US Army Corps of Engineers®

New York District
26 Federal Plaza
New York, N.Y. 10278
ATTN: CENAN-OP-ST

# Public Notice

In replying refer to:
Public Notice No. Raritan River to Arthur Kill Cut-off
Published: September 6, 2013 Expires: October 7,2013

**RARITAN RIVER TO ARTHUR KILL CUT-OFF, NEW JERSEY**
**FEDERAL NAVIGATION PROJECT**
**MAINTENANCE DREDGING**

**TO WHOM IT MAY CONCERN:**

The New York District, U.S. Army Corps of Engineers, pursuant to Section 10 of the Rivers and Harbors Act of 1899, Section 404 (33 U.S.C. 1344) of the Federal Water Pollution Control Act (amended in 1977 and commonly referred to as the Clean Water Act), and Section 103 (U.S.C. 1413, 86 Statute 1052) or Marine Protection, Research and Sanctuaries Act (MPRSA) of 1972 (commonly referred to as the Ocean Dumping Act), proposes to perform maintenance dredging of Raritan River to Arthur Kill Cut-Off, New Jersey Federal Navigation Project (see Figure No. 1) with subsequent placement of the dredged material for environmental remediation purposes at the Historic Area Remediation Site (HARS, see Figure No. 2A and 2B).

ACTIVITY: Maintenance dredging of Raritan River to Arthur Kill Cut-Off, Federal Navigation Project, with placement of the dredged material at the HARS.

WATERWAY: Raritan River to Arthur Kill Cut-off, New Jersey, Federal Navigation Project.

LOCATION: Adjacent to the northwest portion of Perth Amboy Anchorage and connects to Raritan River Channel to the southern end of the Arthur Kill Channel, New York and New Jersey Channels.

The Raritan River to Arthur Kill Cut-off, Federal Navigation Project was authorized and adopted by the Rivers and Harbors Act of 1935. The project includes the following channel:

a. The channel is located adjacent to the northwest portion of Perth Amboy Anchorage and connects to Raritan River Channel to the southern end of the Arthur Kill Channel, New York and New Jersey Channels. The existing project provides for a channel 20 feet deep at Mean Low Water, 800 feet wide and about 1 mile long.

A detailed description of the proposed activities is enclosed to assist in your review. This activity is being evaluated to determine that the proposed placement of dredged material will not

unreasonably degrade or endanger human health, welfare or amenities, or the marine environment, ecological systems or economic potentialities. On September 26, 2000, the United States Environmental Protection Agency (USEPA) and Corps of Engineers signed a Memorandum of Agreement (MOA) outlining the steps to be taken to ensure that remediation of the HARS continues in a manner appropriately protective of human health and the aquatic environment. In making the determination, the criteria established by the Environmental Protection Agency (EPA) will be applied, including the interim change to one matrix value for PCB's as described in the MOA. In addition, based upon an evaluation of the potential effect which the failure to utilize this ocean site will have on navigation, economic and industrial development, and foreign and domestic commerce of the United States, an independent determination will be made of the need to place the dredged material in ocean waters, other possible methods of disposal, and other appropriate locations.

The Corps of Engineers is soliciting comments from the public; federal, state and local agencies and officials; Indian tribes; and other interested parties in order to consider and evaluate the impacts of this proposed activity. Comments are used to assess impacts on navigation, water quality, endangered species, historic resources, wetlands, scenic and recreational values, and other public interest factors. Comments are used in the preparation of an Environmental Assessment (EA) pursuant to the National Environmental Policy Act and to determine the need for a public hearing.

ALL COMMENTS REGARDING THIS ACTIVITY MUST BE PREPARED IN WRITING AND MAILED TO REACH THIS OFFICE AT THE ADDRESS ON THE FRONT PAGE BEFORE THE EXPIRATION DATE OF THIS NOTICE, otherwise, it will be presumed that there are no objections to the activity.

Any person who has an interest, which may be affected by the placement of this dredged material, may request a public hearing. The request must be submitted in writing to the District Engineer within the comment period of this notice and must clearly set forth the interest that may be affected and the manner in which the interest may be affected by the activity. It should be noted that information submitted by mail is considered just as carefully in the process and bears the same weight as that furnished at a public hearing.

Pursuant to Section 307 of the Coastal Zone Management Act of 1972 as amended [16 USC 1456(c)], for activities conducted or supported by a federal agency in a state which has a federally approved Federal Consistency Determination (FCD) program, the Corps must submit a determination that the proposed project is consistent with the State FCD program to the maximum extent practicable. This activity is subject to review by the New Jersey Department of Environmental Protection for its consistency with the enforceable policies of the New Jersey State Coastal Management Program. The U.S. Army Corps of Engineers, New York District, has determined that the proposed activities are consistent to the maximum extent practicable and within the applicable policies of the New Jersey State Coastal Management Program. A copy of this determination will be provided to the State of New Jersey Department of Environmental Protection. Additional information regarding the Corps of Engineers' consistency determination may be obtained by contacting the State of New Jersey Department of Environmental Protection, Bureau of Coastal Regulation, CN 401,501 East State Street, Second Floor, Trenton, New Jersey 08625-0401, Attention: Consistency Review.

The proposed project was reviewed based upon the "Biological Assessment for the Closure of the Mud Dump Site and Designation of the Historic Area Remediation Site (HARS) in the New York

Bight and Apex", (USEPA, 1997). Based upon this review, and a review of the latest public listing of threatened and endangered species, it has been preliminarily determined that the proposed activity for which authorization is sought herein, is not likely to adversely affect any federally threatened or endangered species (humpback whales, finback whales, right whales, loggerhead turtles, leatherback turtles, green turtles, and Kemp's Ridley turtles) or their critical habitat pursuant to Section 7 of the Endangered Species Act (16 USC 1531).

The proposed HARS placements will not result in Remediation Material being placed within 0.27 nautical miles of any identified wrecks, as indicated in the National Register of Historic Places. Other than wrecks, there are no known sites eligible for or included in the Register within the project area. No known archaeological, scientific, prehistorical or historical data are expected to be lost by work accomplished under the required dredging.

Reviews of the activity pursuant to Section 404 of the Clean Water Act will include application of the guidelines announced by the Administrator, U.S. Environmental Protection Agency, under authority of Section 404(b) of the Clean Water Act. The Corps will obtain a water quality certificate or waiver from the appropriate state agency in accordance with Section 401 of the Clean Water Act prior to commencement of any work.

In compliance with Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (1996 amendments), an Essential Fish Habitat Assessment will be prepared and submitted to the National Marine Fisheries Service for review and comment.

The proposed work is being coordinated with the following Federal, State and local agencies:

- U.S. Environmental Protection Agency
- U.S. Department of the Interior, Fish and Wildlife Service
- U.S. Department of Commerce, National Marine Fisheries Service
- U.S. Coast Guard, First District
- State of New Jersey Department of Environmental Protection

If you have any questions concerning this notice, you may contact Mr. Ed Wrocenski at (917) 790-8636. Comments or questions may be FAXED to (212) 264-4260 ATTN: Mr. Ed Wrocenski. Questions about the HARS can be addressed to Mr. Douglas Pabst, Team Leader, Dredged Material Management Team, US Environmental Protection Agency, Region 2, at (212) 637-3797.

**DESCRIPTION OF PLANNED ACTION:**

The New York District U.S. Army Corps of Engineers proposes to perform maintenance dredging of Raritan River to Arthur Kill Cut-Off, New Jersey. The Raritan River to Arthur Kill Cut-Off Channel was last dredged in 2000 with the removal of approximately 154,325 cubic yards (CY) of material. The dredged material was used as remediation material at the Historic Area Remediation Site. The proposed maintenance dredging would involve the removal of approximately 270,000 CY of silt and clay dredged material. Maintenance dredging of this channel is usually accomplished by a clamshell dredge.

Raritan River to Arthur Kill Cut-Off will be dredged to its project depth of 20 feet below mean low water (MLW) plus 2 feet overdepth subject to the availability of funds.

The purpose of the proposed dredging is to restore the authorized project dimensions, thereby assuring safe and economical use of the Raritan River to Arthur Kill Cut-off by shipping interests. The material has been tested and meets the criteria for remediation material at the HARS. The dredged material would be used as such by placing it over degraded sediments within the HARS. The proposed dredged material would be transported by bottom dumping vessels to the placement site.

This public notice serves to announce the government's intent and identifies the proposed location for placement of approximately 270,000 CY of material. The dredging and placement at the HARS for this project is currently anticipated to occur in the summer /fall.

**ENVIRONMENTAL IMPACT STATEMENT:**

The material to be placed at the HARS is dredged material that will be removed from Raritan River to Arthur Kill Cut-Off, New Jersey Federal Navigation Project. The material has been evaluated and found to meet the regulatory testing criteria of 40 CFR Sections 227.13 (b)(1) and the requirements of the rule establishing the HARS in Section 228.15(d)(6). It has been determined that maintenance dredging of the Raritan River to Arthur Kill Cut-Off, with placement of the dredged material at the HARS is not likely to have significant adverse environmental impact on water quality, marine resources, fish, wildlife, endangered species, recreation, aesthetics and flood protection of the area.

An update of the EA and a 404 (b) evaluation as required by the Clean Water Act 40 CFR 230 will be prepared prior to the implementation of the proposed work.

**PLACEMENT SITE**:

The dredged material from this project is proposed to be placed at the HARS (see next section: Introduction to the HARS) using the bottom dumping process. Based upon review of the latest published version of the National Register of Historic Places, two wrecks, believed to be the HLW Lew and the ORMOND, were found in Remediation Area Number 1. As noted in the designation of the HARS, Remediation Material would not be allowed to be placed within 0.27 nautical miles of the identified wrecks or other wrecks that might be found.

**INTRODUCTION TO THE HARS:**

In 1972, the Congress of the United States enacted the Marine Protection Research and Sanctuaries Act (MPRSA) to address and control the dumping of materials into ocean waters. Title I of the Act authorized the US Environmental Protection Agency (USEPA) and the US Army Corps of Engineers (USACE) to regulate dumping in ocean waters. USEPA and USACE share responsibility for MPRSA permitting and ocean disposal site management. USEPA regulations implementing MPRSA can be found in 40 CFR Sections 220 through 229. With few exceptions, MPRSA prohibits the transportation of material from the United States for the purpose of ocean dumping except as may be authorized by a permit issued under the MPRSA. The MPRSA divides permitting responsibility between the USEPA and USACE. Under Section 102 of the MPRSA, USEPA has responsibility for issuing permits for all materials other than dredged material. Under Section 103 of MPRSA, the Secretary of the Army has the responsibility for issuing permits for dredged material. Determinations to issue MPRSA permits for dredged material are subject to USEPA concurrence.

In the fall of 1997, the USEPA de-designated and terminated the use of the New York Bight Dredged Material Disposal Site (commonly known as the Mud Dump Site or MDS). The MDS had been designated in 1984 for the disposal of up to 100 million cubic yards of dredged material from navigation channels and other port facilities within the Port of New York and New Jersey. Simultaneous with the closure of the MDS, the site and surrounding areas that had been used historically as disposal sites for dredged materials were redesigned as the HARS in 40 CFR Sections 228.15(d)(6) (See 62 Fed. Reg. 46142 (August 29, 1997); 62 Fed. Reg. 26267 (May 13, 1997)). The HARS will be managed to reduce impacts of historical disposal activities at the site to acceptable levels in accordance with 40 CFR Sections 228.11(c). The need to remediate the HARS is supported by the presence of toxic effects, dioxin bioaccumulation exceeding Category 1 levels (a definition of which appears in an evaluation memorandum reviewing the results of the testing) in worm tissue, as well as TCDD/PCB contamination in area lobster stocks. Individual elements of those data do not establish sediments within the Study Area as imminent hazards to the New York Bight Apex ecosystem, living resources, or human health; however, the collective evidence presents cause for concern, and justifies the need for remediation. Further information on the condition in the Study Area and the surveys performed may be found in the Supplemental Environmental Impact Statement (SEIS) [USEPA, 1997].

The HARS designation identifies an area: (see Figure No. 2A and 2B) in and around the MDS, which has exhibited the potential for adverse ecological impacts. The HARS will be remediated with dredged material that meets current Category 1 standards and will not cause significant undesirable effects including through bioaccumulation. This dredged material is referred to as "Material for Remediation" or "Remediation Material."

As of the end of July 2013, dredged materials from ninety different completed and ongoing private and federal dredging projects in the Port of New York and New Jersey have been dredged and placed as Remediation Material in the ocean at the HARS since the closure of the Mud Dump Site and designation of the HARS in 1997. This represents approximately 61,403,000 cubic yards of Remediation Material.

The HARS, which includes the 2.2 square nautical mile area of the MDS, is an approximately 15.7 square nautical mile area located approximately 3.5 nautical miles east of Highlands, New Jersey and 7.7 nautical miles south of Rockaway, New York. The MDS is located approximately 5.3 nautical miles east of Highlands, New Jersey and 9.6 nautical miles south of Rockaway, New York. When determined by bathymetry that capping is complete, the USEPA will take any necessary rulemaking to de-designate the HARS. The HARS includes the following three areas:

**Priority Remediation Area (PRA):** A 9.0 square nautical mile area to be remediated with at least 1 meter of Remediation Material. The PRA encompasses the area of degraded sediments as described in greater detail in the SEIS.

**Buffer Zone:** An approximately 5.7 square nautical mile area (0.27 nautical mile wide band around the PRA) in which no placement of the Material for Remediation will be allowed, but which may receive Material for Remediation that incidentally spreads out of the PRA.

**No Discharge Zone:** An approximately 1.0 square nautical mile area in which no placement or incidental spread of Material for Remediation is allowed.

To improve management and monitoring of placement activities at the HARS, electronic monitoring equipment will be on-board any barges carrying Remediation Material to the HARS. This equipment records vessel positions throughout the duration of each trip to the HARS and during remediation operations. To improve communication reliability between tugs and scows, a prescribed formal communication procedure has been put in place (copies of this procedure are available upon request).

Additional information concerning the HARS can be obtained from Mr. Douglas Pabst of the USEPA, Team Leader of the Dredged Material Management Team, at (212) 637-3797.

**HARS SUITABILITY TESTING:**

The proposed dredging areas are depicted in Figure 1.

The areas in the Raritan River to Arthur Kill Cut-Off have been characterized using two (2) sediment testing results with eight (8) core samples in Reach A and eight (8) core samples in Reach B. The samples were taken to depths of 20 feet – project depth, plus two feet allowable overdepth. The core samples in each reach were combined to yield 2 sediment composites which were submitted to chemical and biological testing. Based upon an analysis of sediment samples from the Raritan River to Arthur Kill Cut-Off, the grain size characteristics of the proposed dredged material are:

Reach A: 0.9% GRAVEL, 19.9% SAND, 49.9% SILT & 29.3% CLAY
Reach B: 0.8% GRAVEL, 20.7% SAND, 49.2% SILT & 29.3% CLAY

Results of the chemical and biological testing of the Raritan River to Arthur Kill Cut-Off Channel sediment samples are summarized below.

**Evaluation of the Liquid Phase: Chemistry**

Under the requirements of 40 CFR Sections 227.6 (c) (1) and 227.27 (a), chemical analyses was conducted on project area site water and elutriate. Results of this evaluation are summarized in Table 1 (Reach A and Reach B). Please note in reading Table 1 (Reach A and Reach B) that detection limits have been listed for only those constituents which the laboratory reported as not-detected (ND) (this reporting convention was similarly applied in reporting the results of bioaccumulation potential testing discussed below). If the constituents were detected above the detection limit, the measured value would appear.

Expected concentrations of chemical constituents in the water column following ocean placement, after allowing for initial mixing, were calculated using the Automated Dredging and Disposal Alternatives Management System (ADDAMS). ADDAMS is a mixing model developed by the Corps Waterways Experiment Station (WES) and described in the joint USEPA/Corps implementation manual entitled "Ecological Evaluation of Proposed Discharge of Dredged Material Into Ocean Water" (commonly referred to as the National "Green Book"). The material can be considered suitable for ocean disposal only if the concentration of the Suspended Particulate Phase (SPP) of the dredged material, after allowance for initial mixing, will not exceed the Limiting Permissible Concentration (LPC) beyond the boundaries of the disposal site within the first four hours following dumping or at any point in the marine environment after the first four hours. The ADDAMS Model predicted that applicable marine

water quality criteria for listed constituents were not exceeded after allowance for initial mixing (40 CFR 227.29(a)). Results of the analyses indicate that the LPC will be met for the proposed dredged material from the project area.

## BIOASSAYS

In accordance with 40 CFR Part 227 of the Ocean Dumping Regulations, bioassays were performed to assess the toxicities of the solid phase, liquid phase, and suspended particulate phase of the proposed dredged material from the project area. Liquid phase bioassays, run as part of the suspended particulate phase on three appropriate sensitive marine organisms (a crustacean (shrimp, *Americamysis bahia*), finfish (*Menidia beryllina*), and larvae of a bivalve (mussel, *Mytilus edulis*)), show that after initial mixing (as determined under 40 CFR Sections 227.29(a)(2)) the liquid phase of the material would not exceed a toxicity threshold of 0.01 of a concentration shown to be acutely toxic to appropriate sensitive marine organisms. Accordingly, it is concluded that the liquid phase of the material would be in compliance with 40 CFR Sections 227.6(c)(1) and 227.27(a). The specific test results and technical analysis of the data underlying this conclusion are described and evaluated in a joint U.S. Army Corps of Engineers, New York District/US Environmental Protection Agency Region 2 memorandum (copies available upon request).

### Evaluation of the Suspended Particulate Phase

The suspended particulate phase of the material was evaluated for compliance with 40 CFR Sections 227.6(c)(2) and 227.27(b). Bioassay testing of the suspended particulate phase of the material has been conducted using three appropriate sensitive marine organisms (a crustacean (*Americamysis bahia*), finfish (*Menidia beryllina*), and larvae of a bivalve (*Mytilus edulis).* Median lethal concentrations ($LC_{50}$), which are concentrations of suspended particulate phase resulting in 50% mortality, were determined for all three test species. In addition, the median effective concentration ($EC_{50}$), based on normal larval development to the D-cell stage, was determined for the bivalve larvae of *Mytilus edulis*. The Limiting Permissible Concentration (LPC) was then calculated as 0.01 of the $LC_{50}$ or $EC_{50}$ of the most sensitive organism. The LPC for the suspended particulate phase of the Raritan River to Arthur Kill Cut-Off composites was calculated as 0.22% for Reach A and 0.22% for Reach B based on the $EC_{50}$ of *Mytilus edulis.*

The information shows that when placed at the HARS and after initial mixing (as determined under 40 CFR Sections 227.29(a)(2)), the suspended particulate phase of this material would not exceed a toxicity threshold of 0.01 of a concentration shown to be acutely toxic in the laboratory bioassays and, thus, would not result in significant mortality. Moreover, after placement, the suspended particulate phase would only exist in the environment for a short time, which indicates the suspended particulate phase of the project material would not cause significant undesirable effects, including the possibility of danger associated with bioaccumulation, since these impacts require long duration exposures (see USEPA, 1994). Accordingly, it is concluded that the suspended phase of the material from Raritan River to Arthur Kill Cut-Off would be in compliance with 40 CFR Sections 227.6(c)(2) and 227.27(b). The results of bioassay tests conducted on proposed dredged sediments from the project area are presented in Table 2 (Reach A and Reach B) of this public notice. The specific test results and technical analysis of the data underlying this conclusion are described in a joint U.S. Army Corps of Engineers, New York District/USEPA Region 2 memorandum previously mentioned.

**Evaluation of the solid phase toxicity**

The solid phase is the whole test sediment before it has undergone processing that might alter its chemical or toxicological properties. The reference sediment represents existing background conditions in the vicinity of the dumpsite, removed from the influence of any disposal operation. For the solid phase bioassay, 10-day toxicity was determined by exposing a filter feeding mysid shrimp (*Americamysis bahia*) and a deposit feeding, burrowing amphipod (*Ampelisca abdita*) to a composite of sediment from the project area and comparing mortalities in those treatments to mortalities experienced after exposure to a reference sediment; these organisms are good predictors of adverse effects to benthic marine communities (see, USEPA, 1996a). Results are evaluated for biologically and statistically significant differences in mortality between treatments. The 1991 Green Book guidance considers that dredged material does not meet the whole sediment toxicity criterion when mortality in the test treatments is (a) statistically significant and greater than in the reference sediment and (b) exceeds mortality in the reference treatment by at least 10% for mysid shrimp and 20% for amphipod species. The following sections address the results of those tests and further analyze compliance with the regulatory criteria of 40 CFR Sections 227.6(c)(3), 227.27(b), and 228.15 and with USEPA Region 2/U.S. Army Corps of Engineers, New York District guidance.

The toxicity of project sediments were not statistically greater than the reference for *Ampelisca abdita* and *Americamysis bahia.* The difference between percent survivals in test and reference sediments was less than 10% for mysid shrimp and less than 20% for amphipods. These results show that the solid phase of the material would not cause significant mortality. The results of the toxicity portion of the solid phase bioassays can be seen in Table 2 (Reach A and Reach B).

**Evaluation of the solid phase bioaccumulation**

Bioaccumulation tests for sediments from the project area were conducted on the solid phase of the project material for contaminants of concern using two appropriate sensitive benthic marine organisms, a burrowing, deposit-feeding polychaete *Nereis virens* and a filter-feeding bivalve *Macoma nasuta.* These species are considered to be good representatives of the phylogenetically diverse base of the marine food chain. Contaminants of concern, identified for the regional testing manual are listed in the NY/NJ Harbor Estuary Program Toxics Characterization report (Squibb, *et al.* 1991).

Table 3 (Reach A and Reach B) of this notice addresses the bioaccumulation of contaminants of concern for the project area. Additional information on more rigorous evaluations conducted on individual contaminants may be found in the Testing Evaluation Memo for this project. Table 3 (Reach A and Reach B) indicates that some contaminants bioaccumulated above reference in the clam and/or worm. The testing memo further evaluates these contaminants, and concludes that any contaminant that exceeded reference did not exceed any existing regional matrix or dioxin value. Several contaminants which did not have matrix values did exceed background levels, but in no case did any contaminant accumulate to toxicologically important concentrations even when very conservative assumptions were used in the analysis. Any contaminants that exhibited bioaccumulation test results above referenced were all below the acceptable human health risk range and acceptable aquatic effects range, again using conservative approaches and analyses.

Based on the requirements of 40 CFR Parts 227.6 and 227.27, bioaccumulation analyses were performed for the chemical constituents listed in Table 3 (Reach A and Reach B) of this public

notice. All constituents identified in worm and clam tissue were compared to existing Food and Drug Administration (FDA) action levels for poisonous or deleterious substances in fish and shellfish for human food, regional disposal criteria, background concentrations and risk-based criteria provided by USEPA Region II.

**Conclusion**

Based upon the results of the sediments proposed for dredging from Raritan River to Arthur Kill Cut-Off Federal Navigation Channel, it has been determined that the material is Category 1, meeting the criteria for ocean placement as described in 40 CFR parts 227.13 (b)(1) and 228.15, and is Remediation Material as defined under the USEPA Region 2/USACE, New York District guidance.

Placement of this material at the HARS will serve to reduce impacts at the HARS to acceptable levels and improve benthic conditions. Sediments in the HARS have been found to be acutely toxic to sensitive benthic marine organisms in laboratory tests. Placement of project material over existing toxic sediments would serve to remediate those areas for toxicity. In addition, by covering the existing sediments in the site with this project material, surface dwelling organisms will be exposed to sediments exhibiting Category 1 qualities, whereas the existing sediments exceed these levels.

**ALTERNATIVES TO HARS PLACEMENT:**

As to ocean placement of dredged material, the Ocean Dumping Regulations [Title 40 CFR Sections 227.16(b)] state that "...alternative methods of disposal are practicable when they are available at reasonable incremental cost and energy expenditures which need not be competitive with the costs of ocean dumping, taking into account the environmental impacts associated with the use of alternatives to ocean dumping...." The U.S. Army Corps of Engineers, New York District has evaluated the regional practicability of potential disposal alternatives in the September 1999 Draft Implementation Report for the "Dredged Material Management Plan for the Port of New York and New Jersey". The Recommended Plan within the report addresses both the long and short term dredged material placement options in two specific timeframes, heretofore referred to as the 2010 Plan and the 2040 Plan respectively.

The 2010 Plan relies heavily on the creation, remediation, and restoration of a variety of existing degraded or impacted habitats in the region with material that would be considered unsuitable for HARS restoration. The remaining material is treated and stabilized, as needed, and then applied to remediate degraded and potentially polluting areas such as brownfields, landfills, and abandoned strip mines. The 2040 Plan relies heavily upon the use of land remediation and decontamination methods for the management of HARS unsuitable material. Similar to the 2010 Plan, maximum use of all practicable alternatives to the HARS is envisioned.

Many of dredged material management options presented in the 2010 Plan are not presently permitted and/or under construction at this time and, therefore, considered unavailable for the purposes of this project. Other options are not available at reasonable incremental costs, which leaves the HARS placement as the preferred alternative.

For more information on the New York District Corps of Engineers programs, visit our website at http://www.nan.usace.army.mil.

It is requested that you communicate the foregoing information concerning the proposed work to any persons known by you to be interested and who did not receive a copy of this notice.

Randall G. Hintz
Chief, Operations Support Branch

Enclosures
as stated

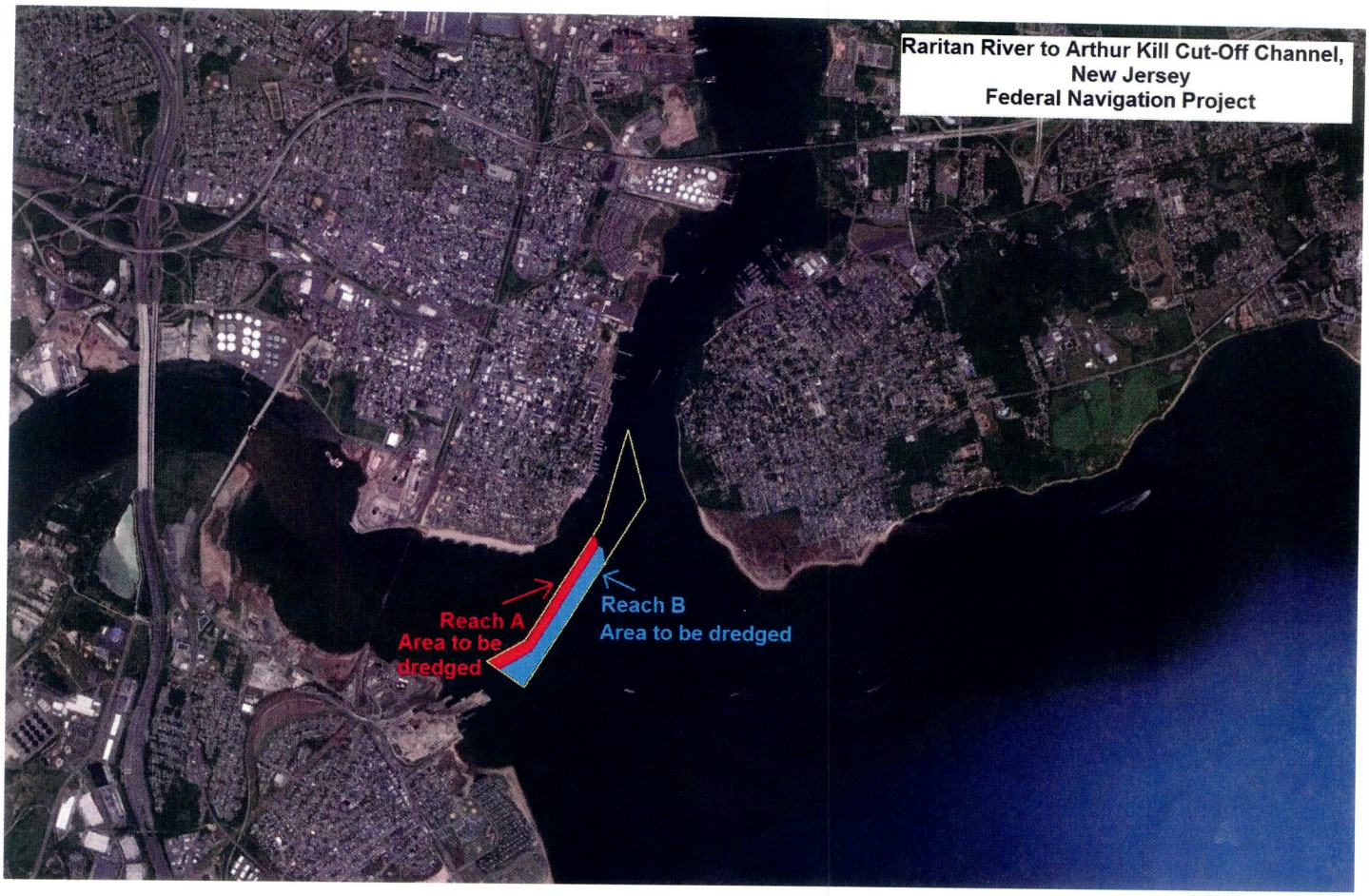


**Figure 1: Project Map**
**(Not to scale)**

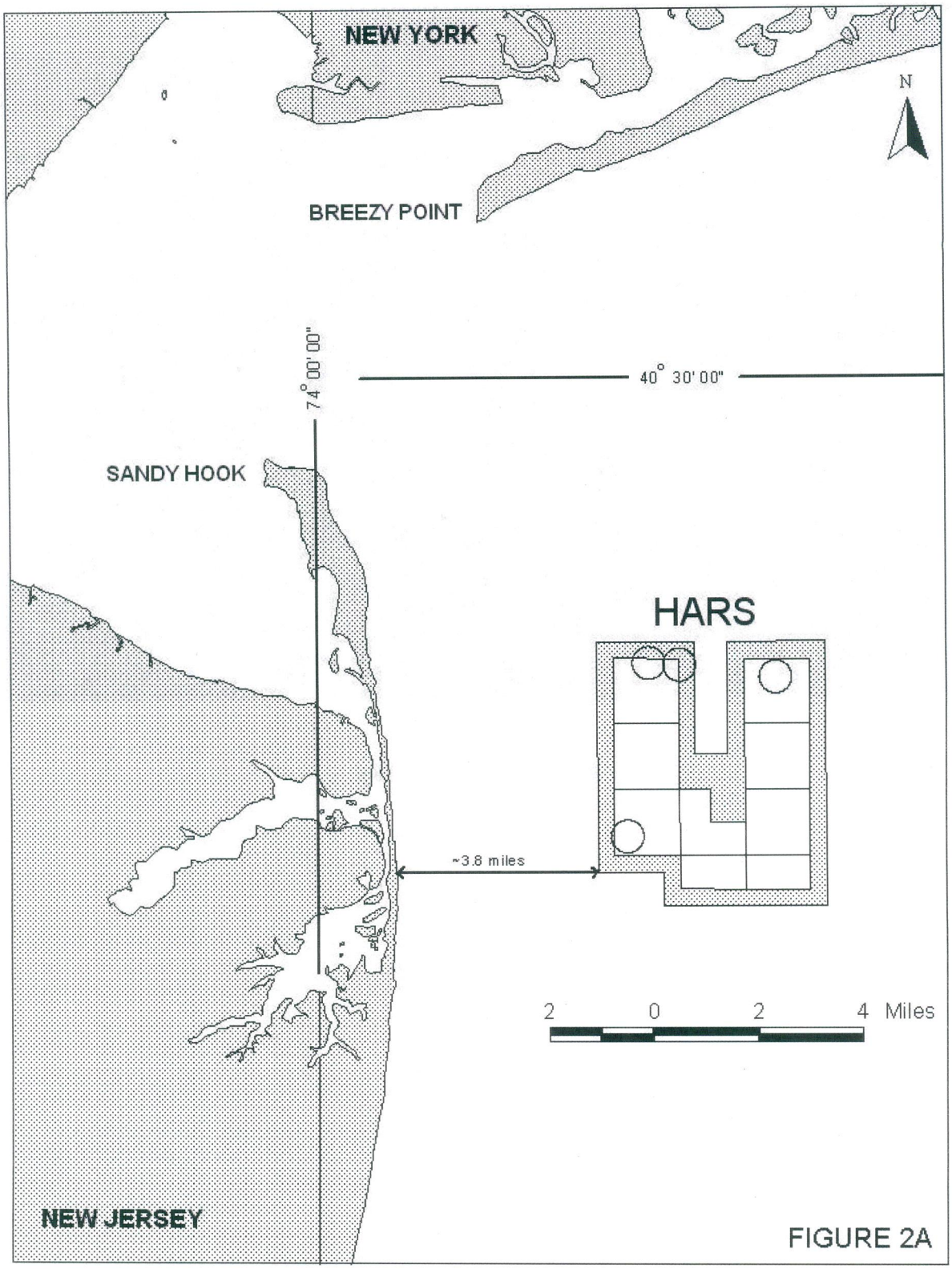


**Figure 2A: HARS Location Map 1**

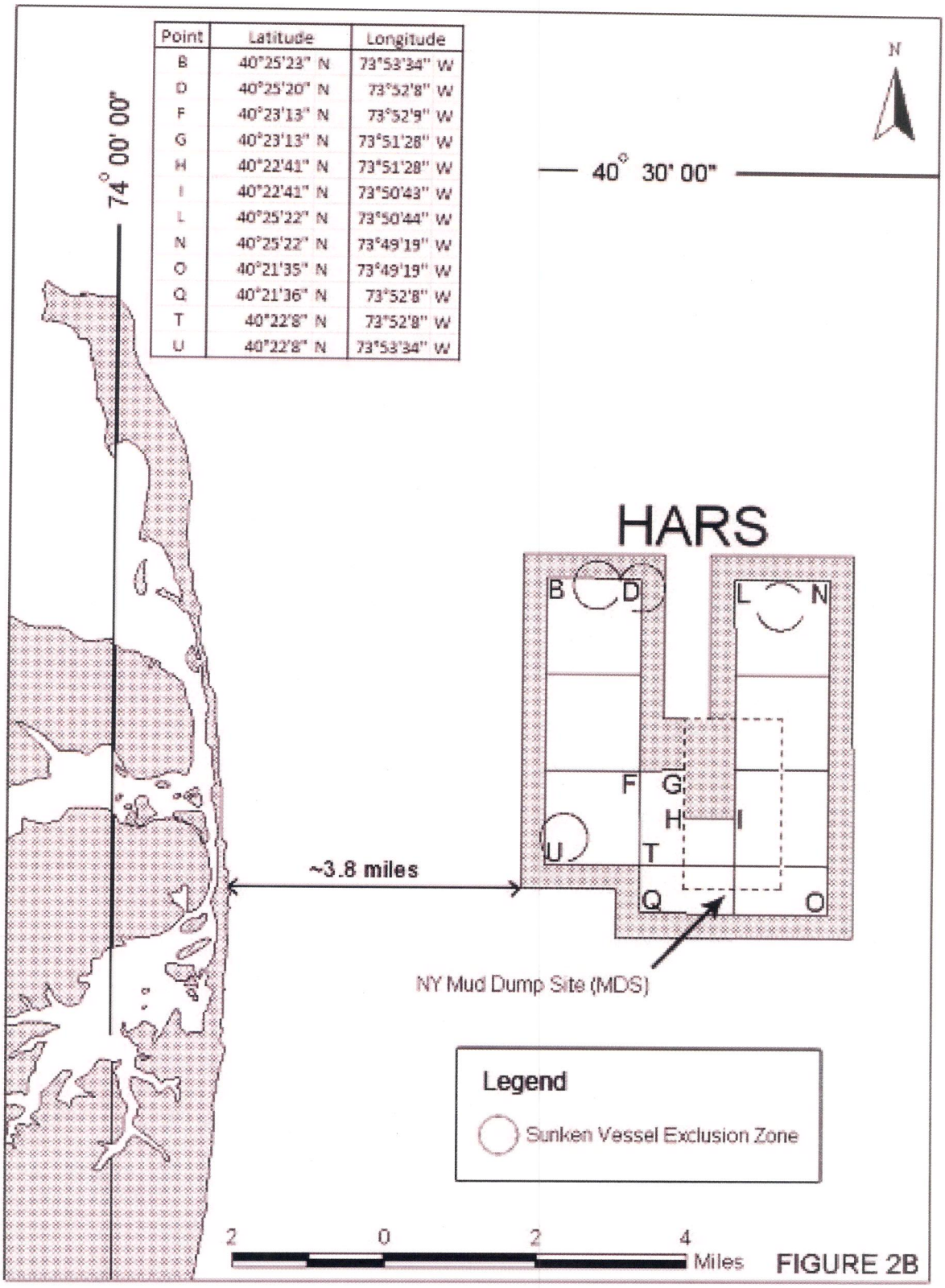


**Figure 2B: HARS Location Map 2**

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# TABLE 1. RESULTS OF CHEMICAL ANALYSIS OF SITE WATER AND ELUTRIATE

ACOE, Arthur Kill Cutoff REACH A

| | SITE WATER | | ELUTRIATE | |
|---|---|---|---|---|
| CONSTITUENTS | DETECTION LIMITS | CONCENTRATION | DETECTION LIMITS | CONCENTRATION |
| **Metals** | ppb | ppb | ppb | ppb |
| Ag | | 0.018 | | 0.044 |
| Cd | | 0.065 | | 0.017 |
| Cr | | 0.841 | | 1.820 |
| Cu | | 2.98 | | 2.210 |
| Hg | | 0.011 | | 0.034 |
| Ni | | 1.37 | | 1.95 |
| Pb | | 1.40 | | 2.31 |
| Zn | | 7.71 | | 5.53 |
| | | | | |
| **Pesticides** | pptr (ng/L) | pptr (ng/L) | pptr (ng/L) | pptr (ng/L) |
| Aldrin | 0.32 | ND | 0.31 | ND |
| a-Chlordane | 0.34 | ND | | 0.467 |
| trans Nonachlor | 0.58 | ND | | 0.250 |
| Dieldrin | 0.59 | ND | | 0.507 |
| 4,4'-DDT | 0.27 | ND | 0.26 | ND |
| 2,4'-DDT | 0.46 | ND | 0.43 | ND |
| 4,4'-DDD | 0.54 | ND | | 1.65 |
| 2,4'-DDD | 0.68 | ND | | 0.97 |
| 4,4'-DDE | 0.34 | ND | | 2.13 |
| 2,4'-DDE | 0.64 | ND | | 0.480 |
| **Total DDT** | | **1.5** | | **5.6** |
| Endosulfan I | 0.52 | ND | 0.49 | ND |
| Endosulfan II | 0.41 | ND | 0.39 | ND |
| Endosulfan sulfate | 0.45 | ND | 0.43 | ND |
| Heptachlor | 0.49 | ND | 0.47 | ND |
| Heptachlor epoxide | 0.58 | ND | 0.55 | ND |
| | | | | |
| **Industrial Chemicals** | pptr (ng/L) | pptr (ng/L) | pptr (ng/L) | pptr (ng/L) |
| PCB 8 | 0.31 | ND | 0.29 | ND |
| PCB 18 | 0.44 | ND | 0.42 | ND |
| PCB 28 | 0.31 | ND | | 0.9 |
| PCB 44 | 0.23 | ND | | 0.93 |
| PCB 49 | 0.28 | ND | | 1.16 |
| PCB 52 | 0.43 | ND | | 1.25 |
| PCB 66 | 0.45 | ND | | 0.88 |
| PCB 87 | 0.35 | ND | | 0.37 |
| PCB 101 | 0.32 | ND | | 1.18 |
| PCB 105 | 0.30 | ND | | 0.32 |
| PCB 118 | 0.37 | ND | | 0.98 |
| PCB 128 | 0.47 | ND | 0.45 | ND |
| PCB 138 | 0.73 | ND | | 1.18 |
| PCB 153 | 0.32 | ND | | 1.18 |
| PCB 170 | 0.66 | ND | | 0.49 |
| PCB 180 | 0.52 | ND | | 1.04 |
| PCB 183 | 0.31 | ND | 0.29 | ND |
| PCB 184 | 0.42 | ND | 0.40 | ND |
| PCB 187 | 0.26 | ND | | 0.43 |
| PCB 195 | 0.20 | ND | 0.19 | ND |
| PCB 206 | 0.26 | ND | 0.25 | ND |
| PCB 209 | 0.34 | ND | 0.33 | ND |
| **Total PCB** | | **10.19** | | **27.1** |

ND = Not detected

Total DDT = sum of 2,4'- and 4,4'-DDD, DDE, and DDT

Total PCB = sum of congeners reported x 2

Concentrations shown are the mean of three replicate analyses.

Means were determined using conservative estimates of concentrations of constituents that were at concentrations below the detection limit.

# TABLE 1. RESULTS OF CHEMICAL ANALYSIS OF SITE WATER AND ELUTRIATE

ACOE, AK Cutoff REACH B

| | SITE WATER | | ELUTRIATE | |
|---|---|---|---|---|
| CONSTITUENTS | DETECTION LIMITS | CONCENTRATION | DETECTION LIMITS | CONCENTRATION |
| **Metals** | ppb | ppb | ppb | ppb |
| Ag | | 0.023 | | 0.035 |
| Cd | | 0.081 | | 0.014 |
| Cr | | 0.978 | | 1.717 |
| Cu | | 3.06 | | 1.750 |
| Hg | | 0.011 | | 0.031 |
| Ni | | 1.44 | | 1.77 |
| Pb | | 1.44 | | 2.06 |
| Zn | | 8.31 | | 5.44 |
| | | | | |
| **Pesticides** | pptr (ng/L) | pptr (ng/L) | pptr (ng/L) | pptr (ng/L) |
| Aldrin | 0.32 | ND | 0.32 | ND |
| a-Chlordane | 0.34 | ND | | 0.467 |
| trans Nonachlor | 0.58 | ND | | 0.290 |
| Dieldrin | 0.59 | ND | | 0.527 |
| 4,4'-DDT | 0.27 | ND | 0.27 | ND |
| 2,4'-DDT | 0.46 | ND | 0.45 | ND |
| 4,4'-DDD | 0.54 | ND | | 1.24 |
| 2,4'-DDD | 0.68 | ND | | 0.85 |
| 4,4'-DDE | | 0.2 | | 2.44 |
| 2,4'-DDE | 0.64 | ND | | 0.633 |
| **Total DDT** | | **1.5** | | **5.5** |
| Endosulfan I | 0.52 | ND | 0.51 | ND |
| Endosulfan II | 0.41 | ND | 0.41 | ND |
| Endosulfan sulfate | 0.45 | ND | 0.44 | ND |
| Heptachlor | 0.49 | ND | 0.49 | ND |
| Heptachlor epoxide | 0.58 | ND | 0.57 | ND |
| | | | | |
| **Industrial Chemicals** | pptr (ng/L) | pptr (ng/L) | pptr (ng/L) | pptr (ng/L) |
| PCB 8 | 0.31 | ND | 0.30 | ND |
| PCB 18 | 0.44 | ND | 0.44 | ND |
| PCB 28 | 0.31 | ND | | 1.1 |
| PCB 44 | 0.23 | ND | | 1.34 |
| PCB 49 | 0.28 | ND | | 1.49 |
| PCB 52 | 0.43 | ND | | 1.72 |
| PCB 66 | 0.45 | ND | | 1.32 |
| PCB 87 | 0.35 | ND | | 0.52 |
| PCB 101 | 0.32 | ND | | 1.62 |
| PCB 105 | 0.30 | ND | | 0.59 |
| PCB 118 | 0.37 | ND | | 1.35 |
| PCB 128 | 0.47 | ND | 0.47 | ND |
| PCB 138 | 0.73 | ND | | 1.50 |
| PCB 153 | 0.32 | ND | | 1.54 |
| PCB 170 | 0.66 | ND | | 0.74 |
| PCB 180 | 0.52 | ND | | 1.41 |
| PCB 183 | 0.31 | ND | 0.30 | ND |
| PCB 184 | 0.42 | ND | 0.41 | ND |
| PCB 187 | 0.26 | ND | | 0.81 |
| PCB 195 | 0.20 | ND | 0.20 | ND |
| PCB 206 | 0.26 | ND | 0.26 | ND |
| PCB 209 | 0.34 | ND | 0.34 | ND |
| **Total PCB** | | **10.19** | | **36.9** |

ND = Not detected
Total DDT = sum of 2,4'- and 4,4'-DDD, DDE, and DDT
Total PCB = sum of congeners reported x 2
Concentrations shown are the mean of three replicate analyses.
Means were determined using conservative estimates of concentrations of constituents that were at concentrations below the detection limit.

**TABLE 2**

**ACOE, Arthur Kill Cutoff**
**TOXICITY TEST RESULTS**

**ASI JOB No. 32-118**
**Reach A**

**Suspended Particulate Phase**

| Test Species | Test Duration | $LC_{50}/EC_{50}$ | LPC (a) |
|---|---|---|---|
| ***Menidia beryllina*** | 96 hours | (b) 26.5% | 0.27 |
| ***Americamysis bahia*** | 96 hours | (b) 77.9% | 0.78 |
| ***Mytilus edulis*** (larval survival) | 48 hours | (b) >100% | 1.00 |
| ***Mytilus edulis*** (larval normal develop.) | 48 hours | (c) 22.3% | 0.22 |

(a) Limiting Permissible Concentration (LPC) is the $LC_{50}$ or $EC_{50}$ multiplied by 0.01

(b) Median Lethal Concentration ($LC_{50}$) resulting in 50% mortatlity at test termination

(c) Median Effective Concentration ($EC_{50}$) based on normal development to the D-cell, prodissoconch 1 stage

**Whole Sediment (10 days)**

| Test Species | % Survival Reference | % Survival Test | % Difference Reference - Test | Is difference statistically significant? (a=0.05) |
|---|---|---|---|---|
| ***Ampelisca abdita*** | 97% | 91% | 6% | No |
| ***Americamysis bahia*** | 97% | 95% | 2% | No |

**TABLE 2**

**ACOE, Arthur Kill Cutoff**
**TOXICITY TEST RESULTS**

**ASI JOB No. 32-118**
**Reach B**

**Suspended Particulate Phase**

| Test Species | Test Duration | $LC_{50}/EC_{50}$ | LPC (a) |
|---|---|---|---|
| ***Menidia beryllina*** | 96 hours | (b) 26.5% | 0.27 |
| ***Americamysis bahia*** | 96 hours | (b) 77.9% | 0.78 |
| ***Mytilus edulis*** (larval survival) | 48 hours | (b) >100% | 1.00 |
| ***Mytilus edulis*** (larval normal develop.) | 48 hours | (c) 22.4% | 0.22 |

(a) Limiting Permissible Concentration (LPC) is the $LC_{50}$ or $EC_{50}$ multiplied by 0.01

(b) Median Lethal Concentration ($LC_{50}$) resulting in 50% mortatlity at test termination

(c) Median Effective Concentration ($EC_{50}$) based on normal development to the D-cell, prodissoconch 1 stage

**Whole Sediment (10 days)**

| Test Species | % Survival Reference | % Survival Test | % Difference Reference - Test | Is difference statistically significant? (a=0.05) |
|---|---|---|---|---|
| ***Ampelisca abdita*** | 97% | 84% | 13% | No |
| ***Americamysis bahia*** | 97% | 98% | -1% | No |

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## TABLE 3. 28 DAY BIOACCUMULATION TEST RESULTS: CHEMICAL ANALYSIS OF TISSUE

**Wet weight concentrations**

**ACOE Arthur Kill Cutoff; REACH A**

| CONSTITUENTS | *Macoma nasuta* | | | | *Nereis virens* | | | |
|---|---|---|---|---|---|---|---|---|
| | REFERENCE | | TEST | | REFERENCE | | TEST | |
| | DETECTION LIMITS | CONCENTRATION | DETECTION LIMITS | CONCENTRATION | DETECTION LIMITS | CONCENTRATION | DETECTION LIMITS | CONCENTRATION |
| **Metals** | ppm (mg/kg) | ppm (mg/kg) | ppm (mg/kg) | ppm (mg/kg) | ppm (mg/kg) | ppm (mg/kg) | ppm (mg/kg) | ppm (mg/kg) |
| Ag | | 0.02 | | * 0.04 | | 0.02 | | 0.02 |
| As | | 2.58 | | 2.77 | | 3.01 | | 2.25 |
| Cd | | 0.03 | | 0.04 | | 0.04 | | 0.04 |
| Cr | | 0.40 | | 0.29 | | 0.11 | | 0.10 |
| Cu | | 1.71 | | * 2.23 | | 1.62 | | 1.42 |
| Hg | | 0.014 | | * 0.015 | | 0.037 | | 0.031 |
| Ni | | 0.43 | | * 0.49 | | 0.27 | | 0.22 |
| Pb | | 0.20 | | * 0.48 | | 0.18 | | * 0.29 |
| Zn | | 14.16 | | 14.27 | | 21.06 | | 22.80 |
| **Pesticides** | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) |
| Aldrin | 0.08 | ND | 0.08 | ND | 0.08 | ND | 0.08 | ND |
| a-Chlordane | | 0.12 | | * 0.58 | | 0.12 | | * 0.78 |
| trans Nonachlor | | 0.04 | | * 0.27 | | 0.20 | | * 0.61 |
| Dieldrin | | 0.17 | | * 0.40 | | 0.34 | | * 0.68 |
| 4,4'-DDT | | 0.07 | | * 0.16 | 0.17 | ND | | 0.09 |
| 2,4'-DDT | 0.09 | ND | 0.09 | ND | 0.09 | ND | 0.09 | ND |
| 4,4'-DDD | | 0.17 | | * 1.98 | | 0.13 | | * 2.55 |
| 2,4'-DDD | | 0.05 | | * 0.84 | | 0.09 | | * 0.88 |
| 4,4'-DDE | | 0.23 | | * 3.19 | | 0.04 | | * 0.83 |
| 2,4'-DDE | 0.03 | ND | | * 0.39 | 0.03 | ND | | * 0.09 |
| **Total DDT** | | **0.58** | | * **6.61** | | **0.41** | | * **4.50** |
| Endosulfan I | 0.12 | ND | | 0.16 | 0.12 | ND | 0.12 | ND |
| Endosulfan II | 0.07 | ND | 0.07 | ND | 0.07 | ND | 0.07 | ND |
| Endosulfan sulfate | 0.17 | ND | 0.17 | ND | 0.17 | ND | 0.17 | ND |
| Heptachlor | 0.08 | ND | 0.08 | ND | 0.08 | ND | 0.08 | ND |
| Heptachlor epoxide | | 0.04 | 0.08 | ND | | 0.11 | | 0.11 |
| | | | | | | | | |
| **Industrial Chemicals** | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) |
| PCB 8 | | 0.02 | | * 0.10 | 0.04 | ND | 0.04 | ND |
| PCB 18 | | 0.03 | | * 0.29 | 0.04 | ND | | * 0.40 |
| PCB 28 | | 0.09 | | * 1.03 | | 0.02 | | * 0.64 |
| PCB 44 | | 0.03 | | * 0.42 | 0.04 | ND | | * 0.54 |
| PCB 49 | | 0.10 | | * 1.23 | | 0.04 | | * 1.27 |
| PCB 52 | | 0.11 | | * 1.39 | | 0.11 | | * 1.96 |
| PCB 66 | | 0.09 | | * 1.18 | | 0.04 | | * 0.88 |
| PCB 87 | | 0.03 | | * 0.33 | 0.07 | ND | | * 0.14 |
| PCB 101 | | 0.13 | | * 1.29 | | 0.21 | | * 1.39 |
| PCB 105 | | 0.03 | | * 0.27 | | 0.07 | | * 0.38 |
| PCB 118 | | 0.08 | | * 0.84 | | 0.11 | | * 0.71 |
| PCB 128 | | 0.04 | | * 0.13 | | 0.08 | | * 0.21 |
| PCB 138 | | 0.08 | | * 0.59 | | 0.40 | | * 1.03 |
| PCB 153 | | 0.15 | | * 1.14 | | 1.05 | | * 2.17 |
| PCB 170 | | 0.04 | | * 0.10 | | 0.14 | | * 0.30 |
| PCB 180 | | 0.04 | | * 0.23 | | 0.27 | | * 0.62 |
| PCB 183 | | 0.02 | | * 0.10 | | 0.14 | | * 0.26 |
| PCB 184 | 0.05 | ND | 0.05 | ND | 0.05 | ND | 0.05 | ND |
| PCB 187 | | 0.05 | | * 0.22 | | 0.42 | | * 0.78 |
| PCB 195 | 0.05 | ND | 0.05 | ND | | 0.03 | | * 0.07 |
| PCB 206 | 0.05 | ND | | * 0.04 | | 0.18 | | * 0.26 |
| PCB 209 | 0.07 | ND | | 0.03 | | 0.16 | | * 0.22 |
| **Total PCB** | | **2.52** | | * **21.96** | | **7.20** | | * **28.57** |
| 1,4-Dichlorobenzene | | 0.04 | | * 0.13 | | 0.04 | | 0.05 |

**TABLE 3. (Continued)** 32-118

**ACOE Arthur Kill Cutoff; REACH A**

| CONSTITUENTS | *Macoma nasuta* | | | | *Nereis virens* | | | |
|---|---|---|---|---|---|---|---|---|
| | REFERENCE | | TEST | | REFERENCE | | TEST | |
| | DETECTION LIMITS | CONCENTRATION | DETECTION LIMITS | CONCENTRATION | DETECTION LIMITS | CONCENTRATION | DETECTION LIMITS | CONCENTRATION |
| **PAH's** | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) |
| Naphthalene | | 0.64 | | * 0.79 | | 0.67 | | 0.88 |
| Acenaphthylene | | 0.07 | | * 0.30 | | 0.08 | | * 0.18 |
| Acenaphthene | | 0.25 | | * 0.64 | | 0.30 | | * 0.86 |
| Fluorene | | 0.58 | | * 1.20 | | 0.13 | | * 0.26 |
| Phenanthrene | | 3.88 | | * 7.93 | | 0.48 | | * 0.97 |
| Anthracene | | 0.65 | | * 2.06 | | 0.06 | | * 0.26 |
| Fluoranthene | | 5.07 | | * 27.35 | | 0.71 | | * 10.42 |
| Pyrene | | 4.59 | | * 29.21 | | 0.56 | | * 11.42 |
| Benzo(a)anthracene | | 0.73 | | * 8.31 | | 0.04 | | * 0.51 |
| Chrysene | | 1.50 | | * 12.65 | | 0.24 | | * 3.92 |
| Benzo(b)fluoranthene | | 0.73 | | * 9.12 | 0.24 | ND | | * 0.81 |
| Benzo(k)fluoranthene | | 0.70 | | * 7.55 | 0.19 | ND | | * 0.95 |
| Benzo(a)pyrene | | 0.56 | | * 6.20 | 0.31 | ND | | * 0.58 |
| Indeno(1,2,3-cd)pyrene | | 0.20 | | * 2.60 | 0.17 | ND | | * 0.22 |
| Dibenzo(a,h)antracene | | 0.10 | | * 0.69 | 0.23 | ND | | 0.11 |
| Benzo(g,h,i)perylene | | 0.27 | | * 3.44 | | 0.07 | | * 0.54 |
| **Total PAH's** | | **20.52** | | * **120.04** | | **3.90** | | * **32.88** |
| | | | | | | | | |
| **Dioxins** | pptr(ng/kg) | pptr(ng/kg) | pptr(ng/kg) | pptr(ng/kg) | pptr(ng/kg) | pptr(ng/kg) | pptr(ng/kg) | pptr(ng/kg) |
| 2378 TCDD | 0.02 | ND | 0.02 | * ND | 0.01 | ND | | 0.13 |
| 12378 PeCDD | 0.02 | ND | 0.02 | ND | 0.02 | ND | | 0.04 |
| 123478 HxCDD | 0.03 | ND | 0.04 | ND | 0.02 | ND | 0.02 | ND |
| 123678 HxCDD | 0.02 | ND | | 0.03 | | 0.05 | | 0.08 |
| 123789 HxCDD | 0.03 | ND | 0.04 | ND | 0.02 | ND | 0.02 | ND |
| 1234678 HpCDD | | 0.06 | | * 1.10 | | 1.91 | | 1.09 |
| 1234789 OCDD | | 1.78 | | * 28.50 | | 15.53 | | 15.78 |
| 2378 TCDF | 0.02 | ND | | * 0.52 | | 0.90 | | * 1.44 |
| 12378 PeCDF | 0.02 | ND | | 0.04 | | 0.13 | | 0.08 |
| 23478 PeCDF | 0.02 | ND | | * 0.08 | 0.02 | ND | | 0.21 |
| 123478 HxCDF | 0.01 | ND | | 0.09 | 0.01 | ND | 0.02 | ND |
| 123678 HxCDF | 0.01 | ND | | 0.02 | | 0.09 | 0.02 | ND |
| 234678 HxCDF | | 0.07 | 0.01 | ND | 0.01 | ND | 0.02 | ND |
| 123789 HxCDF | 0.01 | ND | | * 0.03 | 0.01 | ND | 0.02 | ND |
| 1234678 HpCDF | | 0.16 | | 0.46 | | 0.29 | | 0.32 |
| 1234789 HpCDF | | 0.16 | 0.03 | ND | | 0.06 | | 0.03 |
| 12346789 OCDF | | 0.37 | | 1.06 | | 0.47 | | 0.73 |

ND = Not detected
Total PAH = Sum of all PAH's.
Total DDT = sum of 2,4'- and 4,4'-DDD, DDE, and DDT
Total PCB = 2(x), where x = sum of PCB congeners
Concentrations shown are the mean of 5 replicate analyses in wet weight.
Means were determined using conservative estimates of concentrations of constituents that were at concentrations below the detection limit.
* = Statistically significant at the 95% confidence level.

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## TABLE 3. 28 DAY BIOACCUMULATION TEST RESULTS: CHEMICAL ANALYSIS OF TISSUE

**Wet weight concentrations**

**ACOE Arthur Kill Cutoff; REACH B**

| CONSTITUENTS | *Macoma nasuta* | | | | *Nereis virens* | | | |
|---|---|---|---|---|---|---|---|---|
| | REFERENCE | | TEST | | REFERENCE | | TEST | |
| | DETECTION LIMITS | CONCENTRATION | DETECTION LIMITS | CONCENTRATION | DETECTION LIMITS | CONCENTRATION | DETECTION LIMITS | CONCENTRATION |
| **Metals** | ppm (mg/kg) | ppm (mg/kg) | ppm (mg/kg) | ppm (mg/kg) | ppm (mg/kg) | ppm (mg/kg) | ppm (mg/kg) | ppm (mg/kg) |
| Ag | | 0.02 | | * 0.04 | | 0.02 | | 0.02 |
| As | | 2.58 | | * 3.12 | | 3.01 | | 2.24 |
| Cd | | 0.03 | | 0.04 | | 0.04 | | 0.04 |
| Cr | | 0.40 | | 0.47 | | 0.11 | | 0.09 |
| Cu | | 1.71 | | * 2.42 | | 1.62 | | 1.33 |
| Hg | | 0.014 | | 0.015 | | 0.037 | | 0.032 |
| Ni | | 0.43 | | 0.53 | | 0.27 | | 0.25 |
| Pb | | 0.20 | | * 0.50 | | 0.18 | | 0.18 |
| Zn | | 14.16 | | 15.54 | | 21.06 | | 16.60 |
| **Pesticides** | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) |
| Aldrin | 0.08 | ND | 0.08 | ND | 0.08 | ND | 0.08 | ND |
| a-Chlordane | | 0.12 | | * 0.55 | | 0.12 | | * 0.76 |
| trans Nonachlor | | 0.04 | | * 0.26 | | 0.20 | | * 0.58 |
| Dieldrin | | 0.17 | | * 0.42 | | 0.34 | | * 0.69 |
| 4,4'-DDT | | 0.07 | | 0.08 | 0.17 | ND | | 0.06 |
| 2,4'-DDT | 0.09 | ND | | 0.05 | 0.09 | ND | 0.09 | ND |
| 4,4'-DDD | | 0.17 | | * 1.89 | | 0.13 | | * 2.56 |
| 2,4'-DDD | | 0.05 | | * 0.80 | | 0.09 | | * 0.85 |
| 4,4'-DDE | | 0.23 | | * 3.31 | | 0.04 | | * 0.93 |
| 2,4'-DDE | 0.03 | ND | | * 0.53 | 0.03 | ND | | * 0.08 |
| **Total DDT** | | **0.58** | | * **6.66** | | **0.41** | | * **4.53** |
| Endosulfan I | 0.12 | ND | | 0.14 | 0.12 | ND | 0.12 | ND |
| Endosulfan II | 0.07 | ND | 0.07 | ND | 0.07 | ND | 0.07 | ND |
| Endosulfan sulfate | 0.17 | ND | 0.17 | ND | 0.17 | ND | 0.17 | ND |
| Heptachlor | 0.08 | ND | 0.08 | ND | 0.08 | ND | 0.08 | ND |
| Heptachlor epoxide | | 0.04 | 0.08 | ND | | 0.11 | | 0.11 |
| | | | | | | | | |
| **Industrial Chemicals** | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) |
| PCB 8 | | 0.02 | | * 0.15 | 0.04 | ND | 0.04 | ND |
| PCB 18 | | 0.03 | | * 0.50 | 0.04 | ND | | * 0.57 |
| PCB 28 | | 0.09 | | * 1.46 | | 0.02 | | * 0.86 |
| PCB 44 | | 0.03 | | * 0.59 | 0.04 | ND | | * 0.71 |
| PCB 49 | | 0.10 | | * 1.64 | | 0.04 | | * 1.59 |
| PCB 52 | | 0.11 | | * 1.84 | | 0.11 | | * 2.54 |
| PCB 66 | | 0.09 | | * 1.57 | | 0.04 | | * 1.15 |
| PCB 87 | | 0.03 | | * 0.37 | 0.07 | ND | | * 0.15 |
| PCB 101 | | 0.13 | | * 1.56 | | 0.21 | | * 1.63 |
| PCB 105 | | 0.03 | | * 0.31 | | 0.07 | | * 0.39 |
| PCB 118 | | 0.08 | | * 1.01 | | 0.11 | | * 0.82 |
| PCB 128 | | 0.04 | | * 0.15 | | 0.08 | | * 0.23 |
| PCB 138 | | 0.08 | | * 0.64 | | 0.40 | | * 1.10 |
| PCB 153 | | 0.15 | | * 1.29 | | 1.05 | | * 2.37 |
| PCB 170 | | 0.04 | | * 0.11 | | 0.14 | | * 0.33 |
| PCB 180 | | 0.04 | | * 0.24 | | 0.27 | | * 0.66 |
| PCB 183 | | 0.02 | | * 0.10 | | 0.14 | | * 0.29 |
| PCB 184 | 0.05 | ND | 0.05 | ND | 0.05 | ND | 0.05 | * ND |
| PCB 187 | | 0.05 | | * 0.24 | | 0.42 | | * 0.82 |
| PCB 195 | 0.05 | ND | 0.05 | ND | | 0.03 | | * 0.07 |
| PCB 206 | 0.05 | ND | | 0.03 | | 0.18 | | * 0.28 |
| PCB 209 | 0.07 | ND | | 0.04 | | 0.16 | | * 0.23 |
| **Total PCB** | | **2.52** | | * **27.80** | | **7.20** | | * **33.65** |
| 1,4-Dichlorobenzene | | 0.04 | | * 0.13 | | 0.04 | | 0.04 |

TABLE 3. (Continued) 32-118

ACOE Arthur Kill Cutoff; REACH B

| CONSTITUENTS | *Macoma nasuta* | | | | *Nereis virens* | | | |
|---|---|---|---|---|---|---|---|---|
| | REFERENCE | | TEST | | REFERENCE | | TEST | |
| | DETECTION LIMITS | CONCENTRATION | DETECTION LIMITS | CONCENTRATION | DETECTION LIMITS | CONCENTRATION | DETECTION LIMITS | CONCENTRATION |
| **PAH's** | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) | ppb (ug/kg) |
| Naphthalene | | 0.64 | | * 0.84 | | 0.67 | | 0.86 |
| Acenaphthylene | | 0.07 | | * 0.24 | | 0.08 | | * 0.18 |
| Acenaphthene | | 0.25 | | * 0.52 | | 0.30 | | * 0.74 |
| Fluorene | | 0.58 | | * 1.07 | | 0.13 | | * 0.24 |
| Phenanthrene | | 3.88 | | * 6.16 | | 0.48 | | * 0.78 |
| Anthracene | | 0.65 | | * 1.76 | | 0.06 | | * 0.22 |
| Fluoranthene | | 5.07 | | * 23.71 | | 0.71 | | * 8.39 |
| Pyrene | | 4.59 | | * 28.54 | | 0.56 | | * 10.68 |
| Benzo(a)anthracene | | 0.73 | | * 7.10 | | 0.04 | | * 0.45 |
| Chrysene | | 1.50 | | * 11.32 | | 0.24 | | * 3.69 |
| Benzo(b)fluoranthene | | 0.73 | | * 8.67 | 0.24 | ND | | * 0.77 |
| Benzo(k)fluoranthene | | 0.70 | | * 7.22 | 0.19 | ND | | * 0.95 |
| Benzo(a)pyrene | | 0.56 | | * 5.77 | 0.31 | ND | | * 0.63 |
| Indeno(1,2,3-cd)pyrene | | 0.20 | | * 2.36 | 0.17 | ND | | * 0.19 |
| Dibenzo(a,h)antracene | | 0.10 | | * 0.68 | 0.23 | ND | 0.23 | ND |
| Benzo(g,h,i)perylene | | 0.27 | | * 3.26 | | 0.07 | | * 0.50 |
| **Total PAH's** | | **20.52** | | * **109.24** | | **3.90** | | * **29.40** |
| | | | | | | | | |
| **Dioxins** | pptr(ng/kg) | pptr(ng/kg) | pptr(ng/kg) | pptr(ng/kg) | pptr(ng/kg) | pptr(ng/kg) | pptr(ng/kg) | pptr(ng/kg) |
| 2378 TCDD | 0.02 | ND | | 0.05 | 0.01 | ND | 0.02 | ND |
| 12378 PeCDD | 0.02 | ND | | 0.07 | 0.02 | ND | 0.03 | ND |
| 123478 HxCDD | 0.03 | ND | | 0.10 | 0.02 | ND | 0.03 | ND |
| 123678 HxCDD | 0.02 | ND | | 0.15 | | 0.05 | 0.03 | ND |
| 123789 HxCDD | 0.03 | ND | | 0.11 | 0.02 | ND | 0.02 | ND |
| 1234678 HpCDD | | 0.06 | | * 2.33 | | 1.91 | | 1.11 |
| 1234789 OCDD | | 1.78 | | * 34.70 | | 15.53 | | 16.45 |
| 2378 TCDF | 0.02 | ND | | * 0.65 | | 0.90 | | * 1.34 |
| 12378 PeCDF | 0.01 | ND | | * 0.07 | | 0.13 | 0.02 | ND |
| 23478 PeCDF | 0.02 | ND | 0.02 | ND | 0.02 | ND | | * 0.05 |
| 123478 HxCDF | 0.01 | ND | | 0.14 | 0.01 | ND | | * 0.09 |
| 123678 HxCDF | 0.01 | ND | 0.01 | ND | | 0.09 | 0.02 | ND |
| 234678 HxCDF | | 0.07 | 0.01 | ND | 0.01 | ND | 0.02 | ND |
| 123789 HxCDF | 0.01 | ND | 0.02 | ND | 0.01 | ND | 0.02 | ND |
| 1234678 HpCDF | | 0.16 | | * 0.93 | | 0.29 | | 0.21 |
| 1234789 HpCDF | | 0.16 | | 0.14 | | 0.06 | | 0.04 |
| 12346789 OCDF | | 0.38 | | 1.19 | | 0.47 | | 0.47 |

ND = Not detected
Total PAH = Sum of all PAH's.
Total DDT = sum of 2,4'- and 4,4'-DDD, DDE, and DDT
Total PCB = 2(x), where x = sum of PCB congeners
Concentrations shown are the mean of 5 replicate analyses in wet weight.
Means were determined using conservative estimates of concentrations of constituents that were at concentrations below the detection limit.
* = Statistically significant at the 95% confidence level.

Raritan River to Arthur Kill Cut-Off (2013)

**Table 4a** **Particle Size Distribution, Percent Moisture, and TOC Values of Test Sediment**

| Sample ID | ASI # | % Sand ≥2 mm + Gravel | % Sand <2 mm | % Silt | % Clay | % Moisture | TOC ppm | % TOC of Dry Weight |
|---|---|---|---|---|---|---|---|---|
| 1A | 20130033 | 0.5 | 19.1 | 51.1 | 29.3 | 59.8 | 45,333 | 4.5 |
| 2A | 20130034 | 0.0 | 19.9 | 50.6 | 29.5 | 61.5 | 43,010 | 4.3 |
| 3A | 20130035 | 5.4 | 20.4 | 46.3 | 27.9 | 62.6 | 65,988 | 6.6 |
| 4A | 20130036 | 0.0 | 17.7 | 49.2 | 33.1 | 60.4 | 41,138 | 4.1 |
| 5A | 20130037 | 0.0 | 18.4 | 48.4 | 33.2 | 59.7 | 44,834 | 4.5 |
| 6A | 20130038 | 0.0 | 19.1 | 47.7 | 33.2 | 62.5 | 40,190 | 4.0 |
| 7A | 20130039 | 0.0 | 18.4 | 51.5 | 30.1 | 63.9 | 39,797 | 4.0 |
| 8A | 20130040 | 0.0 | 18.7 | 50.3 | 31.0 | 61.8 | 38,704 | 3.9 |
| 9B | 20130041 | 0.1 | 22.3 | 49.0 | 28.6 | 60.1 | 38,430 | 3.8 |
| 10B | 20130042 | 0.0 | 16.0 | 53.2 | 30.8 | 61.2 | 40,795 | 4.1 |
| 11B | 20130043 | 0.0 | 21.9 | 48.5 | 29.6 | 60.4 | 38,593 | 3.9 |
| 12B | 20130044 | 0.0 | 18.9 | 49.3 | 31.8 | 60.7 | 41,728 | 4.2 |
| 13B | 20130045 | 0.0 | 20.4 | 49.8 | 29.8 | 59.3 | 38,500 | 3.9 |
| 14B | 20130046 | 0.0 | 16.8 | 51.4 | 31.8 | 58.2 | 40,357 | 4.0 |
| 15B | 20130047 | 0.0 | 20.1 | 49.0 | 30.9 | 61.0 | 40,278 | 4.0 |
| 15B | 20130047 dup | | | | | 60.6 | | |
| 15B | 20130047 trip | | | | | 61.2 | | |
| 16B | 20130048 | 0.0 | 23.1 | 48.3 | 28.6 | 62.4 | 35,675 | 3.6 |
| Comp. Reach A | 20130051 | 0.9 | 19.9 | 49.9 | 29.3 | 62.9 | 45,583 | 4.6 |
| Comp. Reach A | 20130051 dup | 0.1 | 18.3 | 50.4 | 31.2 | | | |
| Comp. Reach A | 20130051 trip | 0.4 | 22.9 | 48.2 | 28.5 | | | |
| Comp. Reach B | 20130052 | 0.8 | 20.7 | 49.2 | 29.3 | 59.5 | 38,996 | 3.9 |
| Comp. Reach B | 20130052 dup | 0.0 | 19.0 | 51.1 | 29.9 | | | |
| Comp. Reach B | 20130052 trip | 0.0 | 20.2 | 48.2 | 31.6 | | | |

RF