US ARMY CORPS
OF ENGINEERS
NEW YORK DISTRICT

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2

# Site Management and Monitoring Plan for the Historic Area Remediation Site

April 29, 2010

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Table of Contents


| | | Page |
|---|---|---|
| 1. | Introduction | 1 |
| 2. | HARS SMMP Review and Revision | 1 |
| 3. | Background | 1 |
| 4. | HARS Remediation | 2 |
| 5. | HARS Description | 3 |
| 6. | Existing Conditions | 5 |
| 7. | Objectives | 8 |
| 8. | HARS Management Roles and Responsibilities | 9 |
| 9. | Coordination | 9 |
| 10. | Funding | 10 |
| 11. | Baseline Assessment | 10 |
| 12 | Transportation and Placement Methods Utilized at the HARS | 28 |
| 13. | Monitoring Program | 32 |
| 14. | HARS Remediation Permit Conditions and Management Practices | 42 |
| 15. | Material for Remediation Testing Requirements | 48 |
| 16. | Anticipated HARS Use and Quantity of Material for Remediation to be Placed at the HARS | 49 |
| 17 | References | 50 |
| | Appendices | |

## 1. Introduction

The Historic Area Remediation Site (HARS) was designated as an ocean placement site in September 1997 with a Site Management and Monitoring Plan (SMMP) as called for by the Marine Protection, Research and Sanctuaries Act (MPRSA). MPRSA section 102 (c)(3)(F) further requires that an SMMP established for sites like the HARS include a schedule for review and revision of the plan to occur not less than 10 years after adoption of the plan, and every 10 years thereafter. Since this SMMP for the HARS was established 10 years ago, EPA Region 2 and the USACE – New York District (USACE-NYD) have reviewed the plan annually and have found that the intent of the original procedures and protocols continue to meet the management objectives of the HARS, and will continue to be used. This updated SMMP fulfills the 10 year revision requirement of the MPRSA.

## 2. HARS SMMP Review and Revision

Section 506 of the Water Resources and Development Act (WRDA) of 1992, which amended the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA), required the EPA and the U.S. Army Corps of Engineers (USACE) to prepare a Site Management and Monitoring Plan (SMMP) for the HARS. WRDA provides that after January 1, 1995, no site shall receive a final designation unless an SMMP has been developed. This current document constitutes the updated joint EPA Region 2 and USACE New York District (USACE-NYD) WRDA-required SMMP, and identifies a number of actions, provisions, and practices to manage the operational aspects of dredging, HARS remediation activities, and HARS monitoring tasks. The original HARS SMMP was written to address the SMMP elements specified in WRDA 1992 and was consistent with the joint EPA and USACE National Guidance Document entitled, "Guidance Document for Development of Site Management and Monitoring Plans for Ocean Dredged Material Disposal Sites" **(EPA/USACE, 1996)**. EPA determined that portions of the HARS are Impact Category I [40 CFR 228.11(c)], and the original HARS SMMP was developed to manage the site to reduce impacts to acceptable levels, in accordance with 40 CFR 228.11(c). This update continues that effort.

MPRSA 102 (c)(3)(F) requires that any SMMP include a schedule for review and revision of the SMMP as needed. This shall not be less frequently than 10 years after implementation of the first plan, and every 10 years thereafter. EPA Region 2 and the USACE-NYD evaluate the effectiveness of the HARS SMMP as the results of the monitoring programs are developed and review the SMMP annually to ensure it is effective and up to date. This updated version of the SMMP was developed after almost ten years of HARS remediation activities and reflects the use of current, state-of-the-art monitoring equipment and detailed placement guidelines.

## 3. Background

Dredging is necessary to maintain and improve our Nation's ports, harbors, and channels. Fine-grained sediments transported by rivers and within estuaries settle to the bottom of channels, harbors and berthing areas. Dredging must be performed if this sediment accumulation causes shoaling that interferes with safe navigation.

During the past century, dredged material from the Port of New York and New Jersey was routinely disposed of in the Atlantic Ocean in and around an area approximately 6 miles offshore of Sandy Hook, New Jersey, known as the Mud Dump Site (MDS). The MDS was formally designated in 1973 by the United States Environmental Protection Agency (EPA) as an "interim" ocean dredged material disposal site, and received final designation by EPA in 1984. As stated in a July 24, 1996 letter to several New Jersey Congressmen, signed by EPA Administrator Carol Browner, Secretary of Transportation Federico F. Peña, and Secretary of the Army Togo D. West, Jr. (3-Party Letter):

> "Environmental, tourism, fishing, and other community groups have long contended that the MDS should be closed immediately. These views reflect the important environmental values that New Jersey's communities identify with their coastal environment. Community concerns have been heightened by the unhappy history of other environmental threats that these communities have had to endure -- ranging from oil spills to the littering of shorelines with medical waste. This history warrants sensitivity to concerns about the MDS, including concerns about continued use of the site for so-called "category 2" material. When these concerns are coupled with the limited category 2 disposal capacity we expect the site to provide, we must conclude that long-term use of this site for disposal activity is not realistic."

Dredged material categories are discussed in section 11.1

Effective on September 29, 1997, the EPA, under 40CFR Section 228, closed the MDS and simultaneously re-designated the site and surrounding areas that were used historically as disposal sites for contaminated dredged material as the Historic Area Remediation Site (HARS). This designation included a proposal that the site be managed to reduce impacts at the site to acceptable levels (in accordance with 40 C.F.R. Section 228.11(c)).

## 4. HARS Remediation:

The HARS designation provides that the site be managed to reduce impacts at the site to acceptable levels (in accordance with 40 C.F.R. Section 228.11(c)). The goal is that, consistent with the 3-Party Letter, "The Historic Area Remediation Site will be remediated with uncontaminated dredged material (i.e., dredged material that meets current Category I standards and will not cause significant undesirable effects, including through bioaccumulation)." **(hereinafter referred to as "the Material for Remediation" or "Remediation Material")**.

On March 17, 2003, the EPA published final rule 67 FR 62659, to modify the designation of the Historic Area Remediation Site (HARS) (62 FR 46142) to establish a HARS-specific worm tissue polychlorinated biphenyl (PCB) criterion of 113 parts per billion (ppb) for use in determining the suitability of proposed dredged material for use as Remediation Material. This amendment to the HARS designation became effective on April 16, 2003, and established a pass/fail criterion for evaluating PCBs in worm tissue from bioaccumulation tests performed on dredged material

proposed for use at the HARS as Remediation Material. This value remains in effect until EPA and the U.S. Army Corps of Engineers (USACE) complete their review of the 2002 HARS human health scientific peer review comments, prepare the ecological proposal and respond to the comments on the scientific peer review of it, and revise, as necessary, the process used to evaluate the suitability of dredged material proposed for use as Remediation Material at the HARS for all contaminants of concern.

## 5. HARS Description (also see Section 11)

The HARS (which includes the 2.2 square nautical mile MDS) is a 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, Long Island and includes the following 3 areas (Figure 1):

**Priority Remediation Area (PRA):** 9.0 square nautical mile area to be remediated with at least one meter of the Remediation Material.

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

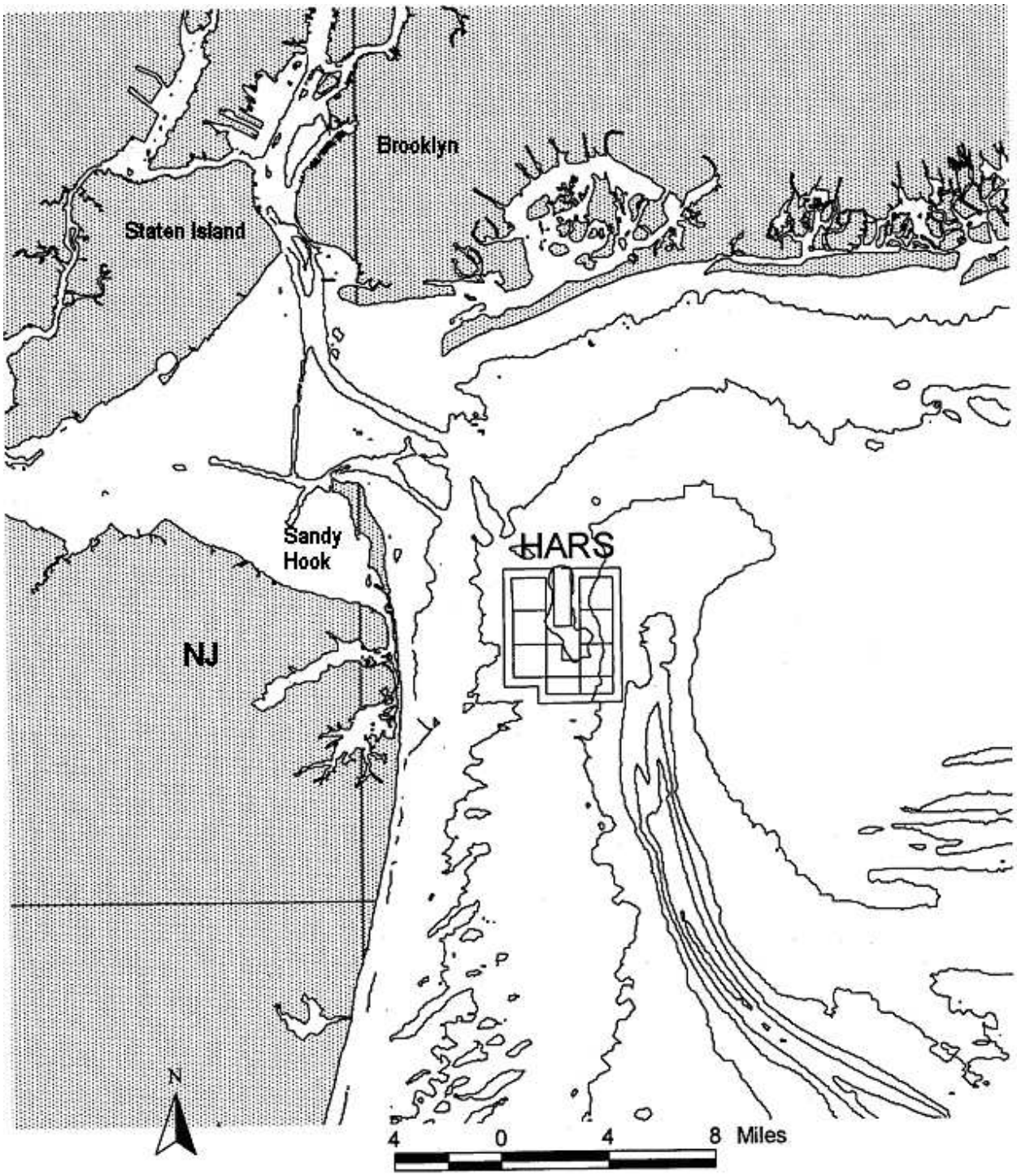


**Figure 1. Location of HARS off shore Sandy Hook, New Jersey. Thirty-foot depth contours are illustrated.**

## 6. Existing Conditions

During the period from HARS designation in 1997 to the end of July, 2008 (the date of the most recent HARS bathymetric survey), material from 58 dredging projects have been used to remediate the HARS. A total of 11,261 placement trips were made (Figure 2), with placement of 34.4 million cubic yards (MCY) of remediation material. A HARS remediation project is defined as one of three types, 1) an annual maintenance dredging cycle in a private 3-year permitted project, 2) a single Federal maintenance dredging project, or 3) a single private or Federal deepening project. Table 1 provides a summary of remediation activity at the HARS through July, 2008. The total volume used for remediation is based on estimated scow volume. The actual placed volume is less because water is added to scows during dredging.

Table 1. Summary of HARS remediation projects through December 2008.

| | Private Maintenance | Federal Maintenance | Private Deepening | Federal Deepening | **Total** |
|---|---|---|---|---|---|
| Number of Remediation Projects | 31 | 10 | 4 | 16 | **61** |
| Volume of Remediation Material | 5.7 MCY* | 3.8 MCY | 0.8 MCY | 25.8 MCY | **36.1 MCY** |

*MCY = Million Cubic Yards

Figure 3 shows the remediation status of the HARS at the time of the most recent bathymetric survey (July 2008). Most of HARS PRA#1 and PRA#2 have been remediated with at least 1m of dredged material (Table 2). About 1/3 of PRA#3 has been remediated with at least 1m. PRA#4 has not been used for placement of many dredging projects; less than 15% of the area available has been covered with at least 1m.

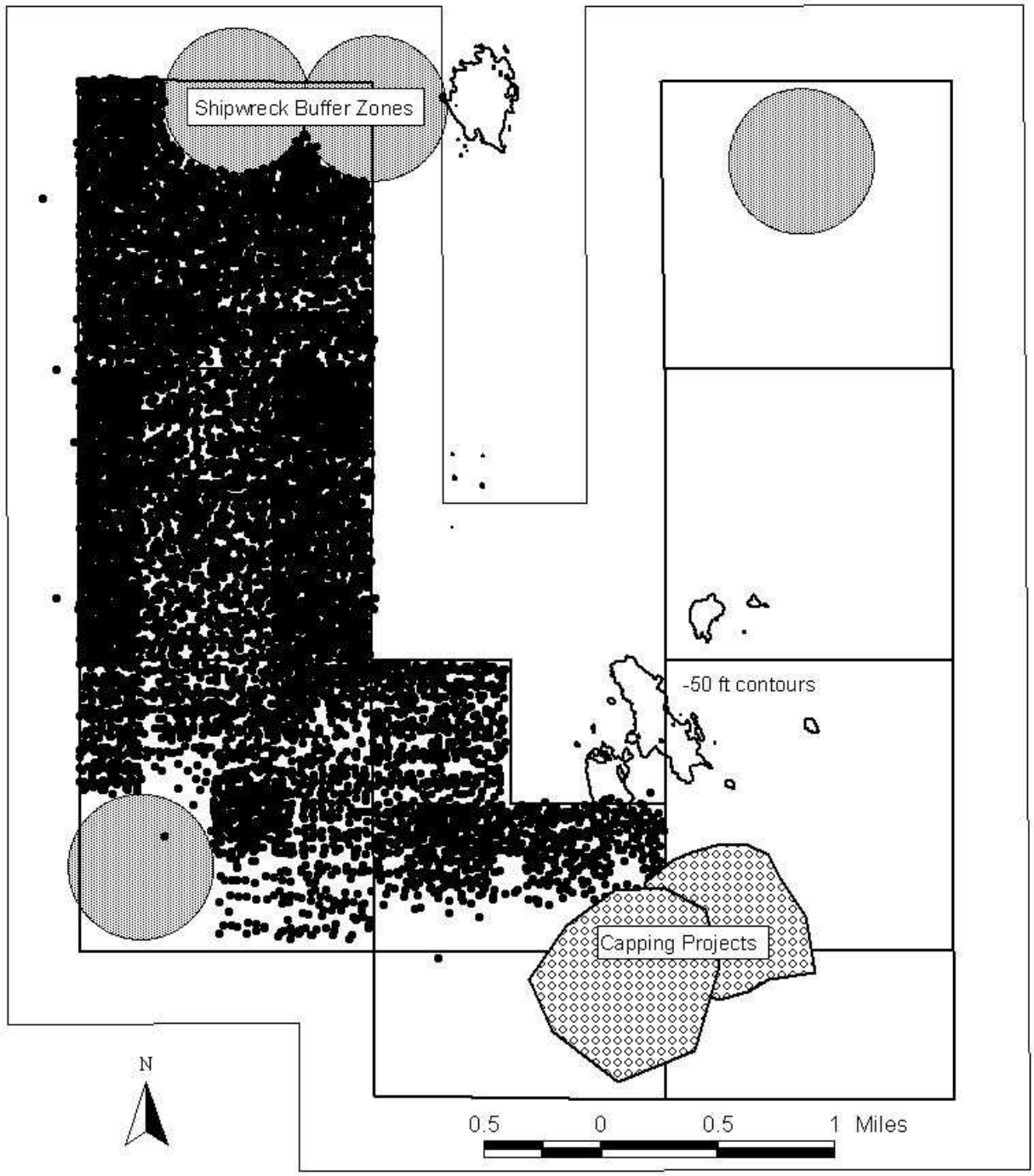


**Figure 2. Location of 11,261 placements made at the HARS from 1998 through the end of July 2008. Center points of placement trips are illustrated. Some points outside of PRAs are due to scows not being completely empty when leaving the HARS resulting in shifting of the center point away from a designated placement grid. The point inside the Shipwreck Buffer Zone in PRA#3 is associated with a scow that capsized during a rock placement trip to a NJ artificial reef.**

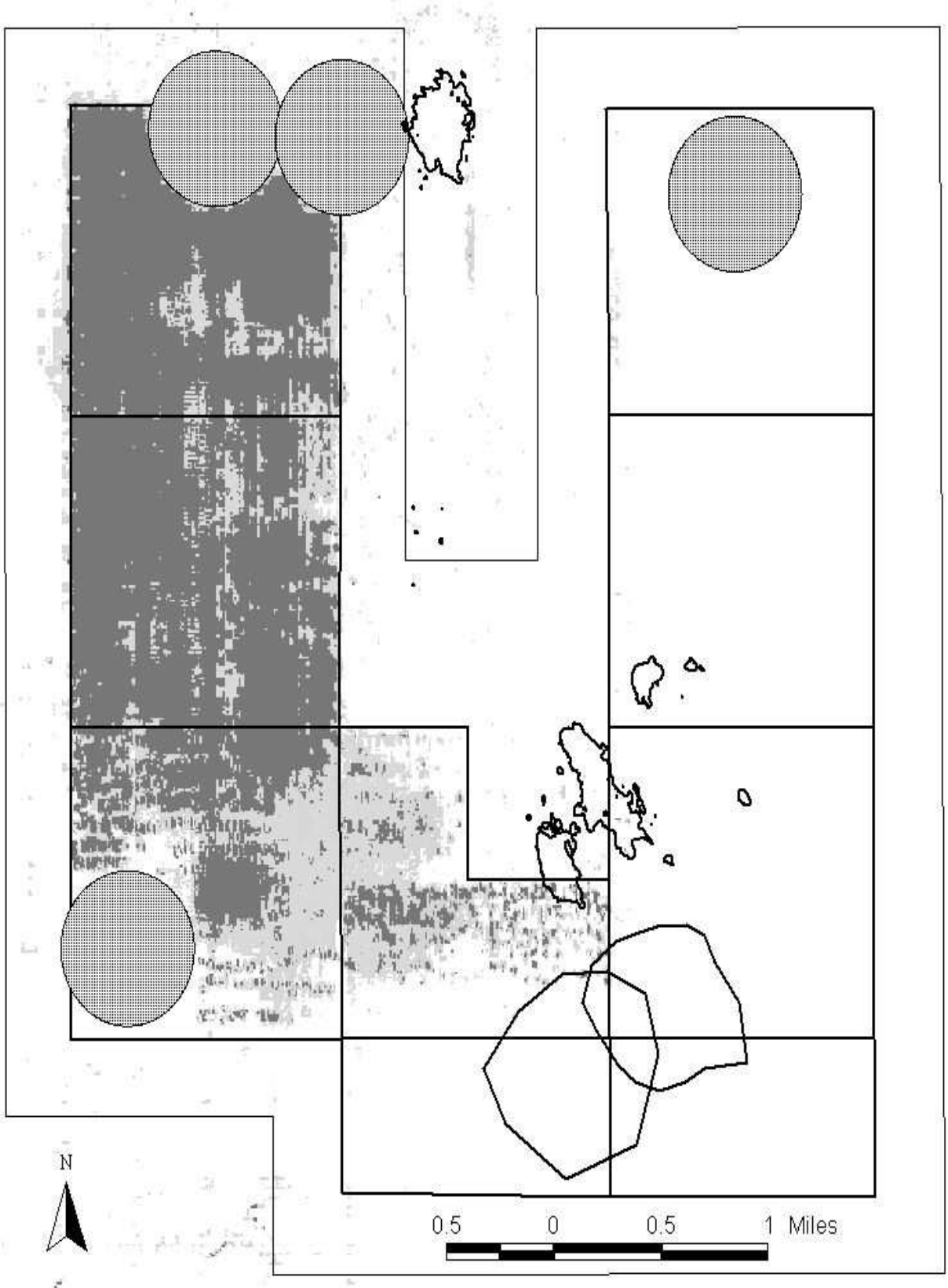


**Figure 3. Remediation status of the HARS as of July 2008. Areas of the HARS that have been remediated with between 1.5ft and 1m are shaded light grey. Areas of the HARS that have been remediated with at least 1m are shaded dark gray. Shipwreck buffer zones are indicated by shaded circles. Areas of the HARS that are shallower than -50ft are indicated by bold contours.**

Table 2. Summary of remediation status for HARS PRAs 1-4* as of August 2008.

| PRA # | Area available for remediation** | Area with ≥1m of remediation | Percentage of area remediated |
|---|---|---|---|
| 1 | 3,850,300 $yd^2$ | 3,352,200 $yd^2$ | 87 % |
| 2 | 4,830,400 $yd^2$ | 4,019,600 $yd^2$ | 83 % |
| 3 | 3,929,000 $yd^2$ | 1,397,500 $yd^2$ | 36 % |
| 4 | 3,228,500 $yd^2$ | 438,300 $yd^2$ | 14 % |

* remediation status as of July, 2008, the date of the most recent HARS bathymetric survey

** Area available for remediation consists of PRA area minus areas of shipwreck buffer zones, capping project footprints, and areas shallower than -50 ft

A status report, summarizing monitoring conducted prior to this revision, will be prepared in 2009. Thereafter, a status report will be prepared annually.

**7. Objectives**

The objectives of the SMMP are as follows:

A. Provide guidelines to document remediation of required areas within the HARS resulting from placement of a one-meter cap (minimum required cap thickness) of Remediation Material on sediments within the PRA (inside the HARS). Sediments within the PRA have been found to exhibit Category II and Category III dredged material characteristics and will be remediated.

B. Collect data to ensure that no significant adverse environmental impacts occur from the placement of Remediation Material at the HARS. The phrase "significant adverse environmental impacts" is inclusive of all significant or potentially substantial negative impacts on resources within the HARS and vicinity. A meeting of the SRP will be convened to review the HARS status report and to recommend evaluative factors to determine occurrence of significant adverse impacts.

C. Recognize and correct any potential unacceptable conditions before they cause any significant adverse impacts to the marine environment or present a navigational hazard to commercial and recreational water-borne vessel traffic. The term "potential unacceptable conditions" is inclusive of the range of negative situations that could arise as a result of Remediation Material placement at the HARS such that its occurrence could have an undesirable affect. Examples could include things such as: Remediation Material placement mounds exceeding the required management depth or the Remediation Material barges releasing materials in the wrong locations.

D. Determine/enforce compliance with MPRSA Permit conditions.

E. Provide a baseline assessment of conditions at the HARS.

F. Provide a program for monitoring the HARS.

G. Describe special management conditions/practices to be implemented at the HARS.

H. Specify the quantity of Remediation Material to be placed at the HARS, and the presence, nature, and bioavailability of the contaminants in Remediation Material.

I. Specify the anticipated use of the HARS, including the closure date.

J. Provide a schedule for review and revision of the HARS SMMP.

This updated SMMP will be in place until modified or revised within the next ten years and/or the remediation of the HARS is completed and the HARS is closed.

## 8. HARS Management Roles and Responsibilities

### 8.1. Regulatory/Statutory Responsibilities

Under MPRSA, the USACE and the EPA have been assigned various duties pertaining to HARS management. EPA and USACE share responsibility for MPRSA permitting and HARS designation and management, as briefly summarized below.

#### 8.1.1. Section 102 of the MPRSA

EPA is assigned permitting authority for non-dredged material. EPA also designates recommended times and sites for ocean disposal (for both non-dredged and dredged material), and develops the environmental criteria used in reviewing permit applications.

#### 8.1.2. Section 103 of the MPRSA

USACE is assigned permitting responsibility for dredged material, subject to EPA review and concurrence that the material meets applicable ocean disposal criteria. The USACE is required to use EPA-designated ocean disposal sites to the maximum extent feasible.

## 9. Coordination

EPA Region 2 and the USACE-NYD jointly manage the New York/New Jersey Harbor Dredged Material Disposal Program and the HARS. EPA Region 2 and the USACE-NYD will continue to coordinate the exchange of information, HARS management and monitoring resources, and documentation of site management decisions. USACE-NYD and EPA Region 2 will continue to provide each other with all pertinent data and information as it becomes available. Specifically, upon discovery/notification, any information concerning disposal/dredging violations will be shared between EPA Region 2 and the USACE-NYD.

EPA Region 2 and the USACE-NYD have convened a Scientific Review Panel (SRP) consisting of qualified representatives from academia, federal agencies, state agencies, public interest groups, port representatives, and consultants. This group has reviewed and provided input to the original HARS SMMP and this revised SMMP, and will continue to evaluate relevant monitoring data in an active, timely, and meaningful way, as well as review and comment on scopes of work for PRAs needing post remediation investigation. Attendance at SRP meetings, which will be held annually, will be by invitation only.

Annual meetings of the SRP will be scheduled to update and discuss relevant monitoring and status issues. Possible interim meetings may be held on an as-needed basis. All data reports and meeting minutes will be distributed to any interested person/party upon request. The SRP will review and comment on scopes of work for PRAs needing post remediation investigation.

## 10. Funding

Funding for the proposed site management and monitoring is essentially provided by USACE-NYD to the extent allowed by funds received in any given Fiscal Year. USACE-NYD has historically budgeted approximately one million dollars annually for HARS SMMP activities and anticipates requesting the same funding levels in the future. Continued funding at this level, while not guaranteed, will ensure that necessary HARS SMMP activities are performed.

## 11. Baseline Assessment

MPRSA 102 (c)(3)(A) requires that the SMMP include a baseline assessment of conditions at the site. Original baseline data were collected prior to HARS designation **(EPA 1997)**. Monitoring data collected since HARS designation are used as updated baseline data when appropriate.

11.1. HARS Characterization:

The HARS is bounded by the following coordinates (**Figure 4**):

| Point | Latitude DMS | Longitude DMS | Latitude DDM | Longitude DDM |
|---|---|---|---|---|
| A | 40° 25' 39" N | 73° 53' 55" W | 40° 25.65' N | 73° 53.92' W |
| M | 40° 25' 39" N | 73° 48' 58" W | 40° 25.65' N | 73° 48.97' W |
| P | 40° 21' 19" N | 73° 48' 57" W | 40° 21.32' N | 73° 48.95' W |
| R | 40° 21' 19" N | 73° 52' 30" W | 40° 21.32' N | 73° 52.50' W |
| S | 40° 21' 52" N | 73° 53' 55" W | 40° 21.87' N | 73° 53.92' W |
| V | 40° 21' 52" N | 73° 52' 30" W | 40° 21.87' N | 73° 52.50' W |

DMS = Degrees, Minutes, Seconds DDM = Degrees, Decimal Minutes

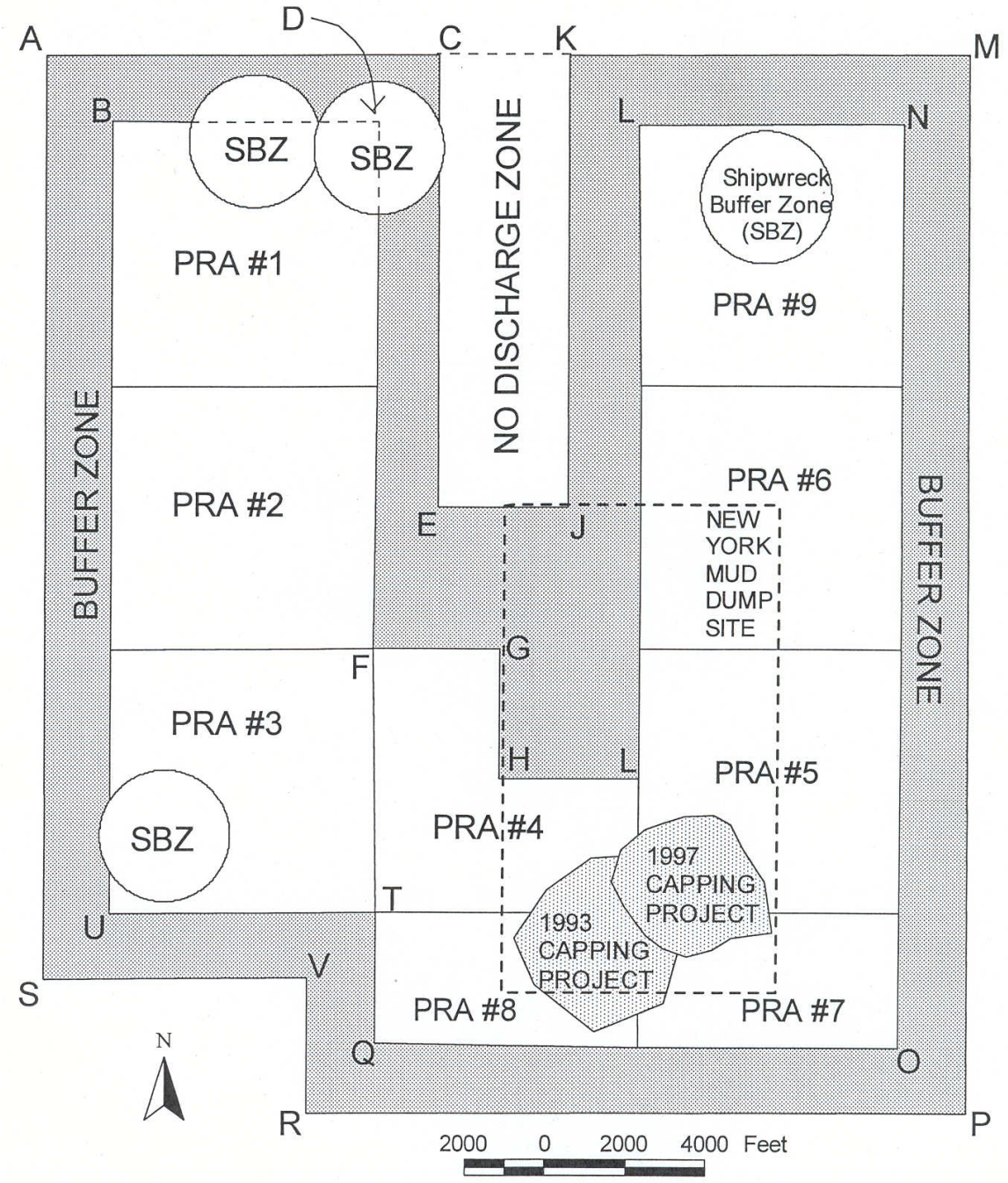


**Figure 4. The Historic Area Remediation Site. Nine Priority Remediation Areas (PRAs), HARS Buffer Zone, and No Discharge Zone, Historic Shipwreck Buffer Zones (SBZs), and Category II dredged material capping project areas are indicated.**

From 1994 to 1996, EPA Region 2 and the USACE-NYD conducted a variety of oceanographic surveys with their respective contractors Battelle and SAIC within an approximately 30 square nautical mile study area (including the 15.7 square nautical mile HARS). In 1994, sediment samples were collected from within the MDS and the HARS and analyzed for toxicity, sediment chemistry, benthic community structure, and worm tissue analyses **(Battelle, 1996 and 1997)**. In 1995, side scan sonar, REMOTS®, seafloor photography, and bathymetric surveying were conducted within the HARS **(SAIC 1995a, b, and c)**. Together the data from these surveys represented the baseline conditions against which all future monitoring data were to be compared (Baseline Data). These surveys served as the HARS Baseline Assessment because they were the most comprehensive surveys conducted to date, utilizing state-of-the-art sampling and analytical techniques/procedures. In addition, these surveys represented the most recent conditions and assessments of the HARS that could be used for subsequent data comparison.

These Baseline studies revealed levels of toxicity within the MDS and surrounding area that would fail ocean disposal criteria and qualify as Category III dredged material (**See Table 3**). Analyses conducted on all worm tissue collected from the HARS revealed levels of dioxin in excess of 1 parts per trillion (pptr) but less than 10 pptr, indicative of Category II dredged material **(See Table 5)**.

Bathymetry **(Figure 1)** collected in September 1995 **(SAIC, 1995a)** and side scan sonar data collected in March 1995 **(SAIC, 1995b)** are included in the baseline data set. As of September 1995 and May 1996, water depths in the HARS range from 40 feet (12 meters) to 138 feet (42 meters) BMLW.

A more accurate and detailed bathymetric survey of HARS PRAs 1-3 was conducted in 1998 and provides a more suitable “baseline” for the western side of the HARS. A bathymetric survey of the entire HARS conducted in 2002 provides a more accurate and detailed depiction of the rest of the HARS and is considered a more suitable “baseline” bathymetry for areas not surveyed in 1998.

The HARS includes the following 3 areas:

**Priority Remediation Area (PRA):** 9.0 square nautical mile area to be remediated with at least one meter of Remediation Material, bounded by the following coordinates:

| Point | Latitude DMS | Longitude DMS | Latitude DDM | Longitude DDM |
|---|---|---|---|---|
| B | 40° 25' 23" N | 73° 53' 34" W | 40° 25.38' N | 73° 53.57' W |
| D | 40° 25' 22" N | 73° 52' 08" W | 40° 25.37' N | 73° 52.13' W |
| F | 40° 23' 13" N | 73° 52' 09" W | 40° 23.22' N | 73° 52.15' W |
| G | 40° 23' 13" N | 73° 51' 28" W | 40° 23.22' N | 73° 51.47' W |
| H | 40° 22' 41" N | 73° 51' 28" W | 40° 22.68' N | 73° 51.47' W |
| I | 40° 22' 41" N | 73° 50' 43" W | 40° 22.68' N | 73° 50.72' W |
| L | 40° 25' 22" N | 73° 50' 44" W | 40° 25.37' N | 73° 50.73' W |
| N | 40° 25' 22" N | 73° 49' 19" W | 40° 25.37' N | 73° 49.32' W |
| O | 40° 21' 35" N | 73° 49' 19" W | 40° 21.58' N | 73° 49.32' W |
| Q | 40° 21' 36" N | 73° 52' 08" W | 40° 21.60' N | 73° 52.13' W |
| T | 40° 22' 08" N | 73° 52' 08" W | 40° 22.13' N | 73° 52.13' W |
| U | 40° 22' 08" N | 73° 53' 34" W | 40° 22.13' N | 73° 53.57' W |

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

| Point | Latitude | Longitude | Latitude | Longitude |
|---|---|---|---|---|
| A | 40° 25' 39" N | 73° 53' 55" W | 40° 25.65' N | 73° 53.92' W |
| B | 40° 25' 23" N | 73° 53' 34" W | 40° 25.38' N | 73° 53.57' W |
| C | 40° 25' 39" N | 73° 51' 48" W | 40° 25.65' N | 73° 51.80' W |
| D | 40° 25' 22" N | 73° 52' 08" W | 40° 25.37' N | 73° 52.13' W |
| E | 40° 23' 48" N | 73° 51' 48" W | 40° 23.80' N | 73° 51.80' W |
| F | 40° 23' 13" N | 73° 52' 09" W | 40° 23.22' N | 73° 52.15' W |

| Point | Latitude | Longitude | Latitude | Longitude |
|---|---|---|---|---|
| G | 40° 23' 13" N | 73° 51' 28" W | 40° 23.22' N | 73° 51.47' W |
| H | 40° 22' 41" N | 73° 51' 28" W | 40° 22.68' N | 73° 51.47' W |
| I | 40° 22' 41" N | 73° 50' 43" W | 40° 22.68' N | 73° 50.72' W |
| J | 40° 23' 48" N | 73° 51' 06" W | 40° 23.80' N | 73° 51.10' W |
| K | 40° 25' 39" N | 73° 51' 06" W | 40° 25.65' N | 73° 51.10' W |
| L | 40° 25' 22" N | 73° 50' 44" W | 40° 25.37' N | 73° 50.73' W |
| M | 40° 25' 39" N | 73° 48' 58" W | 40° 25.65' N | 73° 48.97' W |
| N | 40° 25' 22" N | 73° 49' 19" W | 40° 25.37' N | 73° 49.32' W |
| O | 40° 21' 35" N | 73° 49' 19" W | 40° 21.58' N | 73° 49.32' W |
| P | 40° 21' 19" N | 73° 48' 57" W | 40° 21.32' N | 73° 48.95' W |
| Q | 40° 21' 36" N | 73° 52' 08" W | 40° 21.60' N | 73° 52.13' W |
| R | 40° 21' 19" N | 73° 52' 30" W | 40° 21.32' N | 73° 52.50' W |
| S | 40° 21' 52" N | 73° 53' 55" W | 40° 21.87' N | 73° 53.92' W |
| T | 40° 22' 08" N | 73° 52' 08" W | 40° 22.13' N | 73° 52.13' W |
| U | 40° 22' 08" N | 73° 53' 34" W | 40° 22.13' N | 73° 53.57' W |
| V | 40° 21' 52" N | 73° 52' 30" W | 40° 21.87' N | 73° 52.50' W |

**No Discharge Zone:** an approximately 1.0 square nautical mile area in which no placement or incidental spread of Remediation Material is allowed, bounded by the following coordinates:

| Point | Latitude | Longitude | Latitude | Longitude |
|---|---|---|---|---|
| C | 40° 25' 39" N | 73° 51' 48" W | 40° 25.65' N | 73° 51.80' W |
| E | 40° 23' 48" N | 73° 51' 48" W | 40° 23.80' N | 73° 51.80' W |
| J | 40° 23' 48" N | 73° 51' 06" W | 40° 23.80' N | 73° 51.10' W |
| K | 40° 25' 39" N | 73° 51' 06" W | 40° 25.65' N | 73° 51.10' W |

EPA Region 2/NYD classify dredged material into one of three categories based on sediment toxicity and bioaccumulation tests:

- Category I: Sediments that meet ocean disposal criteria. Test results indicate no unacceptable toxicity or bioaccumulation. These sediments are acceptable for "unrestricted" ocean disposal. There are no potential short-term (acute) impacts or long-term (chronic) impacts; no special precautionary measures are required during disposal.

- Category II: Sediments that meet ocean disposal criteria. Test results indicate no significant toxicity but a potential for bioaccumulation. To protect from this potential for bioaccumulation, EPA and the Corps will require appropriate management practices such as capping. This is referred to as "restricted" ocean disposal.

- Category III: Sediments that do not meet ocean disposal criteria. These sediments are those that fail acute toxicity testing or pose a threat of significant bioaccumulation that cannot be addressed through available disposal management practices. These sediments cannot be disposed in the ocean.

## 11.2 Monitoring Findings

### 11.2.1 Physical Characteristics

The physical characteristics affecting the placement of Remediation Material in the HARS, as determined from moored measurements of waves and near-bottom currents, and measurements of suspended solids concentration within plumes of dredged material disposed at the MDS, can be summarized as follows:

1. Near-bottom, oscillatory tidal currents at the MDS and HARS are relatively weak with maximum speeds on the order of 10 cm/s (0.2 knot; **SAIC 1994a**). Mean currents are also weak (less than 0.2 knot) with directions that are dependent upon location, water depth, and bottom topography (**SAIC 1994b**).

2. Surface waves are generally less than 2 m in height except during major storms, which occur most frequently in the fall and winter seasons (**SAIC 1995c**). Wave-induced near-bottom currents are greater than 20 cm/s (0.4 knot) only when surface wave heights exceed 3 m, wave periods are in excess of 10 sec, and storm centers are to the east or southeast (this analysis included the significant December 11, 1992 Northeaster). These wave conditions are encountered less than 3% of the time in the fall and winter, and less than 1% of the time in the spring and summer (**SAIC 1994a**).

3. Plume tracking studies of dredged material disposed at the MDS have demonstrated that:

- plume behavior is variable depending upon the grain size of the dredged material (coarse to fine-grained material).

- rapid settling of material and turbulent mixing result in initial dilutions of the plume on the order of 3,000:1 to 600,000:1 within 15 minutes of placement based on total suspended solids (TSS) and dioxin/furans **(Battelle, 1994)**.
- total suspended solids (TSS) near the center of the dredged material placement plume body reach near background levels in 35 to 45 minutes **(Battelle, 1994)**.
- the release of dredged material into the water column resulted in rapid dispersal (turbulent mixing) of the plumes within the first few minutes after release; and plume dilution after two hours, based on total suspended solids, ranged from approximately 64,000:1 to 557,000:1 **(Battelle, 1994)**.
- a small amount of fine-grained sediment (silt and clay) remained measurable in the water column for up to 3 hours.

A review of dredged material placement and the mass balance questions can be found in **SAIC (1994)**.

11.2.2 Sediment Contaminant Concentrations/Toxicity Test Results:

The spatial pattern of the sediment grain-size distribution of the HARS was complex and included areas dominated by muddy (fine-grained) sediments and others dominated by coarse sediments (primarily sand). Total organic carbon (TOC) ranged from less than 0.005% to 3.56% **(Battelle, 1996)**. The ranges of organic and trace metal contaminant concentrations varied widely within the HARS and are listed in **Table 3**.

Sediments from the HARS were used in 10-day benthic acute toxicity tests using *Ampelisca abdita*. Test results indicate that sediments in the HARS exhibit between 0% and 99% amphipod survival in these laboratory tests (reference sediments exhibited 94% amphipod survival) **(Table 3)**. Test results less than 74% (20% less than reference site and statistically significant) would be considered biologically significant to *Ampelisca abdita* and unacceptable for ocean disposal (category III) **(EPA/USACE, 1991)**, **(EPA Region 2/USACE-NYD, 1992)**. The PRAs within the HARS were delineated for remediation purposes based principally upon the *Ampelisca abdita* toxicity test results. Specific sampling locations for each station are shown in **Figure 4** and **Table 4** (for further information see **Battelle, 1996**).

11.2.3 Water Column Characteristics/Circulation:

1. The HARS is located on the shallow continental shelf within the New York Bight. The mean flow of water mass, based on long-term current meter moorings on the Atlantic Shelf, is toward the southwest, along depth contours through the New York Bight **(EPA, 1997)**.

2. Physical characteristics of the aquatic systems in the New York Bight are complex. Circulation in the Bight is dominated by a relatively slow flow to the southwest (3.7 cm/sec), occasionally with a clockwise bottom gyre in the New York Bight Apex (**EPA, 1982)**. The bottom gyre is one component of a northward-flowing bottom current that splits when it reaches shallower waters near the coast **(McLaughlin et al., 1975)**.

3. Near shore surface currents are strongly influenced by winds and surface runoff. Average surface currents inshore of the 100-meter isobath (which includes the entire Apex) flow southward from Cape Cod to Cape Hatteras, at mean speeds of approximately 3.7 cm/sec. The southerly flow of the Hudson River plume along the New Jersey coast forces an opposing northward flow of more saline waters to the east (**EPA, 1982)**. A summary of data by Hansen (1977) indicated mean bottom-current flows of up to 2 cm/s toward the shoreline from the Mud Dump Site.

4. The axis of the Hudson Shelf Valley separates two general bottom current directions. East of the valley, flow is generally in a northwesterly to northeasterly direction, toward Long Island; while west of the axis, the flow is generally in a southwesterly to northwesterly direction, toward New Jersey **(EPA, 1982)**.

5. Maximum salinities (33 to 34 ppt) occur inshore during the winter (February and March) when sub-freezing conditions reduce river runoff. The spring thaw reduces the surface salinity, particularly near shore, and strong vertical and horizontal gradients may develop. In summer surface salinities are at the annual minimum (27 to 31 ppt) with bottom salinities of 27 to 29 ppt (**EPA, 1982)**.

6. A summary of wave climate data in the area of the HARS (National Weather Service offshore meteorological platform at Ambrose Light, 40.5$^{o}$N 73.8$^{o}$W) for the period November 1984 through December 1993 shows that the highest waves were recorded in the winter months and in the early spring, with waves exceeding 2 meters about 4% of the time and exceeding 3 meters about 1% of the time **(EPA, 1997)**. Larger wave events are associated with northeasters in the late fall, winter, and spring and with tropical systems (storms and hurricanes) in the summer and early fall. The combination of large wave heights and long wave periods may produce significant bottom shear stress at the HARS, possibly resulting in bed erosion.

11.2.4 Biological Characteristics (**Battelle, 1996)**

A. Benthic Community

1. Mean total benthic infaunal abundance within the HARS was 26,482 (+/- 28,555) individuals/m$^2$.

2. The average total number of species per benthic sample within the HARS was 23.9 (+/-6.5). The proportion of species was: annelids 61%, crustaceans 17%, and mollusks 11%.

3. Benthic species diversity (H') within the HARS was 2.3 (+/-0.8).

**Table 3. Concentration Ranges of Sediment Contaminants in the HARS (Battelle, 1996)[1]**

| Parameter | Concentration |
|---|---|
| | (% *Ampelisca* Survival) |
| Toxicity | 0 to 99 |
| | (ng/g dry weight or ppb) |
| Total PAH | 10.7 to 33,067 |
| Total PCB[2] | 0.73 to 678.4 |
| Total DDT | <0.07 to 151 |
| | (ng/Kg dry weight or |
| 2,3,7,8-TCDD (Dioxin) | <0.2 to 41.7 |
| | (µg/g dry weight or ppm) |
| Silver | <0.04 to 7.33 |
| Arsenic | 2.3 to 29.7 |
| Cadmium | <0.03 to 3.22 |
| Chromium | 15.4 to 187.2 |
| Copper | 4.8 to 178.2 |
| Mercury | <0.03 to 2.47 |
| Nickel | <3 to 99.4 |
| Lead | 10.2 to 402.0 |
| Zinc | 20.5 to 329.0 |

1 = Values reported for chemicals listed in the Regional Testing Manual **(EPA Region 2/USACE-NYD, 1992)**. For additional information see **Battelle, 1996 and EPA, 1997**.
2 = PCB values should be multiplied by 2 in order to compare approximately with values from Regional Testing Manual **(EPA Region 2/USACE-NYD, 1992)**.

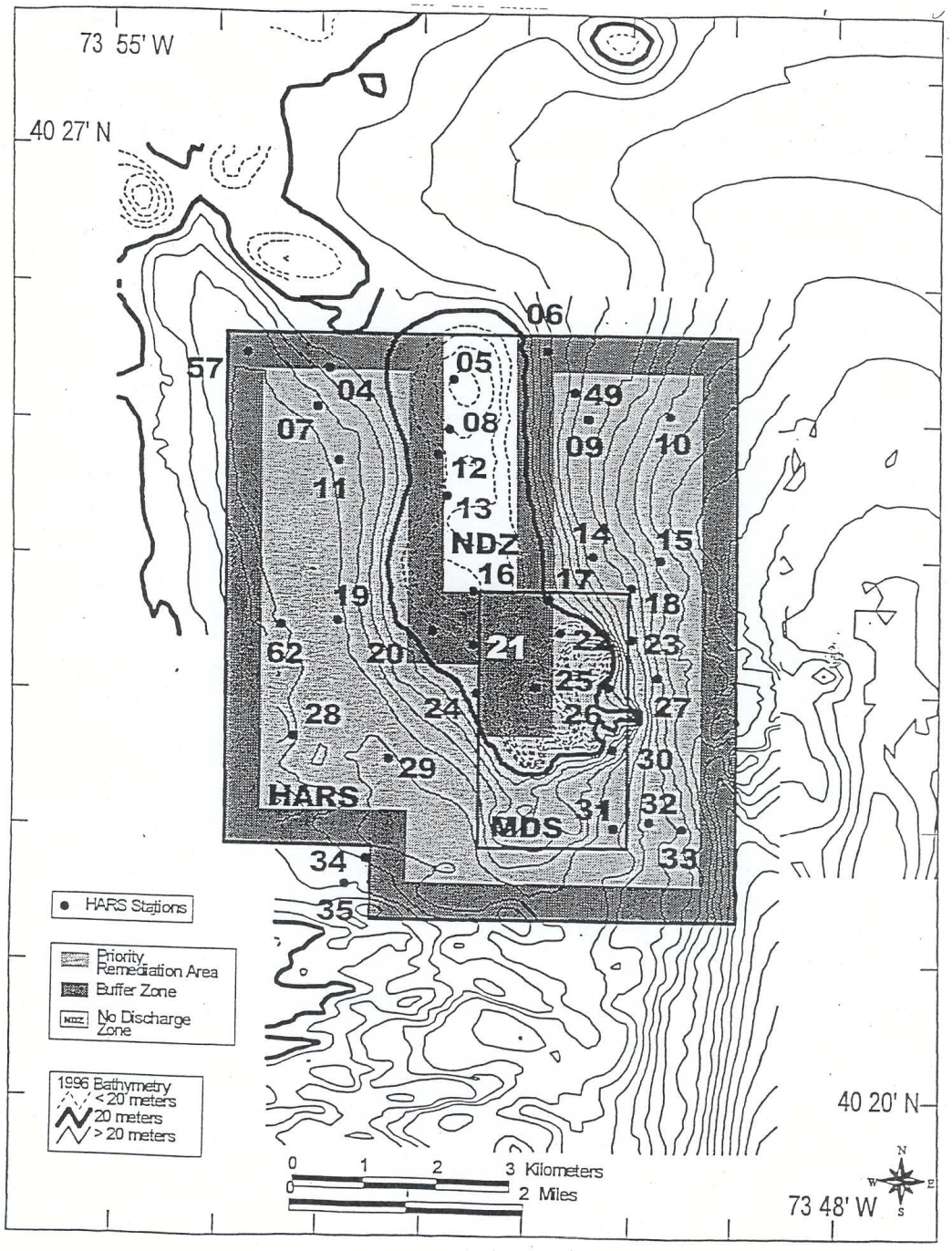


**Figure 4. Locations of baseline sediment chemistry, toxicity, and worm body burden sampling stations.**

**Table 4. Sampling Stations in the HARS. (**For data from specific stations see Battelle, 1996.)

| Sta. | Station Description[a] | | | Comments |
|---|---|---|---|---|
| | Latitude (°N) | Longitude (°W) | Depth (ft) | |
| 4 | 40°25.39′ | 73°52.91′ | 73 | Fine brown sand. |
| 5 | 40°25.32′ | 73°51.70′ | 50 | Medium brown sand; shell hash, crabs. |
| 6 | 40°25.53′ | 73°50.79′ | 75 | Medium brown sand. |
| 7 | 40°25.11′ | 73°53.02′ | 80 | Fine to medium muddy sand, shell hash. |
| 8 | 40°24.95′ | 73°51.74′ | 56 | Fine dark material. |
| 9 | 40°25.03′ | 73°50.40′ | 85 | Brown sand and shell hash to sandy brown mud. |
| 10 | 40°25.06′ | 73°49.62′ | 98 | Soft brown mud. |
| 11 | 40°24.71′ | 73°52.81′ | 80 | Dark brown, muddy, clay-like material. |
| 12 | 40°24.76′ | 73°51.85′ | 58 | Fine to medium brown sand. |
| 13 | 40°24.46′ | 73°51.76′ | 59 | Fine to medium light brown sand. |
| 14 | 40°24.02′ | 73°50.36′ | 88 | Brown/black mud. |
| 15 | 40°24.00′ | 73°49.71′ | 100 | Light grey mud with underlying black layer. |
| 16 | 40°23.76′ | 73°51.50′ | 56 | Fine brown sand to brown sand over black mud and clay. |
| 17 | 40°23.70′ | 73°50.77′ | 65 | Black mud over sand. |
| 18 | 40°23.79′ | 73°49.99′ | 88 | Fine mud, dark grey over dark black layer. |
| 19 | 40°23.53′ | 73°52.82′ | 86 | Brown sand over mud to black sandy mud. |
| 20 | 40°23.46′ | 73°51.90′ | 66 | Fine brown sand. |
| 21 | 40°23.36′ | 73°51.50′ | 62 | Light sand. |
| 22 | 40°23.45′ | 73°50.66′ | 66 | Fine brown sand over mud. |
| 23 | 40°23.41′ | 73°49.99′ | 86 | Black mud with petroleum smell. |
| 24 | 40°23.00′ | 73°51.46′ | 68 | Coarse brown sand and black mud to fine brown sand. |
| 25 | 40°23.05′ | 73°50.89′ | 50 | Fine to medium to coarse brown sand. |
| 26 | 40°23.05′ | 73°50.21′ | 66 | Thick black mud, silty on top. |
| 27 | 40°23.13′ | 73°49.73′ | 99 | Brown muddy clay. |
| 28 | 40°22.67′ | 73°53.26′ | 83 | Firm brown mud. |
| 29 | 40°22.51′ | 73°52.31′ | 83 | Firm, brown mud with sand. |
| 30 | 40°22.59′ | 73°50.17′ | 84 | Medium to fine brown sand with some mud; many tubes. |
| 31 | 40°22.01′ | 73°50.15′ | 92 | Dark brown sandy mud to medium dark, hard-packed sand. Some coarse sand. |
| 32 | 40°22.06′ | 73°49.80′ | 94 | Sandy brown to black mud, large *Nereis*. Rocky. |
| 33 | 40°22.01′ | 73°49.48′ | 100 | Brown mud-gravel-sand mix, to coarse brown sand.. |
| 34 | 40°21.77′ | 73°52.53′ | 78 | Light brown sand. |
| 35 | 40°21.58′ | 73°52.73′ | 72 | Light brown sand. |
| 49 | 40°25.23′ | 73°50.53′ | 80 | Fine grain, worm tubes. |
| 57 | 40°25.50′ | 73°53.71′ | 76 | Surficial sediments fine silt/sand; dark underlying sediments |
| 62 | 40°23.50′ | 73°53.38′ | 78 | Coarse sand mixed with fines. |

4. Benthic distribution of organisms:

a. Annelida: annelids accounted for about 68% of the infaunal abundance in the HARS. The spinoid worm *Prionospio steenstrupi* (a surface deposit feeder) was found in densities of 3,432 (+/-5,314) individuals/$m^2$. *Polygordius* (an archiannelidan worm) was found in densities of 7,734 (+/-26,091) individuals/$m^2$. *Pherusa* (a surface deposit feeder) was found in densities of 784 (+/-1,628) individuals/$m^2$.

b. Crustacea: crustaceans abundance in the HARS averaged 1,000 (+/-2,335) individuals/$m^2$ and accounted for about 4% of the total infaunal abundance in the HARS. Amphipods (Ampelisca sp.) were present at densities of 799 (+/-2,173) individuals/$m^2$.

c. Mollusca: mollusks accounted for about 21% of the total infaunal abundance in the HARS. The nut clam (*Nucula proxima*), a selective deposit feeder, was found in densities of 5,269 (+/-8,844) individuals/$m^2$.

d. Miscellaneous Phlya: The sand dollar *Echinarachnius parma* (Echinodermata)was found at densities of 867 (+/-1,958) individuals/$m^2$ in the HARS. Various species of sea anemones (Anthozoa) were found within the HARS at densities of 377 (+/-417) individuals/$m^2$. *Phoronis*, a tube dwelling suspension feeder, was also found within the HARS at densities of 507 (+/-906) individuals/$m^2$.

B. Commercial/Recreational Fish Resources:

1. Finfish: The New York Bight Apex is a transitional region for many species of fish and shellfish. The area is occupied by many fish species. The following species of finfish are known to inhabit the New York Bight Apex:

a. Demersal Species: silver hake (*Merluccius bilinearis*), red hake (*Urophycis chuss*), yellowtail flounder (*Limanda ferruginea*), scup (*Stenotomus chrysops*), summer flounder (*Paralichthys dentatus*), winter flounder (*Pseudopleuronectes americanus*), tautog (*Tautogs onitus*), cod (*Gadus callarias*), black sea bass (*Centropristis striata*), little skate (*Raja erinacea*), windowpane flounder (*Lophosetta maculata*), four spot flounder (*Paralichthys oblongus*), ocean pout (*Macrozoarces americanus*), cunner (*Tautogolaburs adspersus*), spiny dogfish (*Squalus acanthias*), spotted hake (*Urophycis regius*), northern sea robin (*Prionotus carolinus*), striped sea robin(*Prionotus evolans*) , gulf stream flounder (*Citharichthys arctifrons*), sea raven (*Hemitripterus americanus*), longhorn sculpin (*Myxocephalus octodecimspinosus*)

b. Pelagic Species: Butterfish, Atlantic Herring, Bluefish, Weakfish

c. Pelagic/ Anadromous: American Shad, Alewife, Striped Bass

2. Shellfish: Surf Clam, Sea Scallop, American Lobster, Long-finned Squid, Rock Crab, Horseshoe Crab, Short-finned Squid, Jonah Crab

C. Endangered/Threatened Species:

Remediation Material placement in the HARS is not likely to affect Endangered/Threatened Species **(Battelle, 1997a)**. Dredged Material Inspectors (DMI) (with marine mammal/sea turtle observation certification) are required to accompany each placement trip to the HARS. One of the DMI's duties is to observe the presence of Endangered/Threatened Species. Placement of Remediation Material is prohibited at the HARS if Endangered/Threatened Species are observed. EPA Region 2 prepared a Biological Assessment (BA) **(Battelle, 1997a)** as part of the HARS SEIS Process for Finback Whale, Humpback Whale, Kemps Ridley Sea Turtle, and the Loggerhead Sea Turtle. The BA concluded that the designation of the HARS was not likely to affect the Finback Whale, Humpback Whale, Kemps Ridley Sea Turtle, and the Loggerhead Sea Turtle. NOAA Fisheries concurred with the determination in a letter dated June 30, 1997. Consultation with NOAA Fisheries regarding endangered and threatened species will be reinitiated as appropriate.

D. Essential Fish Habitat

In 2001, the USACE-NYD prepared a programmatic essential fish habitat (EFH) assessment for the placement of Category I dredged material at the HARS, and initiated consultation with NOAA's National Marine Fisheries Service pursuant to the Magunson Stevens Fishery Conservation and Management Act. Based upon the EFH assessment, the SMMP requirements, and other the supporting information, NOAA Fisheries concurred that no additional essential fish habitat conservation recommendations were necessary to minimize impacts to federally managed species and their EFH. Consultation with NOAA Fisheries will be reinitiated as appropriate.

11.2.5 Worm Body Burden Concentrations

Metals levels in worm **(Polychaetes)** tissue from the study area were similar to those in samples collected from outside the HARS Study Area (30 square nautical miles) but still within the Bight Apex **(EPA, 1997 and Battelle, 1997)**. Worm tissue concentrations of metals were relatively consistent across the HARS **(Table 5)**. Thus, metals levels in the worm tissue can be considered to be relatively invariant over broad regions of the inner Bight.

Organic compounds in worm tissue throughout the HARS were more variable than the metals **(Table 5)**. Generally, total PAH concentrations in the Study Area were significantly higher than those from the Apex **(Battelle, 1997)**. PCB levels in worm tissue from the Study Area were higher relative to outside Apex areas to the east and south **(Battelle, 1997)**. Pesticide levels in worms from the study area were generally low **(Table 5)**; total DDT concentrations in worm tissue from areas to the east and southeast of the HARS Study Area were consistently lower than measured in samples from the HARS Study Area. Dioxin and furan levels in worm tissue were relatively similar within and outside the HARS Study Area **(Battelle, 1997)**.

In 2002, samples of benthic infauna were collected to compare with some of the original baseline data. Worm tissue samples were analyzed for comparison to 1996 concentrations as indicated in Table 5. Because of incomplete worm recolonization in areas of active Remediation on the western portion of the HARS, the areal scope of the sampling was limited to Stations 14, 15, 49, and 9. Results of the analyses are presented in Table 6.

**Table 5. Worm (Polychaetes) Tissue Concentrations in the HARS (Battelle, 1997)[1]**

| Parameter | Concentration |
|---|---|
| | **(ug/kg wet weight or** |
| **Total PAH** | **244.28 to 928.18** |
| **Total PCB[2]** | **54.61 to 225.43** |
| **Total DDT** | **13.32 to 44.78** |
| | **(ng/Kg wet weight or pptr)** |
| **2,3,7,8-TCDD** | **2.96 to 5.84** |
| | **(µg/g wet weight or ppm)** |
| **Silver** | **<0.05 to 0.15** |
| **Arsenic** | **1.85 to 5.53** |
| **Cadmium** | **<0.04 to 0.12** |
| **Chromium** | **0.73 to 3.44** |
| **Copper** | **1.21 to 4.84** |
| **Mercury** | **<0.02 to 0.06** |
| **Nickel** | **0.57 to 1.84** |
| **Lead** | **1.37 to 6.22** |
| **Zinc** | **15.60 to 30.40** |

1 = Values reported for chemicals listed in the Regional Testing Manual **(EPA Region 2/ USACE-NYD, 1992)**. For additional information see **Battelle, 1997 and EPA, 1997**.
2 = PCB values should be multiplied by 2 in order to compare approximately with values from Regional Testing Manual **(EPA Region 2/USACE-NYD, 1992)**.

**Table 6. 2002 Worm Tissue Concentrations in the HARS (EPA 2002)**

| Parameter | Concentration |
|---|---|
| | (ug/kg wet weight or |
| Total PAH | 185.57 to 266.42 |
| Total PCB[2] | 69.63 to 237.38 |
| Total DDT | 5.04 to 25.54 |
| | (ng/Kg wet weight or pptr) |
| 2,3,7,8-TCDD | 1.38 to 2.98 |
| | (µg/g wet weight or ppm) |
| Silver | 0.06 to 0.12 |
| Arsenic | 4.12 to 6.18 |
| Cadmium | 0.05 to 0.09 |
| Chromium | 0.50 to 2.12 |
| Copper | 1.99 to 3.51 |
| Mercury | 0.02 to 0.04 |
| Nickel | 0.50 to 0.81 |
| Lead | 1.16 to 2.66 |
| Zinc | 16.40 to 21.60 |

2 = PCB value should be multiplied by 2 to compare with HARS PCB Worm Tissue Criterion

## 11.3 HARS History

The NY Bight Apex which includes the HARS and surrounding area has been historically utilized for ocean disposal of dredged material and a variety of waste products (building materials, sewage sludge, industrial waste, garbage, mud, steam ashes, one man stone, derrick stone, and street sweeping) since the 1800s. The New York Bight Apex is defined as the area of approximately 2,000 $km^2$ extending along the New Jersey coastline from Sandy Hook south to $40^\circ$ 10' latitude and east along the Long Island coastline from Rockaway Point to $73^\circ$ 30' longitude. Ocean disposal of garbage was eliminated in 1934, and other waste product disposal practices ended as a result of the passage of the Ocean Dumping Ban Act (sewage sludge disposal ended in 1992) (**Figure 6** depicts former EPA designated Ocean Disposal Sites in the New York Bight Apex). Dredged material placement in the New York Bight Apex began "officially" in 1888 at a point 2.5 miles south of Coney Island. At that time, the New York Harbor U.S. Congressional Act of 1888, established that the Supervisor of New York Harbor had the authority to grant permits for ocean disposal **(Williams, 1979)**. In 1900 the location was moved to a point one-half mile south and eastward of Sandy Hook Lightship, due to shoaling. In 1903 it was moved 1.5 miles east of Scotland Lightship **(Figure 7)**.

In 1972, the MPRSA was enacted, providing EPA with the authority to designate Ocean Disposal Sites. The MDS was designated as an Interim Ocean Dredged Material Disposal Site in 1973 and incorporated by regulation in 1977. In 1984 the MDS was designated as a "final" Ocean Dredged Material Disposal Site, with a maximum capacity of 100 million cubic yards of dredged material. From 1984 to 1997, approximately 72 million cubic yards of dredged material were disposed of at the MDS. Although available documentation of disposal volumes prior to 1976 is sparse, between 1976 and 1983 approximately 47 million cubic yards of dredged material was disposed within the MDS. Very little information is available on the quantity of material historically disposed in the area now identified as the HARS. However, a description of the types of materials and historical disposal locations in the HARS is provided in **Williams, 1979**.

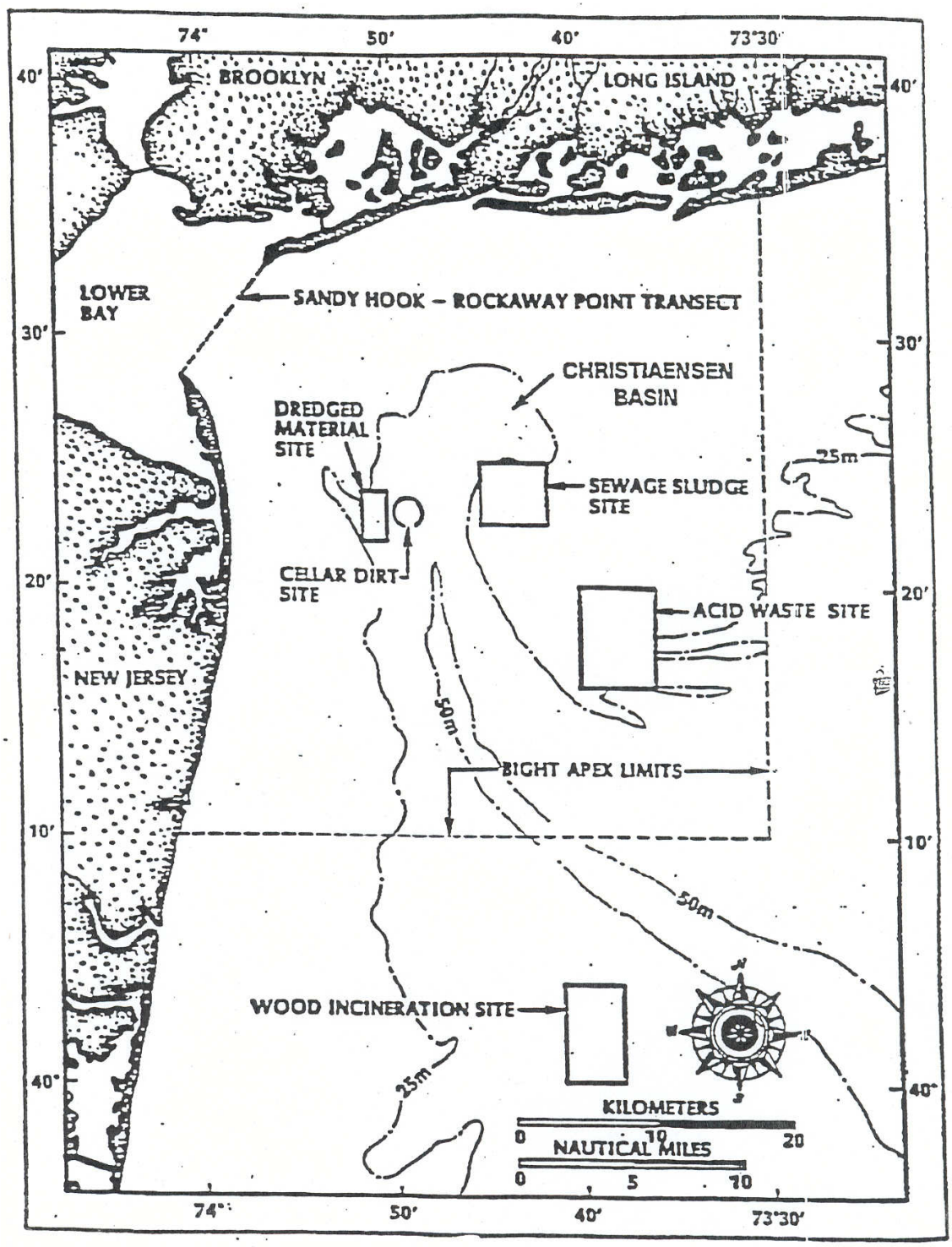


**Figure 6. Location of historic ocean disposal sites in the New York Bight.**

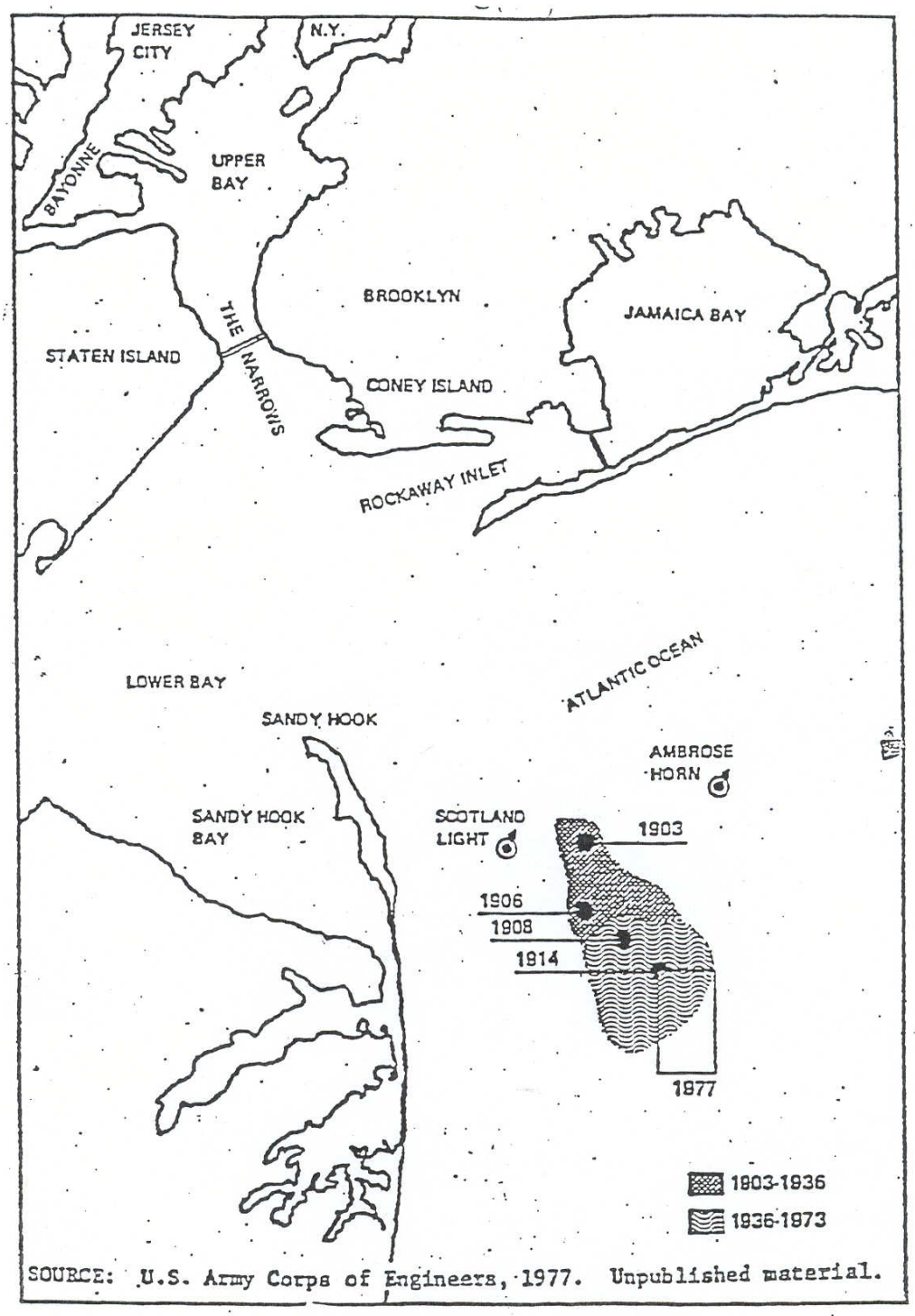


**Figure 7. Locations of historical dredged material disposal offshore New Jersey.**

## 12.0 Transportation and Placement Methods Utilized at the HARS

For approximately the past eleven years, remediation material has been placed at the HARS primarily with split-hull barges, and in some cases with hopper dredges. Permits and contract specifications require placement at pre-determined locations within the HARS. Placement locations prior to fall, 1998, were marked by single, taut-moored buoys, with specific placement radii. Buoys were placed and maintained by the USACE-NYD and/or their representative. Since development and installation of the **A**utomated **Di**sposal **S**urveillance **S**ystem (ADISS) monitoring/positioning systems aboard scows and tugs (SAIC, 1999), discrete placement grids have been used for organized placement at the HARS (see Appendix B for example). The precise positioning capability of the ADISS system allows placement at designated latitude-longitude coordinates. Specific grid coordinates and instructions/requirements are contained in the Department of the Army (DA) Permits issued by the USACE-NYD, listed as contract specifications in Federal dredging contracts, and provided to contractors in placement guidelines associated with each dredging project (Appendix B).

The Priority Remediation Area within the HARS comprises nine individual (sequentially numbered, e.g., PRA-1, PRA-2, etc) PRAs; most of these PRAs are approximately 1 square nautical mile in size. Placement of Remediation Material is managed in priority order, beginning with PRA-1 (highest priority for remediation) and ending with Area 9 (lowest priority for remediation) **(Figure 3)**. Each individual PRA's use may be discontinued upon completion of remedial activities and demonstration through bathymetry that at least a 1-meter cap (minimum required cap thickness) of Remediation Material has been placed over the entire area. Placement is occurring in several phases within each area to allow consolidation of sediments and assessment of coverage through precision bathymetry. Follow-up remediation will occur in PRAs where bathymetric surveys indicate that less than 1m of remediation material is present across the entire PRA.

### 12.1 HARS Remediation General Design

HARS placement grids are developed after consideration of sediment testing results, estimated quantity of material, material characteristics, and past/present remediation activity. These criteria are discussed below, followed by a description of the past and present remediation strategies used to help ensure uniform spreading of material.

<u>Testing Results</u>
Proposed dredging projects that are tested for suitability for ocean placement, particularly most maintenance dredging projects, have limitations on where material can be placed at the HARS. The STFate numerical model is run by New York District personnel to determine the distance from HARS borders where material can be placed so that water quality standards are not exceeded. The distance varies from a few hundred feet to over a thousand feet. Placement must occur at least that far from the nearest outer HARS boundary (the outside boundary of the HARS buffer zone). Because of these distance limitations, most maintenance dredging projects, which are predominantly composed of silt and clay, have been used to remediate the central and eastern portions of HARS PRAs 1, 2, and 3, and the northern portion of HARS PRA 4. Dredged

materials that have previously been characterized as suitable for HARS remediation (Pleistocene glacial till and red clay), material that is predominantly Holocene sand, and dredged rock, have more commonly been used to remediate areas closer to the outer edges of PRAs 1 – 3, although sand has been used to provide the minimum 1m of remediation in scattered areas within the interior regions of PRAs 1 and 2.

Estimated Quantity of Remediation Material

The grid area designated for placement is generally proportional to the estimated volume of material for remediation associated with each project; higher volume projects use larger area grids. The goal has been to provide 0.5 ft to 3 ft of coverage within a grid during each dredging project, assuming uniform spreading of material. However, as discussed below, uniform coverage is difficult to achieve with most dredged materials. The average remediation thickness is estimated by dividing the project volume by the area of the grid. For example, if a dredging project will generate 500,000 $yd^3$ of glacial till, a placement grid covering 1,000,000 $yd^2$ would result in 1.5 ft of remediation across the grid, if the material is completely uniformly spread.

Material Characteristics

Dredged material used for HARS remediation ranges from high-water-content mud, to sand, glacial till, and red clay. Dredged rock has been used on a limited basis during some past dredging projects as well. Each of these materials behaves differently when leaving a scow, and after contact with the bottom. Mud leaves scows quickly, and easily spreads out on the bottom. Placement grids for mud involve large grid cells with minimal expected remediation thickness due to the spreading, compaction, and dewatering of the mud after placement. Sand and glacial till do not spread much, and scows often empty more slowly than when placing mud. Pleistocene red clay also leaves scows slowly, and spreads the least after contact with the bottom, due to its cohesive characteristics. During dredging of red clay, each dredging bucket load creates a large, individual chunk of clay that remains mostly intact after being placed in a scow. During placement at the HARS, these large chunks fall to the bottom and form mounds. Glacial till placement also forms mounds, but generally not as steep as the clay. Each of these mounds, formed from a single scow load of dredged material, typically ranges from 75 ft to 150 ft wide, and 200 to 300 feet long. An individual mound of clay or till may be 5 or 6 feet high, making it difficult to provide uniform remediation thickness.

Past and Present Remediation Activity

Bathymetric survey comparisons are used to determine the thickness of remediation produced by past remediation projects. Large areas that have achieved a minimum of 1 M of remediation thickness, without any patches where remediation thickness is less than 1 M, are not used for new remediation projects. However, dredged rock has been placed on top of areas remediated with more than 1 M of red clay. The rock is considered a “final cap” in those areas, providing additional remediation thickness beyond the minimum 1 M, and providing recreational hard-bottom fishing areas.

Areas of the HARS that have less than 1 M of remediation thickness receive material from projects until the minimum 1m remediation thickness is achieved. If an area has been used for placement of maintenance mud, usually the area is not used for additional placement for a year, to

allow compaction and dewatering of the mud. Grids for concurrent projects are spaced far enough apart, at least 1 km apart if one grid is due north of the other, to help avoid vessel interference during placement activities.

If an area of the HARS is close to achieving 1m of remediation thickness, a placement grid will be developed such that only those areas within the grid with less than 1 M of remediation thickness will receive additional material. In areas where most of the grid area has less than 1m of remediation thickness, remediation strategy, as discussed below, is used to help spread material across the entire grid.

Remediation Strategy

During the first HARS remediation project involving coarse material (Pleistocene glacial till), the 1999 KVK Phase 2, Contract 2 Federal deepening project, large grid cells, measuring 300 feet wide and 800 feet long, were used. The accuracy of scow placement was being evaluated and the goal was to allow all of the dredged material from a scow to be placed in one grid cell. It was later determined that grid cells did not need to be so large and were reduced to 250 ft x 500 ft on subsequent projects. The accuracy of placement, combined with the tendency of coarse material to form mounds, resulted in creation of rows of mounds, where remediation thicknesses significantly exceeded 1m, separated by swales where little or no remediation occurred. During the past two years, grid cells of 100- to 150-ft wide by 100 to 200-ft long have been used on projects with coarse material. Individual grid cells are considered to be "target cells," where scow opening is directed to occur, resulting in dredged material landing on the bottom beyond the location of the target cells, along the towing path (Figure 8). The distance of the center of the mound created by each scow load of material from the center of the target cell varies by towing speed, water depth, and speed that material empties from the scow, usually a function of how quickly the scow doors open. This distance is usually 150 to 200 feet.

Placement is conducted in phases to help spread the material across the grid. The first phase involves placement towing scows from north to south while targeting grid cells in every third row of the grid; the 1$^{st}$ row, the 4$^{th}$ row, the 7$^{th}$ row, etc. This results in most dredged material landing in bottom areas represented by grid cells in the 2$^{nd}$ and 3$^{rd}$ rows, the 5$^{th}$ and 6$^{th}$ rows, etc. The second phase involves placement while towing scows from west to east, with every 3$^{rd}$ grid cell of the previously used target rows used for target cells. The goal is to provide material in the 2$^{nd}$ and 3$^{rd}$ cell, the 5$^{th}$ and 6$^{th}$ cell, etc., of each previously used target row. After completion of the second phase, placement data from the scow monitoring equipment are reviewed to determine where additional north to south, or west to east trips should be made to try and fill areas thought to be deficient in remediation material. Only through bathymetric comparison can the actual remediation status of a project grid be determined, but the scow monitoring data allows reasonable assessment of the progress during an active project.

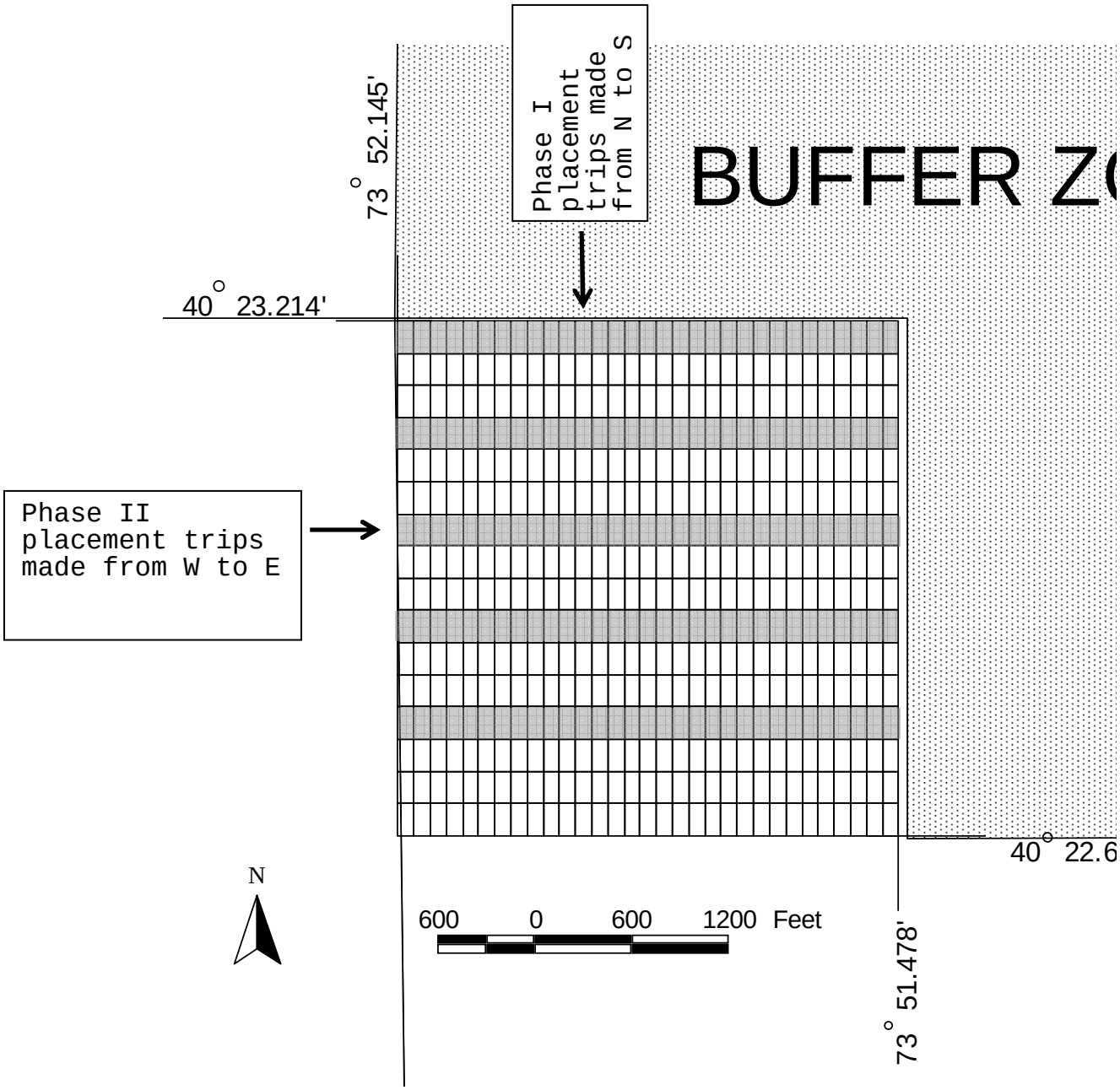


**Figure 8.** HARS placement grid used for the Port Jersey 3 Federal deepening project. Each grid cell is 100ft wide and 200ft long. During this project, the first phase of placement trips involved "targeting" every other grid cell in every third row (shaded) of the grid, while towing scows from N to S. This resulted in most material from each scow landing in the grid cells of the 2nd and 3rd rows, the 5th and 6th rows, etc. After the first phase of placement, a second phase involved "targeting" every third grid cell in the previously targeted rows, but while towing scows from W to E. The bottom row was also used for W to E placement trips. After review of placement data associated with the first two phases, additional N to S, or E to W trips are made to provide material to areas of the grid still requiring remediation

The various dredged material types used for HARS remediation have been placed throughout HARS PRAs 1-4, although the STFate limitations discussed above have limited areas where maintenance mud has been placed. The majority of Pleistocene red clay has been placed along the western border of HARS PRAs 2 and 3. Dredged rock was placed on top of the red clay in 2007, providing additional remediation thickness above 1m, and providing hard bottom benthic habitat that could not be created with conventional dredged materials used for HARS remedation.

Some dredging projects have used a hopper dredge, which allows highly accurate placement at the HARS. Hopper dredges can place material while moving or while stationary and can vary the quantities released depending on the volume needed at a specific location. When a hopper dredge is used for sand, small areas of the HARS that have not achieved the minimum 1m of remediation have been selected for placement, allowing the 1m minimum remediation throughout most of HARS PRA#1. Although hopper dredges are not often available for use at the HARS, they provide the best opportunity to provide the minimum 1m of remediation in areas with widely scattered small patches that still require remediation.

Weather and Sea Conditions

Weather and sea conditions affect any activity in the ocean, and are a factor during HARS placement trips. Dredging contractors and permit holders are advised at the start of each project involving HARS remediation that weather and sea conditions must be closely monitored to ensure safe and accurate placement of dredged material at the HARS. They are also reminded that dredged material that may be washed out of a scow by waves is considered unauthorized discharge of dredged material, and that if such discharge occurs, enforcement action may result. Specific upper limits on wave heights and wind speeds are not specified, due to varying capabilities of scows and tugs, and types of dredged material transported.

12.2 Enforcement Activities

USACE-NYD and EPA have used past enforcement experiences, dredging project incidents, and other issues associated with various ocean placement projects, to modify HARS placement guidelines. The extensive placement guidelines presently used (Appendix B) help ensure that the placement of Remediation Material in the HARS complies with applicable permit conditions.

## 13. Monitoring Program

MPRSA 102 (c)(3)(B) requires that the SMMP include a program for monitoring the site.

The EPA Region 2/USACE-NYD's HARS Monitoring Program (HARSMP) will serve to address both the regulatory and technical issues associated with the open-water (i.e., ocean) placement of Remediation Material at the HARS, and status of the HARS in general. A monitoring program has been developed that includes activities to be conducted while remediation of the HARS is occurring, termed “remediation monitoring,” and after remediation has occurred, termed “post-remediation monitoring.” Some post-remediation monitoring activities will always be conducted

when individual HARS PRAs have been covered with at least one meter of remediation material. An individual PRA is considered to have been covered with at least 1 M of dredged material when at least 95% of the area within a PRA that is available for remediation has been covered with at least one meter of dredged material. Some post-remediation monitoring activities may be conducted when the minimum 1 M of remediation thickness has been achieved across less than 95% of the available remediation area within an individual PRA.

Two different monitoring approaches and levels of intensity will be utilized: (1) for the entire HARS, and (2) for the specific PRAs (1-9), within the HARS.

Remediation and post-remediation monitoring comprise levels of increasing investigative intensity that provide environmentally sound and cost-effective methods for generating technical information necessary to properly manage the HARS.

## 13.1 HARS Monitoring Program (HARSMP)

The HARSMP will focus on the overall effects of the placement of Remediation Material on the entire HARS and in each of the nine Priority Remediation Areas (PRAs) of the HARS. In addition to addressing focused scientific questions regarding physical, chemical, and biological conditions at the HARS (see Section 13.3), overall goals of the HARSMP are as follows.

A. Monitor for remediation of the HARS with uncontaminated dredged material (i.e., dredged material that meets current Category I standards and will not cause significant undesirable effects including through bioaccumulation).

B. Verify that Remediation Material placed at the HARS does not cause any significant adverse environmental impacts, and does cause desirable impacts, such as non-toxicity to amphipods. The phrase “significant adverse environmental impacts” is inclusive of all significant or potentially substantial negative impacts on resources within the HARS and vicinity. Factors to potentially be evaluated were included with the objectives of the SMMP (Section 7, page 8).

C. Assess and monitor sediment quality improvement as a result of remediation activities at the HARS as compared to the HARS Baseline Data (40 CFR Section 228.9 and Section 228.10) and the Impact Category I conditions in the PRA within the HARS (40 CFR Section 228.11).

## 13.2 Types of Monitoring

The HARSMP consists of the following three general types:

The types of monitoring (physical, chemical, biological) suitable for assessing remediation do not need to be conducted sequentially. However, the results of one or more monitoring activities will be evaluated to determine if additional monitoring activities are warranted **(Table 7)**.

Physical Monitoring

Various methods will be employed to determine the physical distribution of Remediation Material after its placement at the HARS (i.e., assess whether material conformed to the placement design). Types of measurements may include: bathymetry, side scan sonar imaging, sub-bottom profiling, coring, Sediment Profile Imaging (SPI), grain size analyses, and wave/current measurements.

Chemical Monitoring

Monitoring will be conducted to evaluate bioaccumulation of contaminants of concern in benthic organisms (body burden levels). Measurements will include sediment toxicity and analysis of the body burden levels of contaminants within target marine species and/or determination of other sub-acute community effects (i.e., have levels of contaminants in indigenous marine species significantly changed in comparison to those in the surrounding environment?) Analytical methods, detection limits, and quality assurance information is contained in the EPA Region 2/USACE-NYD Regional Testing Manual **(EPA Region 2/USACE-NYD, 1992)**.

Worm tissue may be collected for body burden analysis. If EPA Region 2 and the USACE-NYD are unable to collect sufficient worm biomass due to insufficient time being allowed for re-colonization, an additional sampling effort will be conducted at a later date (seasonally dependent) to collect the necessary worm tissue samples.

Biological Monitoring

Monitoring will be conducted to determine the long-term changes, if any, that would occur to benthic marine resources in and around the HARS (i.e., have physical or other effects resulted in potentially adverse impacts on the surrounding marine resources?). This monitoring will typically be done by measuring and analyzing benthic community structure (using sediment profiling imaging (SPI) technology, and standard benthic community structure measurements of species diversity, abundance, and biomass). The benthic community will be considered to be significantly altered if there is a statistically significant change from the baseline data (Baseline Data) based on the above measurements.

13.3 Scientific Questions to be addressed by Monitoring/Surveillance Activities in the HARSMP:

Scientific questions have been developed to guide the monitoring of remediation of the HARS. The types of data and frequency of data collection that are necessary to address each question are described in **Table 7**. The following actions describe monitoring activities that are recommended, as opposed to required, for achieving the best possible data for addressing scientific questions regarding conditions at the HARS. Available funding will directly impact the number and type of activities that can actually be performed in a given fiscal year.

*Question 1: Are Remediation Material placement operations consistent with the requirements of the issued permits/authorizations?*

Actions:

- Monitor real-time data outputs of the scow monitoring systems for proper placement of material
- Review the USACE Certified Dredged Material Inspector Reports, scow monitoring data, and information submitted by permittees to determine compliance.
- Conduct independent surveillance of remediation operations
- See Section 14.1.4 for corrective actions/enforcement

*Question 2: Has the PRA been capped with at least 1 meter of Remediation Material?*

Actions:

- Conduct a precision bathymetric survey annually of the entire HARS.
- Conduct a coring assessment in individual PRAs as needed.

*Question 3: Has the placement of Remediation Material within all areas of the HARS met HARS SMMP Objectives A and B?*

Actions:

- Conduct a precision bathymetric survey annually of the entire HARS.
- Conduct Sediment Toxicity Tests in the specific PRAs (1 through 9, depending upon placement schedule) where Remediation Material has been placed.
- Upon satisfaction that at least one meter of Remediation Material has been placed over at least 95% of a PRA (through use of precision bathymetry), post-remediation monitoring activities will be conducted. Post-remediation monitoring scope will be coordinated through the SRP.
    - The option to conduct post remediation monitoring activities may be exercised when a reasonable portion of a PRA has been remediated. A reasonable portion of an individual PRA will be defined by EPA Region 2 and USACE-NYD, in consultation with the SRP, as:
        - A substantial area within a PRA that has been covered with at least 1 M of Remediation Material and;
        - Time has passed, without active placement, to allow sufficient recolonization of worm populations to levels that would provide adequate tissue sample for body burden analyses. Sufficient recolonization will be evaluated using SPI monitoring.

*Question 4: Are major storms (e.g., hurricanes, northeasters, etc.) causing erosion/loss of cap material such that less than 60 cm (24 inches) of cap material exists over the remediatied areas within the HARS (including capped mounds inside the boundaries of the former MDS)?*

Actions:

- Conduct post-storm bathymetry surveys after complete remediation of a PRA if an extended period of high waves occurs (i.e., significant wave heights exceed 4m for more than 12 hours, and/or, significant wave heights exceed 2m with wave periods of at least 10 seconds for more than 48 hours, based on offshore buoy data).

*Question 5: Are Remediation Material placement operations causing significant unacceptable impacts (physical, chemical, or biological) at the HARS and surrounding area?*

Actions:

- Conduct bathymetry to detect any loss of Remediation Material and pre-HARS dredged material from the HARS.
- Conduct sediment toxicity tests in remediated areas.
- Conduct benthic community structure analyses as needed within the HARS and surrounding area (sooner if other monitoring results trigger additional monitoring).
- Review Certified Dredged Material Inspector Reports to ensure that Remediation Material is not being placed in the HARS in the presence of any marine mammals/endangered turtles.
- Monitor marine mammals/sea turtle landings/stranding

EPA Region 2 and the USACE-NYD have concluded that routine placement of Remediation Material at the HARS will not have any impacts on marine mammals/sea turtles (NMFS concurred with this conclusion on July 30, 1997). However, EPA Region 2 and the USACE-NYD monitor marine mammals/sea turtle landings/stranding in order to determine if there is any correlation between stranding and HARS placement activities.

*Question 6: Do Remediation Material placement operations significantly (see definition of significant adverse impact) alter the benthic community structure of the HARS or surrounding area in the long-term (i.e., allowing sufficient time for re-colonization by the same or similar organisms)?*

Actions:

- Conduct Benthic Community Monitoring using SPI technology (See Section 13.7 for description of technology) as needed if other monitoring results trigger additional monitoring.

13.4 Monitoring Goals: **(Table 7)**

Implementation of HARSMP activities will take place at a suggested frequency and as necessary depending upon monitoring results **(Table 7)** and available funding. If results indicate that any of the triggers have been identified, then decisions will be made as to whether field surveys, additional investigations, or management actions are necessary.

13.5 Triggers:

The triggers are characteristics that will initiate making decisions as to whether field surveys, additional investigations, or management actions are necessary. Specific trigger actions will be decided between EPA Region 2 and the USACE-NYD on a case-by-case basis. Based on the type of event/action that has occurred, EPA Region 2 and the USACE-NYD will work to implement the appropriate action (or subset of actions) within the HARSMP. Further, appropriate actions will be taken to mitigate the problem or other unacceptable situation. The following general trigger levels will apply:

**Trigger 1.** Loss of Remediation Material, such that less than 60 cm (24 in) of remediation/cap material exists over the remediated areas within the HARS (including capped mounds inside the boundaries of the former MDS) will result in appropriate action, which may include the implementation of some type of contingency capping operations and/or trigger additional investigations in the appropriate location(s) (sediment chemistry, toxicity). [Objectives A and C]

Trigger No. 1 and Question 4 are designed to ensure that sufficient cover of Remediation Material is maintained on the remediated areas within the HARS (including capped mounds inside the boundaries of the former MDS). EPA Region 2 and the USACE-NYD will not average values around the existing caps in the MDS and Remediation Material to be placed in the PRA to achieve an average Remediation Material thickness. Instead, all areas of the HARS will be evaluated individually to determine absolute Remediation Material thickness.

Precision bathymetry is the most accurate method for determining cap thickness across the entire capped mound/remediation area. Precision bathymetry has an approximate error/sensitivity range of +/- 1 foot (30 cm). Thus, in order to say with statistical confidence that the precision bathymetry is showing a “loss” of the Remediation Material, we need to experience at least a 30 cm loss of cap/Remediation Material.

EPA Region 2 and the USACE-NYD are allowing a 40 cm loss prior to initiating any contingency capping operations and/or additional monitoring. Various experts have concluded that a practical capping thickness for biological isolation/remediation ranges between 30 and 50 cm **(SAIC, 1997)**. EPA Region 2 and the USACE-NYD believe that a 60-cm cap should sufficiently protect against bioturbation; thus, at least a 1 meter cap (minimum required cap thickness) is utilized to be conservative and provide for an extra degree of protection for Remediation Material against storm-induced erosion. EPA Region 2 and the USACE-NYD will

evaluate the precision bathymetry results on a case-by-case basis (and area-by-area) to decide if any contingency placement and/or additional monitoring are necessary.

**Trigger 2.** Sustained storms (hurricane, northeaster, etc.) generating significant wave heights in excess of 4 meters for at least 12 hours duration and/or significant wave heights in excess of 2 meters with wave periods of 10 seconds or greater with a duration of at least 48 hours (at the HARS) will "trigger" timely and appropriate post-storm investigations, as to whether field surveys are warranted (See Baseline Section for discussion/analysis of wave patterns). Post-storm data from the Islip buoy, or other offshore monitoring stations, if available, will be analyzed to estimate wave conditions at the HARS. Only PRAs completely remediated with at least 1m of dredged material will be considered for post-storm bathymetric surveys, since continuing remediation activities can be used to cover storm-eroded areas identified through annual bathymetric surveying at the HARS. [Objectives A and C]

**Trigger 3.** Bathymetry indicating sufficient cover and SPI data indicating recolonization or lack of recolonization in remedated areas will trigger timely investigation as to whether additional monitoring activities are needed and if additional placement of the Remediation Material is needed. [Objectives A, B, and C]

**Trigger 4.** Demonstrated increase in tissue chemical concentrations above HARS suitability levels will trigger timely investigations as to whether post-remediation monitoring activities are warranted. Upon identification of unsuitable body burdens, EPA Region 2 and the USACE-NYD will examine monitoring data to determine the cause, if possible, and decide upon corrective management actions (additional remediation, move remediation location, etc.) . [Objectives A, B, and C]

**Trigger 5.** Surficial sediment toxicity tests indicating biologically significant amphipod toxicity in areas determined to have been remediated will trigger timely investigation as to whether additional analyses are needed and if additional placement of the Remediation Material is needed. [Objectives A, B, and C]

| Table 7. HARSMP Types and Goals of Monitoring | | | |
|---|---|---|---|
| | **Type of Monitoring** | **Question** | **Notes** |
| **REMEDIATION MONITORING** | Bathymetry | Question 1: Are Remediation Material placement operations consistent with the requirements of the issued permits/authorizations? [Trigger 3]<br><br>Question 2: Has the PRA been capped with at least 1 meter of Remediation Material? [Trigger 2]<br><br>Question 5: Are Remediation Material placement operatons causing significant unacceptable impacts (physical, chemical, or biological) at the HARS and surrounding area? [Trigger ] | Areas of the HARS previously surveyed that have never been used for remediation my be excluded |
| | SPI | Has there been sufficient recolonization to allow postremediation body burden and benthic community analyses? [Trigger 3]<br><br>Question 6: Do Remediation Material placement operations significantly (see definition of significant adverse impact) alter the benthic community structure of the HARS or surrounding area in the long-term (i.e., allowing sufficient time for re-colonization by the same or similar organisms)? | |
| | Side scan Sonar; Geotechnical | Question 1: Are Remediation Material placement operations consistent with the requirements of the issued permits/authorizations?<br><br>Question 6: Do Remediation Material placement operations significantly (see definition of significant adverse impact) alter the benthic community structure of the HARS or surrounding area in the long-term (i.e., allowing sufficient time for re-colonization by the same or similar organisms)? | |
| **POST-REMEDIATION MONITORING** | Bathymetry | Question 2: Has the PRA been capped with at least 1 meter of Remediation Material? [Trigger 1]<br><br>Question 4: Are major storms (e.g., hurricanes, northeasters, etc.) causing erosion/loss of cap material such that less than 60 cm (24 inches) of cap material exists over the remediatied areas within the HARS (including capped mounds inside the boundaries of the former MDS)? [Trigger 2]<br><br>Question 5: Are Remediation Material placement operations causing significant unacceptable impacts (physical, chemical, or biological) at the HARS and surrounding area? [Triggers 4 and 5] | |
| | Surficial Sediment Toxicity | Question 3: Has the placement of Remediation Material within all areas of the HARS met HARS SMMP Objectives A and B? [Trigger 5] | |
| | SPI | Question 6: Do Remediation Material placement operations significantly (see definition of significant adverse impact) alter the benthic community structure of the HARS or surrounding area in the long-term (i.e., allowing sufficient time for re-colonization by the same or similar organisms)? [Trigger 3] | |
| | Body Burden Levels | Question 3: Has the placement of Remediation Material within all areas of the HARS met HARS SMMP Objectives A and B? [Trigger 4] | |
| | Benthic Community Analysis | Question 3: Has the placement of Remediation Material within all areas of the HARS met HARS SMMP Objectives A and B?<br><br>Question 5: Are Remediation Material placement operations causing significant unacceptable impacts (physical, chemical, or biological) at the HARS and surrounding area? | Initiation based on analysis of SPI monitoring |

13.6 Quality Assurance / Quality Control:

Monitoring activities will be accomplished through a combination of EPA Region 2 and USACE-NYD resources (e.g. employees, vessels, laboratories) and contractors. Documentation of QA/QC is required by both agencies for all monitoring activities (i.e., physical, chemical, and biological sampling and testing). QA/QC is documented in the form of Quality Assurance Project Plans (QAPP) and/or Monitoring Work Plan. QAPPs are required for all EPA Region 2 and USACE-NYD monitoring activities. Analytical methods, detection limits, and QA procedures are contained in the EPA Region 2 and USACE-NYD Regional Testing Manual **(EPA Region 2/USACE-NYD, 1992)**.

13.7 Description of Monitoring Technologies and Techniques:

The following is a description of the various types of monitoring activities/procedures discussed above.

A. Physical Monitoring (Long-term/Short-term)

1. Short coring, or Sediment Profiling Imaging

Gravity coring is a standard technique used to collect short cores, providing a record of sedimentation in open water environments. Cores provide physical, storable, records of the vertical sedimentary record. Cores can be photographed, logged, and sub-sampled to determine grain size, evaluate benthic habitat conditions, document the process of recolonization in remediation areas, map out areas of erosion and deposition, determine redox potential discontinuity depth for degree of bioturbation and recolonization, and determine extreme levels of organic loading by presence of sedimentary methane. Sediment Profile Imaging (SPI) technology provides a photographic record of the uppermost sedimentary sequence that can be analyzed to provide information similar to cores, but without physical sampling capability. Bottom photography provided by SPI or underwater photography concurrent with coring, provides information on the hydrodynamic conditions of the bottom based on sedimentary structures visible in the photographs.

The sediment profile imaging camera can rapidly collect and process information on sea floor conditions while documenting organism-sediment relationships. SPI has been used at the HARS to determine grain size, evaluate benthic habitat conditions, document the process of recolonization in the remediation areas, map out areas of erosion and deposition, determine the redox potential discontinuity depth for degree of bioturbation and recolonization, and determine extreme levels of organic loading by analyzing for sedimentary methane. SPI imaging has also been used to infer physical dynamics at the site from the sedimentary structures observed. Automatic disk storage of all parameters measured allows data to be compiled, sorted, statistically compared, and graphically displayed.

2. Precision Bathymetry

This type of survey is usually scheduled based on the volume of Remediation Material placed, and future Remediation Material projects. Bathymetric survey lane spacing and the extent of areal coverage will be emphasized in remediation areas such as the historic disposal mounds and all on-going remediation areas. Two and 3-D Topographic Maps and sediment accumulation difference maps will be generated for each survey and compared with the previous surveys to determine remediation cap thickness.

The USACE-NYD will schedule hydrographic field surveys of specific areas within the HARS **(See Table 7)**. These bathymetric surveys will encompass: a) the active remediation locations within the confines of the HARS and will be performed by the USACE-NYD, b) surveys of the PRA and HARS will be conducted primarily by firms under contract to the USACE-NYD, c) regions of the site where the placement of Remediation Material is proposed (prior to the relocation of placement grids), and d) additional areas of interest which may be added on an "as needed" basis. Copies of all HARS data and survey results are transmitted to the EPA Region 2.

3. Side scan Sonar/Sub-bottom Profiling Imagery

Side scan sonar surveys have been a very effective tool for mapping the configuration and sediment surface features of the seabed within the HARS. Use of this technique permits complete coverage of broad-scale surface areas of the HARS and the environs directly adjacent to the HARS. Information pertaining to topographic seafloor morphology is also obtained. Sub-bottom profiling is valuable in determining the maximum depth of burial of various sediment type interfaces (as in a remediation capping operation) where two or more distinctly different layers of material would be encountered. In conjunction with other types of analyses, sub-bottom profiling is useful in determining discrete thicknesses of a cap.

Side scan sonar and sub bottom profiling provide useful information in determining sediment characteristics, sediment dynamics, remediation cap integrity and thickness. However, this data does not stand alone and is combined with other monitoring data (bathymetry, coring) to determine remediation cap thickness and integrity. Side scan sonar is particularly useful in conducting a large-scale sediment quality (fine grained vs. coarse) “snapshot” of the HARS. If a severe storm impacts the HARS causing erosion and transport of in-place material, EPA Region 2 and the USACE-NYD could conduct a side scan sonar survey to compare with previous side scan sonar survey to determine changes to HARS sediment features. This in turn can be utilized to determine the need for and the location of sediment chemistry samples.

4. Sediment Coring

Gravity and vibra-core surveys of distinct areas within the HARS have been accomplished on an infrequent basis since November 1991. Core lengths have ranged from 4 to 8 ft. penetrating several heterogeneous sediment horizons of Remediation Material and into the pre-remediation sediment bed. In the past, subsamples from discrete core depths from specific sample sites have been taken for chemical analyses to determine the effectiveness of cap thicknesses in isolating

contaminants. Should sediment cores be planned, they will be collected to a sufficient depth to represent the remediation layer.

5. Wave/Current Measurements

Placement of bottom-mounted, in-situ wave/current meters have been used to measure the wave and current regimes, to determine bottom stress at the HARS. Underwater cameras may be included to record sediment resuspension, and transmissometers or optical backscatter sensors may be included to measure the frequency and duration of the resuspension events.

B. Chemical Monitoring (Long-term/Short-term)

Sediment chemistry of field-collected samples utilizing two techniques (i.e., coring and surficial grabs) are analyzed for numerous contaminants that may be derived from Remediation Material placement.

C. Biological Monitoring (Long-term/Short-term)

Past studies have included: bluefish, blackfish, fluke, sea bass, and lobster **(NOAA, 1995, NOAA, 1996, and NOAA 1996a)**. Target species will be collected utilizing a variety of sampling gear, including but not limited to trawl nets, traps, and hook and line. Targeted contaminants to be analyzed, analytical methods, and detection limits will be the same as in previous studies **(NOAA, 1995, NOAA, 1996, and NOAA 1996a)**.

1. Biological monitoring of resident and migratory fishery resources to determine contaminant effects from pre-HARS dredged material disposal has been performed at locations in and around the HARS **(Battelle, 1997b)**.

2. Chemical analyses of tissue collected from invertebrates (polychaete worms), shellfish (crabs and lobsters) and vertebrates (recreational fish) have also been accomplished **(Battelle, 1996b, EPA 2002)**.

HARS monitoring reports are available for downloading from the following website maintained by NY District: http://www.nan.usace.army.mil/business/prjlinks/dmmp/benefic/hars.htm.

## 14. HARS Remediation Permit Conditions and Management Practices

MPRSA 102 (c)(3)(C) requires that the SMMP include special management conditions or practices to be implemented at the site that are necessary for the protection of the environment.

14.1. Regulatory Framework

Department of the Army (DA) permits will be issued for HARS remediation activities involving non-Corps projects, and typically are valid for a period of three years. Copies of the issued

permits or the letters modifying these permits can be obtained from the USACE-NYD, which issues the documents. Placement of Remediation Material cannot occur at the HARS without a permit (or MPRSA Section 103 (e) equivalent, e.g. Federal projects authorized by Congress).

14.1.1. Pre-Dredging Coordination

Prior to issue of new permits for private dredging projects, New York District Dredged Material Management Section and Regulatory Branch personnel meet to discuss special conditions of the permit. As monitoring requirements and placement conditions change, the special conditions may also be changed to help ensure permit holders conduct dredged material placement operations at the HARS as safely and efficiently as possible. Likewise, prior to Federal dredging projects, contract specifications are reviewed and updated as necessary to reflect changes in monitoring requirements and placement conditions.

Within approximately ten days prior to the start of dredging of HARS-suitable material, a pre-construction meeting is held with dredging contractor representatives and, depending on the type of project, with members of the NY District Regulatory Branch personnel for projects, Construction Division for Federal construction dredging projects, or Operations Division's Technical Support Section for Federal maintenance dredging projects. The monitoring requirements and placement conditions are discussed to ensure that everyone is familiar with the requirements prior to the start of HARS-material dredging.

The management depth for dredged material placed at the MDS was 45 feet BMLW. This depth was established in order to address shipping and navigation concerns and has been established for the HARS. Remediation activities have currently occurred in PRAs 1-4. Logistics associated with placement activities, time required to conduct post-placement monitoring, and the need to allow compaction and dewatering of material placed at the HARS, requires simultaneous remediation at more than one PRA.

14.1.2. Permit Conditions

a) General -- Consist generally of standard maritime industry and U.S. Coast Guard regulation requirements.

These are standard conditions set forth so that a waterborne/sea-going activity can be carried out within the minimum or basic guidelines set, primarily for safety reasons, by the regulating authority. In most, if not all, cases the U.S. Coast Guard is that authority.

b) Special/Specific -- Are listed in the text of the Permit and/or Placement Guidelines and include:

1) Remediation area (1 through 9) and placement grid location.

2) Seasonal restrictions or limitations regarding dredging or special conditions with respect to placement of the Remediation Material.

3) Requirements for the submission of transportation and placement logs.

4) Reporting requirements for un-anticipated events and discrepancies, including the completion of a checklist during each trip (Appendix C).

5) Guidance pertaining to aspects of the remediation activity; including placement grid coordinates, release/discharge procedures, and requirements to discharge within specific grid cells. NY District Certified Dredged Material Inspectors (DMIs) are required to document each placement trip on the **Transportation and Placement Log Form (**Appendix A) and notify the USACE-NYD. An Inspector checklist is also included with the electronic monitoring software used during each placement trip. A record of each trip checklist is also submitted with other information associated with the placement trip. (Appendix C)

6) Timing and location of ocean placement events (single and/or multiple) are conducted in order to comply with the required Limiting Permissible Concentration (LPC)(40 CFR Section 227.27) at any and all locations in and outside the HARS (after allowance for initial mixing (40 CFR Section 227.29)). Transport distances associated with LPC analysis are estimated with the STFate numerical model. Placement is planned to ensure that LPCs are below allowable levels by the time tidal current transport affected water masses to any exterior HARS boundary.

7) Placement Guidelines that summarize the location of each project placement grid and procedures to be used for placement. (Appendix B).

9) Prohibition on remediation in 4 locations that contain ship wrecks **(See Section 11.2.2)**.

14.1.3. Federal Authorization

In cases where permits are not issued, as is the case with Federal Navigation Projects, the above permit conditions will be incorporated into Remediation Material dredging contract specifications (see MPRSA Section 103 (e)). When USACE vessels conduct the dredging, "permit"-like instructions are contained within the Contract Specifications and/or Work Orders for the project. These conditions are equivalent to permit conditions and will be enforceable under applicable law.

14.1.4. Violation/Enforcement Cases and Corrective Actions

1. If any action takes place which does not conform to authorized activities described in any permit (Contract Specification and/or Work Order for Federal Projects), reauthorization, response letter, remediation requirements, seasonal restriction, and/or remediation operation, the USACE-NYD should be notified immediately by the USACE Certified Dredged Material Inspector (DMI). In cases where activities beyond the scope of those authorized occur, appropriate action will be determined by consultation between EPA Region 2 and the USACE-NYD. The Inspector checklist includes requirements associated with each placement trip. Any item on the checklist

that receives a “NO” answer, meaning that a required procedure has not been followed, or required equipment is not present or operable, requires an immediate telephone call to USACE-NYD for follow-up action.

2. Dredging or remediation activity occurs only with prior USACE-NYD and EPA Region 2 approval. Those projects not in compliance with regulatory requirements will be subject to enforcement action.

3. A DMI must accompany all trips for placement of Remediation Material at the HARS and be present during all Remediation Material placement events in order to certify compliance with the USACE-NYD permit conditions. The DMI is required to complete, sign, and submit a **Transportation and Placement Log Form (**Appendix B**)** for each event.

> a. USACE-NYD has prepared an “Inspector Manual” that describes the duties of DMIs and discusses dredging activities in the NY/NJ Harbor Estuary. The presently used method of becoming certified as a DMI is for prospective Inspectors to study the manual, receive training on the use of scow monitoring equipment and software with another Inspector working onboard a tug, and take a written test administered by NYD. After passing the written examination (scoring at least 80%), candidates are tested on the use of the scow monitoring equipment and software, and if satisfactory ability to operate the equipment and software is demonstrated, they are certified to work on NY District dredging projects as a DMI. A list of all USACE-NYD Certified DMIs can be obtained from the USACE-NYD. These individuals may also be qualified to serve as Marine Mammal and/or Sea Turtle observers.

4. USACE-NYD and EPA Region 2 (and/or their designated representatives), reserve all rights under applicable law to free and unlimited access to and/or inspection of (through permit conditions):

> a. the Remediation Material dredging project site including the dredge plant, the towing vessel and scow at any time during the course of the project.
>
> b. any and all records, including logs, reports, memoranda, notes, etc., pertaining to a specific dredging and Remediation Material placement project (Federal or non-Federal).
>
> c. towing, survey monitoring and navigation equipment.

5. Navigation logs will be maintained for each vessel (tugboat/barge) utilized for remediation activities. These logs should include the method of positioning (RADAR, GPS, D-GPS, Dead Reckoning, or other), accuracy, calibration methods, any problems and actions taken. EPA Region 2 and the USACE-NYD recommend that each tugboat/barge utilized for the placement of Remediation Material at the HARS utilize D-GPS for navigation purposes.

6. If Remediation Material regulated by a specific DA permit issued by the USACE-NYD or Federal authorization is released, due to an emergency situation to safeguard life or property at

sea in locations or in a manner not in accordance with the terms or conditions of the permit or authorization, the master/operator of the towing vessel and/or the DMI shall immediately notify, by marine VHF or cellular telephone, the USACE-NYD of the incident, as required by permit. The USACE-NYD shall copy EPA Region 2 on such notification the next business day. In addition, both the towing contractor and the DMI shall make a full report of the incident to the USACE-NYD and EPA Region 2 within two (2) days. The report should contain factual statements detailing the events of the emergency and an explanation of the actions that were ultimately taken.

7. Results from HARSMP (Section 12) will be continuously reviewed with respect to HARS remediation management practices and permit conditions to determine if any corrective actions or modifications are required.

14.1.5. Data Management: Processing, Evaluation and Interpretation

A. Data collected from HARS surveys are processed and analyzed by the USACE-NYD, EPA Region 2 and/or their respective contractors. These data are used to make management decisions regarding Remediation Material placement operations and permit decisions. In addition, the USACE-NYD, ERDC, and their contractor Science Applications International Corporation (SAIC), have developed a desktop personal computer-driven Geographical Information System (GIS) to better manage the placement of Remediation Material at the HARS. The Disposal Analysis Network for New York (DAN-NY) System allows the USACE-NYD and EPA Region 2 to utilize existing and future field data (bathymetry, side scan sonar, chemistry, biology, etc...) from the HARS to calculate the Remediation Material needs at the HARS and better manage the remediation of the HARS, and monitor the HARS. USACE-NYD has a PC workstation with the DAN-NY System for routine use by NYD and use by EPA Region 2 if necessary.

The system was designed as a data base for most of the information the USACE-NYD is required to collect and is not limited to survey data.

B. Database files containing NY District Certified Dredged Material Inspector reported placement information and automated scow monitoring data are maintained by the USACE-NYD as part of the DAN-NY software system. This information is used to monitor placement activities at the HARS. DAN-NY has the capability to rapidly analyze this data by project, geographic area, or time increment .

The database file contains the following information:

1. Project identification, permit and trip number.
2. Scow volume and material description.
3. Digital photograph of material in scow.
4. Certified Dredged Material Inspector name.
5. Date and time of departure from dredge site and arrival at HARS.
6. Scow draft information.
7. Tug speed and heading during placement.

8. Latitude, longitude, and time of placement.
9. Tugboat identification.
10. Water depth.
11. Endangered species information.
12. Vessel track lines for each placement trip
13. Location of scow door opening
14. Time-series of scow draft

C. A table summarizing remediation activities at the HARS is compiled by USACE-NYD on a periodic basis. The table includes a summary of the total volume of remediation material placed at the HARS, and annual totals during each year, since designation, including the contributions associated with private and Federal dredging projects. The information is provided to EPA Region 2 upon request.

## 14.2 HARS Remediation Management Practices

### 14.2.1. Reporting Requirements

A. Transportation and Placement Logs

i) A record of each voyage involving an actual remediation event at the HARS is received from dredging/towing contractors on a per-trip basis. The Transportation and Placement Log form is electronically completed by the DMI as part of the scow monitoring software. The log forms include all of the placement information listed in section 11.1.5 B, in addition to weather and ocean conditions. An example of the log form is included in Appendix A. The log forms are faxed to USACE-NYD within 2 hours of placement at the HARS. A website is used to observe placement locations within 12 hours of placement. The website includes several view sizes to observe location of placement. These notification systems ensure that the USACE-NYD is completely informed of daily dredging and remediation activities undertaken within the Port of New York/New Jersey.

ii) The dredging/towing contractor also notifies the Captain of the Port (COTP) of New York/USCG for a reference number before each vessel departs the dredging site en route to the HARS. Every trip made under the permit authorization is required to be recorded and endorsed by the master of the tow or the person acting in such a capacity.

iii. Placement of dredged material at the HARS is conducted according to the placement guidelines associated with each dredging project (see example in Appendix B)

### 14.2.2 Remediation Instructions

Specific instructions/requirements for the placement of Remediation Material are contained in the Department of the Army (DA) Permit issued by the USACE-NYD for private dredging project, and within contract specifications and placement guidelines provided to contractors for Federal dredging projects. The HARS is comprises nine Priority Remediation Areas (PRAs); most are 1

square nautical mile in size. The original HARS SMMP stated that placement would be managed to remediate in order of remediation priority, beginning with Area 1 (highest priority for remediation) and ending with Area 9 (lowest priority for remediation) to the greatest extent practicable **(Figure 4)**. However, as previously discussed, several PRAs are being concurrently remediated. Each remediation area will be closed to further placement of Remediation Material (unless additional material is required (See Triggers in Section 13.5) upon completion of remediation activities and demonstration through bathymetry that at least a 1-meter cap (minimum required cap thickness) of Remediation Material has been placed over the entire area). Placement grids are moved as necessary, to evenly spread Remediation Material throughout each remediation area and to minimize mounding.

Placement of Remediation Material in the No Discharge Zone and/or in a 0.27 nautical mile radius around the following coordinates due to the presence of ship wrecks is prohibited:

1. $40^o$ 25.30' W $73^o$ 52.80' N
2. $40^o$ 25.27' W $73^o$ 52.13' N
3. $40^o$ 25.07' W $73^o$ 50.05' N
4. $40^o$ 22.46' W $73^o$ 53.27' N

Priority Remediation Areas (PRAs) Nos. 4, 5, 7, and 8 (located in the vicinity of the southern end of the MDS) contain areas that were capped with one meter of sand in 1993-94 and 1997-98 during Category II capping projects. Monitoring results to date indicate that both the 1993 and 1997 capping project areas remain sufficiently capped. While these areas do not require remediation, the surrounding areas require remediation and will be remediated with at least one meter of Remediation Material. During the remediation process some of Remediation Material may incidentally spread into already remediated portions of PRAs 4, 5, 7, and 8 and may even be placed on the edges of the capped category II mounds.

In addition, in Remediation Areas where water depths are shallower than 68.3 feet MLW, EPA Region 2 and the USACE-NYD may use more than one meter of Remediation Material.

## 15. Remediation Material Testing Requirements

MPRSA 102 (c)(3)(D) requires that the SMMP include consideration of the quantity of material to be placed at the site, and also consider the presence, nature, and bioavailability of the contaminants in the material to be placed at the HARS.

As part of the permitting process, applicants are required to test/characterize the material to be dredged in order to determine that it is suitable for use as Remediation Material in the HARS. Dredged material testing procedures/requirements (including quality assurance requirements) are contained in the following documents:

i. EPA's Ocean Dumping Regulations 40 CFR Part 227, "Criteria for the Evaluation of Permit Applications for Ocean Dumping of Materials"

ii. EPA/USACE 1991, "Evaluation of Dredged Material Proposed for Ocean Disposal, Testing Manual" as amended (otherwise known as the Green Book) **(EPA/USACE, 1991)**.

iii. EPA/USACE-NYD1992, "Guidance for Performing Tests on Dredged Material proposed for Ocean Disposal" (otherwise known as the Regional Testing Manual)**(EPA Region 2/USACE-NYD, 1992)**.

## 16. Anticipated HARS Use and Quantity of Remediation Material to be Placed at the HARS

In addition to the factors above, MPRSA 102 (c)(3)(D) and (E) requires that the SMMP include consideration of the anticipated use of the site over the long-term.

16.1 Anticipated HARS Use

The PRA within the HARS will be remediated by the placement of at least 1 meter of Remediation Material over all areas within the PRA.

16.2 Estimated Quantity of Material Required to Remediate (1 meter cap [minimum required cap thickness]) the PRA within the HARS:

The original version of the HARS SMMP included an estimated total volume to remediate the entire HARS of 40,548,000 $yd^3$. This estimate was a general calculation that did not take material type and characteristics into account, and appears to be low due to the difficulty in providing a uniform thickness coverage. Coarser dredged material does not appreciably spread after placement, resulting in the formation of small mounds; areas between these mounds may be minimally covered, requiring additional loads of dredged material to ensure at least 1m of coverage. For projects with coarse-grained dredged material and red clay, ensuring at least one meter of coverage results in many areas with greater than 1m of coverage.

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## 18. Appendices

Appendix A. Example of a completed USACE Transportation and Placement Log Form

The following page, a single TPL form associated with the Arthur Kill 2 construction dredging project (Federal), was received via fax transmission to NY District. DMIs onboard tugs transporting scows loaded with dredged material complete the log forms electronically. After each trip is completed, the log form is faxed, and the data is transmitted to a central computer and later posted on a website used to monitor dredging projects that involve remediation of the HARS.

# USACE TRANSPORTATION AND PLACEMENT LOG

**Log Number:** 443 **Date (mm/dd/yy):** 8/21/2006

**Project Information:**

**Trip Number:** 443 **Target Cell:** 368 **PRA Cell Number:** 1 **Tow Owner:** GLD&D
**Permit Number:** W912DS-05-C-0003 **Inspector's Name:** Edward G. Clement
**Project Name:** Arthur_Kill_2 **Tug's Navigational Unit:** Trimble AG 132
**SubProject Name:** AKII-HARS

**Tug, Scow and Dredge Information:**

**Tug Name:** Lemmerhirt **Scow Name/Number:** GL502
**Tug Captain:** Bob Peterson **Scowman's Name:** N/A
**Dredge Departed From:** New York

**Loading/Pre-Transit Information:**

**Volume (Cu. yds):** 3500 **Est. Density (lbs/Cu.Ft):** 110 **Percent Rock:** 20
**Time Loading is Complete (hh:mm:ss):** 1:50:00 PM **ETA to Placement Site (hh:mm:ss):** N/A
**Description of Material:** Black, Watery, Mud **Scow Draft Fore (ft):** 18 **Scow Draft Aft (ft):** 20
**Winds at reporting station closest to placement location are presently blowing:** 14 (mph) From The WNW, 000 (Ft) Seas.

**Placement Site Weather Conditions:**

**Wind Direction (from):** NW **Wind Speed (mph):** 5
**Weather Conditions:** 40 % cloud cover Seas flat
**Observed Water Depth (ft):** 78 **Wave Swell Height (ft):** 0
**Visibility (n miles):** 30
**Marine Mammals/Sea Turtles Sighted (Yes/No):** No

**Transit/Placement Information:**

**Time Scow Departed Dredge Site:** 2:30:00 PM **Tug Position Determined By (GPS/DGPS):** DGPS
**Approximate Distance from Scow to Target at time of Discharge (ft):** 0
**Time Scow Arrives at Project Placement Area:** 6:48:00 PM
**Length of Towline at Time of Discharge (ft):** 1056
**Scow Heading (Degrees):** 179 **Estimated Scow Speed (kts):** 6
**Distance from Tug Navigational Antenna to Tugs Towing Bit (ft):** 70
**Direction of Scow Relative to Tugs Towing Bit (Degrees):** 0

**Start Time (DOORS OPEN):** 7:08:56 PM
**Speed (kts):** 6.8
**Heading (Degrees):** 179.70 **GPS/DGPS: Latitude -** 40.41151 **Longitude -** -073.88899

**End Time (Placement is Complete):** 7:09:15 PM
**Speed (kts):** 6.4
**Heading (Degrees):** 178.10 **GPS/DGPS: Latitude -** 40.41096 **Longitude -** -073.88897

**Post Placement Time (DOORS CLOSED):** 7:13:03 PM
**Speed (kts):** 6.9
**Heading (Degrees):** 101.30 **GPS/DGPS: Latitude -** 40.40535 **Longitude -** -073.88628

**Comments:** No marine mammals or endangetred species seen. PU: 120@14:21 120@16:05 117@19:02 Excellent placment in designated cell. Note: "Cell availability feature" is working perfectly now. No wave heights are available in placment area prior to our trip.

Appendix B. Placement guidelines for a HARS remediation project.

The following placement guidelines were used for the 2006 Passenger Ship Terminal dredging project. These guidelines have been developed during the past eight years and have helped ensure that each placement trip to the HARS is conducted successfully.

Placement Guidelines for the 2006 Passenger Ship Terminal Dredging Project

1. The attached placement guidelines will be used for placement of non-rock dredged material within the Historic Area Remediation Site (HARS) (Figures 1 and 2). Scows loaded with more than 6,000 $yd^3$ **must not** be transported to the HARS.

FOR PLACEMENT AT THE HARS:

2. Dredged material **must** be sequentially placed in grid cells 200 feet wide and 300 feet long within a grid comprised of 9 rows of 10 grid cells (Figure 2). All dredged material transportation and placement must be documented using scow monitoring equipment and software (see attached description of system requirements).

   i. Sequential placement within grid cells **must** occur as directed by the scow monitoring software onboard the towing vessels used during the project.

   ii. Vessel speeds **must** not exceed 2 knots during placement, weather and sea conditions permitting.

   iii. To help ensure proper placement within the designated placement grid, and reduce the need for loaded scows to return to the dredging site, the following placement protocol **must** be followed:

      a) Prior to leaving the dredging site, scows **must** be inspected to ensure correct operation of mechanical features. Scows **must** also be inspected for the presence of any conditions that may cause navigation problems. The scow radio-control system (if used on the project) and scow monitoring systems **must** be inspected for correct operation. A hand-held laser range finder **must** be carried aboard each towing vessel. Range finders shall be tested prior to departure from the dredge site. If any problems with the scow, radio-control system, scow monitoring systems, or range finder are encountered, corrections **must** be made before offshore transport of the scow may proceed. However, when the primary scow monitoring systems (PSMS) are malfunctioning, dredged material may be transported from the dredging site if scow monitoring contractor personnel are onboard, or are communicating with the New York District (NYD) Certified Inspector of Open Water Placement of Dredged Material (NYD Inspector, NYDI) to fix/service the equipment. Alternatively, the backup scow monitoring system (BSMS) may be used while problems with the PSMS are being corrected. However, the BSMS is considered to be emergency backup equipment and may only be used on two consecutive trips offshore. The BSMS is not to be used as a long-term backup to the PSMS.

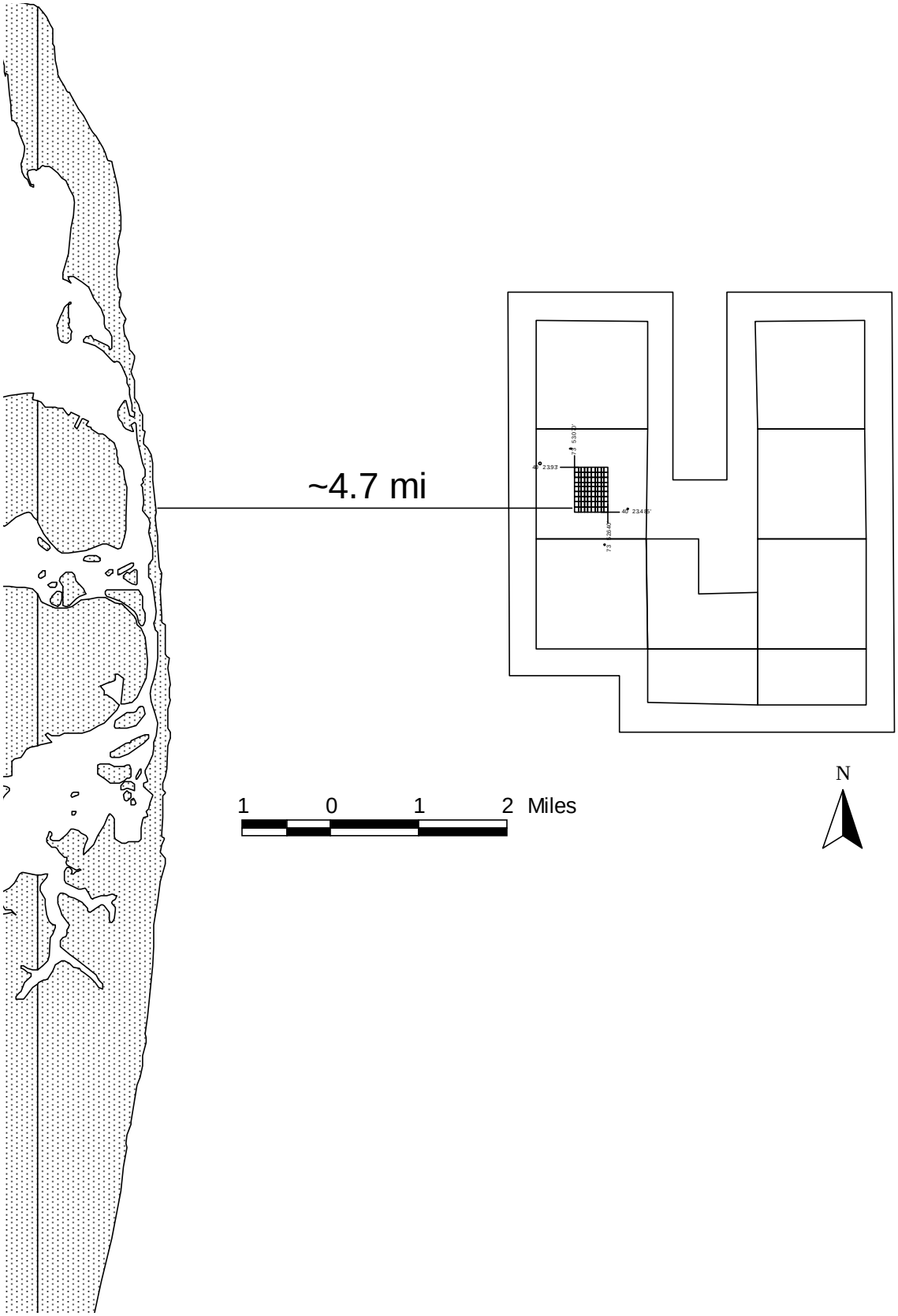


Figure 1. Location of HARS and placement grid offshore of New Jersey.

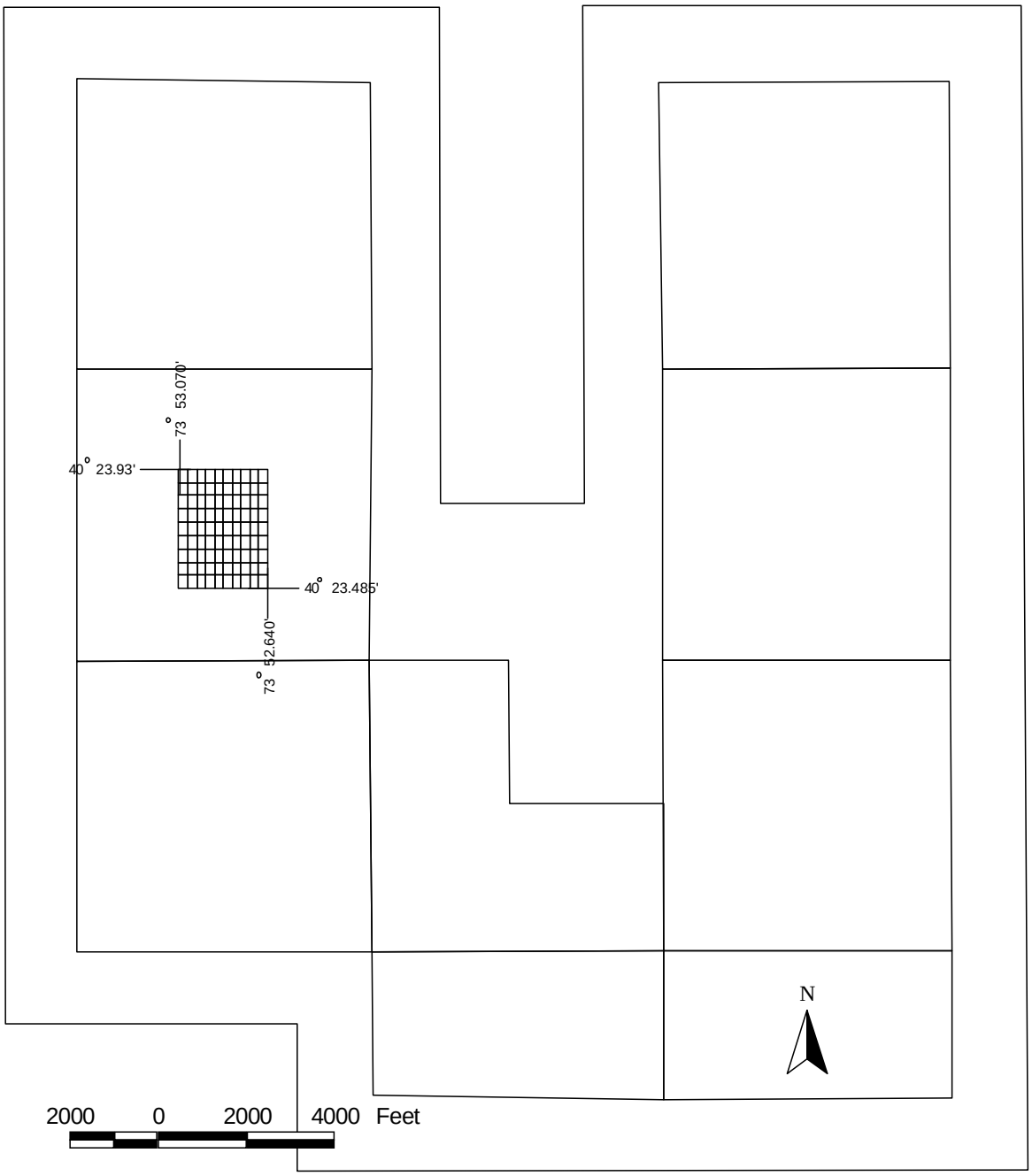


Figure 2. Details of HARS placement grid.

**b) A scow loading table for the scow being towed on the trip to the HARS must be provided to the NYDI working aboard the towing vessel. The estimated dredged material density must be provided to the NYDI to use with the loading table to estimate the volume of dredged material within the scow.**

c) Scows **must** be monitored for possible leaks. After leaving the dredging site, the scow draft count values **must** be recorded from the PSMS on the transportation and placement log form. If the counts begin to significantly change during transport, either leakage of dredge material from the scow may be occurring (counts decreasing), or the scow's hull may be taking on water (counts increasing). However, depending on the specific location of a leak, the opposite trend may occur, according to the direction of a list caused by a leak. Scows suspected of leaking **must** be inspected. If any leaks are found, they **must** be repaired prior to using the scow again.

d) Scows **must** be brought to the designated grid cell of the HARS placement grid developed for each dredging project using the DGPS (Differential Global Positioning System) navigation systems of the tugboat and scow. Scow position will be monitored by the PSMS onboard the tugboat. Placement in the appropriate grid cell will be documented by the NYDI using the PSMS while the scow position and draft information are monitored automatically by the PSMS.

e) If the PSMS does not show reliable DGPS coordinates in the vicinity of the HARS, the tugboat DGPS and BSMS **must** be used to locate the placement cell and estimate the scow position during placement. Length of towlines **must** be measured using a handheld laser range finder. The bearing to the scow from the towing vessel course **must** also be noted at the time of placement. Tow lengths **must** be less than 200 feet unless ocean/weather conditions require longer lines for safe navigation. Vessel navigation during placement **must** be maintained in the direction of the maximum grid dimension to the greatest extent possible. Perimeter grid cells must not be used when the PSMS is not functioning. If the designated placement cell is located along the perimeter of the grid, the adjacent cell located closer to the grid center will be used. The NYDI **must** record the following information if this option is used:

1) coordinates of the tug at the start and end of placement
2) length of tow line (distance from tug stern to scow bow)
3) estimate of lateral displacement of scow from target longitude

f) Placement **must** only occur at the HARS when reliable GPS coordinates are displayed by navigation systems onboard the towing vessels or scows being used at the HARS.

g) If the PSMS fails after leaving the dredging site, the scow **must** not be used again until a fully operational PSMS is installed. If scow monitoring contractor personnel are onboard, or communicating by telephone with the NYDI, to correct problems, or the BSMS is functional, offshore transport may occur. However, the BSMS is considered to be emergency backup to the PSMS, is not to be routinely used for offshore placement, and may only be used on two consecutive offshore placement trips.

h) If the PSMS is not functioning properly, placement **must** occur within the grid only if the scow and towing vessel are both within the grid at the time scow doors are opened.

i) If a situation arises that requires emergency dumping of dredged material, all reasonable efforts to dump outside of navigation channels **must** be made.

j) If radio communication with the scow is lost, preventing operation of radio-controlled scows, a person **must** board the scow to either fix the problem or operate the scow. Persons must only ride aboard scows certified for passengers by the U.S. Coast Guard. Extreme care must be utilized when boarding a scow at sea. Anyone on a scow **must** have at least two working radios. Voice contact, through radio or direct communication, **must** be maintained with the scowman while riding aboard the scow. Scow opening **must** only occur when a direct, voice command has been given to the scowman, or radio communication with radio-controlled scows is maintained. If the radio control system can not be fixed, the scow **must** be towed to the designated placement location and manually discharged following steps (d) through (f). If the scow's engine can not be operated by the radio-control system, and the scow is boarded to attempt to fix the engine, the scow **must** be located at the designated placement position if the scow's engine is started. Past use of radio-controlled scows revealed that manually starting a scow's engine after a failed radio-controlled engine start could cause the "scow open" command to be completed, causing the scow to dump at the location of engine startup. Any problems with a radio control system **must** be fixed prior to subsequent use of the scow.

iv. Voice contact, through radio or direct communication, **must** be maintained with the scowman (if used) for the duration of trips. Scow opening **must** only occur when a direct, voice command has been given to the scowman, or, in the case of radio-controlled scows, direct radio communication with the scow is maintained. A backup radio **must** be onboard all manned scows. Hand signals **must never** be used to direct the scowman regarding scow opening/closing. Radio checks with the scowman **must** be performed prior to departing the

dredge site and enroute in the vicinity of the Verazanno Narrows bridge. Manned scows **must not** be transported to the placement location without at least two working modes of radio communication. Radios **must** have adequate power sources and extra sets of batteries **must** be kept with any battery operated radios. NYDIs will note in their logs the status of radio checks made prior to site departure and enroute to the placement location, in the comments section of the log form.

v. Scows containing dredged material **must** not be towed from the dredging site for ocean placement unless all of the following items are present and fully operational aboard the towing vessel:

- legible copy of the permit or contract specifications, as related to scow loading, transport, and dredged material placement;
- A legible copy of the Placement Guidelines and placement grid map received at the pre-construction meeting, or any additional instructions or guidelines as related to scow loading, transport, and dredged material placement
- PSMS and BSMS*, including bin level sensor on scow
- DGPS navigation system aboard tug
- Radio-control system for scow operation (if scowman is not used)
- Radio and backup radio system aboard scow (if scowman is used)
- Hand-held laser range finder aboard tug
- Fathometer aboard tug
- Digital camera capable of recording images with 1200 x 1600 pixel resolution
- Strobe light capable of illuminating scows for acquisition of legible photographs during low-light conditions
- a fully operational fax machine must be onboard the towing vessel for use by the NYD Inspector within 2 hours of each placement event at the HARS
- an 8” – 12” wide protractor with degrees printed or embossed on the curved surface
- 4” – 8” long dividers for scaling distances off of maps and charts
- scow loading tables for each scow used to transport dredged material
- a fully operational, handheld laser range finder with a range of at least 1000 feet, and manufactured no earlier than 2000, **must** be available for use by the NYDI at any time. Spare batteries for the laser range finder **must** be available at all times.
- access to the towing vessel DGPS, fathometer, and radar
- fully operable personal cellphones in possession of each NYDI at all times with active phone numbers unique to each phone available for placing and receiving calls at all times
- suitable location for completing paperwork associated with NYDI duties
- a fully operational fax machine for use by the NYDI

- Full compliance with any other contract or regulatory requirements related to dredged material placement

* If the PSMS is not functioning properly at the time a scow is ready to be transported from dredging site, the BSMS may be used while the PSMS problems are being corrected.

vi. Scows containing dredged material **must not** be towed from the dredging site for ocean placement unless ocean/weather conditions are forecast to allow safe and accurate placement of dredged material within a designated placement grid.

3. Particular care **must** be used when placing dredged material within the HARS grid due to proximity to historic shipwrecks. Dredged material **must** never be placed in historical shipwreck buffer zones (0.27 nm radius) or on historic shipwrecks. Shipwreck positions are indicated on the PSMS computer screen.

4. Dredged material **must** never be placed in the HARS no-discharge zone, HARS buffer zones, anywhere outside of the HARS boundary, or anywhere outside of the designated grid.

5. Instrument stations or other devices may be deployed at the HARS at any time. Each station would have a 250-foot radius buffer zone associated with it. If such instrument stations or other devices are installed during the dredging project, notification will be provided along with station locations. Dredged materials must never be placed anywhere within buffer zones associated with such stations.

6. Scow monitoring equipment, placement guidelines, and other aspects of dredged material placement at the HARS may be changed. Notice of any changes will be provided to the dredging contractor for implementation as soon as practicable.

7. Transportation and placement log (TPL) forms will be completed electronically or by hand within 30 minutes of placement at the HARS. TPL forms **must** be faxed to NY District (212-264-1463) within 2 hours of placement at the HARS. If a fax transmission can not be completed to this number, logs **must** be faxed to (212) 264-4260. Copies of TPL forms **must** be signed by the NYDI after completion of each trip and placed in a file/folder for submission to NY District after project completion or when the NYDI permanently or temporarily discontinues working on the project.

8. Corps Disposal Inspectors (NYDIs) who have been certified by NY District, but have not worked on a NY District dredging project as a NYDI, must be accompanied by scow monitoring contractor personnel during at least one of the first two trips the NYDI works on the project and must be accompanied by a NY District certified NYDI who has been working on the project, or scow monitoring contractor personnel, during the other trip of the first two trips the NYDI serves as the NYDI. NYDIs who have previously worked on at least one NY District dredging project, but who have not worked on this project, must be accompanied by scow monitoring contractor

personnel during their first trip serving as a NYDI on this project.

9. Failure to adhere to the specifications discussed in these placement guidelines may result in a monetary fine or other punitive measures.

10. The placement grid and guidelines discussed in the preceding paragraphs will be used for up to 400,000 $yd^3$ of dredged material. Additional placement locations and possible changes in the placement guidelines may be provided after dredging begins.

11. To help ensure that dredged material is transported and placed at the HARS in accordance with the guidelines described above, the attached checklist has been prepared. Items in the checklist **must** be reviewed by the NYDI at the dredging site, while underway, and at the HARS. Each item that is pertinent to the trip **must** be answered with a "YES" or "NO" answer, along with other information specific to a checklist item. Any item on the checklist that receives a "NO" answer **must** be reported immediately to the NY District at (917) 790-8427, or x8538, and a dredging contractor representative not onboard the towing vessel. If the "NO" answer is related to the scow monitoring systems, the scow monitoring contractor **must** also be notified immediately at _____. Each placement trip **must** use a checklist, to be completed by the NYDI working aboard the towing vessel. Checklists **must** be signed and dated by the NYDI and placed in a file. All original, signed checklists associated with this project **must** be submitted to the NY District on a weekly basis for the duration of the project. Checklists **must** be hand delivered or mailed to:

Dr. Stephen C. Knowles
U.S. Army Corps of Engineers, NY District
Dredged Material Management Section
Room 1937, CENAN-OP-SD
26 Federal Plaza
New York, NY 10278-0090

12. Original copies of TPL forms for each trip to the HARS, signed and dated by the NYDI on duty during each trip, **must** be submitted to Dr. Knowles at the above address at the completion of the project.

13. Switching of tugs once an ocean placement trip has begun **must** not occur. Towing of any scow loaded with dredged material must be monitored by the scow monitoring equipment/software and documented by a NYDI riding aboard the towing vessel.

14. Failure to adhere to the specifications discussed in these placement guidelines may result in revocation of the dredging permit and/or a monetary fine.

15. If there are any questions pertaining to the guidance given in this document, or additional clarification of procedures is needed, please contact Dr. Stephen Knowles at (917) 790-8538, Mr. Alexander Gregory x8427, or Mr. Monte Greges at x8428.

Appendix C. Inspector Checklist

The following Inspector Checklist is from the 2006 Passenger Ship Terminal dredging project (permitted). The three sections of the checklist are completed by the DMI during three phases of transportation and placement. Most checklist items relate to the dredging site. Ensuring that all required equipment and procedures are followed prior to departure from the dredging site helps ensure safe and accurate placement of dredged material at the HARS.

DREDGING PROJECT: 2006 PASSENGER SHIP TERMINAL
TRIP NUMBER: _____
INSPECTOR NAME: _____

INSPECTOR SIGNATURE: _____DATE: _____

Answer YES or NO to the following questions. Circle other choices and/or fill in blanks as appropriate. Any item on the checklist that receives a "NO" answer **must** be reported immediately to NY District at: (917) 790-8427, or x8538, and a dredging contractor representative not onboard the towing vessel. If the "NO" answer is related to the scow monitoring systems, the scow monitoring contractor **must** also be notified immediately at _____. Items receiving "NO" answers **must** be indicated on the TPLF using the letter-number code next to each item description and described on the TPLF comments section. A supplemental report **must** be filed and faxed to NY District at (212) 264-1463 if space on the TPLF is not sufficient to explain the discrepancy.

**PART A. DREDGING SITE**

A1___ A legible copy of the contract specifications, as related to scow loading, transport, and dredged material placement, is in possession of the NYDI.

A2___ A legible copy of the Placement Guidelines and placement grid map received at the pre-construction meeting, or any additional instructions or guidelines as related to scow loading, transport, and dredged material placement, is in possession of the NYDI.

A3___ The scow being used to transport the dredged material is mechanically sound, does not leak, and has no visible damage that may cause leaking.

A4___ A regularly used scow was used, no backup scow was used.

A5___ A scow loading table for the scow being towed is aboard the towing vessel and available for the NYDI to use.

A6___ An estimated dredge material density has been provided by the dredging contractor. Estimated density is: _____

A7___ The material being dredged has been observed by the NYDI for general characteristics (grain size, color, consistency). Majority of material is dry/thick/watery, color:_____, mud/sand/gravel/rock.

A8___ For scows loaded with any rock (rock is defined as any stones greater than 2.5 inches in diameter), the estimated rock percent has been recorded on the TPL form.

A9___ An estimate of the volume of material in the scow has been calculated by the NYDI using the scow loading table and recorded on the TPL form.

A10__ Scow contains less volume of dredged material than the maximum volume allowed for placement during a single trip.

A11___Digital photograph of loaded scow has been taken such that the characteristics of the dredged material, and the level of material in the scow, are documented within the photograph.

If a scow contains a volume of dredged material greater than the maximum volume allowed for placement during a single trip, the volume **must** be decreased below the maximum volume before the dredged material can be transported away from the dredge site.

A12__ The scow monitoring systems (PSMS and BSMS) are fully operational and are functioning. Any scow monitoring system malfunctions **must** be reported **immediately** to the scow monitoring contractor _____. Transportation vessels are not allowed to leave the dredging site with any dredged material if a PSMS is not fully operational. However, if scow monitoring system contractor personnel are onboard the transporting vessel to service the equipment, or in communication with the NYDI via cellphone or radio, the vessel may depart from the dredging site while malfunctions are being repaired/corrected. Alternatively, if the BSMS is functional, the scow may be transported from the dredging site. If the PSMS is not functional, the BSMS may only be used on two consecutive offshore placement trips.

A13__ The scow draft pressure value, as displayed by the PSMS system, has been recorded on the TPL form.

A14__ A fathometer is fully operational, functioning, and installed on the transporting vessel.

A15__ A radio onboard the transporting vessel is operable and can receive NOAA marine weather forecasts and ocean conditions.

A16__ Current and forecasted marine weather and ocean conditions at the designated placement location have been monitored on the radio and will allow safe and accurate placement of dredged material. Winds at a reporting station closest to the placement location are presently blowing _____ from the ____, with _____ ft seas. Winds forecast for the placement location are _____ from the ___, with ____ seas.

A17__ DGPS navigation system is fully operational, functioning, and installed aboard the transporting vessel.

A18__ A radar system is fully operational, functioning, and installed aboard the transporting vessel.

A19__ Radio-control system for scow operation (if scowman is not used) is fully operational and functioning.

A20__ Radio and backup radio system, for communication between scows and towing vessels, are aboard scow (if scowman is used), are fully operational and functioning.

A21__ Hand-held laser range finder, manufactured no earlier than 2000, with at least a 1000 foot range, is aboard towing vessel, fully operational and functioning, and available for NYDI use, along with a set of backup batteries.

A22__ A fully operable cell phone that can send and receive calls is in the possession of the NYDI onboard the towing vessel.

A23__ A protractor is available for use by the NYDI aboard the towing vessel.

A24__ A compass, for map/chart distance scaling, is available for use by the NYDI aboard the towing vessel.

A25__ An up-to-date nautical chart that includes the placement area is available for use by the NYDI.

A26__ NYDI is provided full access to fathometer, radar, vessel DGPS, and any other equipment/information necessary to conduct NYDI duties.

A27__ Radio and backup radio checks with the scowman's radios has been performed with no problems detected, if a scowman is used.

A28__ Full compliance with any other contract or regulatory requirements related to dredged material placement has been met.

A29__ Time of departure from dredging site has been recorded on the TPL form.

A30__ All other information relative to the dredging site has been entered into the TPL form.

**PART B . ENROUTE TO THE PLACEMENT LOCATION**

B1___ In the vicinity of the Verazanno Bridge, radio and backup radios aboard the scow have been checked to ensure they are both functioning, if a scowman is used.

B2___ Scow draft is being monitored with PSMS.

B3___ If the NYDI is also a NMFS certified marine mammal/endangered species observer, observation and appropriate reporting is conducted.

B4___ Scow draft pressue varies less than 20 points, or 1.5 feet of draft, from the value at the dredge site.

B5___ A gradual increase or decrease in scow draft pressure values (or actual scow draft) is not observed.

B6___ If visible, scow does not appear to be listing.

B7___ Water behind scow has been observed, if possible, to ensure that no turbid water plumes are present.

B8___ Towing vessel DGPS and scow DGPS positions agree using a fixed reference position (channel marker, buoy, etc.)

B9___ Marine weather and sea conditions present and forecast to be present at the placement location are periodically monitored. An updated marine forecast may result in returning to the dredging site to await safer conditions.

**PART C. IN THE VICINITY OF THE DESIGNATED PLACEMENT LOCATION**

For placement at the HARS:

C4___ Scow radio control equipment operates without any problems.

C5___ Placement occurred in correct grid cell and was coordinated with towing vessel crew.

C6___ Scow draft information immediately prior to scow door opening has been recorded on the TPL form.

C7___ TPL form was completed using the scow monitoring system, or by hand if the scow monitoring system malfunctions, within 30 minutes of scow door opening.

C8___ Scow monitoring equipment, transportation vessel navigation equipment, and all other equipment related to placement of dredged material worked without any problems.

C9___ All activities associated with placement of dredged materials appeared to be conducted in a safe manner.

C10__ Nothing occurred that may have resulted in incorrect placement of dredged material.

C11__ TPL form and any supplemental reports faxed to (212) 264-1463 within 2 hours of scow door, or hopper bin, opening.

C13__ A copy of the TPL form has been signed by the NYDI and placed in a file/folder to become part of the permanent record of the trip. All signed TPL forms **must** be submitted to NY District when offshore transport of dredged material associated with the project ends, or when the NYDI finishes working on the project.