8.42 U	296.83	446	67
benzo[e]pyrene[e]	7.98 U	NA	1244.09	2852.72	2582.79	62	NA	NA	NS	NA
benzo[a]pyrene	9.90 U	10.52 U	2397.66	3136.38	2332.46	32 [g]	6.58 U	231.13	404	57
perylene[e]	20.84 U	NA	381.92	1587.57	1953.69	62	NA	NA	NS	NA
indeno[1,2,3-c,d]pyrene	8.55 U	9.08 U	1408.83	2781.05	2292.27	60	5.68 U	239.58	397	60
dibenz[a,h]anthracene	8.68 U	9.22 U	355.49	1583.39	1938.40	63	5.77 U	205.26	336	61
benzo[g,h,i]perylene	7.18 U	7.63 U	1349.43	2656.07	2307.99	57	4.77 U	231.76	400	58
Surrogate Recoveries (%)										
naphthalene-d8	59	69	53	55	NA	NA	54	66	NA	NA
acenaphthene-d10	63	66	60	59	NA	NA	56	63	NA	NA
chrysene-d12	65	63	52	55	NA	NA	58	64	NA	NA

TABLE A.7. (contd)

	STANDARD REFERENCE MATERIAL					
Batch:	1	1		2	2	
Treatment:	NIST 1941a Certified	NIST 1941a		NIST 1941a Certified	NIST 1941a	
Dry Weight (g)	Value	5.133	Percent	Value	5.057	Percent
Units (dry wt):	µg/kg	µg/kg	Difference[h]	µg/kg	µg/kg	Difference[h]
naphthalene	1010	446.35	2	1010	461.60	10
1-methylnaphthalene[e]	NC[f]	69.83	NA	NA	NA	NA
2-methylnaphthalene[e]	NC	149.85	NA	NA	NA	NA
biphenyl	NC	45.65	NA	NC	45.92	NA
2,6-dimethylnaphthalene[e]	NC	33.39	NA	NA	NA	NA
acenaphthylene	NC	50.40	NA	NC	43.38	NA
acenaphthene	NC	23.36	NA	NC	24.71	NA
fluorene	97.3	49.71	18	97	47.87	3
phenanthrene	489	274.57	12	489	275.27	6
anthracene	184	115.14	24	184	114.23	17
1-methylphenanthrene[e]	NC	59.14	NA	NA	NA	NA
fluoranthene	981	558.33	13	981	523.89	1
pyrene	811	465.23	14	811	439.33	2
benz[a]anthracene	427	228.99	7	427	208.24	8
chrysene	380	330.74	73 [i]	380	318.66	58 [i]
benzo[b]fluoranthene	740	540.68	45 [i]	740	519.11	32 [i]
benzo[k]fluoranthene	361	186.68	3	361	192.57	1
benzo[e]pyrene[e]	553	291.70	5	NA	NA	NA
benzo[a]pyrene	628	277.29	12	628	291.97	12
perylene[e]	452	202.39	11	NA	NA	NA
indeno[1,2,3-c,d]pyrene	501	264.41	5	501	248.25	6
dibenz[a,h]anthracene	73.9	60.42	63 [i]	74	54.65	40 [i]
benzo[g,h,i]perylene	525	249.44	6	525	233.31	16
<u>Surrogate Recoveries (%)</u>						
naphthalene-d8	NA	43	NA	NA	51	NA
acenaphthene-d10	NA	50	NA	NA	53	NA
chrysene-d12	NA	51	NA	NA	55	NA

TABLE A.7. (contd)

	ANALYTICAL REPLICATES							
Batch:	1	1	1		2	2	2	
Treatment:	EC-15 Replicate 1	EC-15 Replicate 2	EC-15 Replicate 3		GR-10 Replicate 1	GR-10 Dup. Replicate 2	GR-10 Trip. Replicate 3	
Dry Weight (g)	9.854	9.442	9.339		8.182	8.594	8.657	
Units (dry wt):	µg/kg	µg/kg	µg/kg	RSD(%)	µg/kg	µg/kg	µg/kg	RSD(%)
naphthalene	413.07	383.64	346.57	9	97.15	122.54	106.28	12
1-methylnaphthalene[e]	230.13	293.43	294.48	14	NA	NA	NA	NA
2-methylnaphthalene[e]	220.96	269.92	256.05	10	NA	NA	NA	NA
biphenyl	67.60	81.01	101.32	20	21.24	27.72	23.89	13
2,6-dimethylnaphthalene[e]	141.18	161.94	151.86	7	ND	ND	ND	NA
acenaphthylene	350.59	356.12	360.45	1	72.16	85.43	82.68	9
acenaphthene	393.29	494.18	516.99	14	27.42	37.65	34.18	16
fluorene	496.91	588.49	564.89	9	51.78	69.28	58.58	15
phenanthrene	2775.86	3308.85	2624.88	12	293.40	391.80	305.88	16
anthracene	784.75	917.38	820.41	8	228.03	286.56	241.40	12
1-methylphenanthrene[e]	480.83	521.03	513.57	4	NA	NA	NA	NA
fluoranthene	4967.01	5744.20	5225.88	7	809.42	996.86	801.60	13
pyrene	4698.65	5597.13	5124.00	9	877.93	1063.72	851.74	12
benz[a]anthracene	2158.28	2538.62	2480.41	9	492.12	601.96	493.70	12
chrysene	2530.60	2939.22	2913.86	8	502.85	603.94	493.96	11
benzo[b]fluoranthene	2953.82	3554.01	3284.14	9	572.66	705.11	577.73	12
benzo[k]fluoranthene	678.98	661.98	723.19	5	221.94	269.23	228.73	11
benzo[e]pyrene[e]	1586.76	1869.29	1743.18	8	NA	NA	NA	NA
benzo[a]pyrene	2154.13	2586.21	2437.45	9	518.39	627.31	524.96	11
perylene[e]	380.77	395.37	445.44	8	NA	NA	NA	NA
indeno[1,2,3-c,d]pyrene	1507.35	1811.51	1634.00	9	276.94	335.32	284.94	11
dibenz[a,h]anthracene	371.68	394.28	398.09	4	71.13	90.76	75.94	13
benzo[g,h,i]perylene	1365.92	1673.81	1530.19	10	249.71	298.49	254.12	10
Surrogate Recoveries (%)								
naphthalene-d8	52	61	55	NA	41	52	46	NA
acenaphthene-d10	57	68	59	NA	47	58	51	NA
chrysene-d12	39	44	41	NA	46	56	49	NA

TABLE A.7. (contd)

Qualifiers

(a) NA Not applicable.
(b) Sample concentration of the procedural blank adjusted for the average sample size of the batch.
(c) U Undetected at or above given concentration.
(d) J Concentration estimated; analyte detected below method detection limit (MDL), but above instrument detection limit (IDL).
(e) Analyte required only in samples designated for Central Long Island Disposal Testing Site.
(f) NS Not spiked.
(g) Outside quality control criteria (50-120%) for matrix spike recoveries.
(h) Percent Difference from certified
= absolute value [(certified value ,µg/kg - value detected corrected for surrogate recovery, µg/kg) / certified value, µg/kg].
(i) NC No certified value available.
(j) Outside SRM quality control acceptable criteria ($\leq$30%).

TABLE A.8. MDL Verification Study for Analysis of Polynuclear Aromatic Hydrocarbons (PAH) in Sediment

Sample Number:	OG99	OH01	OH02	OH03	OH04	OH05	OH06	OH07		Method Detection	Method Detection
Percent Moisture (%):	38.233	38.160	38.160	38.160	38.098	38.160	38.160	38.161	Standard	Limit	Limit
Sample Dry Weight (g):	20.919	19.455	19.201	18.645	19.087	19.434	18.896	18.612	Deviation	MDL[a]	MDL
Units (dry wt):	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	STD	(µg/kg)	(ng)
naphthalene	1.61	1.85	1.88	1.86	1.66	1.72	1.75	1.97	0.12	0.36	7.03
biphenyl	1.30	1.55	1.49	1.61	1.56	1.50	1.57	1.67	0.11	0.33	6.35
acenaphthylene	0.93	1.06	1.09	1.15	1.01	1.18	1.09	1.16	0.08	0.25	4.87
acenaphthene	1.12	1.41	1.16	1.41	1.38	1.21	1.34	1.56	0.15	0.44	8.55
fluorene	1.07	1.31	1.12	1.17	1.09	0.99	1.27	1.25	0.11	0.34	6.48
phenanthrene	1.25	1.41	1.35	1.58	1.42	1.38	1.43	1.59	0.11	0.34	6.52
anthracene	0.73	0.87	0.78	0.88	0.87	0.78	0.77	0.99	0.08	0.25	4.80
fluoranthene	1.10	1.24	1.08	1.24	1.11	1.13	1.13	1.11	0.06	0.19	3.64
pyrene	1.16	1.34	1.21	1.21	1.14	1.15	1.19	1.19	0.06	0.19	3.64
benz[a]anthracene	0.82	1.08	0.94	0.96	0.92	0.89	0.88	0.95	0.08	0.23	4.38
chrysene	0.95	1.12	0.98	1.14	1.01	1.16	0.95	1.02	0.09	0.26	4.98
benzo[b]fluoranthene	0.97	1.02	0.93	1.03	0.89	0.88	0.85	0.86	0.07	0.21	4.03
benzo[k]fluoranthene	0.93	0.92	0.93	1.01	0.89	0.92	1.01	0.69	0.10	0.30	5.72
benzo[a]pyrene	0.67	0.77	0.61	0.79	0.81	0.70	0.71	0.60	0.08	0.24	4.54
indeno[1,2,3-c,d]pyrene	0.85	0.84	0.70	0.75	0.75	0.58	0.66	0.61	0.10	0.30	5.79
dibenz[a,h]anthracene	0.70	0.71	0.53	0.62	0.45	0.53	0.44	0.40	0.12	0.36	6.90
benzo[g,h,i]perylene	0.95	0.87	0.86	0.99	0.73	0.84	0.85	0.76	0.09	0.26	4.99
Surrogate Recoveries (%)											
naphthalene-d8	66	74	69	74	68	74	70	71			
acenaphthene-d10	65	71	69	73	68	73	71	70			
chrysene-d12	58	65	61	65	61	64	62	58			

(a) MDL = STD * 2.998, Average Sample Dry Weight (g) = 19.281.

Appendix B

Site Water and Elutriate Chemical Analyses and Quality Assurance/Quality Control Data for Hudson River Project

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects-2

PARAMETER: Metals

LABORATORY: Battelle/Marine Sciences Laboratory, Sequim, Washington

MATRIX: Site Water and Elutriate

QA/QC DATA QUALITY OBJECTIVES

	Reference Method	Range of Recovery	SRM Accuracy	Relative Precision	Target Detection Limit (µg/L)
Cadmium	ICP/MS	75-125%	≤20%	≤20%	0.025
Chromium	GFAA	75-125%	≤20%	≤20%	1.0
Copper	ICP/MS	75-125%	≤20%	≤20%	0.35
Lead	ICP/MS	75-125%	≤20%	≤20%	0.35
Mercury	CVAA	75-125%	≤20%	≤20%	0.002
Nickel	ICP/MS	75-125%	≤20%	≤20%	0.3
Silver	ICP/MS	75-125%	≤20%	≤20%	0.25
Zinc	GFAA	75-125%	≤20%	≤20%	0.15

METHOD

A total of eight metals was analyzed in water and elutriate samples: silver (Ag), cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), nickel (Ni), lead (Pb) and zinc (Zn). Hg was analyzed using cold-vapor atomic absorption spectroscopy (CVAA) according to the method of Bloom and Crecelius (1983). Cr and Zn were analyzed by Graphite Furnace Atomic Absorption (GFAA) spectrometry following the EPA Method 200.9 (EPA 1991). The remaining metals were analyzed by inductively coupled plasma mass spectrometry (ICP/MS) following a procedure based on EPA Method 200.8 (EPA 1991).

All water and elutriate samples were acidified to pH <2 upon receipt in the laboratory. Five metals, Cd, Cu, Pb, Ni and Ag, were extracted from the water according to a procedure based on EPA Method 218.3 (EPA 1979). This preconcentration involves addition of a chelating agent which results in precipitation of the metals from solution, followed by filtration, and digestion of the filter in concentrated acid in order to achieve low detection limits. The digestates were then analyzed by ICP/MS as described above.

HOLDING TIMES

Twelve site water samples (for triplicate analysis) were received on 3/24/94. Five elutriate samples (for triplicate analysis) were received on 4/11/94, and another five elutriate samples (for triplicate analysis) were received on 4/16/94. All samples were received in good condition, assigned ID numbers according to Battelle's log-in system, acidified to pH<2 with concentrated nitric acid, and held at ambient temperature until analysis.

QA/QC SUMMARY/METALS (continued)

Mercury in water has a holding time of 28 days from collection to analysis. All samples were analyzed within this holding time. Samples were analyzed for the remaining metals within 180 days of collection. Samples were received, digested, and analyzed in two batches, Batch 1a/1b (site waters), and Batch 2 (elutriate). The following table summarizes analysis dates:

Task	Date Batch 1a/1b	Batch 2
APDC Extraction	6/13/94	5/24/94
ICP-MS	7/14/94	7/14/94
CVAA-Hg	4/26-28/94	5/9/94
GFAA-Cr	1a: 5/5/94 1b: 5/6/94	5/9/94
GFAA-Zn	5/16/94	5/16/94

DETECTION LIMITS

Target detection limits were met for all metals except Zn. Detection limits for Zn exceeded the target limits; however, all sample values were well above the detection limits achieved. Method Detection Limits (MDLs) for Ag, Cd, Cu, Hg, Ni and Pb were determined by spiking eight replicates of laboratory deionized water and multiplying the standard deviation of the resulting analysis by the Student's t value for n=8. MDLs reported for Cr and Zn were determined by taking the standard deviation of three replicate analyses of the method blank and multiplying the standard deviation by 3. An MDL verification study was performed within the previous year by spiking four replicates of Sequim Bay seawater and multiplying the standard deviation of the resulting analysis by 4.451. All sample MDLs were lower than the MDL verification values.

METHOD BLANKS

Method blanks were generated during the APDC extraction step and analyzed for the metals that were preconcentrated (Ag, Cd, Cu, Ni and Pb.) The blanks reported for Hg, Cr and Zn (the metals analyzed by direct injection of water samples) consist of a dilute nitric acid solution used to dilute all samples for analysis. For Batch 1a/1b, two APDC procedural blanks were analyzed and no APDC metals were detected in the blanks. Cr and Zn were detected in the blank; Cr at levels less than three times the MD, and Zn at levels greater than three times the MDL. All data were corrected for the blank concentrations, and no data were flagged. For Batch 2, two APDC procedural blanks were analyzed and no APDC metals were detected in the blanks. Zn and Cr were detected in the blank at levels less than three times the MDL. All data were corrected for the blank concentrations.

MATRIX SPIKES

Two samples were spiked in duplicate with all metals except Hg, which was spiked on two single samples. The APDC metals (Ag, Cd, Cu, Ni and Pb) were spiked prior to sample processing and the other metals were spiked just prior to analysis. For Batch 1a/1b, all recoveries were within the QC limits of 75% -125%, with the exception of Ag, Cd, and Cu in some of the spikes. Spike recoveries for these metals ranged from 70% to 74%, just below the lower QC limit. No action was taken. For Batch 2, all recoveries were within the QC limits of 75% -125% with the exception of Pb and Ni in one direct spike. Because Pb and

QA/QC SUMMARY/METALS (continued)

Ni values for the other spikes were acceptable, no further action was taken.

REPLICATES

Each sample was analyzed in triplicate. Precision for triplicate analyses was reported by calculating the relative standard deviation (RSD) of the replicate results. For Batch 1a/1b, RSD values were within the QC limits of ±20%, with the exception of Hg, Pb, and Ni on one sample. For Batch 2, RSD values were all within the QC limits of ±20%, with the exception of Cd in one sample and Ag in two samples.

SRMs

Standard Reference Material (SRM), CASS-2, a certified seawater sample from the National Institute of Standards and Technology, (NIST), was analyzed for all metals with the exception of Ag and Hg, which are not certified in this SRM. Results for all metals were within ±20% of mean certified value. Cd and Pb are certified below the MDL and were not detected.

A second SRM, 1641b, a freshwater sample from NIST, was analyzed twice for Hg. Results were within ±20% of mean certified value. No salt water SRMs certified for Ag are available.

A third SRM, 1643c, a freshwater sample from NIST, was analyzed for all metals except Hg. All metals were recovered within ±20% of mean certified value.

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QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects-2

PARAMETER: Chlorinated Pesticides and PCB Congeners

LABORATORY: Battelle Ocean Sciences

MATRIX: Site Water and Elutriate

QA/QC DATA QUALITY OBJECTIVES

Reference Method	Surrogate Recovery	MS Recovery	Relative Precision	Detection Limit
GC/ECD	30-150%	50-120%	≤30%	2-20 ng/L

SAMPLE CUSTODY

Twelve site water samples (in triplicate) were received on 3/31/94. Five elutriate samples (in triplicate) were received on 4/15/94, and another six elutriate samples (in triplicate) were received on 4/19/94. All samples were received in good condition, assigned ID numbers according to Battelle's log-in system, and stored at approximately 4°C until extraction.

METHOD

Water samples were extracted with methylene chloride in a separatory funnel under ambient conditions following a procedure based on the National Oceanic and Atmospheric Administration (NOAA) Status and Trends Program method (Krahn et al. 1988). Sample extracts were passed through a silica/alumina (5% deactivated) chromatography column followed by high performance liquid chromatography (HPLC) cleanup (Krahn et al. 1988). Extracts were analyzed for 15 chlorinated pesticides using gas chromatography with electron capture detection (GC/ECD) following a procedure based on EPA Method 8080 (EPA 1986). The GC column used was a J&W DB-17 capillary column (30-m x 0.25-mm I.D.) with confirmatory analysis on a DB-1701 column (also 30-m x 0.25-mm I.D.).

HOLDING TIMES

Samples were extracted in four batches: Batches 1 and 2 consisted of site waters; Batches 3 and 4 were elutriate samples. The following table summarizes sample extraction and analysis dates for each batch:

Batch No.	Receipt	Extraction	Analysis
1	3/31/94	4/5/94	4/22-26/94
2	3/31/94	4/5/94	4/26-28/94
3	4/15/94	4/19/94	5/5-7/94
4	4/19/94	4/22/94	5/13-15/94

DETECTION LIMITS

Target detection limits (DLs) were met for all pesticides except endosulfan II in some samples (target DL for endosulfan II was 4 ng/L; achieved DL was 11 ng/L).

METHOD BLANKS

One method blank (Sequim Bay seawater) was extracted with each extraction batch for a total of four method blanks. No pesticides or PCBs were detected in any of the method blanks.

SURROGATES

Two compounds, dibromooctafluorobiphenyl (DBOFB) and PCB congener 112, were added to all samples to assess the efficiency of the analysis. Sample surrogate recoveries were all within the QC guidelines of 30% -150%.

MATRIX SPIKES

One water sample in each batch (for a total of four) was spiked with 11 pesticides and 19 PCB congeners. Matrix spike recoveries were within the control limit range of 50-120% with the following exceptions: In the Batch 1, 2, 3, and 4 spike, recovery of PCB 8 was unacceptable due to interference from coelution of the non-target pesticide, alpha-BHC. In the batch 2 matrix spike, recovery of PCB 18 was 48%. In the Batch 3 matrix spike, recovery of endosulfan I/2,4'DDE was 123% and recovery of heptachlor epoxide was 125%. No action was taken.

REPLICATES

Each sample was extracted and analyzed in triplicate. Precision was measured by calculating the relative standard deviation (RSD) of the replicate results. The target precision goal was ≤30% RSD for analytes >10 times the Method Detection Limit (MDL). RSDs ranged from 6% to 79%, however, the majority of mean concentrations of all analytes (in each set of triplicate samples) were <10 times the detection limit. Twenty-five PCB/pesticides had a mean >10 times the detection limit and had an RSD of >30%. These RSDs ranged from 31% to 64%.

REFERENCES

Krahn, M.M., C.A. Wigren, R.W. Pearce, L.K. Moore, R.G. Bogar, W.D. MacLeod, Jr., S-L Chan, and D.W. Brown. 1988. *New HPLC Cleanup and Revised Extraction Procedures for Organic Contaminants.* NOAA Technical Memorandum NMFS F/NWC-153. National Oceanic and Atmospheric Administration, National Marine Fisheries, Seattle, Washington.

EPA (U.S. Environmental Protection Agency). 1986. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.* SW-846. U.S. Document No. 955-001-00000, U.S. Environmental Protection Agency, Washington D.C.

TABLE B.1. Metals in Site Water and Elutriate

Sediment Treatment	Replicate	Concentrations in µg/L: Ag ICP/MS	Cd ICP/MS	Cr GFAA	Cu ICP/MS	Hg CVAF	Ni ICP/MS	Pb ICP/MS	Zn GFAA
Target detection limit		0.25	0.025	1.0	0.35	0.002	0.30	0.35	0.15
MDL verification [a]		0.007	0.025	0.163	0.143	0.0007	0.253	0.035	0.582
HU-A Site Water	1	0.107	0.102	0.83	4.53	0.0178	1.67	3.37	12.2
HU-A Site Water	2	0.082	0.114	0.85	4.59	0.0189	1.79	3.60	14.0
HU-A Site Water	3	0.120	0.114	0.88	4.87	0.0188	1.80	3.78	13.1
HU-A Elutriate	1	0.025	0.028	1.44	1.24	0.0130	1.53	0.994	6.19
HU-A Elutriate	2	0.022	0.028	1.25	1.22	0.0110	1.50	1.03	6.10
HU-A Elutriate	3	0.023	0.025 U[b]	1.17	1.14	0.0108	1.44	0.999	5.91
HU-B Site Water	1	0.192	0.105	1.75	6.73	0.0351	2.13	5.34	13.1
HU-B Site Water	2	0.188	0.105	1.92	6.42	0.0369	2.09	4.95	11.2
HU-B Site Water	3	0.182	0.107	1.75	6.57	0.0373	2.07	5.12	13.1
HU-B Elutriate	1	0.075	0.033	2.44	1.90	0.0198	1.39	1.18	1.78
HU-B Elutriate	2	0.061	0.034	2.16	1.92	0.0187	1.43	1.11	2.16
HU-B Elutriate	3	0.064	0.035	2.42	1.95	0.0179	1.42	1.09	1.88
HU-C Site Water	1	0.144	0.093	0.94	5.52	0.0288	1.85	4.30	30.9
HU-C Site Water	2	0.139	0.087	0.83	5.25	0.0279	1.86	4.15	31.8
HU-C Site Water	3	0.142	0.089	0.90	5.37	0.0296	1.79	4.02	27.1
HU-C Elutriate	1	0.035	0.0310	1.73	1.25	0.0152	2.37	1.11	2.25
HU-C Elutriate	2	0.030	0.0310	1.81	1.14	0.0132	2.24	0.994	2.34
HU-C Elutriate	3	0.031	0.0330	1.95	1.24	0.0124	2.32	1.09	1.88
HU-D Site Water	1	0.119	0.113	1.43	5.69	0.0263	1.82	4.89	38.3
HU-D Site Water	2	0.119	0.113	1.39	5.59	0.0277	1.65	4.94	37.4
HU-D Site Water	3	0.121	0.111	1.26	5.81	0.0269	4.24	5.17	36.5
HU-D Elutriate	1	0.0210	0.0250 U	0.840	0.993	0.0125	1.41	0.847	1.69
HU-D Elutriate	2	0.0160	0.0570	0.840	1.06	0.0129	1.39	0.953	1.59
HU-D Elutriate	3	0.0270	0.0450	0.720	1.03	0.0128	1.44	0.846	1.31

(a) MDL Method detection limit based on standard deviation of 4 replicates of spiked control water x 4.541.
(b) U Not detected at or above concentration shown.

TABLE B.2. Quality Control Data (Method Blanks and Recovery of Matrix Spikes) for Metals in Site Water and Elutriate

Sediment Treatment	Batch	Ag ICP/MS	Cd ICP/MS	Cr GFAA	Cu ICP/MS	Hg CVAF	Ni ICP/MS	Pb ICP/MS	Zn GFAA
		Concentrations in µg/L							
METHOD BLANKS									
Site Water									
Blank-1	1a	0.007 U [(a)]	0.025 U	0.33	0.143 U	0.0009	0.253 U	0.035 U	7.48
Blank-2	1b	0.007 U	0.025 U	0.41	0.143 U	0.0011	0.253 U	0.035 U	8.42
Blank-3	1b	NS [(b)]	NS	0.45	NS	NS	NS	NS	NS
Elutriate									
Blank-4	2	0.007 U	0.025 U	0.18	0.143 U	0.0009	0.253 U	0.035 U	0.75
Blank-5	2	0.007 U	0.025 U	0.16	0.143 U	0.0009	0.253 U	0.035 U	0.75
MATRIX SPIKES									
PC Site Water	1a	NA [(c)]	NA	1.79	NA	NA	NA	NA	27.2
PC Site Water, MS [(d)]	1a	NA	NA	2.81	NA	NA	NA	NA	67.3
Concentration Recovered		NA	NA	1.02	NA	NA	NA	NA	40.1
Amount Spiked		NS	NS	0.97	NS	NS	NS	NS	44.8
Percent Recovery		NA	NA	105%	NA	NA	NA	NA	90%
PC Site Water	1a	NA	NA	1.79	NA	NA	NA	NA	27.2
PC Site Water, MSD [(e)]	1a	NA	NA	6.47	NA	NA	NA	NA	114
Concentration Recovered		NA	NA	4.68	NA	NA	NA	NA	86.8
Amount Spiked		NS	NS	4.67	NS	NS	NS	NS	89.2
Percent Recovery		NA	NA	100%	NA	NA	NA	NA	97%
RPD [(f)]		NA	NA	5%	NA	NA	NA	NA	8%
SB-A Site Water	1a	0.143	0.112	NA	5.15	0.0165	1.95	2.96	NA
SB-A Site Water, MS	1a	0.945	0.903	NA	5.89	0.0511	2.73	4.19	NA
Concentration Recovered		0.802	0.791	NA	0.74	0.0346	0.78	1.23	NA
Amount Spiked		1.00	1.00	NS	1.00	0.0364	1.00	1.00	NS
Percent Recovery		80%	79%	NA	74% [(g)]	95%	78%	123%	NA
SB-A Site Water	1a	0.143	0.112	NA	5.15	NA	1.95	2.96	NA
SB-A Site Water, MSD	1a	4.49	3.83	NA	9.67	NA	5.94	7.4	NA
Concentration Recovered		4.35	3.72	NA	4.52	NA	3.99	4.44	NA
Amount Spiked		5.00	5.00	NS	5.00	NS	5.00	5.00	NS
Percent Recovery		87%	74% [(g)]	NA	90%	NA	80%	89%	NA
RPD		8%	6%	NA	20%	NA	2%	32%	NA
HU-B Site Water	1b	NA	NA	1.81	NA	NA	NA	NA	NA
HU-B Site Water, MS	1b	NA	NA	2.94	NA	NA	NA	NA	NA
Concentration Recovered		NA	NA	1.13	NA	NA	NA	NA	NA
Amount Spiked		NS	NS	0.97	NS	NS	NS	NS	NS
Percent Recovery		NA	NA	116%	NA	NA	NA	NA	NA
HU-B Site Water	1b	NA	NA	1.81	NA	NA	NA	NA	NA
HU-B Site Water, MSD	1b	NA	NA	6.24	NA	NA	NA	NA	NA
Concentration Recovered		NA	NA	4.43	NA	NA	NA	NA	NA
Amount Spiked		NS	NS	4.67	NS	NS	NS	NS	NS
Percent Recovery		NA	NA	95%	NA	NA	NA	NA	NA
RPD		NA	NA	20%	NA	NA	NA	NA	NA

TABLE B.2. (continued)

Sediment Treatment	Batch	Ag ICP/MS	Cd ICP/MS	Cr GFAA	Cu ICP/MS	Hg CVAF	Ni ICP/MS	Pb ICP/MS	Zn GFAA
		Concentrations in µg/L							
Mud Dump Site Water	1b	0.022	0.060	NA	2.06	0.0096	1.27	0.931	NA
Mud Dump Site Water, MS	1b	0.743	0.763	NA	3.00	0.0469	20.8	1.86	NA
Concentration Recovered		0.721	0.703	NA	0.94	0.0373	0.810	0.929	NA
Amount Spiked		1.00	1.00	NS	1.00	0.0347	1.00	1.00	NS
Percent Recovery		72% (g)	70% (g)	NA	94%	107%	81%	93%	NA
Mud Dump Site Water	1b	0.022	0.060	NA	2.06	NA	1.27	0.931	NA
Mud Dump Site Water, MSD	1b	4.13	3.56	NA	6.56	NA	5.3	5.60	NA
Concentration Recovered		4.11	3.50	NA	4.50	NA	4.03	4.67	NA
Amount Spiked		5.00	5.00	NS	5.00	NS	5.00	5.00	NS
Percent Recovery		82%	70% (g)	NA	90%	NA	81%	93%	NA
RPD		13%	0.4%	NA	4%	NA	0.5%	1%	NA
PC Elutriate	2	NA	NA	0.78	NA	NA	NA	NA	6.51
PC Elutriate, MS	2	NA	NA	1.70	NA	NA	NA	NA	54.7
Concentration Recovered		NA	NA	0.92	NA	NA	NA	NA	48.2
Amount Spiked		NS	NS	0.97	NS	NS	NS	NS	44.8
Percent Recovery		NA	NA	95%	NA	NA	NA	NA	108%
PC Elutriate	2	NA	NA	0.78	NA	NA	NA	NA	6.51
PC Elutriate, MSD	2	NA	NA	5.44	NA	NA	NA	NA	102
Concentration Recovered		NA	NA	4.66	NA	NA	NA	NA	95.5
Amount Spiked		NS	NS	4.67	NS	NS	NS	NS	89.2
Percent Recovery		NA	NA	100%	NA	NA	NA	NA	107%
RPD		NA	NA	5%	NA	NA	NA	NA	0.5%
SB-B Elutriate	2	0.018	0.025 U	NA	0.741	0.0034	3.02	0.681	NA
SB-B Elutriate, MS	2	0.824	0.856	NA	1.72	0.0245	4.31	2.32	NA
Concentration Recovered		0.806	0.856	NA	0.982	0.0211	1.29	1.64	NA
Amount Spiked		1.00	1.00	NS	1.00	0.0211	1.00	1.00	NS
Percent Recovery		81%	86%	NA	98%	100%	129% (g)	164% (g)	NA
SB-B Elutriate	2	0.018	0.025 U	NA	0.741	NA	3.02	0.681	NA
SB-B Elutriate, MSD	2	4.34	3.79	NA	5.57	NA	8.10	5.11	NA
Concentration Recovered		4.32	3.79	NA	4.83	NA	5.08	4.43	NA
Amount Spiked		5.00	5.00	NS	5.00	NS	5.00	5.00	NS
Percent Recovery		86%	76%	NA	97%	NA	102%	89%	NA
RPD		7%	12%	NA	2%	NA	24%	60%	NA
EC-B Elutriate	2	NA	NA	NA	NA	0.0275	NA	NA	NA
EC-B Elutriate, MS	2	NA	NA	NA	NA	0.0470	NA	NA	NA
Concentration Recovered		NA	NA	NA	NA	0.0195	NA	NA	NA
Amount Spiked		NS	NS	NS	NS	0.0212	NS	NS	NS
Percent Recovery		NA	NA	NA	NA	92%	NA	NA	NA
HU-B Elutriate	2	NA	NA	0.18	NA	NA	NA	NA	11.0
HU-B Elutriate, MS	2	NA	NA	1.15	NA	NA	NA	NA	59.9
Concentration Recovered		NA	NA	0.97	NA	NA	NA	NA	48.9
Amount Spiked		NS	NS	0.97	NS	NS	NS	NS	44.8
Percent Recovery		NA	NA	100%	NA	NA	NA	NA	109%

TABLE B.2. (continued)

Sediment Treatment	Batch	Ag ICP/MS	Cd ICP/MS	Cr GFAA	Cu ICP/MS	Hg CVAF	Ni ICP/MS	Pb ICP/MS	Zn GFAA
		Concentrations in µg/L							
HU-B Elutriate	2	NA	NA	0.18	NA	NA	NA	NA	11.0
HU-B Elutriate, MSD	2	NA	NA	5.77	NA	NA	NA	NA	111
Concentration Recovered		NA	NA	5.59	NA	NA	NA	NA	100
Amount Spiked		NS	NS	4.67	NS	NS	NS	NS	89.2
Percent Recovery		NA	NA	120%	NA	NA	NA	NA	112%
RPD		NA	NA	18%	NA	NA	NA	NA	3%
EC-A Elutriate	2	0.007 U	0.025 U	NA	0.661	0.0005	0.771	0.992	NA
EC-A Elutriate, MS	2	0.831	0.805	NA	1.55	0.0319	1.59	1.85	NA
Concentration Recovered		0.831	0.805	NA	0.892	0.0314	0.816	0.857	NA
Amount Spiked		1.00	1.00	NS	1.00	0.0316	1.00	1.00	NS
Percent Recovery		83%	81%	NA	89%	99%	82%	86%	NA
EC-A Elutriate	2	0.004	0.012	NA	0.661	NA	0.771	0.992	NA
EC-A Elutriate, MSD	2	4.34	3.82	NA	5.34	NA	5.11	5.48	NA
Concentration Recovered		4.33	3.81	NA	4.68	NA	4.31	4.49	NA
Amount Spiked		5.00	5.00	NS	5.00	NS	5.00	5.00	NS
Percent Recovery		87%	76%	NA	94%	NA	86%	90%	NA
RPD		4%	6%	NA	5%	NA	5%	5%	NA

(a) U Undetected at or above concentration shown.
(b) NS Not spiked.
(c) NA Not applicable.
(d) MS Matrix spike
(e) MSD Matrix spike duplicate
(f) RPD Relative percent difference.
(g) Outside data quality criteria of 75%-125%.

TABLE B.3. Quality Control Data (Triplicate Analyses) for Metals in Site Water and Elutriate

Sediment Treatment	Replicate	Batch	Ag ICP/MS	Cd ICP/MS	Cr GFAA	Cu ICP/MS	Hg CVAF	Ni ICP/MS	Pb ICP/MS	Zn GFAA
			Concentrations in µg/L							
PC Site Water	1	1a	0.079	0.325	1.83	8.13	0.0261	2.36	9.83	25.3
PC Site Water	2	1a	0.080	0.360	1.87	8.38	0.0232	2.36	10.1	28.1
PC Site Water	3	1a	0.099	0.336	1.67	8.32	0.0253	2.45	10.5	18.1
RSD [(a)]			13%	5%	6%	2%	6%	2%	3%	22% [(b)]
EC-A Site Water	1	1a	0.092	0.503	6.47	13.4	0.0685	4.43	20.5	58.9
EC-A Site Water	2	1a	0.091	0.519	6.71	14.1	0.0640	4.64	22.1	64.5
EC-A Site Water	3	1a	0.087	0.542	6.35	18.6	0.0619	4.43	21.7	64.5
RSD			3%	4%	3%	18%	5%	3%	4%	5%
EC-B Site Water	1	1a	0.152	0.411	4.49	19.0	0.212	4.76	18.7	64.5
EC-B Site Water	2	1a	0.167	0.396	4.61	18.9	0.155	4.58	17.6	69.2
EC-B Site Water	3	1a	0.159	0.419	4.44	18.7	0.182	4.69	18.0	71.1
RSD			5%	3%	2%	1%	16%	2%	3%	5%
HU-A Site Water	1	1a	0.107	0.102	0.83	4.53	0.0178	1.67	3.37	12.2
HU-A Site Water	2	1a	0.082	0.114	0.85	4.59	0.0189	1.79	3.60	14.0
HU-A Site Water	3	1a	0.120	0.114	0.88	4.87	0.0188	1.80	3.78	13.1
RSD			19%	6%	3%	4%	3%	4%	6%	7%
SB-A Site Water	1	1a	0.145	0.108	1.02	5.04	0.0190	1.92	2.85	19.6
SB-A Site Water	2	1a	0.141	0.118	1.15	5.09	0.0160	1.96	3.03	18.7
SB-A Site Water	3	1a	0.142	0.110	1.32	5.33	0.0145	1.97	2.99	21.5
RSD			1%	5%	13%	3%	14%	1%	3%	7%
SB-B Site Water	1	1a	0.075	0.094	0.71	3.53	0.0066	1.67	1.30	9.35
SB-B Site Water	2	1a	0.075	0.093	0.59	3.56	0.0061	1.81	1.32	10.3
SB-B Site Water	3	1a	0.073	0.088	0.68	3.49	0.0062	1.58	1.27	11.2
RSD			2%	4%	9%	1%	4%	7%	2%	9%
BU Site Water	1	1b	0.104	0.090	0.81	4.16	0.0233	1.82	2.79	12.2
BU Site Water	2	1b	0.109	0.080	0.85	4.38	0.0220	1.87	2.79	14.0
BU Site Water	3	1b	0.118	0.096	0.92	4.27	0.0216	1.94	2.85	13.1
RSD			6%	9%	6%	3%	4%	3%	1%	7%
Mud Dump Site Water	1	1b	0.023	0.063	0.26 J [(c)]	2.09	0.0097	1.29	0.942	9.35
Mud Dump Site Water	2	1b	0.020	0.058	0.32 J	1.99	0.0093	1.22	0.904	12.2
Mud Dump Site Water	3	1b	0.024	0.060	0.23 J	2.10	0.0097	1.30	0.947	9.35
RSD			9%	4%	17%	3%	2%	3%	3%	16%
HU-B Site Water	1	1b	0.192	0.105	1.75	6.73	0.0351	2.13	5.34	13.1
HU-B Site Water	2	1b	0.188	0.105	1.92	6.42	0.0369	2.09	4.95	11.2
HU-B Site Water	3	1b	0.182	0.107	1.75	6.57	0.0373	2.07	5.12	13.1
RSD			3%	1%	5%	2%	3%	1%	4%	9%
HU-C Site Water	1	1b	0.144	0.093	0.94	5.52	0.0288	1.85	4.30	30.9
HU-C Site Water	2	1b	0.139	0.087	0.83	5.25	0.0279	1.86	4.15	31.8
HU-C Site Water	3	1b	0.142	0.089	0.90	5.37	0.0296	1.79	4.02	27.1
RSD			2%	3%	6%	3%	3%	2%	3%	8%
HU-D Site Water	1	1b	0.119	0.113	1.43	5.69	0.0263	1.82	4.89	38.3
HU-D Site Water	2	1b	0.119	0.113	1.39	5.59	0.0277	1.65	4.94	37.4
HU-D Site Water	3	1b	0.121	0.111	1.26	5.81	0.0269	4.24	5.17	36.5
RSD			1%	1%	7%	2%	3%	56% [(b)]	3%	2%

TABLE B.3. (Contd)

Sediment Treatment	Replicate	Batch	Ag ICP/MS	Cd ICP/MS	Cr GFAA	Cu ICP/MS	Hg CVAF	Ni ICP/MS	Pb ICP/MS	Zn GFAA
			Concentrations in µg/L							
PC Elutriate	1	2	0.018	0.535	0.76	1.64	0.0236	3.57	1.78	7.81
PC Elutriate	2	2	0.022	0.517	0.78	1.60	0.0221	3.48	1.64	6.51
PC Elutriate	3	2	0.020	0.539	0.64	1.63	0.0225	3.57	1.76	6.51
RSD			10%	2%	10%	1%	3%	1%	4%	11%
SB-B Elutriate	1	2	0.017	0.025 U (d)	0.72	0.755	0.0031	2.95	0.667	3.10
SB-B Elutriate	2	2	0.018	0.025 U	0.58	0.736	0.0032	3.02	0.676	3.47
SB-B Elutriate	3	2	0.018	0.025 U	0.64	0.741	0.0034	3.02	0.681	2.72
RSD			3%	NA (e)	11%	1%	5%	1%	1%	12%
SB-A Elutriate	1	2	0.036	0.025 U	1.15	1.28	0.0285	2.61	0.807	3.10
SB-A Elutriate	2	2	0.035	0.025 U	1.21	1.18	0.0290	2.39	0.779	2.63
SB-A Elutriate	3	2	0.030	0.025 U	1.17	1.12	0.0290	2.42	0.772	2.25
RSD			10%	NA	3%	7%	1%	5%	2%	16%
BU Elutriate	1	2	0.021	0.025 U	0.58	0.737	0.0049	2.99	0.586	2.25
BU Elutriate	2	2	0.038	0.025 U	0.62	0.700	0.0051	2.95	0.603	3.28
BU Elutriate	3	2	0.020	0.025 U	0.53	0.709	0.0051	2.85	0.564	2.44
RSD			38% (b)	NA	8%	3%	2%	2%	3%	21% (b)
EC-B Elutriate	1	2	0.027	0.083	1.62	3.54	0.0263	1.75	5.82	5.35
EC-B Elutriate	2	2	0.023	0.236	1.66	3.57	0.0249	1.73	5.28	5.06
EC-B Elutriate	3	2	0.035	0.121	1.83	3.67	0.0275	1.74	5.34	3.94
RSD			22% (b)	54% (b)	7%	2%	5%	1%	5%	16%
HU-B Elutriate	1	2	0.075	0.033	2.44	1.90	0.0198	1.39	1.18	1.78
HU-B Elutriate	2	2	0.061	0.034	2.16	1.92	0.0187	1.43	1.11	2.16
HU-B Elutriate	3	2	0.064	0.035	2.42	1.95	0.0179	1.42	1.09	1.88
RSD			11%	3%	7%	1%	5%	1%	4%	10%
HU-A Elutriate	1	2	0.025	0.028	1.44	1.24	0.0130	1.53	0.994	6.19
HU-A Elutriate	2	2	0.022	0.028	1.25	1.22	0.0110	1.50	1.03	6.10
HU-A Elutriate	3	2	0.023	0.025 U	1.17	1.14	0.0108	1.44	0.999	5.91
RSD			7%	NA	11%	4%	10%	3%	2%	2%
EC-A Elutriate	1	2	0.007 U	0.025 U	0.66	0.590	0.0010	0.711	0.971	1.13
EC-A Elutriate	2	2	0.007 U	0.025 U	0.60	0.640	0.0006 U	0.750	0.935	1.41
EC-A Elutriate	3	2	0.007 U	0.025 U	0.55	0.661	0.0005	0.771	0.992	1.41
RSD			NA	NA	9%	6%	NA	4%	3%	12%
HU-C Elutriate	1	2	0.035	0.031	1.73	1.25	0.0152	2.37	1.11	2.25
HU-C Elutriate	2	2	0.030	0.031	1.81	1.14	0.0132	2.24	0.994	2.34
HU-C Elutriate	3	2	0.031	0.033	1.95	1.24	0.0124	2.32	1.09	1.88
RSD			8%	4%	6%	5%	11%	3%	6%	11%
HU-D Elutriate	1	2	0.021	0.025 U	0.84	0.993	0.0125	1.41	0.847	1.69
HU-D Elutriate	2	2	0.016	0.057	0.84	1.06	0.0129	1.39	0.953	1.59
HU-D Elutriate	3	2	0.027	0.045	0.72	1.03	0.0128	1.44	0.846	1.31
RSD			26% (b)	NA	9%	3%	2%	2%	7%	13%
Control Site Water	1	2	0.007 U	0.054	0.18	0.468	0.0006 U	0.465	0.035 U	7.88
Control Site Water	2	2	0.007 U	0.056	0.18	0.452	0.0003	0.456	0.094	8.72
Control Site Water	3	2	0.007 U	0.057	0.18	0.492	0.0006 U	0.486	0.035 U	11.0
RSD			NA	3%	0%	4%	NA	3%	NA	18%

(a) RSD Relative standard deviation.
(b) Outside data quality criteria of +/-20% RSD.
(c) J Concentration estimated; analyte detected below detection limit.
(d) U Undetected at or above concentration shown.
(e) NA Not applicable.

TABLE B.4. Quality Control Data (Standard Reference Materials) for Metals in Site Water and Elutriate

Standard Reference Material	Replicate	Batch	Ag ICP/MS	Cd ICP/MS	Cr GFAA	Cu ICP/MS	Hg CVAF	Ni ICP/MS	Pb ICP/MS	Zn GFAA
			Concentrations in µg/L							
Site Water										
SRM CASS-2	1	1a	0.007 U[a]	0.025 U	0.32 U	0.695	NA [b]	0.301	0.016 J[c]	2.04
SRM CASS-2	2	1a	0.007 U	0.025 U	0.32 U	0.730	NA	0.339	0.018 J	2.30
SRM CASS-2	1	1b	NA	NA	0.19 U	NA	NA	NA	NA	NA
Certified Value CASS-2			NC [d]	0.019	0.121	0.675	NC	0.298	0.019	1.97
Range			NC	±0.004	±0.016	±0.039	NC	±0.036	±0.006	±0.12
Percent Difference	1		NA	NA	NA	3	NA	1	16	4
Percent Difference	2		NA	NA	NA	8	NA	14	5	17
Percent Difference	1		NA	NA	NA	NA	NA	NA	NA	NA
SRM 1641b	1	1a	NA	NA	NA	NA	1530	NA	NA	NA
SRM 1641b	2	1a	NA	NA	NA	NA	1540	NA	NA	NA
Certified Value 1641b			NC	NC	NC	NC	1520	NC	NC	NC
Range			NC	NC	NC	NC	±40	NC	NC	NC
Percent Difference	1		NA	NA	NA	NA	1	NA	NA	NA
Percent Difference	2		NA	NA	NA	NA	1	NA	NA	NA
SRM 1643c	1	1a	2.09	11.7	20.5	20.6	NA	55.3	33.6	84.2
SRM 1643c	2	1a	2.01	11.0	19.4	19.2	NA	54.2	35.8	84.2
SRM 1643c	1	1b	NA	NA	19.5	NA	NA	NA	NA	NA
Certified Value 1643c			2.21	12.2	19.0	22.3	NC	60.6	35.3	73.9
Range			±0.30	± 1.0	±0.6	±2.8	NC	±7.3	±0.9	±0.9
Percent Difference	1		5	4	8	8	NA	9	5	14
Percent Difference	2		9	10	2	14	NA	11	1	14
Percent Difference	1		NA	NA	3	NA	NA	NA	NA	NA
Elutriate										
SRM CASS-2	1	2	0.003 U	0.025 U	0.103	0.671	NA	0.257	0.035 U	2.10
SRM CASS-2	2	2	0.003 U	0.025 U	0.103	0.668	NA	0.258	0.035 U	1.83
Certified Value CASS-2			NC	0.019	0.118	0.675	NC	0.298	0.019	1.97
Range			NC	±0.004	±0.021	±0.039	NC	±0.036	±0.006	±0.12
Percent Difference	1		NA	NA	13	1	NA	14	NA	7
Percent Difference	2		NA	NA	13	1	NA	13	NA	7
SRM 1641b	1	2	NA	NA	NA	NA	1540	NA	NA	NA
SRM 1641b	2	2	NA	NA	NA	NA	1510	NA	NA	NA
Certified Value 1641b			NC	NC	NC	NC	1520	NC	NC	NC
Range			NC	NC	NC	NC	±40	NC	NC	NC
Percent Difference	1		NA	NA	NA	NA	1	NA	NA	NA
Percent Difference	2		NA	NA	NA	NA	1	NA	NA	NA
SRM 1643c	1	2	1.89	11.3	19.3	20.4	NA	56.7	33.0	76.0
SRM 1643c	2	2	1.80	11.2	21.0	20.0	NA	56.3	32.8	71.9
Certified Value 1643c			2.21	12.2	19.0	22.3	NC	60.6	35.3	73.9
Range			±0.30	± 1.0	±0.6	±2.8	NC	±7.3	±0.9	±0.9
Percent Difference	1		15	7	2	9	NA	6	7	3
Percent Difference	2		19	8	11	10	NA	7	7	3

(a) U Undetected at or above concentration shown.
(b) NA Not applicable.
(c) J Analyte detected below detection limit; concentration estimated.
(d) NC Not certified.

TABLE B.5. Pesticides and PCBs in Site Water and Elutriate

Site/Replicate	HU-A Rep 1		HU-A Rep 2		HU-A Rep 3		HU-A Rep 1		HU-A Rep 2		HU-A Rep 3	
Matrix	Site Water		Site Water		Site Water		Elutriate		Elutriate		Elutriate	
Sample Size (L)	1.04		1.04		1.04		0.98		0.97		0.50	
Units	ng/L		ng/L		ng/L		ng/L		ng/L		ng/L	
2,4-DDD	0.765	U[a]	0.765	U	0.765	U	16.63		8.38		9.81	
2,4-DDT	0.777	U	0.777	U	0.777	U	0.83	U	0.83	U	1.62	U
4,4-DDD	1.12	U	1.12	U	1.12	U	13.44		8.49		9.54	
4,4-DDE	0.949	U	0.949	U	0.949	U	52.12		28.38		26.82	
4,4-DDT	0.962	U	0.962	U	0.962	U	1.03	U	1.03	U	2.00	U
Aldrin	0.713	U	0.713	U	0.713	U	0.760	U	0.764	U	1.48	U
alpha-Chlordane	0.891	U	0.683	J	0.891	U	3.45		1.81		2.06	
Dieldrin	2.28		1.42		1.21		5.64		4.31		4.72	
Endosulfan I/2,4'-DDE	0.813	U	0.813	U	0.813	U	17.0		10.4		10.3	
Endosulfan II	10.8	U	10.8	U	10.8	U	11.5	U	11.5	U	22.4	U
Endosulfan sulfate	7.87	U	7.87	U	7.87	U	8.40	U	8.44	U	16.4	U
Heptachlor	0.631	U	0.631	U	0.631	U	0.673	U	0.676	U	1.31	U
Heptachlor epoxide	0.822	U	0.822	U	0.822	U	3.25		1.59		0.468	J[b]
trans-Nonachlor	0.928	U	0.928	U	0.928	U	0.855	J	0.835	J	1.20	J
CL2(08)	0.841	U	0.841	U	0.841	U	1.75		1.99		1.75	U
CL3(18)	1.02	U	1.02	U	1.02	U	16.0		9.25		7.52	
CL3(28)	1.15	U	1.15	U	1.15	U	19.9		11.3		11.3	
CL4(44)	1.17	U	1.17	U	1.17	U	17.2		11.9		13.0	
CL4(49)	1.01	U	1.01	U	1.01	U	16.8		11.0		9.72	
CL4(52)	1.18	U	1.18	U	1.18	U	23.4		15.6		17.5	
CL4(66)	0.917	U	0.917	U	0.917	U	72.7		48.4		59.9	
CL5(87)	1.56		2.51		2.32		8.62		5.34		5.12	
CL5(101)	1.33		0.96	J	1.13		21.9		13.6		14.0	
CL5(105)	1.24	U	1.24	U	1.24	U	3.56		2.51		2.31	J
CL5(118)	0.977	U	0.977	U	0.977	U	14.9		8.02		8.52	
CL6(128)	1.10	U	1.10	U	1.10	U	5.38		3.40		4.25	
CL6(138)	1.31	U	1.31	U	1.31	U	24.5		14.4		15.1	
CL6(153)	1.26	U	1.26	U	1.26	U	19.2		10.3		10.3	
CL7(170)	1.12	U	1.12	U	1.12	U	7.88		4.82		5.21	
CL7(180)	0.975	U	0.975	U	0.975	U	17.4		9.73		8.42	
CL7(183)	1.02	U	1.02	U	1.02	U	4.43		2.61		3.39	
CL7(184)	1.02	U	1.02	U	1.02	U	1.09	U	1.09	U	2.12	U
CL7(187)	0.964	U	0.964	U	0.964	U	1.03	U	1.03	U	2.01	U
CL8(195)	1.10	U	1.10	U	1.10	U	6.76		3.81		3.11	
CL9(206)	1.08	U	1.08	U	1.08	U	16.5		8.70		7.24	
CL10(209)	1.20	U	1.20	U	1.20	U	12.8		7.77		6.82	
<u>Surrogate Recoveries (%)</u>												
DBOFB	86		75		90		73		64		83	
CL5(112)	72		69		70		64		56		71	

TABLE B.5. (contd)

Site/Replicate	HU-B Rep 1	HU-B Rep 2	HU-B Rep 3	HU-B Rep 1	HU-B Rep 2	HU-B Rep 3
Matrix	Site Water	Site Water	Site Water	Elutriate	Elutriate	Elutriate
Sample Size (L)	1.04	1.04	1.04	0.98	0.96	0.96
Units	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
2,4-DDD	0.765 U	0.765 U	0.765 U	10.29	5.43	6.47
2,4-DDT	0.777 U	0.777 U	0.777 U	0.829 U	0.842 U	0.842 U
4,4-DDD	1.12 U	1.12 U	1.12 U	9.51	4.87	6.98
4,4-DDE	0.949 U	0.949 U	0.949 U	32.2	11.2	14.1
4,4-DDT	0.962 U	0.962 U	0.962 U	1.03 U	1.04 U	1.04 U
Aldrin	14.70	0.713 U	0.713 U	0.760 U	0.772 U	0.772 U
alpha-Chlordane	0.891 U	0.891 U	0.891 U	3.67	1.31	0.906 J
Dieldrin	0.948 U	0.948 U	0.948 U	6.17	2.38	3.03
Endosulfan I/2,4'-DDE	0.813 U	0.813 U	0.813 U	0.868 U	0.881 U	0.881 U
Endosulfan II	10.77 U	10.77 U	10.77 U	11.5 U	11.7 U	11.7 U
Endosulfan sulfate	7.87 U	7.87 U	7.87 U	10.5	4.68 J	5.43 J
Heptachlor	0.631 U	0.631 U	0.631 U	0.673 U	0.683 U	0.683 U
Heptachlor epoxide	0.822 U	0.822 U	0.822 U	3.35	0.825 J	0.792 J
trans-Nonachlor	0.928 U	0.928 U	0.928 U	1.46	0.811 J	0.876 J
CL2(08)	0.841 U	0.841 U	0.841 U	3.58	4.44	3.85
CL3(18)	1.02 U	1.02 U	1.02 U	26.6	10.5	12.0
CL3(28)	1.15 U	1.15 U	1.15 U	31.2	11.2	12.1
CL4(44)	1.17 U	1.17 U	1.17 U	28.6	11.2	13.7
CL4(49)	1.88	2.22	2.27	29.5	9.50	12.0
CL4(52)	1.18 U	2.08	2.02	37.2	18.9	17.8
CL4(66)	0.917 U	0.814 J	0.917 U	65.7	33.4	47.5
CL5(87)	1.03 U	1.03 U	1.03 U	10.2	3.64	5.01
CL5(101)	1.04 U	1.04 U	1.04 U	24.0	10.0	11.5
CL5(105)	1.24 U	1.24 U	1.24 U	5.17	2.34	2.37
CL5(118)	0.977 U	0.977 U	0.977 U	1.04 U	7.03	9.63
CL6(128)	1.10 U	1.10 U	1.10 U	4.14	2.15	2.32
CL6(138)	1.31 U	1.31 U	1.31 U	25.2	9.86	12.9
CL6(153)	1.26 U	1.26 U	1.26 U	21.3	7.50	10.4
CL7(170)	1.12 U	1.12 U	1.12 U	8.05	3.34	3.80
CL7(180)	0.975 U	0.975 U	0.975 U	16.0	5.53	7.56
CL7(183)	1.02 U	1.02 U	1.02 U	3.88	1.67	2.05
CL7(184)	1.02 U	1.02 U	1.02 U	1.09 U	1.11 U	1.11 U
CL7(187)	0.964 U	0.964 U	0.964 U	1.03 U	1.04 U	1.04 U
CL8(195)	1.10 U	1.10 U	1.10 U	7.19	2.09	2.80
CL9(206)	1.08 U	1.08 U	1.08 U	16.7	4.82	6.65
CL10(209)	1.20 U	1.20 U	1.20 U	9.43	3.60	4.09
Surrogate Recoveries (%)						
DBOFB	47	51	49	79	70	73
CL5(112)	57	63	57	64	63	68

TABLE B.5. (contd)

Site/Replicate	HU-C Rep 1	HU-C Rep 2	HU-C Rep 3	HU-C Rep 1	HU-C Rep 2	HU-C Rep 3
Matrix	Site Water	Site Water	Site Water	Elutriate	Elutriate	Elutriate
Sample Size (L)	1.04	1.04	1.04	0.96	0.98	1.00
Units	ng/L	ng/L	ng/L	ng/L	ng/L	ng/L
2,4-DDD	0.765 U	0.765 U	0.765 U	6.49	5.83	5.59
2,4-DDT	0.777 U	0.777 U	0.777 U	0.842 U	0.824 U	0.812 U
4,4-DDD	1.12 U	1.12 U	1.12 U	7.70	6.14	7.89
4,4-DDE	0.949 U	0.949 U	0.949 U	26.3	20.6	20.0
4,4-DDT	0.962 U	0.962 U	0.962 U	1.04 U	1.02 U	1.01 U
Aldrin	0.713 U	0.713 U	0.713 U	0.772 U	0.756 U	0.745 U
alpha-Chlordane	0.891 U	0.891 U	0.891 U	3.65	3.50	2.79
Dieldrin	0.948 U	0.948 U	0.948 U	5.78	5.50	5.62
Endosulfan I/2,4'-DDE	0.813 U	0.813 U	0.813 U	0.881 U	0.863 U	0.850 U
Endosulfan II	10.8 U	10.8 U	10.8 U	11.7 U	11.4 U	11.3 U
Endosulfan sulfate	7.87 U	7.87 U	7.87 U	13.5	10.0	10.0
Heptachlor	0.631 U	0.631 U	0.631 U	0.683 U	0.669 U	0.659 U
Heptachlor epoxide	0.822 U	0.822 U	0.822 U	2.95	3.11	2.72
trans-Nonachlor	0.928 U	0.928 U	0.928 U	1.39	1.45	1.55
CL2(08)	0.841 U	0.841 U	0.841 U	3.77	3.66	0.88 U
CL3(18)	1.02 U	1.02 U	1.02 U	25.1	21.7	16.6
CL3(28)	1.15 U	1.15 U	1.15 U	28.6	22.9	22.7
CL4(44)	1.17 U	1.17 U	1.17 U	24.9	23.5	21.1
CL4(49)	1.01 U	1.01 U	1.01 U	24.9	23.1	21.4
CL4(52)	1.95	2.10	1.87	30.3	30.2	27.4
CL4(66)	0.917 U	0.917 U	0.917 U	46.2	38.8	20.6
CL5(87)	1.03 U	1.03 U	1.03 U	9.99	7.73	7.81
CL5(101)	1.04 U	1.04 U	1.04 U	22.7	20.0	18.2
CL5(105)	1.24 U	1.24 U	1.24 U	5.82	4.17	4.82
CL5(118)	0.977 U	0.977 U	0.977 U	20.3	15.5	14.7
CL6(128)	1.10 U	1.10 U	1.10 U	3.82	2.92	3.32
CL6(138)	1.31 U	1.31 U	1.31 U	27.1	21.7	20.8
CL6(153)	1.26 U	1.26 U	1.26 U	21.2	16.4	16.2
CL7(170)	1.12 U	1.12 U	1.12 U	7.62	5.93	5.75
CL7(180)	0.975 U	0.975 U	0.975 U	14.6	10.8	11.1
CL7(183)	1.02 U	1.02 U	1.02 U	3.94	3.14	3.74
CL7(184)	1.02 U	1.02 U	1.02 U	1.11 U	1.08 U	1.07 U
CL7(187)	0.964 U	0.964 U	0.964 U	1.04 U	1.02 U	1.01 U
CL8(195)	1.10 U	1.10 U	1.10 U	3.89	2.99	3.36
CL9(206)	1.08 U	1.08 U	1.08 U	7.23	4.95	5.10
CL10(209)	1.20 U	1.20 U	1.20 U	6.18	4.99	5.09
Surrogate Recoveries (%)						
DBOFB	49	41	53	74	77	57
CL5(112)	61	57	59	68	71	56

TABLE B.5. (contd)

Site/Replicate	HU-D Rep 1		HU-D Rep 2		HU-D Rep 3		HU-D Rep. 1		HU-D Rep. 2		HU-D Rep. 3	
Matrix	Site Water		Site Water		Site Water		Elutriate		Elutriate		Elutriate	
Sample Size (L)	1.04		1.04		0.52		0.98		0.96		0.96	
Units	ng/L		ng/L		ng/L		ng/L		ng/L		ng/L	
2,4-DDD	0.765	U	0.765	U	1.53	U	3.94		6.65		8.29	
2,4-DDT	0.777	U	0.777	U	1.55	U	0.82	U	0.84	U	0.84	U
4,4-DDD	1.12	U	1.12	U	2.23	U	3.50		2.37		5.01	
4,4-DDE	0.949	U	0.949	U	1.90	U	9.47		5.05		9.47	
4,4-DDT	0.962	U	0.962	U	1.92	U	1.02	U	1.04	U	1.04	U
Aldrin	0.713	U	0.713	U	1.43	U	0.76	U	0.77	U	0.77	U
alpha-Chlordane	0.891	U	0.891	U	1.72	J	1.27		0.27	J	1.56	
Dieldrin	0.948	U	0.948	U	1.53	J	5.14		2.33		4.13	
Endosulfan I/2,4'-DDE	0.813	U	0.813	U	1.63	U	0.86	U	0.88	U	0.88	U
Endosulfan II	10.8	U	10.8	U	2.71	J	11.43	U	1.70	J	11.67	U
Endosulfan sulfate	7.87	U	7.87	U	15.7	U	5.37	J	8.53	U	2.88	J
Heptachlor	0.631	U	0.631	U	1.26	U	0.67	U	0.68	U	0.68	U
Heptachlor epoxide	0.822	U	0.822	U	1.64	U	0.87	U	0.89	U	0.89	U
trans-Nonachlor	0.928	U	0.928	U	1.86	U	0.65	J	1.01	U	1.00	J
CL2(08)	0.841	U	0.841	U	1.68	U	0.89	U	0.91	U	0.91	U
CL3(18)	1.02	U	1.02	U	2.05	U	18.02		8.50		14.85	
CL3(28)	1.15	U	1.15	U	2.29	U	10.74		6.75		11.09	
CL4(44)	1.17	U	1.17	U	2.34	U	14.30		8.22		15.05	
CL4(49)	1.01	U	1.01	U	2.01	U	13.46		6.39		12.93	
CL4(52)	1.16	J	1.51		2.37	U	16.93		9.44		19.15	
CL4(66)	0.917	U	0.917	U	1.83	U	44.09		31.61		49.29	
CL5(87)	1.03	U	1.03	U	2.06	U	4.08		2.38		4.89	
CL5(101)	1.04	U	1.04	U	2.07	U	9.57		5.72		11.90	
CL5(105)	1.24	U	1.24	U	2.48	U	1.98		1.36		2.70	
CL5(118)	0.977	U	0.977	U	1.95	U	7.57		4.00		8.63	
CL6(128)	1.10	U	1.10	U	2.19	U	2.32		0.84	J	2.46	
CL6(138)	1.31	U	1.31	U	2.62	U	10.29		1.42	U	1.42	U
CL6(153)	1.26	U	1.26	U	2.52	U	8.70		4.21		9.28	
CL7(170)	1.12	U	1.12	U	2.25	U	3.55		1.52		3.13	
CL7(180)	0.975	U	0.975	U	1.95	U	5.78		2.58		5.98	
CL7(183)	1.02	U	1.02	U	2.04	U	1.89		0.78	J	1.57	
CL7(184)	1.02	U	1.02	U	2.04	U	1.08	U	1.11	U	1.11	U
CL7(187)	0.964	U	0.964	U	1.93	U	1.02	U	1.04	U	1.04	U
CL8(195)	1.10	U	1.10	U	2.21	U	2.53		1.07	J	2.55	
CL9(206)	1.08	U	1.08	U	2.16	U	5.83		2.19		5.68	
CL10(209)	1.20	U	1.20	U	2.40	U	3.50		1.54		3.60	
Surrogate Recoveries (%)												
DBOFB	57		70		32		89		70		91	
CL5(112)	59		63		49		72		69		80	

(a) U Undetected at or above concentration given.
(b) J Analyte detected is below established Method Detection Limit (MDL)

TABLE B.6. Quality Control Data (Method Blanks and Recovery of Matrix Spikes) for Pesticides and PCBs in Site Water and Elutriate

Sample:	Method Blank	SB-B Rep. 3	SB-B Rep. 3 MS	Amount Spiked	Percent Recovery
Matrix:	Control Water	Site Water	Site Water		
Sample Size (L):	1.01 [(a)]	0.53	0.51		
Batch:	1	1	1	1	1
Units:	ng/L	ng/L	ng/L	ng	%
2,4-DDD	0.79 U [(b)]	1.52 U	NS [(c)]	NS	NA [(d)]
2,4-DDT	0.80 U	1.54 U	159.31	NS	NA
4,4-DDD	1.15 U	2.21 U	142.46	80.40	90
4,4-DDE	0.98 U	1.88 U	138.23	80.20	88
4,4-DDT	0.99 U	1.90 U	135.93	80.20	86
Aldrin	0.73 U	1.41 U	134.31	80.20	85
alpha-Chlordane	0.92 U	1.77 U	129.31	80.00	82
Dieldrin	0.97 U	2.64	111.18	80.20	69
Endosulfan I/2,4'-DDE	0.84 U	1.61 U	138.52	80.20	88
Endosulfan II	11.07 U	21.33 U	131.51	80.20	84
Endosulfan sulfate	8.09 U	15.59 U	120.25	80.20	76
Heptachlor	0.65 U	1.25 U	117.33	80.20	75
Heptachlor epoxide	0.85 U	1.63 U	118.33	80.20	75
trans-Nonachlor	0.95 U	1.84 U	NS	NS	NA
CL2(08)	0.87 U	1.67 U	C [(e)]	80.00	NC [(f)]
CL3(18)	1.05 U	2.03 U	83.25	80.00	53
CL3(28)	1.18 U	2.27 U	131.73	80.00	84
CL4(44)	1.20 U	2.32 U	114.82	80.00	73
CL4(49)	1.03 U	1.99 U	NS	NS	NA
CL4(52)	1.22 U	2.34 U	108.44	80.00	69
CL4(66)	0.94 U	1.82 U	137.82	80.00	88
CL5(87)	1.06 U	2.04 U	NS	NS	NA
CL5(101)	1.06 U	2.05 U	110.62	80.00	71
CL5(105)	1.28 U	2.46 U	133.30	80.00	85
CL5(118)	1.00 U	1.94 U	121.65	80.00	78
CL6(128)	1.13 U	2.17 U	121.75	80.00	78
CL6(138)	1.35 U	2.60 U	123.58	80.00	79
CL6(153)	1.29 U	2.49 U	108.26	80.00	69
CL7(170)	1.16 U	2.23 U	127.93	80.00	82
CL7(180)	1.00 U	1.93 U	118.14	80.00	75
CL7(183)	1.05 U	2.02 U	NS	NS	NA
CL7(184)	1.05 U	2.02 U	NS	NS	NA
CL7(187)	0.99 U	1.91 U	108.34	80.00	69
CL8(195)	1.14 U	2.19 U	122.94	80.00	78
CL9(206)	1.11 U	2.14 U	117.95	80.00	75
CL10(209)	1.23 U	2.38 U	113.65	80.00	72
Surrogate Recoveries (%)					
DBOFB	86	99	94	NA	NA
CL5(112)	77	74	74	NA	NA

TABLE B.6. (Contd)

Sample:	Method Blank	HU-D Rep. 3	HU-D Rep. 3 MS	Amount Spiked	Percent Recovery
Matrix:	Control Water	Site Water	Site Water		
Sample Size (L):	1.01 [(a)]	0.52	0.52		
Batch:	2	2	2	2	2
Units:	ng/L	ng/L	ng/L	ng	%
2,4-DDD	0.79 U	1.53 U	NS	NS	NA
2,4-DDT	0.80 U	1.55 U	NS	NS	NA
4,4-DDD	1.15 U	2.23 U	132.72	80.40	86
4,4-DDE	0.98 U	1.90 U	120.53	80.20	78
4,4-DDT	0.99 U	1.92 U	125.17	80.20	81
Aldrin	0.73 U	1.43 U	113.20	80.20	73
alpha-Chlordane	0.92 U	1.72 J [(g)]	118.11	80.00	76
Dieldrin	0.98 U	1.53 J	84.92	80.20	54
Endosulfan I/2,4'-DDE	0.84 U	1.63 U	136.31	80.20	88
Endosulfan II	11.08 U	2.71 J	111.86	80.20	71
Endosulfan sulfate	8.10 U	15.74 U	98.59	80.20	64
Heptachlor	0.65 U	1.26 U	103.27	80.20	67
Heptachlor epoxide	0.85 U	1.64 U	117.22	80.20	76
trans-Nonachlor	0.95 U	1.86 U	NS	NS	NA
CL2(08)	0.87 U	1.68 U	C	80.00	NC
CL3(18)	1.05 U	2.05 U	73.37	80.00	48 [(n)]
CL3(28)	1.18 U	2.29 U	125.42	80.00	82
CL4(44)	1.20 U	2.34 U	109.8	80.00	71
CL4(49)	1.03 U	2.01 U	NS	NS	NA
CL4(52)	1.22 U	2.37 U	103.56	80.00	67
CL4(66)	0.94 U	1.83 U	147	80.00	96
CL5(87)	1.06 U	2.06 U	NS	NS	NA
CL5(101)	1.07 U	2.07 U	118.56	80.00	77
CL5(105)	1.28 U	2.48 U	138.28	80.00	90
CL5(118)	1.00 U	1.95 U	125.01	80.00	81
CL6(128)	1.13 U	2.19 U	122.64	80.00	80
CL6(138)	1.35 U	2.62 U	113.75	80.00	74
CL6(153)	1.29 U	2.52 U	103.09	80.00	67
CL7(170)	1.16 U	2.25 U	130.43	80.00	85
CL7(180)	1.00 U	1.95 U	115.48	80.00	75
CL7(183)	1.05 U	2.04 U	NS	NS	NA
CL7(184)	1.05 U	2.04 U	NS	NS	NA
CL7(187)	0.99 U	1.93 U	94.93	80.00	62
CL8(195)	1.14 U	2.21 U	112.84	80.00	73
CL9(206)	1.11 U	2.16 U	106.60	80.00	69
CL10(209)	1.23 U	2.40 U	96.54	80.00	63
Surrogate Recoveries (%)					
DBOFB	33	32	62	NA	NA
CL5(112)	46	49	64	NA	NA

TABLE B.6. (Contd)

Sample: Matrix: Sample Size (L): Batch: Units:	Method Blank Control Water 0.94 [(a)] 3 ng/L	EC-B Rep. 3 Elutriate 0.50 3 ng/L	EC-B Rep. 3 MS Elutriate 0.48 3 ng/L	Amount Spiked 3 ng	Percent Recovery 3 %
2,4-DDD	0.85 U	3.07	NS	NS	NA
2,4-DDT	0.86 U	0.925 J	NS	NS	NA
4,4-DDD	1.24 U	12.2	185.49	80.40	103
4,4-DDE	1.06 U	6.55	163.88	80.20	94
4,4-DDT	1.07 U	2.00 U	172.90	80.20	103
Aldrin	0.79 U	22.5	199.10	80.20	106
alpha-Chlordane	0.99 U	13.2	189.13	80.00	106
Dieldrin	1.05 U	3.80	122.35	80.20	71
Endosulfan I/2,4'-DDE	0.90 U	1.69 U	205.25	80.20	123 [(n)]
Endosulfan II	11.97 U	22.4 U	154.59	80.20	93
Endosulfan sulfate	8.75 U	16.4 U	146.38	80.20	88
Heptachlor	0.70 U	1.31 U	179.22	80.20	107
Heptachlor epoxide	0.91 U	1.71 U	209.34	80.20	125 [(n)]
trans-Nonachlor	1.03 U	7.17	7.24	NS	NA
CL2(08)	0.94 U	1.75 U	C	80.00	NC
CL3(18)	1.14 U	2.13 U	145.89	80.00	88
CL3(28)	1.28 U	15.3	203.61	80.00	113
CL4(44)	1.30 U	12.4	185.74	80.00	104
CL4(49)	1.12 U	8.62	10.64	NS	NA
CL4(52)	1.32 U	66.5	201.24	80.00	81
CL4(66)	1.02 U	17.8	215.42	80.00	119
CL5(87)	1.14 U	4.94	NS	NS	NA
CL5(101)	1.15 U	11.6	181.50	80.00	102
CL5(105)	1.38 U	1.88 J	181.11	80.00	108
CL5(118)	1.09 U	9.71	164.19	80.00	93
CL6(128)	1.22 U	2.54	155.43	80.00	92
CL6(138)	1.46 U	11.1	155.98	80.00	87
CL6(153)	1.40 U	7.32	141.71	80.00	81
CL7(170)	1.25 U	2.34 U	163.91	80.00	98
CL7(180)	1.08 U	2.03 U	152.51	80.00	92
CL7(183)	1.14 U	2.09 J	NS	NS	NA
CL7(184)	1.14 U	2.12 U	NS	NS	NA
CL7(187)	1.07 U	2.01 U	121.21	80.00	73
CL8(195)	1.23 U	2.30 U	143.07	80.00	86
CL9(206)	1.20 U	2.24 U	147.57	80.00	89
CL10(209)	1.33 U	2.49 U	131.96	80.00	79
Surrogate Recoveries (%)					
DBOFB	86	113	111	NA	NA
CL5(112)	79	72	74	NA	NA

TABLE B.6. (Contd)

Sample:	Method Blank		HU-A Rep. 3		HU-A Rep. 3 MS	Amount	Percent
Matrix:	Control Water		Elutriate		Elutriate	Spiked	Recovery
Sample Size (L):	0.94 [(a)]		0.47		0.50		
Batch:	4		4		4	4	4
Units:	ng/L		ng/L		ng/L	ng	%
2,4-DDD	0.85	U	9.81		NS	NS	NA
2,4-DDT	0.86	U	1.62	U	NS	NS	NA
4,4-DDD	1.23	U	9.54		180.43	80.40	100
4,4-DDE	1.05	U	26.82		185.20	80.20	93
4,4-DDT	1.06	U	2.00	U	168.19	80.20	99
Aldrin	0.79	U	1.48	U	145.33	80.20	85
alpha-Chlordane	0.98	U	2.06		152.82	80.00	89
Dieldrin	1.05	U	4.72		129.96	80.20	73
Endosulfan I/2,4'-DDE	0.90	U	10.32		178.82	80.20	99
Endosulfan II	11.89	U	22.40	U	160.96	80.20	94
Endosulfan sulfate	8.69	U	16.37	U	167.71	80.20	98
Heptachlor	0.70	U	1.31	U	176.94	80.20	104
Heptachlor epoxide	0.91	U	0.47	J	176.62	80.20	103
trans-Nonachlor	1.02	U	1.20	J	NS	NS	NA
CL2(08)	0.93	U	1.75	U	C	80.00	NC
CL3(18)	1.13	U	7.52		107.87	80.00	59
CL3(28)	1.27	U	11.32		146.96	80.00	80
CL4(44)	1.29	U	12.98		129.37	80.00	68
CL4(49)	1.11	U	9.72		13.77	NS	NA
CL4(52)	1.31	U	17.50		127.11	80.00	64
CL4(66)	1.01	U	59.92		183.33	80.00	73
CL5(87)	1.14	U	5.12		5.28	NS	NA
CL5(101)	1.14	U	13.99		127.98	80.00	67
CL5(105)	1.37	U	2.31	J	155.08	80.00	90
CL5(118)	1.08	U	8.52		130.92	80.00	72
CL6(128)	1.21	U	4.25		146.69	80.00	84
CL6(138)	1.45	U	15.07		142.49	80.00	75
CL6(153)	1.39	U	10.27		114.82	80.00	61
CL7(170)	1.24	U	5.21		161.93	80.00	92
CL7(180)	1.08	U	8.42		152.31	80.00	85
CL7(183)	1.13	U	3.39		NS	NS	NA
CL7(184)	1.13	U	2.12	U	NS	NS	NA
CL7(187)	1.07	U	2.01	U	118.67	80.00	70
CL8(195)	1.22	U	3.11		163.38	80.00	94
CL9(206)	1.19	U	7.24		171.60	80.00	97
CL10(209)	1.32	U	6.82		153.12	80.00	86
<u>Surrogate Recoveries (%)</u>							
DBOFB	79		83		81	NA	NA
CL5(112)	71		71		65	NA	NA

(a) Sample concentration of the method blank adjusted for the average sample size of the batch.
(b) U Undetected at or above concetntration shown.
(c) NS Not spiked.
(d) NA Not applicable.
(e) C PCB congener 08 coeluted with non-target pesticide a-BHC. resulting in unacceptable recovery in matrix spike samples.
(f) NC Percent recovery not calculated due to coeluting peak.
(g) J Concentration estimated; analyte detected below method detection limit (MDL) and above instrument detection limit (IDL).
(h) Outside quality control criteria (50-120%) for matrix spike recovery.

TABLE B.7. Quality Control Data (Triplicate Analyses) for Pesticides and PCBs in Site Water and Elutriate

Matrix	PC Rep. 1 Site Water	PC Rep. 2 Site Water	PC Rep. 3 Site Water	RSD[a]	EC-A Rep. 1 Site Water	EC-A Rep. 2 Site Water	EC-A Rep. 3 Site Water	RSD
Sample Size (L)	1.04	1.04	1.04		1.04	1.04	1.04	
Batch	1	1	1		1	1	1	
Units	ng/L	ng/L	ng/L		ng/L	ng/L	ng/L	
2,4-DDD	0.77 U[b]	0.77 U	0.77 U	NA[c]	0.77 U	0.77 U	0.70 J	NA
2,4-DDT	0.78 U	0.78 U	0.78 U	NA	0.78 U	0.78 U	0.78 U	NA
4,4-DDD	1.95	1.71	1.90	7%	4.99	3.50	3.89	19%
4,4-DDE	0.63 J[d]	0.60 J	0.81 J	16%	2.97	1.84	2.64	23%
4,4-DDT	0.96 U	1.70	0.90 J	NA	4.42	3.92	0.96 U	NA
Aldrin	0.71 U	0.71 U	0.71 U	NA	26.7	27.1	0.71 U	NA
alpha-Chlordane	1.80	1.94	1.76	5%	4.35	4.29	5.59	16%
Dieldrin	1.80	1.55	1.56	9%	3.24	1.76	2.53	30%
Endosulfan I/2,4'-DDE	0.81 U	0.81 U	0.81 U	NA	0.81 U	0.81 U	0.81 U	NA
Endosulfan II	1.57 J	10.8 U	10.8 U	NA	10.8 U	10.8 U	10.8 U	NA
Endosulfan sulfate	7.87 U	7.87 U	7.87 U	NA	7.87 U	7.87 U	7.87 U	NA
Heptachlor	0.63 U	0.63 U	0.63 U	NA	0.63 U	0.63 U	0.63 U	NA
Heptachlor epoxide	0.82 U	0.82 U	0.82 U	NA	0.82 U	0.82 U	0.82 U	NA
trans-Nonachlor	0.93 U	0.93 U	0.93 U	NA	1.62	1.60	3.03	39%
CL2(08)	0.84 U	0.84 U	0.84 U	NA	0.84 U	0.84 U	0.84 U	NA
CL3(18)	1.02 U	1.02 U	1.02 U	NA	1.80	1.02 U	1.02 U	NA
CL3(28)	4.20	2.69	3.05	24%	4.25	1.15 U	1.15 U	NA
CL4(44)	1.17 U	1.17 U	1.17 U	NA	2.97	2.59	1.17 U	NA
CL4(49)	1.01 U	1.01 U	1.01 U	NA	1.01 U	1.01 U	1.01 U	NA
CL4(52)	1.18 U	1.18 U	1.18 U	NA	2.98	2.30	1.18 U	NA
CL4(66)	0.92 U	0.92 U	0.92 U	NA	0.92 U	0.92 U	0.92 U	NA
CL5(87)	0.82 J	0.52 J	0.73 J	23%	1.96	0.69 J	1.41	47%
CL5(101)	1.04 U	1.04 U	1.04 U	NA	1.04 U	1.04 U	1.04 U	NA
CL5(105)	1.24 U	1.24 U	1.24 U	NA	0.71 J	0.86 J	1.24 U	NA
CL5(118)	0.98 U	0.98 U	0.98 U	NA	1.50	0.98 U	1.25	NA
CL6(128)	1.10 U	1.10 U	1.10 U	NA	1.10 U	1.10 U	1.10 U	NA
CL6(138)	1.31 U	1.31 U	0.66 J	NA	1.41	1.28 J	1.31 U	NA
CL6(153)	1.26 U	1.26 U	0.96 J	NA	1.17 J	1.26	1.26 U	NA
CL7(170)	1.12 U	1.12 U	1.12 U	NA	1.12 U	1.12 U	1.12 U	NA
CL7(180)	0.98 U	0.98 U	0.98 U	NA	0.98 U	0.98 U	0.98 U	NA
CL7(183)	1.02 U	1.02 U	1.02 U	NA	1.02 U	1.02 U	1.02 U	NA
CL7(184)	1.02 U	1.02 U	1.02 U	NA	0.67 J	1.02 U	1.02 U	NA
CL7(187)	0.96 U	0.96 U	0.96 U	NA	0.96 U	0.96 U	0.96 U	NA
CL8(195)	1.10 U	1.10 U	1.10 U	NA	1.10 U	1.10 U	1.10 U	NA
CL9(206)	1.08 U	1.08 U	1.08 U	NA	1.08 U	1.08 U	1.08 U	NA
CL10(209)	1.20 U	1.20 U	1.20 U	NA	1.20 U	1.20 U	1.20 U	NA
Surrogate Recoveries (%)								
DBOFB	108	105	103	NA	100	112	114	NA
CL5(112)	72	72	71	NA	69	71	69	NA

TABLE B.7. (Contd)

	EC-B Rep. 1	EC-B Rep. 2	EC-B Rep. 3	RSD	HU-A Rep 1	HU-A Rep 2	HU-A Rep 3	RSD
Matrix	Site Water	Site Water	Site Water		Site Water	Site Water	Site Water	
Sample Size (L)	1.04	1.04	1.04		1.04	1.04	1.04	
Batch	1	1	1	1	1	1	1	
Units	ng/L	ng/L	ng/L		ng/L	ng/L	ng/L	
2,4-DDD	0.77 U	0.77 U	0.77 U	NA	0.77 U	0.77 U	0.77 U	NA
2,4-DDT	0.46 J	0.78 U	0.78 U	NA	0.78 U	0.78 U	0.78 U	NA
4,4-DDD	2.88	2.24	3.07	16%	1.12 U	1.12 U	1.12 U	NA
4,4-DDE	1.03	0.70 J	0.86 J	19%	0.95 U	0.95 U	0.95 U	NA
4,4-DDT	0.96 U	0.96 U	0.88 J	NA	0.96 U	0.96 U	0.96 U	NA
Aldrin	15.5	8.37	7.68	41%	0.71 U	0.71 U	0.71 U	NA
alpha-Chlordane	2.99	2.03	2.57	19%	0.89 U	0.68 J	0.89 U	NA
Dieldrin	1.80	1.14	2.80	44%	2.28	1.42	1.21	35%
Endosulfan I/2,4'-DDE	0.81 U	0.81 U	0.81 U	NA	0.81 U	0.81 U	0.81 U	NA
Endosulfan II	10.8 U	10.8 U	10.8 U	NA	10.8 U	10.8 U	10.8 U	NA
Endosulfan sulfate	7.87 U	7.87 U	7.87 U	NA	7.87 U	7.87 U	7.87 U	NA
Heptachlor	0.63 U	0.63 U	0.63 U	NA	0.63 U	0.63 U	0.63 U	NA
Heptachlor epoxide	0.82 U	0.82 U	0.82 U	NA	0.82 U	0.82 U	0.82 U	NA
trans-Nonachlor	1.00	1.01	1.74	34%	0.93 U	0.93 U	0.93 U	NA
CL2(08)	0.84 U	0.84 U	0.84 U	NA	0.84 U	0.84 U	0.84 U	NA
CL3(18)	1.02 U	1.02 U	1.02 U	NA	1.02 U	1.02 U	1.02 U	NA
CL3(28)	7.34	4.16	5.59	28%	1.15 U	1.15 U	1.15 U	NA
CL4(44)	1.17 U	1.17 U	1.94	NA	1.17 U	1.17 U	1.17 U	NA
CL4(49)	1.01 U	1.01 U	1.01 U	NA	1.01 U	1.01 U	1.01 U	NA
CL4(52)	1.18 U	1.18 U	1.18 U	NA	1.18 U	1.18 U	1.18 U	NA
CL4(66)	0.92 U	0.92 U	0.92 U	NA	0.92 U	0.92 U	0.92 U	NA
CL5(87)	0.76 J	0.75 J	1.45	40%	1.56	2.51	2.32	24%
CL5(101)	1.04 U	1.04 U	1.04 U	NA	1.33	0.96 J	1.13	16%
CL5(105)	1.24 U	1.24 U	1.24 U	NA	1.24 U	1.24 U	1.24 U	NA
CL5(118)	0.56 J	0.52 J	0.87 J	29%	0.98 U	0.98 U	0.98 U	NA
CL6(128)	1.10 U	1.10 U	1.10 U	NA	1.10 U	1.10 U	1.10 U	NA
CL6(138)	1.31 U	1.31 U	1.45	NA	1.31 U	1.31 U	1.31 U	NA
CL6(153)	0.88 J	0.62 J	0.83 J	18%	1.26 U	1.26 U	1.26 U	NA
CL7(170)	1.12 U	1.12 U	1.12 U	NA	1.12 U	1.12 U	1.12 U	NA
CL7(180)	0.98 U	0.98 U	0.98 U	NA	0.98 U	0.98 U	0.98 U	NA
CL7(183)	1.02 U	1.02 U	1.02 U	NA	1.02 U	1.02 U	1.02 U	NA
CL7(184)	1.02 U	1.02 U	0.50 J	NA	1.02 U	1.02 U	1.02 U	NA
CL7(187)	0.96 U	0.96 U	0.96 U	NA	0.96 U	0.96 U	0.96 U	NA
CL8(195)	1.10 U	1.10 U	1.10 U	NA	1.10 U	1.10 U	1.10 U	NA
CL9(206)	1.08 U	1.08 U	1.08 U	NA	1.08 U	1.08 U	1.08 U	NA
CL10(209)	1.20 U	1.20 U	1.20 U	NA	1.20 U	1.20 U	1.20 U	NA
<u>Surrogate Recoveries (%)</u>								
DBOFB	108	64	112	NA	86	75	90	NA
CL5(112)	69	42	67	NA	72	69	70	NA

TABLE B.7. (Contd)

Matrix	SB-A Rep 1 Site Water	SB-A Rep 2 Site Water	SB-A Rep 3 Site Water	RSD	SB-B Rep 1 Water	SB-B Rep 2 Water	SB-B Rep 3 Water	RSD
Sample Size (L)	1.04	1.04	1.04		1.04	1.04	0.53	
Batch	1	1	1	1	1	1	1	1
Units	ng/L	ng/L	ng/L		ng/L	ng/L	ng/L	
2,4-DDD	0.77 U	0.77 U	0.77 U	NA	0.77 U	0.77 U	1.52 U	NA
2,4-DDT	0.78 U	0.78 U	0.78 U	NA	0.78 U	0.78 U	1.54 U	NA
4,4-DDD	1.12 U	1.12 U	1.12 U	NA	1.12 U	1.12 U	2.21 U	NA
4,4-DDE	0.95 U	0.95 U	0.95 U	NA	0.95 U	0.95 U	1.88 U	NA
4,4-DDT	0.96 U	0.96 U	0.96 U	NA	0.96 U	0.96 U	1.90 U	NA
Aldrin	0.71 U	0.71 U	0.71 U	NA	0.71 U	0.71 U	1.41 U	NA
alpha-Chlordane	0.89 U	0.89 U	0.89 U	NA	0.89 U	0.89 U	1.77 U	NA
Dieldrin	0.95 U	1.41	0.95 U	NA	0.95 U	2.18	2.64	NA
Endosulfan I/2,4'-D	0.81 U	0.81 U	0.81 U	NA	0.81 U	0.81 U	1.61 U	NA
Endosulfan II	10.8 U	10.8 U	10.8 U	NA	10.8 U	10.8 U	21.3 U	NA
Endosulfan sulfate	7.87 U	7.87 U	7.87 U	NA	7.87 U	7.87 U	15.6 U	NA
Heptachlor	0.63 U	0.63 U	0.63 U	NA	0.63 U	0.63 U	1.25 U	NA
Heptachlor epoxide	0.82 U	0.82 U	0.82 U	NA	0.82 U	0.82 U	1.63 U	NA
trans-Nonachlor	0.93 U	0.93 U	0.93 U	NA	0.93 U	0.93 U	1.84 U	NA
CL2(08)	0.84 U	0.84 U	0.84 U	NA	0.84 U	0.84 U	1.67 U	NA
CL3(18)	1.02 U	1.02 U	1.02 U	NA	1.02 U	1.02 U	2.03 U	NA
CL3(28)	1.15 U	1.15 U	1.15 U	NA	1.15 U	1.15 U	2.27 U	NA
CL4(44)	1.17 U	1.17 U	1.17 U	NA	1.17 U	1.17 U	2.32 U	NA
CL4(49)	1.01 U	1.01 U	1.01 U	NA	1.01 U	1.01 U	1.99 U	NA
CL4(52)	1.18 U	1.18 U	1.18 U	NA	1.18 U	2.48	2.34 U	NA
CL4(66)	0.92 U	0.92 U	0.92 U	NA	0.92 U	0.92 U	1.82 U	NA
CL5(87)	1.03 U	1.03 U	1.03 U	NA	1.03 U	2.15	2.04 U	NA
CL5(101)	1.04 U	1.23	1.04 U	NA	1.04 U	0.99 J	2.05 U	NA
CL5(105)	1.24 U	1.24 U	1.24 U	NA	1.24 U	1.24 U	2.46 U	NA
CL5(118)	0.98 U	0.98 U	0.98 U	NA	0.98 U	0.98 U	1.94 U	NA
CL6(128)	1.10 U	1.10 U	1.10 U	NA	1.10 U	1.10 U	2.17 U	NA
CL6(138)	1.31 U	1.31 U	1.31 U	NA	1.31 U	1.31 U	2.60 U	NA
CL6(153)	1.26 U	1.26 U	1.26 U	NA	1.26 U	1.26 U	2.49 U	NA
CL7(170)	1.12 U	1.12 U	1.12 U	NA	1.12 U	1.12 U	2.23 U	NA
CL7(180)	0.98 U	0.98 U	0.98 U	NA	0.98 U	0.98 U	1.93 U	NA
CL7(183)	1.02 U	1.02 U	1.02 U	NA	1.02 U	1.02 U	2.02 U	NA
CL7(184)	1.02 U	1.02 U	1.02 U	NA	1.02 U	1.02 U	2.02 U	NA
CL7(187)	0.96 U	0.96 U	0.96 U	NA	0.96 U	0.96 U	1.91 U	NA
CL8(195)	1.10 U	1.10 U	1.10 U	NA	1.10 U	1.10 U	2.19 U	NA
CL9(206)	1.08 U	1.08 U	1.08 U	NA	1.08 U	1.08 U	2.14 U	NA
CL10(209)	1.20 U	1.20 U	1.20 U	NA	1.20 U	1.20 U	2.38 U	NA
Surrogate Recoveries (%)								
DBOFB	82	94	104	NA	73	97	99	NA
CL5(112)	58	72	74	NA	61	67	74	NA

TABLE B.7. (Contd)

Matrix	BU Rep. 1 Site Water	BU Rep. 2 Site Water	BU Rep. 3 Site Water	RSD	Mud Dump Site Rep. 1 Site Water	Mud Dump Site Rep. 2 Site Water	Mud Dump Site Rep. 3 Site Water	RSD
Sample Size (L)	1.04	1.04	1.04		1.04	1.04	1.04	
Batch	2	2	2	2	2	2	2	2
Units	ng/L	ng/L	ng/L		ng/L	ng/L	ng/L	
2,4-DDD	0.77 U	0.77 U	0.77 U	NA	0.77 U	0.77 U	0.77 U	NA
2,4-DDT	0.78 U	0.78 U	0.78 U	NA	0.78 U	0.78 U	0.78 U	NA
4,4-DDD	1.12 U	1.12 U	1.12 U	NA	1.12 U	1.12 U	1.12 U	NA
4,4-DDE	0.95 U	0.95 U	0.95 U	NA	0.95 U	0.95 U	0.95 U	NA
4,4-DDT	0.96 U	0.96 U	0.96 U	NA	0.96 U	0.96 U	0.96 U	NA
Aldrin	0.71 U	0.71 U	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA
alpha-Chlordane	0.89 U	0.89 U	0.89 U	NA	0.89 U	0.89 U	0.89 U	NA
Dieldrin	0.95 U	0.95 U	0.95 U	NA	0.95 U	0.95 U	0.95 U	NA
Endosulfan I/2,4'-DDE	0.81 U	0.81 U	0.81 U	NA	0.81 U	0.81 U	0.81 U	NA
Endosulfan II	10.8 U	10.8 U	10.8 U	NA	10.8 U	10.8 U	10.8 U	NA
Endosulfan sulfate	7.87 U	7.87 U	7.87 U	NA	7.87 U	7.87 U	7.87 U	NA
Heptachlor	0.63 U	0.63 U	0.63 U	NA	0.63 U	0.63 U	0.63 U	NA
Heptachlor epoxide	0.82 U	0.82 U	0.82 U	NA	0.82 U	0.82 U	0.82 U	NA
trans-Nonachlor	0.93 U	0.93 U	0.93 U	NA	0.93 U	0.93 U	0.93 U	NA
CL2(08)	0.84 U	0.84 U	0.84 U	NA	0.84 U	0.84 U	0.84 U	NA
CL3(18)	1.02 U	1.02 U	1.02 U	NA	1.02 U	1.02 U	1.02 U	NA
CL3(28)	1.15 U	1.15 U	1.15 U	NA	1.15 U	1.15 U	1.15 U	NA
CL4(44)	1.17 U	1.17 U	1.17 U	NA	1.17 U	1.17 U	1.17 U	NA
CL4(49)	4.25	1.01 U	1.01 U	NA	1.01 U	1.01 U	1.01 U	NA
CL4(52)	1.18 U	1.18 U	1.18 U	NA	1.18 U	1.18 U	1.18 U	NA
CL4(66)	0.92 U	0.92 U	0.92 U	NA	0.92 U	0.92 U	0.92 U	NA
CL5(87)	1.03 U	1.03 U	1.03 U	NA	1.03 U	1.03 U	1.03 U	NA
CL5(101)	1.04 U	1.04 U	1.04 U	NA	1.04 U	1.04 U	1.04 U	NA
CL5(105)	1.24 U	1.24 U	1.24 U	NA	1.24 U	1.24 U	1.24 U	NA
CL5(118)	0.98 U	0.98 U	0.98 U	NA	0.98 U	0.98 U	0.98 U	NA
CL6(128)	1.10 U	1.10 U	1.10 U	NA	1.10 U	1.10 U	1.10 U	NA
CL6(138)	1.31 U	1.31 U	1.31 U	NA	1.31 U	1.31 U	1.31 U	NA
CL6(153)	1.26 U	1.26 U	1.26 U	NA	1.26 U	1.26 U	1.26 U	NA
CL7(170)	1.12 U	1.12 U	1.12 U	NA	1.12 U	1.12 U	1.12 U	NA
CL7(180)	0.98 U	0.98 U	0.98 U	NA	0.98 U	0.98 U	0.98 U	NA
CL7(183)	1.02 U	1.02 U	1.02 U	NA	1.02 U	1.02 U	1.02 U	NA
CL7(184)	1.02 U	1.02 U	1.02 U	NA	1.02 U	1.02 U	1.02 U	NA
CL7(187)	0.96 U	0.96 U	0.96 U	NA	0.96 U	0.96 U	0.96 U	NA
CL8(195)	1.10 U	1.10 U	1.10 U	NA	1.10 U	1.10 U	1.10 U	NA
CL9(206)	1.08 U	1.08 U	1.08 U	NA	1.08 U	1.08 U	1.08 U	NA
CL10(209)	1.20 U	1.20 U	1.20 U	NA	1.20 U	1.20 U	1.20 U	NA
Surrogate Recoveries (%)								
DBOFB	30	51	44	NA	45	49	44	NA
CL5(112)	47	57	58	NA	52	56	56	NA

TABLE B.7. (Contd)

Matrix	HU-B Rep. 1 Site Water	HU-B Rep. 2 Site Water	HU-B Rep. 3 Site Water	RSD	HU-C Rep. 1 Site Water	HU-C Rep. 2 Site Water	HU-C Rep. 3 Site Water	RSD
Sample Size (L)	1.04	1.04	1.04		1.04	1.04	1.04	
Batch	2	2	2	2	2	2	2	2
Units	ng/L	ng/L	ng/L		ng/L	ng/L	ng/L	
2,4-DDD	0.77 U	0.77 U	0.77 U	NA	0.77 U	0.77 U	0.77 U	NA
2,4-DDT	0.78 U	0.78 U	0.78 U	NA	0.78 U	0.78 U	0.78 U	NA
4,4-DDD	1.12 U	1.12 U	1.12 U	NA	1.12 U	1.12 U	1.12 U	NA
4,4-DDE	0.95 U	0.95 U	0.95 U	NA	0.95 U	0.95 U	0.95 U	NA
4,4-DDT	0.96 U	0.96 U	0.96 U	NA	0.96 U	0.96 U	0.96 U	NA
Aldrin	14.7	0.71 U	0.71 U	NA	0.71 U	0.71 U	0.71 U	NA
alpha-Chlordane	0.89 U	0.89 U	0.89 U	NA	0.89 U	0.89 U	0.89 U	NA
Dieldrin	0.95 U	0.95 U	0.95 U	NA	0.95 U	0.95 U	0.95 U	NA
Endosulfan I/2,4'-DDE	0.81 U	0.81 U	0.81 U	NA	0.81 U	0.81 U	0.81 U	NA
Endosulfan II	10.8 U	10.8 U	10.8 U	NA	10.8 U	10.8 U	10.8 U	NA
Endosulfan sulfate	7.87 U	7.87 U	7.87 U	NA	7.87 U	7.87 U	7.87 U	NA
Heptachlor	0.63 U	0.63 U	0.63 U	NA	0.63 U	0.63 U	0.63 U	NA
Heptachlor epoxide	0.82 U	0.82 U	0.82 U	NA	0.82 U	0.82 U	0.82 U	NA
trans-Nonachlor	0.93 U	0.93 U	0.93 U	NA	0.93 U	0.93 U	0.93 U	NA
CL2(08)	0.84 U	0.84 U	0.84 U	NA	0.84 U	0.84 U	0.84 U	NA
CL3(18)	1.02 U	1.02 U	1.02 U	NA	1.02 U	1.02 U	1.02 U	NA
CL3(28)	1.15 U	1.15 U	1.15 U	NA	1.15 U	1.15 U	1.15 U	NA
CL4(44)	1.17 U	1.17 U	1.17 U	NA	1.17 U	1.17 U	1.17 U	NA
CL4(49)	1.88	2.22	2.27	10%	1.01 U	1.01 U	1.01 U	NA
CL4(52)	1.18 U	2.08	2.02	NA	1.95	2.10	1.87	6%
CL4(66)	0.92 U	0.81 J	0.92 U	NA	0.92 U	0.92 U	0.92 U	NA
CL5(87)	1.03 U	1.03 U	1.03 U	NA	1.03 U	1.03 U	1.03 U	NA
CL5(101)	1.04 U	1.04 U	1.04 U	NA	1.04 U	1.04 U	1.04 U	NA
CL5(105)	1.24 U	1.24 U	1.24 U	NA	1.24 U	1.24 U	1.24 U	NA
CL5(118)	0.98 U	0.98 U	0.98 U	NA	0.98 U	0.98 U	0.98 U	NA
CL6(128)	1.10 U	1.10 U	1.10 U	NA	1.10 U	1.10 U	1.10 U	NA
CL6(138)	1.31 U	1.31 U	1.31 U	NA	1.31 U	1.31 U	1.31 U	NA
CL6(153)	1.26 U	1.26 U	1.26 U	NA	1.26 U	1.26 U	1.26 U	NA
CL7(170)	1.12 U	1.12 U	1.12 U	NA	1.12 U	1.12 U	1.12 U	NA
CL7(180)	0.98 U	0.98 U	0.98 U	NA	0.98 U	0.98 U	0.98 U	NA
CL7(183)	1.02 U	1.02 U	1.02 U	NA	1.02 U	1.02 U	1.02 U	NA
CL7(184)	1.02 U	1.02 U	1.02 U	NA	1.02 U	1.02 U	1.02 U	NA
CL7(187)	0.96 U	0.96 U	0.96 U	NA	0.96 U	0.96 U	0.96 U	NA
CL8(195)	1.10 U	1.10 U	1.10 U	NA	1.10 U	1.10 U	1.10 U	NA
CL9(206)	1.08 U	1.08 U	1.08 U	NA	1.08 U	1.08 U	1.08 U	NA
CL10(209)	1.20 U	1.20 U	1.20 U	NA	1.20 U	1.20 U	1.20 U	NA
Surrogate Recoveries (%)								
DBOFB	47	51	49	NA	49	41	53	NA
CL5(112)	57	63	57	NA	61	57	59	NA

TABLE B.7. (Contd)

Matrix	HU-D Rep. 1 Site Water	HU-D Rep. 2 Site Water	HU-D Rep. 3 Site Water	RSD	GR Rep. 1 Water	GR Rep. 2 Water	GR Rep. 3 Water	RSD
Sample Size (L)	1.04	1.04	0.52		1.04	1.04	1.04	
Batch	2	2	2	2	2	2	2	2
Units	ng/L	ng/L	ng/L		ng/L	ng/L	ng/L	
2,4-DDD	0.77 U	0.77 U	1.53 U	NA	0.77 U	0.77 U	0.77 U	NA
2,4-DDT	0.78 U	0.78 U	1.55 U	NA	0.78 U	0.78 U	0.78 U	NA
4,4-DDD	1.12 U	1.12 U	2.23 U	NA	1.12 U	1.12 U	1.12 U	NA
4,4-DDE	0.95 U	0.95 U	1.90 U	NA	0.95 U	0.95 U	0.95 U	NA
4,4-DDT	0.96 U	0.96 U	1.92 U	NA	0.96 U	0.96 U	0.96 U	NA
Aldrin	0.71 U	0.71 U	1.43 U	NA	0.71 U	0.71 U	0.71 U	NA
alpha-Chlordane	0.89 U	0.89 U	1.72 J	NA	0.89 U	0.89 U	0.89 U	NA
Dieldrin	0.95 U	0.95 U	1.53 J	NA	0.95 U	0.95 U	0.95 U	NA
Endosulfan I/2,4'-D	0.81 U	0.81 U	1.63 U	NA	0.81 U	0.81 U	0.81 U	NA
Endosulfan II	10.8 U	10.8 U	2.71 J	NA	10.8 U	10.8 U	10.8 U	NA
Endosulfan sulfate	7.87 U	7.87 U	15.7 U	NA	7.87 U	7.87 U	7.87 U	NA
Heptachlor	0.63 U	0.63 U	1.26 U	NA	0.63 U	0.63 U	0.63 U	NA
Heptachlor epoxide	0.82 U	0.82 U	1.64 U	NA	0.82 U	0.82 U	0.82 U	NA
trans-Nonachlor	0.93 U	0.93 U	1.86 U	NA	0.93 U	0.93 U	0.93 U	NA
CL2(08)	0.84 U	0.84 U	1.68 U	NA	0.84 U	0.84 U	0.84 U	NA
CL3(18)	1.02 U	1.02 U	2.05 U	NA	1.02 U	1.02 U	1.02 U	NA
CL3(28)	1.15 U	1.15 U	2.29 U	NA	1.15 U	1.15 U	1.15 U	NA
CL4(44)	1.17 U	1.17 U	2.34 U	NA	1.17 U	1.17 U	1.17 U	NA
CL4(49)	1.01 U	1.01 U	2.01 U	NA	3.46	2.79	3.21	11%
CL4(52)	1.16 J	1.51	2.37 U	NA	1.18 U	1.18 U	1.18 U	NA
CL4(66)	0.92 U	0.92 U	1.83 U	NA	0.92 U	0.92 U	0.92 U	NA
CL5(87)	1.03 U	1.03 U	2.06 U	NA	1.03 U	1.03 U	1.03 U	NA
CL5(101)	1.04 U	1.04 U	2.07 U	NA	1.04 U	1.04 U	1.04 U	NA
CL5(105)	1.24 U	1.24 U	2.48 U	NA	1.24 U	1.24 U	1.24 U	NA
CL5(118)	0.98 U	0.98 U	1.95 U	NA	0.98 U	0.98 U	0.98 U	NA
CL6(128)	1.10 U	1.10 U	2.19 U	NA	1.10 U	1.10 U	1.10 U	NA
CL6(138)	1.31 U	1.31 U	2.62 U	NA	1.31 U	1.31 U	1.31 U	NA
CL6(153)	1.26 U	1.26 U	2.52 U	NA	1.26 U	1.26 U	1.26 U	NA
CL7(170)	1.12 U	1.12 U	2.25 U	NA	1.12 U	1.12 U	1.12 U	NA
CL7(180)	0.98 U	0.98 U	1.95 U	NA	0.98 U	0.98 U	0.98 U	NA
CL7(183)	1.02 U	1.02 U	2.04 U	NA	1.02 U	1.02 U	1.02 U	NA
CL7(184)	1.02 U	1.02 U	2.04 U	NA	1.02 U	1.02 U	1.02 U	NA
CL7(187)	0.96 U	0.96 U	1.93 U	NA	0.96 U	0.96 U	0.96 U	NA
CL8(195)	1.10 U	1.10 U	2.21 U	NA	1.10 U	1.10 U	1.10 U	NA
CL9(206)	1.08 U	1.08 U	2.16 U	NA	1.08 U	1.08 U	1.08 U	NA
CL10(209)	1.20 U	1.20 U	2.40 U	NA	1.20 U	1.20 U	1.20 U	NA
Surrogate Recoveries (%)								
DBOFB	57	70	32	NA	37	36	47	NA
CL5(112)	59	63	49	NA	60	55	60	NA

TABLE B.7. (Contd)

Matrix	PC Rep. 1 Elutriate	PC Rep. 2 Elutriate	PC Rep. 3 Elutriate	RSD	SB-B Rep. 1 Elutriate	SB-B Rep. 2 Elutriate	SB-B Rep. 3 Elutriate	RSD
Sample Size (L)	0.87	0.96	0.95		0.97	0.98	0.98	
Batch	3	3	3	3	3	3	3	3
Units	ng/L	ng/L	ng/L		ng/L	ng/L	ng/L	
2,4-DDD	11.1	13.5	17.9	24%	0.82 U	0.81 U	0.81 U	NA
2,4-DDT	5.01	4.62	5.47	8%	0.83 U	0.82 U	0.82 U	NA
4,4-DDD	42.1	48.9	75.1	31% [a]	1.20 U	1.18 U	1.18 U	NA
4,4-DDE	11.6	13.8	22.0	35% [a]	1.02 U	1.01 U	1.01 U	NA
4,4-DDT	1.15 U	1.04 U	1.05 U	NA	1.03 U	1.02 U	1.02 U	NA
Aldrin	0.85 U	0.77 U	0.78 U	NA	0.76 U	0.76 U	0.76 U	NA
alpha-Chlordane	13.4	14.9	21.1	25%	0.96 U	0.95 U	0.95 U	NA
Dieldrin	9.36	11.2	14.8	24%	1.02 U	1.01 U	1.01 U	NA
Endosulfan I/2,4'-DDE	0.97 U	0.88 U	0.89 U	NA	0.87 U	0.86 U	0.86 U	NA
Endosulfan II	4.93 J	4.73 J	6.70 J	20%	11.5 U	11.4 U	11.4 U	NA
Endosulfan sulfate	11.5	13.5	18.0	23%	8.44 U	8.35 U	8.35 U	NA
Heptachlor	0.75 U	0.68 U	0.69 U	NA	0.68 U	0.67 U	0.67 U	NA
Heptachlor epoxide	0.98 U	0.89 U	0.90 U	NA	0.88 U	0.87 U	0.87 U	NA
trans-Nonachlor	6.55	7.38	10.3	25%	0.99 U	0.98 U	0.98 U	NA
CL2(08)	1.01 U	0.91 U	0.92 U	NA	0.90 U	0.89 U	0.89 U	NA
CL3(18)	1.22 U	1.11 U	1.12 U	NA	1.10 U	1.09 U	1.09 U	NA
CL3(28)	5.32	5.88	6.89	13%	1.23 U	1.22 U	1.22 U	NA
CL4(44)	12.2	14.8	19.5	24%	1.25 U	1.24 U	1.24 U	NA
CL4(49)	7.62	7.50	11.4	25%	1.08 U	1.07 U	1.07 U	NA
CL4(52)	24.5	27.5	41.4	29%	1.27 U	1.26 U	1.26 U	NA
CL4(66)	9.78	11.8	21.5	44% [a]	0.98 U	0.97 U	0.97 U	NA
CL5(87)	25.0	26.6	37.1	22%	1.10 U	1.09 U	1.09 U	NA
CL5(101)	67.2	79.1	118	30%	1.11 U	1.10 U	1.10 U	NA
CL5(105)	30.6	34.2	30.0	7%	1.33 U	1.32 U	1.32 U	NA
CL5(118)	47.0	52.5	79.1	29%	1.05 U	1.04 U	1.04 U	NA
CL6(128)	8.85	10.6	14.9	27%	1.18 U	1.16 U	1.16 U	NA
CL6(138)	56.4	66.1	96.5	29%	1.41 U	1.39 U	1.39 U	NA
CL6(153)	35.9	39.0	67.7	37% [a]	1.35 U	1.33 U	1.33 U	NA
CL7(170)	11.3	15.7	22.3	33% [a]	1.21 U	1.19 U	1.19 U	NA
CL7(180)	26.2	29.5	44.9	30%	1.05 U	1.03 U	1.03 U	NA
CL7(183)	5.57	5.91	8.02	20%	1.09 U	1.08 U	1.08 U	NA
CL7(184)	1.22 U	1.11 U	1.12 U	NA	1.09 U	1.08 U	1.08 U	NA
CL7(187)	18.0	20.1	28.0	24%	1.03 U	1.02 U	1.02 U	NA
CL8(195)	3.00	3.41	5.39	32%	1.18 U	1.17 U	1.17 U	NA
CL9(206)	6.07	7.20	11.0	32%	1.16 U	1.14 U	1.14 U	NA
CL10(209)	1.28 J	1.37	1.97	25%	1.29 U	1.27 U	1.27 U	NA
<u>Surrogate Recoveries (%)</u>								
DBOFB	120	120	123	NA	102	101	98	NA
CL5(112)	71	66	58	NA	75	76	82	NA

TABLE B.7. (Contd)

Matrix	SB-A Rep. 1 Elutriate	SB-A Rep. 2 Elutriate	SB-A Rep. 3 Elutriate	RSD	BU Rep. 1 Elutriate	BU Rep. 2 Elutriate	BU Rep. 3 Elutriate	RSD
Sample Size (L)	1.00	0.995	0.995		0.95	0.96	0.98	
Batch	3	3	3	3	3	3	3	3
Units	ng/L	ng/L	ng/L		ng/L	ng/L	ng/L	
2,4-DDD	0.80 U	0.80 U	0.80 U	NA	0.84 U	0.83 U	0.81 U	NA
2,4-DDT	0.81 U	0.81 U	0.81 U	NA	0.85 U	0.84 U	0.82 U	NA
4,4-DDD	1.16 U	1.17 U	1.17 U	NA	1.22 U	1.21 U	1.18 U	NA
4,4-DDE	0.99 U	0.99 U	0.99 U	NA	1.04 U	1.03 U	1.01 U	NA
4,4-DDT	1.00 U	1.01 U	1.01 U	NA	1.05 U	1.04 U	1.02 U	NA
Aldrin	0.74 U	0.74 U	0.74 U	NA	0.78 U	0.77 U	0.76 U	NA
alpha-Chlordane	0.93 U	0.93 U	0.93 U	NA	0.98 U	0.97 U	0.95 U	NA
Dieldrin	0.99 U	0.99 U	0.99 U	NA	1.04 U	1.03 U	1.01 U	NA
Endosulfan I/2,4'-DDE	0.85 U	0.85 U	0.85 U	NA	0.89 U	0.88 U	0.86 U	NA
Endosulfan II	11.2 U	11.3 U	11.3 U	NA	11.8 U	11.7 U	11.4 U	NA
Endosulfan sulfate	8.19 U	8.23 U	8.23 U	NA	8.62 U	8.53 U	8.35 U	NA
Heptachlor	0.66 U	0.66 U	0.66 U	NA	0.69 U	0.68 U	0.67 U	NA
Heptachlor epoxide	0.86 U	0.86 U	0.86 U	NA	0.90 U	0.89 U	0.87 U	NA
trans-Nonachlor	0.97 U	0.97 U	0.97 U	NA	1.02 U	1.01 U	0.98 U	NA
CL2(08)	0.88 U	0.88 U	0.88 U	NA	0.92 U	0.91 U	0.89 U	NA
CL3(18)	1.07 U	1.07 U	1.07 U	NA	1.12 U	1.11 U	1.09 U	NA
CL3(28)	1.19 U	1.20 U	1.20 U	NA	1.26 U	1.24 U	1.22 U	NA
CL4(44)	1.22 U	1.22 U	1.22 U	NA	1.28 U	1.27 U	1.24 U	NA
CL4(49)	1.05 U	1.05 U	0.74 J	NA	1.10 U	1.09 U	1.07 U	NA
CL4(52)	1.23 U	1.24 U	2.12	NA	1.29 U	1.28 U	1.26 U	NA
CL4(66)	0.95 U	0.96 U	0.96 U	NA	1.00 U	0.99 U	0.97 U	NA
CL5(87)	1.07 U	1.07 U	1.07 U	NA	1.13 U	1.11 U	1.09 U	NA
CL5(101)	1.08 U	1.08 U	1.22	NA	1.13 U	1.12 U	1.10 U	NA
CL5(105)	1.29 U	1.30 U	1.30 U	NA	1.36 U	1.34 U	1.32 U	NA
CL5(118)	1.02 U	1.02 U	1.02 U	NA	1.07 U	1.06 U	1.04 U	NA
CL6(128)	1.14 U	1.15 U	1.15 U	NA	1.20 U	1.19 U	1.16 U	NA
CL6(138)	1.36 U	1.37 U	1.37 U	NA	1.43 U	1.42 U	1.39 U	NA
CL6(153)	1.31 U	1.31 U	1.31 U	NA	1.38 U	1.36 U	1.33 U	NA
CL7(170)	1.17 U	1.17 U	1.17 U	NA	1.23 U	1.22 U	1.19 U	NA
CL7(180)	1.01 U	1.02 U	1.02 U	NA	1.07 U	1.06 U	1.03 U	NA
CL7(183)	1.06 U	1.07 U	1.07 U	NA	1.12 U	1.11 U	1.08 U	NA
CL7(184)	1.06 U	1.07 U	1.07 U	NA	1.12 U	1.11 U	1.08 U	NA
CL7(187)	1.00 U	1.01 U	1.01 U	NA	1.06 U	1.04 U	1.02 U	NA
CL8(195)	1.15 U	1.15 U	1.15 U	NA	1.21 U	1.20 U	1.17 U	NA
CL9(206)	1.12 U	1.13 U	1.13 U	NA	1.18 U	1.17 U	1.14 U	NA
CL10(209)	1.25 U	1.25 U	1.25 U	NA	1.31 U	1.30 U	1.27 U	NA
<u>Surrogate Recoveries (%)</u>								
DBOFB	101	94	98	NA	96	88	95	NA
CL5(112)	75	80	77	NA	74	75	81	NA

TABLE B.7. (Contd)

Matrix	EC-B Rep. 1 Elutriate	EC-B Rep. 2 Elutriate	EC-B Rep. 3 Elutriate	RSD	EC-A Rep. 1 Elutriate	EC-A Rep. 2 Elutriate	EC-A Rep. 3 Elutriate	RSD
Sample Size (L)	0.96	0.98	0.50		0.90	0.91	0.92	
Batch	3	3	3	3	4	4	4	4
Units	ng/L	ng/L	ng/L		ng/L	ng/L	ng/L	
2,4-DDD	3.30	1.82	3.07	29%	2.33	3.20	2.49	17%
2,4-DDT	0.912	0.647 J	0.925 J	19%	0.90 U	0.89 U	0.88 U	NA
4,4-DDD	12.2	6.58	12.2	32%	5.21	4.06	4.49	13%
4,4-DDE	6.27	2.65	6.55	42%	7.99	7.13	6.98	7%
4,4-DDT	1.04 U	1.02 U	2.00 U	NA	1.11 U	1.10 U	1.09 U	NA
Aldrin	14.1	14.9	22.5	27%	0.82 U	0.81 U	0.81 U	NA
alpha-Chlordane	10.0	7.93	13.2	26%	1.43	1.24	1.38	7%
Dieldrin	3.25	2.87	3.80	14%	2.36	2.53	1.66	21%
Endosulfan I/2,4'-D	0.88 U	0.86 U	1.69 U	NA	0.94 U	0.93 U	0.92 U	NA
Endosulfan II	11.7 U	11.4 U	22.4 U	NA	12.4 U	12.3 U	12.2 U	NA
Endosulfan sulfate	8.53 U	8.35 U	16.4 U	NA	9.10 U	9.00 U	8.95 U	NA
Heptachlor	0.68 U	0.67 U	1.31 U	NA	0.73 U	0.72 U	0.72 U	NA
Heptachlor epoxide	0.89 U	0.87 U	1.71 U	NA	0.95 U	0.94 U	0.93 U	NA
trans-Nonachlor	6.11	3.94	7.17	29%	0.86 J	0.95 J	0.77 J	10%
CL2(08)	0.91 U	0.89 U	1.75 U	NA	4.26	3.54	4.44	12%
CL3(18)	1.11 U	1.09 U	2.13 U	NA	3.68	4.90	2.30	36%
CL3(28)	6.66	4.10	15.3	68%	9.82	6.22	6.74	26%
CL4(44)	7.88	3.73	12.4	54%	7.46	7.71	5.79	15%
CL4(49)	9.33	4.65	8.62	33%	4.76	3.71	2.83	26%
CL4(52)	39.1	31.06	66.5	41% (a)	11.6	10.5	12.5	9%
CL4(66)	19.9	20.11	17.8	7%	35.9	40.5	33.6	10%
CL5(87)	3.13	2.24	4.94	40%	1.82	1.70	1.50	10%
CL5(101)	6.84	5.66	11.6	39%	3.93	3.82	3.90	1%
CL5(105)	1.94	1.81	1.88 J	3%	1.42 J	2.00	1.28 J	24%
CL5(118)	7.55	4.74	9.71	34%	4.42	3.69	3.70	11%
CL6(128)	1.97	1.69	2.54	21%	1.27 U	1.25 U	1.25 U	NA
CL6(138)	9.97	2.83	11.1	56%	5.12	4.29	5.01	9%
CL6(153)	5.18	3.55	7.32	35%	3.42	3.17	2.66	13%
CL7(170)	1.22 U	1.19 U	2.34 U	NA	2.60	2.09	2.19	12%
CL7(180)	1.06 U	1.03 U	2.03 U	NA	2.60	2.08	2.07	13%
CL7(183)	1.39	0.72 J	2.09 J	NA	0.71 J	0.61 J	0.60 J	9%
CL7(184)	1.11 U	1.08 U	2.12 U	NA	1.18 U	1.17 U	1.16 U	NA
CL7(187)	1.04 U	1.02 U	2.01 U	NA	1.79	1.10 U	1.10 U	NA
CL8(195)	1.20 U	1.17 U	2.30 U	NA	0.41 J	0.43 J	0.69 J	31%
CL9(206)	1.17 U	1.14 U	2.24 U	NA	0.87 J	0.61 J	0.61 J	21%
CL10(209)	1.30 U	1.27 U	2.49 U	NA	0.86 J	0.93 J	0.92 J	5%
Surrogate Recoveries (%)								
DBOFB	111	115	113	NA	70	70	64	NA
CL5(112)	72	72	72	NA	56	63	53	NA

TABLE B.7. (Contd)

	HU-A Rep 1	HU-A Rep 2	HU-A Rep 3	RSD	HU-D Rep. 1	HU-D Rep. 2	HU-D Rep. 3	RSD
Matrix	Elutriate	Elutriate	Elutriate		Elutriate	Elutriate	Elutriate	
Sample Size (L)	0.98	0.97	0.50		0.98	0.96	0.96	
Batch	4	4	4	4	4	4	4	4
Units	ng/L	ng/L	ng/L		ng/L	ng/L	ng/L	
2,4-DDD	16.6	8.38	9.81	38% (a)	3.94	6.65	8.29	35%
2,4-DDT	0.83 U	0.83 U	1.62 U	NA	0.82 U	0.84 U	0.84 U	NA
4,4-DDD	13.4	8.49	9.54	25%	3.50	2.37	5.01	36%
4,4-DDE	52.1	28.4	26.8	40% (a)	9.47	5.05	9.47	32%
4,4-DDT	1.03 U	1.03 U	2.00 U	NA	1.02 U	1.04 U	1.04 U	NA
Aldrin	0.76 U	0.76 U	1.48 U	NA	0.76 U	0.77 U	0.77 U	NA
alpha-Chlordane	3.45	1.81	2.06	36%	1.27	0.27 J	1.56	66%
Dieldrin	5.64	4.31	4.72	14%	5.14	2.33	4.13	37%
Endosulfan I/2,4'-DDE	17.0	10.4	10.3	31% (a)	0.86 U	0.88 U	0.88 U	NA
Endosulfan II	11.5 U	11.5 U	22.4 U	NA	11.4 U	1.70 J	11.7 U	NA
Endosulfan sulfate	8.40 U	8.44 U	16.4 U	NA	5.37 J	8.53 U	2.88 J	NA
Heptachlor	0.67 U	0.68 U	1.31 U	NA	0.67 U	0.68 U	0.68 U	NA
Heptachlor epoxide	3.25	1.59	0.47 J	79%	0.87 U	0.89 U	0.89 U	NA
trans-Nonachlor	0.85 J	0.83 J	1.20 J	21%	0.65 J	1.01 U	1.00 J	NA
CL2(08)	1.75	1.99	1.75 U	NA	0.89 U	0.91 U	0.91 U	NA
CL3(18)	16.0	9.25	7.52	41%	18.0	8.50	14.9	35% (a)
CL3(28)	19.9	11.3	11.3	35% (a)	10.7	6.75	11.1	25%
CL4(44)	17.2	11.9	13.0	20%	14.3	8.22	15.0	30%
CL4(49)	16.8	11.0	9.72	30%	13.5	6.39	12.9	36%
CL4(52)	23.4	15.6	17.5	22%	16.9	9.44	19.1	34% (a)
CL4(66)	72.7	48.4	59.9	20%	44.1	31.6	49.3	22%
CL5(87)	8.62	5.34	5.12	31%	4.08	2.38	4.89	34%
CL5(101)	21.9	13.6	14.0	28%	9.57	5.72	11.9	34%
CL5(105)	3.56	2.51	2.31 J	24%	1.98	1.36	2.70	33%
CL5(118)	14.9	8.02	8.52	37%	7.57	4.00	8.63	36%
CL6(128)	5.38	3.40	4.25	23%	2.32	0.84 J	2.46	48%
CL6(138)	24.5	14.4	15.1	31% (a)	10.3	1.42 U	1.42 U	NA
CL6(153)	19.2	10.3	10.3	39% (a)	8.70	4.21	9.28	37%
CL7(170)	7.88	4.82	5.21	28%	3.55	1.52	3.13	39%
CL7(180)	17.4	9.73	8.42	41% (a)	5.78	2.58	5.98	40%
CL7(183)	4.43	2.61	3.39	26%	1.89	0.78 J	1.57	41%
CL7(184)	1.09 U	1.09 U	2.12 U	NA	1.08 U	1.11 U	1.11 U	NA
CL7(187)	1.03 U	1.03 U	2.01 U	NA	1.02 U	1.04 U	1.04 U	NA
CL8(195)	6.76	3.81	3.11	42%	2.53	1.07 J	2.55	41%
CL9(206)	16.5	8.70	7.24	46%	5.83	2.19	5.68	45%
CL10(209)	12.8	7.77	6.82	35%	3.50	1.54	3.60	40%
Surrogate Recoveries (%)								
DBOFB	73	64	83	NA	89	70	91	NA
CL5(112)	64	56	71	NA	72	69	80	NA

TABLE B.7. (Contd)

Matrix	HU-B Rep. 1 Elutriate	HU-B Rep. 2 Elutriate	HU-B Rep. 3 Elutriate	RSD	HU-C Rep. 1 Elutriate	HU-C Rep. 2 Elutriate	HU-C Rep. 3 Elutriate	RSD
Sample Size (L)	0.98	0.96	0.96		0.96	0.98	1.00	
Batch	4	4	4	4	4	4	4	4
Units	ng/L	ng/L	ng/L		ng/L	ng/L	ng/L	
2,4-DDD	10.3	5.43	6.47	35%	6.49	5.83	5.59	8%
2,4-DDT	0.83 U	0.84 U	0.84 U	NA	0.84 U	0.82 U	0.81 U	NA
4,4-DDD	9.51	4.87	6.98	33%	7.70	6.14	7.89	13%
4,4-DDE	32.2	11.2	14.1	59% (a)	26.3	20.6	20.0	16%
4,4-DDT	1.03 U	1.04 U	1.04 U	NA	1.04 U	1.02 U	1.01 U	NA
Aldrin	0.76 U	0.77 U	0.77 U	NA	0.77 U	0.76 U	0.74 U	NA
alpha-Chlordane	3.67	1.31	0.91 J	76%	3.65	3.50	2.79	14%
Dieldrin	6.17	2.38	3.03	53%	5.78	5.50	5.62	2%
Endosulfan I/2,4'-DDE	0.87 U	0.88 U	0.88 U	NA	0.88 U	0.86 U	0.85 U	NA
Endosulfan II	11.5 U	11.7 U	11.7 U	NA	11.7 U	11.4 U	11.3 U	NA
Endosulfan sulfate	10.5	4.68 J	5.43 J	46%	13.5	10.0	10.0	18%
Heptachlor	0.67 U	0.68 U	0.68 U	NA	0.68 U	0.67 U	0.66 U	NA
Heptachlor epoxide	3.35	0.82 J	0.79 J	89%	2.95	3.11	2.72	7%
trans-Nonachlor	1.46	0.81 J	0.88 J	34%	1.39	1.45	1.55	6%
CL2(08)	3.58	4.44	3.85	11%	3.77	3.66	0.88 U	NA
CL3(18)	26.6	10.5	12.0	55% (a)	25.1	21.7	16.6	20%
CL3(28)	31.2	11.2	12.1	62% (a)	28.6	22.9	22.7	14%
CL4(44)	28.6	11.2	13.7	53% (a)	24.9	23.5	21.1	8%
CL4(49)	29.5	9.50	12.0	64% (a)	24.9	23.1	21.4	8%
CL4(52)	37.2	18.9	17.8	44% (a)	30.3	30.2	27.4	6%
CL4(66)	65.7	33.4	47.5	33% (a)	46.2	38.8	20.6	37% (a)
CL5(87)	10.2	3.64	5.01	55%	9.99	7.73	7.81	15%
CL5(101)	24.0	10.0	11.5	51% (a)	22.7	20.0	18.2	11%
CL5(105)	5.17	2.34	2.37	49%	5.82	4.17	4.82	17%
CL5(118)	1.04 U	7.03	9.63	NA	20.3	15.5	14.7	18%
CL6(128)	4.14	2.15	2.32	38%	3.82	2.92	3.32	13%
CL6(138)	25.2	9.86	12.90	51% (a)	27.1	21.7	20.8	15%
CL6(153)	21.3	7.50	10.38	56%	21.2	16.4	16.2	16%
CL7(170)	8.05	3.34	3.80	51%	7.62	5.93	5.75	16%
CL7(180)	16.0	5.53	7.56	57%	14.6	10.8	11.1	17%
CL7(183)	3.88	1.67	2.05	47%	3.94	3.14	3.74	12%
CL7(184)	1.09 U	1.11 U	1.11 U	NA	1.11 U	1.08 U	1.07 U	NA
CL7(187)	1.03 U	1.04 U	1.04 U	NA	1.04 U	1.02 U	1.01 U	NA
CL8(195)	7.19	2.09	2.80	69%	3.89	2.99	3.36	13%
CL9(206)	16.7	4.82	6.65	68%	7.23	4.95	5.10	22%
CL10(209)	9.43	3.60	4.09	57%	6.18	4.99	5.09	12%
Surrogate Recoveries (%)								
DBOFB	79	70	73	NA	74	77	57	NA
CL5(112)	64	63	68	NA	68	71	56	NA

TABLE B.7. (Contd)

Matrix	C-SB Rep. 1 Site Water	C-SB Rep. 2 Site Water	C-SB Rep. 3 Site Water	RSD
Sample Size (L)	1.02	1.02	1.02	
Batch	4	4	4	4
Units	ng/L	ng/L	ng/L	
2,4-DDD	0.78 U	0.78 U	0.78 U	NA
2,4-DDT	0.80 U	0.80 U	0.79 U	NA
4,4-DDD	1.14 U	1.14 U	1.14 U	NA
4,4-DDE	0.97 U	0.97 U	0.97 U	NA
4,4-DDT	0.99 U	0.99 U	0.98 U	NA
Aldrin	0.73 U	0.73 U	0.73 U	NA
alpha-Chlordane	0.91 U	0.91 U	0.91 U	NA
Dieldrin	0.97 U	0.97 U	0.97 U	NA
Endosulfan I/2,4'-D	0.83 U	0.83 U	0.83 U	NA
Endosulfan II	11.0 U	11.0 U	11.0 U	NA
Endosulfan sulfate	8.07 U	8.07 U	8.03 U	NA
Heptachlor	2.41	0.65 U	0.64 U	NA
Heptachlor epoxide	0.84 U	0.84 U	0.84 U	NA
trans-Nonachlor	0.95 U	0.95 U	0.95 U	NA
CL2(08)	0.86 U	0.86 U	0.86 U	NA
CL3(18)	1.05 U	1.05 U	1.04 U	NA
CL3(28)	1.18 U	1.18 U	1.17 U	NA
CL4(44)	1.20 U	1.20 U	1.19 U	NA
CL4(49)	1.03 U	1.03 U	1.03 U	NA
CL4(52)	1.21 U	1.21 U	1.21 U	NA
CL4(66)	0.94 U	0.94 U	0.94 U	NA
CL5(87)	1.05 U	1.05 U	1.05 U	NA
CL5(101)	1.06 U	1.06 U	1.06 U	NA
CL5(105)	1.27 U	1.27 U	1.27 U	NA
CL5(118)	1.00 U	1.00 U	1.00 U	NA
CL6(128)	1.12 U	1.12 U	1.12 U	NA
CL6(138)	1.34 U	1.34 U	1.34 U	NA
CL6(153)	1.29 U	1.29 U	1.28 U	NA
CL7(170)	0.30 J	0.14 J	0.13 J	48%
CL7(180)	1.00 U	1.00 U	0.99 U	NA
CL7(183)	1.05 U	1.05 U	1.04 U	NA
CL7(184)	0.42 J	1.05 U	1.04 U	NA
CL7(187)	0.99 U	0.99 U	0.98 U	NA
CL8(195)	1.13 U	1.13 U	1.13 U	NA
CL9(206)	1.10 U	1.10 U	1.10 U	NA
CL10(209)	1.23 U	1.23 U	1.22 U	NA
Surrogate Recoveries (%)				
DBOFB	79	94	84	NA
CL5(112)	75	77	74	NA

(a) % RSD Percent relative standard deviation.
(b) U Undetected at or above concentration shown.
(c) NA Not applicable.
(d) J Concentration estimated; analyte detected below method detection limit (MDL) and above instrument detection limit (IDL).
(e) Outside quality control criteria (≤ 30% for replicate analysis) for analytes >10 times the achieved MDL.

TABLE B.8. Quality Control Data (Method Detection Limit Verification) for Pesticides and PCBs in Site Water and Elutriate

Sample Matrix Sample Size (L) Units	Sequim Bay 1 Control Water 1.00 ng/L	Sequim Bay 1 Control Water 1.00 ng/L	Sequim Bay 1 Control Water 1.01 ng/L	Sequim Bay 1 Control Water 0.91 ng/L	Sequim Bay 2 Control Water 1.00 ng/L	Sequim Bay 2 Control Water 1.00 ng/L	Sequim Bay 2 Control Water 1.01 ng/L	Sequim Bay 2 Control Water 0.96 ng/L	Standard Deviation STD (n-1)	Detection Limit MDL[a] (ng/L)
2,4-DDD	NS [a]	NS	NS	NS	NS	NS	NS	NS	NA [b]	NA
2,4-DDT	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
4,4-DDD	9.85	9.95	9.66	11.69	9.90	11.95	10.95	12.23	1.06	3.18
4,4-DDE	9.14	9.34	8.90	9.63	8.78	8.73	9.09	9.75	0.38	1.13
4,4-DDT	10.70	10.49	10.49	12.00	10.65	11.02	11.14	12.74	0.81	2.43
Aldrin	11.33	11.17	11.18	12.03	10.94	10.51	12.02	11.09	0.52	1.55
alpha-Chlordane	9.26	9.72	9.67	10.49	9.22	9.25	9.90	11.44	0.77	2.30
Dieldrin	9.31	9.21	8.87	9.62	8.65	8.61	8.95	9.84	0.44	1.33
Endosulfan I/2,4'-DDE	9.99	10.67	10.31	12.02	10.20	10.70	10.91	13.20	1.09	3.25
Endosulfan II	10.82	10.58	10.45	11.40	10.14	10.30	10.39	11.81	0.58	1.75
Endosulfan sulfate	10.07	9.79	9.74	10.68	9.56	9.73	9.81	10.96	0.50	1.51
Heptachlor	8.85	8.99	8.94	9.80	8.71	8.42	9.38	10.43	0.65	1.96
Heptachlor epoxide	9.30	9.74	9.61	10.27	9.26	9.52	10.01	11.66	0.78	2.34
trans-Nonachlor	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
CL2(08)	6.04	7.39	6.94	6.50	6.63	6.21	6.63	7.03	0.44	1.32
CL3(18)	7.71	9.10	8.43	8.97	7.60	10.60	9.45	10.69	1.17	3.50
CL3(28)	8.32	8.86	8.78	9.75	8.51	7.95	8.83	9.78	0.64	1.92
CL4(44)	9.38	9.27	9.32	10.59	9.01	8.51	10.03	10.69	0.77	2.30
CL4(49)	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
CL4(52)	8.75	8.25	8.82	9.49	8.31	8.14	9.19	9.64	0.57	1.72
CL4(66)	8.87	9.63	9.58	10.32	9.11	9.67	9.87	11.11	0.70	2.09
CL5(87)	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
CL5(101)	9.26	9.82	10.00	10.08	9.12	8.72	9.67	11.19	0.75	2.25
CL5(105)	9.57	9.50	9.64	10.13	9.34	9.04	9.62	10.35	0.42	1.25
CL5(118)	9.68	10.08	9.64	10.75	9.65	9.64	9.96	10.85	0.50	1.50
CL6(128)	9.68	9.81	8.92	10.19	9.22	9.78	8.96	10.19	0.51	1.52
CL6(138)	9.78	9.78	9.80	11.14	9.52	9.44	10.01	11.57	0.78	2.35
CL6(153)	10.59	10.84	10.46	11.93	10.36	10.62	10.56	12.00	0.66	1.98
CL7(170)	9.15	9.24	9.31	10.07	9.30	9.05	9.50	9.86	0.36	1.07
CL7(180)	9.42	9.40	9.43	10.11	9.01	9.37	9.36	10.57	0.50	1.50
CL7(183)	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
CL7(184)	NS	NS	NS	NS	NS	NS	NS	NS	NA	NA
CL7(187)	9.43	9.34	9.24	10.22	9.03	NS	NS	NS	NA	NA
CL8(195)	8.36	8.73	8.33	9.19	8.27	9.21	9.36	9.69	0.37	1.11
CL9(206)	7.86	7.65	7.46	8.03	7.26	8.21	8.57	8.99	0.36	1.09
CL10(209)	8.85	8.63	8.49	8.96	8.02	7.26	7.55	8.30	0.37	1.11
						8.02	8.28	9.14	0.42	1.26
Surrogate Recoveries (%)										
DBOFB	85	89	84	82	81	71	88	71		
CL5(112)	86	88	85	81	82	79	84	84		

(a) MDL Method Detection Limit, calculated as Students-t (2.998 for 8 replicates) x standard deviation.
(b) NS Not spiked.
(c) NA Not applicable.

Appendix C

Water-Column Toxicity Test Data for Hudson River Project

TABLE C.1. Test Results for *M. beryllina* 96-Hour Water Column Toxicity Test

Sediment Treatment	SPP Percent Concentration	Replicate	Live[a]	Dead or Missing	Proportion Surviving	Mean Proportion Surviving	Standard Deviation
COMP HU-A	0	1	9	1	0.90		
COMP HU-A	0	2	9	1	0.90		
COMP HU-A	0	3	8	2	0.80		
COMP HU-A	0	4	10	0	1.00		
COMP HU-A	0	5	9	1	0.90	0.90	0.07
COMP HU-A	10	1	10	0	1.00		
COMP HU-A	10	2	10	0	1.00		
COMP HU-A	10	3	9	1	0.90		
COMP HU-A	10	4	9	1	0.90		
COMP HU-A	10	5	9	1	0.90	0.94	0.05
COMP HU-A	50	1	9	1	0.90		
COMP HU-A	50	2	8	2	0.80		
COMP HU-A	50	3	8	2	0.80		
COMP HU-A	50	4	7	3	0.70		
COMP HU-A	50	5	7	3	0.70	0.78	0.08
COMP HU-A	100	1	0	10	0.00		
COMP HU-A	100	2	0	10	0.00		
COMP HU-A	100	3	0	10	0.00		
COMP HU-A	100	4	2	8	0.20		
COMP HU-A	100	5	3	7	0.30	0.10	0.14
COMP HU-B	0	1	9	1	0.90		
COMP HU-B	0	2	9	1	0.90		
COMP HU-B	0	3	8	2	0.80		
COMP HU-B	0	4	10	0	1.00		
COMP HU-B	0	5	10	0	1.00	0.92	0.08
COMP HU-B	10	1	10	0	1.00		
COMP HU-B	10	2	10	0	1.00		
COMP HU-B	10	3	10	0	1.00		
COMP HU-B	10	4	10	0	1.00		
COMP HU-B	10	5	5	5	0.50	0.90	0.22

TABLE C.1. (contd)

Sediment Treatment	SPP Percent Concentration	Replicate	Live(a)	Dead or Missing	Proportion Surviving	Mean Proportion Surviving	Standard Deviation
COMP HU-B	50	1	0	10	0.00		
COMP HU-B	50	2	0	10	0.00		
COMP HU-B	50	3	0	10	0.00		
COMP HU-B	50	4	0	10	0.00		
COMP HU-B	50	5	0	10	0.00	0.00	0.00
COMP HU-B	100	1	0	10	0.00		
COMP HU-B	100	2	0	10	0.00		
COMP HU-B	100	3	0	10	0.00		
COMP HU-B	100	4	0	10	0.00		
COMP HU-B	100	5	0	10	0.00	0.00	0.00
COMP HU-C	0	1	9	1	0.90		
COMP HU-C	0	2	10	0	1.00		
COMP HU-C	0	3	10	0	1.00		
COMP HU-C	0	4	10	0	1.00		
COMP HU-C	0	5	10	0	1.00	0.98	0.04
COMP HU-C	10	1	10	0	1.00		
COMP HU-C	10	2	9	1	0.90		
COMP HU-C	10	3	8	2	0.80		
COMP HU-C	10	4	8	2	0.80		
COMP HU-C	10	5	9	1	0.90	0.88	0.08
COMP HU-C	50	1	8	2	0.80		
COMP HU-C	50	2	3	7	0.30		
COMP HU-C	50	3	5	5	0.50		
COMP HU-C	50	4	3	7	0.30		
COMP HU-C	50	5	7	3	0.70	0.52	0.23
COMP HU-C	100	1	0	10	0.00		
COMP HU-C	100	2	0	10	0.00		
COMP HU-C	100	3	0	10	0.00		
COMP HU-C	100	4	0	10	0.00		
COMP HU-C	100	5	0	10	0.00	0.00	0.00

TABLE C.1. (contd)

Sediment Treatment	SPP Percent Concentration	Replicate	Live[a]	Dead or Missing	Proportion Surviving	Mean Proportion Surviving	Standard Deviation
COMP HU-D	0	1	10	0	1.00		
COMP HU-D	0	2	10	0	1.00		
COMP HU-D	0	3	9	1	0.90		
COMP HU-D	0	4	9	1	0.90		
COMP HU-D	0	5	10	0	1.00	0.96	0.05
COMP HU-D	10	1	9	1	0.90		
COMP HU-D	10	2	9	1	0.90		
COMP HU-D	10	3	9	1	0.90		
COMP HU-D	10	4	10	0	1.00		
COMP HU-D	10	5	10	0	1.00	0.94	0.05
COMP HU-D	50	1	10	0	1.00		
COMP HU-D	50	2	10	0	1.00		
COMP HU-D	50	3	9	1	0.90		
COMP HU-D	50	4	10	0	1.00		
COMP HU-D	50	5	7	3	0.70	0.92	0.13
COMP HU-D	100	1	7	3	0.70		
COMP HU-D	100	2	4	6	0.40		
COMP HU-D	100	3	4	6	0.40		
COMP HU-D	100	4	7	3	0.70		
COMP HU-D	100	5	8	2	0.80	0.60	0.19

(a) Survival based on initial exposure of 10 organisms per replicate.

TABLE C.2. Water Quality Summary for *M. beryllina* 96-Hour Water Column Toxicity Test

Sediment Treatment	Concentration Percent SPP	Temperature (°C)		pH		Dissolved Oxygen (mg/L)		Salinity (o/oo)	
		Min	Max	Min	Max	Min	Max	Min	Max
Acceptable Range		18.0	22.0	7.30	8.30	4.0	NA [a]	28.0	32.0
COMP HU-A	0	18.1	18.5	7.95	8.05	7.0	9.0	28.5	30.0
COMP HU-A	10	18.1	18.6	7.96	8.14	7.3	8.9	28.5	30.0
COMP HU-A	50	18.1	18.6	7.91	8.21	7.1	8.4	29.5	30.0
COMP HU-A	100	18.1	18.6	7.86	8.30	6.7	7.8	29.5	31.0
COMP HU-B	0	18.1	18.7	7.93	8.05	7.0	8.5	28.0	29.5
COMP HU-B	10	18.1	18.6	7.85	8.09	7.1	9.1	28.0	29.5
COMP HU-B	50	18.1	18.6	7.66	8.43 [b]	7.0	8.6	29.0	30.0
COMP HU-B	100	18.1	18.6	7.59	8.44 [b]	6.0	7.8	30.0	30.0
COMP HU-C	0	18.1	18.7	7.84	7.91	7.2	9.0	30.0	30.5
COMP HU-C	10	18.1	18.6	7.86	8.08	7.1	9.1	30.0	30.5
COMP HU-C	50	18.1	18.7	7.72	8.26	7.1	8.6	30.0	31.0
COMP HU-C	100	18.0	18.7	7.64	8.36 [b]	6.9	7.6	30.0	30.5
COMP HU-D	0	18.1	18.6	7.86	8.01	7.1	9.2	30.0	30.0
COMP HU-D	10	18.1	18.6	7.86	8.96 [b]	7.2	9.1	30.0	30.5
COMP HU-D	50	18.1	18.7	7.89	8.19	7.1	8.7	30.0	30.5
COMP HU-D	100	18.1	18.7	7.80	8.30	7.3	8.1	30.0	31.0

(a) NA Not applicable.

(b) Data point out of range.

TABLE C.3. Test Results for *M. beryllina* 96-Hour Copper Reference Toxicant Test

Copper Concentration (µg/L Cu)	Replicate	Live(a)	Dead or Missing	Proportion Surviving	Mean Proportion Surviving	Standard Deviation
0	1	10	0	1.00		
0	2	10	0	1.00		
0	3	10	0	1.00	1.00	0.00
16	1	10	0	1.00		
16	2	10	0	1.00		
16	3	10	0	1.00	1.00	0.00
64	1	10	0	1.00		
64	2	8	2	0.80		
64	3	8	2	0.80	0.87	0.12
160	1	1	9	0.10		
160	2	1	9	0.10		
160	3	2	8	0.20	0.13	0.06
400	1	0	10	0.00		
400	2	0	10	0.00		
400	3	0	10	0.00	0.00	0.00

(a) Survival based on initial exposure of 10 organisms per replicate.

TABLE C.4. Water Quality Summary for *M. beryllina* 96-Hour Copper Reference Toxicant Test

Copper Concentration (µg/L)	Temperature (°C)		pH		Dissolved Oxygen (mg/L)		Salinity (o/oo)	
	Min	Max	Min	Max	Min	Max	Min	Max
Acceptable Range	18.0	22.0	7.30	8.30	4.0	NA [(a)]	28.0	32.0
0	18.5	19.3	7.90	8.09	7.1	7.9	31.0	32.0
16	18.6	19.2	7.98	8.09	7.3	8.0	31.0	32.0
64	18.5	19.2	7.91	8.07	7.4	8.1	31.0	32.0
160	18.6	19.3	7.95	8.08	7.4	8.1	31.0	32.0
400	18.7	19.4	7.85	8.03	7.3	7.6	31.0	31.5

(a) NA Not applicable.

TABLE C.5. Test Results for *M. bahia* 96-Hour Water Column Toxicity Test

Sediment Treatment	Concentration (Percent SPP)	Replicate	Live[a]	Dead or Missing	Proportion Surviving	Mean Proportion Surviving	Standard Deviation
COMP HU-A	0	1	10	0	1.00		
COMP HU-A	0	2	9	1	0.90		
COMP HU-A	0	3	10	0	1.00		
COMP HU-A	0	4	10	0	1.00		
COMP HU-A	0	5	10	0	1.00	0.98	0.05
COMP HU-A	10	1	10	0	1.00		
COMP HU-A	10	2	10	0	1.00		
COMP HU-A	10	3	10	0	1.00		
COMP HU-A	10	4	10	0	1.00		
COMP HU-A	10	5	10	0	1.00	1.00	0.00
COMP HU-A	50	1	9	1	0.90		
COMP HU-A	50	2	10	0	1.00		
COMP HU-A	50	3	10	0	1.00		
COMP HU-A	50	4	10	0	1.00		
COMP HU-A	50	5	10	0	1.00	0.98	0.05
COMP HU-A	100	1	7	3	0.70		
COMP HU-A	100	2	7	3	0.70		
COMP HU-A	100	3	8	2	0.80		
COMP HU-A	100	4	4	6	0.40		
COMP HU-A	100	5	8	2	0.80	0.68	0.16
COMP HU-B	0	1	10	0	1.00		
COMP HU-B	0	2	10	0	1.00		
COMP HU-B	0	3	10	0	1.00		
COMP HU-B	0	4	10	0	1.00		
COMP HU-B	0	5	10	0	1.00	1.00	0.00
COMP HU-B	10	1	10	0	1.00		
COMP HU-B	10	2	10	0	1.00		
COMP HU-B	10	3	10	0	1.00		
COMP HU-B	10	4	10	0	1.00		
COMP HU-B	10	5	10	0	1.00	1.00	0.00
COMP HU-B	50	1	0	10	0.00		
COMP HU-B	50	2	0	10	0.00		
COMP HU-B	50	3	1	9	0.10		
COMP HU-B	50	4	0	10	0.00		
COMP HU-B	50	5	0	10	0.00	0.02	0.05

TABLE C.5. (contd)

Sediment Treatment	Concentration (Percent SPP)	Replicate	Live[a]	Dead or Missing	Proportion Surviving	Mean Proportion Surviving	Standard Deviation
COMP HU-B	100	1	0	10	0.00		
COMP HU-B	100	2	0	10	0.00		
COMP HU-B	100	3	0	10	0.00		
COMP HU-B	100	4	0	10	0.00		
COMP HU-B	100	5	0	10	0.00	0.00	0.00
COMP HU-C	0	1	10	0	1.00		
COMP HU-C	0	2	10	0	1.00		
COMP HU-C	0	3	10	0	1.00		
COMP HU-C	0	4	10	0	1.00		
COMP HU-C	0	5	9	1	0.90	0.98	0.05
COMP HU-C	10	1	9	1	0.90		
COMP HU-C	10	2	10	0	1.00		
COMP HU-C	10	3	9	1	0.90		
COMP HU-C	10	4	10	0	1.00		
COMP HU-C	10	5	10	0	1.00	0.96	0.06
COMP HU-C	50	1	10	0	1.00		
COMP HU-C	50	2	9	1	0.90		
COMP HU-C	50	3	10	0	1.00		
COMP HU-C	50	4	10	0	1.00		
COMP HU-C	50	5	10	0	1.00	0.98	0.05
COMP HU-C	100	1	0	10	0.00		
COMP HU-C	100	2	0	10	0.00		
COMP HU-C	100	3	1	9	0.10		
COMP HU-C	100	4	0	10	0.00		
COMP HU-C	100	5	0	10	0.00	0.02	0.05
COMP HU-D	0	1	10	0	1.00		
COMP HU-D	0	2	10	0	1.00		
COMP HU-D	0	3	10	0	1.00		
COMP HU-D	0	4	10	0	1.00		
COMP HU-D	0	5	10	0	1.00	1.00	0.00
COMP HU-D	10	1	10	0	1.00		
COMP HU-D	10	2	10	0	1.00		
COMP HU-D	10	3	10	0	1.00		
COMP HU-D	10	4	10	0	1.00		
COMP HU-D	10	5	9	1	0.90	0.98	0.05

TABLE C.5. (contd)

Sediment Treatment	Concentration (Percent SPP)	Replicate	Live[a]	Dead or Missing	Proportion Surviving	Mean Proportion Surviving	Standard Deviation
COMP HU-D	50	1	10	0	1.00		
COMP HU-D	50	2	9	1	0.90		
COMP HU-D	50	3	10	0	1.00		
COMP HU-D	50	4	9	1	0.90		
COMP HU-D	50	5	10	0	1.00	0.96	0.06
COMP HU-D	100	1	10	0	1.00		
COMP HU-D	100	2	10	0	1.00		
COMP HU-D	100	3	10	0	1.00		
COMP HU-D	100	4	9	1	0.90		
COMP HU-D	100	5	10	0	1.00	0.98	0.05

(a) Survival based on initial exposure of 10 organisms per replicate.

TABLE C.6. Water Quality Summary for *M. bahia* 96-Hour Water Column Toxicity Test

Sediment Treatment	Concentration (Percent SPP)	Temperature (°C)		pH		Dissolved Oxygen (mg/L)		Salinity (o/oo)	
		Min	Max	Min	Max	Min	Max	Min	Max
Acceptable Range		18.0	22.0	7.30	8.30	3.0	NA [a]	28.0	32.0
COMP HU-A	0	18.1	19.5	7.89	8.03	4.6	7.7	28.5	30.0
COMP HU-A	10	18.0	19.5	7.91	8.07	4.6	7.7	28.5	30.0
COMP HU-A	50	18.3	19.5	7.91	8.18	4.3	7.6	29.5	30.5
COMP HU-A	100	18.7	19.6	7.87	8.33 [b]	3.2	7.6	30.0	31.0
COMP HU-B	0	18.4	19.4	7.75	8.01	4.6	7.7	28.5	29.5
COMP HU-B	10	18.0	19.6	7.85	8.11	4.5	7.7	28.5	30.0
COMP HU-B	50	18.0	19.5	7.71	8.42 [b]	4.2	7.9	29.5	30.0
COMP HU-B	100	19.0	19.5	7.63	8.51 [b]	5.6	7.6	30.0	30.0
COMP HU-C	0	18.9	19.5	7.81	8.08	4.5	7.6	30.0	31.0
COMP HU-C	10	18.8	19.5	7.60	8.06	4.6	7.5	30.0	31.0
COMP HU-C	50	18.8	19.5	7.75	8.25	4.2	7.6	30.0	31.0
COMP HU-C	100	18.9	19.5	7.67	8.49 [b]	3.4	7.7	30.0	31.0
COMP HU-D	0	18.7	19.2	7.93	8.06	7.0	8.7	30.0	31.5
COMP HU-D	10	18.9	19.4	7.89	8.06	7.2	8.9	30.0	31.5
COMP HU-D	50	18.9	19.5	7.89	8.21	7.1	8.8	30.0	31.5
COMP HU-D	100	18.7	19.4	7.84	8.27	7.2	8.4	30.5	36.5 [c]

(a) NA Not applicable.
(b) Data point out of range.
(c) Data point out of range; evaporation in the sample chamber occured on day three due to a faulty air line.

TABLE C.7. Test Results for *M. bahia* 96-Hour Copper Reference Toxicant Test

Copper Concentration (µg/L)	Replicate	Live[a]	Dead or Missing	Proportion Surviving	Mean Proportion Surviving	Standard Deviation
0	1	10	0	1.00		
0	2	10	0	1.00		
0	3	10	0	1.00	1.00	0.00
100	1	10	0	1.00		
100	2	10	0	1.00		
100	3	10	0	1.00	1.00	0.00
150	1	10	0	1.00		
150	2	6	4	0.60		
150	3	4	6	0.40	0.67	0.31
200	1	3	7	0.30		
200	2	4	6	0.40		
200	3	4	6	0.40	0.37	0.06
300	1	1	9	0.10		
300	2	0	10	0.00		
300	3	0	10	0.00	0.03	0.06

(a) Survival based on initial exposure of 10 organisms per replicate.

TABLE C.8. Water Quality Summary for *M. bahia* 96-Hour Copper Reference Toxicant Tests

Copper Concentration (µg/L)	Temperature (°C) Min	Max	pH Min	Max	Dissolved Oxygen (mg/L) Min	Max	Salinity (o/oo) Min	Max
Acceptable Range	18.0	22.0	7.30	8.30	4.0	NA [(a)]	28.0	32.0
0	18.7	19.4	7.90	8.06	7.3	7.9	31.0	32.0
100	18.7	19.3	7.88	8.04	7.3	7.8	31.5	32.0
150	18.7	19.3	7.82	8.02	7.4	7.9	31.0	32.0
200	18.7	19.3	7.95	8.03	7.3	8.0	31.0	32.0
300	18.7	19.3	7.96	8.04	7.4	8.1	31.0	32.0

(a) NA Not applicable.

TABLE C.9. Test Results for All Replicates in 48-Hour Larval *M. galloprovincialis* Water-Column Toxicity Test

Sediment Treatment	SPP Concentration	Replicate	Mean Stocking Density	Number Normal	Abnormal	Other	Proportion Normal[a]	Mean Proportion Normal	Number Surviving	Proportion Surviving[a]	Mean Proportion Surviving	Standard Deviation[b]
COMP HU-A	0%	1	271	266	0	1	0.98		267	0.99		
COMP HU-A	0%	2	271	265	0	4	0.98		269	0.99		
COMP HU-A	0%	3	271	240	1	4	0.89		245	0.90		
COMP HU-A	0%	4	271	288	0	2	1.00		290	1.00		
COMP HU-A	0%	5	271	257	0	7	0.95	0.96	264	0.97	0.97	0.04
COMP HU-A	10%	1	271	295	0	6	1.00		301	1.00		
COMP HU-A	10%	2	271	173	0	1	0.64		174	0.64		
COMP HU-A	10%	3	271	298	0	5	1.00		303	1.00		
COMP HU-A	10%	4	271	326	0	8	1.00		334	1.00		
COMP HU-A	10%	5	271	298	0	7	1.00	0.93	305	1.00	0.93	0.16
COMP HU-A	50%	1	271	0	0	245	0.00		245	0.90		
COMP HU-A	50%	2	271	0	0	222	0.00		222	0.82		
COMP HU-A	50%	3	271	1	0	266	0.00		267	0.99		
COMP HU-A	50%	4	271	0	0	227	0.00		227	0.84		
COMP HU-A	50%	5	271	0	0	239	0.00	0.00	239	0.88	0.89	0.07
COMP HU-A	100%	1	271	0	0	15	0.00		15	0.06		
COMP HU-A	100%	2	271	0	0	4	0.00		4	0.01		
COMP HU-A	100%	3	271	4	0	8	0.01		12	0.04		
COMP HU-A	100%	4	271	2	0	19	0.01		21	0.08		
COMP HU-A	100%	5	271	0	0	16	0.00	0.00	16	0.06	0.05	0.02
COMP HU-B	0%	1	271	285	1	11	1.00		297	1.00		
COMP HU-B	0%	2	271	224	0	3	0.83		227	0.84		
COMP HU-B	0%	3	271	237	0	6	0.87		243	0.90		
COMP HU-B	0%	4	271	280	0	4	1.00		284	1.00		
COMP HU-B	0%	5	271	296	0	4	1.00	0.94	300	1.00	0.95	0.08
COMP HU-B	10%	1	271	2	66	107	0.01		175	0.65		
COMP HU-B	10%	2	271	79	94	78	0.29		251	0.93		
COMP HU-B	10%	3	271	44	104	97	0.16		245	0.90		
COMP HU-B	10%	4	271	7	80	116	0.03		203	0.75		
COMP HU-B	10%	5	271	177	53	34	0.65	0.23	264	0.97	0.84	0.14

TABLE C.9. (contd)

Sediment Treatment	SPP Concentration	Replicate	Mean Stocking Density	Number Normal	Abnormal	Other	Proportion Normal[a]	Mean Proportion Normal	Number Surviving	Proportion Surviving[a]	Mean Proportion Surviving	Standard Deviation[b]
COMP HU-B	50%	1	271	0	0	4	0.00		4	0.01		
COMP HU-B	50%	2	271	0	0	29	0.00		29	0.11		
COMP HU-B	50%	3	271	0	0	8	0.00		8	0.03		
COMP HU-B	50%	4	271	2	0	28	0.01		30	0.11		
COMP HU-B	50%	5	271	0	0	0	0.00	0.00	0	0.00	0.05	0.05
COMP HU-B	100%	1	271	0	0	8	0.00		8	0.03		
COMP HU-B	100%	2	271	0	0	0	0.00		0	0.00		
COMP HU-B	100%	3	271	1	0	13	0.00		14	0.05		
COMP HU-B	100%	4	271	0	0	0	0.00		0	0.00		
COMP HU-B	100%	5	271	0	0	7	0.00	0.00	7	0.03	0.02	0.02
COMP HU-C	0%	1	271	273	3	5	1.00		281	1.00		
COMP HU-C	0%	2	271	251	0	2	0.93		253	0.93		
COMP HU-C	0%	3	271	236	0	6	0.87		242	0.89		
COMP HU-C	0%	4	271	277	1	3	1.00		281	1.00		
COMP HU-C	0%	5	271	298	0	4	1.00	0.96	302	1.00	0.96	0.05
COMP HU-C	10%	1	271	245	0	5	0.90		250	0.92		
COMP HU-C	10%	2	271	258	0	5	0.95		263	0.97		
COMP HU-C	10%	3	271	251	1	10	0.93		262	0.97		
COMP HU-C	10%	4	271	308	0	6	1.00		314	1.00		
COMP HU-C	10%	5	271	254	0	8	0.94	0.94	262	0.97	0.97	0.03
COMP HU-C	50%	1	271	0	0	26	0.00		26	0.10		
COMP HU-C	50%	2	271	0	0	109	0.00		109	0.40		
COMP HU-C	50%	3	271	0	1	48	0.00		49	0.18		
COMP HU-C	50%	4	271	1	0	98	0.00		99	0.37		
COMP HU-C	50%	5	271	0	0	52	0.00	0.00	52	0.19	0.25	0.13

TABLE C.9. (contd)

Sediment Treatment	SPP Concentration	Replicate	Mean Stocking Density	Number Normal	Abnormal	Other	Proportion Normal[a]	Mean Proportion Normal	Number Surviving	Proportion Surviving[a]	Mean Proportion Surviving	Standard Deviation[b]
COMP HU-C	100%	1	271	0	0	0	0.00		0	0.00		
COMP HU-C	100%	2	271	0	0	0	0.00		0	0.00		
COMP HU-C	100%	3	271	0	0	2	0.00		2	0.01		
COMP HU-C	100%	4	271	0	0	0	0.00		0	0.00		
COMP HU-C	100%	5	271	0	0	6	0.00	0.00	6	0.02	0.01	0.01
COMP HU-D	0%	1	271	261	1	4	0.96		266	0.98		
COMP HU-D	0%	2	271	266	0	6	0.98		272	1.00		
COMP HU-D	0%	3	271	254	0	5	0.94		259	0.96		
COMP HU-D	0%	4	271	230	0	8	0.85		238	0.88		
COMP HU-D	0%	5	271	278	0	1	1.00	0.95	279	1.00	0.96	0.05
COMP HU-D	10%	1	271	264	0	8	0.97		272	1.00		
COMP HU-D	10%	2	271	240	0	5	0.89		245	0.90		
COMP HU-D	10%	3	271	308	0	3	1.00		311	1.00		
COMP HU-D	10%	4	271	239	0	4	0.88		243	0.90		
COMP HU-D	10%	5	271	284	0	2	1.00	0.95	286	1.00	0.96	0.05
COMP HU-D	50%	1	271	2	68	190	0.01		260	0.96		
COMP HU-D	50%	2	271	0	68	116	0.00		184	0.68		
COMP HU-D	50%	3	271	0	18	131	0.00		149	0.55		
COMP HU-D	50%	4	271	0	0	232	0.00		232	0.86		
COMP HU-D	50%	5	271	0	114	116	0.00	0.00	230	0.85	0.78	0.16
COMP HU-D	100%	1	271	0	0	232	0.00		232	0.86		
COMP HU-D	100%	2	271	0	0	228	0.00		228	0.84		
COMP HU-D	100%	3	271	0	0	212	0.00		212	0.78		
COMP HU-D	100%	4	271	1	0	146	0.00		147	0.54		
COMP HU-D	100%	5	271	1	0	211	0.00	0.00	212	0.78	0.76	0.13

(a) When number normal or number surviving exceeded the stocking density, a proportion normal and/or proportion survival of 1.00 was used for mean calculations and statistical analysis.
(b) Standard deviation is based on proportion surviving.

TABLE C.10. Water Quality Summary for *M. galloprovincialis* 48-Hour Water Column Toxicity Test

Sediment Treatment	Percent Concentration	Temperature (°C) Min	Temperature (°C) Max	pH Min	pH Max	Dissolved Oxygen (mg/L) Min	Dissolved Oxygen (mg/L) Max	Salinity (o/oo) Min	Salinity (o/oo) Max
Acceptable Range		14.0	18.0	7.30	8.30	5.0	NA [a]	28.0	32.0
COMP HU-A	0	14.9	17.5	7.94	8.11	7.5	8.0	30.0	30.5
COMP HU-A	10	14.9	17.6	7.90	8.15	7.5	8.0	30.0	30.5
COMP HU-A	50	14.9	17.3	7.96	8.27	7.0	8.0	30.0	30.5
COMP HU-A	100	14.9	17.5	7.93	8.37 [b]	5.6	8.0	30.0	30.5
COMP HU-B	0	14.9	17.9	8.00	8.11	7.5	8.1	30.0	30.5
COMP HU-B	10	14.9	17.9	7.96	8.23	7.6	8.0	30.0	30.5
COMP HU-B	50	14.8	18.0	7.80	8.45 [b]	6.9	8.0	30.0	30.5
COMP HU-B	100	14.8	18.0	7.72	8.49 [b]	6.9	7.9	30.0	30.5
COMP HU-C	0	14.4	17.6	7.95	8.13	7.8	8.7	30.0	30.5
COMP HU-C	10	14.4	17.7	7.90	8.20	7.9	8.7	30.0	30.5
COMP HU-C	50	14.4	17.6	7.72	8.36 [b]	7.7	8.5	30.0	31.0
COMP HU-C	100	14.5	17.4	7.69	8.49 [b]	5.4	8.2	30.0	31.0
COMP HU-D	0	14.4	17.7	8.02	8.11	7.7	8.6	30.0	30.5
COMP HU-D	10	14.6	17.8	8.00	8.13	7.6	8.3	30.0	30.5
COMP HU-D	50	14.6	17.8	7.94	8.24	7.5	8.0	30.0	30.5
COMP HU-D	100	14.6	17.9	7.87	8.33 [b]	6.3	8.0	30.0	31.0

(a) NA Not applicable.
(b) Data point out of range.

TABLE C.11. Test Results for Larval *M. galloprovincialis* 48-Hour Copper Reference Toxicant Tests

Copper Concentration (µg/L)	Replicate	Mean Stocking Density	Number Normal	Abnormal	Other	Proportion Normal[a]	Mean Proportion Normal	Number Surviving	Proportion Surviving[a]	Mean Proportion Surviving	Standard Deviation[b]
0.00	1	285	297	0	3	1.00		300	1.00		
0.00	2	285	287	0	6	1.00		293	1.00		
0.00	3	285	257	0	9	0.90		266	0.93		
0.00	4	285	270	0	6	0.95		276	0.97		
0.00	5	285	264	0	9	0.93	0.96	273	0.96	0.97	0.03
1.00	1	285	298	0	6	1.00		304	1.00		
1.00	2	285	267	1	11	0.94		279	0.98		
1.00	3	285	267	0	8	0.94	0.96	275	0.96	0.98	0.02
4.00	1	285	235	0	0	0.82		235	0.82		
4.00	2	285	249	0	3	0.87		252	0.88		
4.00	3	285	255	1	7	0.89	0.86	263	0.92	0.87	0.05
16.00	1	285	20	109	122	0.07		251	0.88		
16.00	2	285	4	133	104	0.01		241	0.85		
16.00	3	285	0	177	103	0.00	0.03	280	0.98	0.90	0.07
64.00	1	285	0	0	0	0.00		0	0.00		
64.00	2	285	0	0	5	0.00		5	0.02		
64.00	3	285	0	0	0	0.00	0.00	0	0.00	0.01	0.01

(a) When number normal or number surviving exceeded the stocking density, a proportion normal and/or proportion survival of 1.00 was used for mean calculations and statistical analysis.
(b) Standard deviation is based on proportion surviving.

TABLE C.12. Water Quality Summary for *M. galloprovincialis* 48-Hour Copper Reference Toxicant Test

Copper Concentration (µg/L)	Temperature (°C)		pH		Dissolved Oxygen (mg/L)		Salinity (o/oo)	
	Min	Max	Min	Max	Min	Max	Min	Max
Acceptable Range	14.0	18.0	7.30	8.30	5.0	NA[(a)]	28.0	32.0
0.00	16.5	17.6	7.86	8.05	6.7	7.6	30.0	30.5
1.00	16.4	17.6	7.92	8.04	7.1	7.7	30.0	30.5
4.00	16.6	17.6	8.04	8.06	7.5	7.6	30.0	30.5
16.0	16.6	17.6	7.96	8.06	7.3	7.7	30.0	30.5
64.0	16.7	17.6	7.76	8.06	6.1	7.6	30.0	30.0

(a) NA Not applicable.

Appendix D

Benthic Acute Toxicity Test Data for Hudson River Project

TABLE D.1. Test Results for *A. abdita* 10-Day, Static Renewal, Benthic Acute Toxicity Test

Sediment Treatment	Replicate	Live[a]	Dead or Missing	Proportion Surviving	Mean Proportion Surviving	Standard Deviation
COMP HU-A	1	18	2	0.90		
COMP HU-A	2	14	6	0.70		
COMP HU-A	3	17	3	0.85		
COMP HU-A	4	15	5	0.75		
COMP HU-A	5	12	8	0.60	0.76	0.12
COMP HU-B	1	17	3	0.85		
COMP HU-B	2	20	0	1.00		
COMP HU-B	3	13	7	0.65		
COMP HU-B	4	15	5	0.75		
COMP HU-B	5	16	4	0.80	0.81	0.13
COMP HU-C	1	14	6	0.70		
COMP HU-C	2	15	5	0.75		
COMP HU-C	3	15	5	0.75		
COMP HU-C	4	17	3	0.85		
COMP HU-C	5	16	4	0.80	0.77	0.06
COMP HU-D	1	20	0	1.00		
COMP HU-D	2	20	0	1.00		
COMP HU-D	3	17	3	0.85		
COMP HU-D	4	18	2	0.90		
COMP HU-D	5	18	2	0.90	0.93	0.07
R-MUD	1	17	3	0.85		
R-MUD	2	19	1	0.95		
R-MUD	3	18	2	0.90		
R-MUD	4	19	1	0.95		
R-MUD	5	20	0	1.00	0.93	0.06
C-AM	1	20	0	1.00		
C-AM	2	20	0	1.00		
C-AM	3	19	1	0.95		
C-AM	4	18	2	0.90		
C-AM	5	20	0	1.00	0.97	0.04

(a) Survival based on initial exposure of 20 organisms per replicate.

TABLE D.2. Water Quality Summary for *A. abdita* 10-Day Static Renewal, Benthic Acute Toxicity Test

Sediment Treatment	Temperature (°C) Min	Temperature (°C) Max	pH Min	pH Max	Dissolved Oxygen (mg/L) Min	Dissolved Oxygen (mg/L) Max	Salinity (o/oo) Min	Salinity (o/oo) Max	Total Ammonia[a] (mg/L) Min	Total Ammonia[a] (mg/L) Max
Acceptable Range	18.0	22.0	7.30	8.30	5.0	NA [b]	28.0	32.0	NA	30.0
COMP HU-A	17.5 [c]	19.2	7.86	8.22	7.4	8.3	30.5	32.0	<1.00	<1.00
COMP HU-B	17.9 [c]	19.3	7.80	8.26	7.2	8.3	30.5	31.5	<1.00	1.02
COMP HU-C	18.2	19.4	7.88	8.40 [c]	7.2	8.3	30.5	31.5	<1.00	2.36
COMP HU-D	18.0	19.4	7.80	8.14	7.2	8.4	30.0	31.5	<1.00	<1.00
R-MUD	17.9 [c]	19.3	7.93	8.14	7.3	8.3	30.5	32.0	<1.00	<1.00
C-AM	17.9 [c]	19.3	7.80	8.16	6.8	8.2	30.0	31.5	<1.00	1.30

(a) Total ammonia measured in overlying water.
(b) NA Not applicable.
(c) Data point out of range.

TABLE D.3. Water Quality Measurements of Porewater for *A. abdita* 10-Day, Static Renewal, Benthic Acute Toxicity Test

Sediment Treatment	Ammonia (mg/L)	Temperature (°C)	pH	Dissolved Oxygen (mg/L)	Salinity (o/oo)
			Day 0		
COMP HU-A	28.4	18.2	7.99	8.0	32.0
COMP HU-B	27.9	19.3	8.08	8.2	31.5
COMP HU-C	28.7	19.4	8.01	8.2	31.5
COMP HU-D	18.8	19.4	7.94	8.0	31.0
R-MUD	0.737	19.2	8.07	7.9	31.5
C-AM	7.12	19.3	8.03	8.1	31.0
			Day 10		
COMP HU-A	6.69	18.9	8.09	8.2	31.5
COMP HU-B	9.77	18.8	8.11	8.2	30.5
COMP HU-C	12.3	18.8	8.14	8.2	30.5
COMP HU-D	6.03	18.6	8.05	8.2	30.0
R-MUD	ND[(a)]	18.9	8.01	8.2	31.0
C-AM	4.61	18.4	8.12	8.1	30.0

(a) ND No data.

TABLE D.4. Test Results for *A. abdita* 96-Hour Cadmium Reference Toxicant Test

Cadmium Concentration (mg/L)	Replicate	Live[a]	Dead or Missing	Proportion Surviving	Mean Proportion Surviving	Standard Deviation
0.00	1	20	0	1.00		
0.00	2	19	1	0.95		
0.00	3	20	0	1.00	0.98	0.03
0.25	1	13	7	0.65		
0.25	2	13	7	0.65		
0.25	3	15	5	0.75	0.68	0.06
0.50	1	12	8	0.60		
0.50	2	15	5	0.75		
0.50	3	13	7	0.65	0.67	0.08
1.00	1	4	16	0.20		
1.00	2	5	15	0.25		
1.00	3	5	15	0.25	0.23	0.03
2.00	1	0	20	0.00		
2.00	2	0	20	0.00		
2.00	3	0	20	0.00	0.00	0.00

(a) Survival based on initial exposure of 20 organisms per replicate.

TABLE D.5. Water Quality Summary for 96-Hour *A. abdita* Cadmium Reference Toxicant Test

Cadmium Concentration (mg/L)	Temperature (°C)		pH		Dissolved Oxygen (mg/L)		Salinity (o/oo)	
	Min	Max	Min	Max	Min	Max	Min	Max
Acceptable Range	18.0	22.0	7.30	8.30	5.0	NA[(a)]	28.0	32.0
0.00	19.3	19.5	7.97	8.14	7.3	8.0	30.5	31.0
0.25	19.3	19.5	7.92	8.10	7.5	7.9	30.5	31.5
0.50	19.3	19.6	7.91	8.10	7.5	7.8	30.5	31.0
1.00	19.2	19.5	7.90	8.09	7.6	7.9	30.5	31.5
2.00	19.3	19.6	7.85	8.03	7.6	7.9	30.5	31.5

(a) NA Not applicable.

TABLE D.6. Results of *R. abronius* 10-Day, Static Renewal, Benthic Acute Toxicity Test

Sediment Treatment	Replicate	Live[a]	Dead or Missing	Proportion Surviving	Mean Proportion Surviving	Standard Deviation
COMP HU-A	1	15	5	0.75		
COMP HU-A	2	7	13	0.35		
COMP HU-A	3	19	1	0.95		
COMP HU-A	4	13	7	0.65		
COMP HU-A	5	14	6	0.70	0.68	0.22
COMP HU-B	1	17	3	0.85		
COMP HU-B	2	17	3	0.85		
COMP HU-B	3	16	4	0.80		
COMP HU-B	4	18	2	0.90		
COMP HU-B	5	14	6	0.70	0.82	0.08
COMP HU-C	1	17	3	0.85		
COMP HU-C	2	14	6	0.70		
COMP HU-C	3	16	4	0.80		
COMP HU-C	4	18	2	0.90		
COMP HU-C	5	19	1	0.95	0.84	0.10
COMP HU-D	1	18	2	0.90		
COMP HU-D	2	15	5	0.75		
COMP HU-D	3	17	3	0.85		
COMP HU-D	4	17	3	0.85		
COMP HU-D	5	16	4	0.80	0.83	0.06
R-MUD	1	20	0	1.00		
R-MUD	2	20	0	1.00		
R-MUD	3	20	0	1.00		
R-MUD	4	20	0	1.00		
R-MUD	5	18	2	0.90	0.98	0.04
C-WB	1	19	1	0.95		
C-WB	2	20	0	1.00		
C-WB	3	21	0	1.00		
C-WB	4	18	2	0.90		
C-WB	5	20	0	1.00	0.97	0.04

(a) Survival based on initial exposure of 20 organisms per replicate.

TABLE D.7. Water Quality Summary for *R. abronius* 10-Day Solid-Phase, Static Renewal, Benthic Acute Toxicity Test

Sediment Treatment	Temperature (°C) Min	Max	pH Min	Max	Dissolved Oxygen (mg/L) Min	Max	Salinity (o/oo) Min	Max	Total Ammonia[a] (mg/L) Min	Max
Acceptable Range	12.0	16.0	7.30	8.30	5.0	NA [b]	28.0	32.0	NA	30.0
COMP HU-A	14.0	15.6	7.76	8.03	7.6	8.8	30.5	32.0	0.082	2.33
COMP HU-B	13.7	15.2	7.62	8.03	6.7	8.7	30.5	32,0	0.062	1.53
COMP HU-C	13.8	15.0	7.71	8.20	7.2	8.7	30.5	32.0	0.131	3.27
COMP HU-D	13.8	15.5	7.89	8.10	7.7	8.8	30.5	32.0	0.048	2.49
R-MUD	13.8	15.0	7.10	8.12	7.4	8.8	30.5	32.0	0.026	<1.00
C-WB	13.8	15.1	7.91	8.40 [c]	7.6	8.8	31.0	32.0	0.034	0.219

(a) Total ammonia measured in the overlying water.
(b) NA Not applicable.
(c) Data point out of range.

TABLE D.8. Water Quality Measurements of Porewater for *R. abronius* 10-Day, Static Renewal, Benthic Acute Toxicity Test

Sediment Treatment	Ammonia (mg/L)	Temperature (°C)	pH	Dissolved Oxygen (mg/L)	Salinity (o/oo)
			Day 0		
COMP HU-A	21.4	14.8	7.83	7.9	31.0
COMP HU-B	17.9	14.5	7.95	7.6	32.0
COMP HU-C	33.5	14.3	7.71	8.0	32.0
COMP HU-D	12.5	14.7	7.91	7.8	32.0
R-MUD	0.685	15.0	7.99	8.0	32.0
C-WB	2.74	14.8	7.93	7.7	31.5
			Day 10		
COMP HU-A	16.0	14.3	7.96	8.5	31.5
COMP HU-B	5.7	14.5	8.01	8.6	31.0
COMP HU-C	3.3	14.4	8.07	8.6	31.0
COMP HU-D	7.7	14.5	7.99	8.5	31.0
R-MUD	ND[(a)]	14.5	8.10	8.8	31.0
C-WB	ND	14.3	8.09	8.8	31.0

(a) ND No data.

TABLE D.9. Test Results for *R. abronius* 96-Hour Cadmium Reference Toxicant Test

Cadmium Concentration (mg/L)	Rep	Live[a]	Dead or Missing	Proportion Surviving	Mean Proportion Surviving	Standard Deviation
0.00	1	18	2	0.90		
0.00	2	20	0	1.00		
0.00	3	20	0	1.00	0.97	0.06
0.38	1	15	5	0.75		
0.38	2	5	5	0.25		
0.38	3	20	0	1.00	0.67	0.38
0.75	1	15	5	0.75		
0.75	2	17	3	0.85		
0.75	3	12	8	0.60	0.73	0.13
1.50	1	8	12	0.40		
1.50	2	2	18	0.10		
1.50	3	9	11	0.45	0.32	0.19
3.00	1	1	19	0.05		
3.00	2	4	16	0.20		
3.00	3	1	19	0.05	0.10	0.09

TABLE D.10. Water Quality Summary for *R. abronius* 96-Hour Cadmium Reference Toxicant Test

Cadmium Concentration (mg/L)	Temperature (°C)		pH		Dissolved Oxygen (mg/L)		Salinity (o/oo)	
	Min	Max	Min	Max	Min	Max	Min	Max
Acceptable Range	12.0	16.0	7.30	8.30	5.0	NA [(a)]	28.0	32.0
0.00	14.9	15.6	7.91	8.10	7.9	8.3	30.5	32.0
0.38	14.9	15.2	7.90	8.07	8.0	8.4	30.5	32.0
0.75	14.8	15.3	7.90	8.06	8.0	8.3	30.5	31.5
1.50	14.9	15.2	7.87	8.02	8.0	8.3	30.5	32.0
3.00	14.9	15.2	7.66	7.92	7.9	8.2	30.5	32.0

(a) NA Not applicable.

TABLE D.11. Test Results for 10-Day, Static Renewal, Benthic Acute Toxicity Test with *E. estuarius*

Sediment Treatment	Replicate	Live[a]	Dead or Missing	Proportion Surviving	Mean Proportion Surviving	Standard Deviation
COMP HU-A	1	9	11	0.45		
COMP HU-A	2	12	8	0.60		
COMP HU-A	3	10	10	0.50		
COMP HU-A	4	5	15	0.25		
COMP HU-A	5	15	5	0.75	0.51	0.19
COMP HU-B	1	12	8	0.60		
COMP HU-B	2	15	5	0.75		
COMP HU-B	3	7	13	0.35		
COMP HU-B	4	10	10	0.50		
COMP HU-B	5	15	5	0.75	0.59	0.17
COMP HU-C	1	16	4	0.80		
COMP HU-C	2	16	4	0.80		
COMP HU-C	3	10	10	0.50		
COMP HU-C	4	10	10	0.50		
COMP HU-C	5	14	6	0.70	0.66	0.15
COMP HU-D	1	10	10	0.50		
COMP HU-D	2	11	9	0.55		
COMP HU-D	3	12	8	0.60		
COMP HU-D	4	10	10	0.50		
COMP HU-D	5	13	7	0.65	0.56	0.07
R-MUD	1	20	0	1.00		
R-MUD	2	20	0	1.00		
R-MUD	3	19	1	0.95		
R-MUD	4	17	3	0.85		
R-MUD	5	20	0	1.00	0.96	0.07
Eoh Control	1	20	0	1.00		
Eoh Control	2	20	0	1.00		
Eoh Control	3	20	0	1.00		
Eoh Control	4	20	0	1.00		
Eoh Control	5	19	1	0.95	0.99	0.02

(a) Survival based on initial exposure of 20 organisms per replicate.

TABLE D.12. Water Quality Summary for 10-Day, Static Renewal, Benthic Acute Toxicity Test with *E. estuarius*

Sediment Treatment	Temperature (°C) Min	Temperature (°C) Max	pH Min	pH Max	Dissolved Oxygen (mg/L) Min	Dissolved Oxygen (mg/L) Max	Salinity (o/oo) Min	Salinity (o/oo) Max	Total Ammonia[a] (mg/L) Min	Total Ammonia[a] (mg/L) Max
Acceptable Range	12.0	16.0	7.30	8.30	5.0	NA [b]	28.0	32.0	NA	60.0
COMP HU-A	14.3	15.7	7.88	8.12	7.1	8.3	30.5	31.5	<1.00	6.96
COMP HU-B	14.5	15.8	7.85	8.22	7.4	8.2	30.5	31.5	<1.00	4.99
COMP HU-C	14.4	15.7	7.70	8.23	7.2	8.1	30.5	32.0	<1.00	7.58
COMP HU-D	14.2	15.9	7.81	8.04	7.4	8.2	30.5	31.5	<1.00	3.98
R-MUD	14.3	15.7	7.94	8.11	7.3	8.3	30.5	31.5	<1.00	4.94
Eoh Control	14.9	15.8	7.62	8.10	7.6	8.2	30.5	31.5	<1.00	1.42

(a) Total ammonia measured in the overlying water.
(b) NA Not applicable.

TABLE D.13. Water Quality Measurements of Porewater for 10-Day *E. estuarius* Static Renewal Test

Sediment Treatment	Ammonia (mg/L)	Temperature[a] (°C)	pH	Dissolved Oxygen[a] (mg/L)	Salinity o/oo)
			Day 0		
COMP HU-A	22.7	15.1	7.51	8.1	30.5
COMP HU-B	45.8	15.2	7.35	8.2	30.0
COMP HU-C	50.8	15.1	7.47	8.0	30.5
COMP HU-D	24.9	15.2	7.43	8.1	30.0
R-MUD	ND[b]	ND	ND	ND	ND
Eoh Control	<1.00	15.1	ND	8.1	ND
			Day 10		
COMP HU-A	5.91	21.2	7.32	7.8	30.5
COMP HU-B	13.1	21.1	7.01	7.7	30.0
COMP HU-C	10.2	21.4	6.99	7.6	30.5
COMP HU-D	14.5	21.7	6.98	7.6	30.5
R-MUD	1.22	ND	ND	7.9	30.5
Eoh Control	1.11	ND	ND	7.8	30.5

(a) Values are a mean of the five replicates, rather than values from the porewater dummy jars.
(b) ND No data.

TABLE D.14. Test Results for 96-Hour *E. estuarius* Cadmium Reference Toxicant Test

Cadmium Concentration (mg/L)	Replicate	Live[a]	Dead or Missing	Proportion Surviving	Mean Proportion Surviving	Standard Deviation
0	1	18	2	0.90		
0	2	19	1	0.95		
0	3	17	3	0.85	0.90	0.05
5	1	16	4	0.80		
5	2	14	6	0.70		
5	3	15	5	0.75	0.75	0.05
10	1	6	14	0.30		
10	2	5	15	0.25		
10	3	9	11	0.45	0.33	0.10
20	1	2	18	0.10		
20	2	1	19	0.05		
20	3	3	17	0.15	0.10	0.05
30	1	0	20	0.00		
30	2	0	20	0.00		
30	3	0	20	0.00	0.00	0.00

(a) Survival based on initial exposure of 20 organisms per replicate.

TABLE D.15. Water Quality Summary for 96-Hour Cadmium Reference Toxicant Test with *E. estuarius*

Cadmium Concentration (mg/L)	Temperature (°C)		pH		Dissolved Oxygen (mg/L)		Salinity (o/oo)	
	Min	Max	Min	Max	Min	Max	Min	Max
Acceptable Range	12.0	16.0	7.30	8.30	5.0	NA[(a)]	28.0	32.0
0.0	14.0	15.5	8.00	8.10	7.5	8.2	30.5	31.5
5.0	14.2	15.7	7.98	8.10	7.4	8.3	30.5	31.5
10.0	14.2	15.6	7.90	8.10	7.4	8.4	30.5	31.5
20.0	14.1	15.5	7.90	8.10	7.4	8.3	30.5	31.5
30.0	14.1	15.7	7.93	8.10	7.5	8.3	31.0	31.5

(a) NA Not applicable.

TABLE D.16. Test Results for 10-Day, Static, Benthic Acute Toxicity Test with *M. bahia*

Sediment Treatment	Replicate	Live[a]	Dead or Missing	Proportion Surviving	Mean Proportion Surviving	Standard Deviation
COMP HU-A	1	0	20	0.00		
COMP HU-A	2	0	20	0.00		
COMP HU-A	3	0	20	0.00		
COMP HU-A	4	0	20	0.00		
COMP HU-A	5	0	20	0.00	0.00	0.00
COMP HU-B	1	0	20	0.00		
COMP HU-B	2	0	20	0.00		
COMP HU-B	3	0	20	0.00		
COMP HU-B	4	1	19	0.05		
COMP HU-B	5	0	20	0.00	0.01	0.02
COMP HU-C	1	0	20	0.00		
COMP HU-C	2	0	20	0.00		
COMP HU-C	3	0	20	0.00		
COMP HU-C	4	0	20	0.00		
COMP HU-C	5	0	20	0.00	0.00	0.00
COMP HU-D	1	0	20	0.00		
COMP HU-D	2	4	16	0.20		
COMP HU-D	3	3	17	0.15		
COMP HU-D	4	5	15	0.25		
COMP HU-D	5	0	20	0.00	0.12	0.12
R-MUD	1	20	0	1.00		
R-MUD	2	18	2	0.90		
R-MUD	3	18	2	0.90		
R-MUD	4	17	3	0.85		
R-MUD	5	16	4	0.80	0.89	0.07
Control-SB	1	19	1	0.95		
Control-SB	2	16	4	0.80		
Control-SB	3	19	1	0.95		
Control-SB	4	20	0	1.00		
Control-SB	5	19	1	0.95	0.93	0.08

(a) Survival based on initial exposure of 20 organisms per replicate.

TABLE D.17. Water Quality Summary for 10-Day, Static, Benthic Acute Toxicity Test with *M. bahia*

Sediment Treatment	Temperature (°C)		pH		Dissolved Oxygen (mg/L)		Salinity (o/oo)		Ammonia (mg/L)	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Acceptable Range	18.0	22.0	7.30	8.30	3.0	NA [(a)]	28.0	32.0	NA	20.0
COMP HU-A	18.6	19.5	7.84	8.39 [(b)]	6.3	7.1	29.5	31.0	17.9	81.1 [(b)]
COMP HU-B	18.6	19.5	7.72	8.29	5.8	6.9	30.0	31.0	25.4	96.8 [(b)]
COMP HU-C	18.6	19.5	7.55	8.31 [(b)]	5.2	7.0	29.5	31.0	21.1	88.5 [(b)]
COMP HU-D	18.6	19.5	7.61	8.06	5.6	7.1	29.5	30.5	15.0	76.0 [(b)]
R-MUD	18.6	19.6	7.57	8.06	5.8	7.3	30.0	31.0	1.21	52.7 [(b)]
Control-SB	18.6	19.5	7.73	8.24	5.9	7.4	30.0	32.0	3.36	82.0 [(b)]

(a) NA Not applicable.
(b) Data point out of range.

TABLE D.18. Test Results for 10-Day, Static Renewal, Benthic Acute Toxicity Test with *M. bahia*

Sediment Treatment	Replicate	Live[(a)]	Dead or Missing	Proportion Surviving	Mean Proportion Surviving	Standard Deviation
COMP HU-A	1	16	4	0.80		
COMP HU-A	2	20	0	1.00		
COMP HU-A	3	17	3	0.85		
COMP HU-A	4	17	3	0.85		
COMP HU-A	5	19	1	0.95	0.89	0.08
COMP HU-B	1	19	1	0.95		
COMP HU-B	2	20	0	1.00		
COMP HU-B	3	19	1	0.95		
COMP HU-B	4	18	2	0.90		
COMP HU-B	5	19	1	0.95	0.95	0.04
COMP HU-C	1	17	3	0.85		
COMP HU-C	2	19	1	0.95		
COMP HU-C	3	18	2	0.90		
COMP HU-C	4	18	2	0.90		
COMP HU-C	5	18	2	0.90	0.90	0.04
COMP HU-D	1	17	3	0.85		
COMP HU-D	2	17	3	0.85		
COMP HU-D	3	20	0	1.00		
COMP HU-D	4	20	0	1.00		
COMP HU-D	5	19	1	0.95	0.93	0.08
R-MUD	1	18	2	0.90		
R-MUD	2	15	5	0.75		
R-MUD	3	18	2	0.90		
R-MUD	4	17	3	0.85		
R-MUD	5	19	1	0.95	0.87	0.08
Control-SB	1	20	0	1.00		
Control-SB	2	19	1	0.95		
Control-SB	3	18	2	0.90		
Control-SB	4	20	0	1.00		
Control-SB	5	18	2	0.90	0.95	0.05

(a) Survival based on initial exposure of 20 organisms per replicate.

TABLE D.19. Water Quality Summary for 10-Day, Static Renewal, Benthic Acute Toxicity Test with M. bahia

Sediment Treatment	Temperature (°C) Min	Max	pH Min	Max	Dissolved Oxygen (mg/L Min	Max	Salinity (o/oo) Min	Max	Ammonia (mg/L) Min	Max
Acceptable Range	18.0	22.0	7.30	8.30	3.0	NA [a]	28.0	32.0	NA	20.0
COMP HU-A	18.5	20.1	7.69	8.00	6.1	7.3	30.5	31.0	2.89	28.7 [b]
COMP HU-B	18.5	20.1	7.56	7.95	5.6	7.5	30.5	31.0	3.15	27.7 [b]
COMP HU-C	18.6	20.1	7.72	7.94	6.0	7.3	30.5	31.0	3.31	30.0 [b]
COMP HU-D	18.5	20.0	7.54	7.92	5.8	7.6	30.5	31.0	2.61	27.4 [b]
R-MUD	18.4	20.1	7.72	8.03	6.2	7.7	30.5	31.0	1.01	12.9
Control-SB	18.5	20.1	7.62	8.60 [b]	5.2	7.5	30.5	31.0	1.13	15.8

(a) NA Not applicable.
(b) Data point out of range.

TABLE D.20. Test Results for 96-Hour, Benthic Acute Toxicity, Copper Reference Toxicant Test[a] with *M. bahia*

Copper Concentration (µg/L)	Live[b]	Dead or Missing	Proportion Surviving
0	10	0	1.00
100	10	0	1.00
150	9	1	0.90
200	8	2	0.80
250	7	3	0.70
300	7	3	0.70
400	3	7	0.30

(a) Reference toxicant test run concurrently with the static and static renewal benthic acute toxicity tests
(b) Survival based on initial exposure of 10 organisms per replicate.

TABLE D.21. Water Quality Summary for 96-Hour, Benthic Acute Toxicity, Copper Reference Toxicant Test[a] with *M. bahia*

Copper Concentration (µg/L)	Temperature (°C) Min	Max	pH Min	Max	Dissolved Oxygen (mg/L) Min	Max	Salinity (o/oo) Min	Max
Acceptable Range	18.0	22.0	7.30	8.30	4.0	NA[b]	28.0	32.0
0	18.7	18.9	7.84	7.88	6.9	7.8	30.5	31.0
100	18.7	18.9	7.85	7.97	6.9	7.8	30.5	31.0
150	18.7	19.0	7.83	7.91	7.0	7.7	30.5	31.0
200	18.7	19.0	7.80	7.87	6.8	7.9	30.5	31.5
250	18.7	18.9	7.84	7.91	7.0	8.2	30.5	31.0
300	18.6	18.9	7.78	7.94	7.0	8.0	30.5	31.0
400	18.6	18.9	7.73	8.00	7.1	7.9	30.5	31.5

(a) Reference toxicant test run concurrently with the static and static renewal benthic acute toxicity tests.
(b) NA Not applicable.

Appendix E

Bioaccumulation Test Data for Hudson River Project

TABLE E.1. Test Results for 28-Day Bioaccumulation Test with *M. nasuta*

Sediment Treatment	Replicate	Number Live[(a)]	Number Dead or Missing	Proportion Surviving	Mean Proportion Surviving	Standard Deviation
COMP HU-A	1	21	4	0.84		
COMP HU-A	2	22	3	0.88		
COMP HU-A	3	24	1	0.96		
COMP HU-A	4	25	0	1.00		
COMP HU-A	5	25	0	1.00	0.94	0.07
COMP HU-B	1	22	3	0.88		
COMP HU-B	2	22	3	0.88		
COMP HU-B	3	24	1	0.96		
COMP HU-B	4	24	1	0.96		
COMP HU-B	5	25	0	1.00	0.94	0.05
COMP HU-C	1	25	0	1.00		
COMP HU-C	2	21	4	0.84		
COMP HU-C	3	25	0	1.00		
COMP HU-C	4	22	3	0.88		
COMP HU-C	5	25	0	1.00	0.94	0.08
COMP HU-D	1	24	1	0.96		
COMP HU-D	2	22	3	0.88		
COMP HU-D	3	24	1	0.96		
COMP HU-D	4	23	2	0.92		
COMP HU-D	5	25	0	1.00	0.94	0.05
R-MUD	1	22	3	0.88		
R-MUD	2	20	5	0.80		
R-MUD	3	23	2	0.92		
R-MUD	4	21	4	0.84		
R-MUD	5	24	1	0.96	0.88	0.06
C-SB	1	25	0	1.00		
C-SB	2	24	1	0.96		
C-SB	3	24	1	0.96		
C-SB	4	24	1	0.96		
C-SB	5	25	0	1.00	0.98	0.02

(a) Survival based on initial exposure of 25 organisms per replicate.

TABLE E.2. Water Quality Summary for 28-day Bioaccumulation Test with *M. nasuta*

Sediment Treatment	Temperature (°C) Min	Max	pH Min	Max	Dissolved Oxygen (mg/L) Min	Max	Salinity (o/oo) Min	Max
Acceptable Range	12.0	16.0	7.30	8.30	5.0	NA [a]	28.0	32.0
COMP HU-A	14.3	16.5 [b]	7.63	8.04	7.3	8.2	30.0	32.0
COMP HU-B	14.4	16.5 [b]	7.69	8.02	7.0	8.2	30.0	31.5
COMP HU-C	14.4	16.0	7.73	8.03	7.2	8.1	30.0	31.5
COMP HU-D	14.3	16.5 [b]	7.78	8.04	7.1	8.2	30.0	31.0
R-MUD	14.4	16.4 [b]	7.68	8.03	7.4	8.3	30.0	31.0
R-CLIS	14.4	15.9	7.67	8.05	7.2	8.8	30.0	31.0
C-SB	14.3	16.5 [b]	7.71	8.01	7.1	8.2	30.5	31.0

(a) NA Not applicable.
(b) Data point out of range.

TABLE E.3. Test Results for 96-Hour Copper Reference Toxicant Test with *M. nasuta*

Copper Concentration (mg/L)	Live[(a)]	Dead or Missing	Proportion Surviving
0.00	10	0	1.00
0.25	10	0	1.00
0.50	10	0	1.00
0.75	8	2	0.80
1.00	10	0	1.00
1.50	8	2	0.80
2.50	4	6	0.40

(a) Survival based on initial exposure of 10 organisms per replicate.

TABLE E.4. Water Quality Summary for 96-Hour Copper Reference Toxicant Test with *M. nasuta*

Copper Concentration (mg/L)	Temperature (°C)		pH		Dissolved Oxygen (mg/L)		Salinity (o/oo)	
	Min	Max	Min	Max	Min	Max	Min	Max
Acceptable Range	12.0	16.0	7.30	8.30	5.0	NA [a]	28.0	32.0
0.00	15.1	15.8	7.78	7.96	7.0	8.0	30.5	31.5
0.25	15.0	15.5	7.64	7.94	6.9	8.1	30.5	31.5
0.50	15.0	15.6	7.65	7.94	6.9	8.0	30.5	31.5
0.75	15.0	15.5	7.48	7.93	5.4	8.0	30.5	31.5
1.00	15.1	15.5	7.53	7.88	6.2	8.1	30.5	31.5
1.50	15.0	15.6	7.44	7.88	5.3	8.1	30.5	31.5
2.50	15.0	15.6	7.27 [b]	7.86	3.2 [b]	8.1	30.5	31.5

(a) NA Not applicable.
(b) Data point out of range.

TABLE E.5. Test Results for 28-Day Bioaccumulation Test with *N. virens*

Sediment Treatment	Replicate	Live[a]	Dead or Missing	Proportion Surviving	Mean Proportion Surviving	Standard Deviation
COMP HU-A	1	17	3	0.85		
COMP HU-A	2	18	2	0.90		
COMP HU-A	3	19	1	0.95		
COMP HU-A	4	16	4	0.80		
COMP HU-A	5	19	1	0.95	0.89	0.07
COMP HU-B	1	18	2	0.90		
COMP HU-B	2	19	1	0.95		
COMP HU-B	3	17	3	0.85		
COMP HU-B	4	12	8	0.60		
COMP HU-B	5	15	5	0.75	0.81	0.14
COMP HU-C	1	15	5	0.75		
COMP HU-C	2	18	2	0.90		
COMP HU-C	3	15	5	0.75		
COMP HU-C	4	19	1	0.95		
COMP HU-C	5	13	7	0.65	0.80	0.12
COMP HU-D	1	16	4	0.80		
COMP HU-D	2	19	1	0.95		
COMP HU-D	3	6	14	0.30		
COMP HU-D	4	18	2	0.90		
COMP HU-D	5	15	5	0.75	0.74	0.26
R-MUD	1	16	4	0.80		
R-MUD	2	15	5	0.75		
R-MUD	3	18	2	0.90		
R-MUD	4	15	5	0.75		
R-MUD	5	15	5	0.75	0.79	0.07
C-NR	1	19	1	0.95		
C-NR	2	20	0	1.00		
C-NR	3	16	4	0.80		
C-NR	4	19	1	0.95		
C-NR	5	15	5	0.75	0.89	0.11

(a) Survival based on initial exposure of 20 organisms per replicate.

TABLE E.6. Water Quality Summary for 28-Day Bioaccumulation Test with *N. virens*

Sediment Treatment	Temperature (°C) Min	Temperature (°C) Max	pH Min	pH Max	Dissolved Oxygen (mg/L) Min	Dissolved Oxygen (mg/L) Max	Salinity (o/oo) Min	Salinity (o/oo) Max
Acceptable Range	18.0	22.0	7.30	8.30	5.0	NA [(a)]	28.0	32.0
COMP HU-A	17.8 [(b)]	19.9	7.64	8.01	6.5	8.1	30.0	31.5
COMP HU-B	17.8 [(b)]	20.0	7.59	7.99	6.3	8.0	30.0	31.5
COMP HU-C	18.1	20.0	7.57	8.03	5.5	8.2	30.5	31.5
COMP HU-D	17.9 [(b)]	19.8	7.61	8.03	6.0	7.9	30.0	31.5
R-MUD	18.0	19.9	7.73	8.88 [(b)]	6.5	8.3	30.5	32.0
C-NR	18.0	19.9	7.70	8.01	6.3	8.2	30.0	31.5

(a) NA Not applicable.
(b) Data point out of range.

TABLE E.7. Test Results for 96-Hour Copper Reference Toxicant Test with *N. virens*

Copper Concentration (mg/L)	Live(a)	Dead or Missing	Proportion Surviving
0.00	10	0	1.00
0.05	10	0	1.00
0.075	10	0	1.00
0.15	4	6	0.40
0.20	0	10	0.00
0.25	0	10	0.00
0.30	0	10	0.00

(a) Survival based on initial exposure of 10 organisms per replicate.

TABLE E.8. Water Quality Summary for 96-Hour Copper Reference Toxicant Test with *N. virens*

Copper Concentration (mg/L)	Temperature (°C)		pH		Dissolved Oxygen (mg/L)		Salinity (o/oo)	
	Min	Max	Min	Max	Min	Max	Min	Max
Acceptable Range	18.0	22.0	7.30	8.30	5.0	NA [a]	28.0	32.0
0.00	18.6	19.2	7.52	7.94	5.7	7.4	30.5	31.5
0.05	18.6	19.3	7.60	7.95	6.3	7.4	30.5	31.5
0.075	18.6	19.4	7.61	7.91	5.2	7.6	30.5	31.5
0.15	18.6	19.4	7.39	7.93	4.5 [b]	7.4	30.5	31.5
0.20	18.7	19.4	7.00 [b]	7.82	0.6 [b]	7.5	30.5	31.5
0.25	18.6	19.4	7.14 [b]	7.86	2.0 [b]	7.5	30.5	31.5
0.30	18.6	19.4	7.21 [b]	7.90	3.0 [b]	7.6	30.5	31.5

(a) NA Not applicable.
(b) Data point out of range.

Appendix F

Macoma nasuta Tissues Chemical Analyses and Quality Assurance/Quality Control Data for Hudson River Project

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects-2

PARAMETER: Metals

LABORATORY: Battelle/Marine Sciences Laboratory, Sequim, Washington

MATRIX: Worm and Clam Tissue

QA/QC DATA QUALITY OBJECTIVES

	Reference Method	Range of Recovery	SRM Accuracy	Relative Precision	Detection Limit (µg/g dry wt)
Arsenic	ICP/MS	75-125%	≤20%	≤20%	1.0
Cadmium	ICP/MS	75-125%	≤20%	≤20%	0.1
Chromium	ICP/MS	75-125%	≤20%	≤20%	0.2
Copper	ICP/MS	75-125%	≤20%	≤20%	1.0
Lead	ICP/MS	75-125%	≤20%	≤20%	0.1
Mercury	CVAA	75-125%	≤20%	≤20%	0.02
Nickel	ICP/MS	75-125%	≤20%	≤20%	0.1
Silver	ICP/MS	75-125%	≤20%	≤20%	0.1
Zinc	ICP/MS	75-125%	≤20%	≤20%	1.0

METHOD

A total of nine (9) metals was analyzed for the New York Federal Projects-2 Program: silver (Ag), arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), nickel (Ni), lead (Pb) and zinc (Zn). Hg was analyzed using cold-vapor atomic absorption spectroscopy (CVAA) according to the method of Bloom and Crecelius (1983). The remaining metals were analyzed by inductively coupled plasma mass spectrometry (ICP/MS) following a procedure based on EPA Method 200.8 (EPA 1991).

To prepare tissue for analysis, samples were freeze-dried and blended in a Spex mixer-mill. Approximately 5 g of mixed sample was ground in a ceramic ball mill. For ICP/MS and CVAA analyses, 0.2- to 0.5-g aliquots of dried homogenous sample were digested using a mixture of nitric acid and hydrogen peroxide following EPA Method 200.3 (EPA 1991).

HOLDING TIMES

A total of 68 worm and 68 clam samples was received on 6/15/94 in good condition. Samples were logged into Battelle's log-in system, frozen to -80°C and subsequently freeze dried within approximately 7 days of sample receipt. Samples were analyzed within 180 days of collection. Worms and clams were digested in two separate batches. The following table summarizes the analysis dates:

Task	Clams	Worms
Sample Digestion	8/9/94	9/9/94
ICP-MS	9/15/94	10/6/94
CVAA-Hg	8/17-8/24/94	8/17-8/24/94

QA/QC SUMMARY METALS (continued)

DETECTION LIMITS Four aliquots of a background clam tissue were analyzed as four separate replicates. The standard deviation of these results were multiplied by 4.541 to determine a method detection limits (MDL). Target detection limits were exceeded for all metals except Ag, Cd and Hg.

METHOD BLANKS One procedural blank was analyzed per 20 samples. No metals were detected in the blanks above the MDLs.

MATRIX SPIKES One sample was spiked with all metals at a frequency of 1 per 20 samples. All recoveries were within the QC limits of 75% -125% with the exception of Ag in one spiked worm sample and Zn in three of the four spiked worm samples. Zn was spiked at a level near the level found in the native samples and, in one case, Zn was spiked at a level below that detected in the native sample and no recovery was calculated.

REPLICATES One sample was analyzed in triplicate at a frequency of 1 per 20 samples. Precision for triplicate analyses is reported by calculating the relative standard deviation (RSD) between the replicate results. Only the RSDs for Zn in one of the four replicated worm analyses exceeded the QC limits of ±20%. RSDs for the rest of the metals were within the QC limits.

SRMs Standard Reference Material (SRM), 1566a (Oyster tissue from the National Institute of Standards and Technology, NIST), was analyzed for all metals. Results for all metals were within ±20 % of mean certified value with the exception of Cr and Ni. Cr values were below the lower QC limit in two of the five SRMs analyzed with the clams and for three of the four SRMs analyzed with the worms. The SRM certified value for Cr (1.43 μg/g) is close to the detection limit (1.46 μg/g). Ni was also recovered below or above the control limits in some samples.

REFERENCES

Bloom, N. S., and E.A. Crecelius. 1983. "Determination of Mercury in Seawater at Sub-Nanogram per Liter Levels." *Mar. Chem.* 14:49-59.

EPA (U.S. Environmental Protection Agency). 1991 Methods for the Determination of Metals in Environmental Samples. EPA-600/4-91-010. Environmental Services Division, Monitoring Management Branch, Washington D.C.

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects-2

PARAMETER: Chlorinated Pesticides/PCB Congeners

LABORATORY: Battelle/Marine Sciences Laboratory, Sequim, Washington

MATRIX: Worm and Clam Tissue

QA/QC DATA QUALITY OBJECTIVES

Reference Method	Surrogate Recovery	Spike Recovery	Relative Precision	Detection Limit
GC/ECD	30-150%	50-120%	≤30%	0.4 ng/g wet wt.

SAMPLE CUSTODY A total of 68 worm and 68 clam samples was received on 6/15/94 in good condition. Samples were logged into Battelle's log-in system and stored frozen until extraction.

METHOD Tissues were homogenized wet using a stainless steel blade. An aliquot of tissue sample was extracted with methylene chloride using the roller technique under ambient conditions following a procedure which is based on methods used by the National Oceanic and Atmospheric Administration for its Status and Trends Program (Krahn et al. 1988). Samples were then cleaned using silica/alumina (5% deactivated) chromatography followed by HPLC cleanup (Krahn et al. 1988). Extracts were analyzed for 15 chlorinated pesticides and 22 PCB congeners using gas chromatography/electron capture detection (GC/ECD) following a procedure based on EPA Method 8080 (EPA 1986). The column used was a J&W DB-17 and the confirmatory column was a DB-1701, both capillary columns (30m x 0.25mm I.D.). All detections were quantitatively confirmed on the second column.

HOLDING TIMES Samples were extracted in seven batches. All extracts were analyzed by GC/ECD. The following summarizes the extraction and analysis dates:

Batch	Species	Extraction	Analysis
1	*M. nasuta*	7/28/94	9/9-9/12/94
2	*M. nasuta*	8/3/94	9/13-9/15/94
3	*M. nasuta*	8/17/94	9/23-9/25/94
4	*N. virens*	8/19/95	9/26-9/30/94
5	*N. virens*	8/26/94	9/8-9/11/94
6	*N. virens*	9/6/94	9/17-9/19/94
7	*M. nasuta/N. virens*	9/26/94	9/15-9/17-94
8	*M. nasuta* MDL study	10/10/94	10/25/94

DETECTION LIMITS Target detection limits of 0.4 ng/g wet weight were met for all pesticides and PCB congeners, with the exception of dieldrin, PCB 8 and PCB 18, and for the samples that were analyzed in triplicate. These elevated detection limits for the replicates were due to the limited amount of tissue available resulting in smaller aliquots used for extraction. Method detection limits (MDLs) reported were determined by multiplying the standard deviation of seven spiked replicates of clam tissue by the Student's t value (99 percentile). Actual pesticide MDLs ranged from approximately 0.1 to 1.1 ng/g wet weight and PCB congener MDLs ranged from approximately 0.1 to 0.9 ng/g wet weight, depending on the compound and the sample weight extracted. MDLs were reported corrected for individual sample wet weight extracted.

Method detection limit verification was performed by analyzing four replicates of a spiked clam sample and multiplying the standard deviation of the results by 3.5. All detection limits calculated in this way were below the target detection limit of 0.4 ng/g wet weight with the exception of 4,4'-DDD which had a DL of 0.467 ng/g.

METHOD BLANKS

One method blank was extracted with each extraction batch. No pesticides or PCBs were detected in any of the method blanks.

SURROGATES

Two compounds, PCB congeners 103 and 198, were added to all samples prior to extraction to assess the efficiency of the analysis. Sample surrogate recoveries were all within the QC guidelines of 30% - 150%, with the exception of one sample in Batch 3 and two samples in Batch 4. All of these incidents involved a high recovery of PCB 198. This was most likely due to matrix interferences with the internal Standard octachloronaphthalene (OCN) which is used to quantify the recovery of surrogate PCB 198. Since no sample data are corrected for the OCN, sample results should not be affected. One sample had low surrogate recoveries for both PCB 103 and 198. This sample was re-extracted once due to surrogate recoveries. Since the recoveries in the reextraction also exceeded control limits, the problem was determined to be matrix interferences and no additional extractions were performed. Sample results were quantified using the surrogate internal standard method.

MATRIX SPIKES

Ten out of the 15 pesticides and 5 of the 22 PCB congeners analyzed were spiked into one sample per extraction batch. Matrix spike recoveries were within the control limit range of 50-120% for all Pesticides and PCBs in Batches 1, 2, 3, 6 and 7 with the exception of PCB 138 in Batch six and three pesticides and 2 PCBs in Batch seven. In all cases, the recoveries were high and are most likely due to matrix interferences. Recoveries for the majority of pesticides and PCBs in Batches four and five exceeded control limits due to high native levels compared with the levels spiked. In most cases, the spiked concentrations were 2 to 10 times lower than the concentrations detected in the samples.

REPLICATES

One sample from each extraction batch was analyzed in triplicate. Precision was measured by calculating the relative standard deviation (RSD) between the replicate results. RSDs for all detectable values were below the target precision goal of ≤30% in Batches 1, 2, 3, 4 and 7. The RSD for Endosulfan Sulfate in Batch 5 was high due to comparison of very low concentrations, less than 1 ng/g in the replicates. RSDs for two pesticides and for two PCB congeners in Batch 6 were high due to matrix interferences associated with the first replicate sample.

QA/QC SUMMARY/PCBs and PESTICIDES (continued)

SRMs Not applicable.

MISCELLANEOUS All pesticide and PCB congener results are confirmed using a second dissimilar column. RPDs between the primary and confirmation values must be less than 75% to be considered a confirmed value.

REFERENCES

Krahn, M.M., C.A. Wigren, R.W. Pearce, L.K. Moore, R.G. Bogar, W.D. MacLeod, Jr., S-L Chan, and D.W. Brown. 1988. *New HPLC Cleanup and Revised Extraction Procedures for Organic Contaminants.* NOAA Technical Memorandum NMFS F/NWC-153. National Oceanic and Atmospheric Administration, National Marine Fisheries, Seattle, Washington.

EPA (U.S. Environmental Protection Agency). 1986. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.* SW-846. U.S. Document No. 955-001-00000, U.S. Environmental Protection Agency, Washington D.C.

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects-2

PARAMETER: Polynuclear Aromatic Hydrocarbons (PAH) and 1,4-Dichlorobenzene

LABORATORY: Battelle/Marine Sciences Laboratory, Sequim, Washington

MATRIX: Clam and Worm Tissue

QA/QC DATA QUALITY OBJECTIVES

Reference Method	MS Recovery	Surrogate Recovery	SRM Accuracy	Relative Precision	Detection Limit (wet wt)
GC/MS/SIM	50-120%	30-150%	≤30%	≤30%	4 ng/g

SAMPLE CUSTODY A total of 68 worm and 68 clam samples was received on 6/15/94 in good condition. Samples were logged into Battelle's log-in system and stored frozen until extraction.

METHOD Tissue samples were extracted with methylene chloride using a roller under ambient conditions following a procedure which is based on methods used by the National Oceanic and Atmospheric Administration for its Status and Trends Program (Krahn et al. 1988). Samples were then cleaned using silica/alumina (5% deactivated) chromatography followed by HPLC cleanup.

Extracts were quantified using gas chromatography/mass spectrometry (GC/MS) in the selected ion mode (SIM) following a procedure based on EPA Method 8270 (EPA 1986).

HOLDING TIMES Samples were extracted in seven batches. All extracts were analyzed by GC/MS/SIM. The following summarizes the extraction and analysis dates:

Batch	Species	Extraction	Analysis
1	*M. nasuta*	7/28/94	9/9-9/12/94
2	*M. nasuta*	8/3/94	9/13-9/15/94
3	*M. nasuta*	8/17/94	9/23-9/25/94
4	*N. virens*	8/19/95	9/26-9/30/94
5	*N. virens*	8/26/94	9/8-9/11/94
6	*N. virens*	9/6/94	9/17-9/19/94
7	*M. nasuta/N. virens*	9/26/94	9/15-9/17-94
8	*M. nasuta* MDL study	10/10/94	10/25/94

DETECTION LIMITS Target detection limits of 4 ng/g wet weight were met for all PAH compounds except for fluoranthene and pyrene, which had method detection limits (MDL) between 4 and 6 ng/g wet weight. MDLs were determined by multiplying the standard deviation of seven spiked replicates of a-background clam sample by the Student's t value (99 percentile). These MDLs were based on a wet weight of 20 g of tissue sample.

QA/QC SUMMARY/PAHs (continued)

Aliquots of samples that were analyzed in triplicate, used for spiking, or were re-extracted, were generally less than 20 g due to limited quantities of tissue available. Because MDLs reported are corrected for sample weight, the MDLs reported for these samples appear elevated and in some cases may exceed the target detection limit.

In addition a method detection limit verification study was performed, which consisted of analyzing four spiked aliquots of a background clam sample received with this project. The standard deviation of the results of these replicate analyses was multiplied by 3.5. Detection limits calculated in this way were all less than the target detection limit of 4 ng/g wet wt.

METHOD BLANKS

One method blank was extracted with each extraction batch. Benz[a]anthracene was detected in blanks from all batches and benzo[b]fluoranthene was detected in the blank from Batch 3. Two method blanks were analyzed with Batch 7 and in addition to benz[a]anthracene, three other compounds were detected in at least one of the two blanks; naphthalene, benzo[a]pyrene and indeno(123-cd)pyrene. All blank levels were less than three times the target MDL of 4 ng/g wet wt. Sample values that were less than five times the value of the method blank associated with that sample were flagged with a "B."

SURROGATES

Five isotopically labeled compounds were added prior to extraction to assess the efficiency of the method. These were d8-naphthalene, d10-acenaphthene, d12-chrysene, d14-dibenz[a,h]anthracene and d4-1,4 dichlorobenzene. Recoveries of all surrogates were within the quality control limits of 30% -150% with the exception of low recoveries for d4-1,4 dichlorobenzene in one sample from Batch 1 and Batch 4 and two samples in Batch seven. In addition, d8-naphthalene recovery was low in two samples in Batch seven.

MATRIX SPIKES

One sample from each batch was spiked with all PAH compounds. Matrix spike recoveries were generally, within QC limits of 50% -120%, with some exceptions. The recoveries for benzo(b)- and benzo[k]fluoranthene were variable due to the poor resolution of these two compounds. Spike recoveries quantified as the sum of these two compounds were within QC limits. Spike recoveries for a number of PAH compounds in Batches 4 and 7 were out of control due to high native levels, relative to the levels spiked. Spike concentrations were from 2 to 20 times lower than native concentrations. Recoveries for a number of compounds in Batches 4 and 6 were slightly above the upper control limit. These recoveries were all between 120% and 140%.

REPLICATES

One sample from each batch was extracted and analyzed in triplicate. Precision was measured by calculating the relative standard deviation (RSD) between the replicate results. All RSDs were within ±30%.

SRMs

Not applicable.

MISCELLANEOUS

Some of the compounds are flagged to indicate that the ion ratio for that compound was outside of the QC range. This is due primarily to low levels of the compound of interest. Because the confirmation ion is present at only a fraction of the level of the parent ion, when the native level of the compound is low, the amount of error in the concentration measurement of the confirmation ion goes up. The compound is actually quantified from the parent ion only, so most likely this will not affect the quality of the data. For sample values that are relatively high (>5 times the MDL) it may be an indication of some sort of interference.

REFERENCES

Krahn, M.M., C.A. Wigren, R.W. Pearce, L.K. Moore, R.G. Bogar, W.D. MacLeod, Jr., S-L Chan, and D.W. Brown. 1988. *New HPLC Cleanup and Revised Extraction Procedures for Organic Contaminants.* NOAA Technical Memorandum NMFS F/NWC-153. National Oceanic and Atmospheric Administration, National Marine Fisheries, Seattle, Washington.

EPA (U.S. Environmental Protection Agency). 1986. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.* SW-846. U.S. Document No. 955-001-00000, U.S. Environmental Protection Agency, Washington D.C.

TABLE F.1. Metals in Tissue of *M. nasuta* (Wet Weight)

Sediment Treatment	Replicate	Batch	% Dry Weight	*M. nasuta* Metals (wet weight µg/g) Ag ICP/MS	As ICP/MS	Cd ICP/MS	Cr ICP/MS	Cu ICP/MS	Hg CVAF	Ni ICP/MS	Pb ICP/MS	Zn ICP/MS
COMP HU-A	1	1	13.94%	0.057	3.57	0.035	0.449	2.36	0.022	0.527	0.873	11.6
COMP HU-A	2	1	13.78%	0.041	2.51	0.032	0.480	2.25	0.024	0.493	0.897	10.8
COMP HU-A	3	1	14.52%	0.050	2.98	0.036	0.758	2.85	0.028	0.539	1.194	11.9
COMP HU-A	4	1	17.28%	0.063	5.10	0.054	0.964	3.80	0.043	0.791	1.699	14.7
COMP HU-A	5	1	13.44%	0.058	2.65	0.033	0.569	3.09	0.026	0.488	1.138	12.2
COMP HU-B	1	1	13.61%	0.056	2.60	0.033	0.716	2.41	0.023	0.499	1.047	8.66
COMP HU-B	2	1	14.99%	0.058	3.21	0.032	0.493	2.77	0.021	0.442	0.817	10.9
COMP HU-B	3	1	15.14%	0.077	3.63	0.034	0.757	3.12	0.029	0.550	1.110	15.9
COMP HU-B	4	1	12.28%	0.056	2.42	0.034	0.454	2.39	0.018	0.569	0.670	10.5
COMP HU-B	5	1	15.70%	0.064	3.14	0.040	0.725	2.98	0.031	0.559	1.210	11.6
COMP HU-C	1	1	13.61%	0.066	3.01	0.056	0.814	3.01	0.027	0.655	1.047	10.9
COMP HU-C	2	1	13.78%	0.084	3.49	0.048	1.488	3.25	0.033	0.769	1.667	11.2
COMP HU-C	3	1	12.44%	0.061	2.05	0.050	0.953	2.65	0.026	0.566	1.181	8.51
COMP HU-C	4	1	12.25%	0.041	3.17	0.035	0.653	2.29	0.022	0.544	0.865	9.59
COMP HU-C	5-1	1	18.19%	0.103	3.73	0.072	1.419	4.38	0.044	0.960	1.928	15.7
COMP HU-C	5-2	1	18.19%	0.114	3.97	0.069	1.568	4.26	0.045	0.959	1.946	16.1
COMP HU-C	5-3	1	18.19%	0.093	3.69	0.061	1.382	4.17	0.043	0.960	1.779	16.4
COMP HU-D	1	1	17.21%	0.037	3.67	0.032	0.583	2.60	0.028	0.609	0.845	11.4
COMP HU-D	2	1	13.88%	0.045	3.61	0.030	0.569	2.07	0.029	0.548	0.880	11.4
COMP HU-D	3	1	12.56%	0.044	2.79	0.027	0.546	2.00	0.022	0.445	0.785	12.9
COMP HU-D	4	1	13.49%	0.043	1.66	0.030	0.468	2.19	0.021	0.403	0.611	8.30
COMP HU-D	5	1	13.26%	0.040	3.10	0.026	0.619	2.27	0.020	0.459	0.743	11.3
R-MUD	1	1	14.08%	0.031	2.13	0.028	0.404	1.48	0.014	0.322	0.282 U[a]	11.3
R-MUD	2	1	18.71%	0.058	4.40	0.060	0.400	2.39	0.023	0.608	0.374 U	17.2
R-MUD	3	1	13.02%	0.040	2.75	0.023	0.365	1.39	0.014	0.292	0.261 U	12.1
R-MUD	4	1	11.83%	0.040	2.45	0.027	0.285	1.13	0.012	0.299	0.237 U	9.17
R-MUD	5	1	20.96%	0.035 U	4.07	0.039	0.585	2.49	0.026	0.486	0.419 U	15.6

TABLE F.1. (contd)

Sediment Treatment	Replicate	Batch	% Dry Weight	*M. nasuta* Metals (wet weight µg/g) Ag ICP/MS	As ICP/MS	Cd ICP/MS	Cr ICP/MS	Cu ICP/MS	Hg CVAF	Ni ICP/MS	Pb ICP/MS	Zn ICP/MS
C-SB	1	1	12.86%	0.024	3.16	0.022	0.404	1.85	0.011	0.579	0.257 U	12.0
C-SB	2	1	12.45%	0.025	2.95	0.020	0.341	1.93	0.012	0.468	0.249 U	8.83
C-SB	3	1	13.90%	0.023 U	3.06	0.030	0.421	1.74	0.012	0.680	0.278 U	8.15
C-SB	4	1	13.16%	0.022 U	2.95	0.019	0.404	1.65	0.012	0.513	0.263 U	9.29
C-SB	5	1	13.21%	0.023	2.92	0.032	0.432	1.99	0.013	0.633	0.264 U	11.4
M. nasuta Background	1	1	15.16%	0.025 U	2.49	0.019	0.249	1.77	0.011	0.303	0.303 U	10.2
M. nasuta Background	2	1	14.86%	0.025 U	2.69	0.034	0.337	1.52	0.012	0.355	0.297 U	11.2
M. nasuta Background	3-1	1	14.87%	0.025 U	2.38	0.021	0.232	1.74	0.011	0.311	0.298 U	10.6
M. nasuta Background	3-2	1	14.87%	0.025 U	2.54	0.025	0.256	1.72	0.013	0.311	0.298 U	10.6
M. nasuta Background	3-3	1	14.87%	0.025 U	2.48	0.026	0.238	1.78	0.011	0.338	0.298 U	10.5

(a) U Undetected at or above given concentration

Table F.2. Metals in Tissue of *M. nasuta* (Dry Weight)

Sediment Treatment	Replicate	Batch	% Dry Mass	Ag ICP/MS	As ICP/MS	Cd ICP/MS	Cr ICP/MS	Cu ICP/MS	Hg CVAF	Ni ICP/MS	Pb ICP/MS	Zn ICP/MS
COMP HU-A	1	1	13.94%	0.410	25.6	0.253	3.22	16.9	0.159	3.78	6.26	83.2
COMP HU-A	2	1	13.78%	0.296	18.2	0.234	3.48	16.3	0.177	3.58	6.51	78.7
COMP HU-A	3	1	14.52%	0.347	20.5	0.249	5.22	19.6	0.193	3.71	8.22	81.9
COMP HU-A	4	1	17.28%	0.367	29.5	0.310	5.58	22.0	0.247	4.58	9.83	85.1
COMP HU-A	5	1	13.44%	0.434	19.7	0.244	4.23	23.0	0.195	3.63	8.47	90.9
COMP HU-B	1	1	13.61%	0.408	19.1	0.239	5.26	17.7	0.171	3.67	7.69	63.6
COMP HU-B	2	1	14.99%	0.385	21.4	0.211	3.29	18.5	0.138	2.95	5.45	72.4
COMP HU-B	3	1	15.14%	0.509	24.0	0.223	5.00	20.6	0.189	3.63	7.33	105
COMP HU-B	4	1	12.28%	0.452	19.7	0.279	3.70	19.5	0.148	4.63	5.46	85.8
COMP HU-B	5	1	15.70%	0.408	20.0	0.257	4.62	19.0	0.200	3.56	7.71	73.8
COMP HU-C	1	1	13.61%	0.482	22.1	0.412	5.98	22.1	0.197	4.81	7.69	80.2
COMP HU-C	2	1	13.78%	0.611	25.3	0.347	10.8	23.6	0.241	5.58	12.1	81.3
COMP HU-C	3	1	12.44%	0.487	16.5	0.404	7.66	21.3	0.209	4.55	9.49	68.4
COMP HU-C	4	1	12.25%	0.337	25.9	0.287	5.33	18.7	0.177	4.44	7.06	78.3
COMP HU-C	5-1	1	18.19%	0.565	20.5	0.396	7.80	24.1	0.242	5.28	10.6	86.3
COMP HU-C	5-2	1	18.19%	0.629	21.8	0.380	8.62	23.4	0.245	5.27	10.7	88.5
COMP HU-C	5-3	1	18.19%	0.514	20.3	0.335	7.60	22.9	0.238	5.28	9.78	89.9
COMP HU-D	1	1	17.21%	0.213	21.3	0.187	3.39	15.1	0.161	3.54	4.91	66.0
COMP HU-D	2	1	13.88%	0.324	26.0	0.217	4.10	14.9	0.210	3.95	6.34	82.4
COMP HU-D	3	1	12.56%	0.350	22.2	0.214	4.35	15.9	0.176	3.54	6.25	103
COMP HU-D	4	1	13.49%	0.319	12.3	0.220	3.47	16.2	0.153	2.99	4.53	61.5
COMP HU-D	5	1	13.26%	0.305	23.4	0.198	4.67	17.1	0.153	3.46	5.60	84.9
R-MUD	1	1	14.08%	0.221	15.1	0.196	2.87	10.5	0.099	2.29	2.00 U[(a)]	80.0
R-MUD	2	1	18.71%	0.309	23.5	0.323	2.14	12.8	0.124	3.25	2.00 U	91.9
R-MUD	3	1	13.02%	0.307	21.1	0.180	2.80	10.7	0.111	2.24	2.00 U	93.3
R-MUD	4	1	11.83%	0.336	20.7	0.227	2.41	9.51	0.103	2.53	2.00 U	77.5
R-MUD	5	1	20.96%	0.166 U	19.4	0.186	2.79	11.9	0.126	2.32	2.00 U	74.6

Table F.2. (contd)

Sediment Treatment	Replicate	Batch	% Dry Mass	Ag ICP/MS	As ICP/MS	Cd ICP/MS	Cr ICP/MS	Cu ICP/MS	Hg CVAF	Ni ICP/MS	Pb ICP/MS	Zn ICP/MS
C-SB	1	1	12.86%	0.184	24.6	0.174	3.14	14.4	0.082	4.50	2.00 U	93.4
C-SB	2	1	12.45%	0.203	23.7	0.158	2.74	15.5	0.097	3.76	2.00 U	70.9
C-SB	3	1	13.90%	0.166 U	22.0	0.214	3.03	12.5	0.083	4.89	2.00 U	58.6
C-SB	4	1	13.16%	0.166 U	22.4	0.146	3.07	12.5	0.093	3.90	2.00 U	70.6
C-SB	5	1	13.21%	0.171	22.1	0.242	3.27	15.1	0.102	4.79	2.00 U	86.1
M. nasuta Background	1	1	15.16%	0.166 U	16.4	0.125	1.64	11.7	0.075	2.00	2.00 U	67.4
M. nasuta Background	2	1	14.86%	0.166 U	18.1	0.229	2.27	10.2	0.079	2.39	2.00 U	75.5
M. nasuta Background	3-1	1	14.87%	0.166 U	16.0	0.140	1.56	11.7	0.071	2.09	2.00 U	71.0
M. nasuta Background	3-2	1	14.87%	0.166 U	17.1	0.165	1.72	11.6	0.085	2.09	2.00 U	71.3
M. nasuta Background	3-3	1	14.87%	0.166 U	16.7	0.175	1.60	12.0	0.073	2.27	2.00 U	70.5

(a) U Undetected at or above given concentration

TABLE F.3. Quality Control Summary for Metals in Tissue of *M. nasuta*

Sed Code ID	Replicate	Batch	*M. nasuta* Metals (µg/g dry weight)								
			Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Zn
Method Blanks											
Blank-1		1	0.166 U[(a)]	3.39 U	0.081 U	1.46 U	6.86 U	0.001 U	1.32 U	2.00 U	10.8 U
Blank-2		1	0.166 U	3.39 U	0.081 U	1.46 U	6.86 U	0.001 U	1.32 U	2.00 U	10.8 U
Blank-3		1	0.166 U	3.39 U	0.081 U	1.46 U	6.86 U	0.001 U	1.32 U	2.00 U	10.8 U
Blank-4		1	0.166 U	3.39 U	0.081 U	1.46 U	6.86 U	0.001 U	1.32 U	2.00 U	10.8 U
Blank-5		1	0.166 U	3.39 U	0.081 U	1.46 U	6.86 U	0.001 U	1.32 U	2.00 U	10.8 U
Matrix Spikes											
COMP EC-A	3	1	0.244	19.7	0.276	4.37	20.1	0.113	4.42	10.3	81.3
COMP EC-A, MS	3		1.95	72.7	4.21	14.2	73.9	1.22	14.5	14.8	163
Concentration Recovered			1.71	53.0	3.93	9.83	53.8	1.11	10.1	4.52	81.7
Amount Spiked			2.08	52.1	4.17	10.4	52.1	1.04	10.4	4.17	100
Percent Recovery			82%	102%	94%	95%	103%	106%	97%	108%	82%
COMP HU-C	5	1	0.569	20.9	0.37	8.01	23.5	0.242	5.28	10.4	88.2
COMP HU-C, MS	5	1	2.15	74.0	3.95	17.9	76.3	1.21	15.9	14.5	175
Concentration Recovered			1.58	53.1	3.58	9.89	52.8	0.968	10.6	4.14	86.8
Amount Spiked			2.08	52.1	4.17	10.4	52.1	1.04	10.4	4.17	100
Percent Recovery			76%	102%	86%	95%	101%	93%	102%	99%	87%
R-CLIS	5	1	0.203	17.4	0.238	3.25	19.0	0.107	4.06	5.46	94.3
R-CLIS, MS	5	1	1.91	74.3	4.26	13.9	74.1	1.22	14.8	10.2	190
Concentration Recovered			1.71	56.9	4.02	10.65	55.1	1.11	10.7	4.74	95.7
Amount Spiked			2.08	52.1	4.17	10.4	52.1	1.04	10.4	4.17	100
Percent Recovery			82%	109%	96%	102%	106%	107%	103%	114%	96%
M. nasuta Background	3	1	0.166 U	16.6	0.160	1.63	11.8	0.076	2.15	2.00 U	70.9
M. nasuta Background, MS	3	1	1.78	71.7	3.90	10.9	64.7	1.12	12.6	4.75	163
Concentration Recovered			1.78	55.1	3.74	9.27	52.9	1.04	10.5	4.75	92.1
Amount Spiked			2.08	52.1	4.17	10.4	52.1	1.04	10.4	4.17	100
Percent Recovery			86%	106%	90%	89%	102%	100%	100%	114%	92%

TABLE F.3. (contd)

Sed Code ID	Replicate	Batch	*M. nasuta* Metals (μg/g dry weight) Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Zn
Standard Reference Material											
Certified value			1.68	14.0	4.15	1.43	66.3	0.0642	2.25	0.371	830
range			±0.15	±1.2	±0.38	±0.46	±4.3	±0.0067	±0.44	±0.014	±57
SRM 1566a	1	1	1.38	13.6	4.05	1.25	62.6	0.063	1.87	0.372	762
SRM 1566a	2	1	1.41	13.6	4.08	1.23	65.4	0.063	1.61	0.368	808
SRM 1566a	3	1	1.35	13.0	3.99	1.20	64.4	0.060	2.18	0.392	755
SRM 1566a	4	1	1.42	13.8	4.19	0.931	66.9	0.068	2.50	0.382	777
SRM 1566a	5	1	1.44	13.3	3.65	1.04	67.1	0.061	1.51	0.377	765
Percent Difference	1		18	3	2	13	6	2	17	0	8
Percent Difference	2		16	3	2	14	1	2	28 (b)	1	3
Percent Difference	3		20	7	4	16	3	7	3	6	9
Percent Difference	4		15	1	1	35 (b)	1	6	11	3	6
Percent Difference	5		14	5	12	27 (b)	1	5	33 (b)	2	8
Analytical Replicates											
COMP EC-A, Replicate 1	3	1	0.246	19.1	0.256	4.66	21.0	0.130	4.80	11.6	81.1
COMP EC-A, Replicate 2	3	1	0.242	18.9	0.305	4.32	20.6	0.105	4.46	9.69	81.9
COMP EC-A, Replicate 3	3	1	0.245	21.0	0.267	4.12	18.8	0.105	4.00	9.54	80.9
RSD			1%	6%	9%	6%	6%	13%	9%	11%	1%
COMP HU-C, Replicate 1	5	1	0.565	20.5	0.396	7.80	24.1	0.242	5.28	10.6	86.3
COMP HU-C, Replicate 2	5	1	0.629	21.8	0.380	8.62	23.4	0.245	5.27	10.7	88.5
COMP HU-C, Replicate 3	5	1	0.514	20.3	0.335	7.60	22.9	0.238	5.28	9.78	89.9
RSD			10%	4%	9%	7%	3%	1%	0%	5%	2%

TABLE F.3. (contd)

Sed Code ID	Replicate	Batch	*M. nasuta* Metals (μg/g dry weight) Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Zn
R-CLIS, Replicate 1	5	1	0.219	17.1	0.217	3.36	19.1	0.103	4.05	5.60	94.1
R-CLIS, Replicate 2	5	1	0.196	18.4	0.259	3.16	19.4	0.108	4.17	5.48	96.1
R-CLIS, Replicate 3	5	1	0.193	16.8	0.238	3.23	18.5	0.111	3.95	5.29	92.7
RSD			7%	5%	9%	3%	2%	4%	3%	3%	2%
M. nasuta Background, Rep 1	3	1	0.166 U	16.0	0.140	1.56	11.7	0.071	2.09	2.00 U	71.0
M. nasuta Background, Rep 2	3	1	0.166 U	17.1	0.165	1.72	11.6	0.085	2.09	2.00 U	71.3
M. nasuta Background, Rep 3	3	1	0.166 U	16.7	0.175	1.60	12.0	0.073	2.27	2.00 U	70.5
RSD			NA [c]	3%	11%	5%	2%	10%	5%	NA	1%

(a) U Undetected at or above given concentration.
(b) Outside quality control criteria (± 20%) for SRMs.
(c) NA Not applicable.

TABLE F.4. MDL Verification Study for Metals in *M. nasuta* Tissue Chemistry

Sed Code ID	Replicate	Batch	*M. nasuta* Metals (µg/g dry weight) Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Zn
COMP SB-B, Replicate 1	3	1	0.462	22.5	0.188	4.32	20.3	0.122	3.86	6.02	90.1
COMP SB-B, Replicate 2	3	1	0.491	22.4	0.242	4.25	21.5	0.122	4.00	6.27	93.4
COMP SB-B, Replicate 3	3	1	0.392	24.5	0.212	3.41	17.5	0.126	3.19	5.00	88.1
COMP SB-B, Replicate 4	3	1	0.494	23.1	0.201	4.10	21.8	0.126	3.94	6.08	91.3
Mean			0.460	23.1	0.211	4.02	20.3	0.124	3.75	5.84	90.7
Standard Deviation			0.0474	0.967	0.0230	0.417	1.96	0.00231	0.376	0.572	2.22
Method Detection Limit (MDL)[a]			0.215	4.39	0.105	1.89	8.90	0.0105	1.71	2.60	10.1

(a) MDL calculated by multiplying the standard deviation times Students-t for four replicates (4.541).

TABLE F.5. Pesticides and PCB Congeners (Wet Weight) in Tissue of *M. nasuta*

Treatment	COMP HU-A	COMP HU-A	COMP HU-A	COMP HU-A	COMP HU-A
Replicate	1	2	3	4	5
Batch	1	1	1	1	1
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	13.94	13.78	14.52	17.28	13.44
Heptachlor	0.19 U[(a)]	0.18 U	0.19 U	0.18 U	0.19 U
Aldrin	1.66	1.16	8.92	1.17	1.12
Heptachlor Epoxide	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U
2,4'-DDE	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Endosulfan I	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
a-Chlordane	0.10 U	0.09 U	0.53	0.09 U	0.10 U
Trans Nonachlor	0.15 U	0.14 U	0.15 U	0.14 U	0.15 U
4,4'-DDE	5.48	8.06	11.7	8.65	8.88
Dieldrin	0.91	0.96	0.52 U	0.99	0.93
2,4'-DDD	0.77	1.09	0.25 U	1.14	1.02
2,4'-DDT	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
4,4'-DDD	2.67	3.23	0.26 U	3.45	3.77
Endosulfan II	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
4,4'-DDT	12.6	2.27	1.96	4.56	4.15
Endosulfan Sulfate	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U
PCB 8	0.41 U	0.40 U	0.41 U	0.40 U	0.41 U
PCB 18	4.09	5.83	7.04	5.64	5.94
PCB 28	4.92	6.98	8.92	7.37	7.20
PCB 52	4.65	5.96	8.56	6.17	6.39
PCB 49	3.33	4.46	6.26	4.60	4.60
PCB 44	1.37	2.02	2.33	2.30	2.23
PCB 66	4.11	5.39	7.73	5.86	5.62
PCB 101	2.54	3.42	4.89	3.57	3.58
PCB 87	0.86	1.19	1.42	1.24	1.28
PCB 118	1.62	2.20	3.33	2.29	2.22
PCB 184	0.24 U	0.23 U	0.24 U	0.23 U	0.24 U
PCB 153	1.26	1.60	2.54	1.78	1.66
PCB 105	0.63	0.76	1.22	0.85	0.79
PCB 138	1.02	1.28	1.97	1.39	1.33
PCB 187	1.18	0.36	1.96	0.43	1.49
PCB 183	0.24 U	0.23 U	0.24 U	0.23 U	0.24 U
PCB 128	0.27	0.29	0.45	0.32	0.32
PCB 180	0.40	0.75	0.88	0.66	0.62
PCB 170	0.17 U	0.24	0.17 U	0.20	0.17 U
PCB 195	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
PCB 206	0.24	0.30	0.50	0.41	0.34
PCB 209	0.11	0.22	0.36	0.28	0.21
Surrogate Recoveries (%)					
PCB 103 (SIS)	65	73	72	74	71
PCB 198 (SIS)	63	69	62	73	65

TABLE F.5. (contd)

Treatment	COMP HU-B	COMP HU-B	COMP HU-B	COMP HU-B	COMP HU-B
Replicate	1	2	3	4	5
Batch	1	1	1	1	1
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	13.61	14.99	15.14	12.28	15.7
Heptachlor	0.18 U	0.18 U	0.19 U	0.18 U	0.19 U
Aldrin	1.81	2.05	2.60	1.84	2.76
Heptachlor Epoxide	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U
2,4'-DDE	0.25 U	0.26 U	0.26 U	0.26 U	0.26 U
Endosulfan I	0.17 U	0.18 U	0.18 U	0.18 U	0.18 U
a-Chlordane	0.51	0.63	0.88	0.57	1.01
Trans Nonachlor	0.14 U	0.14 U	0.15 U	0.14 U	'0.34
4,4'-DDE	6.68	7.60	9.96	6.95	10.9
Dieldrin	1.32	1.44	2.04	1.35	2.11
2,4'-DDD	0.83	0.78	1.59	0.74	1.60
2,4'-DDT	0.17 U	0.18 U	0.18 U	0.18 U	0.18 U
4,4'-DDD	2.89	3.12	4.59	2.94	4.99
Endosulfan II	0.17 U	0.18 U	0.18 U	0.18 U	0.18 U
4,4'-DDT	6.20	5.40	11.9	7.45	11.8
Endosulfan Sulfate	0.17 U	0.18 U	0.18 U	0.18 U	0.18 U
PCB 8	3.15	2.97	3.04	0.40 U	0.41 U
PCB 18	11.3	9.68	10.4	10.9	10.4
PCB 28	13.6	0.20 U	0.20 U	0.20 U	0.20 U
PCB 52	10.8	9.71	9.82	9.91	9.89
PCB 49	8.51	0.23 U	0.24 U	0.23 U	0.24 U
PCB 44	4.70	5.20	6.91	5.55	8.16
PCB 66	9.40	0.09 U	0.09 U	0.09 U	0.09 U
PCB 101	5.11	4.41	4.49	4.50	4.44
PCB 87	1.98	2.38	2.79	2.14	3.02
PCB 118	3.32	0.29 U	0.29 U	0.29 U	0.29 U
PCB 184	0.23 U	0.23 U	0.24 U	0.23 U	0.24 U
PCB 153	2.08	0.12 U	0.12 U	0.12 U	0.12 U
PCB 105	1.27	0.11 U	0.11 U	0.11 U	0.11 U
PCB 138	1.79	0.68	3.41	2.02	3.16
PCB 187	0.45	0.66	1.06	0.53	0.85
PCB 183	0.23 U	0.23 U	0.24 U	0.23 U	0.24 U
PCB 128	0.41	0.48	0.73	0.44	0.67
PCB 180	0.81	0.98	1.31	0.92	1.04
PCB 170	0.26	0.32	0.51	0.30	0.45
PCB 195	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
PCB 206	0.38	0.41	0.66	0.40	0.50
PCB 209	0.17	0.23	0.32	0.19	0.25
Surrogate Recoveries (%)					
PCB 103 (SIS)	69	77	55	80	75
PCB 198 (SIS)	61	70	44	70	72

TABLE F.5. (contd)

Treatment	COMP HU-C	COMP HU-C	COMP HU-C	COMP HU-C	COMP HU-C
Replicate	1	2	3	4	5
Batch	2	2	1	2	2
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	13.61	13.78	12.44	12.25	18.19
Heptachlor	0.18 U	0.18 U	0.19 U	0.19 U	0.37 U
Aldrin	2.71	2.76	2.80	5.66	3.40
Heptachlor Epoxide	0.13 U	0.13 U	0.13 U	0.13 U	0.26 U
2,4'-DDE	0.26 U	0.26 U	0.26 U	0.26 U	0.52 U
Endosulfan I	0.18 U	0.18 U	0.18 U	0.18 U	0.36 U
a-Chlordane	0.88	0.92	1.15	0.97	0.85
Trans Nonachlor	0.14 U	0.14 U	0.44	0.21	0.29 U
4,4'-DDE	8.74	9.08	10.5	9.67	10.1
Dieldrin	1.69	1.70	1.83	1.92	2.13
2,4'-DDD	1.32	1.37	1.51	1.54	1.49
2,4'-DDT	0.18 U	0.18 U	0.18 U	0.18 U	0.35 U
4,4'-DDD	3.86	3.76	3.93	4.24	4.61
Endosulfan II	0.18 U	0.18 U	0.18 U	0.18 U	0.36 U
4,4'-DDT	1.36	0.15 U	4.80	2.85	0.96
Endosulfan Sulfate	0.20	0.29	0.18 U	0.18 U	0.65
PCB 8	0.40 U	1.98	0.41 U	0.41 U	0.81 U
PCB 18	9.87	9.75	8.07	9.87	17.0
PCB 28	0.20 U	0.20 U	0.20 U	0.20 U	24.6
PCB 52	9.76	10.1	9.43	9.98	21.1
PCB 49	0.23 U	0.23 U	2.35	0.24 U	16.7
PCB 44	9.45	8.65	8.30	9.41	9.51
PCB 66	0.09 U	0.09 U	0.09 U	0.09 U	19.6
PCB 101	4.36	4.55	4.48	4.40	9.97
PCB 87	0.16 U	3.21	3.63	3.17	3.11
PCB 118	0.29 U	0.29 U	0.29 U	0.29 U	7.68
PCB 184	0.23 U	0.23 U	0.24 U	0.24 U	0.47 U
PCB 153	0.12 U	0.12 U	0.12 U	0.12 U	4.43
PCB 105	0.11 U	0.11 U	0.11 U	0.11 U	2.85
PCB 138	2.91	1.09	1.02	3.33	3.68
PCB 187	0.84	0.12 U	0.94	1.00	0.25 U
PCB 183	0.47	0.56	0.24 U	0.61	0.54
PCB 128	0.69	0.76	0.73	0.77	0.90
PCB 180	1.08	1.23	1.22	1.19	1.25
PCB 170	0.55	0.65	0.17 U	0.58	0.33 U
PCB 195	0.10 U	0.10 U	0.10 U	0.10 U	0.20 U
PCB 206	0.30	0.37	0.30	0.34	0.41
PCB 209	0.24	0.32	0.09 U	0.26	0.29
Surrogate Recoveries (%)					
PCB 103 (SIS)	83	73	76	78	81
PCB 198 (SIS)	65	56	68	61	59

TABLE F.5. (contd)

Treatment	HU-D	HU-D	HU-D	HU-D	HU-D
Replicate	1	2	3	4	5
Batch	3	3	3	3	3
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	17.21	13.88	12.56	13.49	13.26
Heptachlor	0.19 U	0.19 U	0.17 U	0.18 U	0.18 U
Aldrin	1.52	1.81	1.79	1.72	1.82
Heptachlor Epoxide	0.13 U	0.13 U	0.12 U	0.13 U	0.13 U
2,4'-DDE	0.26 U	0.26 U	0.25 U	0.26 U	0.26 U
Endosulfan I	0.18 U	0.18 U	0.17 U	0.18 U	0.18 U
a-Chlordane	0.20	0.35	0.32	0.35	0.30
Trans Nonachlor	0.15 U	0.15 U	0.14 U	0.14 U	0.14 U
4,4'-DDE	4.85	5.86	5.62	5.76	5.56
Dieldrin	1.14	1.38	1.40	1.43	1.34
2,4'-DDD	0.25 U	0.60	0.52	0.54	0.61
2,4'-DDT	0.18 U	0.18 U	0.17 U	0.18 U	0.18 U
4,4'-DDD	2.18	3.28	2.92	3.01	2.88
Endosulfan II	0.18 U	0.18 U	0.17 U	0.18 U	0.18 U
4,4'-DDT	4.66	0.84	1.79	5.43	0.72
Endosulfan Sulfate	0.18 U	0.18 U	0.17 U	0.18 U	0.18 U
PCB 8	1.52	1.46	1.51	1.39	1.55
PCB 18	7.90	9.83	10.6	8.61	10.9
PCB 28	8.68	10.5	10.8	9.87	11.3
PCB 52	9.03	10.7	10.8	9.84	10.7
PCB 49	6.60	8.10	7.96	7.43	7.80
PCB 44	2.35	3.56	3.85	3.66	3.97
PCB 66	7.67	9.28	8.89	8.76	9.04
PCB 101	4.57	5.71	5.29	5.32	5.27
PCB 87	1.71	2.05	1.98	1.92	1.97
PCB 118	2.27	2.79	2.78	2.54	2.79
PCB 184	0.24 U	0.24 U	0.22 U	0.23 U	0.23 U
PCB 153	1.44	1.79	1.77	1.65	1.69
PCB 105	0.72	0.94	0.92	0.88	0.84
PCB 138	1.25	1.57	1.54	1.42	1.46
PCB 187	0.27	0.38	0.37	0.35	0.34
PCB 183	0.24 U	0.24 U	0.22 U	0.23 U	0.23 U
PCB 128	0.26	0.35	0.35	0.33	0.30
PCB 180	0.74	0.68	0.71	0.75	0.79
PCB 170	0.37	0.47	0.39	0.36	0.47
PCB 195	0.10 U	0.10 U	0.09 U	0.10 U	0.10 U
PCB 206	0.31	0.42	0.37	0.37	0.35
PCB 209	0.12	0.16	0.09 U	0.14	0.13
Surrogate Recoveries (%)					
PCB 103 (SIS)	55	54	48	61	51
PCB 198 (SIS)	95	91	80	108	85

TABLE F.5. (contd)

Treatment	R-MUD	R-MUD	R-MUD	R-MUD	R-MUD
Replicate	1	2	3	4	5
Batch	2	3	2	3	2
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	14.08	18.71	13.02	11.83	20.96
Heptachlor	0.19 U	0.19 U	0.19 U	0.19 U	0.17 U
Aldrin	0.13 U	0.73	0.13 U	0.68	0.22
Heptachlor Epoxide	0.13 U	0.13 U	0.13 U	0.13 U	0.12 U
2,4'-DDE	0.26 U	0.26 U	0.26 U	0.37	0.24 U
Endosulfan I	0.18 U	0.18 U	0.18 U	0.18 U	0.17 U
a-Chlordane	0.10 U	0.10 U	0.10 U	0.10 U	0.09 U
Trans Nonachlor	0.15 U	0.15 U	0.15 U	0.15 U	0.13 U
4,4'-DDE	0.30	0.36	0.46	0.36	0.24
Dieldrin	0.52 U	0.52 U	0.52 U	0.52 U	0.47 U
2,4'-DDD	0.25 U	0.25 U	0.25 U	0.25 U	0.23 U
2,4'-DDT	0.18 U	0.18 U	0.18 U	0.18 U	0.16 U
4,4'-DDD	0.26 U	0.26 U	0.26 U	0.26 U	0.24 U
Endosulfan II	0.18 U	0.18 U	0.18 U	0.18 U	0.17 U
4,4'-DDT	0.41	3.51	0.15 U	1.71	0.43
Endosulfan Sulfate	0.18 U	0.18 U	0.18 U	0.18 U	0.17 U
PCB 8	0.41 U	1.76	0.41 U	1.99	0.38 U
PCB 18	0.43 U	0.43 U	0.43 U	0.43 U	0.40 U
PCB 28	0.53	0.67	0.65	0.64	0.60
PCB 52	0.68	0.94	0.78	0.84	0.83
PCB 49	0.24 U	0.24	0.24 U	0.25	0.22 U
PCB 44	0.17 U	0.17 U	0.17 U	0.17 U	0.15 U
PCB 66	0.09 U	0.09 U	0.74	0.09 U	0.09 U
PCB 101	0.33	0.52	0.45	0.42	0.53
PCB 87	0.16 U	0.29	0.16 U	0.27	0.15 U
PCB 118	0.29 U	0.29 U	0.30	0.29 U	0.27 U
PCB 184	0.24 U	0.24 U	0.24 U	0.24 U	0.22 U
PCB 153	0.17	0.14	0.26	0.13	0.11 U
PCB 105	0.11 U	0.11 U	0.13	0.11 U	0.13
PCB 138	0.29 U	0.29 U	0.29 U	0.29 U	0.30
PCB 187	0.13 U	0.13 U	0.13 U	0.13 U	0.12 U
PCB 183	0.24 U	0.24 U	0.24 U	0.24 U	0.22 U
PCB 128	0.15 U	0.15 U	0.15 U	0.15 U	0.14 U
PCB 180	0.18 U	0.18 U	0.18 U	0.18 U	0.17 U
PCB 170	0.18	0.17 U	0.17 U	0.19	0.15 U
PCB 195	0.10 U	0.10 U	0.10 U	0.10 U	0.09 U
PCB 206	0.11 U	0.11 U	0.11 U	0.11 U	0.10 U
PCB 209	0.09 U	0.09 U	0.09 U	0.09 U	0.09 U
Surrogate Recoveries (%)					
PCB 103 (SIS)	81	80	83	76	86
PCB 198 (SIS)	66	129	65	121	65

TABLE F.5. (contd)

Treatment	C-SB	C-SB, Dup	C-SB, Trip	C-SB	C-SB
Replicate	1	1	1	2	3
Batch	3	3	3	2	3
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	12.86	12.86	12.86	12.45	13.9
Heptachlor	0.36 U	0.36 U	0.37 U	0.19 U	0.18 U
Aldrin	0.25 U	0.25 U	0.25 U	0.13 U	0.12 U
Heptachlor Epoxide	0.26 U	0.26 U	0.26 U	0.13 U	0.13 U
2,4'-DDE	0.51 U	0.51 U	0.52 U	0.26 U	0.26 U
Endosulfan I	0.35 U	0.35 U	0.36 U	0.18 U	0.18 U
a-Chlordane	0.19 U	0.19 U	0.19 U	0.10 U	0.09 U
Trans Nonachlor	0.28 U	0.28 U	0.29 U	0.15 U	0.14 U
4,4'-DDE	0.81	0.37 U	0.37 U	0.36	0.52
Dieldrin	1.01 U	1.01 U	1.02 U	0.52 U	0.51 U
2,4'-DDD	0.50 U	0.50 U	0.50 U	0.25 U	0.25 U
2,4'-DDT	0.35 U	0.35 U	0.35 U	0.18 U	0.18 U
4,4'-DDD	0.51 U	0.51 U	0.52 U	0.26 U	0.26 U
Endosulfan II	0.35 U	0.35 U	0.36 U	0.18 U	0.18 U
4,4'-DDT	0.30 U	0.30 U	0.30 U	0.37	1.24
Endosulfan Sulfate	0.35 U	0.35 U	0.36 U	0.18 U	0.18 U
PCB 8	0.82	1.26	0.94	0.41 U	0.54
PCB 18	0.84 U	0.84 U	0.85 U	0.43 U	0.42 U
PCB 28	0.40 U	0.40 U	0.40 U	0.20 U	0.23
PCB 52	0.70 U	0.70 U	0.71 U	0.36 U	0.35 U
PCB 49	0.46 U	0.46 U	0.47 U	0.24 U	0.23 U
PCB 44	0.32 U	0.32 U	0.33 U	0.17 U	0.16 U
PCB 66	0.19 U	0.30	0.32	0.90 U	0.09 U
PCB 101	0.29 U	0.29 U	0.29 U	0.15 U	0.19
PCB 87	0.31 U	0.31 U	0.32 U	0.16 U	0.16 U
PCB 118	0.58 U	0.58 U	0.58 U	0.29 U	0.29 U
PCB 184	0.46 U	0.46 U	0.47 U	0.24 U	0.23 U
PCB 153	0.24 U	0.24 U	0.24 U	0.12 U	0.12 U
PCB 105	0.22 U	0.22 U	0.22 U	0.11 U	0.11 U
PCB 138	0.57 U	0.57 U	0.57 U	0.29 U	0.28 U
PCB 187	0.25 U	0.25 U	0.25 U	0.13 U	0.12 U
PCB 183	0.46 U	0.46 U	0.47 U	0.24 U	0.23 U
PCB 128	0.30 U	0.30 U	0.31 U	0.15 U	0.15 U
PCB 180	0.36 U	0.36 U	0.37 U	0.18 U	0.18 U
PCB 170	0.33 U	0.34	0.33 U	0.17 U	0.16 U
PCB 195	0.20 U	0.20 U	0.20 U	0.10 U	0.10 U
PCB 206	0.22 U	0.22 U	0.22 U	0.11 U	0.11 U
PCB 209	0.19 U	0.19 U	0.19 U	0.09 U	0.09 U
Surrogate Recoveries (%)					
PCB 103 (SIS)	89	79	88	77	94
PCB 198 (SIS)	144	125	141	59	162 (b)

TABLE F.5. (contd)

Treatment	C-SB	C-SB	C-SB, Dup	C-SB, Trip
Replicate	4	5	5	5
Batch	2	2	2	2
Units	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	13.16	13.21	13.21	13.21
Heptachlor	0.19 U	0.36 U	0.37 U	0.36 U
Aldrin	0.13 U	0.25 U	0.25 U	0.25 U
Heptachlor Epoxide	0.13 U	0.26 U	0.26 U	0.26 U
2,4'-DDE	0.26 U	0.51 U	0.52 U	0.51 U
Endosulfan I	0.18 U	0.35 U	0.36 U	0.25 U
a-Chlordane	0.10 U	0.19 U	0.19 U	0.19 U
Trans Nonachlor	0.15 U	0.28 U	0.29 U	0.28 U
4,4'-DDE	0.45	0.54	0.37 U	0.36 U
Dieldrin	0.52 U	1.01 U	1.02 U	1.00 U
2,4'-DDD	0.25 U	0.50 U	0.50 U	0.49 U
2,4'-DDT	0.18 U	0.35 U	0.35 U	0.35 U
4,4'-DDD	0.26 U	0.51 U	0.52 U	0.51 U
Endosulfan II	0.18 U	0.35 U	0.36 U	0.35 U
4,4'-DDT	0.39	0.91	0.30 U	0.34
Endosulfan Sulfate	0.18 U	0.35 U	0.36 U	0.35 U
PCB 8	0.41 U	0.81 U	0.81 U	0.80 U
PCB 18	0.43 U	0.84 U	0.85 U	0.83 U
PCB 28	0.20 U	0.40 U	0.40 U	0.40 U
PCB 52	0.36 U	0.70 U	0.71 U	0.69 U
PCB 49	0.24 U	0.46 U	0.47 U	0.46 U
PCB 44	0.17 U	0.32 U	0.33 U	0.32 U
PCB 66	0.09 U	0.19 U	0.19 U	0.18 U
PCB 101	0.15 U	0.29 U	0.29 U	0.28 U
PCB 87	0.16 U	0.31 U	0.32 U	0.31 U
PCB 118	0.29 U	0.58 U	0.58 U	0.57 U
PCB 184	0.24 U	0.46 U	0.47 U	0.46 U
PCB 153	0.12 U	0.24 U	0.24 U	0.24 U
PCB 105	0.11 U	0.22 U	0.22 U	0.21 U
PCB 138	0.29 U	0.57 U	0.57 U	0.56 U
PCB 187	0.13 U	0.25 U	0.25 U	0.24 U
PCB 183	0.24 U	0.46 U	0.47 U	0.46 U
PCB 128	0.15 U	0.30 U	0.31 U	0.30 U
PCB 180	0.18 U	0.36 U	0.37 U	0.36 U
PCB 170	0.17 U	0.33 U	0.45	0.32 U
PCB 195	0.10 U	0.20 U	0.20 U	0.19 U
PCB 206	0.11 U	0.22 U	0.22 U	0.22 U
PCB 209	0.09 U	0.19 U	0.19 U	0.18 U
Surrogate Recoveries (%)				
PCB 103 (SIS)	84	82	76	75
PCB 198 (SIS)	66	61	57	58

TABLE F.5. (contd)

Treatment	*M. nasuta* Background	*M. nasuta* Background	*M. nasuta* Background
Replicate	1	2	3
Batch	7	7	7
Units	ng/g	ng/g	ng/g
Percent Dry Weight	15.16	14.86	14.87
Heptachlor	0.18 U	0.19 U	0.19 U
Aldrin	0.12 U	0.13 U	0.13 U
Heptachlor Epoxide	0.13 U	0.13 U	0.13 U
2,4'-DDE	0.26 U	0.26 U	0.26 U
Endosulfan I	0.18 U	0.18 U	0.18 U
a-Chlordane	0.09 U	0.10 U	0.10 U
Trans Nonachlor	0.14 U	0.15 U	0.15 U
4,4'-DDE	0.58	0.19 U	0.19 U
Dieldrin	0.51 U	0.52 U	0.52 U
2,4'-DDD	0.25 U	0.25 U	0.25 U
2,4'-DDT	0.18 U	0.18 U	0.18 U
4,4'-DDD	0.26 U	0.26 U	0.26 U
Endosulfan II	0.18 U	0.18 U	0.18 U
4,4'-DDT	0.15 U	0.15 U	0.15 U
Endosulfan Sulfate	0.55	0.47	0.39
PCB 8	0.40 U	0.41 U	0.41 U
PCB 18	0.42 U	0.43 U	0.43 U
PCB 28	0.50	0.77	0.20 U
PCB 52	0.35 U	0.36 U	0.36 U
PCB 49	0.23 U	0.24 U	0.24 U
PCB 44	0.16 U	0.17 U	0.17 U
PCB 66	0.09 U	0.09 U	0.09 U
PCB 101	0.14 U	0.15 U	0.15 U
PCB 87	0.16 U	0.16 U	0.16 U
PCB 118	0.29 U	0.29 U	0.29 U
PCB 184	0.23 U	0.24 U	0.24 U
PCB 153	0.12 U	0.12 U	0.12 U
PCB 105	0.11 U	0.11 U	0.11 U
PCB 138	0.28 U	0.29 U	0.29 U
PCB 187	0.12 U	0.13 U	0.13 U
PCB 183	0.23 U	0.24 U	0.24 U
PCB 128	0.15 U	0.15 U	0.15 U
PCB 180	0.18 U	0.18 U	0.18 U
PCB 170	0.16 U	0.17 U	0.17 U
PCB 195	0.10 U	0.10 U	0.10 U
PCB 206	0.11 U	0.11 U	0.11 U
PCB 209	0.09 U	0.09 U	0.09 U
Surrogate Recoveries (%)			
PCB 103 (SIS)	61	61	62
PCB 198 (SIS)	74	76	80

(a) U Undetected at or above given concentration.
(b) Result is outside quality control range (30-150%) for surrogate internal standard.

TABLE F.6. Pesticides and PCB Congeners (Dry Weight) in Tissue of *M. nasuta*

Treatment	COMP HU-A	COMP HU-A	COMP HU-A	COMP HU-A	COMP HU-A
Replicate	1	2	3	4	5
Batch	1	1	1	1	1
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	13.94	13.78	14.52	17.28	13.44
Heptachlor	1.4 U[a]	1.3 U	1.3 U	1.0 U	1.4 U
Aldrin	11.9	8.42	61.4	6.77	8.33
Heptachlor Epoxide	0.93 U	0.94 U	0.90 U	0.75 U	0.97 U
2,4'-DDE	1.9 U	1.9 U	1.8 U	1.5 U	1.9 U
Endosulfan I	1.3 U	1.3 U	1.2 U	1.0 U	1.3 U
a-Chlordane	0.72 U	0.65 U	3.7	0.52 U	0.74 U
Trans Nonachlor	1.1 U	1.0 U	1.0 U	0.81 U	1.1 U
4,4'-DDE	39.3	58.5	80.6	50.1	66.1
Dieldrin	6.5	7.0	3.6 U	5.7	6.9
2,4'-DDD	5.5	7.91	1.7 U	6.60	7.59
2,4'-DDT	1.3 U	1.3 U	1.2 U	1.0 U	1.3 U
4,4'-DDD	19.2	23.4	1.8 U	20.0	28.1
Endosulfan II	1.3 U	1.3 U	1.2 U	1.0 U	1.3 U
4,4'-DDT	90.4	16.5	13.5	26.4	30.9
Endosulfan Sulfate	1.3 U	1.3 U	1.2 U	1.0 U	1.3 U
PCB 8	2.9 U	2.9 U	2.8 U	2.3 U	3.1 U
PCB 18	29.3	42.3	48.5	32.6	44.2
PCB 28	35.3	50.7	61.4	42.7	53.6
PCB 52	33.4	43.3	59.0	35.7	47.5
PCB 49	23.9	32.4	43.1	26.6	34.2
PCB 44	9.83	14.7	16.0	13.3	16.6
PCB 66	29.5	39.1	53.2	33.9	41.8
PCB 101	18.2	24.8	33.7	20.7	26.6
PCB 87	6.2	8.64	9.78	7.18	9.52
PCB 118	11.6	16.0	22.9	13.3	16.5
PCB 184	1.7 U	1.7 U	1.7 U	1.3 U	1.8 U
PCB 153	9.04	11.6	17.5	10.3	12.4
PCB 105	4.5	5.5	8.4	4.9	5.9
PCB 138	7.3	9.3	13.6	8.04	9.90
PCB 187	8.5	2.6	13.5	2.5	11.1
PCB 183	1.7 U	1.7 U	1.7 U	1.3 U	1.8 U
.PCB 128	1.9	2.1	3.1	1.9	2.4
PCB 180	2.9	5.4	6.1	3.8	4.6
PCB 170	1.2 U	1.7	1.2 U	1.2	1.3 U
PCB 195	0.72 U	0.73 U	0.69 U	0.58 U	0.74 U
PCB 206	1.7	2.2	3.4	2.4	2.5
PCB 209	0.79	1.6	2.5	1.6	1.6

TABLE F.6. (contd)

Treatment	COMP HU-B	COMP HU-B	COMP HU-B	COMP HU-B	COMP HU-B
Replicate	1	2	3	4	5
Batch	1	1	1	1	1
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	13.61	14.99	15.14	12.28	15.7
Heptachlor	1.3 U	1.2 U	1.3 U	1.5 U	1.2 U
Aldrin	13.3	13.7	17.2	15.0	17.6
Heptachlor Epoxide	1.0 U	0.87 U	0.86 U	1.1 U	0.83 U
2,4'-DDE	1.8 U	1.7 U	1.7 U	2.1 U	1.7 U
Endosulfan I	1.2 U	1.2 U	1.2 U	1.5 U	1.1 U
a-Chlordane	3.7	4.2	5.8	4.6	6.43
Trans Nonachlor	1.0 U	0.93 U	0.99 U	1.1 U	2.2
4,4'-DDE	49.1	50.7	65.8	56.6	69.4
Dieldrin	9.70	9.61	13.5	11.0	13.4
2,4'-DDD	6.1	5.2	10.5	6.0	10.2
2,4'-DDT	1.2 U	1.2 U	1.2 U	1.5 U	1.1 U
4,4'-DDD	21.2	20.8	30.3	23.9	31.8
Endosulfan II	1.2 U	1.2 U	1.2 U	1.5 U	1.1 U
4,4'-DDT	45.6	36.0	78.6	60.7	75.2
Endosulfan Sulfate	1.2 U	1.2 U	1.2 U	1.5 U	1.1 U
PCB 8	23.1	19.8	20.1	3.3 U	2.6 U
PCB 18	83.0	64.6	68.7	88.8	66.2
PCB 28	99.9	1.3 U	1.3 U	1.6 U	1.3 U
PCB 52	79.4	64.8	64.9	80.7	63.0
PCB 49	62.5	1.5 U	1.6 U	1.9 U	1.5 U
PCB 44	34.5	34.7	45.6	45.2	52.0
PCB 66	69.1	0.60 U	0.59 U	0.73 U	0.57 U
PCB 101	37.5	29.4	29.7	36.6	28.3
PCB 87	14.5	15.9	18.4	17.4	19.2
PCB 118	24.4	1.9 U	1.9 U	2.4 U	1.8 U
PCB 184	1.7 U	1.5 U	1.6 U	1.9 U	1.5 U
PCB 153	15.3	0.80 U	0.79 U	0.98 U	0.76 U
PCB 105	9.33	0.73 U	0.73 U	0.90 U	0.70 U
PCB 138	13.2	4.5	22.5	16.4	20.1
PCB 187	3.3	4.4	7.00	4.3	5.4
PCB 183	1.7 U	1.5 U	1.6 U	1.9 U	1.5 U
PCB 128	3.0	3.2	4.8	3.6	4.3
PCB 180	6.0	6.5	8.65	7.5	6.6
PCB 170	1.9	2.1	3.4	2.4	2.9
PCB 195	0.73 U	0.67 U	0.66 U	0.81 U	0.64 U
PCB 206	2.8	2.7	4.4	3.3	3.2
PCB 209	1.2	1.5	2.1	1.5	1.6

TABLE F.6. (contd)

Treatment	COMP HU-C	COMP HU-C	COMP HU-C	COMP HU-C	COMP HU-C
Replicate	1	2	3	4	5
Batch	.2	2	1	2	2
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	13.61	13.78	12.44	12.25	18.19
Heptachlor	1.3 U	1.3 U	1.5 U	1.6 U	2.0 U
Aldrin	19.9	20.0	22.5	46.2	18.7
Heptachlor Epoxide	0.96 U	0.94 U	1.0 U	1.1 U	1.4 U
2,4'-DDE	1.9 U	1.9 U	2.1 U	2.1 U	2.9 U
Endosulfan I	1.3 U	1.3 U	1.4 U	1.5 U	2.0 U
a-Chlordane	6.5	6.7	9.24	7.9	4.7
Trans Nonachlor	1.0 U	1.0 U	3.5	1.7	1.6 U
4,4'-DDE	64.2	65.9	84.4	78.9	55.5
Dieldrin	12.4	12.3	14.7	15.7	11.7
2,4'-DDD	9.70	9.94	12.1	12.6	8.19
2,4'-DDT	1.3 U	1.3 U	1.4 U	1.5 U	1.9 U
4,4'-DDD	28.4	27.3	31.6	34.6	25.3
Endosulfan II	1.3 U	1.3 U	1.4 U	1.5 U	2.0 U
4,4'-DDT	9.99	1.1 U	38.6	23.3	5.3
Endosulfan Sulfate	1.5	2.1	1.4 U	1.5 U	3.6
PCB 8	2.9 U	14.4	3.3 U	3.3 U	4.5 U
PCB 18	72.5	70.8	64.9	80.6	93.5
PCB 28	1.5 U	1.5 U	1.6 U	1.6 U	135
PCB 52	71.7	73.3	75.8	81.5	116
PCB 49	1.7 U	1.7 U	18.9	2.0 U	91.8
PCB 44	69.4	62.8	66.7	76.8	52.3
PCB 66	0.66 U	0.65 U	0.72 U	0.73 U	108
PCB 101	32.0	33.0	36.0	35.9	54.8
PCB 87	1.2 U	23.3	29.2	25.9	17.1
PCB 118	2.1 U	2.1 U	2.3 U	2.4 U	42.2
PCB 184	1.7 U	1.7 U	1.9 U	2.0 U	2.6 U
PCB 153	0.88 U	0.87 U	0.96 U	0.98 U	24.4
PCB 105	0.81 U	0.80 U	0.88 U	0.90 U	15.7
PCB 138	21.38	7.91	8.20	27.18	20.2
PCB 187	6.2	0.87 U	7.6	8.16	1.4 U
PCB 183	3.5	4.1	1.9 U	5.0	3.0
PCB 128	5.1	5.5	5.9	6.3	4.9
PCB 180	7.94	8.93	9.81	9.71	6.87
PCB 170	4.0	4.7	1.4 U	4.7	1.8 U
PCB 195	0.73 U	0.73 U	0.80 U	0.82 U	1.1 U
PCB 206	2.2	2.7	2.4	2.8	2.3
PCB 209	1.8	2.3	0.72 U	2.1	1.6

TABLE F.6. (contd)

Treatment	HU-D	HU-D	HU-D	HU-D	HU-D
Replicate	1	2	3	4	5
Batch	3	3	3	3	3
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	17.21	13.88	12.56	13.49	13.26
Heptachlor	1.1 U	1.4 U	1.4 U	1.3 U	1.4 U
Aldrin	8.83	13.0	14.3	12.8	13.7
Heptachlor Epoxide	0.76 U	0.94 U	0.96 U	0.96 U	0.98 U
2,4'-DDE	1.5 U	1.9 U	2.0 U	1.9 U	2.0 U
Endosulfan I	1.0 U	1.3 U	1.4 U	1.3 U	1.4 U
a-Chlordane	1.2	2.5	2.5	2.6	2.3
Trans Nonachlor	0.87 U	1.1 U	1.1 U	1.0 U	1.1 U
4,4'-DDE	28.2	42.2	44.7	42.7	41.9
Dieldrin	6.62	9.94	11.1	10.6	10.1
2,4'-DDD	1.5 U	4.3	4.1	4.0	4.6
2,4'-DDT	1.0 U	1.3 U	1.4 U	1.3 U	1.4 U
4,4'-DDD	12.7	23.6	23.2	22.3	21.7
Endosulfan II	1.0 U	1.3 U	1.4 U	1.3 U	1.4 U
4,4'-DDT	27.1	6.1	14.3	40.3	5.4
Endosulfan Sulfate	1.0 U	1.3 U	1.4 U	1.3 U	1.4 U
PCB 8	8.83	10.5	12.0	10.3	11.7
PCB 18	45.9	70.8	84.4	63.8	82.2
PCB 28	50.4	75.6	86.0	73.2	85.2
PCB 52	52.5	77.1	86.0	72.9	80.7
PCB 49	38.3	58.4	63.4	55.1	58.8
PCB 44	13.7	25.6	30.7	27.1	29.9
PCB 66	44.6	66.9	70.8	64.9	68.2
PCB 101	26.6	41.1	42.1	39.4	39.7
PCB 87	9.94	14.8	15.8	14.2	14.9
PCB 118	13.2	20.1	22.1	18.8	21.0
PCB 184	1.4 U	1.7 U	1.8 U	1.7 U	1.7 U
PCB 153	8.37	12.9	14.1	12.2	12.7
PCB 105	4.2	6.8	7.3	6.5	6.3
PCB 138	7.26	11.3	12.3	10.5	11.0
PCB 187	1.6	2.7	2.9	2.6	2.6
PCB 183	1.4 U	1.7 U	1.8 U	1.7 U	1.7 U
PCB 128	1.5	2.5	2.8	2.4	2.3
PCB 180	4.3	4.9	5.7	5.6	6.0
PCB 170	2.1	3.4	3.1	2.7	3.5
PCB 195	0.58 U	0.72 U	0.72 U	0.74 U	0.75 U
PCB 206	1.8	3.0	2.9	2.7	2.6
PCB 209	0.70	1.2	0.72 U	1.0	0.98

TABLE F.6. (contd)

Treatment	R-MUD	R-MUD	R-MUD	R-MUD	R-MUD
Replicate	1	2	3	4	5
Batch	2	3	2	3	2
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	14.08	18.71	13.02	11.83	20.96
Heptachlor	1.3 U	1.0 U	1.5 U	1.6 U	0.81 U
Aldrin	0.92 U	3.9	1.0 U	5.7	1.0
Heptachlor Epoxide	0.92 U	0.69 U	1.0 U	1.1 U	0.57 U
2,4'-DDE	1.8 U	1.4 U	2.0 U	3.1	1.1 U
Endosulfan I	1.3 U	0.96 U	1.4 U	1.5 U	0.81 U
a-Chlordane	0.71 U	0.53 U	0.77 U	0.85 U	0.4 U
Trans Nonachlor	1.1 U	0.80 U	1.2 U	1.3 U	0.62 U
4,4'-DDE	2.1	1.9	3.5	3.0	1.1
Dieldrin	3.7 U	2.8 U	4.0 U	4.4 U	2.2 U
2,4'-DDD	1.8 U	1.3 U	1.9 U	2.1 U	1.1 U
2,4'-DDT	1.3 U	1.0 U	1.4 U	1.5 U	0.76 U
4,4'-DDD	1.8 U	1.4 U	2.0 U	2.2 U	1.1 U
Endosulfan II	1.3 U	1.0 U	1.4 U	1.5 U	0.81 U
4,4'-DDT	2.9	18.8	1.2 U	14.5	2.1
Endosulfan Sulfate	1.3 U	0.96 U	1.4 U	1.5 U	0.81 U
PCB 8	2.9 U	9.41	3.1 U	16.8	1.8 U
PCB 18	3.1 U	2.3 U	3.3 U	3.6 U	1.9 U
PCB 28	3.8	3.6	5.0	5.4	2.9
PCB 52	4.8	5.0	6.0	7.1	4.0
PCB 49	1.7 U	1.3	1.8 U	2.1	1.0 U
PCB 44	1.2 U	0.91 U	1.3 U	1.4 U	0.72 U
PCB 66	0.6 U	0.5 U	5.7	0.8 U	0.4 U
PCB 101	2.3	2.8	3.5	3.6	2.5
PCB 87	1.1 U	1.5	1.2 U	2.3	0.72 U
PCB 118	2.1 U	1.5 U	2.3	2.5 U	1.3 U
PCB 184	1.7 U	1.3 U	1.8 U	2.0 U	1.0 U
PCB 153	1.2	0.75	2.0	1.1	0.52 U
PCB 105	0.78 U	0.59 U	1.0	0.93 U	0.62
PCB 138	2.1 U	1.5 U	2.2 U	2.5 U	1.4
PCB 187	0.92 U	0.69 U	1.0 U	1.1 U	0.57 U
PCB 183	1.7 U	1.3 U	1.8 U	2.0 U	1.0 U
PCB 128	1.1 U	0.80 U	1.2 U	1.3 U	0.67 U
PCB 180	1.3 U	0.96 U	1.4 U	1.5 U	0.81 U
PCB 170	1.3	0.91 U	1.3 U	1.6	0.72 U
PCB 195	0.71 U	0.53 U	0.77 U	0.85 U	0.4 U
PCB 206	0.78 U	0.59 U	0.84 U	0.93 U	0.48 U
PCB 209	0.6 U	0.5 U	0.7 U	0.8 U	0.4 U

TABLE F.6. (contd)

Treatment	C-SB	C-SB, Dup	C-SB, Trip	C-SB	C-SB
Replicate	1	1	1	2	3
Batch	3	3	3	2	3
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	12.86	12.86	12.86	12.45	13.9
Heptachlor	2.8 U	2.8 U	2.9 U	1.5 U	1.3 U
Aldrin	1.9 U	1.9 U	1.9 U	1.0 U	0.86 U
Heptachlor Epoxide	2.0 U	2.0 U	2.0 U	1.0 U	0.94 U
2,4'-DDE	4.0 U	4.0 U	4.0 U	2.1 U	1.9 U
Endosulfan I	2.7 U	2.7 U	2.8 U	1.4 U	1.3 U
a-Chlordane	1.5 U	1.5 U	1.5 U	0.80 U	0.65 U
Trans Nonachlor	2.2 U	2.2 U	2.3 U	1.2 U	1.0 U
4,4'-DDE	6.3	2.9 U	2.9 U	2.9	3.7
Dieldrin	7.85 U	7.85 U	7.93 U	4.2 U	3.7 U
2,4'-DDD	3.9 U	3.9 U	3.9 U	2.0 U	1.8 U
2,4'-DDT	2.7 U	2.7 U	2.7 U	1.4 U	1.3 U
4,4'-DDD	4.0 U	4.0 U	4.0 U	2.1 U	1.9 U
Endosulfan II	2.7 U	2.7 U	2.8 U	1.4 U	1.3 U
4,4'-DDT	2.3 U	2.3 U	2.3 U	3.0	8.92
Endosulfan Sulfate	2.7 U	2.7 U	2.8 U	1.4 U	1.3 U
PCB 8	6.4	9.80	7.3	3.3 U	3.9
PCB 18	6.5 U	6.5 U	6.6 U	3.5 U	3.0 U
PCB 28	3.1 U	3.1 U	3.1 U	1.6 U	1.7
PCB 52	5.4 U	5.4 U	5.5 U	2.9 U	2.5 U
PCB 49	3.6 U	3.6 U	3.7 U	1.9 U	1.7 U
PCB 44	2.5 U	2.5 U	2.6 U	1.4 U	1.2 U
PCB 66	1.5 U	2.3	2.5	7.2 U	0.6 U
PCB 101	2.3 U	2.3 U	2.3 U	1.2 U	1.4
PCB 87	2.4 U	2.4 U	2.5 U	1.3 U	1.2 U
PCB 118	4.5 U	4.5 U	4.5 U	2.3 U	2.1 U
PCB 184	3.6 U	3.6 U	3.7 U	1.9 U	1.7 U
PCB 153	1.9 U	1.9 U	1.9 U	0.96 U	0.86 U
PCB 105	1.7 U	1.7 U	1.7 U	0.88 U	0.79 U
PCB 138	4.4 U	4.4 U	4.4 U	2.3 U	2.0 U
PCB 187	1.9 U	1.9 U	1.9 U	1.0 U	0.86 U
PCB 183	3.6 U	3.6 U	3.7 U	1.9 U	1.7 U
PCB 128	2.3 U	2.3 U	2.4 U	1.2 U	1.1 U
PCB 180	2.8 U	2.8 U	2.9 U	1.4 U	1.3 U
PCB 170	2.6 U	2.6	2.6 U	1.4 U	1.2 U
PCB 195	1.6 U	1.6 U	1.6 U	0.80 U	0.72 U
PCB 206	1.7 U	1.7 U	1.7 U	0.88 U	0.79 U
PCB 209	1.5 U	1.5 U	1.5 U	0.7 U	0.6 U

TABLE F.6. (contd)

Treatment	C-SB	C-SB	C-SB, Dup	C-SB, Trip
Replicate	4	5	5	5
Batch	2	2	2	2
Units	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	13.16	13.21	13.21	13.21
Heptachlor	1.4 U	2.7 U	2.8 U	2.7 U
Aldrin	0.99 U	1.9 U	1.9 U	1.9 U
Heptachlor Epoxide	0.99 U	1.97 U	1.97 U	1.97 U
2,4'-DDE	2.0 U	3.9 U	3.9 U	3.9 U
Endosulfan I	1.4 U	2.6 U	2.7 U	1.9 U
a-Chlordane	0.76 U	1.4 U	1.4 U	1.4 U
Trans Nonachlor	1.1 U	2.1 U	2.2 U	2.1 U
4,4'-DDE	3.4	4.1	2.8 U	2.7 U
Dieldrin	4.0 U	7.65 U	7.72 U	7.57 U
2,4'-DDD	1.9 U	3.8 U	3.8 U	3.7 U
2,4'-DDT	1.4 U	2.6 U	2.6 U	2.6 U
4,4'-DDD	2.0 U	3.9 U	3.9 U	3.9 U
Endosulfan II	1.4 U	2.6 U	2.7 U	2.6 U
4,4'-DDT	3.0	6.9	2.3 U	2.6
Endosulfan Sulfate	1.4 U	2.6 U	2.7 U	2.6 U
PCB 8	3.1 U	6.1 U	6.1 U	6.1 U
PCB 18	3.3 U	6.4 U	6.4 U	6.3 U
PCB 28	1.5 U	3.0 U	3.0 U	3.0 U
PCB 52	2.7 U	5.3 U	5.4 U	5.2 U
PCB 49	1.8 U	3.5 U	3.6 U	3.5 U
PCB 44	1.3 U	2.4 U	2.5 U	2.4 U
PCB 66	0.7 U	1.4 U	1.4 U	1.4 U
PCB 101	1.1 U	2.2 U	2.2 U	2.1 U
PCB 87	1.2 U	2.3 U	2.4 U	2.3 U
PCB 118	2.2 U	4.4 U	4.4 U	4.3 U
PCB 184	1.8 U	3.5 U	3.6 U	3.5 U
PCB 153	0.91 U	1.8 U	1.8 U	1.8 U
PCB 105	0.84 U	1.7 U	1.7 U	1.6 U
PCB 138	2.2 U	4.3 U	4.3 U	4.2 U
PCB 187	1.0 U	1.9 U	1.9 U	1.8 U
PCB 183	1.8 U	3.5 U	3.6 U	3.5 U
PCB 128	1.1 U	2.3 U	2.3 U	2.3 U
PCB 180	1.4 U	2.7 U	2.8 U	2.7 U
PCB 170	1.3 U	2.5 U	3.4	2.4 U
PCB 195	0.76 U	1.5 U	1.5 U	1.4 U
PCB 206	0.84 U	1.7 U	1.7 U	1.7 U
PCB 209	0.7 U	1.4 U	1.4 U	1.4 U

TABLE F.6. (contd)

Treatment	M. nasuta Background	M. nasuta Background	M. nasuta Background
Replicate	1	2	3
Batch	7	7	7
Units	ng/g	ng/g	ng/g
Percent Dry Weight	15.16	14.86	14.87
Heptachlor	1.2 U	1.3 U	1.3 U
Aldrin	0.79 U	0.87 U	0.87 U
Heptachlor Epoxide	0.86 U	0.87 U	0.87 U
2,4'-DDE	1.7 U	1.7 U	1.7 U
Endosulfan I	1.2 U	1.2 U	1.2 U
a-Chlordane	0.59 U	0.67 U	0.67 U
Trans Nonachlor	0.9 U	1.0 U	1.0 U
4,4'-DDE	3.8	1.3 U	1.3 U
Dieldrin	3.4 U	3.5 U	3.5 U
2,4'-DDD	1.6 U	1.7 U	1.7 U
2,4'-DDT	1.2 U	1.2 U	1.2 U
4,4'-DDD	1.7 U	1.7 U	1.7 U
Endosulfan II	1.2 U	1.2 U	1.2 U
4,4'-DDT	1.0 U	1.0 U	1.0 U
Endosulfan Sulfate	3.6	3.2	2.6
PCB 8	2.6 U	2.8 U	2.8 U
PCB 18	2.8 U	2.9 U	2.9 U
PCB 28	3.3	5.2	1.3 U
PCB 52	2.3 U	2.4 U	2.4 U
PCB 49	1.5 U	1.6 U	1.6 U
PCB 44	1.1 U	1.1 U	1.1 U
PCB 66	0.6 U	0.6 U	0.6 U
PCB 101	0.92 U	1.0 U	1.0 U
PCB 87	1.1 U	1.1 U	1.1 U
PCB 118	1.9 U	2.0 U	2.0 U
PCB 184	1.5 U	1.6 U	1.6 U
PCB 153	0.79 U	0.81 U	0.81 U
PCB 105	0.73 U	0.74 U	0.74 U
PCB 138	1.8 U	2.0 U	2.0 U
PCB 187	0.79 U	0.87 U	0.87 U
PCB 183	1.5 U	1.6 U	1.6 U
PCB 128	1.0 U	1.0 U	1.0 U
PCB 180	1.2 U	1.2 U	1.2 U
PCB 170	1.1 U	1.1 U	1.1 U
PCB 195	0.66 U	0.67 U	0.67 U
PCB 206	0.73 U	0.74 U	0.74 U
PCB 209	0.6 U	0.6 U	0.6 U

(a) U Undetected at or above given concentration.

TABLE F.7. Quality Control Summary for Pesticides and PCB Congeners in Tissue of *M. nasuta* (Wet Weight)

Matrix Spike Results

Treatment	COMP HU-A	*Matrix Spike* COMP HU-A			COMP HU-C	*Matrix Spike* COMP HU-C		
Replicate	1	1			5	5		
Batch	1	1			2	2		
Wet Wt	20.12	20.12	Amount	Percent	10.14	10.25	Amount	Percent
Units	ng/g	ng/g	Spiked	Recovery	ng/g	ng/g	Spiked	Recovery
Heptachlor	0.19 U[a]	2.62	2.50	105	0.37 U	4.69	4.90	96
Aldrin	1.66	4.28	2.50	105	3.40	5.96	4.90	52
Heptachlor Epoxide	0.13 U	2.13	2.50	85	0.26 U	3.53	4.90	72
2,4'-DDE	0.26 U	NA [b]	NS [c]	NA	0.52 U	NA	NS	NA
Endosulfan I	0.18 U	2.28	2.50	91	0.36 U	3.31	4.90	68
a-Chlordane	0.10 U	NA	NS	NA	0.85	NA	NS	NA
Trans Nonachlor	0.15 U	NA	NS	NA	0.29 U	NA	NS	NA
4,4'-DDE	5.48	7.48	2.50	80	10.1	13.9	4.90	78
Dieldrin	0.91	3.12	2.50	88	2.13	5.15	4.90	62
2,4'-DDD	0.77	NS	NS	NS	1.49	NA	NS	NA
2,4'-DDT	0.18 U	NS	NS	NS	0.35 U	NA	NS	NA
4,4'-DDD	2.67	5.24	2.50	103	4.61	8.58	4.90	81
Endosulfan II	0.18 U	2.92	2.50	117	0.36 U	4.49	4.90	92
4,4'-DDT	12.6	14.1	2.50	60	0.96	6.16	4.90	106
Endosulfan Sulfate	0.18 U	2.00	2.50	80	0.65	4.51	4.90	79
PCB 8	0.41 U	NA	NS	NA	0.81 U	NA	NS	NA
PCB 18	4.09	NA	NS	NA	17.0	NA	NS	NA
PCB 28	4.92	8.51	3.19	113	24.6	30.9	6.25	101
PCB 52	4.65	10.5	6.65	88	21.1	33.0	13.0	92
PCB 49	3.33	NS	NS	NS	16.7	NA	NS	NA
PCB 44	1.37	NA	NS	NA	9.51	NA	NS	NA
PCB 66	4.11	NA	NS	NA	19.6	NA	NS	NA
PCB 101	2.54	6.73	4.51	93	9.97	17.9	8.84	90
PCB 87	0.86	NA	NS	NA	3.11	NA	NS	NA
PCB 118	1.62	NA	NS	NA	7.68	NA	NS	NA
PCB 184	0.24 U	NA	NS	NA	0.47 U	NA	NS	NA
PCB 153	1.26	3.31	2.64	78	4.43	8.76	5.17	84
PCB 105	0.63	NA	NS	NA	2.85	NA	NS	NA
PCB 138	1.02	2.75	2.04	85	3.68	7.29	3.99	90
PCB 187	1.18	NA	NS	NA	0.25 U	NA	NS	NA
PCB 183	0.24 U	NA	NS	NA	0.54	NA	NS	NA
PCB 128	0.27	NA	NS	NA	0.90	NA	NS	NA
PCB 180	0.40	NA	NS	NA	1.25	NA	NS	NA
PCB 170	0.17 U	NA	NS	NA	0.33 U	NA	NS	NA
PCB 195	0.10 U	NA	NS	NA	0.20 U	NA	NS	NA
PCB 206	0.24	NA	NS	NA	0.41	NA	NS	NA
PCB 209	0.11	NA	NS	NA	0.29	NA	NS	NA

Surrogate Recoveries (%)

PCB 103 (SIS)	65	65	NA	NA	81	77	NA	NA
PCB 198 (SIS)	63	69	NA	NA	59	59	NA	NA

TABLE F.7. (contd)

Matrix Spike Results

Treatment	COMP SB-A	COMP SB-A MS			COMP PC	COMP PC MS		
Replicate	3	3			1	1		
Batch	3	3			7	7		
Wet Wt	10.06	10.32	Amount	Percent	20.84	20.18	Amount	Percent
Units	ng/g	ng/g	Spiked	Recovery	ng/g	ng/g	Spiked	Recovery
Heptachlor	0.37 U	4.35	4.85	90	0.18 U	2.41	2.50	96
Aldrin	1.45	5.18	4.85	77	0.90	2.96	2.50	82
Heptachlor Epoxide	0.26 U	3.97	4.85	82	0.13 U	2.58	2.50	103
2,4'-DDE	0.52 U	NA	NS	NA	0.25 U	NA	NS	NA
Endosulfan I	0.36 U	3.62	4.85	75	0.17 U	2.11	2.50	84
a-Chlordane	0.75	NA	NS	NA	3.09	NA	NS	NA
Trans Nonachlor	0.29 U	NA	NS	NA	0.52	NA	NS	NA
4,4'-DDE	4.00	7.91	4.85	81	4.47	7.19	2.50	109
Dieldrin	1.50	4.84	4.85	69	2.94	5.83	2.50	116
2,4'-DDD	0.55	NA	NS	NA	4.01	NA	NS	NA
2,4'-DDT	0.35 U	NA	NS	NA	0.17 U	NA	NS	NA
4,4'-DDD	2.22	7.25	4.85	104	8.51	13.3	2.50	192 (e)
Endosulfan II	0.36 U	3.77	4.85	78	0.17 U	2.72	2.50	109
4,4'-DDT	2.12	7.55	4.85	112	0.15 U	3.22	2.50	129 (e)
Endosulfan Sulfate	0.36 U	4.57	4.85	94	0.17 U	3.04	2.50	122 (e)
PCB 8	1.54	NA	NS	NA	0.39 U	NA	NS	NA
PCB 18	1.63	NA	NS	NA	0.66	NA	NS	NA
PCB 28	3.31	9.60	6.18	102	0.99	4.93	3.19	124 (e)
PCB 52	3.35	14.8	12.9	89	4.18	10.9	6.65	101
PCB 49	2.63	NA	NS	NA	1.33	NA	NS	NA
PCB 44	0.84	NA	NS	NA	0.35	NA	NS	NA
PCB 66	4.44	NA	NS	NA	0.09 U	NA	NS	NA
PCB 101	3.34	11.8	8.75	97	5.90	11.0	4.51	113
PCB 87	1.12	NA	NS	NA	2.57	NA	NS	NA
PCB 118	1.71	NA	NS	NA	3.67	NA	NS	NA
PCB 184	0.47 U	NA	NS	NA	0.23 U	NA	NS	NA
PCB 153	1.61	4.95	5.12	65	1.90	4.21	2.64	88
PCB 105	0.57	NA	NS	NA	1.49	NA	NS	NA
PCB 138	1.30	4.93	3.95	92	2.42	4.63	2.04	108
PCB 187	0.37	NA	NS	NA	0.49	NA	NS	NA
PCB 183	0.47 U	NA	NS	NA	0.23 U	NA	NS	NA
PCB 128	0.31 U	NA	NS	NA	0.48	NA	NS	NA
PCB 180	0.94	NA	NS	NA	0.57	NA	NS	NA
PCB 170	0.63	NA	NS	NA	0.30	NA	NS	NA
PCB 195	0.20 U	NA	NS	NA	0.10 U	NA	NS	NA
PCB 206	0.22 U	NA	NS	NA	0.11	NA	NS	NA
PCB 209	0.19 U	NA	NS	NA	1.37	NA	NS	NA
Surrogate Recoveries (%)								
PCB 103 (SIS)	86	82	NA	NA	77	82	NA	NA
PCB 198 (SIS)	154 (d)	147	NA	NA	72	67	NA	NA

Analytical Replicate Results

TABLE F.7. (contd)

Treatment	COMP EC-B	DUP COMP EC-B	TRIP COMP EC-B		Control-SB	DUP Control-SB	TRIP Control-SB	
Replicate	5	5	5		5	5	5	
Batch:	1	1	1		2	2	2	
Wet Wt.	10.04	10.02	10.11		10.16	10	10	
Units	ng/g	ng/g	ng/g	RSD%	ng/g	ng/g	ng/g	NA RSD%
Heptachlor	0.37 U	0.37 U	0.37 U	NA	0.36 U	0.37 U	0.36 U	NA
Aldrin	1.15	1.23	1.21	3	0.25 U	0.25 U	0.25 U	NA
Heptachlor Epoxide	0.27 U	0.27 U	0.26 U	NA	0.26 U	0.26 U	0.26 U	NA
2,4'-DDE	0.52 U	0.52 U	0.52 U	NA	0.51 U	0.52 U	0.51 U	NA
Endosulfan I	0.36 U	0.36 U	0.36 U	NA	0.35 U	0.36 U	0.25 U	NA
a-Chlordane	2.58	2.98	2.92	8	0.19 U	0.19 U	0.19 U	NA
Trans Nonachlor	0.75	1.06	1.01	18	0.28 U	0.29 U	0.28 U	NA
4,4'-DDE	3.65	3.82	3.91	3	0.54	0.37 U	0.36 U	NA
Dieldrin	1.77	1.95	1.92	5	1.01 U	1.02 U	1.00 U	NA
2,4'-DDD	1.62	1.50	1.59	4	0.50 U	0.50 U	0.49 U	NA
2,4'-DDT	0.36 U	0.36 U	0.35 U	NA	0.35 U	0.35 U	0.35 U	NA
4,4'-DDD	5.35	5.63	5.96	5	0.51 U	0.52 U	0.51 U	NA
Endosulfan II	0.36 U	0.36 U	0.36 U	NA	0.35 U	0.36 U	0.35 U	NA
4,4'-DDT	1.86	2.54	3.15	26	0.91	0.30 U	0.34	NA
Endosulfan Sulfate	0.36 U	0.36 U	0.36 U	NA	0.35 U	0.36 U	0.35 U	NA
PCB 8	0.82 U	0.82 U	0.82 U	NA	0.81 U	0.81 U	0.80 U	NA
PCB 18	6.73	6.77	6.82	1	0.84 U	0.85 U	0.83 U	NA
PCB 28	7.35	7.93	7.85	4	0.40 U	0.40 U	0.40 U	NA
PCB 52	7.26	7.29	7.44	1	0.70 U	0.71 U	0.69 U	NA
PCB 49	4.78	4.89	4.99	2	0.46 U	0.47 U	0.46 U	NA
PCB 44	2.17	2.65	2.54	10	0.32 U	0.33 U	0.32 U	NA
PCB 66	6.75	7.12	7.26	4	0.19 U	0.19 U	0.18 U	NA
PCB 101	3.35	3.42	3.73	6	0.29 U	0.29 U	0.28 U	NA
PCB 87	1.23	1.35	1.41	7	0.31 U	0.32 U	0.31 U	NA
PCB 118	2.48	2.49	2.70	5	0.58 U	0.58 U	0.57 U	NA
PCB 184	0.47 U	0.47 U	0.47 U	NA	0.46 U	0.47 U	0.46 U	NA
PCB 153	1.38	1.39	1.46	3	0.24 U	0.24 U	0.24 U	NA
PCB 105	0.93	0.97	1.03	5	0.22 U	0.22 U	0.21 U	NA
PCB 138	1.19	1.23	1.31	5	0.57 U	0.57 U	0.56 U	NA
PCB 187	3.47	3.11	3.41	6	0.25 U	0.25 U	0.24 U	NA
PCB 183	0.47 U	0.47 U	0.47 U	NA	0.46 U	0.47 U	0.46 U	NA
PCB 128	0.33	0.31 U	0.34	NA	0.30 U	0.31 U	0.30 U	NA
PCB 180	0.68	0.65	0.62	5	0.36 U	0.37 U	0.36 U	NA
PCB 170	0.33 U	0.33 U	0.33 U	NA	0.33 U	0.45	0.32 U	NA
PCB 195	0.20 U	0.20 U	0.20 U	NA	0.20 U	0.20 U	0.19 U	NA
PCB 206	0.23 U	0.23 U	0.23 U	NA	0.22 U	0.22 U	0.22 U	NA
PCB 209	0.19 U	0.19 U	0.19 U	NA	0.19 U	0.19 U	0.18 U	NA
Surrogate Recoveries (%)								
PCB 103 (SIS)	67	80	74	NA	82	76	75	NA
PCB 198 (SIS)	54	74	62	NA	61	57	58	NA

TABLE F.7. (contd)

Analytical Replicate Results

Treatment	C-SB	DUP C-SB	TRIP C-SB		COMP PC	DUP COMP PC	TRIP COMP PC	
Replicate	1	1	1		5	5	5	
Batch	3	3	3		7	7	7	
Wet Wt	10.22	10.18	10.08	NA	16.10	16.99	17.88	
Units	ng/g	ng/g	ng/g	RSD%	ng/g	ng/g	ng/g	RSD%
Heptachlor	0.36 U	0.36 U	0.37 U	NA	0.23 U	0.22 U	0.21 U	NA
Aldrin	0.25 U	0.25 U	0.25 U	NA	1.14	1.12	1.05	4
Heptachlor Epoxide	0.26 U	0.26 U	0.26 U	NA	0.16 U	0.16 U	0.15 U	NA
2,4'-DDE	0.51 U	0.51 U	0.52 U	NA	0.32 U	0.31 U	0.29 U	NA
Endosulfan I	0.35 U	0.35 U	0.36 U	NA	0.22 U	0.21 U	0.20 U	NA
a-Chlordane	0.19 U	0.19 U	0.19 U	NA	3.54	3.06	2.78	12
Trans Nonachlor	0.28 U	0.28 U	0.29 U	NA	0.61	0.39	0.32	34
4,4'-DDE	0.81	0.37 U	0.37 U	NA	5.66	5.28	4.61	10
Dieldrin	1.01 U	1.01 U	1.02 U	NA	3.96	3.79	3.43	7
2,4'-DDD	0.50 U	0.50 U	0.50 U	NA	5.45	4.75	4.45	11
2,4'-DDT	0.35 U	0.35 U	0.35 U	NA	0.22 U	0.21 U	0.20 U	NA
4,4'-DDD	0.51 U	0.51 U	0.52 U	NA	11.4	10.6	9.14	11
Endosulfan II	0.35 U	0.35 U	0.36 U	NA	0.22 U	0.21 U	0.20 U	NA
4,4'-DDT	0.30 U	0.30 U	0.30 U	NA	0.19 U	0.18 U	0.17 U	NA
Endosulfan Sulfate	0.35 U	0.35 U	0.36 U	NA	0.22 U	0.21 U	0.20 U	NA
PCB 8	0.82	1.26	0.94	23	0.51 U	0.48 U	0.46 U	NA
PCB 18	0.84 U	0.84 U	0.85 U	NA	0.53 U	0.90	0.48 U	NA
PCB 28	0.40 U	0.40 U	0.40 U	NA	1.33	1.17	1.03	13
PCB 52	0.70 U	0.70 U	0.71 U	NA	5.27	4.90	4.38	9
PCB 49	0.46 U	0.46 U	0.47 U	NA	1.83	1.58	1.41	13
PCB 44	0.32 U	0.32 U	0.33 U	NA	0.50	0.19 U	0.18 U	NA
PCB 66	0.19 U	0.30	0.32	NA	0.12 U	0.11 U	0.11 U	NA
PCB 101	0.29 U	0.29 U	0.29 U	NA	7.32	6.83	6.12	9
PCB 87	0.31 U	0.31 U	0.32 U	NA	3.21	3.00	2.64	10
PCB 118	0.58 U	0.58 U	0.58 U	NA	4.56	4.02	3.83	9
PCB 184	0.46 U	0.46 U	0.47 U	NA	0.29 U	0.28 U	0.26 U	NA
PCB 153	0.24 U	0.24 U	0.24 U	NA	2.53	2.19	2.04	11
PCB 105	0.22 U	0.22 U	0.22 U	NA	2.11	1.72	1.60	15
PCB 138	0.57 U	0.57 U	0.57 U	NA	3.19	2.82	2.59	11
PCB 187	0.25 U	0.25 U	0.25 U	NA	0.63	0.50	0.51	13
PCB 183	0.46 U	0.46 U	0.47 U	NA	0.31	0.28 U	0.26 U	NA
PCB 128	0.30 U	0.30 U	0.31 U	NA	0.73	0.59	0.56	14
PCB 180	0.36 U	0.36 U	0.37 U	NA	0.76	0.73	0.64	9
PCB 170	0.33 U	0.34	0.33 U	NA	0.39	0.36	0.34	7
PCB 195	0.20 U	0.20 U	0.20 U	NA	0.12 U	0.12 U	0.11 U	NA
PCB 206	0.22 U	0.22 U	0.22 U	NA	0.18	0.18	0.15	10
PCB 209	0.19 U	0.19 U	0.19 U	NA	0.12 U	0.11 U	0.11 U	NA
Surrogate Recoveries (%)								
PCB 103 (SIS)	89	79	88	NA	95	95	86	NA
PCB 198 (SIS)	144	125	141	NA	93	82	75	NA

(a) U Undetected at or above given concentration.
(b) NA Not applicable.
(c) NS Not spiked.
(d) Outside quality control range (30-150%) for SIS.
(e) Outside quality control criteria (50-120%) for matrix spike recovery.

TABLE F.8. Polynuclear Aromatic Hydrocarbons (PAH) and 1,4-Dichlorobenzene (Wet Weight) in Tissue of M. nasuta

Treatment	COMP HU-A	COMP HU-A	COMP HU-A	COMP HU-A	COMP HU-A
Replicate	1	2	3	4	5
Batch	1	1	1	1	1
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	13.94%	13.78%	14.52%	17.28%	13.44%
1,4-Dichlorobenzene	1.86 U[a]	1.83 U	1.86 U	1.83 U	1.86 U
Naphthalene	3.34	3.47	5.83	4.80	4.70
Acenaphthylene	2.20 [b]	2.44 [b]	4.90	2.74 [b]	2.84
Acenaphthene	7.45	13.9	15.8	12.5	17.1
Fluorene	8.07	13.7	15.3	11.9	15.5
Phenanthrene	90.2	146	155	122	145
Anthracene	42.8	64.1	71.3	55.8	65.2
Fluoranthene	232	315	391	326	326
Pyrene	278	387	467	410	397
Benzo(a)anthracene	144	182	253	190	190
Chrysene	155	193	278	211	200
Benzo(b)fluoranthene	86.6	110	170	124	114
Benzo(k)fluoranthene	24.1	28.5	42.5	30.8	31.7
Benzo(a)pyrene	69.7	88.4	144	102	96.7
Indeno(123-cd)pyrene	13.9	16.2	29.3	19.2	18.1
Dibenzo(a,h)anthracene	4.22	4.57	7.49	5.27	4.91
Benzo(g,h,i)perylene	14.4	17.4	31.0	21.2	19.5
Surrogate Internal Standards (%)					
d4 1,4-Dichlorobenzene	43	53	48	59	47
d8 Naphthalene	53	65	62	72	62
d10 Acenaphthene	62	72	66	74	67
d12 Chrysene	76	84	79	82	80
d14 Dibenzo(a,h,i)anthracene	84	95	97	103	97

TABLE F.8. (contd)

Treatment	COMP HU-B	COMP HU-B	COMP HU-B	COMP HU-B	COMP HU-B
Replicate	1	2	3	4	5
Batch	1	1	1	1	1
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	13.61%	14.99%	15.44%	12.28%	15.70%
1,4-Dichlorobenzene	1.79 U	1.83 U	1.86 U	1.83 U	1.86 U
Naphthalene	5.91	5.86	14.5	10.1	9.42
Acenaphthylene	1.96	2.30	3.86	2.63	3.28
Acenaphthene	29.0	20.2	52.0	37.6	49.9
Fluorene	37.5	29.0	67.3	47.4	64.1
Phenanthrene	271	236	457	305	435
Anthracene	83.8	78.4	142	94.3	133
Fluoranthene	318	325	525	331	541
Pyrene	323	333	526	336	534
Benzo(a)anthracene	122	141	211	134	211
Chrysene	118	137	206	133	207
Benzo(b)fluoranthene	71.3	88.7	130	83.3	126
Benzo(k)fluoranthene	20.4	24.0	36.2	22.7	33.5
Benzo(a)pyrene	55.8	71.7	107	68.1	102
Indeno(123-cd)pyrene	10.7	13.3	20.8	13.2	18.6
Dibenzo(a,h)anthracene	3.04	3.68	5.52	3.67	5.14
Benzo(g,h,i)perylene	12.1	15.6	24.0	15.4	22.0
Surrogate Internal Standards (%)					
d4 1,4-Dichlorobenzene	47	51	33	60	55
d8 Naphthalene	61	65	43	74	71
d10 Acenaphthene	65	72	48	79	73
d12 Chrysene	75	82	55	85	81
d14 Dibenzo(a,h,i)anthracene	97	104	72	107	105

TABLE F.8. (contd)

Treatment	COMP HU-C	COMP HU-C	COMP HU-C	COMP HU-C	COMP HU-C
Replicate	1	2	3	4	5
Batch	2	2	1	2	2
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	13.61%	13.78%	12.44%	12.25%	18.19%
1,4-Dichlorobenzene	1.83 U	1.86 U	1.86 U	1.86 U	3.73 U
Naphthalene	3.54	4.52	3.66	4.42	4.24 (b)
Acenaphthylene	1.57 (b)	1.87 (b)	1.42 (b)	1.69 (b)	2.20 (b)
Acenaphthene	2.94 (b)	3.19	2.98	3.28	3.49 (b)
Fluorene	3.05	3.45	3.51	3.56	3.70
Phenanthrene	20.0	23.5	22.1	24.5	20.4
Anthracene	12.3	13.7	13.7	14.6	12.3
Fluoranthene	79.5	88.6	80.1	96.9	91.6
Pyrene	108	119	105	125	124
Benzo(a)anthracene	40.0	45.4	45.7	47.5	46.8
Chrysene	51.9	59.8	56.9	59.0	61.4
Benzo(b)fluoranthene	38.7	45.1	44.1	42.1	62.8
Benzo(k)fluoranthene	11.6	12.3	12.9	14.1	3.34 (c)
Benzo(a)pyrene	26.8	30.9	29.5	29.1	33.6
Indeno(123-cd)pyrene	7.49	9.27	8.26	8.37	9.36
Dibenzo(a,h)anthracene	2.17	2.59	2.40	2.43	2.92
Benzo(g,h,i)perylene	8.27	10.5	9.43	9.69	10.7
Surrogate Internal Standards (%)					
d4 1,4-Dichlorobenzene	64	45	55	52	58
d8 Naphthalene	74	57	69	62	69
d10 Acenaphthene	78	62	74	68	69
d12 Chrysene	79	68	80	73	70
d14 Dibenzo(a,h,i)anthracene	95	79	95	88	82

TABLE F.8. (contd)

Treatment	COMP HU-D	COMP HU-D	COMP HU-D	COMP HU-D	COMP HU-D
Replicate	1	2	3	4	5
Batch	3	3	3	3	3
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	17.21%	13.88%	12.56%	13.49%	13.26%
1,4-Dichlorobenzene	1.86 U	1.86 U	1.86 U	1.86 U	1.86 U
Naphthalene	3.00 (b)	4.17	3.30	3.14	4.01
Acenaphthylene	2.43 (b)	3.40	3.40 (b)	3.33 (b)	3.47
Acenaphthene	6.83	7.55	10.5	7.84	8.52
Fluorene	7.33	9.41	11.6	7.99	9.59
Phenanthrene	84.5	102	124	93.4	113
Anthracene	37.3	46.0	53.2	41.1	48.6
Fluoranthene	256	331	376	290	358
Pyrene	301	362	440	338	420
Benzo(a)anthracene	141	176	189	162	178
Chrysene	154	194	208	180	199
Benzo(b)fluoranthene	120	152	166	115	118
Benzo(k)fluoranthene	1.67 U	1.67 U	1.67 U	31.4	34.9
Benzo(a)pyrene	75.3	98.4	105	95.2	98.7
Indeno(123-cd)pyrene	14.5	19.6	19.8	19.4	19.2
Dibenzo(a,h)anthracene	3.78	5.15	5.29	4.97	5.00
Benzo(g,h,i)perylene	14.9	20.5	20.8	20.0	19.7
Surrogate Internal Standards (%)					
d4 1,4-Dichlorobenzene	37	34	33	35	32
d8 Naphthalene	43	41	40	44	39
d10 Acenaphthene	44	43	42	48	40
d12 Chrysene	46	42	41	51	38
d14 Dibenzo(a,h,i)anthracene	55	50	49	62	44

TABLE F.8. (contd)

Treatment	R-MUD	R-MUD	R-MUD	R-MUD	R-MUD
Replicate	1	2	3	4	5
Batch	2	3	2	3	2
Wet Wt.	20.1	20.15	20.01	20.11	21.04
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	14.08%	18.71%	13.02%	11.83%	20.96%
1,4-Dichlorobenzene	1.86 U	1.86 U	1.86 U	1.86 U	1.71 U
Naphthalene	1.86 U	1.86 U	1.86 U	1.86 U	1.87 (b)
Acenaphthylene	0.72 U	0.72 U	0.72 U	0.72 U	0.67 U
Acenaphthene	1.30 U	1.30 U	1.30 U	1.30 U	1.20 U
Fluorene	1.24 U	1.24 U	1.24 U	1.24 U	1.14 U
Phenanthrene	2.56 U	2.56 U	2.56 U	2.56 U	2.35 U
Anthracene	2.24 U	2.24 U	2.24 U	2.24 U	2.06 U
Fluoranthene	5.36 U	5.36 U	5.36 U	5.36 U	4.94 U
Pyrene	4.57 U	4.57 U	4.57 U	4.57 U	4.20 U
Benzo(a)anthracene	2.16 (b)B(d)	2.38 (b)B	2.73 (b)B	2.34 (b)B	2.20 (b)B
Chrysene	2.27 U	2.27 U	2.27 U	2.27 U	2.09 U
Benzo(b)fluoranthene	2.98 (b)	3.25 (b)B	4.14 (c)	2.95 (b)B	3.54
Benzo(k)fluoranthene	2.05 (b)	2.12 (b)	1.67 U	2.17 (b)	1.96
Benzo(a)pyrene	1.49 U	1.49 U	1.54 (b)	1.62 (b)	1.41
Indeno(123-cd)pyrene	1.76 U	1.76 U	1.76 U	1.76 U	1.62 U
Dibenzo(a,h)anthracene	1.26 U	1.26 U	1.26 U	1.26 U	1.16 U
Benzo(g,h,i)perylene	1.40 U	1.40 U	1.46 (b)	1.40 U	1.41 (b)
Surrogate Internal Standards (%)					
d4 1,4-Dichlorobenzene	58	51	55	43	60
d8 Naphthalene	66	60	65	51	71
d10 Acenaphthene	68	63	70	56	73
d12 Chrysene	73	61	72	61	73
d14 Dibenzo(a,h,i)anthracene	88	70	86	71	86

TABLE F.8. (contd)

Treatment	C-SB	*DUP* C-SB	*TRIP* C-SB	C-SB	C-SB	C-SB
Replicate	1-1	1-2	1-3	2	3	4
Batch	3	3	3	2	3	2
Units	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	12.86%	12.86%	12.86%	12.45%	13.90%	13.16%
1,4-Dichlorobenzene	3.65 U	3.65 U	3.69 U	1.86 U	1.86 U	1.86 U
Naphthalene	3.65 U	3.65 U	3.69 U	1.86 U	1.86 U	1.86 U
Acenaphthylene	1.42 U	1.42 U	1.44 U	0.72 U	0.72 U	0.72 U
Acenaphthene	2.56 U	2.56 U	2.58 U	1.30 U	1.30 U	1.30 U
Fluorene	2.42 U	2.42 U	2.45 U	1.24 U	1.24 U	1.24 U
Phenanthrene	5.02 U	5.02 U	5.07 U	2.56 U	2.56 U	2.56 U
Anthracene	4.39 U	4.39 U	4.43 U	2.24 U	2.74 (b)	2.24 U
Fluoranthene	10.5 U	10.5 U	10.6 U	5.36 U	5.76	5.92
Pyrene	8.95 U	8.95 U	9.05 U	4.57 U	4.57 U	4.57 U
Benzo(a)anthracene	4.54 (b)B	4.95 (b)B	4.65 (b)B	2.52 (b)B	2.57 (b)B	2.46 (b)B
Chrysene	4.45 U	4.45 U	4.49 U	2.27 U	2.27 U	2.27 U
Benzo(b)fluoranthene	6.41 (b)B	5.72 (b)B	6.18 (b)B	3.54	4.11 (b)B	4.35 (c)
Benzo(k)fluoranthene	3.27 U	3.93 (b)	3.31 U	2.09 (b)	1.67 U	1.67 U
Benzo(a)pyrene	2.92 U	2.93 U	2.96 U	1.49 U	1.49 U	1.49 U
Indeno(123-cd)pyrene	3.45 U	3.45 U	3.49 U	1.76 U	1.76 U	1.76 U
Dibenzo(a,h)anthracene	2.47 U	2.47 U	2.50 U	1.26 U	1.26 U	1.26 U
Benzo(g,h,i)perylene	2.75 U	2.75 U	2.78 U	1.40 U	1.40 U	1.48
<u>Surrogate Internal Standards (%)</u>						
d4 1,4-Dichlorobenzene	54	57	59	57	65	53
d8 Naphthalene	64	65	71	62	74	65
d10 Acenaphthene	67	66	76	64	73	69
d12 Chrysene	80	75	87	65	78	75
d14 Dibenzo(a,h,i)anthracene	83	77	91	76	89	87

TABLE F.8. (contd)

Treatment	C-SB	*DUP* C-SB	*TRIP* C-SB	*M. nasuta* Background	*M. nasuta* Background	*M. nasuta* Background
Replicate	5-1	5-2	5-3	1	2	3
Batch	2	2	2	7	7	7
Units	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	13.21%	13.21%	13.21%	15.16%	14.86%	14.87%
1,4-Dichlorobenzene	3.65 U	3.69 U	3.62 U	1.83 U	1.86 U	1.86 U
Naphthalene	3.65 U	3.69 U	3.62 U	2.31	2.51	3.18 (b)
Acenaphthylene	1.42 U	1.44 U	1.41 U	0.71 U	0.73 U	0.73 U
Acenaphthene	2.56 U	2.58 U	2.53 U	1.28 U	1.3 U	1.3 U
Fluorene	2.42 U	2.45 U	2.40 U	1.21 U	2.82 (b)	2.86 (b)
Phenanthrene	5.02 U	5.07 U	4.96 U	5.25	3.74	3.96
Anthracene	4.39 U	4.43 U	4.34 U	2.19 U	2.24 U	2.24 U
Fluoranthene	10.5 U	10.6 U	10.4 U	6.49 (b)	7.05 (b)	7.42 (b)
Pyrene	8.95 U	9.05 U	8.86 U	4.61 (b)	5.10	5.49
Benzo(a)anthracene	4.73	4.80 (b)B	4.53 (b)B	4.00 (b)	4.04 (b)	4.06 (b)
Chrysene	4.45 U	4.49 U	4.40 U	2.22 U	2.27 U	2.27 U
Benzo(b)fluoranthene	5.67	5.81 (b)	6.38	4.90	4.67 (b)	4.97 (b)
Benzo(k)fluoranthene	3.98	4.08 (b)	3.24 U	2.51 (b)	2.65 (b)	2.62 (b)
Benzo(a)pyrene	4.70	2.96 U	2.90 U	2.85 (b)	2.26 (b)	2.64 (b)
Indeno(123-cd)pyrene	3.45 U	3.49 U	3.42 U	3.31 (b)	3.48 (b)	3.44 (b)
Dibenzo(a,h)anthracene	2.47 U	2.50 U	2.45 U	1.24 U	1.26 U	1.26 U
Benzo(g,h,i)perylene	2.75 U	2.78 U	2.72 U	3.12 (b)	1.4 U	1.4 U
<u>Surrogate Internal Standards (%)</u>						
d4 1,4-Dichlorobenzene	58	59	53	11 (e)	45	31
d8 Naphthalene	67	67	61	18 (e)	59	44
d10 Acenaphthene	68	66	62	27 (e)	76	66
d12 Chrysene	68	63	63	70	75	75
d14 Dibenzo(a,h,i)anthracene	79	71	74	88	71	92

(a) U Undetected at or above given concentration.
(b) Ion ratio out or confirmation ion not detected.
(c) Benzo(b)fluoranthene is the sum of benzo(b)fluoranthene and benzo(k)fluoranthene. Benzo(k)fluoranthene is present but could not be quantified due to poor resolution.
(d) B Value is < 5 times concentration in blank.
(e) Outside quality control criteria (30-150%) for surrogate internal standards.

TABLE F.9. Polynuclear Aromatic Hydrocarbons (PAH) and 1,4-Dichlorobenzene (Dry Weight) in Tissue of *M. nasuta*

Treatment	COMP HU-A	COMP HU-A	COMP HU-A	COMP HU-A	COMP HU-A
Replicate	1	2	3	4	5
Batch	1	1	1	1	1
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	13.94%	13.78%	14.52%	17.28%	13.44%
1,4-Dichlorobenzene	13.3 U[(a)]	13.3 U	12.8 U	10.6 U	13.8 U
Naphthalene	24.0	25.2	40.2	27.8	35.0
Acenaphthylene	15.8 [(b)]	17.7 [(b)]	33.7	15.9 [(b)]	21.1
Acenaphthene	53.4	101	109	72.3	127
Fluorene	57.9	99.4	105	68.9	115
Phenanthrene	647	1060	1070	706	1080
Anthracene	307	465	491	323	485
Fluoranthene	1660	2290	2690	1890	2430
Pyrene	1990	2810	3220	2370	2950
Benzo(a)anthracene	1030	1320	1740	1100	1410
Chrysene	1110	1400	1920	1220	1490
Benzo(b)fluoranthene	621	798	1171	718	848
Benzo(k)fluoranthene	173	207	293	178	236
Benzo(a)pyrene	500	642	992	590	719
Indeno(123-cd)pyrene	99.7	118	202	111	135
Dibenzo(a,h)anthracene	30.3	33.2	51.6	30.5	36.5
Benzo(g,h,i)perylene	103	126	213	123	145

TABLE F.9. (contd)

Treatment	COMP HU-B	COMP HU-B	COMP HU-B	COMP HU-B	COMP HU-B
Replicate	1	2	3	4	5
Batch	1	1	1	1	1
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	0.1361	0.1499	0.1544	0.1228	0.157
1,4-Dichlorobenzene	13.2 U	12.2 U	12.0 U	14.9 U	11.8 U
Naphthalene	43.4	39.1	93.9	82.2	60.0
Acenaphthylene	14.4	15.3	25.0	21.4	20.9
Acenaphthene	213	135	337	306	318
Fluorene	276	193	436	386	408
Phenanthrene	1990	1570	2960	2480	2770
Anthracene	616	523	920	768	847
Fluoranthene	2340	2170	3400	2700	3450
Pyrene	2370	2220	3410	2740	3400
Benzo(a)anthracene	896	941	1370	1090	1340
Chrysene	867	914	1330	1080	1320
Benzo(b)fluoranthene	524	592	842	678	803
Benzo(k)fluoranthene	150	160	234	185	213
Benzo(a)pyrene	410	478	693	555	650
Indeno(123-cd)pyrene	78.6	88.7	135	107	118
Dibenzo(a,h)anthracene	22.3	24.5	35.8	29.9	32.7
Benzo(g,h,i)perylene	88.9	104	155	125	140

TABLE F.9. (contd)

Treatment	COMP HU-C	COMP HU-C	COMP HU-C	COMP HU-C	COMP HU-C
Replicate	1	2	3	4	5
Batch	2	2	1	2	2
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	13.61%	13.78%	12.44%	12.25%	18.19%
1,4-Dichlorobenzene	13.4 U	13.5 U	15.0 U	15.2 U	20.5 U
Naphthalene	26.0	32.8	29.4	36.1	23.3 (b)
Acenaphthylene	11.5 (b)	13.6 (b)	11.4 (b)	13.8 (b)	12.1 (b)
Acenaphthene	21.6 (b)	23.1	24.0	26.8	19.2 (b)
Fluorene	22.4	25.0	28.2	29.1	20.3
Phenanthrene	147	171	178	200	112
Anthracene	90.4	99.4	110	119	67.6
Fluoranthene	584	643	644	791	504
Pyrene	108	119	105	125	124
Benzo(a)anthracene	294	329	367	388	257
Chrysene	381	434	457	482	338
Benzo(b)fluoranthene	284	327	355	344	345
Benzo(k)fluoranthene	85.2	89.3	104	115	18.4 (c)
Benzo(a)pyrene	197	224	237	238	185
Indeno(123-cd)pyrene	55.0	67.3	66.4	68.3	51.5
Dibenzo(a,h)anthracene	15.9	18.8	19.3	19.8	16.1
Benzo(g,h,i)perylene	60.8	76.2	75.8	79.1	58.8

TABLE F.9. (contd)

Treatment	COMP HU-D	COMP HU-D	COMP HU-D	COMP HU-D	COMP HU-D
Replicate	1	2	3	4	5
Batch	3	3	3	3	3
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	0.1721	0.1388	0.1256	0.1349	0.1326
1,4-Dichlorobenzene	10.8 U	13.4 U	14.8 U	13.8 U	14.0 U
Naphthalene	17.4 (b)	30.0	26.3	23.3	30.2
Acenaphthylene	14.1 (b)	24.5	27.1 (b)	24.7 (b)	26.2
Acenaphthene	39.7	54.4	10.5	58.1	64.3
Fluorene	42.6	67.8	11.6	59.2	72.3
Phenanthrene	491	735	987	692	852
Anthracene	217	331	424	305	367
Fluoranthene	1490	2390	2990	2150	2700
Pyrene	1750	2610	3500	2510	3170
Benzo(a)anthracene	819	1270	1510	1200	1340
Chrysene	895	1400	1660	1330	1500
Benzo(b)fluoranthene	697	1100	1320	852	890
Benzo(k)fluoranthene	9.70 U	12.0 U	13.3 U	233	263
Benzo(a)pyrene	438	709	836	706	744
Indeno(123-cd)pyrene	84.3	141	158	144	145
Dibenzo(a,h)anthracene	22.0	37.1	42.1	36.8	37.7
Benzo(g,h,i)perylene	86.6	148	166	148	149

TABLE F.9. (contd)

Treatment	R-MUD	R-MUD	R-MUD	R-MUD	R-MUD
Replicate	1	2	3	4	5
Batch	2	3	2	3	2
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	14.08%	18.71%	13.02%	11.83%	20.96%
1,4-Dichlorobenzene	13.2 U	9.94 U	14.3 U	15.7 U	8.16 U
Naphthalene	13.2 U	9.94 U	14.3 U	15.7 U	8.92 (b)
Acenaphthylene	5.1 U	3.8 U	5.5 U	6.1 U	3.2 U
Acenaphthene	9.23 U	6.95 U	9.98 U	11.0 U	5.73 U
Fluorene	8.81 U	6.63 U	9.52 U	10.5 U	5.44 U
Phenanthrene	18.2 U	13.7 U	19.7 U	21.6 U	11.2 U
Anthracene	15.9 U	12.0 U	17.2 U	18.9 U	9.83 U
Fluoranthene	38.1 U	28.6 U	41.2 U	45.3 U	23.6 U
Pyrene	32.5 U	24.4 U	35.1 U	38.6 U	20.0 U
Benzo(a)anthracene	15.3 (b)B(d)	12.7 (b)B	21.0 (b)B	19.8 (b)B	10.5 (b)B
Chrysene	16.1 U	12.1 U	17.4 U	19.2 U	9.97 U
Benzo(b)fluoranthene	21.2 (b)	17.4 (b)B	31.8 (c)	24.9 (b)B	16.9
Benzo(k)fluoranthene	14.6 (b)	11.3 (b)	12.8 U	18.3 (b)	9.35
Benzo(a)pyrene	10.6 U	7.96 U	11.8 (b)	13.7 (b)	6.73
Indeno(123-cd)pyrene	12.5 U	9.41 U	13.5 U	14.9 U	7.73 U
Dibenzo(a,h)anthracene	8.95 U	6.73 U	9.68 U	10.7 U	5.53 U
Benzo(g,h,i)perylene	9.94 U	7.48 U	11.2 (b)	11.8 U	6.73 (b)

TABLE F.9. (contd)

Treatment Replicate Batch Units Percent Dry Weight	C-SB 1-1 3 ng/g 12.86%	C-SB 1-2 3 ng/g 12.86%	C-SB 1-3 3 ng/g 12.86%	C-SB 2 2 ng/g 12.45%	C-SB 3 3 ng/g 13.90%	C-SB 4 2 ng/g 13.16%
1,4-Dichlorobenzene	28.4 U	28.4 U	28.7 U	14.9 U	13.4 U	14.1 U
Naphthalene	28.4 U	28.4 U	28.7 U	14.9 U	13.4 U	14.1 U
Acenaphthylene	11.0 U	11.0 U	11.2 U	5.8 U	5.2 U	5.5 U
Acenaphthene	19.9 U	19.9 U	20.1 U	10.4 U	9.35 U	9.88 U
Fluorene	18.8 U	18.8 U	19.1 U	9.96 U	8.92 U	9.42 U
Phenanthrene	39.0 U	39.0 U	39.4 U	20.6 U	18.4 U	19.5 U
Anthracene	34.1 U	34.1 U	34.4 U	18.0 U	19.7 (b)	17.0 U
Fluoranthene	81.6 U	81.6 U	82.4 U	43.1 U	41.4	45.0
Pyrene	69.6 U	69.6 U	70.4 U	36.7 U	32.9 U	34.7 U
Benzo(a)anthracene	35.3 (b)B	38.5 (b)B	36.2 (b)B	20.2 (b)B	18.5 (b)B	18.7 (b)B
Chrysene	34.6 U	34.6 U	34.9 U	18.2 U	16.3 U	17.2 U
Benzo(b)fluoranthene	49.8 (b)B	44.5 (b)B	48.1 (b)B	28.4	29.6 (b)B	33.1 (c)
Benzo(k)fluoranthene	25.4 U	30.6 (b)	25.7 U	16.8 (b)	12.0 U	12.7 U
Benzo(a)pyrene	22.7 U	22.8 U	23.0 U	12.0 U	10.7 U	11.3 U
Indeno(123-cd)pyrene	26.8 U	26.8 U	27.1 U	14.1 U	12.7 U	13.4 U
Dibenzo(a,h)anthracene	19.2 U	19.2 U	19.4 U	10.1 U	9.06 U	9.57 U
Benzo(g,h,i)perylene	21.4 U	21.4 U	21.6 U	11.2 U	10.1 U	11.2

TABLE F.9. (contd)

Treatment Replicate Batch Units Percent Dry Weight	C-SB 5-1 2 ng/g 13.21%	C-SB 5-2 2 ng/g 13.21%	C-SB 5-3 2 ng/g 13.21%	*M. nasuta* Background 1 7 ng/g 15.16%	*M. nasuta* Background 2 7 ng/g 14.86%	*M. nasuta* Background 3 7 ng/g 14.87%
1,4-Dichlorobenzene	27.6 U	27.9 U	27.4 U	12.1 U	12.5 U	12.5 U
Naphthalene	27.6 U	27.9 U	27.4 U	15.2	16.9	21.4 (b)
Acenaphthylene	10.7 U	10.9 U	10.7 U	4.68 U	4.91 U	4.91 U
Acenaphthene	19.4 U	19.5 U	19.2 U	8.44 U	8.75 U	8.74 U
Fluorene	18.3 U	18.5 U	18.2 U	7.98 U	19.0 (b)	19.2 (b)
Phenanthrene	38.0 U	38.4 U	37.5 U	34.6	25.2	26.6
Anthracene	33.2 U	33.5 U	32.9 U	14.4 U	15.1 U	15.1 U
Fluoranthene	79.5 U	80.2 U	78.7 U	42.8 (b)	47.4 (b)	49.9 (b)
Pyrene	67.8 U	68.5 U	67.1 U	30.4 (b)	34.3	36.9
Benzo(a)anthracene	35.8	36.3 (b)B	34.3 (b)B	26.4 (b)	27.2 (b)	27.3 (b)
Chrysene	33.7 U	34.0 U	33.3 U	14.6 U	15.3 U	15.3 U
Benzo(b)fluoranthene	42.9	44.0 (b)	48.3	32.3	31.4 (b)	33.4 (b)
Benzo(k)fluoranthene	30.1	30.9 (b)	24.5 U	16.6 (b)	17.8 (b)	17.6 (b)
Benzo(a)pyrene	35.6	22.4 U	22.0 U	18.8 (b)	15.2 (b)	17.8 (b)
Indeno(123-cd)pyrene	26.1 U	26.4 U	25.9 U	21.8 (b)	23.4 (b)	23.1 (b)
Dibenzo(a,h)anthracene	18.7 U	18.9 U	18.5 U	8.18 U	8.48 U	8.47 U
Benzo(g,h,i)perylene	20.8 U	21.0 U	20.6 U	20.6 (b)	9.4 U	9.41 U

(a) U Undetected at or above given concentration.
(b) Ion ratio out or confirmation ion not detected.
(c) Benzo(b)fluoranthene is the sum of benzo(b)fluoranthene and benzo(k)fluoranthene. Benzo(k)fluoranthene is present but could not be quantified due to poor resolution.
(d) B Value is < 5 times concentration in blank.

TABLE F.10. Quality Control Summary for Polynuclear Aromatic Hydrocarbons (PAHs) and 1,4-Dichlorobenzene in Tissue of *M. nasuta* (Wet Weight)

Matrix Spike Results

		Matrix Spike		
Treatment	COMP PC	COMP PC(MS)		
Replicate	1	1		
Batch	7	7	Amount	
Wet Weight	20.84	20.18	Spiked	Percent
Units	ng/g	ng/g	ng/g	Recovery
1,4-Dichlorobenzene	1.79 U[a]	22.3	24.8	90
Naphthalene	3.19 [b]	30.6	24.8	111
Acenaphthylene	0.70 U	26.0	24.8	105
Acenaphthene	14.3	44.1	24.8	120
Fluorene	5.12 [b]	32.5	24.8	110
Phenanthrene	23.9	54.5	24.8	123 [c]
Anthracene	27.2	62.2	24.8	141 [c]
Fluoranthene	495	555	24.8	242 [c]
Pyrene	364	414	24.8	202 [c]
Benzo(a)anthracene	80.6	118	24.8	151 [c]
Chrysene	96.0	128	24.8	129 [c]
Benzo(b)fluoranthene	69.4	83.3	24.8	56
Benzo(k)fluoranthene	1.60 U	47.1	24.8	190 [c]
Benzo(a)pyrene	25.6	55.7	24.8	121 [c]
Indeno(123-cd)pyrene	9.45	34.9	24.8	103
Dibenzo(a,h)anthracene	2.97	30,9	24.8	113
Benzo(g,h,i)perylene	9.36	33.5	24.8	97
Surrogate Internal Standards (%)				
d4 1,4-Dichlorobenzene	49	57	NA[d]	NA
d8 Naphthalene	63	67	NA	NA
d10 Acenaphthene	73	74	NA	NA
d12 Chrysene	79	76	NA	NA
d14 Dibenzo(a,h,i)anthracene	96	93	NA	NA

TABLE F.10. (contd)

Matrix Spike Results

Treatment	COMP HU-A	*Matrix Spike* COMP HU-A(MS)		
Replicate	1	1		
Batch	1	1	Amount	
Wet Weight	20.12	20.12	Spiked	Percent
Units	ng/g	ng/g	ng/g	Recovery
1,4-Dichlorobenzene	1.86 U	37.1	37.8	98
Naphthalene	3.34	25.8	24.9	90
Acenaphthylene	2.20 (b)	24.4	24.9	89
Acenaphthene	7.45	31.8	24.9	98
Fluorene	8.07	31.9	24.9	96
Phenanthrene	90.2	112	24.9	92
Anthracene	42.8	68.2	24.9	102
Fluoranthene	232	251	24.9	76
Pyrene	278	291	24.9	52
Benzo(a)anthracene	144	167	24.9	92
Chrysene	155	173	24.9	72
Benzo(b)fluoranthene	86.6	110	24.9	94
Benzo(k)fluoranthene	24.1	49.8	24.9	103
Benzo(a)pyrene	69.7	94.1	24.9	98
Indeno(123-cd)pyrene	13.9	34.2	24.9	82
Dibenzo(a,h)anthracene	4.22	25.5	24.9	85
Benzo(g,h,i)perylene	14.4	34.8	24.9	82
Surrogate Internal Standards (%)				
d4 1,4-Dichlorobenzene	43	53	NA	NA
d8 Naphthalene	53	65	NA	NA
d10 Acenaphthene	62	69	NA	NA
d12 Chrysene	76	84	NA	NA
d14 Dibenzo(a,h,i)anthracene	84	95	NA	NA

TABLE F.10. (contd)

Analytical Replicate Results

Treatment	COMP PC	*Dup* COMP PC	*Trip* COMP PC	
Replicate	5-1	5-2	5-3	
Batch	7	7	7	
Wet Weight	16.10	16.99	17.88	
Units	ng/g	ng/g	ng/g	RSD%
1,4-Dichlorobenzene	2.31 U	2.20 U	2.09 U	NA
Naphthalene	4.65	4.68	4.39	3
Acenaphthylene	0.93 (b)	0.86 U	0.82 (b)	NA
Acenaphthene	20.2	18.4	17.5	7
Fluorene	6.90	6.56	5.99	7
Phenanthrene	34.0	30.5	28.1	10
Anthracene	36.7	34.0	30.8	9
Fluoranthene	627	587	533	8
Pyrene	453	425	383	8
Benzo(a)anthracene	106	96.8	85.5	11
Chrysene	122	112	99.5	10
Benzo(b)fluoranthene	69.3	81.1	57.6	17
Benzo(k)fluoranthene	17.6	1.97 U	13.7	NA
Benzo(a)pyrene	32.8	30.5	26.6	10
Indeno(123-cd)pyrene	12.2	11.4	10.1	9
Dibenzo(a,h)anthracene	3.88	3.64	3.25	9
Benzo(g,h,i)perylene	12.1	11.4	10.0	10
Surrogate Internal Standards (%)				
d4 1,4-Dichlorobenzene	62	68	50	NA
d8 Naphthalene	74	80	63	NA
d10 Acenaphthene	88	91	79	NA
d12 Chrysene	95	94	83	NA
d14 Dibenzo(a,h,i)anthracene	118	114	102	NA

TABLE F.10. (contd)

Analytical Replicate Results

Treatment	COMP EC-B	*Dup* COMP EC-B	*Trip* COMP EC-B	
Replicate	5-1	5-2	5-3	
Batch	1	1	1	
Wet Weight	10.04	10.02	10.11	
Units	ng/g	ng/g	ng/g	RSD%
1,4-Dichlorobenzene	3.73 U	3.73 U	3.73 U	NA
Naphthalene	5.99	4.80	5.64	11
Acenaphthylene	3.26 (b)	3.21 (b)	3.24 (b)	1
Acenaphthene	40.0	41.5	41.8	2
Fluorene	25.8	26.2	25.9	1
Phenanthrene	210	213	213	1
Anthracene	103	106	106	2
Fluoranthene	453	464	475	2
Pyrene	466	476	484	2
Benzo(a)anthracene	183	188	190	2
Chrysene	226	233	234	2
Benzo(b)fluoranthene	139	139	146	3
Benzo(k)fluoranthene	31.7	34.1	32.7	4
Benzo(a)pyrene	88.9	91.4	94.4	3
Indeno(123-cd)pyrene	22.2	22.3	22.9	2
Dibenzo(a,h)anthracene	4.77	5.06	5.17	4
Benzo(g,h,i)perylene	24.1	24.4	25.0	2
Surrogate Internal Standards (%)				
d4 1,4-Dichlorobenzene	44	52	53	NA
d8 Naphthalene	54	65	64	NA
d10 Acenaphthene	58	74	70	NA
d12 Chrysene	69	89	78	NA
d14 Dibenzo(a,h,i)anthracene	79	102	89	NA

TABLE F.10. (contd)

Analytical Replicate Results

Treatment	C-SB	*Dup* C-SB	*Trip* C-SB	
Replicate	5-1	5-2	5-3	
Batch	2	2	2	
Wet Weight	10.16	10.14	10.34	
Units	ng/g	ng/g	ng/g	RSD%
1,4-Dichlorobenzene	3.65 U	3.69 U	3.62 U	NA
Naphthalene	3.65 U	3.69 U	3.62 U	NA
Acenaphthylene	1.42 U	1.44 U	1.41 U	NA
Acenaphthene	2.56 U	2.58 U	2.53 U	NA
Fluorene	2.42 U	2.45 U	2.40 U	NA
Phenanthrene	5.02 U	5.07 U	4.96 U	NA
Anthracene	4.39 U	4.43 U	4.34 U	NA
Fluoranthene	10.5 U	10.6 U	10.4 U	NA
Pyrene	8.95 U	9.05 U	8.86 U	NA
Benzo(a)anthracene	4.73	4.80 (b)B(e)	4.53 (b)B	3
Chrysene	4.45 U	4.49 U	4.40 U	NA
Benzo(b)fluoranthene	5.67	5.81 (b)	6.38	7
Benzo(k)fluoranthene	3.98	4.08 (b)	3.24 U	NA
Benzo(a)pyrene	4.70	2.96 U	2.90 U	NA
Indeno(123-cd)pyrene	3.45 U	3.49 U	3.42 U	NA
Dibenzo(a,h)anthracene	2.47 U	2.50 U	2.45 U	NA
Benzo(g,h,i)perylene	2.75 U	2.78 U	2.72 U	NA
Surrogate Internal Standards (%)				
d4 1,4-Dichlorobenzene	58	59	53	NA
d8 Naphthalene	67	67	61	NA
d10 Acenaphthene	68	66	62	NA
d12 Chrysene	68	63	63	NA
d14 Dibenzo(a,h,i)anthracene	79	71	74	NA

TABLE F.10. (contd)

Analytical Replicate Results

Treatment	C-SB	*Dup* C-SB	*Trip* C-SB	
Replicate	1-1	1-2	1-3	
Batch	3	3	3	
Wet Weight	10.22	10.18	10.08	
Units	ng/g	ng/g	ng/g	RSD%
1,4-Dichlorobenzene	3.65 U	3.65 U	3.69 U	NA
Naphthalene	3.65 U	3.65 U	3.69 U	NA
Acenaphthylene	1.42 U	1.42 U	1.44 U	NA
Acenaphthene	2.56 U	2.56 U	2.58 U	NA
Fluorene	2.42 U	2.42 U	2.45 U	NA
Phenanthrene	5.02 U	5.02 U	5.07 U	NA
Anthracene	4.39 U	4.39 U	4.43 U	NA
Fluoranthene	10.5 U	10.5 U	10.6 U	NA
Pyrene	8.95 U	8.95 U	9.05 U	NA
Benzo(a)anthracene	4.54 (b)B	4.95 (b)B	4.65 (b)B	5
Chrysene	4.45 U	4.45 U	4.49 U	NA
Benzo(b)fluoranthene	6.41 (b)B	5.72 (b)B	6.18 (b)B	6
Benzo(k)fluoranthene	3.27 U	3.93 (b)	3.31 U	NA
Benzo(a)pyrene	2.92 U	2.93 U	2.96 U	NA
Indeno(123-cd)pyrene	3.45 U	3.45 U	3.49 U	NA
Dibenzo(a,h)anthracene	2.47 U	2.47 U	2.50 U	NA
Benzo(g,h,i)perylene	2.75 U	2.75 U	2.78 U	NA
Surrogate Internal Standards (%)				
d4 1,4-Dichlorobenzene	54	57	59	NA
d8 Naphthalene	64	65	71	NA
d10 Acenaphthene	67	66	76	NA
d12 Chrysene	80	75	87	NA
d14 Dibenzo(a,h,i)anthracene	83	77	91	NA

(a) U Undetected at or above given concentration.
(b) Ion ratio out or confirmation ion not detected.
(c) Outside quality control range (50-120%) for matrix spike recovery.
(d) NA Not applicable.
(e) B Value is less than 5 times concentration in associated blank.

TABLE F.11. Lipids in Tissue of *M. nasuta*

Sediment Treatment	Replicate	Sample Weight	% Dry Weight	% Lipids (wet weight)	% Lipids (dry weight)
Macoma Background	1	5.18	15.16	0.58	3.83
Macoma Background	2	5.07	14.86	0.59	3.97
Macoma Background	3	5.04	14.87	0.60	4.03

Appendix G

Nereis virens Tissues Chemical Analyses and Quality Assurance/Quality Control Data for Hudson River Project

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects-2

PARAMETER: Metals

LABORATORY: Battelle/Marine Sciences Laboratory, Sequim, Washington

MATRIX: Worm and Clam Tissue

QA/QC DATA QUALITY OBJECTIVES

	Reference Method	Range of Recovery	SRM Accuracy	Relative Precision	Detection Limit (μg/g dry wt)
Arsenic	ICP/MS	75-125%	≤20%	≤20%	1.0
Cadmium	ICP/MS	75-125%	≤20%	≤20%	0.1
Chromium	ICP/MS	75-125%	≤20%	≤20%	0.2
Copper	ICP/MS	75-125%	≤20%	≤20%	1.0
Lead	ICP/MS	75-125%	≤20%	≤20%	0.1
Mercury	CVAA	75-125%	≤20%	≤20%	0.02
Nickel	ICP/MS	75-125%	≤20%	≤20%	0.1
Silver	ICP/MS	75-125%	≤20%	≤20%	0.1
Zinc	ICP/MS	75-125%	≤20%	≤20%	1.0

METHOD

A total of nine (9) metals was analyzed for the New York Federal Projects-2 Program: silver (Ag), arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), nickel (Ni), lead (Pb) and zinc (Zn). Hg was analyzed using cold-vapor atomic absorption spectroscopy (CVAA) according to the method of Bloom and Crecelius (1983). The remaining metals were analyzed by inductively coupled plasma mass spectrometry (ICP/MS) following a procedure based on EPA Method 200.8 (EPA 1991).

To prepare tissue for analysis, samples were freeze-dried and blended in a Spex mixer-mill. Approximately 5 g of mixed sample was ground in a ceramic ball mill. For ICP/MS and CVAA analyses, 0.2- to 0.5-g aliquots of dried homogenous sample were digested using a mixture of nitric acid and hydrogen peroxide following EPA Method 200.3 (EPA 1991).

HOLDING TIMES

A total of 68 worm and 68 clam samples was received on 6/15/94 in good condition. Samples were logged into Battelle's log-in system, frozen to -80°C and subsequently freeze dried within approximately 7 days of sample receipt. Samples were analyzed within 180 days of collection. Worms and clams were digested in two separate batches. The following table summarizes the analysis dates:

Task	Clams	Worms
Sample Digestion	8/9/94	9/9/94
ICP-MS	9/15/94	10/6/94
CVAA-Hg	8/17-8/24/94	8/17-8/24/94

QA/QC SUMMARY METALS (continued)

DETECTION LIMITS Four aliquots of a background clam tissue were analyzed as four separate replicates. The standard deviation of these results were multiplied by 4.541 to determine a method detection limits (MDL). Target detection limits were exceeded for all metals except Ag, Cd and Hg.

METHOD BLANKS One procedural blank was analyzed per 20 samples. No metals were detected in the blanks above the MDLs.

MATRIX SPIKES One sample was spiked with all metals at a frequency of 1 per 20 samples. All recoveries were within the QC limits of 75% -125% with the exception of Ag in one spiked worm sample and Zn in three of the four spiked worm samples. Zn was spiked at a level near the level found in the native samples and, in one case, Zn was spiked at a level below that detected in the native sample and no recovery was calculated.

REPLICATES One sample was analyzed in triplicate at a frequency of 1 per 20 samples. Precision for triplicate analyses is reported by calculating the relative standard deviation (RSD) between the replicate results. Only the RSDs for Zn in one of the four replicated worm analyses exceeded the QC limits of ±20%. RSDs for the rest of the metals were within the QC limits.

SRMs Standard Reference Material (SRM), 1566a (Oyster tissue from the National Institute of Standards and Technology, NIST), was analyzed for all metals. Results for all metals were within ±20 % of mean certified value with the exception of Cr and Ni. Cr values were below the lower QC limit in two of the five SRMs analyzed with the clams and for three of the four SRMs analyzed with the worms. The SRM certified value for Cr (1.43 µg/g) is close to the detection limit (1.46 µg/g). Ni was also recovered below or above the control limits in some samples.

REFERENCES

Bloom, N. S., and E.A. Crecelius. 1983. "Determination of Mercury in Seawater at Sub-Nanogram per Liter Levels." *Mar. Chem.* 14:49-59.

EPA (U.S. Environmental Protection Agency). 1991 Methods for the Determination of Metals in Environmental Samples. EPA-600/4-91-010. Environmental Services Division, Monitoring Management Branch, Washington D.C.

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects-2

PARAMETER: Chlorinated Pesticides/PCB Congeners

LABORATORY: Battelle/Marine Sciences Laboratory, Sequim, Washington

MATRIX: Worm and Clam Tissue

QA/QC DATA QUALITY OBJECTIVES

Reference Method	Surrogate Recovery	Spike Recovery	Relative Precision	Detection Limit
GC/ECD	30-150%	50-120%	≤30%	0.4 ng/g wet wt.

SAMPLE CUSTODY A total of 68 worm and 68 clam samples was received on 6/15/94 in good condition. Samples were logged into Battelle's log-in system and stored frozen until extraction.

METHOD Tissues were homogenized wet using a stainless steel blade. An aliquot of tissue sample was extracted with methylene chloride using the roller technique under ambient conditions following a procedure which is based on methods used by the National Oceanic and Atmospheric Administration for its Status and Trends Program (Krahn et al. 1988). Samples were then cleaned using silica/alumina (5% deactivated) chromatography followed by HPLC cleanup (Krahn et al. 1988). Extracts were analyzed for 15 chlorinated pesticides and 22 PCB congeners using gas chromatography/electron capture detection (GC/ECD) following a procedure based on EPA Method 8080 (EPA 1986). The column used was a J&W DB-17 and the confirmatory column was a DB-1701, both capillary columns (30m x 0.25mm I.D.). All detections were quantitatively confirmed on the second column.

HOLDING TIMES Samples were extracted in seven batches. All extracts were analyzed by GC/ECD. The following summarizes the extraction and analysis dates:

Batch	Species	Extraction	Analysis
1	*M. nasuta*	7/28/94	9/9-9/12/94
2	*M. nasuta*	8/3/94	9/13-9/15/94
3	*M. nasuta*	8/17/94	9/23-9/25/94
4	*N. virens*	8/19/95	9/26-9/30/94
5	*N. virens*	8/26/94	9/8-9/11/94
6	*N. virens*	9/6/94	9/17-9/19/94
7	*M. nasuta/N. virens*	9/26/94	9/15-9/17-94
8	*M. nasuta* MDL study	10/10/94	10/25/94

DETECTION LIMITS Target detection limits of 0.4 ng/g wet weight were met for all pesticides and PCB congeners, with the exception of dieldrin, PCB 8 and PCB 18, and for the samples that were analyzed in triplicate. These elevated detection limits for the replicates were due to the limited amount of tissue available resulting in smaller aliquots used for extraction. Method detection limits (MDLs) reported were determined by multiplying the standard deviation of seven spiked replicates of clam tissue by the Student's t value (99 percentile). Actual pesticide MDLs ranged from approximately 0.1 to 1.1 ng/g wet weight and PCB congener MDLs ranged from approximately 0.1 to 0.9 ng/g wet weight, depending on the compound and the sample weight extracted. MDLs were reported corrected for individual sample wet weight extracted.

Method detection limit verification was performed by analyzing four replicates of a spiked clam sample and multiplying the standard deviation of the results by 3.5. All detection limits calculated in this way were below the target detection limit of 0.4 ng/g wet weight with the exception of 4,4'-DDD which had a DL of 0.467 ng/g.

METHOD BLANKS

One method blank was extracted with each extraction batch. No pesticides or PCBs were detected in any of the method blanks.

SURROGATES

Two compounds, PCB congeners 103 and 198, were added to all samples prior to extraction to assess the efficiency of the analysis. Sample surrogate recoveries were all within the QC guidelines of 30% - 150%, with the exception of one sample in Batch 3 and two samples in Batch 4. All of these incidents involved a high recovery of PCB 198. This was most likely due to matrix interferences with the internal Standard octachloronaphthalene (OCN) which is used to quantify the recovery of surrogate PCB 198. Since no sample data are corrected for the OCN, sample results should not be affected. One sample had low surrogate recoveries for both PCB 103 and 198. This sample was re-extracted once due to surrogate recoveries. Since the recoveries in the reextraction also exceeded control limits, the problem was determined to be matrix interferences and no additional extractions were performed. Sample results were quantified using the surrogate internal standard method.

MATRIX SPIKES

Ten out of the 15 pesticides and 5 of the 22 PCB congeners analyzed were spiked into one sample per extraction batch. Matrix spike recoveries were within the control limit range of 50-120% for all Pesticides and PCBs in Batches 1, 2, 3, 6 and 7 with the exception of PCB 138 in Batch six and three pesticides and 2 PCBs in Batch seven. In all cases, the recoveries were high and are most likely due to matrix interferences. Recoveries for the majority of pesticides and PCBs in Batches four and five exceeded control limits due to high native levels compared with the levels spiked. In most cases, the spiked concentrations were 2 to 10 times lower than the concentrations detected in the samples.

REPLICATES

One sample from each extraction batch was analyzed in triplicate. Precision was measured by calculating the relative standard deviation (RSD) between the replicate results. RSDs for all detectable values were below the target precision goal of ≤30% in Batches 1, 2, 3, 4 and 7. The RSD for Endosulfan Sulfate in Batch 5 was high due to comparison of very low concentrations, less than 1 ng/g in the replicates. RSDs for two pesticides and for two PCB congeners in Batch 6 were high due to matrix interferences associated with the first replicate sample.

QA/QC SUMMARY/PCBs and PESTICIDES (continued)

SRMs Not applicable.

MISCELLANEOUS All pesticide and PCB congener results are confirmed using a second dissimilar column. RPDs between the primary and confirmation values must be less than 75% to be considered a confirmed value.

REFERENCES

Krahn, M.M., C.A. Wigren, R.W. Pearce, L.K. Moore, R.G. Bogar, W.D. MacLeod, Jr., S-L Chan, and D.W. Brown. 1988. *New HPLC Cleanup and Revised Extraction Procedures for Organic Contaminants.* NOAA Technical Memorandum NMFS F/NWC-153. National Oceanic and Atmospheric Administration, National Marine Fisheries, Seattle, Washington.

EPA (U.S. Environmental Protection Agency). 1986. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.* SW-846. U.S. Document No. 955-001-00000, U.S. Environmental Protection Agency, Washington D.C.

QA/QC SUMMARY

PROGRAM: New York/New Jersey Federal Projects-2

PARAMETER: Polynuclear Aromatic Hydrocarbons (PAH) and 1,4-Dichlorobenzene

LABORATORY: Battelle/Marine Sciences Laboratory, Sequim, Washington

MATRIX: Clam and Worm Tissue

QA/QC DATA QUALITY OBJECTIVES

Reference Method	MS Recovery	Surrogate Recovery	SRM Accuracy	Relative Precision	Detection Limit (wet wt)
GC/MS/SIM	50-120%	30-150%	≤30%	≤30%	4 ng/g

SAMPLE CUSTODY A total of 68 worm and 68 clam samples was received on 6/15/94 in good condition. Samples were logged into Battelle's log-in system and stored frozen until extraction.

METHOD Tissue samples were extracted with methylene chloride using a roller under ambient conditions following a procedure which is based on methods used by the National Oceanic and Atmospheric Administration for its Status and Trends Program (Krahn et al. 1988). Samples were then cleaned using silica/alumina (5% deactivated) chromatography followed by HPLC cleanup.

Extracts were quantified using gas chromatography/mass spectrometry (GC/MS) in the selected ion mode (SIM) following a procedure based on EPA Method 8270 (EPA 1986).

HOLDING TIMES Samples were extracted in seven batches. All extracts were analyzed by GC/MS/SIM. The following summarizes the extraction and analysis dates:

Batch	Species	Extraction	Analysis
1	*M. nasuta*	7/28/94	9/9-9/12/94
2	*M. nasuta*	8/3/94	9/13-9/15/94
3	*M. nasuta*	8/17/94	9/23-9/25/94
4	*N. virens*	8/19/95	9/26-9/30/94
5	*N. virens*	8/26/94	9/8-9/11/94
6	*N. virens*	9/6/94	9/17-9/19/94
7	*M. nasuta/N. virens*	9/26/94	9/15-9/17-94
8	*M. nasuta* MDL study	10/10/94	10/25/94

DETECTION LIMITS Target detection limits of 4 ng/g wet weight were met for all PAH compounds except for fluoranthene and pyrene, which had method detection limits (MDL) between 4 and 6 ng/g wet weight. MDLs were determined by multiplying the standard deviation of seven spiked replicates of a background clam sample by the Student's t value (99 percentile). These MDLs were based on a wet weight of 20 g of tissue sample.

QA/QC SUMMARY/PAHs (continued)

Aliquots of samples that were analyzed in triplicate, used for spiking, or were re-extracted, were generally less than 20 g due to limited quantities of tissue available. Because MDLs reported are corrected for sample weight, the MDLs reported for these samples appear elevated and in some cases may exceed the target detection limit.

In addition a method detection limit verification study was performed, which consisted of analyzing four spiked aliquots of a background clam sample received with this project. The standard deviation of the results of these replicate analyses was multiplied by 3.5. Detection limits calculated in this way were all less than the target detection limit of 4 ng/g wet wt.

METHOD BLANKS

One method blank was extracted with each extraction batch. Benz[a]anthracene was detected in blanks from all batches and benzo[b]fluoranthene was detected in the blank from Batch 3. Two method blanks were analyzed with Batch 7 and in addition to benz[a]anthracene, three other compounds were detected in at least one of the two blanks; naphthalene, benzo[a]pyrene and indeno(123-cd)pyrene. All blank levels were less than three times the target MDL of 4 ng/g wet wt. Sample values that were less than five times the value of the method blank associated with that sample were flagged with a "B."

SURROGATES

Five isotopically labeled compounds were added prior to extraction to assess the efficiency of the method. These were d8-naphthalene, d10-acenaphthene, d12-chrysene, d14-dibenz[a,h]anthracene and d4-1,4 dichlorobenzene. Recoveries of all surrogates were within the quality control limits of 30% -150% with the exception of low recoveries for d4-1,4 dichlorobenzene in one sample from Batch 1 and Batch 4 and two samples in Batch seven. In addition, d8-naphthalene recovery was low in two samples in Batch seven.

MATRIX SPIKES

One sample from each batch was spiked with all PAH compounds. Matrix spike recoveries were generally, within QC limits of 50% -120%, with some exceptions. The recoveries for benzo(b)- and benzo[k]fluoranthene were variable due to the poor resolution of these two compounds. Spike recoveries quantified as the sum of these two compounds were within QC limits. Spike recoveries for a number of PAH compounds in Batches 4 and 7 were out of control due to high native levels, relative to the levels spiked. Spike concentrations were from 2 to 20 times lower than native concentrations. Recoveries for a number of compounds in Batches 4 and 6 were slightly above the upper control limit. These recoveries were all between 120% and 140%.

REPLICATES

One sample from each batch was extracted and analyzed in triplicate. Precision was measured by calculating the relative standard deviation (RSD) between the replicate results. All RSDs were within ±30%.

SRMs

Not applicable.

MISCELLANEOUS

Some of the compounds are flagged to indicate that the ion ratio for that compound was outside of the QC range. This is due primarily to low levels of the compound of interest. Because the confirmation ion is present at only a fraction of the level of the parent ion, when the native level of the compound is low, the amount of error in the concentration measurement of the confirmation ion goes up. The compound is actually quantified from the parent ion only, so most likely this will not affect the quality of the data. For sample values that are relatively high (>5 times the MDL) it may be an indication of some sort of interference.

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Table G.1. Metals in Tissue of *N. virens* (Wet Weight)

Sediment Treatment	Replicate	Batch	% Dry Weight	*N. virens* Metals (µg/g wet weight) Ag ICP/MS	As ICP/MS	Cd ICP/MS	Cr ICP/MS	Cu ICP/MS	Hg CVAF	Ni ICP/MS	Pb ICP/MS	Zn ICP/MS
COMP HU-A	1	1	14.80%	0.025 U[a]	2.00	0.062	0.216 U	1.49	0.010	0.195 U	0.349	8.52
COMP HU-A	2	1	13.05%	0.022 U	1.61	0.050	0.190 U	1.53	0.008	0.172 U	0.355	7.96
COMP HU-A	3	1	13.85%	0.026	1.86	0.059	0.215	1.50	0.012	0.190	0.353	8.23
COMP HU-A	4	1	13.42%	0.022 U	2.38	0.060	0.196 U	1.27	0.010	0.177 U	0.321	24.6
COMP HU-A	5-1	1	14.25%	0.024 U	2.32	0.081	0.208 U	1.62	0.010	0.188 U	0.405	14.1
COMP HU-A	5-2	1	14.25%	0.024 U	2.24	0.070	0.208 U	1.58	0.013	0.188 U	0.393	11.4
COMP HU-A	5-3	1	14.25%	0.024 U	2.21	0.076	0.208 U	1.51	0.010	0.188 U	0.385	16.7
COMP HU-B	1	1	14.51%	0.024 U	2.18	0.061	0.212 U	1.49	0.011	0.191 U	0.337	24.1
COMP HU-B	2	1	13.43%	0.024	1.81	0.058	0.211	1.54	0.012	0.223	0.364	30.9
COMP HU-B	3	1	14.17%	0.024 U	1.74	0.058	0.207 U	1.47	0.006	0.187 U	0.317	75.2
COMP HU-B	4	1	14.15%	0.023 U	1.88	0.083	0.206 U	2.76	0.009	0.186 U	0.531	13.6
COMP HU-B	5	1	15.61%	0.059	2.23	0.077	0.754	2.36	0.026	0.322	1.366	10.6
COMP HU-C	1	1	14.53%	0.024 U	1.63	0.052	0.212 U	1.38	0.010	0.191 U	0.334	19.9
COMP HU-C	2	1	14.77%	0.025 U	1.96	0.080	0.229	1.55	0.011	0.204	0.424	8.89
COMP HU-C	3	1	14.06%	0.023 U	2.15	0.056	0.205 U	1.20	0.006	0.185 U	0.281 U	8.63
COMP HU-C	4	1	14.77%	0.025 U	1.77	0.066	0.216 U	1.35	0.012	0.194 U	0.331	8.14
COMP HU-C	5	1	14.41%	0.024 U	1.95	0.058	0.210 U	1.50	0.009	0.190 U	0.337	9.11
COMP HU-D	1	1	17.59%	0.029 U	2.78	0.083	0.257 U	2.27	0.015	0.232 U	0.478	24.98
COMP HU-D	2	1	14.19%	0.024 U	1.82	0.053	0.207 U	1.52	0.011	0.187 U	0.338	21.85
COMP HU-D	3	1	13.35%	0.026	1.50	0.057	0.195 U	1.11	0.010	0.176 U	0.319	21.48
COMP HU-D	4	1	13.15%	0.023	1.62	0.063	0.192 U	1.81	0.010	0.173 U	0.497	30.77
COMP HU-D	5	1	15.15%	0.028	2.20	0.064	0.342	1.58	0.014	0.208	0.715	8.33
R-MUD	1	1	13.12%	0.022	1.86	0.063	0.191 U	1.64	0.011	0.173 U	0.321	8.46
R-MUD	2	1	14.94%	0.029	2.29	0.079	0.218 U	10.8	0.013	0.197 U	0.647	11.6
R-MUD	3	1	15.21%	0.025 U	2.18	0.053	0.222 U	1.11	0.010	0.200 U	0.304 U	10.4
R-MUD	4	1	14.00%	0.026	2.11	0.062	0.204 U	1.58	0.011	0.184 U	0.280 U	8.08
R-MUD	5	1	13.24%	0.022	1.91	0.053	0.193 U	1.34	0.015	0.174 U	0.297	17.7
C-NV	1	1	14.84%	0.025 U	2.37	0.056	0.217 U	1.23	0.011	0.195 U	0.297 U	7.73
C-NV	2	1	12.32%	0.020 U	1.71	0.048	0.180 U	1.02	0.010	0.162 U	0.247 U	27.1
C-NV	3	1	14.51%	0.024 U	2.02	0.077	0.212 U	1.51	0.016	0.191 U	0.315	8.20
C-NV	4	1	13.67%	0.023 U	2.16	0.062	0.199 U	1.35	0.012	0.180 U	0.325	16.4
C-NV	5	1	14.91%	0.025 U	2.03	0.085	0.218 U	1.76	0.014	0.196 U	0.416	9.87
N. virens Background	1	1	12.86%	0.021 U	1.84	0.051	0.247	1.61	0.011	0.240	0.257 U	9.75
N. virens Background	2	1	12.94%	0.021 U	2.02	0.045	0.189 U	1.24	0.016	0.170 U	0.259 U	8.14
N. virens Background	3	1	12.05%	0.020 U	1.57	0.055	0.180	1.78	0.018	0.172	0.241 U	9.97

(a) U Undetected at or above given concentration.

Table G.2. Metals in Tissue of *N. virens* (Dry Weight)

Sediment Treatment	Replicate	Batch	% Dry Weight	*N. virens* Metals (μg/g dry weight) Ag ICP/MS	As ICP/MS	Cd ICP/MS	Cr ICP/MS	Cu ICP/MS	Hg CVAF	Ni ICP/MS	Pb ICP/MS	Zn ICP/MS
COMP HU-A	1	1	14.80%	0.166 U[a]	13.5	0.419	1.46 U	10.1	0.065	1.32 U	2.36	57.6
COMP HU-A	2	1	13.05%	0.166 U	12.3	0.384	1.46 U	11.7	0.059	1.32 U	2.72	61.0
COMP HU-A	3	1	13.85%	0.191	13.4	0.428	1.55	10.8	0.087	1.37	2.55	59.4
COMP HU-A	4	1	13.42%	0.166 U	17.7	0.446	1.46 U	9.45	0.074	1.32 U	2.39	183
COMP HU-A	5-1	1	14.25%	0.166 U	16.3	0.568	1.46 U	11.4	0.071	1.32 U	2.84	98.9
COMP HU-A	5-2	1	14.25%	0.166 U	15.7	0.490	1.46 U	11.1	0.090	1.32 U	2.76	80.1
COMP HU-A	5-3	1	14.25%	0.166 U	15.5	0.536	1.46 U	10.6	0.069	1.32 U	2.70	117
COMP HU-B	1	1	14.51%	0.166 U	15.0	0.417	1.46 U	10.3	0.076	1.32 U	2.32	166
COMP HU-B	2	1	13.43%	0.176	13.5	0.430	1.57	11.5	0.088	1.66	2.71	230
COMP HU-B	3	1	14.17%	0.166 U	12.3	0.412	1.46 U	10.4	0.043	1.32 U	2.24	531
COMP HU-B	4	1	14.15%	0.166 U	13.3	0.586	1.46 U	19.5	0.067	1.32 U	3.75	96.0
COMP HU-B	5	1	15.61%	0.377	14.3	0.493	4.83	15.1	0.167	2.06	8.75	68.1
COMP HU-C	1	1	14.53%	0.166 U	11.2	0.360	1.46 U	9.52	0.068	1.32 U	2.30	137
COMP HU-C	2	1	14.77%	0.166 U	13.3	0.542	1.55	10.5	0.075	1.38	2.87	60.2
COMP HU-C	3	1	14.06%	0.166 U	15.3	0.396	1.46 U	8.52	0.042	1.32 U	2.00 U	61.4
COMP HU-C	4	1	14.77%	0.166 U	12.0	0.450	1.46 U	9.14	0.079	1.32 U	2.24	55.1
COMP HU-C	5	1	14.41%	0.166 U	13.5	0.404	1.46 U	10.4	0.062	1.32 U	2.34	63.2
COMP HU-D	1	1	17.59%	0.166 U	15.8	0.470	1.46 U	12.9	0.087	1.32 U	2.72	142
COMP HU-D	2	1	14.19%	0.166 U	12.8	0.373	1.46 U	10.7	0.074	1.32 U	2.38	154
COMP HU-D	3	1	13.35%	0.194	11.2	0.430	1.46 U	8.32	0.072	1.32 U	2.39	161
COMP HU-D	4	1	13.15%	0.175	12.3	0.478	1.46 U	13.8	0.077	1.32 U	3.78	234
COMP HU-D	5	1	15.15%	0.184	14.5	0.422	2.26	10.4	0.095	1.37	4.72	55.0
R-MUD	1	1	13.12%	0.168	14.2	0.478	1.46 U	12.5	0.086	1.32 U	2.45	64.5
R-MUD	2	1	14.94%	0.196	15.3	0.531	1.46 U	72.6	0.089	1.32 U	4.33	77.5
R-MUD	3	1	15.21%	0.166 U	14.3	0.347	1.46 U	7.27	0.067	1.32 U	2.00 U	68.3
R-MUD	4	1	14.00%	0.186	15.1	0.444	1.46 U	11.3	0.075	1.32 U	2.00 U	57.7
R-MUD	5	1	13.24%	0.166	14.4	0.397	1.46 U	10.1	0.116	1.32 U	2.24	134
C-NV	1	1	14.84%	0.166 U	16.0	0.376	1.46 U	8.26	0.074	1.32 U	2.00 U	52.1
C-NV	2	1	12.32%	0.166 U	13.9	0.387	1.46 U	8.28	0.082	1.32 U	2.00 U	220
C-NV	3	1	14.51%	0.166 U	13.9	0.530	1.46 U	10.4	0.112	1.32 U	2.17	56.5
C-NV	4	1	13.67%	0.166 U	15.8	0.454	1.46 U	9.86	0.086	1.32 U	2.38	120
C-NV	5	1	14.91%	0.166 U	13.6	0.573	1.46 U	11.8	0.097	1.32 U	2.79	66.2
N. virens Background	1	1	12.86%	0.166 U	14.3	0.398	1.92	12.5	0.089	1.87	2.00 U	75.8
N. virens Background	2	1	12.94%	0.166 U	15.6	0.349	1.46 U	9.58	0.120	1.32 U	2.00 U	62.9
N. virens Background	3	1	12.05%	0.166 U	13.0	0.459	1.49	14.8	0.148	1.43	2.00 U	82.7

(a) U Undetected at or above given concentration.

TABLE G.3. Quality Control Summary for Metals in Tissue of *N. virens*

Sediment Treatment	Replicate	Batch	Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Zn
			N. virens Metals (µg/g dry weight)								
Method Blanks											
Blank-1		1	0.166 U[a]	3.39 U	0.081 U	1.46 U	6.86 U	0.001 U	1.32 U	2.00 U	10.8 U
Blank-2		1	0.166 U	3.39 U	0.081 U	1.46 U	6.86 U	0.001 U	1.32 U	2.00 U	10.8 U
Blank-3		1	0.166 U	3.39 U	0.081 U	1.46 U	6.86 U	0.001 U	1.32 U	2.00 U	10.8 U
Blank-4		1	0.166 U	3.39 U	0.081 U	1.46 U	6.86 U	0.001 U	1.32 U	2.00 U	10.8 U
Matrix Spikes											
COMP BU	2	1	0.166 U	13.9	0.404	1.46 U	10.6	0.059	1.32 U	2.42	69
COMP BU, MS	2	1	1.90	61.6	4.34	9.63	57.6	1.02	10.3	6.66	183
Concentration Recovered			1.90	47.7	3.94	9.63	47.0	0.96	10.3	4.24	114.0
Amount Spiked			2.08	52.1	4.17	10.4	52.1	1.04	10.4	4.17	100
Percent Recovery			91%	92%	94%	93%	90%	92%	99%	102%	114%
COMP BU	4	1	0.191	14.3	0.385	1.46 U	8.4	0.068	1.32 U	2.19	93.8
COMP BU, MS	4	1	2.06	63.4	4.45	10.2	57.4	1.18	10.4	6.13	153
Concentration Recovered			1.87	49.1	4.07	10.2	49.0	1.11	10.4	4.75	59.2
Amount Spiked			2.08	52.1	4.17	10.4	52.1	1.04	10.4	4.17	100
Percent Recovery			90%	94%	97%	98%	94%	107%	100%	114%	59% [b]
COMP EC-A	3	1	0.178 U	14.7	0.476	1.46 U	10.2	0.059	1.32 U	2.79	NA [c]
COMP EC-A, MS	3	1	0.968	61.3	4.28	9.84	56.8	1.04	10.1	6.95	NA
Concentration Recovered			0.968	46.6	3.80	9.84	46.6	0.98	10.1	4.16	NA
Amount Spiked			2.08	52.1	4.17	10.4	52.1	1.04	10.4	4.17	NS [d]
Percent Recovery			47% [b]	89%	91%	95%	89%	94%	97%	100%	NA
COMP HU-A	5	1	0.173 U	15.8	0.5313	1.46 U	11.0	0.077	1.32 U	2.77	98.7
COMP HU-A, MS	5	1	1.91	63.8	4.56	9.78	58.7	1.05	10.3	7.13	160
Concentration Recovered			1.91	48.0	4.03	9.78	47.7	0.973	10.3	4.36	61.3
Amount Spiked			2.08	52.1	4.17	10.4	52.1	1.04	10.4	4.17	100
Percent Recovery			92%	92%	97%	94%	91%	94%	99%	105%	61% [b]

TABLE G.3. (contd)

Sed Code ID	Replicate	Batch	*N. virens* Metals (µg/g dry weight) Ag	As	Cd	Cr	Cu	Hg	Ni	Pb	Zn
Standard Reference Material											
Certified value			1.68	14.0	4.15	1.43	66.3	0.0642	2.25	0.371	830
Range			±0.15	±1.2	±0.38	±0.46	±4.3	±0.0067	±0.44	±0.014	±57
SRM 1566a	1	1	1.62	13.2	4.25	1.23	63.6	0.064	2.13	0.369	854
SRM 1566a	2	1	1.54	12.5	4.01	1.00	58.3	0.057	3.05	0.389	778
SRM 1566a	3	1	1.47	11.9	4.00	0.921	57.9	0.058	1.86	0.369	764
SRM 1566a	4	1	1.51	11.9	4.01	0.948	60.4	0.061	1.65	0.363	792
Percent Difference	1		4	6	2	14	4	0	5	1	3
Percent Difference	2		8	11	3	30 (e)	12	11	36 (e)	5	6
Percent Difference	3		13	15	4	36 (e)	13	10	17	1	8
Percent Difference	4		10	15	3	34 (e)	9	5	27 (e)	2	5
Analytical Replicates											
COMP BU, Replicate 1	4	1	0.195	14.4	0.388	1.459 U	8.30	0.065	1.32 U	2.18	60.2
COMP BU, Replicate 2	4	1	0.195	14.0	0.362	1.459 U	8.34	0.074	1.32 U	2.19	59.1
COMP BU, Replicate 3	4	1	0.182	14.6	0.404	1.459 U	8.55	0.066	1.32 U	2.19	162
RSD			4%	2%	6%	NA	2%	7%	NA	0%	63% (f)
COMP EC-A, Replicate 1	3	1	0.166 U	13.6	0.472	1.459 U	9.66	0.059	1.32 U	2.58	156
COMP EC-A, Replicate 2	3	1	0.166 U	15.4	0.466	1.459 U	10.8	0.061	1.32 U	2.88	155
COMP EC-A, Replicate 3	3	1	0.166 U	15.1	0.491	1.459 U	10.3	0.058	1.32 U	2.90	165
RSD			NA	7%	3%	NA	6%	3%	NA	6%	3%
COMP BU, Replicate 1	2	1	0.166 U	13.5	0.396	1.459 U	10.3	0.055	1.32 U	2.30	87.2
COMP BU, Replicate2	2	1	0.166 U	14.1	0.401	1.459 U	10.8	0.064	1.32 U	2.43	61.8
COMP BU, Replicate 3	2	1	0.166 U	14.0	0.416	1.459 U	10.7	0.058	1.32 U	2.54	58.1
RSD			NA	2%	3%	NA	2%	8%	NA	5%	23% (f)
COMP HU-A, Replicate 1	5	1	0.166 U	16.3	0.568	1.459 U	11.4	0.071	1.32 U	2.84	98.9
COMP HU-A, Replicate 2	5	1	0.166 U	15.7	0.490	1.459 U	11.1	0.090	1.32 U	2.76	80.1
COMP HU-A, Replicate 3	5	1	0.166 U	15.5	0.536	1.459 U	10.6	0.069	1.32 U	2.70	117
RSD			NA	3%	7%	NA	4%	15%	NA	3%	19%

(a) U Undetected at or above given concentration.
(b) Outside quality control criteria (75-125%) for matrix spike recovery.
(c) NA Not applicable.
(d) NS Not spiked.
(e) Outside quality control criteria (± 20%) for SRMs.
(f) Outside quality control criteria (±20%) for RSD.

TABLE G.4. Pesticides and PCB Congeners (Wet Weight) in Tissue of *N. virens*

						DUP	*TRIP*
Treatment	HU-A	HU-A	HU-A	HU-A	HU-A	HU-A	HU-A
Replicate	1	2	3	4	5-1	5-2	5-3
Batch	4	5	6	5	4	4	4
Units	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	14.8	13.05	13.85	13.42	14.25	14.25	14.25
Heptachlor	0.87	0.74	0.18 U[(a)]	0.19 U	1.02	0.89	1.00
Aldrin	3.41	1.16	1.59	1.50	3.64	3.48	3.65
Heptachlor Epoxide	0.13 U	0.13 U	0.52	0.13 U	0.18 U	0.19 U	0.19 U
2,4'-DDE	0.26 U	0.26 U	0.26 U	0.26 U	0.36 U	0.38 U	0.38 U
Endosulfan I	0.18 U	0.18 U	0.18 U	0.18 U	0.25 U	0.26 U	0.26 U
a-Chlordane	0.43	0.28	0.48	0.63	0.13 U	0.14 U	0.14 U
Trans Nonachlor	0.64	0.68	0.95	1.15	0.54	0.21 U	0.21 U
4,4'-DDE	6.47	4.13	5.89	5.84	6.42	6.41	6.43
Dieldrin	2.28	1.34	1.86	2.03	2.00	1.69	1.85
2,4'-DDD	2.76	1.25	2.11	2.46	0.93	1.12	1.38
2,4'-DDT	0.18 U	0.18 U	0.18 U	0.18 U	0.25 U	0.26 U	0.26 U
4,4'-DDD	11.5	4.90	6.73	7.82	6.97	6.32	6.62
Endosulfan II	0.18 U	0.18 U	0.18 U	0.18 U	0.25 U	0.26 U	0.26 U
4,4'-DDT	0.15 U	0.15 U	0.15 U	0.15 U	0.21 U	0.22 U	0.22 U
Endosulfan Sulfate	0.18 U	0.18 U	0.81	0.18 U	0.25 U	0.26 U	0.44
PCB 8	0.41 U	0.41 U	0.40 U	0.41 U	0.57 U	0.60 U	0.60 U
PCB 18	7.24	3.92	5.16	5.58	8.28	8.45	8.44
PCB 28	8.51	5.15	6.59	6.67	8.87	8.92	9.03
PCB 52	9.11	7.06	8.98	9.33	9.39	9.06	9.43
PCB 49	5.53	4.15	5.22	5.19	5.31	5.21	5.38
PCB 44	2.87	2.29	2.70	2.35	3.08	3.02	3.05
PCB 66	0.09 U	0.09 U	0.09 U	0.09 U	0.13 U	0.14 U	0.14 U
PCB 101	6.05	4.20	6.05	6.40	5.04	4.93	5.10
PCB 87	0.84	0.58	0.81	0.74	0.91	0.99	0.82
PCB 118	3.12	2.10	3.39	3.09	2.51	2.44	2.54
PCB 184	0.24 U	0.24 U	0.23 U	0.24 U	0.33 U	0.34 U	0.34 U
PCB 153	4.64	3.30	5.37	5.72	4.40	4.4	4.47
PCB 105	1.52	1.06	1.79	1.80	1.25	1.11	1.18
PCB 138	3.94	2.56	4.28	4.61	2.92	2.91	2.91
PCB 187	1.38	1.11	1.96	2.12	1.39	1.32	1.36
PCB 183	0.69	0.53	0.98	1.08	0.65	0.54	0.60
PCB 128	0.69	0.44	0.78	0.80	0.60	0.5	0.56
PCB 180	2.38	1.64	2.73	3.25	1.71	1.69	1.65
PCB 170	1.11	0.78	1.22	1.46	0.23 U	0.24 U	0.24 U
PCB 195	0.10 U	0.19	0.10 U	0.32	0.17	0.17	0.15 U
PCB 206	1.50	1.17	1.49	1.85	1.25	1.29	1.24
PCB 209	1.03	0.87	0.82	1.02	0.87	0.77	0.83
Surrogate Recoveries (%)							
PCB 103 (SIS)	69	87	83	85	75	74	66
PCB 198 (SIS)	122	82	78	86	116	115	102

TABLE G.4. (contd)

Treatment	HU-B	HU-B	HU-B	HU-B	HU-B
Replicate	1	2	3	4	5
Batch	4	6	4	6	6
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	14.51	13.43	14.17	14.15	15.61
Heptachlor	1.39	0.36 U	1.00	2.54	0.19 U
Aldrin	1.57	2.56	3.46	2.72	1.41
Heptachlor Epoxide	0.13 U	0.51	0.13 U	0.13 U	0.13 U
2,4'-DDE	0.26 U	0.50 U	0.26 U	0.26 U	0.26 U
Endosulfan I	0.18 U	0.35 U	0.18 U	0.18 U	0.18 U
a-Chlordane	0.84	1.16	0.38	1.76	0.65
Trans Nonachlor	0.83	1.65	0.83	1.86	1.12
4,4'-DDE	5.68	2.34	2.86	11.2	3.30
Dieldrin	2.56	0.99 U	1.36	0.51 U	2.01
2,4'-DDD	2.52	0.49 U	0.25 U	4.26	0.25 U
2,4'-DDT	0.18 U	0.34 U	0.18 U	0.18 U	0.18 U
4,4'-DDD	14.4	1.91	3.14	16.0	4.41
Endosulfan II	0.18 U	0.35 U	0.18 U	0.18 U	0.18 U
4,4'-DDT	0.15 U	0.29 U	0.15 U	0.15 U	0.15 U
Endosulfan Sulfate	0.18 U	0.35 U	0.18 U	1.27	0.18 U
PCB 8	0.41 U	0.41 U	0.41 U	0.40 U	0.41 U
PCB 18	11.8	9.99	4.68	21.5	9.11
PCB 28	14.5	14.4	6.70	29.6	13.2
PCB 52	17.0	18.3	9.13	35.8	16.1
PCB 49	10.0	10.9	5.26	20.9	9.71
PCB 44	6.29	5.96	2.62	12.2	4.19
PCB 66	14.3	13.4	0.09 U	22.9	13.1
PCB 101	10.6	9.99	5.29	15.8	8.37
PCB 87	1.71	1.32	1.50	5.60	0.90
PCB 118	5.18	6.15	2.39	11.4	5.00
PCB 184	0.24 U	0.24 U	0.24 U	0.23 U	0.24 U
PCB 153	6.10	7.64	3.72	12.5	6.22
PCB 105	2.52	3.16	1.41	4.85	2.60
PCB 138	5.36	6.62	2.93	10.5	5.31
PCB 187	1.79	2.50	1.25	3.99	2.08
PCB 183	0.90	1.26	0.59	2.03	1.00
PCB 128	1.05	1.21	0.61	2.03	1.02
PCB 180	3.21	3.64	2.04	5.36	2.95
PCB 170	1.55	1.68	1.07	2.71	1.37
PCB 195	0.31	0.10 U	0.22	0.10 U	0.10 U
PCB 206	1.85	2.21	1.59	3.37	1.76
PCB 209	0.92	0.73	0.83	1.37	0.83
Surrogate Recoveries (%)					
PCB 103 (SIS)	73	83	74	79	81
PCB 198 (SIS)	131	64	134	67	67

TABLE G.4. (contd)

Treatment	HU-C	HU-C	HU-C	HU-C	*DUP* HU-C	*TRIP* HU-C	HU-C
Replicate	1	2	3	4	4	4	5
Batch	7	5	6	6	6	6	5
Units	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	14.53	14.77	14.06	14.77	14.77	14.77	14.53
Heptachlor	0.28 U	1.61	2.29	2.50	2.43	2.33	1.67
Aldrin	1.77	1.03	2.20	2.42	2.25	2.29	1.61
Heptachlor Epoxide	0.20 U	0.13 U	0.13 U	0.15 U	0.15 U	0.16 U	0.13 U
2,4'-DDE	0.40 U	0.13 U	0.26 U	0.30 U	0.30 U	0.32 U	0.26 U
Endosulfan I	0.28 U	0.18 U	0.18 U	0.21 U	0.21 U	0.22 U	0.18 U
a-Chlordane	2.21	1.01	1.39	1.83	1.78	1.66	1.23
Trans Nonachlor	0.68	1.33	1.74	1.65	1.61	1.52	1.33
4,4'-DDE	3.87	4.13	5.96	16.8	7.50	6.89	4.75
Dieldrin	2.50	2.11	3.07	0.60 U	4.31	4.16	2.44
2,4'-DDD	0.39 U	0.25 U	0.25 U	7.71	7.61	7.11	2.31
2,4'-DDT	0.28 U	0.18 U	0.18 U	0.21 U	0.20 U	0.22 U	0.18 U
4,4'-DDD	4.66	4.93	6.29	26.0	22.5	21.3	4.78
Endosulfan II	0.28 U	0.18 U	0.18 U	0.21 U	0.21 U	0.22 U	0.18 U
4,4'-DDT	0.23 U	0.15 U	0.15 U	0.18 U	0.17 U	0.18 U	0.15 U
Endosulfan Sulfate	0.28 U	0.18 U	0.18 U	0.21 U	0.21 U	0.22 U	0.68
PCB 8	0.63 U	0.41 U	0.41 U	0.48 U	0.47 U	0.50 U	0.41 U
PCB 18	9.95	11.1	16.7	19.8	19.3	18.5	12.0
PCB 28	14.3	0.20 U	24.6	25.7	24.3	23.8	15.7
PCB 52	19.3	12.3	29.4	37.1	34.0	31.8	18.1
PCB 49	10.0	8.37	16.7	17.8	16.7	16.5	10.4
PCB 44	4.98	6.24	9.03	11.6	10.6	9.58	6.75
PCB 66	15.3	0.09 U	22.2	27.2	25.1	24.1	15.0
PCB 101	9.92	7.97	12.6	20.8	19.3	18.7	8.33
PCB 87	0.88	1.10	1.91	20.6	2.04	1.82	1.05
PCB 118	5.30	0.29 U	8.07	18.4	10.5	9.87	4.89
PCB 184	0.36 U	0.24 U	0.24 U	0.27 U	0.27 U	0.29 U	0.24 U
PCB 153	7.80	0.12 U	9.30	17.9	13.6	12.8	6.70
PCB 105	3.38	3.19	3.92	6.30	5.72	5.38	2.59
PCB 138	7.19	6.05	8.17	13.3	12.0	11.5	5.48
PCB 187	2.51	1.97	3.01	3.62	3.20	3.00	2.00
PCB 183	1.21	0.92	1.50	1.85	1.68	1.57	0.94
PCB 128	1.28	1.03	1.54	2.64	2.46	2.27	1.00
PCB 180	3.05	3.09	4.32	3.77	4.79	4.46	2.73
PCB 170	1.45	1.56	2.01	2.44	2.44	2.25	1.38
PCB 195	0.22	0.10 U	0.10 U	0.25	0.39	0.12 U	0.26
PCB 206	1.23	1.07	1.36	1.53	1.24	1.14	0.92
PCB 209	0.82	0.74	0.93	0.92	0.90	0.88	0.66
<u>Surrogate Recoveries (%)</u>							
PCB 103 (SIS)	64	47	84	89	82	88	86
PCB 198 (SIS)	68	48	70	81	67	70	76

TABLE G.4. (contd)

Treatment	HU-D	HU-D	HU-D	HU-D	HU-D
Replicate	1	2	3	4	5
Batch	7	5	5	5	4
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	17.59	14.19	13.35	13.15	15.15
Heptachlor	1.17	1.17	1.77	1.05	0.19 U
Aldrin	2.09	1.18	1.67	1.05	0.89
Heptachlor Epoxide	0.32 U	0.13 U	0.18 U	0.13 U	0.13 U
2,4'-DDE	0.63 U	0.26 U	0.36 U	0.26 U	0.26 U
Endosulfan I	0.44 U	0.18 U	0.25 U	0.18 U	0.18 U
a-Chlordane	0.23 U	0.60	1.08	0.41	0.29
Trans Nonachlor	0.35 U	0.76	1.42	0.60	0.45
4,4'-DDE	4.61	3.25	6.34	2.55	1.95
Dieldrin	2.20	1.94	3.52	1.61	1.39
2,4'-DDD	0.65	3.53	3.40	0.25 U	0.25 U
2,4'-DDT	0.43 U	0.18 U	0.25 U	0.18 U	0.18 U
4,4'-DDD	4.61	14.9	12.7	3.45	2.98
Endosulfan II	0.44 U	0.18 U	0.25 U	0.18 U	0.14
4,4'-DDT	0.37 U	0.15 U	0.21 U	2.16	0.15 U
Endosulfan Sulfate	0.74	0.18 U	0.25 U	0.91	0.18 U
PCB 8	0.99 U	0.41 U	0.57 U	0.41 U	0.41 U
PCB 18	11.1	8.61	15.0	8.77	8.09
PCB 28	13.8	9.40	16.8	9.37	8.02
PCB 52	15.0	13.0	18.2	11.7	9.98
PCB 49	9.53	7.36	12.0	7.04	5.57
PCB 44	6.63	4.58	8.16	4.08	2.69
PCB 66	11.6	0.09 U	15.9	0.09 U	0.09 U
PCB 101	7.06	9.34	9.78	5.50	4.38
PCB 87	1.48	1.09	1.63	0.70	0.57
PCB 118	3.91	5.93	4.91	2.86	2.04
PCB 184	0.57 U	0.24 U	0.33 U	0.24 U	0.24 U
PCB 153	4.86	7.14	6.74	3.95	3.56
PCB 105	1.61	2.90	2.67	1.27	1.06
PCB 138	4.19	6.96	6.08	3.12	2.65
PCB 187	0.31 U	1.51	2.08	1.13	1.01
PCB 183	0.57 U	0.77	0.98	0.51	0.43
PCB 128	0.70	1.36	1.14	0.49	0.45
PCB 180	1.55	2.47	3.23	1.63	1.31
PCB 170	0.40 U	1.31	1.56	0.75	0.17 U
PCB 195	0.24 U	0.10 U	0.32	0.10 U	0.12
PCB 206	0.27 U	1.18	1.72	1.11	1.01
PCB 209	0.74	0.63	0.64	0.60	0.53
Surrogate Recoveries (%)					
PCB 103 (SIS)	73	87	84	84	76
PCB 198 (SIS)	76	81	91	79	116

TABLE G.4. (contd)

Treatment	R-MUD	R-MUD	R-MUD	R-MUD	R-MUD
Replicate	1	2	3	4	5
Batch	4	5	6	7	6
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	13.12	14.94	15.21	14.00	13.24
Heptachlor	0.19 U	0.18 U	0.19 U	0.19 U	0.23 U
Aldrin	0.13 U	0.12 U	0.13 U	0.13 U	0.16 U
Heptachlor Epoxide	0.13 U	0.13 U	0.13 U	0.13 U	0.16 U
2,4'-DDE	0.26 U	0.26 U	0.26 U	0.26 U	0.32 U
Endosulfan I	0.18 U	0.18 U	0.18 U	0.18 U	0.22 U
a-Chlordane	0.10 U	0.09 U	0.10 U	0.10 U	0.12 U
Trans Nonachlor	0.43	0.61	0.67	0.39	0.61
4,4'-DDE	0.19 U	0.18 U	0.35	0.19 U	0.23 U
Dieldrin	0.94	0.71	0.52 U	0.66	0.64 U
2,4'-DDD	0.25 U	0.35	0.25 U	0.25 U	0.31 U
2,4'-DDT	0.18 U	0.18 U	0.18 U	0.18 U	0.22 U
4,4'-DDD	1.00	0.39	0.26 U	0.85	0.32 U
Endosulfan II	0.18 U	0.18 U	0.18 U	0.18 U	0.22 U
4,4'-DDT	0.15 U	0.15 U	0.15 U	0.15 U	0.19 U
Endosulfan Sulfate	0.18 U	0.18 U	0.18 U	0.18 U	0.22 U
PCB 8	0.41 U	0.40 U	0.41 U	0.41 U	0.51 U
PCB 18	0.43 U	0.42 U	0.43 U	0.43 U	0.53 U
PCB 28	0.20 U	0.20 U	0.20 U	0.20 U	0.25 U
PCB 52	0.36 U	0.35 U	0.43	0.36 U	0.64
PCB 49	0.24 U	0.23 U	0.24 U	0.24 U	0.29 U
PCB 44	0.17 U	0.16 U	0.17 U	0.17 U	0.20 U
PCB 66	0.09 U	0.09 U	0.09 U	0.09 U	0.12 U
PCB 101	0.15 U	0.81	0.44	0.45	0.54
PCB 87	0.16 U	0.16 U	0.23	0.16 U	0.20 U
PCB 118	0.29 U	0.29 U	0.29 U	0.29 U	0.37 U
PCB 184	0.24 U	0.23 U	0.24 U	0.24 U	0.29 U
PCB 153	1.76	2.35	2.20	2.08	1.66
PCB 105	0.11 U	0.11 U	0.24	0.28	0.27
PCB 138	0.92	1.44	1.17	1.36	1.03
PCB 187	0.38	0.53	0.60	0.58	0.43
PCB 183	0.24 U	0.24	0.24	0.24 U	0.29 U
PCB 128	0.19	0.22	0.20	0.20	0.90 U
PCB 180	0.45	0.69	0.60	0.56	0.59
PCB 170	0.17 U	0.37	0.33	0.27	0.34
PCB 195	0.10 U	0.10 U	0.10 U	0.10 U	0.12 U
PCB 206	0.30	0.23	0.23	0.11 U	0.31
PCB 209	0.16	0.15	0.16	0.17	0.15
Surrogate Recoveries (%)					
PCB 103 (SIS)	77	93	83	58	84
PCB 198 (SIS)	118	82	66	57	64

TABLE G.4. (contd)

Treatment	C-NV	C-NV	C-NV	C-NV	C-NV
Replicate	1	2	3	4	5
Batch	6	6	7	4	4
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	14.84	12.32	14.51	13.67	14.91
Heptachlor	0.19 U	0.19 U	0.31 U	0.19 U	0.19 U
Aldrin	0.13 U	0.13 U	0.21 U	0.80	0.13 U
Heptachlor Epoxide	0.13 U	0.13 U	0.22 U	0.13 U	0.13 U
2,4'-DDE	0.26 U	0.26 U	0.43 U	0.26 U	0.26 U
Endosulfan I	0.18 U	0.18 U	0.30 U	0.18 U	0.18 U
a-Chlordane	0.10 U	0.10 U	0.26	0.10 U	0.10 U
Trans Nonachlor	0.61	0.60	0.24 U	0.48	0.38
4,4'-DDE	0.22	0.29	0.31 U	0.47	0.19 U
Dieldrin	0.92	0.93	1.37	0.52 U	0.52 U
2,4'-DDD	0.42	0.40	3.25	1.67	0.25 U
2,4'-DDT	0.18 U	0.18 U	0.30 U	0.18 U	0.18 U
4,4'-DDD	0.71	0.83	10.5	5.21	0.26 U
Endosulfan II	0.18 U	0.18 U	0.30 U	0.18 U	0.18 U
4,4'-DDT	0.15 U	0.15 U	0.38	0.15 U	0.15 U
Endosulfan Sulfate	0.18 U	0.18 U	0.30 U	0.18 U	0.18 U
PCB 8	0.41 U	0.41 U	0.68 U	0.41 U	0.41 U
PCB 18	0.43 U	0.43 U	0.71 U	0.43 U	0.43 U
PCB 28	0.20 U	0.20 U	0.34 U	0.20 U	0.20 U
PCB 52	0.69	0.52	0.59 U	2.45	0.40
PCB 49	0.24 U	0.24 U	0.39 U	0.26	0.24 U
PCB 44	0.17 U	0.17 U	0.27 U	0.17 U	0.17 U
PCB 66	0.09 U	0.09 U	0.16 U	0.09 U	0.09 U
PCB 101	0.80	0.78	2.53	3.69	0.15 U
PCB 87	0.16 U	0.16 U	0.26 U	0.16 U	0.16 U
PCB 118	0.47	0.45	0.95	1.95	0.47
PCB 184	0.24 U	0.24 U	0.39 U	0.24 U	0.24 U
PCB 153	2.19	2.20	4.48	3.73	1.93
PCB 105	0.34	0.33	1.02	1.09	0.28
PCB 138	1.47	1.42	3.46	3.05	1.19
PCB 187	0.64	0.62	0.88	0.86	0.51
PCB 183	0.28	0.25	0.41	0.44	0.24 U
PCB 128	0.26	0.25	0.63	0.61	0.22
PCB 180	0.71	0.72	1.19	1.44	0.57
PCB 170	0.43	0.38	0.58	0.75	0.38
PCB 195	0.10 U	0.10 U	0.17 U	0.10 U	0.10 U
PCB 206	0.29	0.27	0.29	0.41	0.21
PCB 209	0.16	0.16	0.83	0.21	0.12
<u>Surrogate Recoveries (%)</u>					
PCB 103 (SIS)	83	87	81	71	41
PCB 198 (SIS)	68	69	84	124	63

TABLE G.4. (contd)

Treatment	*N. virens* Background	*N. virens* Background	*N. virens* Background
Replicate	1	2	3
Batch	7	7	7
Units	ng/g	ng/g	ng/g
Percent Dry Weight	12.86	12.94	12.05
Heptachlor	0.19 U	0.19 U	0.19 U
Aldrin	0.73	0.13 U	0.13 U
Heptachlor Epoxide	0.13 U	0.13 U	0.13 U
2,4'-DDE	0.26 U	0.26 U	0.26 U
Endosulfan I	0.18 U	0.18 U	0.18 U
a-Chlordane	0.10 U	0.10 U	0.10 U
Trans Nonachlor	0.44	0.15 U	0.46
4,4'-DDE	0.19 U	0.99	0.19 U
Dieldrin	0.52 U	1.01	0.65
2,4'-DDD	0.25 U	0.25 U	0.25 U
2,4'-DDT	0.18 U	0.18 U	0.18 U
4,4'-DDD	0.26 U	0.26 U	0.56
Endosulfan II	0.18 U	0.18 U	0.18 U
4,4'-DDT	0.18	0.15 U	0.15 U
Endosulfan Sulfate	0.18 U	0.18 U	0.18 U
PCB 8	0.41 U	0.41 U	0.41 U
PCB 18	0.43 U	0.43 U	0.43 U
PCB 28	0.21	0.20 U	0.20 U
PCB 52	0.36 U	0.36 U	0.36 U
PCB 49	0.24 U	0.24 U	0.24 U
PCB 44	0.17 U	0.17 U	0.17 U
PCB 66	0.73	0.09 U	0.55
PCB 101	0.58	0.45	0.44
PCB 87	0.16 U	0.62	0.16 U
PCB 118	0.29 U	0.29 U	0.29 U
PCB 184	0.24 U	0.24 U	0.24 U
PCB 153	2.24	1.97	1.72
PCB 105	0.26	0.23	0.25
PCB 138	1.60	1.35	1.19
PCB 187	0.63	0.54	0.41
PCB 183	0.24	0.24 U	0.24 U
PCB 128	0.24	0.20	0.17
PCB 180	0.49	0.43	0.43
PCB 170	0.17 U	0.21	0.19
PCB 195	0.10 U	0.10 U	0.10 U
PCB 206	0.11 U	0.11 U	0.11 U
PCB 209	0.10	0.09 U	0.09 U
Surrogate Recoveries (%)			
PCB 103 (SIS)	96	84	75
PCB 198 (SIS)	84	80	81

(a) U Undetected at or above given concentration.

TABLE G.5. Pesticides and PCB Congeners (Dry Weight) in Tissue of *N. virens*

						DUP	*TRIP*
Treatment	HU-A	HU-A	HU-A	HU-A	HU-A	HU-A	HU-A
Replicate	1	2	3	4	5-1	5-2	5-3
Batch	4	5	6	5	4	4	4
Units	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	14.8	13.05	13.85	13.42	14.25	14.25	14.25
Heptachlor	5.88	5.67	1.30 U[a]	1.42 U	7.16	6.25	7.02
Aldrin	23.04	8.89	11.48	11.18	25.54	24.42	25.61
Heptachlor Epoxide	0.88 U	1.00 U	3.75	0.97 U	1.26 U	1.33 U	1.33 U
2,4'-DDE	1.76 U	1.99 U	1.88 U	1.94 U	2.53 U	2.67 U	2.67 U
Endosulfan I	1.22 U	1.38 U	1.30 U	1.34 U	1.75 U	1.82 U	1.82 U
a-Chlordane	2.91	2.15	3.47	4.69	0.91 U	0.98 U	0.98 U
Trans Nonachlor	4.32	5.21	6.86	8.57	3.79	1.47 U	1.47 U
4,4'-DDE	43.72	31.65	42.53	43.52	45.05	44.98	45.12
Dieldrin	15.41	10.27	13.43	15.13	14.04	11.86	12.98
2,4'-DDD	18.65	9.58	15.23	18.33	6.53	7.86	9.68
2,4'-DDT	1.22 U	1.38 U	1.30 U	1.34 U	1.75 U	1.82 U	1.82 U
4,4'-DDD	77.70	37.55	48.59	58.27	48.91	44.35	46.46
Endosulfan II	1.22 U	1.38 U	1.30 U	1.34 U	1.75 U	1.82 U	1.82 U
4,4'-DDT	1.01 U	1.15 U	1.08 U	1.12 U	1.47 U	1.54 U	1.54 U
Endosulfan Sulfate	1.22 U	1.38 U	5.85	1.34 U	1.75 U	1.82 U	3.09
PCB 8	2.77 U	3.14 U	2.89 U	3.06 U	4.00 U	4.21 U	4.21 U
PCB 18	48.92	30.04	37.26	41.58	58.11	59.30	59.23
PCB 28	57.50	39.46	47.58	49.70	62.25	62.60	63.37
PCB 52	61.55	54.10	64.84	69.52	65.89	63.58	66.18
PCB 49	37.36	31.80	37.69	38.67	37.26	36.56	37.75
PCB 44	19.39	17.55	19.49	17.51	21.61	21.19	21.40
PCB 66	0.61 U	0.69 U	0.65 U	0.67 U	0.91 U	0.98 U	0.98 U
PCB 101	40.88	32.18	43.68	47.69	35.37	34.60	35.79
PCB 87	5.68	4.44	5.85	5.51	6.39	6.95	5.75
PCB 118	21.08	16.09	24.48	23.03	17.61	17.12	17.82
PCB 184	1.62 U	1.84 U	1.66 U	1.79 U	2.32 U	2.39 U	2.39 U
PCB 153	31.35	25.29	38.77	42.62	30.88	30.88	31.37
PCB 105	10.27	8.12	12.92	13.41	8.77	7.79	8.28
PCB 138	26.62	19.62	30.90	34.35	20.49	20.42	20.42
PCB 187	9.32	8.51	14.15	15.80	9.75	9.26	9.54
PCB 183	4.66	4.06	7.08	8.05	4.56	3.79	4.21
PCB 128	4.66	3.37	5.63	5.96	4.21	3.51	3.93
PCB 180	16.08	12.57	19.71	24.22	12.00	11.86	11.58
PCB 170	7.50	5.98	8.81	10.88	1.61 U	1.68 U	1.68 U
PCB 195	0.68 U	1.46	0.72 U	2.38	1.19	1.19	1.05 U
PCB 206	10.14	8.97	10.76	13.79	8.77	9.05	8.70
PCB 209	6.96	6.67	5.92	7.60	6.11	5.40	5.82

TABLE G.5. (contd)

Treatment	HU-B	HU-B	HU-B	HU-B	HU-B
Replicate	1	2	3	4	5
Batch	4	6	4	6	6
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	14.51	13.43	14.17	14.15	15.61
Heptachlor	9.58	2.68 U	7.06	17.95	1.22 U
Aldrin	10.82	19.06	24.42	19.22	9.03
Heptachlor Epoxide	0.90 U	3.80	0.92 U	0.92 U	0.83 U
2,4'-DDE	1.79 U	3.72 U	1.83 U	1.84 U	1.67 U
Endosulfan I	1.24 U	2.61 U	1.27 U	1.27 U	1.15 U
a-Chlordane	5.79	8.64	2.68	12.44	4.16
Trans Nonachlor	5.72	12.29	5.86	13.14	7.17
4,4'-DDE	39.15	17.42	20.18	79.15	21.14
Dieldrin	17.64	7.37 U	9.60	3.60 U	12.88
2,4'-DDD	17.37	3.65 U	1.76 U	30.11	1.60 U
2,4'-DDT	1.24 U	2.53 U	1.27 U	1.27 U	1.15 U
4,4'-DDD	99.24	14.22	22.16	113.07	28.25
Endosulfan II	1.24 U	2.61 U	1.27 U	1.27 U	1.15 U
4,4'-DDT	1.03 U	2.16 U	1.06 U	1.06 U	0.96 U
Endosulfan Sulfate	1.24 U	2.61 U	1.27 U	8.98	1.15 U
PCB 8	2.83 U	3.05 U	2.89 U	2.83 U	2.63 U
PCB 18	81.32	74.39	33.03	151.94	58.36
PCB 28	99.93	107.22	47.28	209.19	84.56
PCB 52	117.16	136.26	64.43	253.00	103.14
PCB 49	68.92	81.16	37.12	147.70	62.20
PCB 44	43.35	44.38	18.49	86.22	26.84
PCB 66	98.55	99.78	0.64 U	161.84	83.92
PCB 101	73.05	74.39	37.33	111.66	53.62
PCB 87	11.78	9.83	10.59	39.58	5.77
PCB 118	35.70	45.79	16.87	80.57	32.03
PCB 184	1.65 U	1.79 U	1.69 U	1.63 U	1.54 U
PCB 153	42.04	56.89	26.25	88.34	39.85
PCB 105	17.37	23.53	9.95	34.28	16.66
PCB 138	36.94	49.29	20.68	74.20	34.02
PCB 187	12.34	18.62	8.82	28.20	13.32
PCB 183	6.20	9.38	4.16	14.35	6.41
PCB 128	7.24	9.01	4.30	14.35	6.53
PCB 180	22.12	27.10	14.40	37.88	18.90
PCB 170	10.68	12.51	7.55	19.15	8.78
PCB 195	2.14	0.74 U	1.55	0.71 U	0.64 U
PCB 206	12.75	16.46	11.22	23.82	11.27
PCB 209	6.34	5.44	5.86	9.68	5.32

TABLE G.5. (contd)

Treatment	HU-C	HU-C	HU-C	HU-C	*DUP* HU-C	*TRIP* HU-C	HU-C
Replicate	1	2	3	4	4	4	5
Batch	7	5	6	6	6	6	5
Units	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	14.53	14.77	14.06	14.77	14.77	14.77	14.41
Heptachlor	1.93 U	10.90	16.29	16.93	16.45	15.78	11.59
Aldrin	12.18	6.97	15.65	16.38	15.23	15.50	11.17
Heptachlor Epoxide	1.38 U	0.88 U	0.92 U	1.02 U	1.02 U	1.08 U	0.90 U
2,4'-DDE	2.75 U	0.85 U	1.85 U	2.03 U	2.03 U	2.17 U	1.80 U
Endosulfan I	1.93 U	1.22 U	1.28 U	1.42 U	1.42 U	1.49 U	1.25 U
a-Chlordane	15.21	6.84	9.89	12.39	12.05	11.24	8.54
Trans Nonachlor	4.68	9.00	12.38	11.17	10.90	10.29	9.23
4,4'-DDE	26.63	27.96	42.39	113.74	50.78	46.65	32.96
Dieldrin	17.21	14.29	21.83	4.06 U	29.18	28.17	16.93
2,4'-DDD	2.68 U	1.69 U	1.78 U	52.20	51.52	48.14	16.03
2,4'-DDT	1.93 U	1.22 U	1.28 U	1.42 U	1.35 U	1.49 U	1.25 U
4,4'-DDD	32.07	33.38	44.74	176.03	152.34	144.21	33.17
Endosulfan II	1.93 U	1.22 U	1.28 U	1.42 U	1.42 U	1.49 U	1.25 U
4,4'-DDT	1.58 U	1.02 U	1.07 U	1.22 U	1.15 U	1.22 U	1.04 U
Endosulfan Sulfate	1.93 U	1.22 U	1.28 U	1.42 U	1.42 U	1.49 U	4.72
PCB 8	4.34 U	2.78 U	2.92 U	3.25 U	3.18 U	3.39 U	2.85 U
PCB 18	68.48	75.15	118.78	134.06	130.67	125.25	83.28
PCB 28	98.42	1.35 U	174.96	174.00	164.52	161.14	108.95
PCB 52	132.90	83.28	209.10	251.18	230.20	215.30	125.61
PCB 49	68.82	56.67	118.78	120.51	113.07	111.71	72.17
PCB 44	34.27	42.25	64.22	78.54	71.77	64.86	46.84
PCB 66	105.30	0.61 U	157.89	184.16	169.94	163.17	104.09
PCB 101	68.27	53.96	89.62	140.83	130.67	126.61	57.81
PCB 87	6.06	7.45	13.58	139.47	13.81	12.32	7.29
PCB 118	36.48	1.96 U	57.40	124.58	71.09	66.82	33.93
PCB 184	2.48 U	1.62 U	1.71 U	1.83 U	1.83 U	1.96 U	1.67 U
PCB 153	53.68	0.81 U	66.15	121.19	92.08	86.66	46.50
PCB 105	23.26	21.60	27.88	42.65	38.73	36.43	17.97
PCB 138	49.48	40.96	58.11	90.05	81.25	77.86	38.03
PCB 187	17.27	13.34	21.41	24.51	21.67	20.31	13.88
PCB 183	8.33	6.23	10.67	12.53	11.37	10.63	6.52
PCB 128	8.81	6.97	10.95	17.87	16.66	15.37	6.94
PCB 180	20.99	20.92	30.73	25.52	32.43	30.20	18.95
PCB 170	9.98	10.56	14.30	16.52	16.52	15.23	9.58
PCB 195	1.51	0.68 U	0.71 U	1.69	2.64	0.81 U	1.80
PCB 206	8.47	7.24	9.67	10.36	8.40	7.72	6.38
PCB 209	5.64	5.01	6.61	6.23	6.09	5.96	4.58

TABLE G.4. (contd)

Treatment	HU-D	HU-D	HU-D	HU-D	HU-D
Replicate	1	2	3	4	5
Batch	7	5	5	5	4
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	17.59	14.19	13.35	13.15	15.15
Heptachlor	1.17	1.17	1.77	1.05	0.19 U
Aldrin	2.09	1.18	1.67	1.05	0.89
Heptachlor Epoxide	0.32 U	0.13 U	0.18 U	0.13 U	0.13 U
2,4'-DDE	0.63 U	0.26 U	0.36 U	0.26 U	0.26 U
Endosulfan I	0.44 U	0.18 U	0.25 U	0.18 U	0.18 U
a-Chlordane	0.23 U	0.60	1.08	0.41	0.29
Trans Nonachlor	0.35 U	0.76	1.42	0.60	0.45
4,4'-DDE	4.61	3.25	6.34	2.55	1.95
Dieldrin	2.20	1.94	3.52	1.61	1.39
2,4'-DDD	0.65	3.53	3.40	0.25 U	0.25 U
2,4'-DDT	0.43 U	0.18 U	0.25 U	0.18 U	0.18 U
4,4'-DDD	4.61	14.9	12.7	3.45	2.98
Endosulfan II	0.44 U	0.18 U	0.25 U	0.18 U	0.14
4,4'-DDT	0.37 U	0.15 U	0.21 U	2.16	0.15 U
Endosulfan Sulfate	0.74	0.18 U	0.25 U	0.91	0.18 U
PCB 8	0.99 U	0.41 U	0.57 U	0.41 U	0.41 U
PCB 18	11.1	8.61	15.0	8.77	8.09
PCB 28	13.8	9.40	16.8	9.37	8.02
PCB 52	15.0	13.0	18.2	11.7	9.98
PCB 49	9.53	7.36	12.0	7.04	5.57
PCB 44	6.63	4.58	8.16	4.08	2.69
PCB 66	11.6	0.09 U	15.9	0.09 U	0.09 U
PCB 101	7.06	9.34	9.78	5.50	4.38
PCB 87	1.48	1.09	1.63	0.70	0.57
PCB 118	3.91	5.93	4.91	2.86	2.04
PCB 184	0.57 U	0.24 U	0.33 U	0.24 U	0.24 U
PCB 153	4.86	7.14	6.74	3.95	3.56
PCB 105	1.61	2.90	2.67	1.27	1.06
PCB 138	4.19	6.96	6.08	3.12	2.65
PCB 187	0.31 U	1.51	2.08	1.13	1.01
PCB 183	0.57 U	0.77	0.98	0.51	0.43
PCB 128	0.70	1.36	1.14	0.49	0.45
PCB 180	1.55	2.47	3.23	1.63	1.31
PCB 170	0.40 U	1.31	1.56	0.75	0.17 U
PCB 195	0.24 U	0.10 U	0.32	0.10 U	0.12
PCB 206	0.27 U	1.18	1.72	1.11	1.01
PCB 209	0.74	0.63	0.64	0.60	0.53
Surrogate Recoveries (%)					
PCB 103 (SIS)	73	87	84	84	76
PCB 198 (SIS)	76	81	91	79	116

TABLE G.5. (contd)

Treatment	R-MUD	R-MUD	R-MUD	R-MUD	R-MUD
Replicate	1	2	3	4	5
Batch	4	5	6	7	6
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	13.12	14.94	15.21	14.00	13.24
Heptachlor	1.45 U	1.20 U	1.25 U	1.36 U	1.74 U
Aldrin	0.99 U	0.80 U	0.85 U	0.93 U	1.21 U
Heptachlor Epoxide	0.99 U	0.87 U	0.85 U	0.93 U	1.21 U
2,4'-DDE	1.98 U	1.74 U	1.71 U	1.86 U	2.42 U
Endosulfan I	1.37 U	1.20 U	1.18 U	1.29 U	1.66 U
a-Chlordane	0.76 U	0.60 U	0.66 U	0.71 U	0.91 U
Trans Nonachlor	3.28	4.08	4.40	2.79	4.61
4,4'-DDE	1.45 U	1.20 U	2.30	1.36 U	1.74 U
Dieldrin	7.16	4.75	3.42 U	4.71	4.83 U
2,4'-DDD	1.91 U	2.34	1.64 U	1.79 U	2.34 U
2,4'-DDT	1.37 U	1.20 U	1.18 U	1.29 U	1.66 U
4,4'-DDD	7.62	2.61	1.71 U	6.07	2.42 U
Endosulfan II	1.37 U	1.20 U	1.18 U	1.29 U	1.66 U
4,4'-DDT	1.14 U	1.00 U	0.99 U	1.07 U	1.44 U
Endosulfan Sulfate	1.37 U	1.20 U	1.18 U	1.29 U	1.66 U
PCB 8	3.13 U	2.68 U	2.70 U	2.93 U	3.85 U
PCB 18	3.28 U	2.81 U	2.83 U	3.07 U	4.00 U
PCB 28	1.52 U	1.34 U	1.31 U	1.43 U	1.89 U
PCB 52	2.74 U	2.34 U	2.83	2.57 U	4.83
PCB 49	1.83 U	1.54 U	1.58 U	1.71 U	2.19 U
PCB 44	1.30 U	1.07 U	1.12 U	1.21 U	1.51 U
PCB 66	0.69 U	0.60 U	0.59 U	0.64 U	0.91 U
PCB 101	1.14 U	5.42	2.89	3.21	4.08
PCB 87	1.22 U	1.07 U	1.51	1.14 U	1.51 U
PCB 118	2.21 U	1.94 U	1.91 U	2.07 U	2.79 U
PCB 184	1.83 U	1.54 U	1.58 U	1.71 U	2.19 U
PCB 153	13.4	15.7	14.5	14.9	12.5
PCB 105	0.84 U	0.74 U	1.58	2.00	2.04
PCB 138	7.01	9.64	7.69	9.71	7.78
PCB 187	2.90	3.55	3.94	4.14	3.25
PCB 183	1.83 U	1.61	1.58	1.71 U	2.19 U
PCB 128	1.45	1.47	1.31	1.43	6.80 U
PCB 180	3.43	4.62	3.94	4.00	4.46
PCB 170	1.30 U	2.48	2.17	1.93	2.57
PCB 195	0.76 U	0.67 U	0.66 U	0.71 U	0.91 U
PCB 206	2.29	1.54	1.51	0.79 U	2.34
PCB 209	1.22	1.00	1.05	1.21	1.13

TABLE G.5. (contd)

Treatment	C-NV	C-NV	C-NV	C-NV	C-NV
Replicate	1	2	3	4	5
Batch	6	6	7	4	4
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	14.84	12.32	14.51	13.67	14.91
Heptachlor	1.3 U	1.5 U	2.1 U	1.4 U	1.3 U
Aldrin	0.88 U	1.1 U	1.4 U	5.9	0.87 U
Heptachlor Epoxide	0.88 U	1.1 U	1.5 U	1.0 U	0.87 U
2,4'-DDE	1.8 U	2.1 U	3.0 U	1.9 U	1.7 U
Endosulfan I	1.2 U	1.5 U	2.1 U	1.3 U	1.2 U
a-Chlordane	0.67 U	0.8 U	1.8	0.7 U	0.67 U
Trans Nonachlor	4.1	4.9	1.7 U	3.5	2.5
4,4'-DDE	1.5	2.4	2.1 U	3.4	1.3 U
Dieldrin	6.2	7.5	9.44	3.8 U	3.5 U
2,4'-DDD	2.8	3.2	22.4	12.2	1.7 U
2,4'-DDT	1.2 U	1.5 U	2.1 U	1.3 U	1.2 U
4,4'-DDD	4.8	6.7	72.6	38.1	1.7 U
Endosulfan II	1.2 U	1.5 U	2.1 U	1.3 U	1.2 U
4,4'-DDT	1.0 U	1.2 U	2.6	1.1 U	1.0 U
Endosulfan Sulfate	1.2 U	1.5 U	2.1 U	1.3 U	1.2 U
PCB 8	2.8 U	3.3 U	4.7 U	3.0 U	2.7 U
PCB 18	2.9 U	3.5 U	4.9 U	3.1 U	2.9 U
PCB 28	1.3 U	1.6 U	2.3 U	1.5 U	1.3 U
PCB 52	4.6	4.2	4.1 U	17.9	2.7
PCB 49	1.6 U	1.9 U	2.7 U	1.9	1.6 U
PCB 44	1.1 U	1.4 U	1.9 U	1.2 U	1.1 U
PCB 66	0.6 U	0.7 U	1.1 U	0.7 U	0.6 U
PCB 101	5.4	6.3	17.4	27.0	1.0 U
PCB 87	1.1 U	1.3 U	1.8 U	1.2 U	1.1 U
PCB 118	3.2	3.7	6.5	14.3	3.15
PCB 184	1.6 U	1.9 U	2.7 U	1.8 U	1.6 U
PCB 153	14.8	17.9	30.9	27.3	12.9
PCB 105	2.3	2.7	7.03	7.97	1.9
PCB 138	9.91	11.5	23.8	22.3	7.98
PCB 187	4.3	5.0	6.1	6.3	3.4
PCB 183	1.9	2.0	2.8	3.2	1.6 U
PCB 128	1.8	2.0	4.3	4.5	1.5
PCB 180	4.8	5.8	8.20	10.5	3.8
PCB 170	2.9	3.1	4.0	5.5	2.5
PCB 195	0.7 U	0.8 U	1.2 U	0.7 U	0.7 U
PCB 206	2.0	2.2	2.0	3.0	1.4
PCB 209	1.1	1.3	5.7	1.5	0.8

TABLE G.5. (contd)

Treatment	*N. virens* Background	*N. virens* Background	*N. virens* Background
Replicate	1	2	3
Batch	7	7	7
Units	ng/g	ng/g	ng/g
Percent Dry Weight	12.86	12.94	12.05
Heptachlor	1.5 U	1.5 U	1.6 U
Aldrin	5.7	1.0 U	1.1 U
Heptachlor Epoxide	1.0 U	1.0 U	1.1 U
2,4'-DDE	2.0 U	2.0 U	2.2 U
Endosulfan I	1.4 U	1.4 U	1.5 U
a-Chlordane	0.78 U	0.77 U	0.83 U
Trans Nonachlor	3.4	1.2 U	3.8
4,4'-DDE	1.5 U	7.7	1.6 U
Dieldrin	4.0 U	7.81	5.4
2,4'-DDD	1.9 U	1.9 U	2.1 U
2,4'-DDT	1.4 U	1.4 U	1.5 U
4,4'-DDD	2.0 U	2.0 U	4.6
Endosulfan II	1.4 U	1.4 U	1.5 U
4,4'-DDT	1.4	1.2 U	1.2 U
Endosulfan Sulfate	1.4 U	1.4 U	1.5 U
PCB 8	3.2 U	3.2 U	3.4 U
PCB 18	3.3 U	3.3 U	3.6 U
PCB 28	1.6	1.5 U	1.7 U
PCB 52	2.8 U	2.8 U	3.0 U
PCB 49	1.9 U	1.9 U	2.0 U
PCB 44	1.3 U	1.3 U	1.4 U
PCB 66	5.7	0.7 U	4.6
PCB 101	4.5	3.5	3.7
PCB 87	1.2 U	4.8	1.3 U
PCB 118	2.3 U	2.2 U	2.4 U
PCB 184	1.9 U	1.9 U	2.0 U
PCB 153	17.4	15.2	14.3
PCB 105	2.0	1.8	2.1
PCB 138	12.4	10.4	9.88
PCB 187	4.9	4.2	3.4
PCB 183	1.9	1.9 U	2.0 U
PCB 128	1.9	1.5	1.4
PCB 180	3.8	3.3	3.6
PCB 170	1.3 U	1.6	1.6
PCB 195	0.78 U	0.77 U	0.83 U
PCB 206	0.86 U	0.85 U	0.91 U
PCB 209	0.78	0.7 U	0.7 U

(a) U Undetected at or above given concentration.

TABLE G.6. Quality Control Summary for Pesticides and PCB Congeners in Tissue of *N. virens* (Wet Weight)

Blanks

Treatment	Blank	Blank	Blank	Blank
Replicate	1	1	1	1
Batch	4	5	6	7
Wet Wt.	NA	NA	NA	NA
Units	ng/g	ng/g	ng/g	ng/g
Heptachlor	0.20 U[a]	0.19 U	0.19 U	0.21 U
Aldrin	0.13 U	0.13 U	0.13 U	0.15 U
Heptachlor epoxide	0.14 U	0.14 U	0.14 U	0.15 U
2,4'-DDE	0.28 U	0.27 U	0.27 U	0.30 U
Endosulfan I	0.19 U	0.18 U	0.19 U	0.21 U
a-Chlordane	0.10 U	0.10 U	0.10 U	0.11 U
Trans Nonachlor	0.15 U	0.15 U	0.15 U	0.17 U
4,4'-DDE	0.20 U	1.90 U	0.20 U	0.22 U
Dieldrin	0.55 U	0.53 U	0.54 U	0.60 U
2,4'-DDD	0.27 U	0.26 U	0.26 U	0.29 U
2,4'-DDT	0.19 U	0.18 U	0.19 U	0.21 U
4,4'-DDD	0.28 U	0.27 U	0.27 U	0.30 U
Endosulfan II	0.19 U	0.18 U	0.19 U	0.21 U
4,4'-DDT	0.16 U	0.15 U	0.16 U	0.18 U
Endosulfan Sulfate	0.19 U	0.18 U	0.19 U	0.21 U
PCB 8	0.44 U	0.42 U	0.43 U	0.48 U
PCB 18	0.46 U	0.44 U	0.45 U	0.50 U
PCB 28	0.22 U	0.21 U	0.21 U	0.24 U
PCB 52	0.38 U	0.37 U	0.37 U	0.42 U
PCB 49	0.25 U	0.24 U	0.25 U	0.27 U
PCB 44	0.17 U	0.17 U	0.17 U	0.19 U
PCB 66	0.10 U	0.10 U	0.10 U	0.11 U
PCB 101	0.15 U	0.15 U	0.15 U	0.17 U
PCB 87	0.17 U	0.16 U	0.17 U	0.19 U
PCB 118	0.31 U	0.30 U	0.31 U	0.34 U
PCB 184	0.25 U	0.24 U	0.25 U	0.27 U
PCB 153	0.13 U	0.12 U	0.13 U	0.14 U
PCB 105	0.12 U	0.11 U	0.12 U	0.13 U
PCB 138	0.31 U	0.30 U	0.30 U	0.34 U
PCB 187	0.13 U	0.13 U	0.13 U	0.15 U
PCB 183	0.25 U	0.24 U	0.25 U	0.27 U
PCB 128	0.16 U	0.16 U	0.16 U	0.18 U
PCB 180	0.20 U	0.19 U	0.19 U	0.21 U
PCB 170	0.18 U	0.17 U	0.17 U	0.19 U
PCB 195	0.11 U	0.10 U	0.10 U	0.12 U
PCB 206	0.12 U	0.12 U	0.12 U	0.13 U
PCB 209	0.10 U	0.10 U	0.10 U	0.11 U
Surrogate Recoveries (%)				
PCB 103 (SIS)	68	82	86	104
PCB 198 (SIS)	106	79	79	110

TABLE G.6. (contd)

Matrix Spike Results

Treatment	COMP SB-A	*Matrix Spike* COMP SB-A			COMP EC-A	*Matrix Spike* COMP EC-A		
Replicate	1	1			1	1		
Batch	4	4	Amount	Percent	5	5	Amount	Percent
Wet Wt.	20.08	20.02	Spiked	Recovery	20.08	20.05	Spiked	Recovery
Units	ng/g	ng/g	ng/g		ng/g	ng/g	ng/g	
Heptachlor	1.39	2.45	2.50	42 (b)	0.19 U	3.10	2.50	124 (b)
Aldrin	1.57	3.16	2.50	64	2.08	2.72	2.50	116
Heptachlor epoxide	0.13 U	2.10	2.50	84	0.13 U	2.33	2.50	93
2,4'-DDE	0.26 U	NA (c)	NS (d)	NA	0.26 U	NA	NS	NA
Endosulfan I	0.18 U	1.96	2.50	78	0.18 U	2.23	2.50	89
a-Chlordane	0.84	NA	NS	NA	1.29	NA	NS	NA
Trans Nonachlor	0.83	NA	NS	NA	1.40	NA	NS	NA
4,4'-DDE	5.68	8.14	2.50	98	2.68	7.38	2.50	188 (b)
Dieldrin	2.56	4.63	2.50	83	1.58	6.23	2.50	186 (b)
2,4'-DDD	2.52	NA	NS	NA	0.25 U	NA	NS	NA
2,4'-DDT	0.18 U	NA	NS	NA	0.18 U	NA	NS	NA
4,4'-DDD	14.4	19.3	2.50	196 (b)	2.16	13.2	2.50	442 (b)
Endosulfan II	0.18 U	1.50	2.50	60	0.18 U	1.52	2.50	61
4,4'-DDT	0.15 U	2.59	2.50	104	0.15 U	2.55	2.50	102
Endosulfan Sulfate	0.18 U	1.95	2.50	78	0.18 U	1.72	2.50	69
PCB 8	0.41 U	NA	NS	NA	0.41 U	NA	NS	NA
PCB 18	11.8	NA	NS	NA	1.58	NA	NS	NA
PCB 28	14.5	21.1	3.18	208 (b)	3.24	9.65	3.18	202 (b)
PCB 52	17.0	30.4	6.65	202 (b)	5.08	19.5	6.65	217 (b)
PCB 49	10.0	NA	NS	NA	3.10	NA	NS	NA
PCB 44	6.29	NA	NS	NA	1.28	NA	NS	NA
PCB 66	14.3	NA	NS	NA	0.09 U	NA	NS	NA
PCB 101	10.6	17.7	4.51	157 (b)	5.24	18.2	4.51	287 (b)
PCB 87	1.71	NA	NS	NA	0.48	6.62	5.70	108
PCB 118	5.18	NA	NS	NA	2.84	NA	NS	NA
PCB 184	0.24 U	NA	NS	NA	0.24 U	NA	NS	NA
PCB 153	6.10	9.64	2.64	134 (b)	5.61	12.0	2.64	242 (b)
PCB 105	2.52	NS	NS	NS	1.33	NS	NS	NS
PCB 138	5.36	9.10	2.04	183 (b)	4.40	14.6	2.04	500 (b)
PCB 187	1.79	NA	NS	NA	1.56	NA	NS	NA
PCB 183	0.90	NA	NS	NA	0.74	NA	NS	NA
PCB 128	1.05	NA	NS	NA	0.69	NA	NS	NA
PCB 180	3.21	NA	NS	NA	2.34	NA	NS	NA
PCB 170	1.55	NA	NS	NA	1.13	NA	NS	NA
PCB 195	0.31	NA	NS	NA	0.10 U	NA	NS	NA
PCB 206	1.85	NA	NS	NA	0.50	NA	NS	NA
PCB 209	0.92	NA	NS	NA	0.21	NA	NS	NA
Surrogate Recoveries (%)								
PCB 103 (SIS)	73	49	NA	NA	86	94	NA	NA
PCB 198 (SIS)	131	83	NA	NA	78	87	NA	NA

TABLE G.6. (contd)

Matrix Spike Results

Treatment	C-NV	*Matrix Spike* C-NV			COMP HU-C	*Matrix Spike* COMP HU-C		
Replicate	2	2			1	1		
Batch	6	6			7	7		
Wet Wt.	20.08	20.17	Amount	Percent	12.96	12.71	Amount Spiked	Percent
Units	ng/g	ng/g	Spiked	Recovery	ng/g	ng/g	ng/g	Recovery
Heptachlor	0.19 U	2.71	2.50	108	0.28 U	4.76	3.95	121 (b)
Aldrin	0.13 U	2.23	2.50	89	1.77	4.88	3.95	79
Heptachlor epoxide	0.13 U	2.48	2.50	99	0.20 U	3.45	3.95	87
2,4'-DDE	0.26 U	NA	NS	NA	0.40 U	NA	NS	NA
Endosulfan I	0.18 U	2.40	2.50	96	0.28 U	2.93	3.95	74
a-Chlordane	0.10 U	NA	NS	NA	2.21	NA	NS	NA
Trans Nonachlor	0.60	NA	NS	NA	0.68	NA	NS	NA
4,4'-DDE	0.29	2.11	2.50	73	3.87	7.30	3.95	87
Dieldrin	0.93	2.96	2.50	81	2.50	6.10	3.95	91
2,4'-DDD	0.40	NA	NS	NA	0.39 U	NA	NS	NA
2,4'-DDT	0.18 U	NA	NS	NA	0.28 U	NA	NS	NA
4,4'-DDD	0.83	3.5	2.50	105	4.66	10.1	3.95	138
Endosulfan II	0.18 U	1.71	2.50	68	0.28 U	3.00	3.95	76
4,4'-DDT	0.15 U	2.31	2.50	92	0.23 U	4.23	3.95	107
Endosulfan Sulfate	0.18 U	2.23	2.50	89	0.28 U	3.71	3.95	94
PCB 8	0.41 U	NA	NS	NA	0.63 U	NA	NS	NA
PCB 18	0.43 U	NA	NS	NA	9.95	NA	NS	NA
PCB 28	0.20 U	3.98	3.19	118	14.30	21.78	5.04	148 (b)
PCB 52	0.52	7.4	6.65	104	19.31	31.6	10.51	117
PCB 49	0.24 U	NA	NS	NA	10.00	NA	NS	NA
PCB 44	0.17 U	NA	NS	NA	4.98	NA	NS	NA
PCB 66	0.09 U	NA	NS	NA	15.27	NA	NS	NA
PCB 101	0.78	5.7	4.51	109	9.92	19.7	7.13	137 (b)
PCB 87	0.16 U	NA	NS	NA	0.88	NA	NS	NA
PCB 118	0.45	NA	NS	NA	5.30	NA	NS	NA
PCB 184	0.24 U	NA	NS	NA	0.36 U	NA	NS	NA
PCB 153	2.20	4.5	2.64	88	7.80	11.3	4.17	83
PCB 105	0.33	NA	NS	NA	3.38	NA	NS	NA
PCB 138	1.42	5.6	2.04	202 (b)	7.19	10.4	3.22	99
PCB 187	0.62	NA	NS	NA	2.51	NA	NS	NA
PCB 183	0.25	NA	NS	NA	1.21	NA	NS	NA
PCB 128	0.25	NA	NS	NA	1.28	NA	NS	NA
PCB 180	0.72	NA	NS	NA	3.05	NA	NS	NA
PCB 170	0.38	NA	NS	NA	1.45	NA	NS	NA
PCB 195	0.10 U	NA	NS	NA	0.22	NA	NS	NA
PCB 206	0.27	NA	NS	NA	1.23	NA	NS	NA
PCB 209	0.16	NA	NS	NA	0.82	NA	NS	NA
Surrogate Recoveries (%)								
PCB 103 (SIS)	87	83	NA	NA	64	77	NA	NA
PCB 198 (SIS)	69	61	NA	NA	68	80	NA	NA

TABLE G.6. (contd)

Analytical Replicate Results

Treatment	COMP HU-A	*DUP* COMP HU-A	*TRIP* COMP HU-A		COMP SB-B	*DUP* COMP SB-B	*TRIP* COMP SB-B	
Replicate	5	5	5		2	2	2	
Batch	4	4	4		5	5	5	
Wet Wt.	14.57	13.76	13.79		17.11	17.25	17.13	
Units	ng/g	ng/g	ng/g	RSD%	ng/g	ng/g	ng/g	RSD%
Heptachlor	1.02	0.89	1.00	7	0.21 U	0.21 U	0.21 U	NA
Aldrin	3.64	3.48	3.65	3	1.67	1.72	1.64	2
Heptachlor epoxide	0.18 U	0.19 U	0.19 U	NA	0.15 U	0.24	0.15 U	NA
2,4'-DDE	0.36 U	0.38 U	0.38 U	NA	0.3 U	0.3 U	0.3 U	NA
Endosulfan I	0.25 U	0.26 U	0.26 U	NA	0.21 U	0.21 U	0.21 U	NA
a-Chlordane	0.13 U	0.14 U	0.14 U	NA	0.8	0.89	0.85	5
Trans Nonachlor	0.54	0.21 U	0.21 U	NA	0.86	0.96	0.94	6
4,4'-DDE	6.42	6.41	6.43	0	1.9	2.05	1.95	4
Dieldrin	2.00	1.69	1.85	8	1.80	1.9	1.81	3
2,4'-DDD	0.93	1.12	1.38	20	5.42	5.91	5.86	5
2,4'-DDT	0.25 U	0.26 U	0.26 U	NA	0.21 U	0.21 U	0.21 U	NA
4,4'-DDD	6.97	6.32	6.62	5	10.30	11.7	12	8
Endosulfan II	0.25 U	0.26 U	0.26 U	NA	0.21 U	0.21 U	0.21 U	NA
4,4'-DDT	0.21 U	0.22 U	0.22 U	NA	0.18 U	2.33	0.18 U	NA
Endosulfan Sulfate	0.25 U	0.26 U	0.44	34 (e)	0.65	0.45	0.3	38 (e)
PCB 8	0.57 U	0.60 U	0.60 U	NA	0.48 U	0.48 U	0.48 U	NA
PCB 18	8.28	8.45	8.44	1	1.18	1.34	1.21	7
PCB 28	8.87	8.92	9.03	1	2.39	2.46	2.30	3
PCB 52	9.39	9.06	9.43	2	4.22	4.32	3.85	6
PCB 49	5.31	5.21	5.38	2	2.23	2.27	2.07	5
PCB 44	3.08	3.02	3.05	1	0.79	0.86	0.86	5
PCB 66	0.13 U	0.14 U	0.14 U	NA	0.11 U	0.11 U	0.11 U	NA
PCB 101	5.04	4.93	5.10	2	4.37	4.52	4.09	5
PCB 87	0.91	0.99	0.82	9	0.19 U	0.28	0.33	27
PCB 118	2.51	2.44	2.54	2	2.79	2.72	2.23	12
PCB 184	0.33 U	0.34 U	0.34 U	NA	0.27 U	0.27 U	0.27 U	NA
PCB 153	4.40	4.40	4.47	1	5.28	5.19	4.11	13
PCB 105	1.25	1.11	1.18	6	1.42	1.41	1.16	11
PCB 138	2.92	2.91	2.91	0	4.06	4.1	3.41	10
PCB 187	1.39	1.32	1.36	3	1.32	1.29	1.03	13
PCB 183	0.65	0.54	0.60	9	0.62	0.6	0.48	13
PCB 128	0.60	0.50	0.56	9	0.69	0.69	0.56	12
PCB 180	1.71	1.69	1.65	2	1.94	2.01	1.78	6
PCB 170	0.23 U	0.24 U	0.24 U	NA	0.98	1.01	0.88	7
PCB 195	0.17	0.17	0.15 U	NA	0.17	0.12 U	0.12 U	NA
PCB 206	1.25	1.29	1.24	2	0.49	0.51	0.42	10
PCB 209	0.87	0.77	0.83	6	0.32	0.31	0.25	13
Surrogate Recoveries (%)								
PCB 103 (SIS)	75	74	66	NA	65	81	72	NA
PCB 198 (SIS)	116	115	102	NA	61	73	66	NA

TABLE G.6. (contd)

Analytical Replicate Results

Treatment	COMP HU-C	*DUP* COMP HU-C	*TRIP* COMP HU-C		COMP BU	*DUP* COMP BU	*TRIP* COMP BU	
Replicate	4	4	4		3	3	3	
Batch	6	6	6		7	7	7	
Wet Wt.	17.18	17.51	16.38		8.6	8.47	8.21	
Units	ng/g	ng/g	ng/g	RSD%	ng/g	ng/g	ng/g	RSD%
Heptachlor	2.5	2.43	2.33	4	0.43 U	0.44 U	0.45 U	NA
Aldrin	2.42	2.25	2.29	4	2.42	2.74	2.2	11
Heptachlor epoxide	0.15 U	0.15 U	0.16 U	NA	0.31 U	0.31 U	0.32 U	NA
2,4'-DDE	0.3 U	0.3 U	0.32 U	NA	0.61 U	0.62 U	0.64 U	NA
Endosulfan I	0.21 U	0.21 U	0.22 U	NA	0.42 U	0.42 U	0.44 U	NA
a-Chlordane	1.83	1.78	1.66	5	1.13	1.46	1.11	16
Trans Nonachlor	1.65	1.61	1.52	4	0.54	0.77	0.35 U	NA
4,4'-DDE	16.8	7.5	6.89	53 (e)	2.01	2.54	2.23	12
Dieldrin	0.60 U	4.31	4.16	69 (e)	1.43	1.84	1.58	13
2,4'-DDD	7.71	7.61	7.11	4	0.59 U	0.60 U	0.62 U	NA
2,4'-DDT	0.21 U	0.2 U	0.22 U	NA	0.42 U	0.42 U	0.44 U	NA
4,4'-DDD	26.00	22.5	21.3	10	2.24	2.56	1.85	16
Endosulfan II	0.21 U	0.21 U	0.22 U	NA	0.42 U	0.42 U	0.44 U	NA
4,4'-DDT	0.18 U	0.17 U	0.18 U	NA	0.35 U	0.36 U	0.37 U	NA
Endosulfan Sulfate	0.21 U	0.21 U	0.22 U	NA	0.42 U	0.75	0.44 U	NA
PCB 8	0.48 U	0.47 U	0.50 U	3	0.95 U	0.97 U	1.00 U	NA
PCB 18	19.8	19.3	18.5	3	1 U	1.01 U	1.05 U	NA
PCB 28	25.70	24.30	23.80	4	2.34	3.19	2.54	17
PCB 52	37.10	34.00	31.8	8	3.94	5.27	4.37	15
PCB 49	17.80	16.7	16.5	4	2.09	2.79	2.14	17
PCB 44	11.60	10.6	9.58	10	1.07	1.44	1.18	15
PCB 66	27.20	25.10	24.1	6	0.22 U	0.22 U	0.23 U	NA
PCB 101	20.80	19.3	18.70	6	3.09	4.17	3.26	17
PCB 87	20.60	2.04	1.82	132 (e)	0.37 U	0.41	0.39 U	NA
PCB 118	18.40	10.5	9.87	37 (e)	1.51	2.05	1.68	16
PCB 184	0.27 U	0.27 U	0.29 U	NA	0.55 U	0.56 U	0.58 U	NA
PCB 153	17.90	13.60	12.8	19	3.89	5.28	4.33	16
PCB 105	6.30	5.72	5.38	8	0.95	1.33	1.08	17
PCB 138	13.30	12	11.5	8	3.06	4.33	3.44	18
PCB 187	3.62	3.2	3	10	0.99	1.51	1.13	22
PCB 183	1.85	1.68	1.57	8	0.55 U	0.65	0.58 U	NA
PCB 128	2.64	2.46	2.27	8	0.52	0.68	0.56	14
PCB 180	3.77	4.79	4.46	12	1.39	1.97	1.55	18
PCB 170	2.44	2.44	2.25	5	0.73	0.96	0.79	14
PCB 195	0.25	0.39	0.12 U	NA	0.23 U	0.24 U	0.24 U	NA
PCB 206	1.53	1.24	1.14	16	0.42	0.57	0.45	17
PCB 209	0.92	0.90	0.88	2	0.23	0.31	0.26	15
Surrogate Recoveries (%)								
PCB 103 (SIS)	89.	82	88	NA	81	66	74	NA
PCB 198 (SIS)	81	67	70	NA	83	67	79	NA

(a) U Undetected at or above given concentration.
(b) Outside Spike QC range (50-120%) for matrix spike recoveries
(c) NA Not applicable.
(d) NS Not spiked.
(e) Exceeds quality control criteria (±30%) for replicates.

TABLE G.7. MDL Verification Study for Pesticide/PCB Tissue Chemistry

Treatment	MDL	MDL	MDL	MDL	
Replicate	R1	R2	R3	R4	
Batch	8	8	8	8	
Wet Wt.	20.12	20.40	20.09	20.03	
Units	ng/g	ng/g	ng/g	ng/g	MDL[(a)]
Heptachlor	1.01	1.08	1.09	1.04	0.129
Aldrin	0.82	0.79	0.83	0.82	0.061
Heptachlor Epoxide	1.32	1.27	1.33	1.28	0.103
2,4'-DDE	1.18	1.2	1.24	1.19	0.092
Endosulfan I	NA [(b)]	NA	NA	NA	NA
a-Chlordane	0.94	0.96	0.95	1.1	0.264
Trans Nonachlor	1.43	1.49	1.46	1.61	0.276
4,4'-DDE	1.87	1.62	1.77	1.78	0.363
Dieldrin	2.27	2.38	2.39	2.32	0.196
2,4'-DDD	1.40	1.52	1.52	1.52	0.210
2,4'-DDT	1.07	1.02	1.17	1.18	0.273
4,4'-DDD	1.40	1.52	1.67	1.68	0.467
Endosulfan II	NA	NA	NA	NA	NA
4,4'-DDT	1.04	1.18	1.13	1.25	0.309
Endosulfan Sulfate	NA	NA	NA	NA	NA
PCB 8	0.56	0.57	0.54	0.56	0.044
PCB 18	0.84	0.80	0.85	0.84	0.078
PCB 28	1.04	1.01	1.07	1.10	0.136
PCB 52	1.20	1.20	1.27	1.31	0.191
PCB 49	0.24 U[(c)]	0.23 U	0.24 U	0.24 U	NA
PCB 44	0.96	0.90	0.93	0.94	0.088
PCB 66	1.47	1.42	1.47	1.44	0.086
PCB 101	1.59	1.54	1.62	1.55	0.129
PCB 87	0.79	0.81	0.79	0.97	0.305
PCB 118	1.02	1.00	1.05	1.10	0.152
PCB 184	0.24 U	0.23 U	0.24 U	0.24 U	NA
PCB 153	2.54	2.46	2.61	2.60	0.241
PCB 105	1.00	0.95	1.03	1.04	0.141
PCB 138	1.91	1.89	1.89	1.96	0.116
PCB 187	1.24	1.23	1.24	1.35	0.199
PCB 183	0.24 U	0.23 U	0.24 U	0.24 U	NA
PCB 128	0.87	0.87	0.88	0.92	0.083
PCB 180	1.18	1.34	1.22	1.17	0.273
PCB 170	0.98	0.93	1.01	1.03	0.152
PCB 195	0.82	0.80	0.84	0.89	0.135
PCB 206	1.03	1.01	1.09	1.13	0.193
PCB 209	1.00	0.95	1.03	1.06	0.164

(a) MDL Calculated by multiplying the standard deviation of the four replicates by Students-t (4.54).
(b) NA Not applicable.
(c) U Undetected at or above given concentration.

TABLE G.8. Polynuclear Aromatic Hydrocarbons (PAHs) in Tissue of *N. virens* (Wet Weight)

Treatment	COMP HU-A	COMP HU-A	COMP HU-A	COMP HU-A	COMP HU-A	COMP HU-A, Dup	COMP HU-A, Trip
Replicate	1	2	3	4	5-1	5-2	5-3
Batch	4	5	6	5	4	4	4
Units	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	14.80%	13.05%	13.85%	13.42%	14.25%	14.25%	14.25%
1,4-Dichlorobenzene	1.86 U[(a)]	1.86 U	1.83 U	1.86 U	2.57 U	2.72 U	2.72 U
Naphthalene	1.91	2.13	5.48	1.97	4.51	3.53	3.67
Acenaphthylene	1.93 [(b)]	1.93 [(b)]	4.37	2.87	2.97 [(b)]	3.18 [(b)]	2.79 [(b)]
Acenaphthene	11.3	4.76	10.2	5.85	23.5	22.8	23.6
Fluorene	3.60	1.60	5.08	2.25	9.15	9.0	9.20
Phenanthrene	23.8	7.91	19.1	8.72	53.3	53.7	55.1
Anthracene	8.03	4.06	8.34	4.87	17.6	17.4	18.0
Fluoranthene	184	48.9	98.7	68.8	263	258	264
Pyrene	196	61.3	111	68.0	295	289	292
Benz(a)anthracene	22.0	5.63 B[(c)]	18.3	9.03 B	34.7	34.4	34.6
Chrysene	69.8	28.8	59.2	42.2	79.1	76.9	79.2
Benzo(b)fluoranthene	17.8	9.26 [(b)]	22.4	9.40	24.5	34.1	24.6
Benzo(k)fluoranthene	8.86	5.21 [(b)]	11.1	6.93	10.1 [(b)]	2.44 U	11.1
Benzo(a)pyrene	14.2	6.17 [(b)]	19.6	11.2	19.2	19.5	20.1
Indeno(123-cd)pyrene	3.02	2.67	9.15	2.92	5.01	5.09	5.03
Dibenz(a,h)anthracene	1.29	1.26 U	3.45	1.59 [(b)]	1.98 [(b)]	1.84 U	2.07
Benzo(g,h,i)perylene	5.52	4.10	10.2	4.74	6.20	6.44	6.52
Surrogate Internal Standards (%)							
d4 1,4-Dichlorobenzene	65	69	63	74	63	60	52
d8 Naphthalene	79	88	77	93	77	77	67
d10 Acenaphthene	83	92	83	96	80	82	70
d12 Chrysene	75	92	83	96	73	75	65
d14 Dibenzo(a,h,i)anthracene	84	98	93	105	82	85	73

TABLE G.8. (contd)

Treatment	COMP HU-B	COMP HU-B	COMP HU-B	COMP HU-B	COMP HU-B
Replicate	1	2	3	4	5
Batch	4	6	4	6	6
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	14.51%	13.43%	14.17%	14.15%	15.61%
1,4-Dichlorobenzene	1.86 U	1.86 U	1.86 U	1.83 U	1.86 U
Naphthalene	3.79	14.9	5.63	3.87	3.81
Acenaphthylene	1.92 (b)	3.80 (b)	2.22	3.92	2.80 (b)
Acenaphthene	23.2	20.8	12.9	37.7	14.1
Fluorene	11.1	8.55	2.97	18.9	4.27
Phenanthrene	62.7	33.5	22.3	91.6	14.3
Anthracene	14.4	9.37	7.95	19.5	4.51 (b)
Fluoranthene	152	110	53.0	256	52.2
Pyrene	146	110	55.3	214	55.1
Benzo(a)anthracene	12.6	14.6	8.75 (b)B	19.4	7.14 B
Chrysene	33.8	40.1	20.0	59.3	24.1
Benzo(b)fluoranthene	10.3 (b)	16.5	9.73 (b)	13.7	8.83 (b)
Benzo(k)fluoranthene	4.84	8.03	5.07	7.37	5.45 (b)
Benzo(a)pyrene	7.74	15.3 (b)	8.24	12.2	6.91 (b)
Indeno(123-cd)pyrene	2.45	7.32	4.02	4.36	3.82
Dibenzo(a,h)anthracene	1.26 U	2.63	1.26 U	2.32	2.07 (b)
Benzo(g,h,i)perylene	3.53	9.68	5.30	5.66	4.87
<u>Surrogate Internal Standards (%)</u>					
d4 1,4-Dichlorobenzene	60	52	51	71	69
d8 Naphthalene	76	72	68	81	80
d10 Acenaphthene	82	79	76	84	83
d12 Chrysene	80	78	81	79	76
d14 Dibenzo(a,h,i)anthracene	87	87	86	87	86

TABLE G.8. (contd)

Treatment	COMP HU-C	COMP HU-C	COMP HU-C	COMP HU-C	COMP HU-C, Dup	COMP HU-C, Trip	COMP HU-C
Replicate	1	2	3	4-1	4-2	4-3	5
Batch	7	5	6	6	6	6	5
Units	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	14.53%	14.77%	14.06%	14.77%	14.77%	14.77%	14.41%
1,4-Dichlorobenzene	2.87 U	1.86 U	1.86 U	2.16 U	2.12 U	2.27 U	1.86 U
Naphthalene	7.42	1.86 U	11.3	3.01 (b)	3.22	3.50 (b)	2.99
Acenaphthylene	1.59	1.03 (b)	2.83 (b)	2.59 (b)	2.84 (b)	2.71 (b)	1.11 (b)
Acenaphthene	3.75	1.90 (b)	4.21	4.77	4.59	4.75	2.07
Fluorene	1.90 U	1.24 U	4.56 (b)	3.39 (b)	3.40 (b)	3.96	1.24 U
Phenanthrene	5.24	2.56 U	7.60	6.43	5.66	5.74	3.26
Anthracene	3.45 U	2.24 U	3.51 (b)	4.34 (b)	4.12 (b)	3.75 (b)	3.65 (b)
Fluoranthene	19.0	18.1	20.1	46.1	44.8	43.5	16.8
Pyrene	22.7	22.5	34.2	59.7	57.6	56.3	20.2
Benzo(a)anthracene	6.61	2.87 B	1.09 U	7.37 B	7.18 B	7.30 B	4.37 B
Chrysene	10.3	8.78	13.9	20.7	19.8	19.2	9.85
Benzo(b)fluoranthene	8.74	4.18 (b)	8.53 (b)	9.45	9.35	9.07	5.30
Benzo(k)fluoranthene	4.77 (b)	2.75 (b)	1.67 U	5.05	4.69	5.29	3.50
Benzo(a)pyrene	5.14	2.31 (b)	4.33 (b)	5.87	5.72	5.79	3.51 (b)
Indeno(123-cd)pyrene	5.85 (b)	1.76 U	3.14 (b)	3.95	3.77 (b)	4.12	1.87
Dibenzo(a,h)anthracene	1.94 U	1.26 U	1.80 (b)	2.14 (b)	2.14 (b)	2.23 (b)	1.26 U
Benzo(g,h,i)perylene	5.28 (b)	1.40 U	3.76	4.23	4.09	4.28	2.42
Surrogate Internal Standards (%)							
d4 1,4-Dichlorobenzene	41	33	59	63	62	68	66
d8 Naphthalene	53	43	72	74	77	81	88
d10 Acenaphthene	66	48	81	79	81	86	92
d12 Chrysene	67	53	78	76	79	81	87
d14 Dibenzo(a,h,i)anthracene	85	56	88	82	88	90	89

TABLE G.8. (contd)

Treatment	COMP HU-D	COMP HU-D	COMP HU-D	COMP HU-D	COMP HU-D
Replicate	1	2	3	4	5
Batch	7	5	5	5	4
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	17.59%	14.19%	13.35%	13.15%	15.15%
1,4-Dichlorobenzene	4.51 U	1.86 U	2.61 U	1.86 U	1.86 U
Naphthalene	8.05 (b)	1.86 U	2.61 U	8.35	2.47
Acenaphthylene	2.09 (b)	1.82 (b)	3.27	4.50	1.50 (b)
Acenaphthene	6.76	3.92	10.0	5.31	4.62
Fluorene	6.93 (b)	1.47	3.71	4.58	1.97
Phenanthrene	14.8	8.59	15.7	52.6	7.83
Anthracene	9.30 (b)	3.91 (b)	5.51	27.1	3.90
Fluoranthene	118	81.7	88.0	247	76.5
Pyrene	130	103	97.0	227	85.5
Benzo(a)anthracene	17.0	7.93 B	9.51 B	85.5	8.73 (b)B
Chrysene	57.0	37.4	37.4	98.9	31.1
Benzo(b)fluoranthene	21.9	10.7	11.4	93.4	8.53
Benzo(k)fluoranthene	12.2	6.22	6.29	36.9	5.01
Benzo(a)pyrene	12.9	7.58 (b)	6.37 (b)	78.7	6.02 (b)
Indeno(123-cd)pyrene	10.2	2.44	2.47 U	48.2	2.32
Dibenzo(a,h)anthracene	4.99	1.26 U	1.76 U	10.4	1.26 U
Benzo(g,h,i)perylene	9.80	3.41	4.03	37.7	2.50
Surrogate Internal Standards (%)					
d4 1,4-Dichlorobenzene	33	62	69	51	61
d8 Naphthalene	46	85	89	75	78
d10 Acenaphthene	65	92	97	87	83
d12 Chrysene	69	94	99	89	75
d14 Dibenzo(a,h,i)anthracene	86	99	104	105	86

TABLE G.8. (contd)

Treatment	R-MUD	R-MUD	R-MUD	R-MUD	R-MUD
Replicate	1	2	3	4	5
Batch	4	5	6	7	6
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	13.12%	14.94%	15.21%	14.00%	13.24%
1,4-Dichlorobenzene	1.86 U	1.83 U	1.86 U	1.86 U	2.31 U
Naphthalene	1.86 U	1.83 U	2.71 (b)	6.00 (b)B	11.9
Acenaphthylene	0.73 U	0.71 U	0.73 U	0.73 U	2.93 (b)
Acenaphthene	1.30 U	1.28 U	2.28 (b)	3.24	3.29
Fluorene	1.24 U	1.21 U	1.24 U	3.31	4.07
Phenanthrene	2.56 U	2.51 U	2.56 U	4.04	7.21
Anthracene	2.24 U	2.19 U	2.24 U	2.24 U	2.77 U
Fluoranthene	5.36 U	5.26 U	5.36 U	5.36 U	6.65 U
Pyrene	4.57 U	4.48 U	4.57 U	5.54 (b)	6.97 (b)
Benzo(a)anthracene	2.43 (b)B	2.47 B	3.68 (b)B	4.05 (b)B	4.51 (b)B
Chrysene	2.27 U	2.22 U	2.27 U	2.27 U	2.81 U
Benzo(b)fluoranthene	2.51 (b)	1.61 U	4.09 (b)	1.64 U	5.09 (b)
Benzo(k)fluoranthene	1.92 (b)	1.64 U	1.67 U	1.67 U	2.07 U
Benzo(a)pyrene	1.49 U	1.46 U	1.49 U	1.49 U	1.85 U
Indeno(123-cd)pyrene	1.76 U	1.73 U	1.76 U	1.76 U	3.66 (b)
Dibenzo(a,h)anthracene	1.26 U	1.24 U	1.26 U	1.26 U	1.56 U
Benzo(g,h,i)perylene	1.40 U	1.37 U	1.40 U	1.40 U	3.57 (b)
Surrogate Internal Standards (%)					
d4 1,4-Dichlorobenzene	69	63	64	12 (d)	66
d8 Naphthalene	82	85	76	28 (d)	76
d10 Acenaphthene	83	92	81	47	79
d12 Chrysene	72	93	77	54	78
d14 Dibenzo(a,h,i)anthracene	82	102	86	70	87

TABLE G.8. (contd)

Treatment	C-NV	C-NV	C-NV	C-NV	C-NV
Replicate	1	2	3	4	5
Batch	6	6	4	4	4
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	14.84%	12.32%	14.51%	13.67%	14.91%
1,4-Dichlorobenzene	1.86 U	1.86 U	1.86 U	1.86 U	1.86 U
Naphthalene	2.16 (b)	2.72 (b)	2.49	2.80	2.09 (b)
Acenaphthylene	2.04 (b)	0.73 U	0.73 U	0.73 U	0.73 U
Acenaphthene	1.30 U	2.34 (b)	1.30 U	1.40 (b)	1.30 U
Fluorene	1.24 U	2.76	1.24 U	1.24 U	1.24 U
Phenanthrene	2.56 (b)	2.76 (b)	2.56 U	2.56 U	2.56 U
Anthracene	2.24 U	2.24 U	2.24 U	2.24 U	2.24 U
Fluoranthene	7.87 (b)	6.80	11.1	5.46	5.36 U
Pyrene	9.30	7.20	14.7	4.95	5.01 (b)
Benzo(a)anthracene	3.95 B	1.09 U	2.45 (b)B	2.26 (b)B	1.09 U
Chrysene	3.21	2.87	3.77	2.27 U	2.27 U
Benzo(b)fluoranthene	5.00	4.44 (b)	3.53	2.60	2.70 (b)
Benzo(k)fluoranthene	3.19 (b)	2.81 (b)	2.48 (b)	2.02 (b)	2.05 (b)
Benzo(a)pyrene	2.64 (b)	1.49 U	1.49 U	1.49	1.49 U
Indeno(123-cd)pyrene	3.07 (b)	2.87 (b)	1.76 U	1.76 (b)	1.76 U
Dibenzo(a,h)anthracene	1.26 U	1.26 U	1.26 U	1.26	1.26 U
Benzo(g,h,i)perylene	2.96 (b)	2.78 (b)	1.40 U	1.40 (b)	1.40 U
Surrogate Internal Standards (%)					
d4 1,4-Dichlorobenzene	68	71	46	55	27 (d)
d8 Naphthalene	82	85	58	71	35
d10 Acenaphthene	89	88	63	76	38
d12 Chrysene	78	80	58	71	41
d14 Dibenzo(a,h,i)anthracene	85	92	61	77	38

TABLE G.8. (contd)

Treatment	*N. virens* Background	*N. virens* Background	*N. virens* Background
Replicate	1	2	3
Batch	7	7	7
Units	ng/g	ng/g	ng/g
Percent Dry Weight	12.86%	12.94%	12.05%
1,4-Dichlorobenzene	1.86 U	1.86 U	1.86 U
Naphthalene	2.79	2.67	2.98
Acenaphthylene	0.73 U	2.79 U	0.73 U
Acenaphthene	2.12	2.24 (b)	2.09 (b)
Fluorene	1.24 U	1.24 U	1.24 U
Phenanthrene	2.56 U	2.56 U	2.67 (b)
Anthracene	3.49	2.24 U	2.24 U
Fluoranthene	5.36 U	5.36 U	5.36 U
Pyrene	4.57 U	4.57 U	4.57 U
Benzo(a)anthracene	4.22	3.86 (b)	3.77 (b)
Chrysene	2.27 U	2.27 U	2.27 U
Benzo(b)fluoranthene	1.64 U	1.64 U	4.49 (b)
Benzo(k)fluoranthene	1.67 U	1.67 U	1.67 U
Benzo(a)pyrene	1.49 U	2.59	1.49 U
Indeno(123-cd)pyrene	1.76 U	1.76 U	1.76 U
Dibenzo(a,h)anthracene	1.26 U	1.26 U	1.26 U
Benzo(g,h,i)perylene	1.40 U	1.40 U	1.40 U
<u>Surrogate Internal Standards (%)</u>			
d4 1,4-Dichlorobenzene	72	68	51
d8 Naphthalene	85	82	67
d10 Acenaphthene	91	89	84
d12 Chrysene	84	81	82
d14 Dibenzo(a,h,i)anthracene	105	103	104

(a) U Undetected at or above given concentration.
(b) Ion ratio out or confirmation ion not detected.
(c) B Value is < 5 times concentration in blank.
(d) Outside quality control criteria (30-150%) for surrogate internal standards.

TABLE G.9. Polynuclear Aromatic Hydrocarbons (PAH) in Tissue of *N. virens* (Dry Weight)

Treatment	COMP HU-A	COMP HU-A	COMP HU-A	COMP HU-A	COMP HU-A	COMP HU-A, Dup	COMP HU-A, Trip
Replicate	1	2	3	4	5-1	5-2	5-3
Batch	4	5	6	5	4	4	4
Units	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	14.80%	13.05%	13.85%	13.42%	14.25%	14.25%	14.25%
1,4-Dichlorobenzene	12.6 U[(a)]	14.3 U	13.2 U	13.9 U	18.0 U	19.1 U	19.1 U
Naphthalene	12.9	16.3	39.6	14.7	31.6	24.8	25.8
Acenaphthylene	13.0 [(b)]	14.8 [(b)]	31.6	21.4	20.8 [(b)]	22.3 [(b)]	19.6 [(b)]
Acenaphthene	76.4	36.5	73.6	43.6	165	160	166
Fluorene	24.3	12.3	36.7	16.8	64	63	65
Phenanthrene	161	60.6	138	65.0	374	377	387
Anthracene	54.3	31.1	60.2	36.3	124	122	126
Fluoranthene	1240	375	713	513	1850	1810	1850
Pyrene	1320	470	801	507	2070	2030	2050
Benzo(a)anthracene	149	43.1 B[(c)]	132	67.3 B	244	241	243
Chrysene	472	221	427	314	555	540	556
Benzo(b)fluoranthene	120	71.0 [(b)]	162	70.0	172	239	173
Benzo(k)fluoranthene	59.9	39.9 [(b)]	80.1	51.6	70.9 [(b)]	17.1 U	77.9
Benzo(a)pyrene	95.9	47.3 [(b)]	142	83.5	135	137	141
Indeno(123-cd)pyrene	20.4	20.5	66.1	21.8	35.2	35.7	35.3
Dibenzo(a,h)anthracene	8.72	9.66 U	24.9	11.8 [(b)]	13.9 [(b)]	12.9 U	14.5
Benzo(g,h,i)perylene	37.3	31.4	73.6	35.3	43.5	45.2	45.8

TABLE G.9. (contd)

Treatment	COMP HU-B	COMP HU-B	COMP HU-B	COMP HU-B	COMP HU-B
Replicate	1	2	3	4	5
Batch	4	6	4	6	6
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	14.51%	13.43%	14.17%	14.15%	15.61%
1,4-Dichlorobenzene	12.8 U	13.8 U	13.1 U	12.9 U	11.9 U
Naphthalene	26.1	111	39.7	27.3	24.4
Acenaphthylene	13.2 (b)	28.3 (b)	15.7	27.7	17.9 (b)
Acenaphthene	160	155	91.0	266	90.3
Fluorene	76.5	63.7	21.0	134	27.4
Phenanthrene	432	249	157	647	91.6
Anthracene	99.2	69.8	56.1	138	28.9 (b)
Fluoranthene	1050	819	374	1810	334
Pyrene	1010	819	390	1510	353
Benzo(a)anthracene	86.8	109	61.8 (b)B	137	45.7 B
Chrysene	233	299	141	419	154
Benzo(b)fluoranthene	71.0 (b)	123	68.7 (b)	96.8	56.6 (b)
Benzo(k)fluoranthene	33.4	59.8	35.8	52.1	34.9 (b)
Benzo(a)pyrene	53.3	114 (b)	58.2	86.2	44.3 (b)
Indeno(123-cd)pyrene	16.9	54.5	28.4	30.8	24.5
Dibenzo(a,h)anthracene	8.68 U	19.6	8.89 U	16.4	13.3 (b)
Benzo(g,h,i)perylene	24.3	72.1	37.4	40.0	31.2

TABLE G.9. (contd)

Treatment	COMP HU-C	COMP HU-C	COMP HU-C	COMP HU-C	COMP HU-C, Dup	COMP HU-C, Trip	COMP HU-C
Replicate	1	2	3	4-1	4-2	4-3	5
Batch	7	5	6	6	6	6	5
Units	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	14.53%	14.77%	14.06%	14.77%	14.77%	14.77%	14.41%
1,4-Dichlorobenzene	19.8 U	12.6 U	13.2 U	14.6 U	14.4 U	15.4 U	12.9 U
Naphthalene	51.1	12.6 U	80.4	20.4 (b)	21.8	23.7 (b)	20.7
Acenaphthylene	10.9	6.97 (b)	20.1 (b)	17.5 (b)	19.2 (b)	18.3 (b)	7.70 (b)
Acenaphthene	25.8	12.9 (b)	29.9	32.3	31.1	32.2	14.4
Fluorene	13.1 U	8.40 U	32.4 (b)	23.0 (b)	23.0 (b)	26.8	8.61 U
Phenanthrene	36.1	17.3 U	54.1	43.5	38.3	38.9	22.6
Anthracene	23.7 U	15.2 U	25.0 (b)	29.4 (b)	27.9 (b)	25.4 (b)	25.3 (b)
Fluoranthene	131	123	143	312	303	295	117
Pyrene	156	152	243	404	390	381	140
Benzo(a)anthracene	45.5 (b)	19.4 B	7.75 U	49.9 B	48.6 B	49.4 B	30.3 B
Chrysene	70.9	59.4	98.9	140	134	130	68.4
Benzo(b)fluoranthene	60.2	28.3 (b)	60.7 (b)	64.0	63.3	61.4	36.8
Benzo(k)fluoranthene	32.8	18.6 (b)	11.9 U	34.2	31.8	35.8	24.3
Benzo(a)pyrene	35.4	15.6 (b)	30.8 (b)	39.7	38.7	39.2	24.4 (b)
Indeno(123-cd)pyrene	40.3 (b)	11.9 U	22.3 (b)	26.7	25.5 (b)	27.9	13.0
Dibenzo(a,h)anthracene	13.4 U	8.53 U	12.8 (b)	14.5 (b)	14.5 (b)	15.1 (b)	8.74 U
Benzo(g,h,i)perylene	36.3 (b)	9.5 U	26.7	28.6	27.7	29.0	16.8

TABLE G.9. (contd)

Treatment	HU-D	HU-D	HU-D	HU-D	HU-D
Replicate	1	2	3	4	5
Batch	7	5	5	5	4
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	17.59%	14.19%	13.35%	13.15%	15.15%
1,4-Dichlorobenzene	25.6 U	13.1 U	19.6 U	14.1 U	12.3 U
Naphthalene	45.8 (b)	13.1 U	19.6 U	63.5	16.3
Acenaphthylene	11.9 (b)	12.8 (b)	24.5	34.2	9.9 (b)
Acenaphthene	38.4	27.6	75	40.4	30.5
Fluorene	39.4 (b)	10.4	27.8	34.8	13.0
Phenanthrene	84.1	60.5	118	400	51.7
Anthracene	52.9 (b)	27.6 (b)	41.3	206	25.7
Fluoranthene	671	576	659	1880	505
Pyrene	739	726	727	1730	564
Benzo(a)anthracene	96.7	55.9 B	71.2 B	650	57.6 (b)B
Chrysene	324	264	280	752	205
Benzo(b)fluoranthene	125	75.4	85.4	710	56.3
Benzo(k)fluoranthene	69.4	43.8	47.1	281	33.1
Benzo(a)pyrene	73.3	53.4 (b)	47.7 (b)	598	39.7 (b)
Indeno(123-cd)pyrene	58.0	17.2	18.5 U	367	15.3
Dibenzo(a,h)anthracene	28.4	8.88 U	13.2 U	79.1	8.32 U
Benzo(g,h,i)perylene	55.7	24.0	30.2	287	16.5

TABLE G.9. (contd)

Treatment	R-MUD	R-MUD	R-MUD	R-MUD	R-MUD
Replicate	1	2	3	4	5
Batch	4	5	6	7	6
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	13.12%	14.94%	15.21%	14.00%	13.24%
1,4-Dichlorobenzene	14.2 U	12.2 U	12.2 U	13.3 U	17.4 U
Naphthalene	14.2 U	12.2 U	17.8 (b)	42.9 (b)B	89.9
Acenaphthylene	5.56 U	4.8 U	4.8 U	5.2 U	22.1 (b)
Acenaphthene	9.91 U	8.57 U	15.0 (b)	23.1	24.8
Fluorene	9.45 U	8.10 U	8.15 U	23.6	30.7
Phenanthrene	19.5 U	16.8 U	16.8 U	28.9	54.5
Anthracene	17.1 U	14.7 U	14.7 U	16.0 U	20.9 U
Fluoranthene	40.9 U	35.2 U	35.2 U	38.3 U	50.2 U
Pyrene	34.8 U	30.0 U	30.0 U	39.6 (b)	52.6 (b)
Benzo(a)anthracene	18.5 (b)B	16.5 B	24.2 (b)B	28.9 (b)B	34.1 (b)B
Chrysene	17.3 U	14.9 U	14.9 U	16.2 U	21.2 U
Benzo(b)fluoranthene	19.1 (b)	10.8 U	26.9 (b)	11.7 U	38.4 (b)
Benzo(k)fluoranthene	14.6 (b)	11.0 U	11.0 U	11.9 U	15.6 U
Benzo(a)pyrene	11.4 U	9.77 U	9.80 U	10.6 U	14.0 U
Indeno(123-cd)pyrene	13.4 U	11.6 U	11.6 U	12.6 U	27.6 (b)
Dibenzo(a,h)anthracene	9.60 U	8.30 U	8.28 U	9.00 U	11.8 U
Benzo(g,h,i)perylene	10.7 U	9.17 U	9.20 U	10.0 U	27.0 (b)

TABLE G.9. (contd)

Treatment	C-NV	C-NV	C-NV	C-NV	C-NV
Replicate	1	2	3	4	5
Batch	6	6	4	4	4
Units	ng/g	ng/g	ng/g	ng/g	ng/g
Percent Dry Weight	14.84%	12.32%	14.51%	13.67%	14.91%
1,4-Dichlorobenzene	12.5 U	15.1 U	12.8 U	13.6 U	12.5 U
Naphthalene	14.6 (b)	22.1 (b)	17.2	20.5	14.0 (b)
Acenaphthylene	13.7 (b)	5.9 U	5.0 U	5.3 U	4.9 U
Acenaphthene	8.76 U	19.0 (b)	9.0 U	10.2 (b)	8.72 U
Fluorene	8.36 U	22.4	8.55 U	9.07 U	8.32 U
Phenanthrene	17.3 (b)	22.4 (b)	17.6 U	18.7 U	17.2 U
Anthracene	15.1 U	18.2 U	15.4 U	16.4 U	15.0 U
Fluoranthene	53.0 (b)	55.2	76.5	39.9	35.9 U
Pyrene	62.7	58.4	101	36.2	33.6 (b)
Benzo(a)anthracene	26.6 B	8.85 U	16.9 (b)B	16.5 (b)B	7.31 U
Chrysene	21.6	23.3	26.0	16.6 U	15.2 U
Benzo(b)fluoranthene	33.7	36.0 (b)	24.3	19.0	18.1 (b)
Benzo(k)fluoranthene	21.5 (b)	22.8 (b)	17.1 (b)	14.8 (b)	13.7 (b)
Benzo(a)pyrene	17.8 (b)	12.1 U	10.3 U	10.9	9.99 U
Indeno(123-cd)pyrene	20.7 (b)	23.3 (b)	12.1 U	12.9 (b)	11.8 U
Dibenzo(a,h)anthracene	8.49 U	10.2 U	8.68 U	9.22	8.45 U
Benzo(g,h,i)perylene	19.9 (b)	22.6 (b)	9.65 U	10.2 (b)	9.39 U

TABLE G.9. (contd)

Treatment	*N. virens* Background	*N. virens* Background	*N. virens* Background
Replicate	1	2	3
Batch	7	7	7
Units	ng/g	ng/g	ng/g
Percent Dry Weight	12.86%	12.94%	12.05%
1,4-Dichlorobenzene	14.5 U	14.4 U	15.4 U
Naphthalene	21.7	20.6	24.7
Acenaphthylene	5.7 U	21.6 U	6.1 U
Acenaphthene	16.5	17.3 (b)	17.3 (b)
Fluorene	9.64 U	9.58 U	10.3 U
Phenanthrene	19.9 U	19.8 U	22.2 (b)
Anthracene	27.1	17.3 U	18.6 U
Fluoranthene	41.7 U	41.4 U	44.5 U
Pyrene	35.5 U	35.3 U	37.9 U
Benzo(a)anthracene	32.8	29.8 (b)	31.3 (b)
Chrysene	17.7 U	17.5 U	18.8 U
Benzo(b)fluoranthene	12.8 U	12.7 U	37.3 (b)
Benzo(k)fluoranthene	13.0 U	12.9 U	13.9 U
Benzo(a)pyrene	11.6 U	20.0	12.4 U
Indeno(123-cd)pyrene	13.7 U	13.6 U	14.6 U
Dibenzo(a,h)anthracene	9.80 U	9.74 U	10.5 U
Benzo(g,h,i)perylene	10.9 U	10.8 U	11.6 U

(a) U Undetected at or above given concentration.

(b) Ion ratio out or confirmation ion not detected.

(c) B Value is < 5 times concentration in blank.

TABLE G.10. Quality Control Summary for Polynuclear Aromatic Hydrocarbons (PAHs) in Tissue of *N. virens* (Wet Weight)

	METHOD BLANKS				
Treatment	BLANK	BLANK	BLANK	BLANK	BLANK
Replicate	1	1	1	1	2
Batch	4	5	6	7	7
Wet Wt.	NA	NA	NA	NA	NA
Units	ng/g	ng/g	ng/g	ng/g	ng/g
1,4-Dichlorobenzene	1.98 U[a]	1.90 U	1.94 U	2.24 U	2.16 U
Naphthalene	1.98 U	1.90 U	1.94 U	2.24 U	2.24 [b]
Acenaphthylene	0.77 U	0.74 U	0.75 U	0.87 U	0.84 U
Acenaphthene	1.38 U	1.33 U	1.36 U	1.56 U	1.51 U
Fluorene	1.31 U	1.26 U	1.29 U	1.48 U	1.43 U
Phenanthrene	2.71 U	2.61 U	2.66 U	3.07 U	2.97 U
Anthracene	2.37 U	2.28 U	2.33 U	2.69 U	6.22 U
Fluoranthene	5.69 U	5.47 U	5.58 U	6.44 U	5.30 U
Pyrene	4.84 U	4.66 U	4.75 U	5.48 U	5.30 U
Benzo(a)anthracene	2.29	2.13 [b]	3.50 [b]	4.40 [b]	4.41 [b]
Chrysene	2.40 U	2.31 U	2.36 U	2.72 U	2.63 U
Benzo(b)fluoranthene	1.74 U	1.67 U	1.71 U	1.97 U	1.90 U
Benzo(k)fluoranthene	1.77 U	1.70 U	1.74 U	2.00 U	1.94 U
Benzo(a)pyrene	1.58 U	1.52 U	1.55 U	2.75	1.73 U
Indeno(123-cd)pyrene	1.87 U	1.80 U	1.83 U	4.02 [b]	2.04 U
Dibenzo(a,h)anthracene	1.34 U	1.29 U	1.31 U	1.51 U	1.46 U
Benzo(g,h,i)perylene	1.49 U	1.43 U	1.46 U	1.68 U	1.63 U
Surrogate Internal Standards (%)					
d4 1,4-Dichlorobenzene	59 [b]	76	78	89	59
d8 Naphthalene	70	91	84	91	65
d10 Acenaphthene	72	87	81	94	72
d12 Chrysene	81	75	83	105	77
d14 Dibenzo(a,h,i)anthracene	66	78	76	108	97

TABLE G.10. (contd)

	MATRIX SPIKES							
Treatment	COMP EC-A	COMP EC-A, MS			COMP HU-C	COMP HU-C, MS		
Replicate	1	1			1	1		
Batch	5	5	Amount		7	7	Amount	
Wet Wt.	20.08	20.05	Spiked	Percent	12.96	12.71	pike	Percent
Units	ng/g	ng/g	ng/g	Recover	ng/g	ng/g	ng/g	Recovery
1,4-Dichlorobenzene	1.86 U	21.5	24.9	86	2.87 U	36.1	39.3	92
Naphthalene	1.86 U	23.5	24.9	94	7.42	47.9	39.3	103
Acenaphthylene	1.58 (b)	21.4	24.9	80	1.59	39.3	39.3	100
Acenaphthene	6.17	27.8	24.9	87	3.75	47.6	39.3	112
Fluorene	1.90 (b)	23.2	24.9	86	1.90 U	46.1	39.3	117
Phenanthrene	6.07	25.1	24.9	76	5.24	52.6	39.3	121 (c)
Anthracene	4.07	27.1	24.9	92	3.45 U	51.3	39.3	131 (c)
Fluoranthene	45.0	133	24.9	353 (c)	19.0	73.9	39.3	140 (c)
Pyrene	65.0	134	24.9	277 (c)	22.7	69.9	39.3	120
Benzo(a)anthracene	6.87	30.0	24.9	93	6.61 (b)	55.6	39.3	125 (c)
Chrysene	25.7	46.0	24.9	82	10.3	54.0	39.3	111
Benzo(b)fluoranthene	7.13	32.6	24.9	102	8.74	54.5	39.3	116
Benzo(k)fluoranthene	4.61	28.4	24.9	96	4.77 (b)	54.7	39.3	127 (c)
Benzo(a)pyrene	6.27 (b)	27.9	24.9	87	5.14	53.8	39.3	124 (c)
Indeno(123-cd)pyrene	1.76 U	23.0	24.9	85	5.85 (b)	47.6	39.3	106
Dibenzo(a,h)anthracene	1.26 U	22.8	24.9	87	1.94 U	47.8	39.3	122 (c)
Benzo(g,h,i)perylene	2.91	22.1	24.9	77	5.28 (b)	43.5	39.3	97
Surrogate Internal Standards (%)								
d4 1,4-Dichlorobenzene	56	70	NA	NA	41	52	NA	NA
d8 Naphthalene	75	90	NA	NA	53	63	NA	NA
d10 Acenaphthene	86	97	NA	NA	66	77	NA	NA
d12 Chrysene	92	96	NA	NA	67	81	NA	NA
d14 Dibenzo(a,h,i)anthracene	101	103	NA	NA	85	102	NA	NA

TABLE G.10. (contd)

	MATRIX SPIKES							
Treatment	COMP SB-A	COMP SB-A, MS			C-NV	C-NV, MS		
Replicate	1	1			2	2		
Batch	4	4	mount		6	6	Amount	
Wet Wt.	20.08	20.02	Spiked	Percent	20.08	20.17	Spiked	Percent
Units	ng/g	ng/g	ng/g	Recovery	ng/g	ng/g	ng/g	Recovery
1,4-Dichlorobenzene	1.86 U	20.2	25.0	81	1.86 U	24.1	24.8	97
Naphthalene	3.79	27.5	25.0	95	2.72 [b]	30.5	24.8	112
Acenaphthylene	1.92 [b]	23.0	25.0	84	0.73 U	27.1	24.8	109
Acenaphthene	23.2	52.2	25.0	116	2.34 [b]	31.1	24.8	116
Fluorene	11.1	36.9	25.0	103	2.76	28.1	24.8	102
Phenanthrene	62.7	101	25.0	153 [c]	2.76 [b]	30.4	24.8	111
Anthracene	14.4	42.8	25.0	114	2.24 U	30.2	24.8	122 [c]
Fluoranthene	152	218	25.0	264 [c]	6.80	40.1	24.8	134 [c]
Pyrene	146	208	25.0	248 [c]	7.20	35.8	24.8	115
Benzo(a)anthracene	12.6	38.8	25.0	105	1.09 U	33.9	24.8	137 [c]
Chrysene	33.8	63.8	25.0	120	2.87	31.0	24.8	113
Benzo(b)fluoranthene	10.3 [b]	33.7	25.0	94	4.44 [b]	32.5	24.8	113
Benzo(k)fluoranthene	4.84	29.4	25.0	98	2.81 [b]	32.5	24.8	120
Benzo(a)pyrene	7.74	32.4	25.0	99	1.49 U	31.3	24.8	126 [c]
Indeno(123-cd)pyrene	2.45	24.1	25.0	87	2.87 [b]	29.1	24.8	106
Dibenzo(a,h)anthracene	1.26 U	24.1	25.0	96	1.26 U	29.8	24.8	120
Benzo(g,h,i)perylene	3.53	25.4	25.0	87	2.78 [b]	27.4	24.8	99
Surrogate Internal Standards (%)								
d4 1,4-Dichlorobenzene	60	37	NA	NA	71	59	NA	NA
d8 Naphthalene	76	46	NA	NA	85	69	NA	NA
d10 Acenaphthene	82	50	NA	NA	88	77	NA	NA
d12 Chrysene	80	49	NA	NA	80	73	NA	NA
d14 Dibenzo(a,h,i)anthracene	87	53	NA	NA	92	83	NA	NA

TABLE G.10. (contd)

	ANALYTICAL REPLICATES							
Treatment	COMP HU-A	COMP HU-A Dup	COMP HU-A Trip		COMP HU-C	COMP HU-C Dup	COMP HU-C Trip	
Replicate	5-1	5-2	5-3		4-1	4-2	4-3	
Batch	4	4	4		6	6	6	
Wet Wt.	14.57	13.76	13.79		17.18	17.51	16.38	
Units	ng/g	ng/g	ng/g	RSD	ng/g	ng/g	ng/g	RSD%
1,4-Dichlorobenzene	2.57 U	2.72 U	2.72 U	NA	2.16 U	2.12 U	2.27 U	NA
Naphthalene	4.51	3.53	3.67	14	3.01 (b)	3.22	3.50 (b)	8
Acenaphthylene	2.97 (b)	3.18 (b)	2.79 (b)	7	2.59 (b)	2.84 (b)	2.71 (b)	5
Acenaphthene	23.5	22.8	23.6	2	4.77	4.59	4.75	2
Fluorene	9.15	9.0	9.20	1	3.39 (b)	3.40 (b)	3.96	9
Phenanthrene	53.3	53.7	55.1	2	6.43	5.66	5.74	7
Anthracene	17.6	17.4	18.0	2	4.34 (b)	4.12 (b)	3.75 (b)	7
Fluoranthene	263	258	264	1	46.1	44.8	43.5	3
Pyrene	295	289	292	1	59.7	57.6	56.3	3
Benzo(a)anthracene	34.7	34.4	34.6	0	7.37 B	7.18 B	7.30 B	1
Chrysene	79.1	76.9	79.2	2	20.7	19.8	19.2	4
Benzo(b)fluoranthene	24.5	34.1	24.6	20	9.45	9.35	9.07	2
Benzo(k)fluoranthene	10.1 (b)	2.44 U	11.1	NA	5.05	4.69	5.29	6
Benzo(a)pyrene	19.2	19.5	20.1	2	5.87	5.72	5.79	1
Indeno(123-cd)pyrene	5.01	5.09	5.03	1	3.95	3.77 (b)	4.12	4
Dibenzo(a,h)anthracene	1.98 (b)	1.84 U	2.07	NA	2.14 (b)	2.14 (b)	2.23 (b)	2
Benzo(g,h,i)perylene	6.20	6.44	6.52	3	4.23	4.09	4.28	2
Surrogate Internal Standards (%)								
d4 1,4-Dichlorobenzene	63	60	52	NA	63	62	68	NA
d8 Naphthalene	77	77	67	NA	74	77	81	NA
d10 Acenaphthene	80	82	70	NA	79	81	86	NA
d12 Chrysene	73	75	65	NA	76	79	81	NA
d14 Dibenzo(a,h,i)anthracene	82	85	73	NA	82	88	90	NA

TABLE G.10. (contd)

	ANALYTICAL REPLICATES							
Treatment	COMP SB-B	COMP SB-B Dup	COMP SB-B Trip		COMP BU	COMP BU Dup	COMP BU Trip	
Replicate	2-1	2-2	2-3		3-1	3-2	3-3	
Batch	5	5	5		7	7	7	
Wet Wt.	17.11	17.25	17.13		8.60	8.47	8.21	
Units	ng/g	ng/g	ng/g	RSD%	ng/g	ng/g	ng/g	RSD%
1,4-Dichlorobenzene	2.24 U	2.24 U	2.24 U	NA	4.32 U	4.40 U	4.55 U	NA
Naphthalene	2.33 (b)	2.31 (b)	2.33	0	10.8	11.2	10.2	5
Acenaphthylene	1.76 (b)	1.62 (b)	1.40 (b)	11	1.68 U	1.85 (b)	1.77 U	NA
Acenaphthene	7.39	6.96	6.72	5	5.01	5.63	5.95 (b)	9
Fluorene	2.21	2.02 (b)	1.83	9	6.39	2.92 U	6.84 (b)	NA
Phenanthrene	6.73	7.08	6.61	4	7.61	8.28	7.52	5
Anthracene	4.76	4.92	4.99	2	7.93 (b)	5.28 U	5.46 U	NA
Fluoranthene	49.4	50.7	45.6	5	16.3	19.6	17.6	9
Pyrene	69.5	70.2	63.8	5	21.1	24.8	22.1	8
Benzo(a)anthracene	7.72 B	7.14 B	6.68 B	7	2.54 U	9.61 (b)	2.67 U	NA
Chrysene	21.1	21.7	19.1	7	10.2	10.8	10.9	4
Benzo(b)fluoranthene	7.70	7.49 (b)	6.76	7	11.9	12.6	12.5	3
Benzo(k)fluoranthene	4.59	4.44	3.98	7	6.60 (b)	6.85 (b)	6.78 (b)	2
Benzo(a)pyrene	6.38 (b)	5.52 (b)	5.18	11	6.06	6.67	6.38	5
Indeno(123-cd)pyrene	2.11 U	2.11 U	2.11 U	NA	8.11 (b)	8.18	8.54 (b)	3
Dibenzo(a,h)anthracene	1.51 U	1.51 U	1.51 U	NA	2.92 U	2.97 U	3.08 U	NA
Benzo(g,h,i)perylene	2.82	2.68	2.53	5	7.71	8.09	7.98	2
<u>Surrogate Internal Standards (%)</u>								
d4 1,4-Dichlorobenzene	44	61	53	NA	50	41	50	NA
d8 Naphthalene	60	80	71	NA	60	50	60	NA
d10 Acenaphthene	64	83	76	NA	78	65	74	NA
d12 Chrysene	64	83	75	NA	83	67	77	NA
d14 Dibenzo(a,h,i)anthracene	71	92	82	NA	104	85	99	NA

(a) U Undetected at or above given concentration.
(b) Ion ratio out or confirmation ion not detected.
(c) Outside quality control range (50-120%) for matrix spike recovery.
(d) NA Not applicable.

TABLE G.11. Lipids in Tissue of *N. virens*

Sediment Treatment	Replicate	Sample Weight	% Dry Weight	% Lipids (wet weight)	% Lipids (dry weight)
Nereis Background	1	5.04	12.86	1.98	15.4
Nereis Background	2	5.07	12.94	2.17	16.8
Nereis Background	3	5.13	12.05	2.14	17.8